iPRAY: UNDERSTANDING THE RELATIONSHIP BETWEEN DESIGN AND

USE IN CATHOLIC AND ISLAMIC MOBILE PRAYER APPLICATIONS

A Dissertation

by

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ABSTRACT

This dissertation examines the relationship between religious mobile app design and use in Catholic and Islamic contexts. Understanding this relationship is important because it provides a clearer picture of how mobile technology is being integrated into social life, how religious practices are evolving as they are engaged in new technological environments, and how different technological and religious affordances create a mobile space for religious practice. This dissertation uses two methods to examine both design and use of Catholic and Islamic prayer applications. First, 65 Catholic and Islamic prayer app descriptions and the apps themselves were textually analyzed to identify and explain what technological and religious affordances were present, and how those affordances were combined in different ways to create three main approaches to prayer app design. Second, a Catholic prayer app and an Islamic prayer app were chosen for an app user test, which revealed data about how participants were engaging and understanding prayer apps at the time of app use.

Key findings from the textual analysis phase of the dissertation include: developers' use of traditional religious authority, such as pastors or *imams,* and algorithmic authority within app descriptions to justify the authenticity of their apps; a list that identifies and explains what technological and religious affordances were present within the apps themselves; and how developers combined these affordances that reflected a translation design approach, a mobile environment design approach, and a multi-purpose religious app design approach. Key findings from the user-testing phase

of the dissertation include: an engagement with technological and religious affordances that are indicative of the translation design approach; the importance of reminders and alert features to provide a way for users to micro coordinate their religious lives; a lack of engagement with features that provide users a way to share prayer app content; and a negotiated and complex framing of app use for religious practice.

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The data analyzed for Chapter IV was identified and collected from the Network for New Media, Religion and Digital Culture Studies.

All other work conducted for this dissertation was completed by the student independently.

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CHAPTER I

INTRODUCTION

The ubiquity of mobile phones throughout the developed world has touched many aspects of modern life, including religious life. Religious mobile applications (apps), or computer programs used on mobile devices for religious purposes (Campbell, Altenhofen, Bellar, & Cho, 2014), are proliferating in digital app stores and range in price from free to upwards of $30. Individuals, religious organizations, and software companies develop religious apps. There are many types of apps for a variety of religions including the major world religions of Christianity, Islam, Judaism, Buddhism and Hinduism, to smaller religions such as Wicca, Bahà'í, Jainism and others. Apps within these religions can be used to read and study sacred texts, such as the Torah and Quran, to have access to different types of prayers and tools with which to pray, and to observe other religious rituals or guidelines, such as finding kosher restaurants or casting a spell (Campbell et. al, 2014).

With a variety of options available to religious users, apps have the potential to create new religious practices as some individuals and communities move from, or combine, religious engagement with offline and online technologies. Religion and media scholars who focus on digital technologies have noted shifting and evolving religious practices in online environments (Lövheim & Campbell, 2017). For example, studies have focused on the way ultra-Orthodox Jews use the internet to expand their influence, which also creates tension and change in how the group has traditionally formed

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communal boundaries (Golan, 2012). Other scholars have noted how religious groups reshape technology to fit their needs, such as koshering the cell phone (Campbell, 2010), and how online church communities create digital worship rituals that in turn affect offline practice in physical churches (Hutchings, 2012). These studies point to a complex relationship between technology and religion and lay the groundwork for understanding how individuals and communities may use apps to create new religious practices in the mobile digital context.

Additionally, there are few published studies that look specifically at religious apps. Of those available, two focus on mapping the field (Campbell et. al, 2014; Wagner, 2012), a few investigate the design and development of religious apps (see Torma & Teusner, 2011); and a handful engage with app users (Bellar, 2016; Hutchings, 2015; Lechebusch, Kowalewshi, Lidynia & Ziefle, 2015). None of the published studies found specifically examine the *relationship* between religious app design and religious app use. It is important to understand how religious mobile applications are designed to provide different ways for individuals to learn about and explore religious practices in a digital, mobile context. It is also important to investigate how religious users actually engage these apps and the meaning they attribute to digital religious practices. Therefore, this study highlights the understudied phenomenon of religious mobile apps and their users.

Religious apps, as mentioned earlier, include those that focus on one of the most common religious practices: prayer. Mobile prayer apps have been identified as one of the main categories of religious apps in the Apple App Store and are defined as those in which users listen to, type, or otherwise engage in communicating messages to a

monotheistic deity (Campbell, Altenhofen, Bellar, & Cho, 2014). No published study at the time of this research looked specifically at prayer apps. Therefore, this study will focus on prayer because it is a common religious practice and because prayer apps have been identified as a prominent group within available religious apps in the Apple App Store. Prayer app practices can be facilitated through listening to audio prayers, typing in prayers and prayer requests, engaging in structured prayer (i.e. praying the Rosary), or developing a private, personal prayer practice (Campbell et. al, 2014, p. 164). While the authors acknowledge that prayer is not always communicating with a monotheistic divine being, they noted that most of the apps in the sample that could be considered prayer to a polytheistic deity were substantial enough to warrant their own meditation/focus category.

Therefore, this study investigates religious mobile prayer apps specifically and contributes to three areas of study: mobile communication, digital religion, and technological affordances. First, mobile communication approaches aimed at understanding human engagement with mobile phones and their disruptions (*see* Ling, 2004) and integration into the normal social patterns of life (*see* Ito et. al, 2005; Wallis, 2013) provide a framework for this research. In the same way that mobile phones cause "social turbulence" by interrupting everyday practices (Ling, 2004, p. xv) (e.g. passing time while riding the bus or contacting friends to set up a meeting), religious apps have the capability of interrupting everyday religious practices. That is not to say that they cause problems, but rather that apps have the potential to intercede in established religious practices. While religious app use may initially cause a disruption of social

routines and possibly of individual religious practice, we have seen from past scholars that the relationship between mobile technologies and society are negotiated within social life (Ito et. al, 2005; Wallis, 2013). For some users, the mobile app's disruption of religious practice may prove too arduous and the religious individual may reject the new technology. For others, they may see the technology as useful and accept it as is and integrate it into the everyday religious life. Still others may see some aspects of the technology as problematic and some as helpful: in these cases the user may reshape the technology to fit into their everyday lives in specific ways. These three approaches to negotiating technology use – rejection, acceptance, and reshaping – are a part of the main premise of the Religious Social Shaping of Technology, which is also used as a guiding framework for this study's assumptions about the relationship between technology and society (Campbell, 2010) as discussed in a subsequent section.

Studies on mobile apps also provide a background for understanding both design and use. Researchers focused on design have defined apps as "…a translation device, enabling communication between the user interface and the hardware by a specific protocol," (Flueckiger, 2012, p. 178). This definition focuses on the hardware and software of mobile apps which result in app studies that tend to focus on specific technological aspects such as web browsing (Chen, 2007) and engineering issues (Wasserman, 2010). However, there are other studies that speak to social concerns including healthcare apps (Nystrom, Asuzu, Amin, Schindler, & Wira, 2015) and location-based services (Pirker, Gutl, Weiner, Garcia-Barrios, & Tomintz. 2014). This

study fits within the second category as it looks as social and cultural practices associated with religious mobile apps.

Second, this research contributes to the field of digital religion. Digital religion is defined as a "framework for articulating the evolution of religious practices online which are linked to online and offline contexts simultaneously," (Campbell, 2012b, p. 1; Campbell, 2016). Digital religion consists of two areas of inquiry: first, "online culture" that includes "traits of interactivity, convergence, and audience-generated content" as well as mobility, which this research argues; and second, "offline religion" which consists of "patterns of belief and ritual tied to historically grounded communities" (Campbell, 2016, p. 17). Previous literature in digital religion studies has explored the relationship between technology and religion by focusing on religious authority (Cheong, 2012), religious communities (Campbell, 2012a), and the authenticity of religion practiced in digital spaces (Wagner, 2012). Early studies focused on utopian and dystopian views of online contexts by describing the potential impact technology would have on religious understanding (Campbell, 2012a, p. 8). As the field progressed, scholars turned to exploring internet technologies, and actual users who practice religion online, developing theoretical and methodological modes, and focusing on how online and offline contexts were becoming less distinct and more integrated (Campbell, 2012b). This study focuses on religious mobile app design and use and contributes to the field by exploring the continuously blurring lines between online, offline, and mobile contexts.

Within the framework of digital religion, there are a limited number of studies that focus on religious apps, although interest in the area is increasing (see Campbell et.

al, 2014; Hutchings, 2014; Wagner, 2012). In most religious app studies that fall under the framework of digital religion, conclusions are typically drawn only from content analysis of specific apps and focus on the technological elements and religious content. For instance, some researchers have used app analysis to explore how inherent app features speak to religious culture (Torma & Teusner, 2011), while others have examined a large sample of religious apps in order to make general claims about what is being offered through the Apple App Store (Campbell et. al 2014). There are very few studies in this area that collect data specifically from app users themselves. Of the published studies of religious apps available, only three gathered data from actual users engaging these apps and found various interactions of apps with religious identity (Bellar, 2016), various positive and negative effects of Bible app use (Hutchings, 2015), and feelings of excitement and hesitation for a wholesale adoption of mobile technology into religious life (Richardson & Pardun, 2015).

Third, this study uses the concept of *affordances* (Gibson, 1977) to describe the ways in which technological design elements enable, restrict, and sometimes restructure, the possible and/or perceived actions users can take through the app (*see* p. 30-35 for a more complete discussion). Therefore, the goal of this dissertation is to explore the manner in which mobile app affordances (i.e. such as setting an alert or reminder, or listening to audio) are understood and used by developers to design apps, as well as how users understand and actually engage with app affordances. This study also uncovers the way technical affordances are combined with religious content to create religious affordances that become central to user app engagement. Analyzing specific religious

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app content and user interfaces, and looking at what users actually do with religious apps clarifies the relationship between app design and use by illuminating the role of both technological and religious affordances. While the term *affordances* can point to all of the different possibilities and constraints the design allows, in this study it specifically focuses on developers' intended actions that are made possible or constrained through app design (i.e. content and structure). Additionally, the term *religious affordance* is delineated by, and will be developed through, the findings of this research.

In summary, this research draws into conversation mobile communication studies, digital religion, and literature on affordances coming out of design studies. It seeks to make two noteworthy contributions. First, on a scholarly level, it addresses the clear need for research that focuses on user practices in conjunction with studying apps as text. Most religious app research relies on the text (i.e. the app) in order to draw conclusions about how it is being used. However, even though apps make certain actions possible, those possibilities do not necessarily dictate the user's actual app engagement. Therefore, the contribution of this research adds to our understanding of prayer app design by pushing the focus of research from the text to user engagement, and specifically at the *relationship* between the two. Second, on a societal level, this research expands current knowledge on the role mobile media play in influencing users in society today. In more concrete terms, mobile media are known to disrupt social situations, including those situations when religious practice is designed for and used within a mobile context. Acknowledging the need to focus on mobility as a unifying feature of new media technology design and use, which is concerned with how offline information

and practices are translated into mobile contexts (Boase, 2013), this dissertation explicates how technological affordances of app design are combined with religious content to create new modes of religious engagement. This contributes a more complete picture of the relationship between design and use, which is crucial for our understanding of relationship between technology and society as a whole. As a result, studying mobile apps in religious contexts can inform future research in various cultural contexts. New media research, of which this study is apart, should not just contribute to the conversation but also push the field forward. Therefore, this study, while also analyzing apps to reveal the way religious actions are designed into the app, directly engages religious app users *at the time* they encounter the app and with special attention to the way the design offers unique religious understandings and practices.

Theoretical Framework

In addition to contributing to the fields of mobile communication, digital religion, and affordances, this research also draws from and contributes to the Religious Social Shaping of Technology theoretical framework (Campbell, 2010). The Religious Social Shaping of Technology (RSST) is used to explicate both the theoretical assumptions of this study and how religious communities and individuals negotiate technology use. RSST is a theoretical method that argues the need to examine religious groups' specific historical and cultural interactions with media in order to understand current negotiation processes with new forms of media. These negotiation processes, in which groups accept, reshape, or reject emerging media, result in communal framing about the larger

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role of media within the group as a whole. RSST provides researchers with a four-layer theoretical framework to help them understand how a religious communities' decision-making regarding media is informed by the specific religious communities' history and traditions, core beliefs and values, negotiation with technology, and communal framing of technology use (Campbell, 2010). While the four-layer analysis approach is not strictly applied in this research, the theoretical assumptions of RSST, which point to a reciprocal relationship between religious groups and technology, inform this research. This outlook that religious groups actively use and shape technology so it compliments and supports their religious beliefs, and does so in relation to certain historical, communal and value related priorities, underscores the importance of carefully contextualizing and interpreting religious decision making about technology within a broader framework than is often considered in some work. RSST is based on specific assumptions about the relationship between technology and religion as well as provides theoretical understandings about how religious communities and individuals adopt and use technology.

The Religious Social Shaping of Technology approach builds upon the Social Shaping of Technology framework and is specifically used within religious contexts (Campbell, 2010). A reframing of the SST approach is necessary because of unique "moral economies" of religious communities (Campbell, 2010, p. 58). The following section will explicate the main assumptions of SST that are adopted by RSST. Then, a review of RSST will show how religious communities and individuals approach technology based upon their religious understandings and practices.

SST assumptions on the relationship between technology and society. SST

was developed as a response to technological determinism, which posits that technology

determines the shape of society (Campbell, 2010; MacKenzie & Wajcman 1985, 1999;

Williams & Edge, 1996). SST, however, views the relationship between technology and

society as reciprocal: technology impacts and shapes society, but society also impacts

and shapes technology. To contextualize this to mobile communication and app studies,

this study takes the view that mobile technology and app affordances can shape the

religious uses that it also mediates. At the same time that technological affordances

mediate religious practice, religious users still maintain the agency to employ app

affordances in ways not necessarily intended, and therefore reshape the technology to

meet their specific needs. Reality in this approach, then, is viewed as a social

construction. Users are not forced to adhere to the intentional uses of the app but can

either accept them as they are, reject them, or negotiate with and reshape the affordances

of the app to meet their specific needs (Campbell, 2010).

Interpretive flexibility is another central presupposition of SST. As Campbell

(2010) states "…choices are inherent in the design and development of technological

innovations," (p. 50). Looking at apps, their design, and their specific affordances

provides insight about the choices designers have made and how those choices reflect

the ways in which apps may shape user experiences. These choices are made within the

context of interpretive flexibility. Howcroft et. al (2004) point out that there are no right

or wrong choices in these processes; there are just different choices. Based upon the

interactions of different app designs with different types of users there could be myriad

different outcomes. For example, a developer working on a Catholic prayer app may be influenced by the traditional Rosary and develop an app that allows users to turn virtual rosary beads as they pray. A developer working on an Islamic app may include a compass to point the person praying in the right direction as well as provide audio cues to say the right words and phrases for the different prayers of the day. Neither app design is right or wrong, rather their construction is based upon the interpretive flexibility of the groups involved in the design as well as the multiplicity of choices that can be made and implemented.

Therefore, SST provides a social constructionist framework within which to study designers and users of religious mobile apps. It provides important concepts such as inherent design choices and interpretive flexibility that will help situate and analyze the different approaches to app design as well as different user approaches with app engagement. However, the SST framework is limited in that it does not overtly situate this study within its unique religious context. Therefore, an understanding of the Religious Social Shaping of Technology is needed in order for a more thorough understanding of the interaction between religion and app design as well as religion and new media.

RSST's four-layer analysis. It is important within the RSST approach to comprehend the *history and traditions* of religious communities' engagement with new technology as it may influence the design and use of technologies in the present. The RSST framework also takes the *core beliefs and patterns,* or the everyday religious lives of the individual or community, into consideration. These beliefs and patterns form the

basis for how users will evaluate whether or not apps fit into their everyday spaces or whether they are incompatible with their religious beliefs. The *negotiation process,* informed by the previous two areas, focuses on how religious communities and individuals decide to accept, modify, or reject the new technology. Whatever decision the community makes about the technology, the negotiation process leads to *communal framing and discourse,* which helps them understand and justify their decisions and their overall approach to technology use (Campbell, 2010, pg. 60-63).

RSST highlights the need to look at the technology and the historical and cultural practices of the religious group separately in order to understand how technology is appropriated, rejected, or negotiated and reshaped by religious groups. While this study does not do a full historical and cultural analysis, later sections of this introduction will define and introduce prayer as a practice and give a brief example of different prayer practices. This study does contribute to the negotiation and communal framing levels of analysis. First, investigating prayer apps provides important insight into the choices developers make when combining specific technological affordances with religious content to create religious affordances, which are used for religious practices in mobile spaces. The choices developers make in both marketing their apps in app stores and within the design of the app itself reveals the negotiation process by exposing what technological and religious affordances were, and were not, used. Second, analyzing user engagement with an app highlights religious individual's negotiation with prayer apps (i.e. what technological and religious affordances they engage with and those they do not). Studying users can also uncover how they talk about using mobile technology and

its influence on their prayer practices. Therefore, this research contributes specifically to the negotiation and communal framing levels of analysis found within RSST.

Again, this study does not apply the four-level analysis as a strict interpretive framework and does not perform a complete analysis of each step. Rather, RSST provides useful theoretical assumptions and understandings for this study in four ways: (a) it conceptualizes the relationship between technology and society as reciprocal rather than one determining the other; (b) it takes the "unique moral economies" of the religious context into consideration which works to reveal a more nuanced understanding of the relationship between technology and users; (c) rather than taking possible actions as given, it highlights the complex negotiation process users have when adopting and using new media technologies for religious practices; and (d) understanding the complex relationship between app design and user negotiations could possibly reveal unique processes of religious identity formation and use of religious authority in the current study.

Context of Research

The purpose of this study is to explore and understand the relationship between religious mobile app design and use through employing multiple qualitative methods. This requires exploring a number of areas including the religious context of prayer, the different possibilities of prayer practices, and the context of prayer apps and their users within this research. The following sections explain and justify the choices made about what religions are included in the analysis, a brief description of prayer practices within

those traditions, and a discussion of what constitutes a prayer app and religious participants in this study.

Catholic and Islamic contexts. This research explores the relationship between app design and use as it relates to two different religions - Catholicism and Islam. Using two religions allows for triangulation of the findings by collecting data from two or more different sources (Denzin, 1978; Patton, 1999), which will help facilitate a deeper understanding of the design/use relationship. Triangulation posits that comparing data from two different sources can corroborate findings that are similar across the sources (Mathison, 1988). It also is used to "study and understand when and why there are differences," (Patton, 1980, p. 331). Looking at two religions then will highlight similarities across app design and use, while also providing insight into when and why differences occur.

Researching Catholic and Islamic apps and users also provides a nuanced view of how each religion's differences may affect app design and user engagement. For instance, daily prayer in Catholicism is different from the prescribed five daily prayers in Islam. In Catholicism there are no strict rules and regulations for the time of prayer, just that it is a daily practice. In Islam, the time and direction in which individuals pray must be exact. Therefore, the way designers include reminders and alerts for daily prayers may look different based upon the religions unique traditions and values, similar to the way Jewish designers koshered the cell phone for use in orthodox communities (Campbell, 2010). Each religion has distinct core beliefs and traditions that inform the way users interact with apps, and therefore provide different insights.

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While there are differences in core beliefs and practices, Catholicism and Islam are connected through their history and some theological approaches. First, both faiths find their origin in Abraham and can trace their lineage to his sons Isaac and Ishmael. They both worship one God. They also share the same background as faiths grounded in community. Second, Catholics and Muslims in general are both known as "people of the book," which describes their relationship to their holy texts (Campbell, 2010; Jeffrey, 1996). For Catholics, the Bible serves as the inspired words in which God chooses to communicate with them. For Muslims, the *Quran* is also inspired by God (i.e. *Allah*) and is understood as a way in which He communicates to His people. Religious adherents understand their place in the world and their religious practices through the study of these holy texts. There are rules and regulations (i.e. Ten Commandments or Five Pillars of Faith) that guide behavior. The holy texts explain to religious adherents who they are and how they should behave in the world.

Just as both Catholicism and Islam share a relationship to specific holy texts that God uses to communicate with them, they also share the common practice of prayer used to help people communicate with God. Prayer is a multidimensional and complex phenomenon that researchers and theologians have been trying to capture and understand for hundreds of years. It is important to note, then, that this research does *not* seek to intervene in theological approaches to prayer. Rather, the focus is on prayer experiences, or those behaviors that are "theistically oriented" (Ladd & Spilka, 2013, p. 293). Although this definition may seem broad it is a sufficient starting point when studying two different religions with different prayer practices. Both Catholicism and Islam see

prayer as an action, which can be internal, external, or both, that connects the individual or group with God or *Allah*. Additionally, this definition avoids the pitfall that many studies have fallen into when studying prayer: it does not operationalize prayer as frequency only (Ladd & Spilka, 2013). It allows for prayer to be explored in all of "its thick forms and content, expressive mediums, uses of the body, social contexts and modes and times of engagement," (Ladd & Spilka, 2013, p. 293).

   Prayer descriptions and examples. Prayer in Catholicism and Islam, although with distinct differences and rules, stems from the same goal: to communicate with God. The Lord's Prayer or Our Father, and *salah (i.e.* prayer), which is the second of the Five Pillars of Islamic faith, serve as good illustrations for some of the differences. Catholics, and Christians in general, often use the Our Father as a template for how to pray, thanking God for meeting daily needs, asking for forgiveness and forgiving others, and being able to overcome temptation as provided by the words of Jesus in Matthew 6:9-14. Within this passage Jesus also laid out basic rules to pray privately and without "babbling like pagans." Another essential instruction for prayer in the Catholic faith comes from 1 Thessalonians 4:17, to "pray continuously" (New International Version translation).

   In Islam, the main form of *salah* take place five times a day and must follow a very specific routine of washing, movements, and sayings. Prayer is the "essential obligation of Muslim worship and is considered the supreme act of righteousness. Therefore, greater importance is placed on prayer than on any other duty in Islam," (Abu-Raiva, 2013 p. 682; see also Farah, 1987). The five main prayers are *fajir,* the

morning prayer; *zuhr*, the noon prayer when the sun reaches its highest point; *asr,* the afternoon prayer; *maghrib,* the sunset prayer; *isha,* the evening prayer (El-Sayed, Greenhill, & Westrup, 2015). For all of these prayers Muslims are required to face *Kabaa*, or *qibla*, the holiest site in Islam (Berghammer & Fliegenschnee, 2014).

While it is impossible to give an exact description of what prayer looks like for Catholics and Muslims, a brief comparison of how people use prayer beads in each tradition is helpful for showing some similarities and differences in their practices. The similarity lies in the general purpose of prayer beads: to keep track of or count repetitive prayers (Dubin, 1987). For Catholics, the most common practice is called the Rosary. For Muslims, there are two different ways adherents use the beads: in *salah* (or daily prayers) and *Dhikr* (or remembrance of I). It is important to be aware that practices will vary depending on the various traditions, cultures, communities, and individuals (Mosher, 2005; Katz, 2013). The following descriptions are meant to be an example of a possible practice and not an instruction of the practice itself.

Use of Rosary beads in Catholicism can be traced back to the third or fourth centuries when monks tied knots in ropes to count repetitions of the *Lord's Prayer* (Dubin, 1987). Rosary literally means "crown of roses" and the beads are used to pray and meditate in specific sequences, or *Mysteries,* on different days of the week (Miller, 2002). The beads themselves consist of groups of 10 small beads separated by five larger beads. A small chain extends off of the circlet that has three additional beads and ends in a crucifix. According to the United States Conference of Catholic Bishops, "The rosary is meant to lead one into restful and contemplative prayer related to each Mystery,"

("How to Pray the Rosary, 2017). There are traditionally five separate prayers that are used in the Rosary practice, although variations do exit: *Apostles Creed, Our Father, Hail Mary, Glory Be, and Hail Holy Mary.*

The precant, or the person praying, starts the Rosary by making the sign of the cross and reciting the *Apostles Creed* while holding the crucifix. The first bead up from the crucifix denotes the *Our Father* prayer. Three beads follow this for three *Hail Marys,* which is followed by the *Glory Be*, denoted by the first big bead on the circlet. Then the precant moves up to the first strand of 10 beads for counting the recitation of 10 *Hail Marys,* which are then followed by the *Glory Be* at the big bead. The completion of the first set of beads is referred to as one decade. In between each decade, the precant announces the Mystery, which can be followed by a brief scripture reading, and the recitation of the *Our Father.* Once the five decades are complete, the precant says the *Hail Holy Mary.* A full Rosary can consists of 5 to 20 decades and takes anywhere from 10-30 minutes (Caroll, 1987).

Counting prayers is also the main function of prayer beads, or *tasbeeh,* in the Muslim faith. There is no historical record of the first use of prayer beads in Islam, however the prophet Muhammed directed his followers to complete 33 recitations each of *Glory to Allah (Subhanallah), Praise be to Allah (Alhamdulillah) and Allah is Great (Allahuakhbar*) after each *salah* (Tönük, 2011; Yildirim, 1971*).* The *tasbeeh* (also spelled *tasbeeh)* take on different forms but the most common contain either 33 smaller beads with one indicator bead called the *imam,* or leader, to track the sequences, or 99 beads with an indicator bead between every 33 beads to track the sequences (Miller,

2002). *Dhikr,* is another prayer practice in which Muslims may use the *tasbeeh*. *Dhikr* consist of reciting the 99 names of *Allah* and is considered a devotional that creates stronger bonds between the precant and *Allah* (Kassam, 2006; Tönük, 2011). These names are mentioned in the *Quran* and by the Prophet Mohammed in the *Hadith* who is recorded as saying, "Verily, there are 99 names of God and whoever recites them all shall enter into Paradise," (Miller, 2001, p. 84-85). In some cases, devout Muslims will recite "extreme numbers" of the prayers and may use *tasbeeh* with upwards of 500 or 1000 beads (Tönük, 2011).

Before Muslims pray they must first perform *wudu,* a ritual washing of hands, mouth, nose, face, forearms, head, ears and feet (Kats, 2013). Next the precant must face *qibla*, the direction of the holy site of *Kabba* in Mecca. Next, they must perform *niyat,* or set their prayer intention (Katz, 2013). This is a silent, inward action that works to purify their heart before prayer. The place of prayer must also be ritually pure which is why prayer carpets are used. There are also rules for men, women, and for specific instances, such as when the precant has had sexual intercourse. The full *salah* is a combination of prayers and movements in specific sequences. After the sequence is complete the precant would use *tasbeeh,* moving from bead to bead, to complete the 99 recitations mentioned earlier.

These descriptions underscore that, while the main goal is to count the recitation of prayers, the specific core beliefs and practices shape the form the practice takes. This is important for understanding the different ways in which Catholic and Islamic developers use technological affordances (i.e. timers, alerts, calendars, audio) in

combination with religious content (prayer texts, instructions, holy texts) to create a mobile environment in which to pray. It also underscores the need to understand how religious users actually understand and engage technological and religious affordances.

Prayer apps. Due to the theological, historical, and prayer practice understandings of these two faiths, this study will focus on Catholic and Islamic prayer apps specifically. It also makes sense to study prayer apps because they are one of the main types of apps developers are marketing to religious users (Campbell et. al, 2014). According to a typology based on an examination of more than 400 apps, prayer apps can be defined as those which aide users in communicating with a monotheistic deity (Campbell et. al, 2014). Prayer practices can be facilitated through listening to audio prayers, typing in prayers and prayer requests, engaging in structured prayer, or developing a private, personal prayer practice (p. 164). Because prayer practices can differ among Catholic and Islamic groups, the apps will be examined for the ways in which prayer is presented (what types of prayers, information on prayer, etc.), and the tools through which the app provides specific prayer aids (i.e. text of prayers, recitations of prayers, alerts and alarms, etc.) Additionally, users in this study will be asked to explain their personal prayer experiences and practices. To illustrate, Muslims are required to pray in the direction of Mecca, which drives the use of compass tools to help adherents determine the correction direction. Developers and users must have at least a basic understanding of these practices in order to provide the proper prayer experience through mobile apps.

Technologically mediated prayer practices are important to consider because

digital media are creating spaces for prayer that have the capability to "reconfigure, extend, and challenge traditional religious structures and practices," (Drescher, 2013, para. 4). Understanding the technological mediation of prayer may also serve as a microcosm for understanding other social practices that are mediated through mobile applications (see Campbell, 2012a).

Prayer apps, as mentioned above, are defined as those in which users listen to, type, or otherwise engage in communicating messages to a monotheistic deity (Campbell et. al, 2014). There are three types of prayer app developers: (a) individual developers; (b) religious organizations; and (c) secular organizations. Although looking at the different types of developers is not the main focus of the paper, it is still important to consider the types and their possible motivations for developing prayer apps. Different developers will have varying levels of religious understanding and different goals for app development.

First, individual developers are those that design and deploy the app on their own. Their religious understandings will vary based on their backgrounds and experiences. Individual developers could be designing these apps as a way to help themselves and others engage in religious practices, or they could be designing them to tap into a specific religious market.

Second, religious organizations that develop apps also have specific religious understandings and goals in mind, such as communicating about specific community events or creating a social network specifically for their community members. It could also be assumed that these organizations want to provide authentic and sanctioned apps

for their followers to use when engaging in religious practices. Although religious organizations may usually be developing apps for their followers, it should not be ruled out that they may seek to make a profit on their product.

Third, secular companies may or may not have a stake in authentic or authorized religious understandings and practices. Rather, they may be developing apps for religious users because they see the potential of a relatively untapped market. However, if religious organizations or individuals hire app developers, their understandings of religious practice will be informed by their client's understandings.

Noting the different types of developers may also help explain different app affordances. For example, sharing info with others may be seen as important by both individual and religious organization developers. However, the way individuals and organizations go about designing the action to share could be different. The religious organization may feel the need to control who and what is shared through the app to control the narrative, while an individual developer may see the practice as being open and free. Of course this could vary greatly among the different types of developers, which is beyond the scope of this dissertation.

Religious participants. This study also examines religious individuals from both Catholic and Islamic faiths. Participants in this study self-identified as Catholic or Muslim and discussed their prayer experiences and practices as they understand them. Participants answered questions and were observed as they used the app, which uncovered the relationship between how prayer was being presented through app design and how users actually engaged prayer through the design. Allowing participants to

define and explain their prayer practices is important to gain a deeper understanding of how and why individuals engage apps for religious practice. This study suggests individual understandings of religious practices stem from their respective religious backgrounds and experiences. Therefore, individual understandings of prayer may or may not mirror traditional or religiously sanctioned understandings of prayer. After gauging participants' religious understandings and goals for using prayer apps, they were asked to engage with a prayer app. Studying user engagement with specific prayer apps provided a more nuanced understanding of the way design intentions may influence app experiences. For example, developers may have designed an app for sharing prayers with others through social media; however, users could view prayer as an individual practice and not want to share personal prayers with others (Bellar, 2016). Additionally, technologically mediated prayer practices are important to consider because digital media are creating spaces for prayer that have the capability to "reconfigure, extend, and challenge traditional religious structures and practices," (Drescher, 2013, para. 4). Understanding the technological mediation of prayer may also serve as a microcosm for understanding other social practices that are mediated through mobile applications (see Campbell, 2012a).

Research Questions and Focus

Based on the stated criteria of studying Catholic and Islamic prayer apps and users with a focus on both technological and religious affordances, the following research questions guide the study:

RQ1: How do Catholic and Islamic prayer apps communicate and construct prayer experiences through mobile app design, specifically in the technological and religious affordances offered?

RQ2: How do Catholic and Islamic users engage different technological and religious affordances while using a prayer app?

Studying not only the content and structure of Catholic and Islamic apps, but also users' understandings and intentions related to these apps, offers a more nuanced view of how, and the extent to which, app design influences religious app use. These research questions relate to current work within digital religion studies as they focus on how religious practices are situated within the blurring line of online and offline contexts. Particularly, this study is located within digital religion research, in that it seeks to explore this increasingly enmeshed online/offline context, as well as uses new methodological tools in which to answer the research questions.

Methodological Approach

The research questions posed are attempting to reveal data that will aid our understanding of the complex relationship between design and use. As mentioned previously, this complex relationship has not been an area of inquiry that has received a lot of attention in the digital religion literature. These two details, along with the researcher's epistemological approach, highlight the appropriateness of using qualitative research methods to answer the research questions. Qualitative research is particularly useful for exploring the complex relationship between religious app design and use

within the specific context of Catholic and Islamic apps for two reasons: (a) the goal of qualitative methods is not to extract generalizable data, but to gather rich, deep data that reveal the complexity and nuances of a specific site of study (Hesse-Biber & Leavy, 2011); and (b) qualitative research is concerned with understanding the everyday lives of people and the meanings people make as they engage with each other and cultural objects (Denzin & Lincoln, 2000). Studying the interactions between developers and users through prayer apps is one way to make meaning and develop understanding about the practice of prayer in mobile contexts.

Multiple qualitative methods help researchers approach the same experiences or contexts in different ways so that in-depth understanding of meanings and practices are revealed (Denzin & Lincoln, 2000). Therefore, studying the relationship between religious app design and use is approached from two different methods: a) textual analysis of Catholic and Islamic prayer app descriptions and the apps themselves; b) semi-structured online user tests with Catholic and Muslim prayer app users. First, Catholic and Islamic prayers apps, identified through the Network for New Media, Religion and Digital Culture Studies database, were textually analyzed to gain a clearer picture of how prayer is conceptualized and the digital tools used to provide users specific prayer affordances. Second, 25 Catholic and 25 Muslim users tested a prayer app from their respective religions. These tests include a video recording of the users' mobile screens as they engaged the app as well as audio recordings of their thoughts and feelings throughout the process.

The combination of textual analysis and users tests provide data that speak

clearly to the relationship between design and use. The user tests specifically provide a

unique approach within media studies that allow data to be collected from participants at

the time of use. These qualitative methods resulted in thick, rich data that can be used to

explore and understand the complex religious processes and experiences of everyday

people. More details related to these methods are given in chapter three.

Significance and Chapter Guides

This study contributes to the fields of mobile communication, digital religion, and the

literature on affordances in three distinct ways. First, it contributes to mobile

communication by exploring the areas of mobile app design and app use as well as

illuminating the complex relationship between the two. Second, the study speaks to an

important area of religion and technology by explaining the ways technology influences

religious users, while at that same time, those users negotiate with and reshape

technology. Third, the study contributes data gathered by a unique methodological tool

that allows for direct access to users' mobile interfaces and thoughts at the time of use.

Therefore, this study will utilize qualitative textual analysis and qualitative user

testing methods to study the relationship between religious mobile app design and use.

The Religious Social Shaping of Technology lays the theoretical groundwork necessary

to understand the relationship between technology and religious groups and individuals.

Along with RSST, the digital religion literature provides important insight into the role

of religious authority, religious communities, and religious practices in digital contexts.

Finally, the descriptive concepts of affordances and user interface design are also used as a lens through which to analyze the findings.

Chapter II. This chapter begins with a review of the mobile communication, digital religion, and affordances literatures. Important studies and sensitizing concepts are explicated within each of these sections. Mobile communication lays the broad groundwork from previous researchers who emphasized scholarship on mobile technology should extend beyond the artifact to include historical, cultural, and societal contexts. Next, the study is situated within the digital religion literature with an emphasis on how religion online influences religious identity and religious authority structures. Finally, the chapter concludes with an explication of the term *affordances,* and an explanation of how the term is used within this research with definitions of both technological and religious affordances.

Chapter III. This chapter explains and justifies the study design and the methods used to answer the research questions. It provides a step-by-step overview of the textual analysis of Catholic and Islamic payer applications and Catholic and Islamic user tests. Literature supporting each method is used to justify the approach. Sub-sections include the sampling procedure for apps and users. Appendices A and B for this section include the coding guide and the user test protocol respectively.

Chapter IV. The fourth chapter presents and discusses the findings from the textual analysis of the prayer apps sampled from the Network for New Media, Religion, and Digital Culture Studies database. The chapter is organized into three parts. The first part explicates findings from the prayer app descriptions, which shows how Catholic and

Islamic app developers are framing prayer within the mobile context. Part two identifies, defines, and explains the various technological and religious affordances found within the Catholic and Islamic prayer apps. Part three explains how these technological and religious affordances are combined in different ways, which resulted in three key approaches to prayer app design. Further, the findings from this chapter set up and inform the analysis from the user test results.

Chapter V. Chapter five analyzes presents the data from the first part of the Catholic and Muslim user tests, including how participants frame prayer within their own lives and how they expect to use a prayer app. Findings from this chapter are presented in comparison to the themes from Chapter IV to answer the research questions. First, participants' framing of prayer mirrored that of developers, although there were a few minor differences. Muslim participants specifically framed prayer in the same way as developers by emphasizing prayer as a duty that should be conducted according to strict rules and guidelines. Catholic participants differed from the developers' framing of prayer by emphasizing prayer as a way to connect with others, as well as to God. Second, participants interacted with the interface, which revealed important insights about the user interface design and highlighted the customization features participants thought were the most and least important for their prayer practice. Participants from both faiths discussed and interacted with technological affordances before engaging with prayer affordances. Finally, the findings are discussed within the larger framework of engaging specific interface design features and customizations that may lead to a personalization of religious practice.

Chapter VI. This chapter presents the findings from the second half of the data collected from Catholic and Muslim participants' user tests. The first part of the chapter analyzes how participants tended to gravitate toward features that indicated a translation design approach to prayer. However, design issues and the user-testing environment may have contributed to this finding. The second part of the chapter explicates how participants made sense of using a prayer app for religious practice, which revealed either outright acceptance of the technology for prayer practice or a more complicated negotiation process that placed rules and limitations on prayer app use.

Chapter VII. This chapter concretely answers each of the research questions and what they tell us about the relationship between design and use and subsequently about the relationship between technology and society. Findings are related back to the relevant literature discussed in Chapter II as well as how the findings further our understanding of RSST framework. This chapter also provides concrete suggestions for app developers, users, and media studies researchers that were revealed in the findings. Additionally, the contributions of the study as related to the mobile communication, digital religion, and affordances literature are explained. Finally, the chapter concludes with suggestions for future research surrounding religious app design and use.

CHAPTER II

REVIEW OF MOBILE COMMUNICATION, DIGITAL RELIGION, AND

AFFORDANCES LITERATURE

The goal of this chapter is to situate the current research within relevant fields of study, which includes literature on mobile communication, digital religion, mobile and religious apps, and affordances and user interfaces. Each section in this chapter works together to delimit the various aspects of religious mobile apps that need to be understood to explain and support the research questions and support the analysis of the data. Additionally, this chapter provides context for the various contributions this research makes to each field of study.

First, studying religious mobile apps and their users, and more specifically, examining how app design enables and/or constrains religious practice, speaks to three different areas of inquiry: mobile communication, digital religion, and technological affordances. Mobile communication is the larger field of study within which this research is situated. The mobile communication literature influences the approach of the current study as well as provides perspective for how mobile devices have been used and understood in different social and cultural contexts. Additionally, this section defines *app* and explains how research in this area provide important insights future studies. Next, digital religion is defined and an argument is made as to how this study fits within the current wave of research in the field. Within the digital religion literature, identity and authority are two key areas of inquiry that are important to this research. Also, this

section reviews the current but limited literature available on religious mobile apps. Finally, the affordances literature is explored and used to define and explain the concepts of technological and religious affordances that this study adopts. It also examines user interface (UI) design research, which is important because the UI is the means through which affordances are communicated and represented to users. Therefore, an extensive literature review situates the current study within the areas of mobile communication, digital religion, and affordances. Each section contains an overview of the field along with more in-depth analysis of specific studies that provide sensitizing concepts that inform the current study in terms of data analysis and implications of the findings.

Mobile Communication

There are several key researchers within the mobile communication literature that have influenced the way this study explores both technology and users in specific social contexts. This section begins with an overview of the history of the mobile communication field before moving into an exploration of how Katz and Aakhus (2002), Ling (2004), Goggin (2006), Ito et. al (2005), and Wallis (2013) among others have shaped the field and provided the groundwork for this study. This section also highlights how different concepts, such as social turbulence and telecocooning, are presented within this literature and pertain to the current study. Finally, the section concludes with a discussion of the difficulties and solutions to studying mobile phones due to the proliferation of different types of devices and platforms since the advent of the iPhone.

Mobile communication can trace its roots back to telephony studies. Although such studies were relatively sparse to begin with, the telephone's growing role in national and international policy pointed to social and cultural relevance for researchers (Goggin, 2006). Fischer (1992), a sociologist, was one of the first researchers to look at the telephone in depth. His important work rejected the technological deterministic approaches of the time as well as symptomatic approaches, which viewed all technology as having a unified "spirit" or "Geist" which resulted in expressions of culture and society (p. 13). Rather, Fischer adopted what he termed a "user-centric" approach, using historical and statistical analysis to expose the social uses of the telephone and how society adopted and adapted it within U.S. social and cultural contexts. Fischer's research is important because it laid the groundwork that expanded inquiry of telephony beyond the technology-centric studies of the day. The current research adheres to this push beyond technological deterministic frameworks to included analysis of both apps and users.

Other early researchers focused on the gendered nature of the telephone (Martin, 1991; Rakow, 1992). Rakow used a feminist lens to explore how the gendered technology of the telephone influenced the social lives of women. Her findings point to an important distinction: even though a technology may afford new social practices, new social practices may or may not develop depending on a number of factors (p. 4, 154). Therefore, it is important to not only look at what the technology *can* do, but also what people are actually *doing* with the technology. This study mirrors this approach in that

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two methods are used to look first at what religious mobile apps are offering to users, and second at how users actually understand and engage with the app.

Katz and Aakhus (2002) hailed the mobile device as bringing the attention of society and researchers back to telephony. Researchers focused on the domestication of the mobile phone, uses and practices in both public and private, attitudes and opinions, histories and markets, new users and new practices, gendered uses, and negotiated uses to name a few (Contarello, Fortunati & Sarrica, 2007). Katz and Aakhus (2002) argue that telecommunication technologies, and in particular mobile technologies, embody a "spirit" of what they call perpetual contact, or pure communication, defined as "the idealization of communication committed to the prospect of sharing one's mind with another," (p. 307). Others, however, argue that while there may be an overall spirit of perpetual contact in mobile communication, the different needs and cultures of groups and individuals that use mobile devices may be more nuanced than this "spirit" allows (Campbell & Kelly, 2008). Perpetual contact warns that users may be expected to be reachable all the times. However, some users resist this expectation and purposefully and strategically deny contact with others (Licoppe & Heurtin, 2002). It is interesting to think of perpetual contact in terms of prayer apps because both Catholic and Islamic adherents are exhorted to pray constantly. The act of prayer should be undertaken daily and consistently; while mobile technology offers the possibility or drawback of perpetual contact, mobile prayer apps may actually provide a way to be in perpetual contact with God in different ways throughout the day, therefore aiding the user in fulfilling their religious obligations.

In addition to Katz and Aakhus' concept of perpetual contact, Ling (2004) was also looking at the social consequences of the mobile phone in everyday life using domestication theory, in which individuals become aware of a technology or an artifact, and in turn, their identity becomes entwined with their consumption of the technology. Ling (2004) noted that mobile phones caused "social turbulence" in spite of their "taken-for-granted" everyday use (p. xv). Ling (2004) noted that social turbulence occurred in three different ways; the disruption of norms and hierarchies (p. 125), the disruption of interpersonal contexts (p. 130), and the subjugation of others in the social context who are forced listen or take part in someone else's use of the mobile (p. 140). When thinking about the ways in which religious mobile apps may disrupt social religious life, the first example that comes to mind may be use of the app within public worship in churches or mosques. In these contexts, mobile users are breaking the traditional rules and norms for worship in a public space. Because of this, there may be pushback from religious authorities and other adherents about the way apps are used in public. We may also think about the disruption of the routine in which religious individuals communicate with God. Prayer, after all, is communication with another, a divine other. Therefore, we may also see a disruption not only of social uses of religious mobile apps, but of personal religious practice as a means to communicate with the divine as well. Finally, use of mobile apps for religious practice in public may intervene in interpersonal contexts as well. For instance, religious adherents could use mobile phones for religious practice in public, but within the private mobile space. They would be isolating themselves from others. Additionally, use of mobile apps in public for religious practice may break into a social

groups space and force others in the area to be present in the third space of the app use itself. For instance, if the call to prayer alert from a mobile app goes off in a crowded coffee shop, all of the people within hearing range may be unwillingly engaged within the practice and unwillingly removed from the physical space of the coffee shop. It will be interesting to see if and how these possible disruptions are negotiated both within the app design and within app use.

Additionally, mobiles helped users keep track of and coordinate activities with others (i.e. micro coordination) (Ling, 2004; Ling & Yttri, 2002). Micro coordination refers to the "nuanced management of social interaction" of daily life (Ling, 2004, p. 58). The activity is tied to communication with others to structure everyday life and activities, such as scheduling when to meet for coffee with a friend. Ling argues that the mobile phone replaced or supplemented the use of timekeeping as a mediating structure for managing daily life. Instead of setting an exact time to meet for coffee, people use their phones to contact specific individuals at any time to set, adjust or break off an activity.

Micro coordination could be an interesting concept in relation to religious apps as prayer is often a required daily practice for one to remember and times are particularly important within the Islamic faith. Much like the everyday activities people coordinate with others, prayer can also be considered social in that the main purpose of prayer, as established in Chapter I, is to communicate with God. Prayer is not only a solitary activity, but is also often practiced in community within offline, online, and mobile contexts (Campbell, 2005). Nevertheless, prayer is inherently a social activity, whether

communicating with God on one's own or praying together to God in community. In this sense, using a prayer app to schedule and remember to pray, either alone or with others in online and offline contexts, can be seen as using the mobile app for religious micro coordination of everyday religious activities. Religious micro coordination is different in that the activity is being coordinated with a divine being and others of the faith for spiritual and religious purposes.

A year before the Apple iPhone was to be released, Goggin (2006) took a cultural approach to studying the cell phone. Instead of focusing more on the device itself and understanding the technology as a whole, Goggin (2006) was interested in studying the specific cultures surrounding cell phone use. He used the circuit of culture approach, which sees culture as constitutive; to look at five interlinked processes including representation, identity, production, consumption and regulation (Goggin, 2002, p. 7). He combined this with Actor Network Theory, which argues that technology is not a given, meaning it is not created and used independent of influences. Rather, it is dependent upon historical and social contexts (p. 12). The study points to SMS, or text messages, as an example of interpretive flexibility, or the various ways developers and users understand and interact with technology. Developers viewed text messages as a minor add-on function to the cell phone. Users, however, decided SMS was a major function and it became heavily used in everyday life. Essentially, Goggin's approach emphasizes the importance of taking cultural contexts, technology, and groups of people designing and using the technology into consideration for a more complete understanding of mobile communication.

Ito, Okabe, and Matsuda (2005) also grounded their exploration of mobile

phones in the cultural and social setting of Japan. In addition to calling for approaches

that were grounded in culturally embedded contexts, the authors argued for the need for

new observational methods in order to "document private communication and trace

practices that span physically demarcated localities," (p. 11). Ito et. al (2005) also coined

the term "telecocooning" which refers to how people within the Japanese culture tend to

use mobiles to communicate within their own tightly-bounded circles rather than

contacting outside or unknown contacts (p. 15). Farman (2012), notes that Ito et. al's

concept of telecocooning also is a way for people to distance themselves from others

within shared public spaces. For instance, people on a crowded subway may be

physically close, but use their headphones to distance their interactions. In this way,

users "cocoon" themselves as a way to distance themselves from others while also using

up time on their commute (Farman, 2012, p. 5). The practice of cocooning in public

spaces through the use of religious apps is an interesting problem when thinking about

the user's relationships to mundane places while occupying a mobile, spiritual space.

Later studies set in other cultures further problematized the "freedom and

liberation" discourse that seemed to be inherent in analyses of mobile phone research.

Wallis (2013) studied mobile phone use of rural migrant women in China and found that

although the modern mobile device provided them access to other networks and

opportunities, social and political constraints kept them from moving beyond their rural

or peasant identities in the city. In essence, they were both liberated and constrained

through what Wallis calls "immobile mobility" (2013, p. 103). This concept serves to

represent how possible technological affordances may not manifest themselves in practice due to varied and complex social contexts. In this study then, an app may allow for interaction with people all over the globe, but that does not mean users will actually communicate outside their known, local networks.

The work of Goggin (2007), Ito (2005), and Wallis (2013) highlight an important shift in thinking about the relationship between mobile technology and society. Katz, Akkhus, and Ling seem to highlight the impacts that technology is having on society – the ways in which the technology is altering everyday life. Goggin, Ito, and Wallis emphasize the ways in which technology is integrated into everyday life. While the initial introduction of technology may disrupt society in different ways, eventually society adapts the technology to fit within their everyday lives. The rules for use and the ways in which technology is used are necessarily negotiated within cultural and social contexts. This is important for this study because it adopts the social shaping of technology and RSST view of a reciprocal relationship between technology and society. Therefore, this study, while acknowledging the disruptions possible through religious mobile apps, also emphasizes the agency of the user and communities to negotiate use and integration of technology into their everyday lives, rather than forced and obligated transformations of their everyday lives as dictated by technology.

Except for Wallis' 2013 study, the approaches to mobile communication studies mentioned above were written before the advent of the iPhone in 2007 and the introduction of mobile apps only a year later. Boase (2013) noted that as technology progressed in 2008 when Apple first introduced the possibility of third-party app, the

number of possibilities and the complexity of interactions of mobiles in social interactions increased considerably. The onslaught of possibilities and complexities introduced made the so-called smartphone a salient one for research, but also posed challenges. Boase identified two main concerns: (a) because of the myriad differences of different platforms and applications, it would be difficult for researchers to compare findings; and (b) because of the variety of possibilities for social interaction now made possible through mobile technology, it would be more difficult to make general observations. Although these were and continue to be big challenges for the field, Boase suggested two solutions: (a) focusing on mobility as a unifying feature across topics and artifacts, and (b) focusing on creating clear definitions of the common affordances shared across platforms. This study, in part, seeks to answer Boase's call by focusing on the mobile context of religious practices as well as defining common technological affordances and approaches to design across Catholic and Muslim prayer applications. One of the challenges Boase mentions is for researchers to uncover the opportunities and constraints of the technology without reducing the importance of other factors. This research also attempts to heed this warning by understanding and uncovering the ways in which cultural differences between Catholic and Islamic users impact both design and use.

This review of mobile communication literature informs the current study of mobile apps in three ways. First, rather than focusing solely on the medium itself, the literature points to the need for a more nuanced approach that considers historical and social contexts, as well as different groups involved in technology design and use

(Goggin, 2006). To clarify, researchers such as Goggin (2006), Ito (2005), and Wallis (2013) lay the groundwork to studying mobile phone use and society while acknowledging the complex, socially constructed interactions surrounding mobile technology. In the same way, the current study looks not only at the apps themselves, but also how technological features combined with religious content develop religious affordances. Additionally, this research extends beyond the focus on technology to include analysis of how users from two different religious backgrounds understand and engage prayer through mobile apps. As such, this study attempts to follow the lead of mobile communication scholars by focusing on more than the medium, that is more than just mobile apps, by considering the users of these apps within their cultural and social contexts.

Second, the concepts introduced in this literature that may help inform findings from this study on how users actually engage with different affordances. To be more specific, micro coordination (Ling, 2004) and telecocooning (Ito et. al, 2005) provide unique insights into how mobile devices have been used and also how users may reshape those devices to meet their specific needs. Religious app use could be considered religious micro coordination as people use them to work out different times and places to pray in order to better manage their everyday lives. Also, how people engage the social networking functions of some of these apps may be indicative of telecocooning if they only communicate with close, social ties rather than communicating with the broader networked community. To clarify, users may be able to share and communicate with others in the faith though features that allow them access to social networking sites like

Facebook and Twitter. If and how users engage the sharing affordances will add to our knowledge about the ways in which mobile devices and apps are used and understood within daily life.

Third, this research seeks to answer Boase's (2013) call to focus on mobility – access to information and digital tools available anytime and anywhere – as a unifying feature, and to create clear definitions of affordances across platforms. This study seeks to undertake this call in three ways. First, this study explores how the developers of apps explain their uses to consumers within their iTunes app descriptions. Second, this research examines the apps themselves to discover what mobile technological affordances are used in conjunction with religious content to create a mobile religious practice. A mobile religious practice refers to the ways in which users integrate or replace their offline religious practice with content and tools on mobile devices. Third, this research compares and contrasts user engagement with prayer apps from two different religious perspectives, Catholicism and Islam.

While the previous section gave an overview of the history and different approaches to mobile communication, the sub-field of app studies provides further context and insight for this research. The next section focuses specifically on defining mobile applications as well as highlighting important studies that provide interesting insights for the study at hand.

Mobile apps. *App* is simply an abbreviation for the word application, which refers to a software program that can run on a computer or other device. One of the simplest and earliest definitions for an app came from *Wired*'s Chris Anderson and

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Michael Wolf in 2010, who described apps as condensed platforms that use internet connections to transport data. These small computer programs on mobile devices delivered a variety of options for users from playing games, doing business, and learning. Flueckiger's (2012) definition also focuses on the app as an object, made up of both hardware and software, that translates information and actions "between the user interface and the hardware by a specific protocol," (p. 178). This definition takes into account that hardware and software are intrinsically linked and therefore accessing the same software on a different device (or hardware) will result in possibility different modes of translating information and content (Boase, 2013).

However, these definitions fail to take into consideration the content contained within, and the actions made possible or constrained through, the app itself. As Miller (2014) explains, "…you can think of an app as a kind of dynamic tension between code and culture," (p. xii). These small computer programs that are written in code to represent information and actions are not created or used in a vacuum. Therefore, the culture, experiences, and environments of both developers and users are coded into, and extracted out from, apps. In this sense, apps can be seen as a means of understanding the self and social interactions with others in mobile contexts (i.e. online/offline contexts simultaneously).

Based upon these definitions, *apps* in this study refer specifically to small computer programs downloaded and used on a mobile device that contain cultural content and create spaces for social action and interaction. Developers' understandings and intentions about prayer are embedded within the app itself. At the same time, users

engage these understandings and intentions through the app design. However, users'

understandings and actions related to prayer can be different from the intention of the

developer. Therefore, this study examines the communication processes between

developers and users that take place through mobile apps in the context of religious

practice in a mobile space.

App studies. Apps have been studied critically as a technological object and also

as a set of relationships in the areas of coding architectures, extensions of the human

body, commodities, and as remediations of culture through app forms and functions in

society (*see* Miller & Matviyenki, 2014). In Miller and Matviyenki's (2014) edited

volume *Imaginary App,* chapter authors use philosophical and critical cultural lenses to

try and understand the nature of apps and their influences on society. In addition to this

edited volume, most of the research surrounding mobile apps focuses mainly on

technical development (Yuchul, Yoo-mi, Hyun Joo, Byung Sun, & Jinsul, 2011), such as

web browsing (Chen, 2007; Evens, Schuurman, De Marez & Verleye, 2010), software

engineering issues (Wasserman, 2010), and usability (Nayebi, Desharnais, & Abran,

2012).

Systematic studies of apps are proliferating, although there are very few

proposals on how to study this relatively new phenomenon aside from the affordance

approaches discussed in subsequent sections. Fagerjord's (2012) article is one of the few

that proposes a model for research. Four processes in the model include input,

calculation, network, and output. Fagerjord (2012) concluded that internet capabilities of

apps are only one part of their function and work to supplement, rather than replace,

internet use. Again, this type of research focuses heavily on the technology rather than use. Other than Campbell et. al's (2014) typology of religious mobile apps, no other studies were found that offered unique categorizations of apps.

There are studies though, that focus on users as a unit of analysis rather than on the technological features of the apps. The majority of this work has been done only in the last few years. From these studies, two main types of approaches were most prevalent: those that focus on the effects of app use and those that focus on how and why users choose and use apps. In terms of the effects mobile apps can have on users, most of the research focuses on health-based effects; such as helping users monitor their health (Nystrom, Asuzu, Amin, Schindler, & Wira, 2015), or quit smoking (Buller, Borland, Bettinghaus, Shane & Zimmerman, 2014), and also how interface design can impact user's understandings of privacy (Lin, Amini, Hong, Sadeh, Lindqvist, & Zhang, 2012). One study in particular had some interesting findings that could be related to this research. Chan (2013) studied the impact that mobile apps have on well being and social capital. While Chan did not look at a specific app or category of app, the findings show voice communication and online communication affordances were positively related to a sense of well being and as a way to create social capitol. This may point to religious apps that use voice and other internet communication affordances (i.e. chat or social networking sites) having a bigger impact on users. He also found information seeking activities were not related to any positive affects. However, Chan does not adequately define or explain what the parameters of information seeking activities actually are.

Therefore, more research about religious information seeking through apps needs to be done in order to make claims about their effects on well being and social capital.

The studies discussed so far have focused on how user demographics and experiences impacted app adoption rates. First, Sohn and Choi (2014) showed that previous app experience necessarily affects present and future app experiences. They argue that users are not rational when choosing and using an app. Rather users rely upon schemas developed from past app experience to judge and interact with apps in the present and future. Users do not actually go through each feature in order to decide whether the app they are using is good or not. This is important for the current study in that first-time religious app users may have a different experience than those who have engaged with religious apps in the past.

Another study looked at how the elderly experiment with and decide to adopt app technology (Gasćon, Alcalde, Seebach & Zamora, 2015). Findings suggested age did not directly mediate how the participants viewed the apps, if they would experiment with them, or how they evaluated them. This speaks to common conceptions that the elderly do not, or are not willing to engage with apps in general. Therefore, it is important to allow elderly participants in this study, as well as not to assume their level of understanding and engagement with apps, in order to not miss possibly important findings for users within this age group.

A recent study looked at what users complained about in the ratings and reviews for 20 apps in the App Store (Khalid, Shihab, Nagappan, & Hasson, 2015). Users most often complained about bug issues such as errors and app crashes. However, complaints

about more substantial issues, such as privacy or ethical issues, resulted in lower app ratings than the other complaints. For this study, it will be interesting to compare and contrast what issues religious users may have about prayer apps and if those issues or concerns might cause them to discontinue app use.

Finally, the uses and gratifications perspective has been used to explore the ways and reasons users engaged with mobile apps (Gerlich, Drumheller, & Babb, 2015). The researchers used a marketing approach and found that past uses and gratifications measurements were incompatible with examining apps, which are more dynamic than traditional media. Users tended to pass the time, get information, and socialize on mobile apps. Findings showed most use was for entertainment, education, and social factors. This is an interesting finding for the current study as religious practices do not necessarily fit into any of those categories, and yet, depending on user context, could fit into all of them.

App studies represent a relatively new sub-field of mobile communication that, so far, has focused on app effects and also on user adoption and interaction. Specifically, these studies provide interesting findings such as the effects of previous app use on future app use, the importance of not making assumptions about elderly users' motivations and interactions with apps, the importance of technical, ethical, and privacy issues on app ratings, and an introductory uses and gratifications study that showed app use centered on entertainment, education and social factors. While important, these specific studies do not reflect on the unique religious context in which the current study

is located. Therefore, the next section explicates the field of digital religion and explores

the few religious app studies that have been published to date.

Digital Religion

As mentioned in the introduction chapter, digital religion is a growing area of research

that explores the evolution of online religious practices within the context of authority,

community, and authenticity (Campbell, 2012a; Lövheim & Campbell, 2017). A key

feature of digital religion posits that online religious practices are connected to both

online and offline contexts at the same time (Campbell, 2012a, p. 1). This means that

online and offline are not separate, but are often engaged concurrently within religious

practices. Religious authority (Cheong, 2012), community (Campbell, 2010, 2012a),

identity (Lövheim, 2012), and authenticity (Radde-Antweiler, 2012; Wagner 2012) are

all areas of focus that pertain to the current study.

Research in digital religion has flowed through four different waves (Campbell,

2012a): (a) a focus on describing the new opportunities online spaces provide for

religious practice and the potential impact technology has on religious understanding (p.

8); (b), an exploration of technologies and actual users practicing and engaging religion

in online spaces through questions about religious identity, authenticity, and practice (p.

8); and (c) theoretical and interpretive research on how the "embeddedness of the

internet in everyday life influenced religious digital practice," (p. 9-10). Lövheim and

Campbell (2017) argue that a fourth wave is currently underway which focuses on "new

theoretical and multi-methodological" modes of study (p. 11). This fourth wave focuses

on "integration and negotiation of religious beliefs, practices, and identities" in the increasingly enmeshed online and offline contexts (p. 11). The following paragraphs explain each wave of digital religion research, highlight specific studies of mobile communication and religious app studies, and contextualize the current study within the fourth wave of digital religion research.

The first wave of research approached the study of religion and technology with awe and wonder of the new world of cyberspace (Grieve, 2012). In the late 80s and early 90s, people were just beginning to explore this new space and often focused on the "new and extraordinary aspects" and all the good and bad it could bring to society (Campbell, 2012a). Religion and media researchers argued that this new virtual world would cause a "transformation of religious beliefs and practices," (O'Leary, 1996, p. 783; see also Brasher, 2004). Scholars worked toward documenting cyberspace and describing how people used and interacted in this new, virtual world. Indeed, sociologists were also studying how the computer and internet capabilities influenced the way people saw themselves in relation to others (Lövheim, 2012; Turkle 1995). During the mid- to- late 90s, Turkle (1995) studied how the computer served as a mirror of identity, reflecting back to us how we spent our time and valued different aspects of our lives. It served as a tool to help users assemble the various parts of their lives while also providing a way to engage with others in an easy way. Researchers looking at religious authority and identity in this wave often focused on how the internet provided a space for individuals to explore and practice religion outside of the purview of religious authorities (Lövheim, 2012; Cheong, 2012). The separate space of the internet was said to give more power to

the individual while challenging existing authority structures. Early internet research also pointed to the possibility for anonymity and disembodiment, which allowed for users to play with their identities in a way they could not in offline contexts (Baym, 2006; McKenna & Bargh, 2000). People could then "pick 'n mix" their religious identities, drawing on different aspects of religions that fit their personalized beliefs (Lövheim, 2012). However, the problem with this wave is that researchers conceptualized cyber-space as separate from the "real world," which challenged the authenticity of the practices and identities being built online during that time (Campbell, 2012b).

The second wave of digital religion research in the 2000s moved from away from the wonder of online religious practices to categorizing the actual technology and users who were engaging it for specific religious practice (Campbell, 2012b). Researchers during this phase focused on how online practices influenced users' religious identities, how it redefined the concept of community, and if and how those practices where seen as authentic. When looking at how online practice actually impacted identity, Dawson (2004) found the alternative identity formation earlier researchers were so excited about had minimal impact on actual users. Dawson and other researchers (*see* also Dawson & Cowan, 2004) started focusing on the experience of individuals and their understandings of their personal religious identities. Rather than focusing on how the internet was used to create and engage alternative identities, researchers studied how people "used new media to perform" religious identities in "everyday offline life" (Lövheim, 2012, p. 48). In terms of community engagement with new media, the second wave research critically

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reflected on the way people gathered online to form so-called virtual communities (Campbell, 2012a). The fear from the first wave was that online communities would replace offline communities and disrupt traditional religious authority. However, the second wave research showed online communities supplemented the offline rather than replacing it (Campbell, 2012a). It was also during this phase that researchers started longitudinal studies to explore peoples' experiences as well as how the online was connected to the offline (Grieve, 2012). While research in the second wave was beginning to underscore the connectedness of offline and online contexts in early internet studies, the emergence of interactivity and user-generated content in online spaces opened up new theoretical and interdisciplinary opportunities.

The third wave of research surrounded what was called web 2.0 and interactive online applications (Grieve, 2012). In fact, some referred to this wave as "Religion 2.0" which is defined as "individual and institutional practices, values and beliefs that make up specific religious traditions and how they interact with the multiple affordances and possibilities of CMC (Computer Mediated Communication) and Web 2.0," (Cheong and Ess, 2012). Studies moved toward the theoretical and brought together research from many different disciplines. While identity and community had been the major concepts of the first two waves, authority joined in during this phase. In fact, researchers were finding it hard to separate the three and instead conceptualized them as being interrelated. Online and offline interactions were giving individuals more opportunities to create their own religious stories and control their own religious practice (Cheong, 2012). To understand religious communities, researchers were applying the SST

framework and uncovering the ways in which communities negotiate and reshape

technologies to fit within religious infrastructures (Campbell, 2010; Lövheim, 2012).

Religious authorities also began moving away from a negative approach to online

engagement and instead begin incorporating it into their everyday routines, such as

posting sermons (Cheong, 2012). While the third wave gave form to new theoretical

work from a variety of scholarly perspectives, inquiry into digital religious interactions

were limited to traditional methods.

The fourth wave, as mentioned earlier, is concerned with how digital

technologies are being integrated into, and negotiated within, users religious lives

(Lövheim & Campbell, 2017). It is argued that this study is situated within this fourth

wave of digital religion by exploring how religious mobile engagement is a unique

amalgamation of online and offline contexts. The online goes with the user, rather than

being tied to a desktop that stays in the home or office. It is embedded within every

offline situation in which the user pulls out their mobile device in order to engage

different applications. In earlier waves of research, most people used technology

together in an online space. Smartphones though, allow for the online to accompany and

combine within offline religious spaces, such as church services. Wagner and Accardo

(2014) argue the iPhone specifically is personal and not communal, the fact that devices

enter into communal spaces by way of individual needs that must be taken into

consideration. Also, mobile apps can use social media to afford an online connection to

other religious users. If this is an affordance users engage, is the nature of the mobile

device still highly personal? It could be argued that with every different person and

every different app the context shifts, which points back to the blurring of online/offline and to the individualization of religious practice.

The current study on mobile apps fits within the fourth wave of the digital religion literature in two ways. First, how developers choose to code the practice of prayer into app form, and also how they signal prayer affordances to users through interface design, shows how design is used to transfer offline practices of prayer into mobile contexts. Developers in this sense may become a type of religious authority independent of, or in conjunction with, traditional religious authorities who may guide the app design process. The contribution of this study to digital religion speaks to how the blurring of offline and online contexts may result in the shifting of individual religious identities and the emergence of developers as a type of religious authority. Second, users take the traditionally offline practice of prayer into the mobile context throughout changing interactions and environments, such as praying at home alone with the app or using it in a religious service setting with others. Consequently, shifting religious practices into a mobile space (i.e. a blurred online/offline space) may also shift the way the user understands their own religious identity.

Religious identity. Identity, or the understanding of the self (Goffman 1959), tells the story of how we make sense of our relationship with ourselves and to others (Ammerman, 2003). Religious identity is constructed through the stories people tell about their own path into and through religion as well as how they relate to the stories that religious authorities and organizations tell about the religion (Ammerman, 2003). Therefore, when new media technologies become available, there is a restructuring of

religious identity and understanding of religious practices in relation to the new process. Religious individuals and organizations have to rework the narratives they tell about themselves and their faith.

Religious identity is a core area of investigation within digital religion research specifically related to how the use of, and engagement with, online technologies influences the ways in which religious individuals understand themselves and others. A key finding from this literature posits that new technology provides the opportunity for individuals to restructure their religious narratives outside the view of, or input from, traditional religious authorities (i.e. pastors, imams, theologians and religious texts) (Hoover, Clark, & Rainie, 2004; Cheong, 2012). Essentially, digital technology is posited to give religious individuals more autonomy in picking and mixing different understandings and practices to form a personal bricolage that helps them make sense of their religious lives in both online and offline spaces. However, even though religious individuals have the opportunity to "pick 'n mix" their religious identity (Wagner, 2012), that does not mean that users will actually go outside traditional religious authorities or organizations to do so. In fact, participants in one study actually picked religious apps that mirrored their already established offline practices (Bellar, 2016). One way this study speaks to religious identity construction is by engaging with actual users about what technological and religious features are important to them during app use. Another contribution of this study is to explore how both developers and users draw upon different types of religious authority to make sense of app design and use.

Religious authority. Religious authority has traditionally been defined through

four different aspects: hierarchical roles of religious leaders (such as pastors, imams, and

theologians); the structure of religious communities, organizations, and practices; shared

religious identities through shared beliefs and practices; and sacred texts that are seen

central to the religion (Cheong, 2012, p. 73). Within this study, traditional religious

authority is defined through the hierarchical roles of leaders and organizations and

through the sacred texts.

Cheong (2012) maps out two logics that have emerged from studies of religious

authority in digital contexts. The first is the logic of "disjuncture and displacement" (p.

74), which views technology and traditional religious authority as antithetical. Leaders in

this logic are constantly battling new media forms for control of the narrative and

definitions of religious symbols and practices. However, the second logic, that of

"continuity and complementarity" (p. 74) is emerging as the dominant narrative in

digital religion studies. In this view, traditional religious authorities view media

technologies as a supportive tool through which to communicate with adherents. This

logic underscores the way religious authorities and organizations have adapted to the

new media environment to maintain control of the religious narrative (Campbell, 2007).

Cheong claims that religious authority under this new logic "is reframed as shaping,

sustaining, and being sustained by online practices," (p. 74).

In light of these two logics, Cheong (2012) posits a third logic of "dialectics and

paradox" which "articulates the multiple links between new media and religious

authority," (p. 82). This logic points to factors that both enable and constrain traditional

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religious authority. For example, traditional religious authorities are operating along side new forms of religious authority developed within online contexts. First, traditional religious authority may compete or supplement their authority with what is being coined as "algorithmic authority," which is defined as "the legitimate power of algorithms to direct human action and to impact which information is considered true," (Lustig & Nardi, 2015, p. 743).). It is important to juxtapose traditional religious authority with algorithmic authority in the case of religious mobile applications because it may imply a control of religious practice by those outside the hierarchical structure of religious faith. The next subsection defines and explains algorithmic authority in more detail.

Algorithmic authority. An algorithm is a set of tasks written in computer code that instructs the hardware to perform certain actions (Lustig & Nardi, 2015), or "a description of a method by which a task is to be accomplished," (Goffey, 2008, p. 15). Algorithms structure boundaries and regulate the flow of information (Thacker & Bromiley, 2004). These definitions seem to attribute much power to algorithms to control or structure action. Cheney-Lippold (2011) says that algorithms are made up of "a complex set of relationships that tie together the coded system of definition and organization that constitute our experience online" (p. 167). The connection between these definitions is the power of the algorithm to govern or control.

However, other scholars note that algorithms are mediated not just through technology (i.e. hardware), but also through culture and social contexts. Rather than reducing the code of algorithms to a "recipe" it is important to see them as performative, and to avoid conflating meaning and action (Chun, 2011). Rather, algorithms are not

fixed, but open, and are more complex that a set of numerical operations that result in certain outcomes. Indeed, Weizenbaum as early as 1978 posits that, "Programmers thus cannot even know the path of decision–making within his own program, let alone what the immediate or final results will produce," (234). Therefore, algorithms are dynamic, socially and culturally situated instructions that result in a certain technological output or action.

For this study then, algorithmic authority is determined by the developer who writes the code as well as by the organization(s) that maintain the applications. Algorithmic authority is seen as that which is built upon the developer's control of selecting specific technological features and religious content to construct a mobile religious practice. It is important to identify the type of developer as mentioned in the introduction: individual, religious organization, and secular organization. The type of developer may influence the way algorithmic authority is being used in addition to, or in conjunction with, traditional religious authority. It remains to be seen if traditional religious authority and algorithmic authority are mostly complementary or adversarial in constructing religious narratives, or if traditional religious authorities are appropriating algorithmic authority for their own use.

It is also important to differentiate algorithmic authority from the actions that are, or are not, taken by users of religious mobile applications. As the RSST framework suggests, the relationship between technology and society is reciprocal. While developers write the code that results in certain technological action, users have the agency to create different meanings and act in ways other than those intended by

developers or designers. Therefore, while algorithmic authority is helpful for understanding the ways in which developers understand, frame, and structure religious practice through mobile apps, it does not necessarily equate or force users to make meaning and take action through the app in the same way. In essence, the algorithm may compute certain outcomes on the app, and may or may not necessarily result in the same specific meanings and actions by the user.

Thus, this study is located within the fourth wave of digital religion studies, which focuses on the development of new methodologies in which to study how religious users make choices about, and engage with, religious mobile apps. This study also works to uncover the continued blending of online and offline practices by exploring the way mobile app devices enable or constrict the religious practice of prayer. Additionally, the literature on religious identity and authority is important for underscoring the way online technologies have been shown to influence or be used by individuals and religious authorities. Specifically, it is important to understand how religious authority and algorithmic authority are used to justify or authenticate app use from both the developer and user perspectives. The relationship between identity and authority is important for understanding how religious mobile app technology may be influencing shifts in how religion is design for, and practiced in, everyday life. Therefore, this study seeks to extend this literature by exploring how designers and religious authority structures use technological and religious affordances to build and maintain the authenticity of religious app use.

So far, this chapter has explored mobile communication, general app studies, and digital religion literature. All of these areas have been laid the groundwork for the current approach used in this research. However, as mentioned earlier, there are a few religious app studies that provide important definitions and findings that relate to the current research. The following section provides an overview of these studies and how the insights from these studies may inform to the findings from this dissertation.

Religious apps. At the time of writing this research, an extensive literature review yielded less than 20 articles that focused on religious mobile apps. Although, interest in this area is gaining ground. Out of the available articles, two distinct categories emerge: those that focus on design and development and those that focus on use (Bellar, Cho, & Campbell, Forthcoming).

Design and development. Research that focuses on the apps as a unit of analysis is most represented within the available literature. Within this category, two articles lay the groundwork of the sub-field by analyzing the number and type of religious apps available (Campbell et. al, 2014; Wagner, 2012). Wagner highlighted six categories of religious apps on iTunes and analyzed how apps could influence users' religious identities. Her conclusion notes the personal nature of religious apps as used on a mobile device, in that users determine what apps to download as well as when and where to use them. The users' private and personal interactions with religious apps allow them to practice religion in a way that is in line with their personal views, rather than under the gaze of religious authorities. However, some apps are developed by organizations guided by traditional religious authorities, and users often look for trusted sources when

downloading and using apps (Bellar, 2012). As Wagner highlights, individuals decide what to download and what their mobile religious practice should look like. "Therefore our selection and use of particular apps reveals our concern about what constitutes authentic religious practice and to what degree this depends upon traditional authority and contexts," (Wagner, 2012, p. 205). However, it is important to note that these possibilities are revealed through Wagner's analysis of the apps only, and may or may not reflect how actual app users engage religious apps.

Wagner's (2012) categories helped lay the groundwork for Campbell et. al's (2014) systematic categorization of more than 400 religious apps available on iTunes, which resulted in a typology of 11 different categories defining different religious app uses (p.163). The eleven categories were organized into two "parent classifications: apps oriented around religious practice and apps embedded with religious content" (p. 164). Bible apps, prayer apps, focus meditation apps, devotionals and rituals are all examples of the former parent category (p. 165). The latter is comprised of apps that may not necessarily promote a specific religious practice, but rather provide "access to a specific form of religious information or material," (p. 165). Examples of apps within this category include apps that are created and used for specific religious organizations, religious games, and religious forms of social media, or apps that perform a specific religious utility (p. 166). The important distinction is this: some app affordances are designed to facilitate a specific religious practice within which the phone and app become enmeshed; other app affordances provide information, tools, or access to other

types of religious information and material that are not necessarily used in a religious practice itself.

The categories from Campbell et. al (2014) are not mutually exclusive, however. Therefore, an app could have affordances that are designed to incorporate the phone and app into the actual prayer practice as well as have tools and features that provide information and actions that help the user prepare for and understand the prayer practice. Prayer apps, and all religious apps for that matter, can be multifaceted. There are two categories that fall within both the apps oriented around religious practice and apps embedded with religious content that are important for the current research. First, the prayer app category is defined as those apps that engage a monotheistic view of a divine being within the Abrahamic faiths (p. 164). "Prayers occur through reading text on the device, listening to audio of prayers, typing in prayer requests, or constructing a private, personal prayer," (p. 164). Analyzing Catholic and Muslim prayer apps should confirm, refine, or extend this definition. Also, this study should help validate these categories by showing how users actually engage with apps that fit into the prayer category.

Second, religious utilities apps are defined as those apps that provide tools and information that orient the user to a specific practice, but are not necessarily meant to be an integral part of the actual practice (p. 166). For instance, perhaps the app is designed to alert the user to specific prayer times. Additionally, some apps may have added features that allow users to keep track of their prayer practice or provide instructions on proper ways to pray. In each of these examples, the app is important for understanding or preparing for prayer, but is not meant to be used during the prayer practice itself.

Other app research that focuses on apps rather than users link specific design elements and affordances with possible understandings and outcomes. Findings include how the specific use of audio and visual affordances are necessary to create meaningful interactions and engagement with user (Torma & Teusner, 2011), and how the private, personal nature of the mobile devices itself may reshape understandings and practices among religious users (Wagner & Accardo, 2014).

Religious app use. Unlike the articles that explore religious app design, research in this category makes users the unit of analysis. Including data from users is important because design affordances do not always lead to their intended actions. Studies in this area have used surveys and focus groups (Hutchings, 2015; Richardson & Pardun, 2015), digital diaries and in-depth interviews (Bellar, 2016), and user experiences approaches (Al-Ghannam, Kanjo, & Al-Dossari, 2015) to study religious mobile apps in different context and for different reasons.

Two studies explored Christians' understandings and expectations about the use of digital Bibles in today's mobile context. Hutchings (2015) found both positive and negative effects of app use. On the positive side, those surveyed felt the mobile app made it easier and more convenient than taking a physical Bible with them everywhere. Participants in Hutchings study also enjoyed engaging with other readers online and said that the app helped them read the Bible more consistently. However, participants also felt a sense of loss of the printed Bible. The physical Bible was ascribed sacred status and played an essential role in their religious practice throughout their lives. Richardson and Pardun's (2015) study supports this finding and showed that participants' viewed the

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physical Bible as being imbued with memories that they were reluctant to abandon. Other concern from these studies included reading verses out of context (Hutchings, 2015), not being able to physically underline, highlight, and take notes with the physical book, and added distractions during corporate worship (Richardson & Pardun, 2015).

Choosing and using religious apps have also been shown to play a role in how Evangelical Christians understand themselves and their relationship to others. Bellar (2016) used a combination of digital diaries and in-depth interviews to show that participants choose apps that already align with their core religious practices, therefore supporting their religious identities. Participants also used their larger religious network to choose religious apps. However, participants either did not show interest in, or were concerned about revealing personal, private religious feelings, through social media affordances in religious apps.

Only one study found compared religious app use across religious faiths (Leckebusch, Kowalewshi, Lidynia & Ziefle, 2015). The study surveyed both Christians and Muslims in Germany and found that Muslims were more likely to use religious apps. While both groups were interested in using religious apps to get information or learn more about the faith, Muslims were more likely to use it for a religious practice. More comparative studies are needed from a variety of international contexts to gain a more complete picture of religious app adoption and use.

User-experience (UX) researchers have also been involved in designing and testing apps for religious use. These studies highlight the need for more interdisciplinary research in this area. One of the earlier studies used interviews with participants who

used a beta version of Muslim prayer app (Wyche, Caine, Davison, Patel, Arteaga, & Grinter, 2009). The findings seem to mirror that of Torma and Tuesner (2011) in that participants found the images and audio cues used created a more meaningful connection to the larger religious community. Five other studies in this area used Human and Computer Interaction (HCI) approaches to study use of Islamic apps by the elderly (Ahmad, Zainal, Razak, Adnan, & Osman, 2015), using accelerometer functions to monitor correct prayer postures for Muslims (Al-Ghannam, Kanjo, & Al-Dossari, 2016), intentions to use a pilgrimage app for Spain's Camino de Santiago (Antunes & Amaro, 2016) evaluating appropriate design affordances using Near Field Communication for Muslims' Hajj pilgrimage (Mohandes, 2015), and development and use of a religious education app for Indonesian Muslim youth (Saidin, Mohamed, Adzmi, & Azhar, 2015). Studies in this group differ from the other studies mentioned in that they are concerned not so much with how participants view their religious identities or religious authority as related to app use, but rather with the usability of the app design. For example, the app has already been designed based upon the developer's religious understandings and experiences. It is being tested to see if the design is usable for religious participants. Therefore, the focus is on how technological skills are used to create engaging affordances for different religious users, and how creating user tests helps evaluate app success. This study intends to use a similar approach but with different parameters. First, this study tests one Catholic and one Islamic app that have already been developed and are widely used. Second, while the user tests are designed to evaluate usability, this research digs deeper by using in-depth questions and tasks that illuminate participant's

own understandings and engagement with religious practice through mobile apps (*see* Chapter III for full description). It is important for digital religion studies to engage with HCI approaches to accurately understand design processes and the communication that takes place between interface and user. At the same time, HCI studies would also benefit from collaboration with digital religion scholars in evaluating and understanding how religious groups' core values and beliefs drive engagement with technology and interact with identity, authority, and community.

Religious apps are relatively understudied area of research, although over the last few years more work has been published. This research seeks to contribute this growing body of literature by examining both apps and users as units of analysis, by comparing the affordances and use across two different religious, and by using the interdisciplinary approach of user-experience testing. Specifically, this study will contribute to the digital religion literature by illuminating how app affordances are used to translate the offline practice of prayer into mobile apps. Additionally, the findings will help clarify what technological and religious affordances are used and if they are used as intended, which speaks to the evolving religious practice of prayer in mobile contexts.

In order to adequately understand these concepts within the context of the current study, the literature on affordances and usability illuminates app development and design. The next section traces the history and development of the term through technology studies, provides a definition of technological affordances, and works to develop the term religious affordances as the result of combining technological affordances with religious content.

Affordances and Usability

The affordance and usability literature is useful for considering the relationship between technology design and use. While the term *affordances* can point to all of the different possibilities and constraints the design allows, in this study it specifically focuses on developer's intended actions that are made possible or constrained through app design (i.e. content and structure). Additionally, the term helps conceptualize the way users perceive affordances. Users maintain the agency to implement different actions into their daily practice that may be afforded by religious apps, even if that practice looks different from the developer's intentions. The remainder of this section will discuss the history of the term as well as relevant literature that explicates further how the term is utilized within the current study. The section ends by developing a working definition of religious affordances that are designed through specific technological affordances and religious content.

The term *affordances* has been used in several different ways in the design literature. However, sociologist J. J. Gibson (1977) first coined the term as he tried to conceptualize the relationship between the environment and the animals that inhabited it. Gibson said affordances are what the environment "offers the animal, what it provides or furnishes, for good or ill…" (1977, p. 127). Therefore, the way the environment is, or is not, presented, could influence certain behaviors in the animals. Gibson was keen to point out that these environmental affordances could mean different things to different animals. Also, as the environment evolves and changes, so do ways of acting. This is important as it speaks to the changing nature of affordances: they can have various

definitions, or be perceived differently by different animals as they evolve. Bearne and

Kress (2001) stressed the importance of looking not only at what affordances allow, but

also what they inhibit (p. 910). They argued that people perceive both possibilities and

constraints when assessing objects and their environment. However, some criticized this

approach as being too deterministic and utilizing binary terms (Prior, 2005).

While Gibson applied the term affordance to the environment, it was Norman

(1988) who first applied it to technology. Norman conceptualized the environment as the

technology and the animals as the users. Gibson's definition allowed only the

environment to present affordances, while Norman extended the definition to include

what people can, and often do, to shape affordances themselves as they design the very

technological objects they encounter. Norman, then, defines affordances as "the

perceived and actual properties of the thing, primarily those fundamental properties that

determine just how the thing could possibly be used," (1988, p. 9). This definition splits

the term affordances into two parts: possible affordances and perceived affordances.

Possible affordances are all the actions, both good and bad, the technology creates.

Perceived affordances are the potential actions the user intuits when encountering the

technology. Norman highlights that often times there are discrepancies between possible

and perceived affordances. The greater the discrepancy, or the farther apart the possible

affordance is from the user's perceived affordance, the worse the design. Technologies

that are designed well, then, are those that render affordances visible to the user and

match the user's perceived ideas of what actions can be taken (1988, p. 82). Norman

(1990, 1999) further refined the concept of perceived affordances as our "mental

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interpretation of things," (1999, p. 219). These mental interpretations are predicated on the user's previous knowledge and experiences that they use to understand objects in their environments.

Others scholars of technology design debated and reworked the term affordances in order to provide a less deterministic and more constructionist definition (Bearne & Kress, 2001; Bloomfield, Latham, & Vurdubakis, 2010; Faraj & Azad, 2012; Fayard & Weeks, 2014; Gaver, 1996; Goldring, 1991; Hutchby, 2001; McGrenere & Ho, 2000; Stoffregen, 2003; Turvey, 1992). In fact, some argue that Gibson's concept of affordances as advanced by Norman balances between technological and social determinism (Bloomfield et. al, 2010). Possible affordances may be able to prompt the user to act in certain ways, but users can accept, reject or reshape these affordances (Campbell, 2010; Fayard & Weeks, 2014). Hutchby (2001) and Gaver (1996) speak about affordances not as determining action, but rather as channeling it. Affordances should be seen as relational, which account for the way a user interacts within their socially and physically constructed environments. Therefore, when using affordances as a lens through which to study a technological object (i.e. apps) the researcher must pay attention to the affordances of the object, the users intent of engaging that technology, and also the social and physical environments in which the technology is used. Therefore some scholars adopted realist interpretations that examine the interaction between affordances and users (Turvey, 1992). In this approach, the relationship between affordances and users was conceptualized as a system (i.e. actor-environment system), which directs what can and cannot be done (Stoffregen, 2003, p. 124). Indeed,

affordances can then be defined as the relationship between the environment (technology

and the contexts in which it is engaged) and the users themselves (Chemero, 2003).

Goldring (1991) also tried to extend this relationship to include not only the relationship

between the affordances and the user, but also among the users themselves. Users do not

learn about and engage technology in a bubble; rather users often learn about

affordances from others and engage technology in other social situations and contexts

(Van Leeuwen, Smitsman, & Van Leeuwen, 1994).

Scholars are still doing the work of refining the term. For instance, Faraj and

Azad (2012) defined affordances as a "multifaceted relational structure, not just a single

attribute or property or functionality of the technology artifact or the actor (p. 254). This

definition lends its self to a "practice lens" through which to view affordances (see also

Orlikowski, 2000). In this sense, affordances are not about the object's traits but rather

the "actions in the world that involve technology," (Faraj & Azad, 2012, p. 255). Fayard

and Weeks (2014) contend that affordances "provide a powerful lens for studying the co-

constitutive relations between technology and people… and provide a better language

for describing how particular practices are shaping and patterned by structure and

setting," (p. 237). The language used here strikes that chord between technological and

social determinism. Rather than one determining the other, technology and users co-

construct each other.

For this study, the language of affordances provides a way to articulate both how

technology shapes behavior and how users' behavior shapes technology. Again, studying

the relationship between technology and users through possible and perceived

affordances does not happen in isolation. Therefore, it is important to acknowledge that users compare affordances to other technologies and contexts. In addition to the co-constructed nature of this relationship, affordances must be both physically and socially possible (Fayard & Weeks, 2014). Essentially, there are social affordances in addition to possible and perceived affordances that researchers must take into account. Social affordances give researchers a way to explain "how the social construction of a technology impacts the practices afforded by a particular environment," (Fayard and Weeks, 2014, p. 245).

This study takes a unique approach to the term *affordances*. Technological affordances are conceptualized as the possible actions the app provides as well as the perceived and actual actions a user may engage when using apps for prayer. Therefore, a technological affordance is defined as those features developers include in the app to provide certain actions that users can take. At the same time, users may engage technological affordances in ways not intended by the developers. Affordances need to be understood as the multi-faceted relationship among the different actions possible in the mobile context. The practice view of affordances (Faraj and Azad, 2012) is especially helpful in this study as it looks at the relationship between how actions of prayer are coded into apps and how users perceive and possibly alter those actions in practice.

This study also adds to the affordance literature by defining and exploring the concept of religious affordances. The difference between technological and religious affordances lies in the content and resulting action that the design prescribes. The unique

mix of technological features and religious content work to build religious affordances that result in religious practice through mobile apps. Religious affordances, much like technological affordances, can be understood and engaged in different ways by both developers and users. Therefore, it is important to distinguish this concept in three ways: a) how developers frame the religious affordances of their apps, b) what religious affordances are actually contained in the apps themselves, and c) how religious users understand and engage religious affordances during app use.

Because technological and religious affordances are constructed and designed from different app features, it is important to explore the basic elements that make up mobile applications. The next section works to define these elements by exploring the usability literature on interface design. Understanding the elements of usability will help in parsing out technological affordances and how they are used in conjunction with religious content to build religious affordances.

Usability and design. It is important that an object's affordances are distinguished from their usability (McGrenere & Ho, 2000). Usability has been described as perceptual information that signals the affordances, such as how a touch screen affords certain movements like touching and swiping among others (McGrenere & Ho, 2000). Usability lies between the hardware (i.e. the touchscreen) and the users perceptions of possible use (i.e. touching, swiping etc.). It is important to study user interface because it is what signals the affordances to the user. It consists of design aspects such as colors, graphics, and sounds.

Usability has been defined by the International Standards Organization as, "…the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in s specified context of use," (ISO 9241, 1997, p. 2). This definition originated within the context of the work sphere and pointed to three attributes used to evaluate the usability of a product: (a) effectiveness, (b) efficiency, and (c) satisfaction. It also outlined three different elements: (a) the user, (b) the goal or intended outcome of use, and (c) the context. However, as technology has advanced, new affordances and features require a reevaluation of the elements usability researchers look for. Nayebi, Desharnais, and Abran (2012) examined how researchers have been defining and measuring usability within the mobile context. They mention the different approach by both Apple iOS and Google Android, the two main operating systems in use today. Apple provides interface guidelines for uses that include attention to multi-touch screens, display differences, and device orientations and gestures. Google Android guidelines mention all of the above and add the size and location of the icons and buttons, navigation menus, simplicity, text formats, and different aspects of messages. Other findings show that researchers have failed to take into account multi-touch gestures, device orientation changes, and location awareness aspects (Navebi et. al, 2012, p. 3). Usability is determined by how well the design of the graphical user interface (i.e. the screen output) communicates available affordances with the user.

Graphical user interface (UI) originated in the design of computers for in the work sphere (Pold & Anderson, 2014). Matviyenko (2014) explains, "the purpose of the graphical user interface (UI was to mediate between a user and a technology," (p. xx).

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User interfaces became important as websites became more interactive. Web designers struggled, and are still struggling as new technological opportunities emerge, to develop rules for user interface design. Shneiderman (1992) came up with what the industry called the "Eight Golden Rules for Interface Design." These include "consistency, universal usability, informative feedback, closure, prevent errors, permit easy reversal of actions, support internal locus of control, and reduce short-term memory load," (Shneiderman, 2004, p. 49). Web designers built upon these rules but it was not until 2004 that researchers tried to translate the "golden eight" to the mobile design context (Gong & Tarasewich, 2004). Basically, four of Shneiderman's rules were said to apply to the mobile context without change: (a) "provide shortcuts to frequent users" (i.e. permit easy reversal of actions); (b) "offer informative feedback;" (c) "design dialogs to yield closure;" and (d) "support internal locus of control," (Gong & Tarasewich, 2004, p. 3751-3752). The first rule, enable frequent users to use shortcuts, prompts designers to create easier access to content and action through different mechanisms such as push notifications, bookmarks, and reminders. Frequent users should not have to go back to the beginning and redo tedious tasks. Second, informative feedback suggests that designers provide some kind of response for users' actions, such as beeping or clicking sounds when pushing a button or an error message when something goes wrong. Third, design dialogs to yield closure can be translated into giving the user a series of steps with a clear "beginning, middle and end" which provides a feeling of satisfaction or accomplishment when the task is done (p. 3751). Fourth, support internal locus of control suggests the design should allow the user to feel in control of the actions they are

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taking with the technology. "Systems should be designed for users to initiate actions rather than respond to them," (Gong & Tarasewich, 2004, p. 3752).

Shneiderman's other four rules needed to be amended for the mobile context (Gong & Tarasewich, 2004). First, consistency for desktop interfaces did not have to take multiple devices and platforms into consideration. In the mobile context designers have to think about Apple hardware and iOS software verses other smartphones such as Android (p. 3752). Additionally, the mobile interface should mirror and feel connected to the desktop interface (p. 3752). For example, if the app provides a mobile experience of a particular web site, the theme, colors, and other design features should mirror each other in both contexts. Next, when thinking about reversal of actions, designers have to rely on available memory to maintain the user's history. In the mobile context, there are fewer available resources and therefore designers should not rely as heavily on network connection (p. 3752). This may be why some apps use the store descriptions to highlight the app can operate without wireless networks order. Next, reducing errors, while similar to the desktop interface issue, is different in the mobile context because users are on the go in a rapidly changing environment (p. 3753). Finally, reducing short-term memory load is also different in the mobile context due to the fast-pace environment of the user. Designers should try to limit the steps users have to memorize in order to recognize a specific function. Instead, designers should use sound cues, such as audible directions, to give the user the information they may need (p. 3752-3753).

While Gong and Tarasewich (2004) reviewed Shneiderman's rules, they also found some gaps that they addressed with seven new guidelines. First, users are engaged

in a variety of changing contexts as they use their mobile devices throughout the day.

Designers should allow users to configure app outcomes such as text size and screen

brightness to meet their individual needs (p. 3753). Second, designers have to take

screen size into account. As screens continue to shrink, like the new Apple iWatch for

example, "modified techniques" will have to be engaged to account for "physical

limitations," (p. 3754). In this case, users could give audible commands rather than

pushing buttons with their hands. Third, due to the changing contexts of mobile use,

designers should factor in the user's limited resources, such as time and attention. Again,

Gong and Tarasewich (2004) highlight using sound and other "tactile output options" so

users' movements and attention will be free to engage with their changing environment

(p. 3753-3754). Fourth, mobile apps should be able "to be stopped, started and resumed

with little or no effort," (p. 3753). Because the context is changing and users are

operating under time constraints, apps should operate as fast as possible with little

interaction from the user (p. 3753, 3755). Fifth, designers should aim for "top-down

interactions," (p. 3755). Because of screen limitations, information should be presented

in different ways, rather than all at once. A good example of this might be the email

inbox, where users can see the new messages, the title of the email and maybe the first

few words. This should give the user enough information to decide whether to open the

email in full or if it can wait until later. Sixth, users should be able to change different

outputs to fit their unique needs and preferences (p. 3755). For example, some systems

and apps allow the user to use their own photos as backgrounds or to change the screen

brightness according to their own needs. Seventh, and last, designers need to take the

user's enjoyment into consideration. The colors, layout, graphics and other aesthetics need to be pleasing to the eye as well as fun to engage (p. 3755).

For this study, the affordances and usability literature explains how designers have used certain elements to develop interfaces through which users perceive affordances. There are several key takeaways from the previous discussion of these two literatures. First, rather than seeing affordances as either possible or perceived, they are complex relationships between the technology, which was developed and designed with certain ideas and rules in mind, and the user, who brings their background and experiences with them as they perceive how the technology will help them in their everyday lives. Therefore, this study is situated well within the affordances and user interface literature.

Second, the usability guidelines help in two ways: they provide an understanding of the design elements that are used to create both technological and religious affordances; and they guide how questions are framed for both developers and users, as will be shown in the study design section of the paper. For example, how do developers determine what type of output signals (i.e. pop up notes, chimes to signal the end of a timed prayer) to use in prayer apps? Output signals will have to be determined in connection with the designer's understanding of how prayer should be practiced offline in order to be translated to the app. Therefore, understanding the design elements of usability will work to uncover technological and religious affordances found in prayer applications.

To this point, this chapter has laid the groundwork for understanding the relationship between design and use by situating the current study within the mobile communication and general app studies, digital religion and religious apps studies, and affordance and usability literatures. Mobile communication lays the broad foundation from previous scholars who emphasized studies that looked beyond the technology to study the unique histories, cultures, and societies in which mobile devices are used. It also provided sensitizing concepts, such as micro coordination and telecocooning that may be helpful in analyzing the data from both the app and user perspective.

Next, the study was situated within the fourth wave of digital religion, which provides insight on religious practices in online contexts that are also linked to offline contexts. Specifically, the literature on religious identity and religious authority within digital religion are integral to analyzing the role religious apps may or may work to develop user's religious identities as well as how authority is used to authenticate the prayer app's legitimacy. The religious app literature provided definitions of religious apps and prayer apps as well as insights that the current study takes into consideration in the analysis chapters.

Finally, an overview of the term affordances highlighted the possible and perceived actions that are made possible through the design and use of specific technologic and religious elements. The term technological affordances refers to both the possible and perceived actions made available through technological and religious elements, and also how users perceive the actions made possible by the design. Therefore, understanding technological affordances reveal a complex relationship

between technology design and use. Additionally, the term religious affordances was defined as the possible and perceived and actions made available through a mix of technological elements and religious content.

Viewing affordances through the lens of RSST. RSSTs theoretical assumptions about the relationship between technology and society, and more specifically, the relationship between technology and religion, help frame the way this research understands affordances. Specifically, RSST emphasizes the need to look at the technology and the religious users separately so that the affordances can be defined and explained before analyzing how they are accepted, negotiated with, and/or reshaped by users. The view of relationship between technology and religion within RSST is one of reciprocity: technology informs and shapes religious practices but users also understand and use technology in different ways other than intended by the design. As explained in detail in Chapter I, RSST uses a four-layer analysis to understand this relationship through a specific religious community's history and traditions, core beliefs and values, negotiation with technology, and communal framing of technology use (Campbell, 2010). The four-layer analysis is not used in this research as a strict interpretive framework. Rather, RSST is used to underscore important assumptions about the relationship between technology and religion as well as provide theoretical ideas about how religious communities and individuals adopt and use technology.

This study adopts those assumptions from the RSST and SST theoretical frameworks that the relationship between technology and religion is reciprocal: technology influences and shapes religious communities and individuals, but religious

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communities and individuals also employ their unique histories, traditions, core values and beliefs to negotiate with and often reshape technology to fit their religious needs. RSST views these relationships as rich and complex and provides a template to understand the ways in which Catholic and Islamic app developers use technological and religious affordances to design prayer apps, and also how Catholic and Islamic users understand and engage these affordances within their prayer practices. This informs the practice view of affordances that is used within this study to underscore both the how religious mobile apps are designed and how they are used. Affordances within RSST, both technological and religious, are combined in unique ways to communicate and construct prayer practices in different ways though mobile apps. Affordances within the RSST framework are also understood as the perceived actions users interpret from the design. The important argument is that users may interpret affordances differently than the intended design, and therefore have unique negotiations with how mobile technology is implemented, rejected, or negotiated into their religious practices.

Chapter Summary

This chapter has reviewed mobile communication, digital religion, and affordances literature. All of these areas of study are important for the structure and analysis that this research employs to uncover the relationship between design and use in mobile prayer applications. There were several key takeaways from the literature review. First, this study follows in the tradition of mobile communication scholars who sought to understand more than just the technological elements and impacts of mobile phones on

society. Mobile scholars emphasized how cultural and social elements were just as important to explore the ways in which mobile technology was adopted and used in specific context. Similarly, this study seeks to look not only at apps, but also at users within in different religious contexts.

Second, digital religion provided two important contributions to this study. The first contribution is an exploration of the three waves, which worked to situate this research squarely within the fourth and developing wave. This fourth wave asks questions about religious practices in online and offline context and how digital technology continues to blur the line between the two. The second contribution comes from other literature within the field that speaks to religious identity and religious authority in online contexts. Identity construction is seen as fluid and digital technology seems to provide the opportunity for religious individuals to have more autonomy over their own religious narratives. However, at the same time, traditional religious authorities have adopted a complimentary use of new technology to solidify their power to control religious narratives. Therefore, during the data analysis phase of this study, close attention was paid to these two areas in order to refine or add to our understanding of them in religious mobile app contexts.

Third, the review of the literature on general mobile apps and religious mobile apps reveals the dearth of studies on app developers and users and specifically a lack that focuses on religious apps. However, the field has grown over the last five years. General app studies focused mainly on app effects and factors that influenced user adoption or engagement with specific apps. Religious app studies had two categories: studies that

focused on the app design and development, and studies that focused on app use. Studies within the design and development approach mapped the field of religious apps. This study adopts the definition of religious apps and prayer apps specifically from one of the studies mapping the field (Campbell et. al, 2014). This study also uses the database developed from that study which is housed on the Network for New Media, Religion and Digital Culture Studies web site. Those studies that focused on religious apps provided important insights about Christian users' expectations for digital Bible use, how Evangelical Christians' choice and use of religious apps revealed important aspects about religious identity and the way they interacted with the community in the process. Lastly, this study adopts the user experience methodological approach that seeks to uncover how easy the app is to understand and interact with. However, this study differs from the user experience studies in that it applies the method but focuses on the users understandings and engagement, rather than only on the usability functions of the app.

Fourth, the literature on affordances and usability provided important concepts that relate to understanding the way app design might allow or constrain certain actions. At the same time, the concept helps focus on how users actually understand, implement, or reshape those actions to fit their specific needs. Additionally, the usability literature provides concrete rules and functions that render app affordances visible to the users. A deeper understanding of these elements will work to reveal the ways in which technological and religious affordances interact within the design and also within use.

Therefore, this literature review delineates the boundaries of this study, which focuses on how technological and religious affordances are understood and engaged by

both designers and religious users. This literature review also provides insight into important findings and concepts that are relevant for data analysis. As each of the sections on mobile communication, digital religion, and affordances explained, the design and use of religious mobile apps are complex. There are multiple choices on various levels that designers and users can make related to their engagements with technological and religious affordances within prayer apps. Therefore, two specific qualitative research methods are used to uncover and explain this complexity: textual analysis of Catholic and Islamic prayer apps and users tests with Catholic and Muslim users. The next chapter explicates the relationship between the RSST and qualitative research methods and explains the how the methods result in data that can be used to answer the research questions.

CHAPTER III

STUDY DESIGN

Given this study's engagement with the Religious Social Shaping of Technology theoretical framework and its contribution to mobile communication, digital religion, and affordances literatures, qualitative research methods were particularly useful for exploring the complex relationship between religious app design and use within the specific context of Catholic and Islamic prayer apps. First, the RSST framework views the relationship between technology and religion as reciprocal – both affect and shape the other in complex ways. This complexity can be difficult to quantify. Qualitative methods, however, are particularly useful for untangling rich complex data and giving insight into complicated relationships and processes (Hesse-Biber and Leavy, 2011). Also, if the relationship between technology and religion is reciprocal, and interpretive flexibility (i.e. the opportunity for myriad choices in design and use) is assumed, then studying both technology and people that use the technology makes sense. Qualitative research is concerned with understanding the everyday lives of people and the meanings people make as they engage with each other and cultural objects (Denzin & Lincoln, 2000). Studying the interactions between design and use through prayer apps is one way to understand the meaning-making process and develop insight about the practice of prayer in mobile contexts. Data collected from apps and users in this study provided an opportunity to see the connections and missed opportunities between design and use. Multiple qualitative methods also help researchers approach the same experiences or

contexts in different ways so that in-depth understandings of meanings and practices are revealed (Denzin & Lincoln, 2000). Therefore, multiple qualitative methods uncovered the elements in the technology necessary to understand design affordances as well as revealed how users engage, or did not engage, the technology in specific ways within this research.

Second, the mobile communication literature emphasizes investigating mobile technology within the cultural and social settings that they are used. The design of this study accomplished this by exploring the phenomenon in two different religious contexts. As such it took each religions history and traditions and core values and practice around prayer into consideration. Looking at two religious contexts helped show general similarities to technology design and also how specific cultural understandings and practices also shaped the affordances of the technology and engagement with technology. Additionally, this study illuminated how Catholic and Muslim users engaged prayer apps *at the time of use* by allowing a recording of their mobile device screen and audio. Although the time and place of that engagement was set up beforehand, having access to a recording of their app use at the time it happens was invaluable given that former research has mostly collected data through self-report surveys or in the field, in which the researcher is not always able to see the actual screen during use.

Third, literature on both mobile and religious apps shows a larger number of studies focused only on the technology and design of apps. While it is important to investigate technological elements and their enabling and constraining affordances, it is

just as important to see these elements engaged by real people. Without data from users, the findings and implications of the study would be based only on one element in the relationship between technology and religion, and between design and use. Additionally, a review of the religious app and affordances literature revealed an opportunity to apply Human and Computer Interaction (HCI) approaches that look specifically at the usability of technological artifacts. Therefore, this study extended the focus of research to include both technology and users.

Due to the epistemological link to RSST that assumes the relationship between religion and media is reciprocal, and that technology design and religious users both affect each other in complex ways, the underlying approach to place the research of mobile technology within cultural and social contexts, and the need to expand the focus to studying the *relationship* between technology and users, this study employed two different qualitative methods: textual analysis and qualitative user experience tests. The following sections provide a description of the data, a rational for the selected methods and more details about data collection and analysis.

Data

This study utilized textual and user-based data from two different sources: (a) Catholic and Muslim prayer apps available on the Network for New Media, Religion and Digital Culture Studies app database; and (b) Catholic and Muslim religious app users selected from a pool of users through UserTesting, a company that provides the online tool used to test website and mobile application usability. The company's goal is to "eliminate bad

user experiences" that are both frustrating for customers and result in lost profits for companies ("About us," 2017). Founder Dave Garr created the methodological tool to streamline the usability testing process that he had experienced while working with companies like Apple, HP, Palm, and Intuit. While most companies use the online and mobile testing site to work through design flaws and usability issues, it can also be used to collect data that provide deeper analysis and understanding of user engagement with online and mobile products. It does this by allowing data collection through surveys, modifiable user tests, and recorded audio and video of the mobile user's screen as described in full in the following sections. The following sections also provide more details about the textual analysis and user testing methods used, a justification for why they were appropriate to answer the study's research questions, and also the procedures followed for data collection and analysis.

Catholic and Islamic App Data

In this study, prayer apps are defined as those that engage a monotheistic view of a divine being and seek to provide opportunities for communicating with that being through reading texts, listening to recorded audio of prayers, engaging in the act of prayer through typing into a set format, or constructing private, individually crafted prayers in an app setting (Campbell et. al, 2014, p. 163). When searching the keyword "prayer" on iTunes, almost 500 results for many different religions are returned on one page. However, as noted on the bottom of the search page, "Less relevant items are not displayed. To narrow your results, use more specific search terms," (iTunes search

results, 2015). This shows that there are other available options to users interested in prayer apps. When searching for "Catholic prayer" and "Muslim prayer" pages of close to 500 results for each were also returned. Based on these numbers it is hard to determine just how many prayer apps are actually available through the store. Therefore, narrowing down the sample for both Catholicism and Islam is difficult. However, the Network for New Media, Religion, and Digital Culture Studies app database along with ratings and reviews on the iTunes store, were used to narrow the field.

All apps in this study have been recorded and identified from the Network for New Media, Religion, and Digital Culture Studies app database. The database originated as a research project managed by Heidi Campbell at Texas A&M University. Campbell et. al's (2014) article details the sampling strategy that resulted in this app database. To summarize, the researchers first used the keywords "religion," "spirituality," "religious apps," and "apps and religion," as well as specific religion keywords "Christianity," and "Islam" among others (p. 157-158). This strategy returned highly rated and reviewed apps but they were not representative of each religious tradition. For example, more search results were found for Christianity than Buddhism.

There were 44 Christian prayer apps and 29 Islamic prayer apps in the database. Out of the 44 Christian apps, 41 were considered Catholic. However, the 29 Muslim prayer apps available on the database had no clear indication if the prayer practices concerned one sect of the religion or another. Specifically, the database was important for identifying apps that had already been coded as prayer within the Catholic and

Islamic context. This research specifically engaged with information gathered from the database about the developer, cost, religion, name, and link to iTunes descriptions.

Downloading and documenting all Catholic and Islamic prayer apps listed on the database was the next step in data collection. Upon further examination, there were six Catholic apps that were no longer available to users so they were eliminated from the sample, resulting in a total of 36 apps. Along with the 29 Islamic apps, this resulted in the final sample of 65 prayer apps. It is also important to note that at the time of downloading the apps, many had been updated from the time they were first entered into the database. For this study, the latest available versions for all apps in the sample were downloaded for analysis.

Textual Analysis of Catholic and Islamic Prayers Apps

Textual analysis has long been the method of choice for researchers who explore different media texts (i.e. books, photos, videos, speech acts, etc.) and their relationship to how people make sense of their everyday world. Texts can be defined as "the material traces that are left of the practice of sense-making – the only empirical evidence we have of how other people make sense," (McKee, 2003, p. 15). In this study, prayer apps are the texts that provide the empirical evidence of how app developers make sense of the ways in which religion can and should be practiced in a mobile space. The design of the app, the affordances coded into the app, and the words and images chosen to represent those affordances and different meanings all provide clues about how religious practice is understood by designers and how they see that practice being lived out by users (*see*

Appendix A for a coding list). Textual analysis data provides deeper insight into how

developers understand and translate the practice of prayer into mobile contexts, as well

as what is being offered to users for their personal prayer practice.

      App description analysis. Analysis of Catholic and Islamic app descriptions in

iTunes began after downloading all 65 prayer apps by recoding the following

information from the database and the iTunes app description page: name, version, cost,

size, operating system requirements, languages, app creator/company and contact

information, app rating, iTunes classification, app categorization, and user ratings. All

Catholic and Islamic prayer app descriptions from the iTunes app web page were entered

into Voyant Tools, which is a "web-based text reading and analysis environment,"

(Sinclair & Rockwell, 2016). The site analyzed the texts and created word clouds of the

most frequently used words from the app descriptions. All of the text from the app

descriptions found in the Apple iTunes web site were copied and pasted together into

Voyant. The data was then analyzed for the most used words presented in the form of a

word cloud and lists where the context of the words could be seen. The word clouds,

which presented information about the most frequently used words from the app

descriptions, were used to analyze what aspects of religion and technology the

developers emphasized. This helped paint a picture of what developers thought was

important for users to have in terms of prayer and technological affordances. Three word

clouds and analyses were created: one for all app descriptions, one for only Catholic app

descriptions, and one for only Islamic app descriptions. The top 10 religious words and

technological words were added to a coding list (see appendix A) for the second phase of the textual analysis as well as to code and analyze user test observations.

Prayer App Analysis. In addition to basic app information and word clouds, it was also important to examine the different technological and religious affordances to which the design lent itself. As mentioned in chapter two, technological affordances are conceptualized as the possible actions the app provides through various elements (i.e. alerts, audio, video, etc.). Religious affordances are created by combining technological elements with religious content that result in or create possible religious practices in mobile contexts. Understanding affordances answered the first research question and refined the instrument for the app user test observations. The prayer apps were analyzed with special attention to several key areas including: (a) general design and technological elements and (b) religious elements (*see* Appendix A and also Figure 1). Design and technological elements refer to those aspects that can be found in general app design, meaning they are not unique to religious apps. This included things like shortcuts, informative feedback like pop-up notifications or noise cues, consistency in design colors, graphics and tool, general app responsiveness such as app size, motion controls, and aesthetics like colors, layout, and graphics. Religious elements were coded specifically for textual descriptions of prayers, prayer instructions or information, mode of prayer practice such as reading text, typing a prayer or listening to audio, prayer tools such as searching, sharing and highlighting, and context of use such as personal private use, offline communal use, or online communal use. Special attention was paid to the
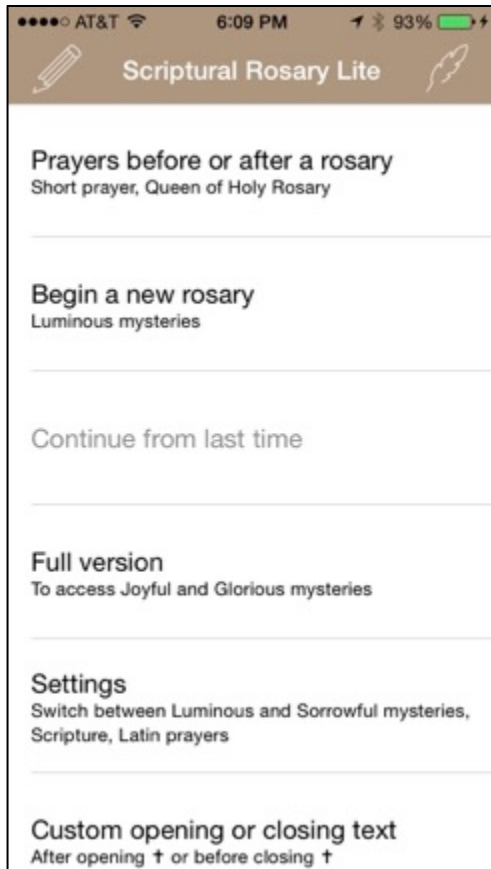
Figure 1: Examples of Screenshots. Image to the right is an example of a screenshot taken and reprinted from 3D Salah, a free Islamic app. Image to the left is an example of a screenshot taken and reprinted from Scriptural Rosary Lite, a free Catholic app..

ways the general design elements and prayer elements were combined to create religious affordances and general approaches to app design.

To analyze general design elements and prayer elements, screenshots were taken from each app page of all 65 apps. First, every app was downloaded to an iPod or an iPhone, due to the amount of data needed to store all of the apps. The apps with older operating systems were downloaded on the iPod and the newer operating systems on the iPhone. Then, one by one, the apps were opened and technological and religious elements were documented by taking a screenshot of each app page. During this process, also referred to as an "app walkthrough" (Light, Burgess & Duguay, 2016), every menu option, prayer page, and other features (i.e. sharing, note taking, audio, etc.) was explored and photographed. Research notes were also taken during the documentation phase. Originally, data was analyzed on Atlas.ti, qualitative coding software, but due to software issues all data was re-coded through Nvivo 8 for Mac, a different qualitative coding software. After screenshots of each app page of all 65 apps were recorded and saved, they were loaded into Nvivo 8 for Mac, a qualitative coding software to be coded and analyzed using an open coding scheme as well as the coding guide developed from the literature review (*see* appendix A). In total, 2,249 screenshots were coded and analyzed. To ensure reliability of the coding process, all apps were coded twice, and there were three different rounds of organizing, combining, and finalizing the final coding list.

Limitations. While examining the app descriptions and the design elements of the religious prayer apps provide us with insight into how developers frame and

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construct prayer practices through technological and religious affordances, there are some limitations that need to be addressed. First, this research only examines one version of the apps that were available at the time of study. For most of the apps in this study, there were multiple previous versions, and even after the time of analysis, many had updated versions in the iTunes store. As a result, this study only examines a snapshot of app descriptions and design, which, in some cases, are constantly changing and being updated. Second, and related to earlier and updated versions of the apps, this study does not look at the user ratings and reviews specifically to see how they correlate with changes made to the app. There could be interesting findings related to the relationship between user suggestions, app content, and design changes, but that is beyond the scope of this study. The textual analysis phase of this study, then, looks at one version of Catholic and Islamic prayer apps that can illuminate how developers frame and design apps, but does not look at different versions or the relationship between user comments and updates.

User Test Observations of a Catholic and an Islamic Prayer App

The second phase of data collection involved detailed information of religious app users' engagement with one Catholic app and one Islamic app, both of which were chosen from the textual analysis (the next section details how apps were chosen). User tests were comprised of a short pre-survey, a list of tasks to complete, and questions to answer. Twenty-five Catholic and 25 Muslim app users, both male and female, and ages 18 and up, completed user tests to generate data related about user perceptions and engagement

with prayer design and affordances. As mentioned before, UserTesting, which is a company that tests the usability of websites and mobile applications, provided access to these users. The pool of testers can be prescreened for religion, age, and other factors. Looking at users who are of the same faith and already inclined to use app technology answered the second research question and provided valuable data that helped explore the relationship between design and use. Limiting the age to 18 and older was the result of two considerations: (a) participants under the age of 18 are considered a vulnerable population, and therefore access to this group is restricted; and (b) limiting the age group to anything other than 18 and up makes an assumption that religious app users are a certain age and may exclude important or unique findings. This research fills the gap left by app studies that collected self-reported data *after* the time of use. User tests record users' mobile screens and audio which allows observation of their interactions and thoughts *at the time* they are engaging the app. Being able to see the screen will allow for a more in-depth analysis of what users actually do with the app rather than only analyzing self-reported data. Also, having users talk about what they are doing and thinking at the time of use, while it may influence what they do and do not do, provides valuable data on not only how they are engaging the app but how they understand that engagement in terms of what actions the app affords. Finally, acknowledging that there are pertinent ethical considerations to using a private company to collect data, a discussion of ethics is necessary. This discussion will be presented after the data collection and analysis is explained in full to avoid confusion related to the specific research protocol.

Data collection. Data collection for the user tests took place over three different phases. To begin, the researcher identified the prayer apps for the user testing observations. Next, a pre-survey was distributed on the UserTesting web site, which helped to identify participants who met the criteria and recruited them to participant in the test. Then, participants who qualified entered and completed the user test. This section details each of these steps in the data collection process.

Identifying the apps to test. One Catholic and one Islamic app were chosen from the 65 apps that were textually analyzed: "Laudate" and "Muslim Pro - Prayer Times, Aazan, Quran, Qibla and Islamic Calendar" (i.e. Muslim Pro) respectively. These apps were chosen because they offered a variety of prayer-related affordances for which users could choose to engage. Both apps were chosen based on their variety of prayer affordances, clean design with few bugs (i.e. glitches in the software), multiple customization features, multiple additional religious features, and user ratings. Therefore, these apps provided the most comprehensive set of technical and religious affordances that users could engage. The data collected from these tests allowed for an exploration of the key ideas found in the textual analysis presented in Chapter IV.

To illustrate, "Laudate" provided sections for daily prayers, liturgical prayers, and for the user to create personal prayers. "Muslim Pro" also had multiple prayer features including prayer times, different *azans* (i.e. call to prayer) and a different *duas* (prayers) for different days, activities, and issues. Both apps also had audio options as well as reminders and/or bookmarks for different prayers. Therefore, a variety of prayer activities were available on both apps. Additionally, both apps are highly rated on both

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the iOS and Android platforms. "Laudate" received 4.5 out of 5 stars with more than 2,000 users ratings, and 4.5 stars with more than 21,000 user ratings on the Google Play store. "Muslim Pro" received 4.5 out of 5 stars with more than 10,000 user ratings on iTunes, and 4.5 stars with more than 388,000 user ratings in the Google Play store.

After the apps had been identified through the mentioned criteria, UserTesting was contacted to develop the user test. However, there was a glitch. Due to limitations with the iOS operating system and the UserTesting software, the iOS apps would not work with the tool. The designers would have to code additional data into the apps in order for them to be compatible with the testing software. Because no designers responded to requests to do this, the Android versions of "Laudate" and "Muslim Pro" were examined to determine how different the design and affordances were. Luckily, "Laudate" and "Muslim Pro" are both available on Android through the Google Play store and the design and app structures were essentially identical. Both apps maintained the same color schemes, layout designs, and content hierarchies. The screen shots are essentially identical and the features work in much the same way within the apps. The only differences between the two were system management styles, such as managing notifications within the iOS operating system and the Android system, and keeping the app running in the background. While it is obvious that iOS and Android apps and users are different, the differences in these two apps in terms of design and affordances were minimal. Therefore, the user test observations were conducted with the Android app versions of "Laudate" and "Muslim Pro."

Identifying and recruiting the participants. It is important to acknowledge

UserTesting awarded a scholarship of 50 free user tests for this research project, worth a

total $2,500. Participants who complete the test are paid up to $15. The only identifiable

information available in the data is the users' screen names. All users' screen names and

information are kept confidential and no references were made to them within any

written reports.

UserTesting identified participants who met the following criteria for

participation: (a) users ages 18 and up, (b) users who lived with the United States. The

company then notified potential participants through their website that there was a new

test available. In order to participate in any test, users confirmed that they understand

their rights and consent to participate. They could stop a test at any time, but would not

be paid for incomplete tests. If they could not complete the test due to technical issues,

they would receive partial payment at the company's discretion. Participants who

volunteered to test apps were required to have a UserTesting account and could see

studies for which they qualified. UserTesting also sends an email notifying the

participants if they qualify for a new study. The participants either accepted or declined

participation. If they accepted, they logged onto the web site and were presented with

screener questions (*see* Appendix B) including the following questions: (a) Please

indicate if you are a member of the following faiths; (b) How frequently do you pray?

(c) How uninterested (1) or interested (5) would you be in using a mobile phone

application for prayer? The first question limited the test to only Catholic or Muslim

users. The second question limited participants to those who were involved in some type

of prayer practice. The only exclusion criteria for the second question were the answers "rarely" and "never." The third question helped to limit participants to those who were at least somewhat interested in using a prayer app.

Description of user tests. If the users qualified for the test after answering the screener questions, they started the test on their mobile device. The tests lasted between 15 and 25 minutes in length. Participants would have already download the UserTesting app that presents the test information as well as records both video of the mobile screen and audio from the user as they engaged the app. The test contained 15 tasks and four post-test questions (*see* appendix B). They were also asked to download the app that they were to test and were given links to the Google Play store where they could do this. Both apps were free, so there was no cost to the participant to download the apps.

When participants opened the test in the UserTesting app, they were presented with a few questions about their understanding of prayer and how they might expect to use an app for this purpose (tasks 1-4) (*see* Figure 2 for images from the testing app). Then they were instructed to open the prayer app and provide their initial reactions to the interface design (tasks 5-6). The participants were then asked to find a prayer on the app that they were interested in, and were asked to pray it out loud if they felt comfortable doing so (task 7 -9). Users then discussed how they felt about praying with an app (task 10), how they felt about the customization features of the app (task 11), and their
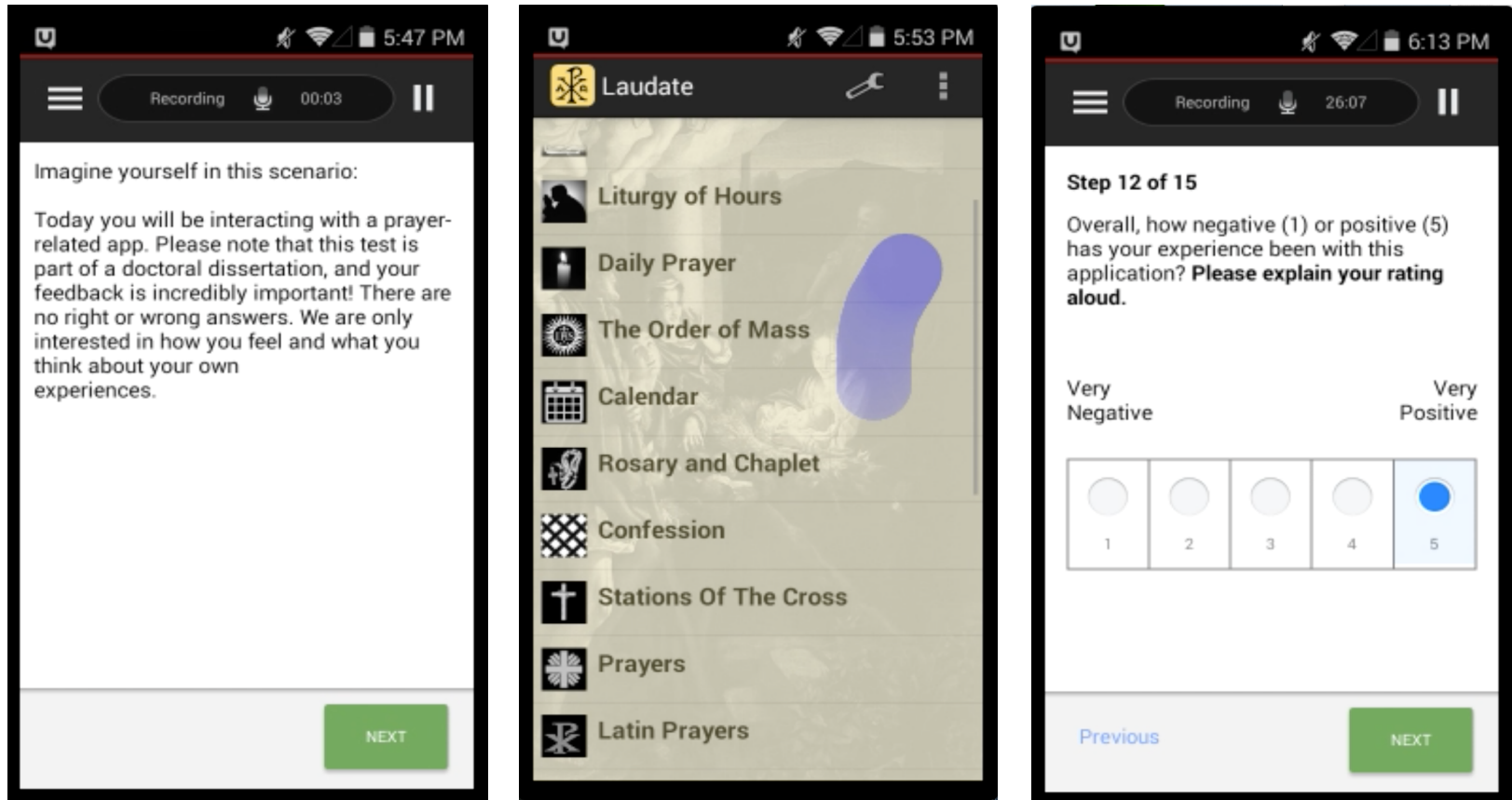
Figure 2: Screenshots from a User Test Video. Image to the left shows the screen the participants see when they open the app. The center image shows the participants' screen when they open the prayer app. The purple smudge shows where the participant is touching the screen during the test. The image to the right shows one of the post-test questions.

personal assessment of the prayer app overall. Finally, users discussed what they liked and did not like about the experience (tasks 12-15).

The post-test questionnaire (*see* appendix B) included the following questions that users answered by typing in provided text boxes: (a) What was the most frustrating thing about your experience? (b) What other ideas do you have about how it could be improved? (c) What did you like about it? (d) Would you be interested in participating in future studies about religious apps outside of the UserTesting platform? If so, please provide your email in the space below. The idea behind the post-test questionnaire was to get the participants to talk either about the user test experience and/or more about the religious app experience. It was a final push to get users to really think about the test itself and the religious app experience. Also, collecting users' emails allows opportunity for a longitudinal test in the future.

Description of the user test participants. Twenty-five Catholic and 25 Muslim tests were completed. However, one Catholic test was removed from the sample because the participant was not Catholic, which the participant mentioned during the test. Four Muslim tests were removed: one because the participant never downloaded or opened the app during the test; one because they downloaded and tested the wrong app; and two because the audio cut out and the tests were incomplete.

Therefore, 24 Catholics and 21 Muslims participated in the user tests. Thirty-two were male and 13 were female (16 male Catholics and 8 female Catholics; 16 male Muslims and 5 female Muslims). The youngest participant was 19 and the oldest was 67; the average age was 35.5; the median age was 32.

UserTesting collects data from participants when they sign up to test web and mobile sites. The options for submitting annual household income are less than $40,000, $40,000 to $100,000, and $100,000+. Twenty-three participants reported making $40,000 to $100,000; 15 reported making less than $40,000; and seven reported making $100,000+.

The Catholic tests were completed within 24 hours and all participants were from the U.S. However, the Islamic tests took more than 3 weeks, at which point the test was opened up to users from the UK and Canada. This resulted in 14 Islamic participants from the US, four from the U.K. and three from Canada. Therefore, the totals are as follows: 38 from the US, four from the UK, and three from Canada.

UserTesting also collects data about the participants' level of Web expertise from three options: beginner, average, and advanced. In this study, 31 participants reported advanced status and 14 reported average. The company also collects information about the participants' mobile device. Twenty-seven participants used devices made by Samsung, seven used LGE, four used Motorola, two used Sony, two used TCL, and one participant apiece used OnePlus, Sony and Xiaomi.

Thirty-one participants reported that they were extremely interested in using a prayer app and 14 said they were somewhat interested in using a prayer app. Twenty-three participants reported that they prayed multiple times a day, 17 reported praying at least once a day, four reported praying multiple times a week, and one reported praying at least once a week.

Data analysis. The textual analysis data from Chapter IV was informed by the findings from the user tests. The main themes found in the analysis were general prayer affordances and general technological affordances. In addition to coding for these elements in the user testing data, open coding was also used to identify other categories and themes related to visual elements (i.e. the visual representation of affordances in the user interface) provided by the video of the mobile device's screen and recorded audio of what participants said about their experience. Open coding means that data analysis does not start with preconceived notions of what the researcher will find; rather, the findings and key themes are revealed through the data (Braun & Clark, 2006). No specific coding list was used to guide the analysis other than the definitions of technological and religious affordances as used in the research question and as defined in Chapter II. These findings were related back to the conclusions from the textual analysis to better understand the relationship between religious app design and use.

Ethical considerations. There are two key ethical considerations to using a public company for collecting data. First, participants sign up to test web sites and apps. This means that they already have a preconceived notion of what the test may look like and what they will be asked to do. To offset this, a descriptive scenario was shown to participants to read before the test that oriented them to the fact that this research was being done by a graduate student for their dissertation project. It also communicated that the researcher was not interested in right or wrong answers but rather that the goal was to understand their thoughts about using mobile technology for prayer and to see their interaction with the chosen prayer app.

Second, because participants are paid up to $15 per test, some of the participants tried to game the system by answering the screener questions more than once and with different answers. For instance, there was one participant who was advanced to the test even though he was not Catholic. He mentioned in his recording that he was not Catholic and therefore was removed from the sample. Additionally, the researcher had the opportunity to review the participants by giving them between one and five stars. These reviews could affect how much money the participant was paid or if they would be allowed to complete more tests in the future. No participants in this study were ranked using this system. Only testers who had technical difficulty were reported to the company so the test could be re-administered with a new participant.

Limitations. The user tests provide important insight into how participants are understood and interact with various affordances in Catholic and Islamic prayer apps. User tests are able to collect data from a series of open-ended questions and tasks that participants can reflect upon and engage at the time of their app use. However, there are some limitations to this method that need to be discussed as well. First, the UserTesting platform only allowed for a 15-25 minute test. Users who have tested apps on the platform before understand they are required to complete the test within this time limit. As a result, the time limit influences the types of questions and tasks that could be answered and undertaken by the participants. More time in the testing environment may have allowed users to engage with other features in different ways.

Second, while these user tests can be considered qualitative, as they ask open-ended questions and seek to illuminate engagement while collecting in-depth responses

to the app use, the researcher is somewhat limited to the role of observer, rather than participant observer. Participants take tests in a private environment and the researcher cannot interact with them during the test to ask more questions or for clarification. While UserTesting does provide some of these services, they were more expensive and were beyond the means of the researcher. There was also an opportunity for the researcher to contact the participants after the test through the UserTesting site for premium versions of the test, which was also beyond the means of the researcher.

Third, the user testing environment is artificial and is only entered into for an abbreviated time period. Therefore, the findings are not reflective of app use in daily life because the tests are not designed to be completed that way. Participants are required to take user tests in quiet, controlled environments with access to reliable Wi-Fi. While the testing environment is appropriate to see how participants make sense of the design and engage with various affordances, it does not show long-term use in a natural, daily environment. Therefore, this study cannot answer questions related to long-term use in daily life. The tests are only providing the initial impressions of the participant as they engage with the app. The findings need to be analyzed and understood within the context of this limitation.

Chapter Summary

To summarize, data collection took place in two phases: textual analysis of prayer apps, and app tests with religious apps users. First, all 65 prayer apps descriptions from each religion were textually analyzed to gain a clearer picture of how the developers were

framing prayer to users. Next, all pages of the 65 apps were analyzed to for the type of affordances available. Next, 45 users (24 Catholic and 19 Muslim) completed a user test with the Laudate app for Catholics and Muslim Pro app for Muslims. Findings from the textual analysis informed the user test observations and data analysis. The goal in using these two sources of data is to offer a more complete picture of the relationship between religious app design and use.

Qualitative textual analysis of the app descriptions and of the apps themselves revealed data that helped identify what and how technological affordances are employed within prayer apps as well as how technological affordances were combined with religious content to develop religious affordances. The textual analysis also pointed to three common approaches to prayer app design, which were oriented around combining technological and prayer affordances in certain ways. The qualitative user tests revealed data that explained how actual users understood and engaged these affordances. The video and audio of the user's app test revealed how users understand the use of technology for religious practice, what affordances they were most likely and least likely to use, and how using technology for religious practice resulted in a frame that may be applied to future interactions with technology for religious purposes.

CHAPTER IV

TEXTUAL ANALYSIS OF CATHOLIC AND ISLAMIC PRAYER APPS

To understand the relationship between design and use within the context of Catholic

and Islamic mobile prayer applications, this research explores both apps and users. This

chapter focuses on the prayer applications collected and analyzed from the Network for

New Media, Religion and Digital Culture Studies, as outlined in Chapter III of this

dissertation. The specific research question that guides this part of the study is as

follows:

> How do Catholic and Islamic prayer apps communicate and construct prayer
>
> experiences through mobile app design, specifically in the technological and
>
> religious affordances offered?

As defined previously, technological affordances are those features developers include in

the app to provide or constrain certain actions that users can take. At the same time,

users may engage technological affordances in ways not intended by the developers.

Affordances need to be understood as a multi-faceted relationship among the different

actions possible or perceived within the mobile context. This chapter focuses on the

features the developers tout within their app descriptions on the iTunes app store as well

as what features are actually contained within the app themselves. When technological

affordances are combined with religious content, the design results in religious

affordances. Religious affordances lie within the intersection of technological

affordances, religious content, and the resulting religious action that is intended or

perceived. Understanding how technological and religious affordances are used within the app descriptions and the apps themselves will answer how prayer apps are communicating and constructing prayer experiences through mobile app design.

To answer this research question, this study looks at how developers communicate about, and frame, their prayer apps through the iTunes app descriptions, and how technological and religious affordances form the structure of the apps themselves. First, all 65 prayer app descriptions from iTunes (36 Catholic and 29 Islamic) were collected and uploaded to Voyant, a word-cloud analysis online software. The results revealed the most used words within the app descriptions, which were also studied in context to examine how developers (a) understood the practice of prayer, and (b) how developers framed the use of mobile application technology to practice prayer. This is important because it provides insight into what mobile prayer practices are and how mobile prayer apps are being justified for religious use. Second, an in-depth textual analysis of all 65 apps, which included a walkthrough of all app pages of which screenshots were taken and analyzed, revealed how developers actually designed mobile prayer practices through technological and religious affordances. More than 2,000 screenshots were analyzed for this part of the textual analysis. The results of this analysis revealed two main categories of technological and religious affordances and how those affordances were used within three key prayer app design approaches. The findings from the word cloud analysis of the app descriptions and the in-depth textual analysis of the apps themselves work in conjunction with one another to provide a clearer picture of

how prayer apps are communicating and constructing prayer using a combination of technological and religious affordances.

It is important to note that all apps and their descriptions were in English, although the Islamic app descriptions often contained specific Arabic words, such as *salah,* a word that denotes the five required daily prayers. It is also important to acknowledge that the type of app developer (i.e. individual, religious organization, secular organization) may be important for understanding why prayer is framed and designed in certain ways within mobile contexts. Different types of developers may have different approaches to understanding and designing mobile prayer applications. However, deeper understanding of this is beyond the scope of this research and should be considered for future scholarship.

This chapter is divided into three parts. The first part presents the findings from the word cloud analysis of the iTunes descriptions of the Catholic and Islamic apps. The most prominent words used in the app descriptions were analyzed first, and then they were analyzed in context. Word cloud analysis was used to reveal how developers framed prayer apps and touted their various affordances in the iTunes app descriptions. This is important because provides a better understanding of the design strategies used within the apps themselves in relation to the technological and religious affordances used. Findings from this section show that Catholic and Islamic app descriptions present prayer as a practice that should be undertaken daily to communicate with God/*Allah.* In the Catholic app descriptions, developers focused on the amount and type of prayer content available to users. In the Islamic app descriptions, developers focused on the

prayer-related tools that helped users pray correctly. App developers for both religions used the app descriptions to call upon traditional religious authority figures to validate their app. At the same time, developers used the app descriptions to build their own algorithmic authority.

The findings from part one contextualize the findings in part two, in which a textual analysis of the Catholic and Islamic apps themselves revealed the technological and religious affordances that are available to users. Analysis of more than 2,000 pictures of every app page within each of the 65 apps (36 Catholic and 29 Islamic) revealed the technological and religious affordances that developers designed into their prayer apps. There were two main categories of affordances: general religious affordances and general technological affordances. The results from the word clouds and the definitions and examples of the affordances contained with the apps were compared to reveal important connections and differences between the app descriptions and the apps themselves. This is important because it provided a clearer picture of how prayer was constructed within mobile apps through the use of different affordances.

Once the affordances within the Catholic and Islamic apps were identified and defined, it became possible to classify three key design strategies used within Catholic and Islamic prayer apps. Part three of this chapter presents these three approaches to prayer app design, which include (a) a translation approach, (b) a mobile environment approach, and (c) a multi-purpose design approach. Within this section, the design approaches are defined and explained along with examples from both Catholic and Islamic apps from the sample. Understanding these three key approaches to design is

important because it reveals how prayer is understood and constructed within the mobile context. On a deeper level, the design approaches point to an understanding of how developers understand religious apps should or should not be used for religious practice.

Part One: Word Cloud Analysis of App Descriptions

Data analysis began by creating word clouds from the 36 Catholic and 29 Islamic iTunes app descriptions. As mentioned above, the iTunes app descriptions were collected and uploaded into the word cloud software to analyze the most used words and also to be able to see those words in context. This relates to the analysis of the app descriptions because it allowed insight into the developers' understandings and approaches to designing mobile prayer applications, which were then compared with the apps themselves. For the most part, these descriptions were accurate when compared with the affordances in the apps with some minor variance, which is discussed in the following sections. Results revealed which aspects of prayer and technical features app developers find important to describe and advertise their apps. Therefore, the word clouds indicated how developers understand prayer as well as how they believe mobile apps can aid users with this religious practice. This is important in this research because the word cloud results helped to answer the question related to how developers are framing and constructing prayer experiences in mobile apps through technological and religious affordances. The most used words revealed commonalities across Catholic (*see* Figure 3) and Islamic (*see* Figure 4) apps as well as highlighted differences among the approaches. The following section provides an overview of the highest ranked words common to

Figure 3: Catholic Prayer App Descriptions Word Cloud. This word cloud created on Voyant Tools online depicts the most used words in the Catholic prayer app descriptions from iTunes.

Figure 4: Islamic Prayer App Descriptions Word Cloud. This word cloud created on Voyant Tools online depicts the most used words in the Islamic prayer app descriptions from iTunes.

both religions, followed by a separate analysis of the Catholic and Islamic apps respectively.

General overview. As expected, *prayer* and *app* as well as variations of the words (i.e. praying, *duaa*, *salah*, supplication, apps, application etc.), were prominent in both the Catholic and Islamic word clouds. *Prayer* was used mostly in app names as well in specific prayer names, such as the Rosary or *Fajer*, which were listed in the app descriptions. Some developers referred to prayer generically while others provided extensive lists of specific prayers that were available on the app. Developers used the word *app* most commonly to describe both religious and technical features with phrases such as, "This app has…" or "This app will help…" Other highly ranked words of both faiths were: a) the names of God (i.e. *Lord*, *Jesus*, *Allah*); b) *daily*, which indicated that apps of both faiths advocate a daily prayer practice and provide users with prayer tools to meet that requirement; and c) the names of both faiths, *Catholic* and *Islamic*.

Analyzing Catholic and Islamic faiths separately revealed how developers understood and framed prayer practices as well as the affordances related to each religion's unique core values and practices. Evaluating the top used words for each faith and then examining them in the context in which they were used revealed the following findings. First, the main themes from the Catholic word cloud analysis are (a) framing prayer as a connection with God, (b) advocating for users to have a daily prayer practice through specific mobile app features, and c) establishing the authenticity and authority of the app by calling upon traditional religious authority and developing algorithmic authority. Second, the Islamic app word clouds highlighted (a) framing prayer as a daily

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duty to connect with Allah, (b) focusing on orthodoxy of practice, (c) and evoking

traditional religious authority, new religious authority, and algorithmic authority. To

review, traditional religious authority in this study refers to the hierarchical role of

religious leaders and organizations as well as the religions' sacred texts (Cheong, 2012).

Algorithmic authority refers to the ways in which the design may structure information

and deem it true by merit of its inclusion, and also how the design works to structure

action (Lustig & Nardi, 2015). Both Catholic and Islamic religious app descriptions used

these different types of authority to assure app content, quality, and accuracy.

Catholic app descriptions. A quick glance at the top 10 words or phrases used

in the 35 Catholic app descriptions revealed an emphasis on the religious content of the

apps rather than the technological features (*see* Table 1). Out of the top 10 words used in

all 35 Catholic app descriptions, *app* was the only non-religious word that made the list.

The focus was first on the religious aspects of prayer that are important to users, and

second on how mobile technology can help users maintain a prayer practice in today's

modern context. Therefore, the practice of prayer itself was emphasized more than the

mobile affordances that would be used within the app for the prayer practice. To

illustrate, the app "Prayer 2000+" description reads, "Keep handy all of the Common

Prayers listed in the Compendium of the Catechism of the Catholic Church and many

more…" This example explicitly calls attention to the religious content of prayer texts

by referencing the common prayers users will have access to while implicitly indicating

the technological affordance of convenience with the phrase "keep handy." The need to

have access to prayers is not necessarily new, but the mode of accessing them is.

A closer analysis of the top words and phrases in context of the app descriptions revealed three major themes: (a) framing prayer as a connection with God, (b) emphasizing daily prayer practice through lists of prayers and different technological features, and (c) calling upon traditional religious authority and using algorithmic authority to underscore the authenticity of the app.

Table 1 Top 10 Words/Phrases Used in Prayer App Descriptions*		
No.	Words/Phrases	No. of References
1	Pray, Prayer(s), Praying	254
2	Day(s), Daily	182
3	Jesus, Christ, Lord, God	156
4	App(s), Application	101
5	Mary(s), Virgin, Mother	97
6	St. Saint	96
7	Holy	68
8	Catholic	60
9	Divine	37
10	Liturgy	32
*Out of words/phrases with more than 10 references		

Framing prayer as a connection with God was evident in these apps through the connection made between the words *prayer* and the names of *God, Jesus, Christ* and *Lord.* App developers emphasized a daily prayer practice by listing all of the different types of prayers for different times of days, seasons, and aspects of life.

The importance of daily prayer practice was also underscored in the app descriptions by the ways in which developers described the technological features and tools available on the app. Finally, the references to *Holy Catholic Church* and *Liturgy* subtly invoked traditional religious authority. Finally, algorithmic authority was created through a combination of not mentioning traditional religious authorities and by referencing awards and user ratings.

Framing prayer as a connection with God. As mentioned in the previous section, the word *prayer*, as well as its counterparts (i.e. *prayers*, *praying*), was the most common word used in Catholic app descriptions. *Prayer* was mentioned most, and was often paired, with the top words of *God, Jesus, Christ,* and *Lord*. In most cases, developers chose such phrases connecting prayer as an act of "being mindful of Christ's crucifixion" which resulted in maintaining the users "intimate connection with God," (Evening Prayers). Another example from the "3 Minute Retreat" app shows *prayer* as a way for daily users to "enrich their spirituality and rest in God's loving presence." This illustrates the way developers understand the purpose of prayer, which was to communicate with God, as well as the outcomes of the act of prayer. The names of God were also used within app descriptions as a benediction to the users, such as in "God Bless!" (Best Daily Prayers). The outcomes of maintaining a personal connection with

God through these prayer apps included being at peace, being inspired, being encouraged, and being blessed.

These examples mirror the understanding of prayer within the Catholic context as mentioned in Chapter I. Framing of prayer as communication with God, which results in benefits to the person praying, is not new. However, the mode of the act of prayer, through accessing text or praying with a mobile app rather than a printed book, is new. App descriptions highlighted this through their framing of prayer as a daily practice that is to be undertaken and how specific mobile app features could aid users in their prayer practice.

Daily prayer practice. Prayer was not only framed as a way to communicate with God, but it was also described within app descriptions as a practice that should be done on a *daily* basis. This was evident by the use of the word *daily* in conjunction with long lists of prayers and technological features that reminded the users to pray. A representative example of the long lists of the types and names of prayers used in the app descriptions comes from the "Catholic Devotions" app:

> When you just wake up and about to begin the day, there are "Morning Prayers". When you are about to end the day, there are "Evening Prayers". When you attend the mass (but it is not advisable to use iPhone during the mass), there are "Prayers at Holy Mass". When you have finished attending a mass, there are "Prayers after Mass". When you want to go for Confession and you want to prepare yourself better by praying, there are "Prayers before Confession". When you have received

Sacrament of Reconciliation, there are "Prayers after Confession". When you are about to receive the Body and Blood of Christ (it is not advisable to use iPhone during the mass), there are "Prayers before Communion". When you have received the Communion, there are also "Prayers after Communion". When you want to go for Adoration, there is prayer "Visit to Blessed Sacrament".

It was in these long lists of different types of prayers that the words *Mary, Virgin, Mother, Saints (St.), Liturgy, Holy,* and *Divine* were most used in the app descriptions. Almost every *Mary* reference was contained within a list of prayer names in the app descriptions as well as in the names of the apps themselves. This was also the case with *St.*, which stands for *saint.* The description for the "Catholic Novena To Fourteen Holy Helpers Lite" app contained almost 30 references to saints alone.

The long lists of prayer names found within app descriptions emphasized the need to access prayer texts, which illustrated the numerous amounts of prayers to be said in every situation, time, and season of the users' daily lives. For example, the "Santo Rosario" app description states: "It's your virtual pocket reference of the Rosary." Statements like these imply the app has all the prayers you need within the convenience of a digital device in order to maintain a faithful daily prayer practice.

App descriptions of technological affordances emphasized the ease and convenience of mobile prayer apps for daily prayers. Developers connect daily prayer

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through tools such daily *reminders* or alarms to "encourage yourself to pray the rosary more often," (Scriptural Rosary Lite). App descriptions included narratives about the user's busy lives and having trouble finding the time to pray. Developers frame the mobile prayer context as the remedy for overcoming users' fast-paced modern lives and maintaining an adequate daily religious practice.

The most common related words after *app* were *audio* and *text,* which refers to the app features of listening to recordings of prayers or accessing the text of the prayers themselves. These words did not make it in the top 10 word list, but they were significantly connected to the word *daily,* which indicates a connection to framing prayer as a daily practice. Developers used *audio* most to reference an affordance that provides a daily audible prayer guide for users. Other references included audio that was available for download or purchase, but is most often mentioned with *text* to indicate both features were available for daily use.

Therefore, app descriptions emphasized daily prayer practice within the app descriptions through long lists of prayers that were available on the app for every day and occasion. The mentions of technological affordances of *audio* and digital availability of *texts* pointed to the convenient access of these prayers for users. Prayer then is framed within the Catholic app descriptions as a daily practice to communicate with God that results in positive outcomes for the user. The mobile apps provide access to these daily prayer practices through the ease and convenience of technological affordances of audio and text. While the app descriptions frame prayer in these ways, they must also convince

the user that their app is adequate to meet the users' prayer needs. Developers used various means of religious authority to sell the app to users.

Traditional religious authority and algorithmic authority. Developers used app descriptions to establish the authority of the app for religious practice by referring to specific religious authority figures and organizations. These religious authority figures and organizations (i.e. the Pope, the Vatican, etc.) fit into the definitions of traditional religious authority established within the literature review and mentioned briefly at the beginning of this chapter. In this sense, app developers use traditional forms of religious authority (i.e. references to religious leaders, organizations, and sacred texts) to validate the authenticity of the content on their apps. When developers used references to religious leaders as guides in app development, they were attempting to establish the authenticity of, or show approval for, religious app use. A good example of this is from the "Catholic Handbook" app, which states: "Content has been researched from authoritative Catholic sources such as the Vatican's Catechism of the Catholic Church, Catholic.org, HolySpiritInteractive.net, CatholicParents.org, Catholic Culture.org, and EWTN." Another example from the "3-Minute Retreat" app links itself explicitly to the name of the app developer, Loyola Press, a well-known and respected Catholic publisher of religious materials. Making these links with known, traditional religious authority figures works to authorize, or legitimize, app use for religious practice. Developers were trying to establish their responsibility and authority for designing an authentic prayer practice into a new mobile context.

Developers also cited the names of respected theologians or established religious authors to call upon traditional religious authority. The "Adventus Lite" app, which provides daily meditation during the Christmas season, cites Père Médaille, S.J.'s book "*Meditations on the Gospels for every day in the year*" as the basis for the app content. The "Catholic Devotions" app starts their app description with the following: "Providing you with general Catholic devotions and litanies compiled by Rev. Bonaventure Hammer, O.F.M." App developers use these references because they are well-known entities within the Catholic sphere, and therefore provide support for the authenticity and validity of the app. Specifically, references to religious figures reinforces traditional religious authority in the realm of digital religion. By calling upon traditional religious authorities, app developers are reifying that authority, which seeks to control religious information and guide religious practice.

In addition to citing traditional religious authorities in app descriptions, app developers themselves perform a new type of religious authority, whether they intended to or not. The most overt example of this comes from apps like "Catholic Devotions" and "Catholic Devotions Lite." The phrase, "it is not advisable to use iPhone during the mass" is used multiple times in the app descriptions. This admonition works to establish new rules for conduct related to digital technology in religious spaces. Therefore, mobile use for religious practice needs to look different in varying contexts, according to the developer. Inherently, the app developer is saying that mobile app use in private is fine, but use in public religious spaces should be limited. The developer offered no reference or specifics for this rule, rather they just stated it as an imperative. In this sense,

developers set themselves up as religious authorities that determine appropriate rules for use of mobile apps.

Developers also invoked authority even when they used no references to traditional religious authority within the app description. Algorithmic authority, or how applications themselves become an authority figures by shaping user actions and providing information which is deemed to be true by virtue of its inclusion, is established when there is a lack of information about religious authority in the app description. The lack of reference to traditional religious authorities implies that the design of the app is sufficient to guide the users' religious practice. Therefore, algorithmic authority can be established within the app descriptions by simply laying out the content available in the app without mentioning or calling on any type of traditional religious authority. The "Santo Rosario" app is a good example of this: "The Holy Rosary is here. It is your virtual pocket reference of the Rosary." It goes on to describe the content and language features but does not mention sources for content or approval of the app. Perhaps, even mentioning such a common Catholic prayer could be seen as invoking traditional authority, but the lack of citation or specific references makes these few apps stand out from the others. Of course, more references to traditional religious authority could be used within the app itself. However, within the Catholic app descriptions that lacked references to traditional religious authority, developers relied upon the their own control of content and design choices that the app offered.

Algorithmic authority is also revealed within app descriptions by referencing app awards, app ratings, and app reviews. The "Divine Office" app, for example, cited their

About.com Reader's Choice Awards that they won from 2011 to 2013. The "iMissal'" app description used explicit examples of the app's popularity, "… with over 4,000 5-star reviews, we hope that you'll agree that iMissal is the #1 Catholic App." By highlighting how many people have relied upon and found the app useful, the app gains authority or legitimacy through its previous and/or continued success. Because the app has worked well for others, its algorithm has been deemed successful and therefore useful for others in the faith. Other app descriptions were less explicit but appealed to algorithmic authority by popularity through claims, such as, "The most popular and comprehensive free Catholic App," (Laudate); and "Join the thousands of people who use Universalis daily," (Universalis). Often times, app descriptions used direct quotes from user reviews to denote the usability and accessibility of the app. iMissal used quotes in connection with explicit references to popularity and app awards, such as, "This is one cool app if your (sic) a geeky Catholic like myself." This works to establish algorithmic authority by providing evidence of its usefulness and popularity. Outside of traditional religious authority, algorithmic authority is based upon the designer's control of the app and its validation through user ratings and reviews. Popularity, which is measured in reviews and ratings on the App Store, is being used within app descriptions to authenticate the app's authority to provide religious content and structure religious practice.

In summary, Catholic app developers most often called upon traditional religious authority within app descriptions that provided a sense of authenticity to the religious app. As shown in the examples above, some app descriptions called up religious figures

such as the Pope and religious organizations to lend credence to app content and use. At times, developers also evoked their own authority by stating rules for use within specific religious contexts. Some developers also worked to establish algorithmic authority within the app descriptions in two ways: (a) by not mentioning traditional forms of religious authority but rather focusing on the app content and design in the app descriptions, and/or (b) by pointing to awards, ratings and reviews that validated the app as a good resource for prayer in the mobile context.

Islamic app descriptions. *Prayer* and other words for prayer were the most numerous words and phrases in the Islamic prayer app description word clouds (*see* Table 2). Of course, Islamic prayer apps had many more words for prayer than Catholic apps because Arabic is the formal language of religious texts in the faith. Therefore, the English app descriptions were often interspersed with specific religious Arabic words and phrases. First, *prayer* or *salah/salaht* were used most often in the app descriptions. *Salah* is one of the five pillars of the Islamic faith and is considered the "foundation of the religion" (El-Sayed, Greenhill, & Westrup, 2015, p. 36). *Salah* specifically refers to the obligatory five daily prayers that are said at specific times of day depending on the position of the sun and moon. *Dua, or duaa*, which some say is the closest translation to the English word *prayer,* is defined as " to call upon, to invoke, and to supplicate" to *Allah* (Khan & Siddiqui, 2012, p. 168). This word was used most often within app descriptions in lists of prayers available on the app. The word *adhan/azan*, which refers to the audible call to prayer to signal daily prayer times, was also counted within these prayer-related words.

The Islamic prayer app descriptions contained three technologically related words as compared to one in the Catholic prayer app descriptions. *Application, times, iPhone and iPad* all had more than 10 references. The prevalence of these words along with the way they were used in descriptions denotes more of an emphasis on features and tools than Catholic apps. Based on a closer examination of the context of these words and their combination with religious words, the following themes emerged: (a) framing prayer as a daily duty to connect with Allah, (b) focusing on orthodoxy of

Table 2 Top 10 Words/Phrases Used in Islamic Prayer App Descriptions*		
No.	Words/Phrases	No. of References
1	Dua, Supplication, Azan, Prayer, Salah	236
2	Application, App(s)	71
3	Times	70
4	Qibla, Direction, Location	55
5	Islamic	33
6	Day, Daily	29
7	Allah, God	26
8	iPhone, iPad	25
9	Quran	24
10	Arabic	23
*Out of words/phrases with more than 10 references		

practice, (c) and citing traditional religious authority, new religious authority, and technological authority.

Framing prayer as daily duty to connect with Allah. App descriptions used both implicit and explicit references in app descriptions to frame prayer as a required daily practice to communicate with Allah. *Prayer/salah* and *dua* were mentioned frequently with the word *daily. Salah* is never formally defined but most app descriptions included phrases like, "5 daily Salah" (SunChat). More explicitly, app descriptions that referred to daily *duas* for every occasion actually prescribe their daily use. They do this similarly to Catholic app descriptions, by including long lists of specific *duas* for different times of days and for different occasions. The "Hisnii – My Fortress" app description boasted "more than 440 authentic supplications (*du'as*) (sic)." The "iSupplicate" app listed 58 different *duas*, including ones for everyday of the week, as part of their lengthy app description. In this instance, developers do not explicitly state that users should pray every day, but the lists of *duas* reinforce the implicit implication that prayer should be a daily, consistent practice. The emphasis on daily *salah* and *duas* for every occasion implies that no matter what a Muslim user may be engaged in, there is a prayer they could be saying in that moment. In addition to the long list of prayer names and times, the developers of the "Hisnii – My Fortress" app described their application as "… a complete work that meets its needs in terms of supplication and reminders, and this on a daily basis." Therefore, app descriptions contained explicit references to daily prayer practice as well.

App descriptions used the word *time* in connection with *prayer* and *daily,* which enforced the emphasis on consistent prayer practice. *Time/s* was mentioned most often in app names, such as in "My Prayer: Prayer Times Adnan Alarm and Qibla," "Prayer Times, iPrayer: Prayer Times and Qibla," "SunChat – Qibla Compass," "Islamic Prayer times (sic) and News," and "Minimalist Islamic Prayer Times Lite." These apps highlight the calculation of the times of *salah,* the five daily prayers. As mentioned before, times are calculated based upon the location of the sun and moon in the sky and therefore change often (Shah-Kazemi, 2013). It is important for Muslims to complete the compulsory prayers at the correct times and in the correct manner (*see* p. 126 for discussion of orthodoxy of practice).

Connecting with *Allah* is the point of daily prayers, whether in the form of *salah* or *dua*. *Allah* was one of the top ten religious words from the word clouds and its use in connection with prayer was to underscore the point of prayer itself. As the app "Hadith of the Day" says, "HOTD (Hadith of the Day) aims to help you increase your knowledge and open you up to Allah's presence." The app "AlMosally" phrases it as being "continuously close to Allah." The closeness that is attained through daily prayer results in blessings. As shown in the "Hadith of the Day" quote above, prayer not only connects you with *Allah*, it increases your knowledge and will "inspire, guide and comfort you." Another good example comes from the "Ya Allah (Duas from Quran)" app: "It (*dua*) is a method which makes you feel closer to God. Duas provide you inner satisfaction and prevent you from many ailments. They help you build strong beliefs, illuminate your heart and pursue repentance." The use of these words and phrases in app descriptions,

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which point to the daily practice of prayer to connect with Allah and receive blessings, speaks to the intention of the app developers. The mobile app provides the space to access features such as prayer texts and correct prayer times to connect with Allah.

Additionally, daily *duas* were framed as a way to manage a variety of needs or situations. The "Hadith of the Day" app description reads:

Whether you are on top of the world, blessed and thankful, need some patience, are thinking about a loved one, or facing temptation, HOTD (Hadith of the Day) has the key for you: an Ayah, A Hadith, a Dua to inspire, guide, and comfort you.

This example shows an implicit framing of prayer as a consistent practice, which connects you to *Allah* with the result of the devotee being blessed through inspiration and comfort. It suggests no matter the circumstances the user is in or where they are, prayer is always a practice they should be engaging. The developers seek to provide access to this prayer practice in the mobile context.

Orthodoxy of practice. Orthodoxy refers to following and maintaining the correct rules and beliefs particularly in religious contexts. Islamic app developers were especially concerned with making sure daily prayer practice was done correctly. For example, The "Prayer Companion Lite" app description says, "Just as offering prayer is obligatory, learning the correct way to offer is also obligatory." There are two ways Islamic app descriptions emphasized orthodoxy of practice: a) referencing holy texts, which provide rules and guidelines for prayer, and (b) focusing on technological tools that aid the user in adhering to those rules and guidelines.

Many app descriptions used references to the *Quran* (the ninth most frequent word in the word cloud) as the source for prayer rules and guidelines. The sacred text was referred to within the descriptions as the ultimate form of authority and provided the exact positions, words, and formulations that the daily prayers and *duas* should take. When using the *Quran* as a source for correct practice, apps referred to "…selected *Quran* ayahs which mention Salah and times…" (Salah Clock). Other apps mentioned a specific set of duas in the Quran that start with the *Rabanna*, which literally translates to "Our Lord." For example, the "Muslim Dua Now " app description mentioned the 40 *Rabanna* specifically saying, "Includes 40 of the most effective Duas (sic) from the Holy Quran."

The word *Quran* in this context was also mentioned in connection with other holy texts, such as the *Sunnah* and *Hadith*. The *Sunnah* is a record of the teachings, sayings, and experiences of the Prophet and reports from his companions that have been recorded from verbal recitations. The *Hadith* is another collection of sayings from the Prophet that gives accounts of his daily practice, which is another source of guidance apart from the *Quran*. The "Hisnii- My Fortress'" app description mentioned "supplications from the *Quran* and *Sunnah* in Islam." While the app descriptions did not define *Sunnah* and *Hadith* specifically, they did call upon them as authentic information that informs Muslims on the correct way to pray. In referencing these sacred texts and guides, developers are showing users that they are providing them with the correct prayer text and information by going directly to the sacred source. The nature of these references to the *Quran* and other holy texts show that the app developers understand the

correct performance of prayer rituals, and also how using their apps to pray will help users adhere to these rules and guidelines. References to holy texts can also be seen as an appeal to traditional religious authority, which is discussed in a subsequent section.

Developers used references to sacred texts to emphasize the apps' adherence to correct practice, and they also used references to technological tools to show how technological affordances support correct prayer practices. The developers used much more explicit language here than in their appeals to orthodoxy through sacred texts. *Application, times, Qibla, iPhone and iPad* were all top ten words in the word cloud and were technologically focused. However, *application* was mostly used as a descriptor (i.e. "This application…") and *iPhone* and *iPad* were used to describe when the app was available on both devices. *Times* and *Qibla,* when examined in context, were important because they were used specifically to highlight the features that will help users with correct daily prayer practices.

Time(s), while also used to emphasize daily practice as mentioned previously, was also mentioned often in connection with providing prayer times. iPray provides a good example of describing the app simply as a prayer tool with technological features that enable praying on *time*. The descriptions reads: "iPray is the ultimate tool to get accurate prayer timings for your selected cities along with accurate Qibla direction from anywhere in the world." *Time* was also used in reference to setting alarms and reminders to remember to pray. For example, The MyPrayer app description reads, "MyPrayer app will show you times, quibla (sic) direction compass, Islamic calendar, prayer times alarm

notifications, all of these features in one app." Fourteen of the 28 apps referenced correct prayer times as the main function, or one of the main functions, of the app.

Qibla refers to the direction of the *Kaaba*, a sacred site in Mecca, which Muslims should face during daily prayers. Muslims must ensure they are praying in the right direction, which is why location tools were highly touted. *Qibla* was mentioned most often with the words *direction* and *location* to indicate that the app provided either a compass to point users in the correct direction, and/or a way to determine the user's location for correct *qibla* information and prayer times. Indeed, some apps such as "Find Mecca" and "alQibla" were designed specifically with this affordance in mind.

In addition to *times* and *qibla*, Islamic app developers focused much more on touting the technological features of the app. For example, "iSubha: Islamic Prayer Beads" is described as, "an intuitive interface for doing Tasbeeh." *Tasbeeh* are a Muslim form of prayer beads used to perform *dhikr*, which is a form of repetitive sentences to glorify *Allah* (Geels, 2013). The app provided a digital image of prayer beads on which the user can keep count of the *tasbeeh* recited.

Developers draw upon technological affordances, such as calculating prayer times, locating Mecca, and keeping track of recitations as a tool that encourages orthodoxy of practice. Movements, times, direction, and repetition are all important aspects of Muslim prayer and developers appealed to both *Quranic* text and technological features in the description of their apps. In this sense, both forms are used as qualifying rhetoric, or a way to solidify the accuracy of their mobile prayer tool and its adequacy for use in practice.

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Traditional religious authority and algorithmic authority. The Islamic app

descriptions that cited religious authority resemble those seen in the Catholic

descriptions, as described in the previous section. However, there were a few unique

differences. First, Islamic developers drew upon traditional religious authority most

often by referencing sacred texts. While they also referenced important religious figures,

such as specific *imams* or interpretations, they did so less often. Second, developers

themselves became a source of new religious authority by explaining their expertise,

giving disclaimers about their intentions, or providing context and instruction about the

religious aspects of their apps. Third, developers built algorithmic authority by an

emphasizing technological tools and processes and also by referencing consumer

awards, user ratings and reviews, and other social networking sites.

Islamic app descriptions cited the "Holy *Quran*" the most when calling upon

traditional religions authority. For example, as mentioned in the previous section, the

Quran was used to advocate for orthodoxy of practice that was available through the

app. Therefore, the *Quran* was a resource for authentic practice and authority used by

developers within app descriptions to legitimize app use for prayer. At the same time,

citing the *Quran* as the source for the apps' prayer information and content legitimized

the app through the authority of the sacred text. For instance, the "Ya Allah" app

description reads, "The app can also be used as a study tool because of the reference to

the context mentioned for every invocation taken from the Holy Quran itself," and also,

"Examine the reference to the context taken from the Holy Quran itself." When the

developers mentioned translating the *duas* directly from the *Quran,* they established the

apps' legitimacy. About 20 of the 28 app descriptions appealed directly to the authority of the sacred text.

Although used less often, Islamic app developers also named or quoted specific imams to as a way to invoke traditional religious authority, which is defined at the beginning of this chapter. A good example from the "Hisnii – My Fortress" app used both the sacred text and the name of a popular *imam* to authenticate the content of the app: "More than 440 authentic supplications (du'as) (sic) from the Quran and the Sunnah all authenticated by the hadith specialist shaykh Muhammed Nâsir ad-din al-Albani (may allah [sic] have mercy upon him." Therefore, the developer pointed to the expertise of the *Hadith* expert to legitimize the content that is available through the app. Similarly, the app "Ryad Al Saheen" named the author of the text "Imam Al-Naway." These two examples are typical of the ways in which religious leaders were used as forms of authority for the app within the app descriptions. However, "Shia *duas* (sic) by duas.org" took a different tact on the same theme – instead of explicitly stating that the app material came from or was authorized by *Imam* Ali, the description instead used a quote from him which reads, "He who is greedy is disgraced; he who discloses his hardship will always be humiliated; he who has no control over his tongue will often have to face discomfort." In this case, the quote has less to do with the material of the app and more to do with the app developers associating themselves with *Imam* Ali. The association implies their adherence or acceptance of *Imam* Ali's approach and therefore links the app's authority with his authority. Therefore, developers used explicit and implicit

references to traditional religious authority within the app descriptions to establish the apps' credibility.

Islamic app developers placed themselves in positions of religious authority whether they intended to or not. To clarify, developers established themselves as religious authorities through explicit and implicit statements, which helped authenticate their app's approach to prayer. Algorithmic authority, then, was represented through identifying other secular sources of content for users. For example, many of the developers listed their other social media accounts and websites as a source of information and updates within the app descriptions. An example from the "Find Mecca" app exhorts app users to "Join us on Facebook" or "Follow us on Twitter." The "Muslim Pro" app simply states, "FOLLOW US FOR MORE UPDATES (sic)" and lists links to Facebook, Twitter, and their website.

Another way Islamic app developers established themselves as religious authority figures was by explaining different religious terms and practices within the app description. The "iSubha: Islamic prayer beads" app added this note in their description: "'Subha' is also referred to as 'Tasbeeh' in different parts of the Muslim World. 'Subha' are the traditional prayer beads in Arabic. This app can be used for making zikr/azkar and can be used in conjunction with daily prayers." Therefore, by not citing the source for their information, the developers became the source themselves and the correctness of that information was subsumed within algorithmic authority.

Some Islamic app developers attempted to distance themselves from their religious authority by adding disclaimers or notes in the app descriptions about their role in the app development. To illustrate, the "Al Quran World Famous" app states:

Disclaimer: This app is uploaded in good faith and we have tried to remain as careful as possible to avoid mistake (sic) and provide content, which is agreed by the most (sic) but feel free to guide us if you find any objections or missing content.

A disclaimer of this nature attempted to protect the developer from attacks of inauthenticity or inaccuracy as well as opened up authority to their users through reviews and suggestions. At the same time they tried to distance themselves, they solidified their authority by stating, "uploaded in good faith and have tried to remain careful." This not only protected them from attacks but also established their credible intentions. Similarly, the "Islamic iPrayer" app states, "Inshallah my intention is not to offend anyone, instead I am striving to present the basic tools to support the 'Islamic iPrayer' and build the foundation regarding performing Salah." The phrases "in good faith," "tried to remain careful" and "striving to present… and build" from the examples in this paragraph show the developers' attempts to convey their authentic intentions to their users. Those intentions, even while attempting to create distance, solidified the algorithmic authority and authenticity of the app through good faith statements or disclaimers.

Algorithmic authority, or the authority driven by the way app design and content shapes user actions and their understanding of what information is true, was established in two ways by developers in the Islamic app descriptions: a) by emphasizing technical

features using language that describes the precise and accurate capabilities of the app; and b) by calling upon user support of the app through likes, ratings, and reviews. First, app descriptions used technological words and phrases to describe the professional and reliable nature of the app. The "Find Mecca" description said, "Utilizing the iOS state of the art technology is now possible to give you the EXACT (sic) bearing of Kaaba from any place on earth." As mentioned in the section above, orthodoxy of practice is paramount to the successful prayer practice. Being exact in the direction the user prays in will result in more successful prayer. The accuracy the technology provides was framed as a determining factor in authentic, correct practice. Therefore, the technology, or the algorithm that provides the exact location and direction, acts as the authority that authenticates app use. The "iSupplicate" app description provides a good example of algorithmic authority as well, stating:

> iSupplicate provides users access to vast database of duas and supplications. All the duas are stored on our server and you can access them over the internet (either 3G/4G or Wi-Fi). You can then DOWNLOAD (sic) what you want onto your phone for offline access. So if you are on the train, or on your way for hajj or Ziyarah, the duas you download into the app can be accessed within the app in your 'Drive'.

The phrasing here was not an accident: "vast database," "stored on our server" "DOWNLOAD" etc. all emphasized the technological features that allow for authentic, correct prayer practice wherever and whenever the user needs access. The features offered through technology become the means through which orthodoxy of practice

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becomes possible. Therefore, the more technological tools in the apps arsenal, the more authority the app has as a source of religious practice. Developers used the app descriptions to tout technological features, such as the compass or the way the prayer times are calculated, to justify use of the app for such an importance religious practice.

User metrics, awards, user ratings, and feedback were another form of algorithmic authority, which legitimized the app as an authentic tool for prayer practice. Developers listed the number of users and awards the app had received, which also established the app's algorithmic authority. The "Al Quran World Famous" app started their iTunes description with the following:

The Best Selling appScholar's Choice***Top paid in whole world***Best Reviews

Developers highlighted the award from Scholar's Choice as the "best-selling app" and the "top paid app in the whole world" to immediately call attention to the app's authenticity and value as well as to the highlight number of users who have bought the app. However, it is important to note that the number of downloads does not equal the number of consistent users. Different metrics and measures would need to be used by developers to make claims of use rather than downloads alone. For example, many users may download an app only to delete it when they realize it is not what they want. So, the number of downloads may be high but that does not necessarily reflect consist use of the app.

The "Hadith of the Day" app and "My Duaa: Fortress of a Muslim (sic)" app both started their descriptions with the number of users/downloads the apps had. "Hadith

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of the Day" boasts "over 3 million members worldwide" and follows up this claim with others that are hard to verify, including "Ranked No. 2 Educational App in the App Store. No 1 Ranked Islamic App in the App Store." These rankings are difficult to verify because the description does not mention which App Store in which these rankings were made. For instance, there is a US store, a UK store, etc. "Muslim Pro" makes the claim of "The most popular Muslim App. Recognized by more than 20 million Muslims around the world as the most accurate prayer time and azan application." However, there were no citations or references for these claims in the description. The claims are made outright as fact. Nonetheless, emphasizing awards and number of users creates algorithmic authority based on user and outside evaluations.

Emphasizing technological aspects of the app, espousing claims of highest number of users, and listing awards work together to cement the algorithmic authority of the app and app developers. Algorithmic authority is important support to the religious authority of the app. It works to ensure the accuracy of the religious features (as in the *qibla* compass features) as well as to support the legitimacy of the app developers. Traditional religious authority and algorithmic authority work in tandem to solidify the authenticity and legitimacy of the use of religious apps for religious practice.

To summarize the findings from the Islamic prayer app descriptions, developers highlighted two forms of prayer: *salah* and *duas*. The developers' descriptions framed prayer as a duty that results in connection to Allah and blessings. Prayer is framed using both religious (i.e. *Quran* and other holy texts) and technological references (i.e. calculating times, determining direction) to establish orthodoxy of practice. Finally,

developers called upon traditional religious authority by connecting their apps to religious texts and respected *imams*. App descriptions also established algorithmic authority by calling upon other social networking sites, citing disclaimers or notes, and focusing on technological features as well as user ratings, reviews, and awards.

Summary of findings from Catholic and Islamic app descriptions. The findings from the word cloud analysis revealed three important themes related to how developers communicate and construct prayer practices in their mobile app descriptions: (a) both Catholic and Islamic app developers frame prayer as a way to communicate with God/*Allah*; (b) both Catholic and Islamic app developers prescribed daily prayer practice through the use of different technological affordances; and (c) both Catholic and Islamic app developers called upon traditional religious authority while also developing their own algorithmic authority.

First, as mentioned in the introductory chapter, prayer is presented as an important practice to communicate with God/Allah. The developers mirrored this understanding of prayer within the app descriptions. However, the core values and practices of each religion as discussed in Chapter I informed the way prayer practices were framed as a daily practice. The basic understanding of prayer in both religions is to communicate with God on a consistent basis. Developers framed prayer as a daily practice within app descriptions by emphasizing the use of reminders and alerts. While the Islamic apps descriptions also framed prayer as a daily practice, it did so through the use of tools that would help users pray correctly, according to the *Quran* and other sacred texts. Offline practices of praying at a certain time, in a certain direction, and with

certain movements influenced the way developers described app affordances that helped achieve these requirements for Muslims.

Finally, developers used app descriptions to call upon traditional forms of religious authority, such as religious leaders and theologians and/or sacred texts to authenticate the appropriateness of app for religious use. At the same time, developers used descriptions of technological affordances to create their own form of algorithmic authority, or how the design of the app itself shaped user actions within the app and what information the user may understand to be true or correct. By choosing the content and the way it is engaged through technological and religious affordances, developers are making decisions that would usually be left to religious leaders. Now the developers are determining what those decisions should be, what and how information is included, and what affordances are most appropriate for the prayer practice.

Therefore, the word cloud analysis of app descriptions provides an understanding how prayer is understood and constructed within the mobile context. This is important when identifying the technological and religious affordances that are actually present with the apps. While part one of this chapter has established how app descriptions frame prayer app use, part two actually analyzes the apps themselves to see what and how technological and religious affordances are offered.

Part Two: In-Depth Textual Analysis of Catholic and Islamic Prayer Apps
Beginning in part two, analysis of the 36 Catholic and 29 Islamic prayer apps will help illuminate the ways in which technological and religious affordances construct prayer

practices within the app. Part one provided an analysis of how developers describe

prayer with a mobile app as presented within the app descriptions on the iTunes store;

part two identifies and defines the actual technological and religious affordances used in

the app. This adds an important discussion about the similarities and differences between

the word cloud analysis of the app descriptions and the in-depth textual analysis of the

apps. The findings from this part of the chapter are also important because they lay the

foundation for understanding the three key design approaches that developers used for

prayer apps, which are described in part three of the chapter.

Therefore, in-depth textual analysis of all 65 apps answered how religious apps

use technological and religious affordances to frame and construct prayer practices. Each

app was downloaded to an iPhone or iPod touch and a screenshot was taken of each app

page. Thus, some figures of app screenshots will vary in size. More than 2,000

screenshots from all 65 apps were then uploaded to qualitative analysis software. Data

analysis from the in-depth textual analysis of the 35 Catholic and 28 Islamic apps

resulted in four main categories, each with their own subcategories. These categories

culminated from a combination of conceptual coding (i.e. coding for specific app design

concepts revealed in the literature; *see* appendix A) and open coding (i.e. coding for

elements revealed through the data as discussed in Chapter III) that resulted in 506

original codes. The individual codes were sorted into two major categories each with

their own sub-categories (*see* Appendix C for table of all affordances coded). The first

category, general religious affordances, is defined by religious affordances specifically

such as those related to prayer and other religious content; the other main category,

general technological affordances, is defined by those digital elements that may be found in all different types of apps, including religious-oriented apps that allow for certain actions to happen with the app. First, this section introduces and illustrates *general religious affordances,* including prayer specific affordances and other religious content. Second, this section describes the *general design affordances* and explains their influence upon mobile prayer practices.

It is important to note that this section is merely describing the affordances that were revealed through the analysis. The definitions and examples in the following sections explain the features that make up specific technological and religious affordances. The following sections provide basic definitions and examples while the subsequent sections explain how affordances are used in conjunction with one another that result in specific prayer app design approaches.

In addition to definitions and examples, this section also refers to different sets of measurements. First, "N=" represents the number of apps represented within the category; "n=" is the number of references made about the category. "C=" refers to the number of Catholic apps in the category, and "c=" refers to the number of references made about the category within the Catholic apps. "M=" refers to the number of Islamic/Muslim apps in the category, and "m=" refers to the number of references made about the category within the Islamic apps. For example, there were 397 references made about sharing app content within 42 out of the 65 religious apps. It will appear in the text as: Sharing (n=310; N=42; C=26, M=16).

Each main category has sub-categories and/or sub-sub categories that provide more in-depth analysis (*see* Appendix C). The sections list the categories in order from the least to most prevalent affordances starting with general religious affordances and followed by general technological affordances. While the affordances often intersect or interact with one another, the following sections provide only a general description of what elements are included within them. Rich descriptions of these interactions for each religion are provided in the subsequent section that explores how these elements are used in conjunction with one another to create specific prayer app design approaches.

General religious affordances. General religious affordances is an overarching category that lists and defines all of the religious affordances that offer users access to, or engagement with, prayer specifically. Open coding of the data revealed this category, which was the most prevalent category with 4,138 coded references across eight sub-categories (listed from most to least prevalent in terms of the number of apps that contained a coded reference within the category). These categories were comprised of: a) prayer visualizations (N=65); b) prayer navigation (N=57); c) prayer instructions and information (N=52); d) sharing (N=42); e) prayer settings and tools (N=40); f) prayer reminders and alerts (N=36); g) prayer customization (N=32); and h) prayer media options (N=29). Twenty-seven Catholic and 17 Islamic prayer apps had additional content related to religious texts and practices other than prayer and were coded under *other religious content.*

Prayer visualizations. (n=1,879; N= 65). Prayer visualizations were by far the most prominent sub category within general religious affordances. Prayer visualizations

refer to the ways in which images were used for prayer practices and how prayer text was displayed. In this category, apps were coded for the type of image used in the app (e.g. background images, icons, interactive graphics), and for the type text displayed (e.g. Arabic calligraphy, basic digital text, old-school font, w/ page decorations, with prayer images, with translations and transliterations). All apps were coded for some form of prayer visualization although not every app contained both text and images. Of apps that used images, interactive graphics were the most prevalent, followed by background images, and religious icons and paintings. Interactive graphics were included digital prayer beads (e.g. rosary and *tasbeeh*), prayer trackers and counters, and compasses. Most of the text visualization contained basic digital font although a few tried to mimic an old school or scroll-like feel with font and page decorations. The way developers used images and/or displayed prayer texts has the potential to influences prayer practices in different ways. For instance, an image could be used as a focal point for meditative prayer. Calligraphy or old-school font design in text displays may be an attempt to mimic offline versions of prayer books to give the user a more authentic feel.

 Prayer navigation. (n=502; N=57; C=33, M=24). Prayer navigation is the way prayer or prayers were displayed and organized in the app, and other features that allowed users to access prayers in different ways. Most prayers in the apps were organized into prayer menus, with shortcuts to specific prayers or categories of prayers. Prayers could also be listed alphabetically, according to dates and times, or by specific parts of the prayer such as in the rosary or prayer phrases used in Islamic daily prayers. Unique navigation features included apps that allowed users to shake the phone to

display a random prayer, or shortcut buttons to select or go to specific categories or prayers. Prayer navigation is important for prayer practice because it allows users to find the prayer(s) that they are looking for quickly and easily.

  Prayer instructions and information. (n=272; N=52; C=31, M=21) This category refers to material that informed users on how to pray with the app and/or gave users background about prayer in general or a specific type of prayer. This could include information about prayer definitions, the purpose of prayer, and the outcomes one could expect from praying. This section also contained specific prayer instructions such as how to set the intention or *Niya*t, which is required for Islamic prayer, the specific method of meditation, or the correct postures or gestures to use during the prayer. In some instances, prayer citations or references were provided, including the author, book, or sacred text references from which the prayers in the app were derived. When apps instructed users to pray on their own, the app might also provide an example of what to say. One app provided information about how many other app users were praying through the app at a specific moment in time. Another provided the number of prayers contained in a certain section or menu. Prayer instructions and information are important because they help shape the way prayer practices are understood and undertaken within the mobile context.

  Sharing. (n=310; N=42; C=26, M=16). This category is defined as the type of content and the means of sending prayer text, images or information to others through technological tools. It contains three sub-categories: a) content, b) social media, and c) other. Forty-two of the 65 apps gave users the option to share some type of content in a

variety of ways. First, *content* refers to the type of material that can be shared (e.g. an ad for the app itself, images with prayer content, location, prayers, prayer information, and prayer requests). Next, *social media* shows the sites users can post app content to, including Facebook, Twitter, Tumblr, Google+, Foursquare, and LinkedIn. Facebook and Twitter were by far the most common social media sites to which the apps connected. "Laudate" was the only app that offered to share content with Facebook Twitter, Foursquare, LinkedIn and Tumblr. All of the other apps in this category offered Facebook and Twitter. Finally, *other* refers to the actions a user could take to share content other than social media, or to open content in another app on their device. For example, users could add content such as prayer requests to their phone's reading list, add it to the 'phone reminders' folder, or take a screen shot of the content to send over text. Users could share the content using iPhone's Airdrop, and through chat, email, and SMS messages. There could be a variety of other ways to open or share the content depending on the other apps users have on their devices. The practice of sharing is important when exploring prayer applications because it speaks to the ways in which users are able to interact with others of the faith through technological means. This could reflect how developers understand, and/or influence how users understand, the solitary or communal nature of prayer within their faith.

   Prayer settings and tools. (n=312; N=40; C=20, M=20). Prayer settings and tools allowed users to select the way prayers were displayed. For example, users could choose to have a prayer displayed every time they opened the app. Islamic apps specifically had options such changing the way prayer times were calculated or to select different calls to

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prayer (i.e. azans). Options also included showing a history of recent prayers used, ways to send and receive prayer requests, how to find the correct direction to pray, how to see related prayers, and how to access transliteration. Obviously, some of these options apply more to Catholic or Islamic apps respectively and will be explicated further in separate sections on each religion. Being able to customize the way prayer-related material is displayed gives the user more ownership of the app and can create a sense of connection. It is important to understand how prayer settings and tools are offered and used in order to make connections to how prayer should be understood and approached within the mobile app context.

   Reminders and alerts. (n=198; N=36; C=23, M=13). This category refers to the tools within the apps that allowed users to set times to remind them to pray or alert them that it was time to pray. It could be argued that reminders and alerts could have fit under *prayer settings and tools*. However, it was a prominent enough category within the data to stand on its own. Users could set reminders and alerts for daily prayers, for specific prayers, for a specific time and date, for when they were at a certain location, and for when they were interrupted during prayer. Some apps allowed users to add their own reminders or set a repeating alarm. While most reminders were set up as audio alerts, some reminders could be sent through text to the user's device or by activating the LED light on the user's device. This category was highlighted as an essential feature of many of the apps in the App Store descriptions, but only 36, or a little more than half, of the apps actually provided the feature. Understanding what types of reminders and alerts are available and how users engage them speaks to how prayer practice is understood as an

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important daily practice. It could also indicate how religion or spirituality is becoming one of the areas of life that users want to quantify and keep track of through technological affordances.

Prayer customization. (n=237; N=32; C=14, M=8). Prayer customization refers to the ways in which users can alter, change or edit prayers within the apps. Users can add prayers, select certain types of prayers such as different mysteries for the rosary, and change or select opening and closing prayers for liturgical, meditative, or daily prayers. In some instances users could add personal prayers, and import and export both personal and standard prayers. However, there were very few apps that allowed editing or changing of prayers. Being able to customize prayer may speak to the argument that users can "pic 'n mix" religious elements based upon their personal preferences outside the purview of traditional religious authorities. Depending on the specific features provided in the apps, prayer customization may indicate an overall trend of the personalization of religion, or how people are practicing religion outside of a specific organized community or tradition.

Prayer media options. (n=84; N=29; C=12, M=17). This category refers to the different media options users have to engage prayer in different ways other than text. Prayer media options include five sub-categories: a) audio; b) video; c) media player toolbar; d) media settings; and e) image tools. It is interesting to note that while *audio* was a term that was highly noted in the word cloud descriptions, only 11 Catholic apps and 13 Islamic apps had audio options. Most of the *audio* options were in the form of recitations of prayers although there were a few links to podcast audio from different

religious media. Only three apps had *video* options, one of which linked to YouTube. The other two had video elements embedded in the app. The *media player toolbar* took various forms but was usually in the header or footer menu. Specific elements comprised play/pause/stop, fast-forward and rewind, play in repeat or continuous mode, control audio speed, and volume controls. *Media settings* allowed users to enter full-screen mode, to preview the audio, and to mute the audio. Finally, three apps provided *image tools* that allowed the user to change images, use image filters, and edit the text displayed of the image. When thinking about ways technology can change or inform how we practice prayer or other types of religion, an emphasis is placed on all the different ways users can engage that practice through media affordances. However, only a few apps provided this interaction beyond basic audio, which could be a function of the lack of designer ability or the lack of user interest.

   Other religious affordances. (n=296; N=44; C=27, M=17). This category denotes any religious content other than that related to prayer. The category was further divided by religion. Other Catholic content included information about access to the Bible, canticles or hymns, information on Saints/religious figures, commentary, devotionals, historical information, etc. Other Islamic content included the *Quran*, articles of faith, information on the five pillars, *Hadith*, *halal* and other holy places, history and information on religious figures and *imams*, user comments, and *zakat* calculators, which helps determine the amount and kind of payment made to charities or other religious organization for different purposes. Exploring what other religious

content is available on the applications may indicate to specific approaches to prayer app design, which is discussed in depth in part three of this chapter.

General design affordances. General design affordances is the other overarching category that refers to digital, technological affordances that may be found in all different types of apps, including religious-oriented apps, that allow for certain actions to happen within the app. This is the second largest major category with 3,660 coded references (derived from both open and conceptual coding) and denotes elements that pertain to common app design features including (listed from most to least prevalent in terms of the number of apps that contained a coded reference within the category): a) global navigation (Krug, 2014) (N=65); b) primary navigation (Krug, 2014) (N=65); (c) app information and instructions (N=52); (d) utilities and settings; (e) notifications (N=39); (f) customization (N=32); and (g) advertisements (N=43). These elements do not specifically apply to religious content and are found in the design of all types of secular and religious apps. However, the ways in which they are combined with religious content in the prayer apps, as well as how successfully they are implemented within the app, makes a difference in how the prayer practice is framed and understood.

Global navigation. (n=591; N=65). Global navigation describes elements that should appear on every page of a web site/app, including things like contact information, search, etc. (see Krug, 2014). The breakdown of subcategories is: a) contact information, b) registration, and c) search. Contact information contains codes like links to developer social media sites, websites, and blogs, feedback and help sections, app rating elements, and support. The registration sub-category contains elements like login/logout options,

passwords, and subscriptions to email or newsletters. The search element helps users find information or content quickly. Search functions use search bars (a place to type in text to search for) or links (take user to separate search page) as well as different options, such as search for a specific prayer or location. This category is important to understanding prayer apps especially given the way in which developers referred to these types of elements when building the algorithmic authority of their apps, as discussed in the word cloud sections.

Primary navigation. (n=906; N=65). Primary navigation includes those design elements such as breadcrumbs and different types of menus and tool bars to guide users to specific content, tools or features. This category includes two sub-categories: (a) menu navigation, (b) button and touch navigation, (c) shortcuts, and (d) "You are here" indicators. Menu navigation works by providing words or icons to, "show you the path from the home page to where you are and make it easy to navigate back to through the path," (Krug, 2014, p. 79) (*see* Figure 5). There are many different types of menus including dropdown menus, floating menus, header and footer tool bars, phone status bar, popup menus, side menu, and slide-out menus. Menu changes, when a menu was altered or disappeared from different app sections or pages, were also recorded in this section. For example, the main header menu on the homepage may contain a settings shortcut, a page name, and an information shortcut. However, whenever the user selects a specific prayer, the header menu may change and offer different shortcuts or tools, like a search bar or font options. This is an important category for understanding all types of apps, but also prayer apps specifically because the way navigation is displayed may
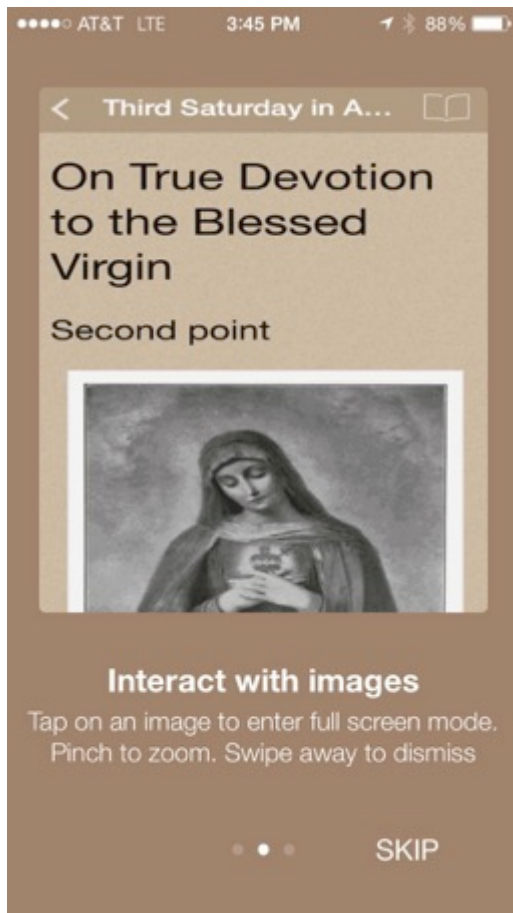
Figure 5: "You are here" Indicator.
The three dots at the bottom of the
photo shows the user where they are in
relation to other available content . The
image was reprinted from iTunes.com

prevent users from finding the information they are looking for. Also, if the navigation

impedes the users progress through the app it may negatively influence the algorithmic

authority of the app and therefore the user may not see the content for prayer as

authentic or correct.

Button and touch navigation. (n=404; N=65). Button and touch navigation is an extension of primary navigation that refers to specific buttons that indicate movement to the user, and that also indicates actions the user applies with their fingers or hand to move from page to page and element to element. For example, "back" and "next" buttons navigate the user from page to page or from prayer to prayer. Touch navigation allows the user to navigate the app and content using their finger and the screen through actions such as, flipping, scrolling, swiping, or tapping. Sometimes, apps afforded only one option (i.e. buttons or touch) while others allowed for both. Additionally, touch navigation includes actions made with the device itself. For example, some apps had only vertical or horizontal orientation while other allowed for both.

Shortcuts. (n=334; N=65). Shortcuts, which were also included in the primary navigation category, could also contain any icon or link that help the user navigate to certain content or settings quickly. For instance, the symbol for information, which is a lowercase "i" with a circle around it, is a shortcut to information about the app or prayer. In addition, bookmarks, favorites, "Go to" buttons, home page buttons, and tags are included in this section because each provides a quicker way for the user to navigate through the app. These specific navigation features should be intuitive. If prayer app users cannot figure out how to move around within the app or choose options because they cannot figure out what physical actions control the app navigation, it could influence the overall engagement with prayer through the app as well. Good design may not always lead to good prayer experiences, but bad design will certainly cut off any prayer experience that users are seeking to engage.

"You Are Here" indicators. (n=276; N=31; C=16, M=15). This feature is included in primary navigation and is prevalent in mobile apps and within the religious prayer app sample. Much like the name suggests, this design element shows the user where they are in the app or in the prayer through dot trackers, highlighting, and status bars (see Figure 5). This feature helps users navigate and track their progress through the app. This is important for engagement with prayer apps because without an indication that there is more content, users may skip over or be unaware of other options available to them.

App Information and Instructions. (n=310; N=52; C=34, M=18). This category differs from the prayer information and instructions category in that the content refers only to app statistics, such as the version number and memory specifications, or instructions on how to navigate through the app using primary navigation, shortcuts, and button and touch navigation. Information is usually contained in a separate "About" page. Designers use a variety of icons as shortcuts to the "about app" information which consisted of relatively little information (i.e. the current app version number and the latest update info) to legal information about the sources of the content used in the app (authors, titles, copyright info, etc.), app developer info, and occasionally a log of different updates made to the app. Instructions could be a short sentence or two about a unique feature of the app, such as, "Shake phone for a random prayer," or could be multiple pages of tutorials on the different navigation, settings, and content features. If the app contained a tutorial, it often had a navigational button that allowed the user to "skip" the instructions. Many times the user could find the tutorial again through the

information or "about app" shortcut. Again, this type of information is important because it can guide how the user understands and engages the prayer app. It provides information about the app, which could also be a way for developers to call upon traditional religious authority or algorithmic authority by highlighting certain information about the design and different elements on the app.

Utilities and settings. (n=383, N=46; C=27, M=19). Utilities are a variety of tools and functions designers include that provide different options to manipulate the content on the app. Settings are a bit different because users will generally select them once before using the app, while the utilities will pop up in different formations throughout app content pages. For instance, utilities can add content to a reading list in their phone, look at their app history, clear all content, download content, delete content, highlight content, edit content, create notes, print content, reload/refresh/restore content, and save content. There is often a "more options" feature that provide innumerable little tweaks users can make when accessing, changing, or organizing their app content or features. The most common settings are browser settings, which include Wi-Fi and cellular options, download options, and language options. Apps with language options were coded for English, Arabic, French, Spanish, and more than 3 languages. Additionally, many apps had location access settings whether or not the content was based on the user's location or not. Options to change this setting usually popped up in the form of a notification when the user opens the app. Other less prominent features include memory status, privacy options, screen timeout and rotation control, and time settings (e.g. 24 hour and daylight savings time). These settings and features were

especially important for prayer apps that used location-based reminders to pray or that needed to calculate the correct direction in which to pray.

Notifications. (n=64; N=39; C=24, M=15). Notifications included alerts, sounds, and icon badges related to the app itself rather than prayer content. These alert the user to new information, contain feedback loops, or allow users to configure settings. Notifications are always found in pop-up boxes that contain the information. They usually overlay the screen so whatever app page the user was on it is in the background. Users have the option to allow or not allow notifications and can usually be changed later in the settings menu of the device. Without notification, users may be unaware that certain settings and utilities were available or that they had the option to customize certain settings and content. This is important for all apps to have, but also for prayer apps because the user will have easier access to these settings and customization. Types of notifications noted by users will be discussed in Chapter V.

Feedback loops. (Gong & Tarasewich, 2004; Shneiderman, 1993). (n=113; N=32; C=20, M=12). Feedback loops are a type of notification provided when users take some sort of action. Most feedback loops come in the form of notifications. To illustrate, if a user bookmarks a prayer, a little notification box will pop up that says, "Added to bookmarks" and will promptly disappear or give the user an OK button to accept the notification. Feedback loops in prayer apps included notifications to check settings that the network is unavailable, storage is full, or updates are available. Designers also used icons to indicate what content was downloading, when audio or video was playing, or where users could search the content. Other feedback loops included highlighting design

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elements that the user selected, notifying the user of the size of downloads, or providing

other information about the content the user was engaging. It is important to let users

know that an action they have tried to take with the app has worked or is that the app is

working on taking action based on the users' selection. Again, this speaks to good design

and reassuring users that they are using the app correctly, and in supporting algorithmic

authority through good design.

Customization. (n=237; N=32; C=14, M=18). Customization refers to the ways

users can manipulate the display or text to suit their individual preferences. *Display* (56),

Font (94), and *Theme (63)* are the three subcategories that make up customization.

Display could be changed in some apps by altering the background or wallpaper image,

changing the color options, or adding a grunge border. There were two ways for users to

manipulate font: changing the size and changing the typeface. Finally, the theme (or the

color scheme used in the design of the app) could be changed to multiple colors, to day

or night mode, or to a common sepia tone. This is an important category because it

speaks to the user being able to shape how the app looks and feels, and therefore shape

the way their prayer practice looks and feels within the prayer app. Chapter V also

explores the ways in which users understood the customization options and which ones

were most important for their prayer practice.

Advertisements. (n=263, N=43; C=25, M=18). Advertisements in the prayer apps

were not uncommon although there were a few apps that maintained their ad-free status.

This category is divided by content (to upgrade or remove ads, for other prayer apps and

religious apps, for secular products) and type of ad (footer banners, pop-ups, and as part

of menu options). Ads to *upgrade,* or to *remove ads,* were the most prevalent in this

category. This was closely followed by ads for other religious apps made by the

developers or companies. The remaining types of ads included those for non-religious

apps or products, for other religious products, for in-app purchases, to donate to religious

organizations, and one app advertised to "buy app ad space." It is interesting to note

which apps had advertisements and which did not because that also provides an

indication of the motivations of the developers: were they interested in providing a

prayer experience, making money, or both? Ads could work to take the user out of their

prayer experience which would be disruptive, but could also encourage them to pay for

the full app. Sometimes, ads were unobtrusive and did not flash or change and therefore

were not as distracting as others.

Most ads were found in free applications (34), one $.99 app had ads, two $1.99

apps had ads, five $2.99 apps had ads, and two $4.99 apps had ads. Apps costing $3.99

or $12.99 did not contain ads. Additionally, the free apps with the most ads had the

highest amount of user ratings, 45 of which received 4 stars. Perhaps the free apps are

rated more than the costly apps because users are not willing to pay for an app they are

not sure will work for them. It also indicates that users are willing to put up with certain

types of advertising in their prayer apps. Advertisements could be distracting to the

overall purpose of providing access to prayer practices through mobile apps. However,

they could also be used to alert users to other religious app options.

Summary of general religious affordances and general technological

affordances. To summarize, this section explicated two overarching categories: general

religious affordances and general design affordances. It is important to break down and define all of these elements individually so that it is easier to see how they are combined to create specific approaches to prayer app design, as discussed in part three of this chapter. The two categories speak to how developers used affordances to shape prayer practices specifically, and to identify affordances that could be found in general across all different apps. It was also important to explicate the specific prayer and technological affordances contained in the app so they could be compared to the claims the developers made about the app in the iTunes descriptions, which is done in the next section.

Comparing word cloud descriptions to prayer app affordances. One interesting result of looking at both how developers frame their prayer apps within the iTunes descriptions and the affordances used within the apps themselves is seeing the consistencies and/or discrepancies between the two findings. The point of the prayer apps studied is to provide access to a daily prayer practice, according to both descriptions of the app and affordances found within the apps. The developers that touted long lists of prayers in the descriptions provided those prayers within the apps. However, depending upon the variety of features employed in the app the design approaches varied (as discussed in the next section). Another way developers designed these apps for daily practice was by focusing on one style of prayer a day (e.g. the "3 Minute Retreat" app) or by building in a prayer-of-the-day element in which a random prayer would be displayed (e.g. the "Laudate" app).

Next, within the app descriptions, developers emphasized the need for a daily prayer practice by touting specific digital tools to help users remember to pray. The

developers' descriptions most often mentioned reminders and alarms as the design feature the app offered to help users to remember to prayer. However, only 36 out of 63 apps actually contained this feature. This may be explained by the nature of the app, such as the "3 Minute Retreat" app, which was designed to be used as a daily meditation. Other apps offered the daily prayer option but did not have a feature to alert users. Finally, some developers may assume that users will set their own alarms and reminders through other apps on their devices and did not see the need for an in-app option. Often times when the app did have a reminder feature, it was limited and would be easily replaced by a basic reminder app on their device. However, there were a few apps that did have alarms and reminders that were for specific prayers during specific times of the day or year. Nonetheless, 27 apps did not include this feature in their actual design.

Additionally, calling upon religious authority was found more often within app descriptions than within the apps themselves. Invoking traditional religious authority was used mainly as a selling point and did not carry over into the apps. There were a few subtle references to traditional religious authority in 20 Catholic and 11 Islamic apps (31 total) that mirrored the references in the app descriptions. Within the apps, traditional religious authority was represented in prayer citations or references. In these cases, a citation (e.g. to a saint or to an *imam*) would accompany the prayer text. Another example is when the Vatican or the *Quran* were used as a reference for prayer instructions. These instructions could usually be found in the app's "about" page or in some cases a section of frequently asked questions. In these cases, the user had to search for the info rather than it being explicitly stated along with the prayers themselves.

The lack of explicit references to other types of traditional religious authority (rather through religious leaders or holy texts) in many of the apps could be seen as building algorithmic authority. To clarify, in some cases there was no indication if the instructions or information about the prayers were coming from a traditional religious source, such as a priest or sacred text. Therefore, the app itself, and in turn the developer, is acting as an authority as they disperse information about the prayers and about how to practice the prayers. It is up to the user to compare this information to traditional religious authority information to check for accuracy.

Finally, algorithmic authority is presented in the word clouds as a way to sell the app and get the user to download it. Within the app however, algorithmic authority allows the users to make decisions about the form and functions of the app through customization features. The user is given control, based upon design elements, to change prayers, add prayers, comment on prayers, edit or takes notes on prayers, design their own opening and closing prayers for certain rituals, choose from different audio for *adhan*, etc. In this sense, algorithmic authority shifts from a selling point in the word clouds to an opportunity within the app to "pick 'n mix" (Wagner, 2012) from different religious elements. While they are not picking between different types of religions (i.e. the Catholics did not allow access to *duas* and vice versa), they are customizing the prayer practice to their own personal preferences. To illustrate, users can determine what prayers or translations are used when they access prayer elements. However, it is important to understand that just because these features are available, doesn't mean users will engage with them. Therefore, the customization affordances allow the opportunity

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for users to shape their own prayer practice, but there is no guarantee that they will not just use the app as is and therefore rely on the apps algorithmic authority.

The general religious affordances and general design affordances are combined in different ways, which reflect the developer's overall approach to prayer app design. Part three of this chapter explicates three key prayer app design approaches with in-depth descriptions and examples from both Catholic and Islamic apps. These design approaches answer how technological and religious affordances combine to communicate and construct prayer experiences in specific ways.

Part Three: Three Key Prayer App Design Approaches

The findings from part one and part two of this chapter revealed the ways in which developers frame prayer within the app context as well as what technological and religious affordances were found within the apps. During data analysis, all 65 of the apps were compared with one another to see which ones used different affordances in different ways. Therefore, general religious affordances and general technological affordances discussed part two were combined in different ways by app developers for different purposes, which is the focus of this part of the chapter.

App developers from this sample, based upon how they used and combined affordances, approached prayer app design in one of three key ways: a) translating prayer text from print and analog into digital mobile form while providing the tools to aid in daily prayer practice; b) creating a mobile prayer environment in which the app is integral to the user's daily prayer practice; c) developing a multi-functional religious app

with prayer as a major purpose of the design. Each of these approaches is defined and explained in detail in the sections below. It is important to note that these approaches are not mutually exclusive and appeared in any number of combinations within the apps. Understanding these different approaches is important because it provides insight into how prayer is communicated and constructed with the app in certain ways. The three approaches also speak to the underlying assumptions developers may have about the relationship between technology and religion.

Translation approach. As mentioned above, literally copying and pasting prayer text from the print and analog format into the digital format characterizes the translation approach to prayer app design. For instance, some prayer books were cited as the source for the prayer text found in the app. No interactive features were added – just digitized text available through the app platform. Prayer texts are generally presented in such a way to educate young or new religious adherents about prayer, and/or to remind more advanced religious users of the prescribed prayers consistently used within specific religious settings, such as praying alone or following along during a mass or prayers at the mosque. Although not always present, apps using the translation approach also provided tools like customization, reminders and alerts, sharing, audio, and other utilities and settings that aid users in maintaining a daily prayer practice. The important distinction here is that the design features offered in the app with the translation approach provide limited engagement. To clarify, users can change the font of the prayer text or set reminders to pray, but the device itself does not become a part of the prayer practice as in the mobile-environment design approach discussed subsequent sections. It

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seems within these apps, the traditional prayer texts are simply made digitally available for easy access by religious users.

A Catholic example. The "Catholic Short Prayers Lite" app, designed by independent developer Valent Richie, is a good example of this approach. It is free, and has a 5 out 5 star rating calculated by almost 300 users on the Apple iTunes Store. The app opens with a notification pop-up informing the user about new features, such as location-based reminders or the ability to enable or disable sound effects. The app contains a long list of common Catholic prayers, such as Hail Mary, Glory Be, prayers against depression, and the Magnificat. The only difference between the full and lite versions is that some of the prayers on the lite version are disabled. The homepage menu is scrollable with headings to separate the prayers as well as other elements like an advertisement to the full version of the app that activates the disabled prayers. The homepage also has a header menu which contains a feather icon shortcut to the "about app" page on the left, the page name "Short Prayers Lite Version," and a settings menu shortcut on the right. Below the header menu is a search bar with a feedback loop that says, "Search or shake for random prayer."

If the user taps the "about app" shortcut from the homepage header menu, a notification feedback loop pops up with touch navigation instructions showing the user they can swipe between pages. A new footer menu appears on this page with shortcuts options to share the app, set up daily alerts, or add the page to favorites. The about app page contains legal information about the sources of the prayers and information as well as the designers name and links to more of the Catholic apps he has designed. If the user

selects the settings shortcut on the top right of the header menu, a slide-out menu opens, which gives the user the option to change the font size, jump to a random prayer, turn the sound effects off and on, and write a feedback email to the developer.

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When a user selects a prayer such as "The Lord's Prayer," (*see* Figure 6), the prayer page opens and there is a menu change for the header menu and an added footer menu. The header menu now has the homepage button on the left, the name of the prayer as the page name, and the setting menu shortcut on the right. The prayers are presented with titles in old-school font and prayer text in basic digital font. In this app both the Latin and English version of the prayer are available. The footer menu has a series of shortcut icons that allow the user (from left to right) to go back to the previous prayer, share the prayer via Facebook, Twitter, email, and SMS message, set an daily alarm for this prayer, add this prayer to favorites, and the next prayer button. Some of the prayers also have an image that accompanies the prayer text. For example, the Sign of the Cross

is presented along with a painting of Jesus mimicking the sign of the cross gesture. This

image can be opened full screen and has pinch zoom scaling so the user can see image

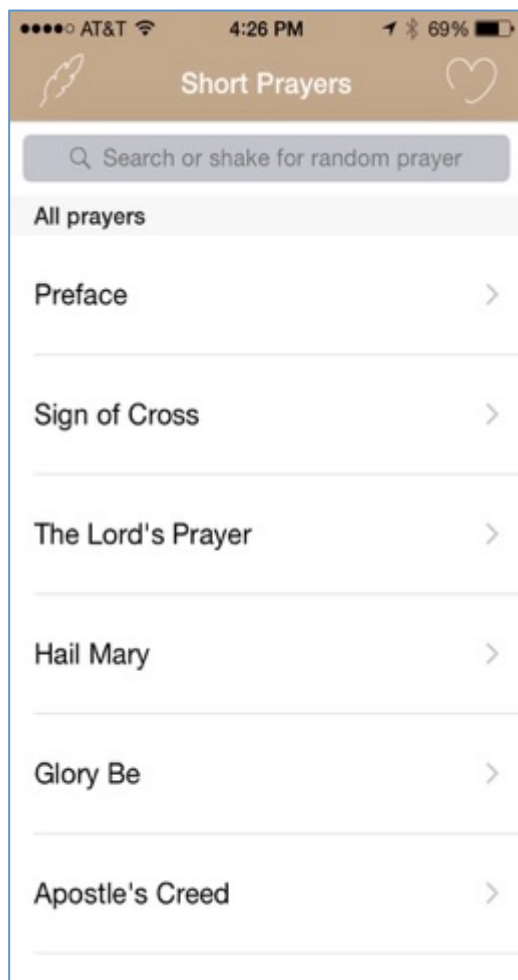details. However, only the text is sharable.

Figure 6: Catholic Short Prayers. This is
a free app designed by Valent Ritchie. The
simple list of prayers is a characteristic of
the translation approach to prayer app
design. Reprint from iTunes.com

When thinking about how these types of apps may be used, new Catholics who may not be familiar with the prayers come to mind. Although young or new Catholic users may pray with the app at first, as they mature in their faith the prayers could be memorized. However, the prayer design functions as a tool to learn or memorize short prayers and to remember to pray daily at certain time or at a certain location. Additional tools also allow users to store their favorite prayers in a bookmark folder. This app could be likened to print text version of a prayer book that has been translated into a mobile digital app. The digital affordances allow apps like this one to also function as a tool for daily reminder and prayer practice.

Overall the features of this app illustrate how some Catholic apps are designed to translate prayer from offline sources to digital apps. Designers seek to translate the prayer texts as the main function for users to engage with. Through this the app frames prayer as a more individual practice to be developed rather than actually using the app during the prayer practice every day.

An Islamic example. The "Islamic Duas" app is a basic app example of the translation approach to design in the Islamic context. The free app is developed by Waqas Habbib for Wiky Apps, rated at 4 stars out of 5 on iTunes, and classified on the app store under "Education." The app homepage (*see* Figure 7) is characterized by a horizontal orientation, a phone status bar at the top, a main title, and a prayer menu with duas for specific situations such as at "time of sleeping," "seeing a Muslim smiling," and "receiving a gift." The bottom of the prayer menu on the homepage contains a link to the developer's blog. No app information or instructions are available to the user. The

designer expects the user to intuitively figure out the scroll function, as well as the back button arrow, which are present on prayer text pages.

When the user opens a prayer (such as the prayer for the time of sleeping in the figure), there is a back arrow at the top left of the page, the title of the prayer, Arabic calligraphy in a decorative box in the middle of the page, followed by the English translation. These are short prayers, however some of the longer ones are hard to read because the text gets scrunched up on the screen rather than allowing for scrolling. The link to the developer blog opens to a short website with the title Wiky Apps and a list of development products they provide. There is no other contact information.

Overall, the features, and the lack of features, of this app illustrate how designers seek to translate the prayer text from offline or printed versions to digital mobile apps. The lack of features also works to frame prayer within this app as just having access to the text when you are learning or need to be reminded of specific prayers. The basic features relay a view of technology use within prayer as a limited one. Once again, the app is used as a reference rather than as an active part of the prayer practice. For developers, this may underscore the need to make access to various religious texts and information more convenient. Rather than having to carry around big prayer books, the user has access to the text on a small convenient device.

In conclusion, the two app examples are indicative of the type of translation done and tools used to present prayer in this app design. No interactive features were present that require the user to integrate the app into their prayer practice.

Figure 7: Islamic Duaas (sic)**.** This app, designed by Waqas Habbib for Wiky Apps, costs 99 cents and is an example of the translations approach to prayer app design. Reprint form Islamic Duaas app.

For example, the person could review the text and then pray or pray with the app in hand. The prayer is presented in digital text rather than through other interactive features such as audio or interactive graphics. Rather, the apps simply provide text, with no real instruction on how to use them, and various tools with which to remember to pray. The translation approach frames emphasizes access to texts for learning or remembering prayers that is available in the convenience of a mobile app. This is in stark contrast to the next prayer app approach: creating a mobile prayer environment.

Mobile prayer environment approach. Some designers take the approach where they seek to create apps that offer a mobile environment in which users can enter into a prayer practice. Therefore rather than just presenting the text, users can engage

with interactive graphics and media options to pray while using the app. A distinguishing characteristic of this approach is that apps and mobile devices are seen as become a part of the prayer practice and ritual. To clarify, most of these types of apps have an element that enables the user to touch the screen, move or shake the phone itself, keep track of the prayers, or listen along with audio while praying. Other apps provide a space for users to write and store their own personal prayers or prayer requests. Unlike the translation approach, apps taking the mobile prayer environment approach provide a prayer environment through interactive features and media options that may also contain a variety of tools that help users remember to engage a daily or consistent prayer practice.

A Catholic example. The "Rosary Guide" app developed by BigRiver Software, LLC is free of charge, has a rating of 4.5 stars, and is designated as a "reference" in iTunes. The design looks basic but is actually more complex (see Figure 8). The homepage opens on to a black screen with rosary beads surrounding the outside, a tan colored text box with black, basic digital font in the middle, and back and next navigation buttons below the text box. In the lower left hand corner is "RG" standing for Rosary Guide which is a shortcut to the "about" page of the app. It contains the app name and prayer information as well as navigation instructions. On the bottom right is the information icon, which is a shortcut to the settings menu. The settings menu consists of options to choose the mysteries to pray during the Rosary, to turn on and off the Latin prayers, to edit the prayers and mysteries text, to alter text size, to turn on or off the interactive beads, and to choose the decade and concluding prayers. Once the

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user has decided on all the settings, they can navigate through the Rosary using the back and next buttons or by touching the rosary beads draped along the outside of the screen. The text changes for each section of the prayer in the text box and includes instructions such as "Make the sign of the cross." Using the navigation buttons or touching the rosary beads results in a simple but effective "You Are Here" indicator, which is denoted by a highlighting effect. Each part of the rosary, from the crucifix on, lights up depending on where the user is during the prayer. These digital rosary beads recreate the physical beads used to keep track of where the person is in this long-form prayer.

The features within this design approach offer more engagement between the user and the app. The user touches the screen at specific intervals that mimics the offline practice of prayer with physical rosary beads. This is significant because offline artifacts are being designed into digital form, which may result in different types of engagement from users. For instance, users may be more comfortable praying the rosary on their mobile phone in public rather than on the more obvious physical beads. In a sense, it provides the user a modicum of privacy while praying in public spaces through the app. Significantly, this design approach uses various technological and religious affordances to frame prayer in the mobile context as more than just translating texts. It applies interactive features such as audio and interactive graphics like the digital rosary that the user engages during their actual prayer practice. Therefore, the device itself becomes a part of the practice, integrated into the physical actions of the precant.

Figure 8: Rosary Guide. This is a free app designed by BigRiver Software, LLC and is an example of the mobile prayer environment approach. Image reprinted form Rosary Guide.

An Islamic example. The "iSubha" app is a good example of the mobile environment approach by offering the Islamic form of the *tasbeeh* prayer beads. The app was developed by Guided Ways Technology, costs $.99, has English and Arabic options,

is rated 4.5 stars, and is classified as utilities in iTunes. The homepage is simple with glowing, blended colors and a simple yet artistic image that replicates the arch design often used in Mosque architecture (*see* Figure 9). At the top of the page is the phone status bar and below it on either side are two shortcut icons. On the left is the play/pause button and on the right is the refresh arrow. The pause button freezes the screen so that the user cannot see any information on the homepage. The user must push the pause button again to return the homepage. The refresh arrow opens a pop-up menu with the options to restart the session, create a new session or cancel.

At the center of the arch graphic on the homepage is a circle with the number 0 on the inside. This is where the app shows the user how many times they have repeated the supplication. Around the circle toward the edge of the arch are 11 half circles with dots on the insight. These work as the virtual prayer beads. Each time the user touches the screen the counter goes up and a bead fills the center of the half circles. Below the circle is the name of the *tasbeeh* in English and Arabic. Below that is a timer that shows the user how long they have spent in prayer.

On the bottom left of the screen is a menu icon shortcut that takes the user to a list of different *tasbeeh*. The app doesn't actually provide exact phrase in English, only

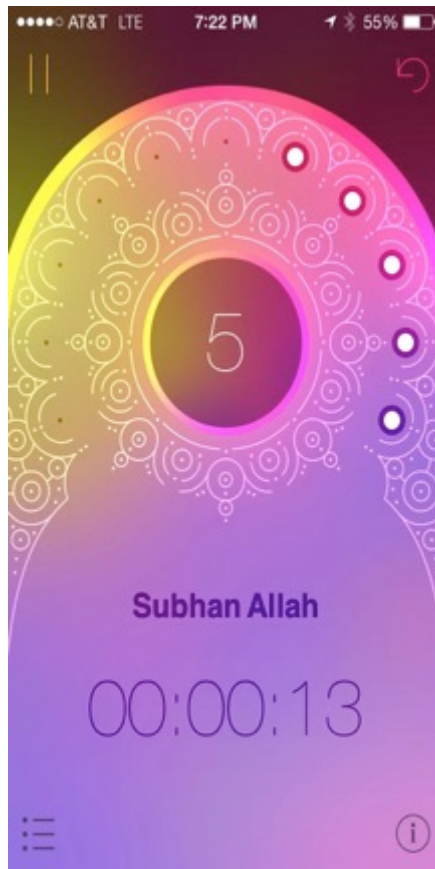**Figure 9: iSubha Islamic Prayer Beads.** This app by Guided Ways Technology costs 99 cents and is an example of the mobile prayer environment approach. Image reprinted from iSubha app.

sessions and taps per day as well as the most used phrase. The very bottom shows the

latest *tasbeeh* used and how long they were used. Below this is a button with the word

'more', which shows the stats for the day.

The bottom right of the screen shows an information icon which takes the user to settings. Users can turn on or off the transliteration, sounds, and vibration. Below this is the app icon and version number along with the developer's icon and symbol. There is a close button at the top left of the page, which allows the user to go back to the homepage.

The lack of text for any of the phrases, except for the transliteration on the menu page, implies this is not an app for beginners. The users are expected to know what the phrases are and how prayer beads are to be used. There is no tutorial or instructions, but the design is so basic that a minute or so of exploration is enough for most users to figure out the concepts. We can see that although there are tools to quantify and track prayers, the point of the app is to replace physical beads during the practice. Therefore, the device becomes a physical part of the practice because users are required to touch the digital representation of the prayer beads on their phone. Instead of trying to translate text from print to digital, the designers seek to replicate the offline prayer ritual experience, by offering tools and images through digitizing religious artifacts for use in prayer that recreate and also enhance the users prayer environment and experience. When users engage with a prayer app that is designed to provide a mobile prayer environment, they have the option to complete prayer practices in public but within the privacy of their app. For instance, there are no physical prayer beads or books that strangers on a train or bus can see. Using a mobile phone is a common sight in public; therefore, using a prayer app can provide a modicum of privacy if they want to pray in

public. Whether users engage in this behavior or not remains to be seen, but the affordance is available through the mobile prayer environment approach to app design.

Together these two examples indicate that designers understand the practice of prayer to be compatible with mobile technology. This may indicate that developers see technology as a tool to be used in different ways and not as antithetical to religious practice. The significance of the creating a mobile prayer environment is that offline artifacts and practices are replicated in the digital format. The device and app become an integral part of the everyday prayer practice.

Multi-purpose religious app approach. The multi-purpose religious app design approach attempts to create an all-in-one religious experience for users, of which prayer plays a major role but is not necessarily the main or only design goal. Prayer design within multi-purpose religious apps can incorporate either or both of the translation and mobile environment design approaches. However, multi-purpose apps also provide substantial access to other religious information and resources, such as full copies of the Bible or *Quran*. The two apps described below contain both of the first two approaches incorporated into their design, as well as providing other extensive religious resources. The significance of this approach is that developers frame the religious app use as conducive to most, if not all religious practices including prayer. Therefore, using app technology to pray and read sacred texts and perform other religious rituals is framed as compatible with the religion. The developers seek to provide access to multiple religious resources and thus encourage a variety of religious practices. This is illustrated in depth in the Catholic and Islamic examples below.

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A Catholic example. The "Laudate" app is a free Catholic app developed by

Andrzej Krawczyk of Aycka Soft. It has a 4.5 star rating in iTunes with more than 2,000

user responses. It boasts more than 5 language options and is classified as reference in

iTunes. Upon opening this app the user is greeting by a pop-up notification with the

dated information of each update since its release (see Figure 10). There are 50 pages of

updates users can see if they are interested. This also serves as a sort of app information

page with acknowledgements and some legal information about the content. It also

contains links to donate to different organizations that helped make the app possible as

well as an email on the last page where users can send any suggestions for new features.

The user can exit this notification box anytime by clicking the X at the top left corner of

the box.

Once the user is finished with the update and "about app" information, the

homepage menu appears. The color scheme is either a light blue or gray, but there is a

list of color options from which the user can choose. At the top of the screen is the phone

status bar. Below that is the top menu bar with a settings shortcut on the left said and the

name of the app in the middle of the page. The user can scroll down to see all of the

options in the menu, which includes daily readings, bookmarks, liturgy of hours, Roman

Missal changes, order of the mass, calendar, religious freedom information, rosary and

chaplet, stations of the cross, prayers, Latin prayers, my prayers, search prayers,

confession religious media, Bible options, and even Vatican documents. It is easy to see

that the developers wanted to meet different needs for Catholic users; indeed, their

tagline in the App Store description is, "The #1 Catholic app!"

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The homepage design includes a background image of a religious painting, and each option in the menu has an icon symbol on the left and the next arrow on the right. Although this app offers many choices, some may call the design "noisy," meaning the page looks cluttered. If users tap the settings shortcut on the top left of the header menu, the settings options for all of the content opens. In all, there are 18 app pages worth of settings with everything from fonts and themes to rosary and bible settings.

As shown by the extensive homepage menu, there are many different options for prayer. If the user goes to the 'Prayer' section, a long list of common catholic prayers-21 scrollable app pages long (with about 12-13 prayers per page). This, as well as the "Latin Prayers," "Liturgy of Hours," and "Daily Prayer" sections reflects the translation approach to prayer app design. Users can simply click on a section and a prayer and the text is displayed on a blank background color in small text (which can be adjusted in settings). It is very basic: no audio, no images, no page decorations or fancy font- just the text of the prayer as it might be seen in a prayer book.

The prayer text pages have a different header and footer tool bar menu. The top bar has a back button, plus the name of the section or prayer the user is in. The footer has button navigation for back, forward, and share. The forward button doesn't really work, and the back button just refreshes the prayer text back to the top of the page. If users select 'Share' a popup menu opens with the following options: email, Twitter, Facebook, more, and cancel. If the user presses 'more' the a full-screen menu option opens options to copy, email, SMS, and logout as well as links again to share through Twitter and Facebook.
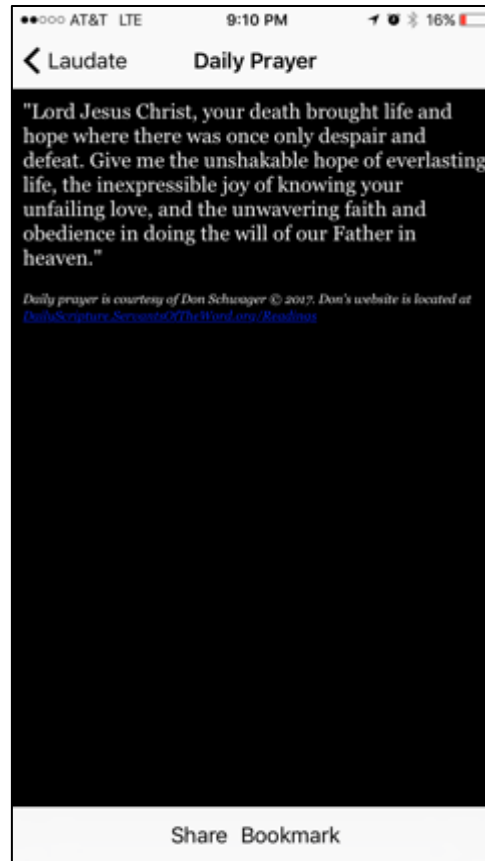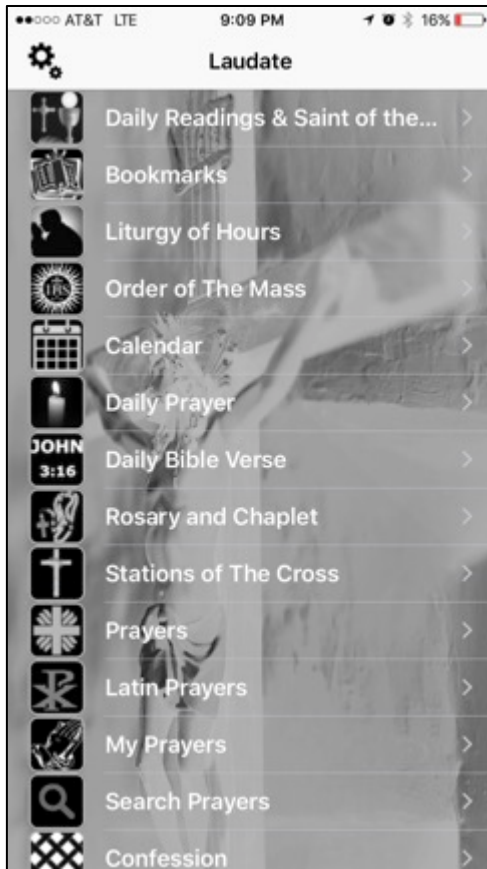
Figure 10: Laudate. The homepage (pictured left), the interactive rosary (center) and the daily prayer (pictured right) show the different prayer elements of this multi-purpose design approach to prayer app design. All images reprinted from the Laudate app.

Essentially, the only options not listed on the popup menu are copy, SMS, and logout. The logout function is interesting. There is no login option, so it seems as though the logout button just closes the app. However, it feels like it crashes the app rather than closes it.

The "rosary and chaplet" section is one place where the designers tried to implement a mobile prayer environment through interactive elements like podcasts and interactive rosary beads. When the user selects "Pray Interactive Rosary Beads" a page with image of the crucifix and beads opens. A brief instruction feedback loop pops up instructing the user to touch the screen to begin and follow the beads. There is also a header menu change with a back button on the left, the name of the mystery being prayed in the title bar and two button options on the right that say "Mystery" and "New". If users touch the mystery button, they can change their options from joyful, sorrowful, glorious, and luminous mysteries. The 'new' button opens a notification asking if the user really wants to start a new rosary with the options 'cancel' and 'ok.'

Once the user selects their settings and touches the screen to begin, a yellowish circle appears on the crucifix indicating to the user where to touch next. Once the user taps the crucifix, the prayer text for the rosary opens in a pop up box. Again the text is on the blank color background with basic digital text and the close button on the top left of the text box. Once the user closes the text box, the rosary image reappears with the next button indicator lit up for the user. On the beads with the shorter prayers only the name of the prayer appears. The next bead creates a small text box with "Our Father" in it and disappears quickly. If the user tries to jump ahead to other beads a feedback loop

pops up that says, "Please follow the order…" and an 'ok' button to accept the feedback. This continues throughout the entire rosary. As the user moves from bead to bead, the yellow indictor dot turns blue on the beads that have been pressed. There are also interactive beads for chaplets of St. Michael, St. Jude, the Seven Sorrows Rosary, Holy Wounds Chaplet, the Franciscan Crown Rosary, etc.

Additionally, there are podcasts of the rosaries and chaplets that are essentially just audio recordings of the prayers. The basic media player tool bar appears in the footer with a play/pause button and a slider to fast forward and rewind. The header menu bar changes again with a back button on the left, no page title, and 'Bookmark' and 'Share' buttons on the right. When the user selects the bookmark option a page slides open from the side with a bar to type in the title of the bookmark. During the audio the text opens in a text box and can be scrolled through along with the audio prayer. There are several of these podcast options. The audio recitation is done by both men and women and by multiple people during the responses.

Finally, the last option for user to engage in a prayer practice through the app is to type them on through the interface. Users can go to the 'My Prayers' section where a footer toolbar gives them the option to add and type their prayers or prayer requests into a text box, export their personal prayers from the app, and import other prayers into the app. Once the user has added enough prayers, the app allows them to form groups of different prayers, such as family prayers, work prayers, etc.

While the designers do give users the option to search the app for certain prayers using keywords or phrases, they do not give the user a prayer reminder or alert option,

which was one of the main selling points of many of the Catholic and Islamic apps. However, there is a 'Daily Prayer' option where users are provided with a different short prayer every day, although no alert or alarm can be set for any of the prayers or other content.

The multi-purpose design approach is manifested in the different religious affordances that provide access to specific prayer texts, and also by having the option to pray the rosary and listen to prayers in an interactive way. Both the translation and mobile prayer environment approaches are available through these features. For example, "Laudate" and "Muslim Pro" both provided the digital texts of prayer, which is indicative of the translation approach. Both apps also had more interactive features such as audio and interactive graphics that represented the mobile prayer environment approach. The religious affordances, such as reading the text or tapping on prayer beads, are not the only religious affordances, such as reading the Bible or *Quran,* which is what makes this app truly multi-purpose. Users have access to catechism, information about confession, information about religious figures, and options to read different versions of the Bible among others. This is important because it indicates that developers see the ability to converge all of these different types of religious information and practices into a mobile app. As seen here, this approach frames prayer facilitated through the mobile context as multi-functional, or as simply one of a number of important religious practices that can be engaged through digital devices.

An Islamic example. The "Muslim Pro" app created by Bitsmedia Pte Ltd., is a free app with 4.5 star rating calculated from more than 10,000 user responses in iTunes

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(*see* Figure 11). It is classified as reference in iTunes and boasts more than five language options. The app opens on a series of pages that help users choose important settings and learn navigation options before going to the homepage. First, users are greeting with a page welcoming them to "Muslim Pro" along with the app icon logo. The page tells the user that the app needs their location to calculate accurate prayer times with a button at the bottom of the page that says, "Locate Me." When the button is selected, a notification box pops up asking the user for permission to access their location during app use. It explains that access to location will allow the app to "calculate prayer times, the direction of *Qibla* and to help you locate *halal* restaurants or mosques nearby. The user can choose from "Don't Allow" or "Allow" on this page.

After location access has been granted, the app moves on to a tutorial showing users how to adjust notifications for each prayer time and that they to "select different *adhan* voices and options from the settings menu." After the user selects notifications for the daily prayers a notification pops up asking for permission to send the user other notifications that include, "alerts, sounds, and icon badges." The next tutorial page points out "awesome features" of the app including reading the *Quran*, learning *duas*, finding *halal* and mosques, and others. The button at the bottom of this page says, "Start using Muslim Pro."

Rather than the list menu style of other apps, Muslim Pro uses an icon menu to organize its homepage. At the top is the phone status bar with the date from both the Gregorian and *Hajir* calendars. Below this is a wide horizontal banner with a background image of holy sites, such as mosques or other famous buildings. The banner

includes the information the user will need for the next scheduled daily prayer. In the figure, it shows that *Asr* will be at 3:49 PM. On the left side of the prayer time information is a bell icon with a line through it showing that the alarm notification for this prayer is not set. The user can click this link to change the notifications for this prayer. On the right hand side a countdown clock shows how much time is remaining until the prayer is scheduled to begin. The user can swipe the banner from left to right to see information for all the daily prayer times.

Below prayer banner information is the homepage menu that uses icons for sections including prayers, *Qibla*, *Quran*, calendar, *dua*, popular, places, mosques, and premium. A "You Are Here" dot tracker is at the bottom of the page and has two dots indicated that the user can swipe left to open another menu page. The bottom of the screen contains a footer banner advertisement for a non-religious game app.

When 'prayers' is selected from the homepage menu, it takes the user to a more complete daily prayer information page. There is a header menu change that includes a back button on the left, the location information in the title bar, and a calendar icon shortcut on the right, which takes the user to a spreadsheet image of prayer times for a full month. Below the header menu is a graph, which shows the sun's trajectory across sky at any given time, which is how the prayers times are calculated. The check marks along the bottom of the graph show which prayers have passed (which are in gray), which prayer is next (which is in green), and which prayers are yet to come (which are in
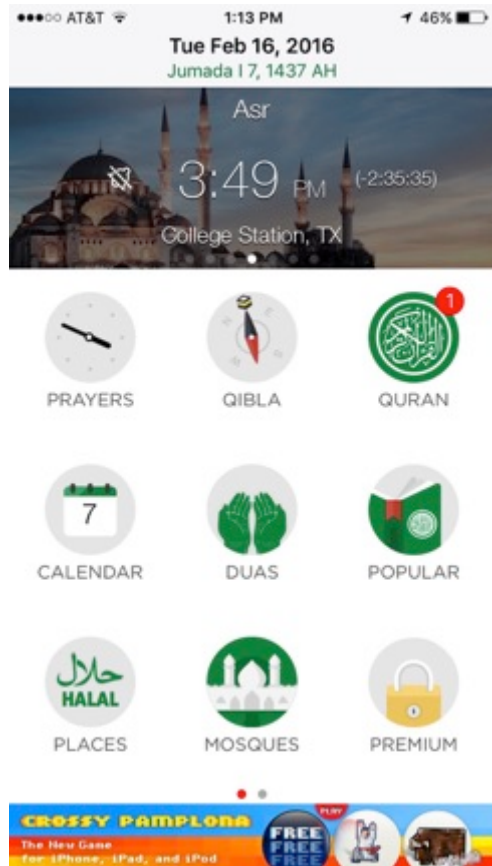
Figure 11: Muslim Pro. The homepage (left), the qibla compass (center), and a dua (right) are examples of the Muslim Pro app that represents a multi-purpose approach to prayer app design. Images are reprinted from Muslim Pro app.

white). Below the graph is an interactive calendar, which the user can scroll through from left to right to display the prayer times for a certain week. A red circle around the date indicates which prayer times are being shown. Calendar information from the Gregorian and *Hajir* is below the calendar. Below this, the prayer times are listed in a table format with the names of the prayers on the left and the times on the right. Next to the prayers are icons, which indicate which prayers have notifications and what type of notifications. At the bottom of the page is a banner advertisement for a new mobile game.

If the user selects a prayer, such as *Maghrib* as shown in the figure, a menu opens which allows them to set the reminder type. The choices include different *adhans*, none, silent, beep, and long beep. Each of these choices in accompanied by an icon that is specific to the type that will be displayed next to the prayer times banner on the homepage. On this page is another header menu change, which contains a back button and the prayer name in the title bar. For this version of the app (i.e. the free version), there are only two version of the *adhan* users can choose from. However, there are more than 15 different *adhans* listed which a lock icon next to them, showing that the user can have access if they upgrade to the premium version of the app (which costs $4.99).

The next icon related to prayer on the homepage menu is *Qibla*, which is the direction in which all Muslims are to face when praying their daily prayers. The *Qibla* page contains header menu bar with a back button on the left, the name of the page and a location icon on the right. Below this is a map graphic showing the users location in relation to Mecca. This map can be opened up full screen if the user selects the location

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icon on the header page or if they tap anywhere in the map graphic. When opened full screen, the map shows a more details view of the users location along with an arrow and line indicated the direction in which to prayer. Below this map is a compass which is has red line pointing true north and a white line which an icon of the *Kabba* indicated the direction of Mecca. The user can rotate the mobile device to use the compass. The page also contains information warning the user that "metallic cases or magnetic closure may cause interference." This warning is indicative of the types of cases users have for phones that may interfere with the features and cause the user to prayer incorrectly. The page also has a footer banner advertisement for a game app.

Muslim Pro has another prayer feature on the homepage called "*Duas*." When selected, the app opens to a list of 132 duas taken from the *Quran* and *Hadith* for many different occasions and situations in life. The top of the page has a header menu with a back button on the left, the page name "Hinsul Muslim: Fortress of the Muslim" which is the name of a book of *duas*, and a menu icon (three stacked horizontal lines). The bottom of the page contains another footer banner advertisement for a game app. If the user selects the menu button a slide-out menu opens from the right to left and allows the user to display the duas from 12 different categories including "Morning and Evening, Home and Family, Food and Drink, Joy and Distress, Travel, Prayer," etc.

The other icons on the homepage menu give users the option to read the *Quran*, use the calendar, open a list of popular *suras*/verses from the *Quran* and *Hadith*, locate *halal* and mosques in the area, and upgrade to a premium version of the app. If the user swipes left it opens a second page menu of icons with the same page design as the

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homepage. This offers the user several other options including cards, *Shahahah*, 99 names, apps, *zakat*, sleep, settings and help. Three of the content icons (i.e. cards, 99 names and sleep) relate to prayer activities and practices.

The cards section allows users to select an image with a message on it to send to friends or family. The image options include those with religious artifacts, Arabic calligraphy, settings, places, and nature. Users can choose from different messages including prayer phrases, *duas*, and other blessings. After the user selects a phrase, they can choose the image they want to accompany it. When the image is chosen, the image editor opens where users can manipulate the text size and typeface, the opacity, the alignment, and the character style. The header menu on the page has a back button and a send button. Once the user is finished selecting and editing their message they can send it through email, message, Twitter, and Facebook. They also have options to copy, save, and print the image as well.

The 99 names of Allah are recited in a prayer-like fashion and often people will use *tasbeeh* beads to keep track of recitations. The app provides a list of the 99 names with the Arabic, transliteration and English translations. Users have the option to play audio of the names as well. The media player tool bar is at the bottom of the screen with a play/pause button and a slider, which shows the time and allows users to fast forward and rewind. It plays an a cappella version of the names being sung by a choir.

Finally, the sleep mode button is the last element on the page that affects the prayer practice. If activated, sleep mode "allows you to hear the full *adhan* without any action, even if your device is on 'Silent' or 'Do not disturb'. We'll turn your screen

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black until the next *adhan*, just tap on the screen to switch it back on." This gives the user control to silence their device for other apps and features while allowing the alert to play so they do not miss their next prayer time. It is important to note that the developers chose to make this an icon featured on the second screen of the homepage rather than just placing it in the app settings. The placement provides the user ease of access as well as denotes the necessity of quickly silencing the app in public or other situations as necessary.

There is an impressive amount of features that offer different levels of engagement not only with religious affordances but with other religious affordances as well. The app contains both the translation and mobile environment prayer approaches. The translation approach can be seen in the *duas* option, which provides access to the texts of different duas for different occasions and times. The mobile prayer environment can be seen in the audio versions of different *adhans* as well as in audio and media functions available during the prayer practice. This creates a mobile environment in that the phone is used for an important part of the prayer practice by hearing the *adhan* and or by enabling a customization of those affordances. Of course, the app offers options to other religious content and practices such as reading the *Quran*, having access to the *Zakat* calculator, and being able to find *halal* places to eat nearby speak to its multi-purpose religious design approach. Again, the multi-purpose approach indicates that designers view the mobile app as cable of being a storehouse for religious information and practices, in which prayer plays only one part. This frames prayer in mobile spaces as both providing access to important texts that are translated from offline printed

resources, but also as providing access to interactive features and tools that create a mobile prayer environment. Prayer is framed as one of the important elements of being a Muslim and therefore creates a space where users can engage many different religious aspects.

To summarize the multi-religious app approach, the Catholic and Islamic examples above show the extensive ways multi-purpose apps provide for the translation of prayer text into digital form as well as creating a mobile environment to practice prayer. Laudate provided multiple ways for users to either learn or read prayers, and to use interactive features on the mobile device within a specific prayer practice such as by listening to audio or watching video. Similarly, Muslim Pro also provided a long list of *duas* and the 99 names of Allah to learn and read, but also provided audio of the call to prayer and various settings in which the device plays an active role. Recent updates to the Islamic app after the initial analysis also include more interactive opportunities through the *tasbeeh*, or prayer beads, in which users actually touch the beads on the display during the prayer. This design approach is interesting when contrasted with the other two design approaches because it sees both the translation and mobile prayer environment as an important part of religious practice in connection with other religious resources and practices. The mobile app becomes an important tool within which to engage prayer and other religious practices.

Summary of the three approaches to prayer app design. The three approaches to prayer app design indicate three different understandings of the way mobile app technology can be designed and should be used for prayer. In the translation approach,

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the way prayer text and tools are presented, suggests a functional relationship between technology and religion. Therefore, the app is used primarily as a tool with which to read and learn the digitized texts of prayer. It is the translation of printed text to digitized text. The app is also used as tool to remember to pray consistently. Although the user may decide to use the app as they pray, this deeper engagement is a decision each user will make on their own. The design does not engage interactive features, such as audio or digital prayer beads, that lead to deeper interaction between user and app during a prayer practice. Designers or companies who pay to develop this type of app may have a more traditional approach to prayer as well as a view that technology should play a more conservative role in religion as a whole.

The second approach, creating a mobile prayer environment, suggests a more interactive or intertwined relationship between technology and religion. To unpack this claim, designers use interactive graphics and media that will be engaged during the actual prayer, which in effect makes the phone a part of the practice. Rather than leaving it up to the user to decide if or when to use the app in actual prayer, these apps are designed to create an environment in which the device and app become an integral part of the prayer practice. Audio, interactive graphics, prayer counters, and tracker features engage the user on deeper levels than text alone. Audio, sharing, and seeing the number of people in prayer at the same time work to create a more communal feel of prayer, as though the user is acting in concert with fellow believers. Interactive graphics work to recreate and possibly replace physical religious artifacts, such as prayer beads. Designers

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who use this approach may have the belief that technology is an appropriate gateway to actively engage religious and spiritual practices.

Finally, the multifunctional religious app approach may incorporate either or both of the previous design approaches by providing access to digitized texts of prayers and/or by designing interactive features that are used within the prayer practice. Its unique difference is that prayer is only one of many different religious practices in which the user can engage. Prayer may or may not be the main goal of the app; the important issue is whether or not the app also contains other extensive religious content. The examples used in the section above show that these apps tend to be denser, with multiple levels and pages with the app. Also, the prayer tools featured in the app may vary from basic to more complex. For example, the "Laudate" app did not have a reminder tool, while Muslim Pro had a variety of tools with varying complexity. Designers who develop these types of apps may tend to view app design as a one-stop-shop intended to meet multiple religious needs. Subsequently, this approach speaks to an understanding of the reciprocal relationship between technology and religion in terms of the design of prayer apps as tools that can be used to read prayers, and/or that can be used within prayer practices through interactive features. However, the reciprocity from users in this relationship and the varying ways in which they may actually engage religious applications will be further discussed in the next chapter.

Chapter Summary

The way developers framed prayer and presented affordances in the descriptions, and what technological and religious affordances were actually present in the apps, leads to an understanding of how prayer is communicated and constructed in mobile apps through three key design approaches. The app descriptions gave insight into how developers frame prayer as a communication with God/Allah that should be done on a daily basis. The different offline cultural traditional practices influenced the ways in which technological and religious affordances were justified within the app description to support a daily practice. Finally, developers called upon traditional religious authority to authenticate mobile app use for prayer practices, while at the same time developing their own algorithmic authority.

Uncovering the different types of technological and religious affordances that were actually available in the app showed that developers, for the most part, delivered the content and affordances they touted in the app descriptions. The categories also showed the different ways developers used religious and technological affordances to design prayer practices in the mobile context. It was important to separate out all the general religious affordances from the technological affordances so that it was easier to see the ways in which they were used in prayer app design.

The culmination of findings from the word clouds and the in-depth textual analysis uncovered three key approaches to prayer app design for both Catholic and Islamic apps. First, developers used the digitization of text and basic tools to translate prayer books from the offline to the mobile context. This approach indicates an

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understanding that the mobile app is a tool to help facilitate prayer, but not necessarily a tool that should be used during, or as a part of prayer. Second, the mobile prayer environment approach worked to move beyond translation to engagement with religious and technological affordances. The apps provided access to content and interactive graphics that became a part of the prayer practice, rather than just a tool to facilitate a prayer practice. Third, some developers combined the first two approaches and added other religious content and features to create a multipurpose app design approach. Prayer within these apps may not be the main goal, but rather an important part of many different religious practices users should engage in. The significance of this approach frames the use of mobile apps as an important tool for a variety of religious practices and information.

Therefore, these approaches offer to this study a more nuanced understanding of how prayer is communicated and constructed through technological and religious affordances. The communication of prayer begins in the prayer descriptions, which adhere to the basic religious understandings of prayer for both Catholic and Islamic apps. Prayer apps construct the practice of prayer as a daily ritual to communicate with God/Allah. Apps shape prayer practice in a mobile space through different combinations of technological and religious affordances, such as navigation and prayer visualizations. Prayer apps are used either as a translation of the physical prayer texts to digital spaces, as creating a mobile space for prayer in which the app becomes an integral part of the practice, or as a multi-purpose religious app of which prayer is only one feature. These findings are important because now that there is more understanding of how prayer is

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communicated and constructed with in apps, it will be easier to define and understand

how actual users engage with different technological and religious affordances while

using a prayer app, which is the focus on the next chapter.

CHAPTER V

REPORTING ON CATHOLIC AND MUSLIM USER TESTS OF PRAYER APPS: PARTICIPANTS' FRAMING OF PRAYER, EXPECTATIONS FOR PRAYER APPS, AND INTERPRETATION OF THE APP INTERFACE

While Chapter IV used textual analysis of Catholic and Islamic prayer applications to paint a clearer picture of prayer app design and affordances, Chapter V shows how actual Catholic and Muslim users engage and make sense of prayer app use for their personal practice through qualitative user tests. This is important in understanding the relationship between design and use, as it looks at the second part of the equation – user engagement with prayer apps. Therefore, this chapter reports the findings and analysis from the user test video and audio data from 45 users, 24 Catholic participants and 21 Muslim participants, (C=24, M=21). The video and audio data were transcribed and coded with Nvivo and the analysis was used to answer the second research question of this study:

> How do Catholic and Islamic users engage different technological and
>
> religious affordances while using a prayer app?

User tests provide important insight into how the participants understood the practice of prayer, how they expected to use a prayer app, how they interpreted the technological and religious affordances through the user interface design, and how they actually engaged different technological and religious affordances during the app use. After their engagement with the app, participants were also asked to reflect upon how they felt

about using a mobile app for religious practice. Asking these questions and gaining these insights through the user tests is important not only for understanding how participants engaged with the prayer apps, but also how they frame their use of mobile technology within their religious lives. Therefore, the user testing method, analyzed in conjunction and in comparison with the prayer app textual analysis results, shows us both the intention behind the design as well as how users interpret and engage the design.

As mentioned previously in Chapters 1 and 2, the literature on religious apps shows a lack of focus on how actual users engage with the technology. There are a few studies that collect data from participants (Bellar, 2016; Hutchings, 2015; Richardson & Pardun, 2015), but all of them relied on self-reported data only through interviews and/or surveys. The user test methodology allowed the researcher to see participants' screens and hear their voices at the time of prayer app use. This type of data is invaluable for seeing, analyzing, and understanding engagement with digital technologies. Additionally, being able to hear the voices of the participants as they engage different affordances allowed for the researcher to hear nuances in tone and affect, which enriched data analysis. Therefore, this research contributes to important knowledge about user engagement with prayer apps through a new methodological tool that shows user engagement at the time of use instead of collecting self-reported data after use.

Chapter IV illuminated all the technological and religious affordances that were available through apps and were used within different design approaches. Chapter V and 6 reports on how participants make sense of and actually engage with technological and religious affordances. To review, technological affordances refer to the actions that are

allowed, constrained, or restructured through specific design features. Religious affordances are the result of technological affordances that are combined with religious content that allow, constrain, or restructure religious action or practice. Therefore, it is important to note that this view of affordances illuminates the actions that users perceived and engaged with through the app design.

Before the user tests were administered, a Catholic app and Islamic app were chosen for participants to test. The Catholic participants tested an app called "Laudate" and the Muslim participants tested an app called "Muslim Pro." Both apps were chosen because they had elements that represented all three prayer app design approaches as outline in Chapter IV; the translation approach, the mobile environment approach, and the multi-purpose religious app approach. To illustrate, "Laudate" presented prayer as text to be read, which is indicative of the translation approach to design. Also, through interactive features, this app became a part of the actual prayer practice, as users touched the screen as they advanced through the prayer, listened to prayer audio, or watched a prayer video, which is indicative of the mobile environment approach. "Laudate" also had other religious elements that indicated a multi-purpose design approach, such different translations of the full Bible, and information on the Vatican and catechism. "Muslim Pro" contained all three design approaches. The translation approach was represented through basic prayer timetables that users could download as well as texts of *duas* that could be read. The mobile environment approach was represented through interactive features, such audio *adhan* options and different recitation features in which the prayers were read from the *Quran*. "Muslim Pro" also had elements of the multi-

purpose design approach, which was represented through features such as the *Quran,* finding *Halal* places, and finding *Mosques* at which to worship. In addition to having all three design approaches to prayer evident within these apps, both had decent design with multiple features and minor issues or bugs. Both apps were also highly rated in the iTunes App Store and the Google Play store. It was important that the apps chosen for the user test have as many options as possible for users to engage so that the data would reveal what aspects participants would be more interested in, such as reading prayer texts or using interactive prayer features like the digital rosary, and also how they engaged various technological and religious affordances, such as sharing and accessing features such as reminders and alerts. Therefore, the apps were chosen primarily because they used all three approaches to prayer app design as described in Chapter IV. These prayer apps provided the most comprehensive prayer features that were common to the three approaches, which is important for understanding how participants engaged with prayer in different ways as they felt comfortable.

In a pretest questionnaire, participants selected if they were active members in either the Catholic or Islamic religion. All 45 participants answered that they were either extremely interested (N= 31) or somewhat interested (N= 14) in using a prayer related application (*see* Table 3). Out of those who answered that they were somewhat interested, two said they prayed multiple times a day, seven said they prayed at least once a day, four said they prayed multiple times a week, and one said they prayed at least one a week. Out of the participants who were extremely interested in using a prayer

app, 21 said they prayed multiple times a day and 10 said they prayed at least once a

day. It is interesting to note that Catholic

Table 3 Pre-test Questionnaire Results from Catholic and Muslim Participants.			
Prayer Questions	**Catholic Participants**	**Muslim Participants**	**Total**
Pray Multiple times a day	5	18	**23**
Pray At least once a day	14	3	**17**
Pray Multiple times a week	4	0	**4**
Pray At least once a week	1	0	**1**
Prayer App Questions			
Extremely interested in using prayer app	13	18	**31**
Somewhat interested in using prayer app	11	3	**14**

participants were almost evenly distributed between extremely interested and somewhat

interested in using a prayer app. As shown later in this chapter, some Catholic

participants felt "weird" about using technology during prayer, as though it tainted the

religious practice. Table 4 also shows that Muslim users were more likely to pray

multiple times a day, which is in line with Islam's core values and practices that require

five daily prayers at specific times facing *qibla*. Catholics were more likely to pray at least once a day, either in the morning or evening.

It is also important to note that nine Muslims and one Catholic participant mentioned previous experience with digital prayer practices. Muslim participants mentioned downloading other prayers apps most of the time, but one said he had already used "Muslim Pro." One Muslim and one Catholic participant said they had also used web-based prayer applications or chat forums for prayer related activities. Participants' former interactions with prayer apps and web sites may have shaped their expectations going into the user test in terms of design and affordance expectations.

Due to participants being mostly male (N= 32; C=16, M=16), it is difficult to make any claims about the impact of gender on understandings of prayer and engagement with prayer app affordances. This gender difference could be due to UserTesting's applicant pool. UserTesting is a tech-based company and there are more men than women working in tech-based fields, which also may account for the disparity. Of course, there may be other unknown factors. In addition to gender, it is hard to make claims based on average household income because the financial range is so broad. Therefore, the following findings relate only to the differences in religion. While it will be noted in specific sections if there is any possibility that gender or income might be influencing the findings, it is important to note the limitations of the data collected.

The previous characteristics mentioned portray participants who are invested in prayer as a religious practice. Specifically, most participants said they prayed daily and were at least somewhat interested in using a prayer app during that practice.

Additionally, participants' involvement with UserTesting suggests a certain aptitude for technology use, which is also reflected in their interest to use an app for prayer.

This chapter is organized into two parts based on the different sections of the user test and on participants' answers. The first section presents finding on how participants understand and frame prayer and also on what their expectations are for a prayer app. In this part of the test, participants were asked: what do you think about prayer, how do you pray, what is a positive and negative prayer experience you have had, and what are your expectations for this prayer app? These questions work in conjunction with one another to illuminate how participants' framing of prayer relates to their expectations for a prayer app. The second section of this chapter explains how participants interpreted the user interface design, which influenced what technological and religious affordances they would possibly engage. In this part of the test, participants were asked to open the app and take a look around. They were asked to note how the app looked and felt while they were using it as well as what they liked, or did not like, about the interface. Watching the participants navigate through the app and which features on the interface they engaged, as well as hearing their thoughts on the design, underscored the important role of design in app engagement. The exploration of these themes leads into the final exploration of the user testing data presented in Chapter VI. Together, the data presented here and in the following chapter offers a clear and overall picture of how Catholics and Muslims engage with technological and religious affordances of these prayer apps and provide important insights into user interpretations of prayer as experienced through these apps.

Part One: Participants' Framing of Prayer and Their Prayer App Expectations

The first part of this chapter is devoted to explaining how participants' understood the practice of prayer and what they expected from their prayer app use. Participants were asked to answer three sets of questions in order to uncover their understandings and expectations. The first set of questions asked what participants thought about prayer and how they prayed. The second set of questions asked them to describe a positive and negative prayer experience. The last set of questions asked about their expectations for the prayer app and what they hoped it would do for them. Their responses are important because it will show if their understanding of prayer is similar or different from how developers framed prayer within the app descriptions. The similarity or difference in framing may reveal important insights about what affordances users engage and how they make sense of the use of technology for religious practices.

The findings from this part of the user test responses are presented in two main subsections. The first subsection show how participants' framing of prayer within the user tests mirrors developers' framing of prayer within the app descriptions as communicating with God or Allah. However, there were some differences about the reasons for that communication from the participants' point of view, which are briefly mentioned here, but will be discussed at length in the subsections below. To clarify, developer descriptions framed prayer as a communicating with God/Allah, while Catholic and Muslim participants emphasized prayer specifically as a way to express gratitude and to ask for help. Participants also talked about using prayer to manage their moods and as a way to receive answers to prayer, which is also discussed in subsequent

sections. Although most participants were reluctant to admit having any negative prayer experiences, those that did mention it pointed to their own personal failures, such as hurting their friends and family through bad choices, and to environmental elements that were out of their control, such as praying in public. Muslim participants specifically mirrored the developers' framing of prayer as duty. Some Catholic participants, however, differed from developers' framing by focusing on prayer as a way to connect with others.

After describing their understandings of, and experiences with, prayer, the second subsection presents how participants described their expectations for the prayer app mostly from a functional perspective. To illustrate what the functional perspective looks like, participants wanted an app that would help them schedule in daily prayer practices and help them remember to pray by providing them with reminders and alerts. Next, participants wanted access either to a variety of prayer types and categories and also to a variety of tools that would help them pray. Finally, participants wanted access not only to a variety of prayers and prayer-related tools, but also to other types of religious content, such as access to sacred texts and religious calendars. All of these findings are discussed in length in subsequent sections. To begin, an in depth exploration of how participants framed prayer in their user test answers will be followed by a description of the how they described their prayer app expectations.

Communicate and give thanks to God/Allah. All participants, 24 Catholics and 21 Muslims, described prayer as a way to communicate, connect, and/or have a

relationship with God. The most common phrase participants used was "communicate

with God/*Allah*." A male Catholic participant went more in depth about this connection:

> Prayer is the main tether in our relationship with God. It's our intimacy with
> God. It's how we are close to God. Prayers are our time when we are connecting
> with the Father and seeking Him, and dialoging with him… It's got a wide
> definition, but really it comes down to communing with God and spending time
> with him.

Muslim participants' answers were very similar: "It gives time for the human being to

interact with his Creator, with his Lord" (Male Muslim Participant); "It's a way to

interact and speak to Allah, speak to God, pray to Him, connect with Him…" (Male

Muslim Participant). These responses align with both Catholic and Islamic definitions of

prayer as discussed in the introduction, in which prayer is seen as a way to commune

with a higher power.

Expressing gratitude to God through prayer. Part of this communion with the

divine, for some participants, was giving praise and gratitude for God's help. Eight

Catholic and six Muslim participants mentioned giving gratitude to God as an essential

aspect of prayer. Gratitude served as a guide to structure the conversation with God. For

many, it is the main purpose of prayer: "I think prayer is essential in faith and in giving

praise and thankfulness," a male Catholic participant said. Another male Catholic

participant echoed this and said, "(It's a way to) thank Him for everything he has given

us and a way for us to show our appreciation." The gratitude works to bring participants

closer to God and to strengthen their relationship with Him. "Prayer is a time where I do

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feel that I become closer to God and closer to Allah and spend that time trying to be mentally and physically concentrated on thanking Allah for everything that he supplies or grants," (Male Muslim Participant).

Although the practice of prayer looks very different from the Catholic and Islamic perspective, both approaches to prayer serve the main purpose of communicating with God through praise and gratitude. The intent behind the practice is to cultivate a relationship with God through prayerful communication and practices. This is important to note because using a prayer app, as perceived by the informants, may or may not interfere with or enhance this connection with divine.

Participants' framing of prayer lines up with the developers' framing in the app descriptions for the most part. Developers also stressed prayer as communication with God/Allah as the main purpose of prayer for religious adherents. However, within the app descriptions, developers were less likely to mention prayer as a way to thank God/*Allah* and more as a way to be blessed by God/*Allah*. This is significant because even this minor difference in framing of prayer in the app descriptions could help relate the apps importance to users' understandings in a better way.

Prayer as duty. For more than half of the Muslim participants (M=13), prayer is much more than simply having a conversation and expressing gratitude to God. It is also considered a sacred duty. Prayer in the Islamic faith, as mentioned in Chapter II, is one of the five pillars that Muslims are required to maintain to stay in good standing. Those participants who defined prayer as a duty referred to *Quranic* or other types of religious authority: "Prayer in the Islamic faith is something which is instructed in the *Quran*, It's

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something that's obligatory upon every Muslim," (Male Muslim Participant). A female Muslim participant mirrored this understanding of prayer: "Prayer, what I think about it, is that it's part of my religion. As a Muslim, I am required to pray 5 times a day, to submit to my Lord."

Prayer is prescriptive for these participants and it is a measure by which they can judge themselves and others as being "a good Muslim." For example, one male Muslim participant talked about watching others of the faith ignoring prayer. This was problematic for him because, "It's probably the most, if not the most, important thing a Muslim can do in their daily life." Another male Muslim participant noted that prayer was not the only required practice in the Islamic faith:

> …just praying because you have to do it, I don't think that's going to lead
> anywhere. I think you need to research and find out how the Islamic faith is a lot
> more than just praying. There are a lot of other tasks that need to be completed,
> for example having a smile on your face all day. That's an act of charity, which it
> doesn't matter how well off you are or not well off you are. It's a task, which
> anybody can do.

Prayer as duty then, may be the most important practice in a Muslim's life, but it is not the only one on which adherents should focus.

While more than half of the Muslim participants mentioned *duty* in their descriptions of prayer, only one male Catholic participant made reference to prayer as duty. For him, describing prayer as duty was an example of what prayer was *not:*

I just think one aspect that could be touched on or should be touched on is the

fact that prayer is not a duty. Prayer is not something that we do because we have

to. It is communion with God and there is life in that.

…I'm not looking to use an app like this to kind of pray through it mechanically

or out of like some kind of duty. I mean really prayer in its essence is

communing with God and it's not scripted. It's not a… Man, you know it's living

and active. It's something full of life (Male Catholic Participant).

Prayer, from this male Catholic participant's viewpoint, is a practice that should be done

out of a desire to maintain a relationship with God. Rote prayer, or prayers read from a

book without the intent to connect with God, is meaningless without communion

according to the participant. Of course, prayer as duty and prayer said without intent to

connect with God are not mutually exclusive.

Therefore, the larger framing of prayer as a duty within the Islamic faith through

consistent daily prayers in a prescribed way aligned with 13 Muslim participants'

framing of prayer. Muslim participants' framing of prayer as a duty also aligned with the

developers' framing in the app descriptions as discussed in Chapter IV. Developers'

focused on *salah* and *duas* for every occasion, as well as keeping track of the prayer

times and using the compass to ensure users would pray at the correct times and in the

right direction. This is important because it shows a common understanding of the

practice of prayer as a daily duty to be performed in specific ways within Muslims' daily

lives.

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Prayer as a connection with others. There were a few male Catholic participants (C=3) who related prayer as a practice that helped them connect with others. Although this was a smaller theme, it is important to consider when exploring how mobile app design can or cannot accommodate this. For the participants, feeling connected to others through prayer could come through being physically present with others or feeling connected through the app. One male Catholic participant describes praying in the same physical space as others:

> A positive experience while praying is that one time I was just praying with a person during prayer requests, which are pretty common. It was just a good way to connect with another person through a religious way.

Another participant described praying the Rosary with his extended family. "We were all praying the rosary. It was a really nice experience to have the family be connected that way…"

When discussing how the app may be able to help users connect to others through prayer, participants also focused on becoming more aware of the world around them. They had an expectation that the app may help them be aware of what others were going through, rather than just focusing on themselves. One male Catholic participant described it this way:

> I hope it will perhaps make me a little bit more cognitive of the world around me. Sometimes I think, in all honesty, that my prayers are little bit on the selfish side. Perhaps it'll (the app) open my mind to other people going through the same things, as well as people in my family.

Another male Catholic participant hoped the prayer app would be able to connect her to a "prayer community." The connection would be built based on how many people were also using the app.

> Something I guess that makes me feel a part of a prayer community. The idea would be that maybe a lot of people use this prayer app and I would feel connected to those people…and it's kind of all of us as a community joining in whatever prayer or readings or reflections points that are there throughout the day (Male Catholic Participant).

Only one male Muslim mentioned connection to others through prayer the prayer app. He said, "I think the application will be a really good one to help keep Muslims connected throughout the world." However, he does not say explicitly how he thinks the app can or should be able to do that.

In comparison, developers never explicitly mentioned connecting with others through the prayer app. Rather, the app descriptions implied some type of connection through brief mentions of sharing content through social media. However, the terms *sharing* and *social media* did not even warrant enough mentions in the word cloud analysis to show up in the top 10 technologically related words. This is mirrored in the fact that only three male Catholic users (C=3) and one male Muslim (M=1) user mentioned this as an important aspect of prayer. However, even though it wasn't mentioned in the app descriptions as much, within the apps themselves sharing was available through social networking sites, such as Facebook and Twitter. Therefore, there may be a disconnect between how participants expect prayer to connect them with

others and how developers may be designing basic social media features in order to afford this connection. How users actually interacted with the sharing affordance is discussed in Chapter VI.

Positive prayer outcomes. After discussing their thoughts about prayer, participants were asked to talk about a positive and negative experience they had while praying to parse out different aspects and issues they may have surrounding prayer practices. Twenty-four Catholics and 17 Muslim participants were willing to discuss their positive prayer experiences in terms of what prayer does for them and how it makes them feel. Specific outcomes revealed in the data analysis related to these positive experiences were mood management (C=21; M=14) and answered prayers (C=15; M=8), Mood management consisted of phrases like *stress relief, feeling peaceful,* and *inspiration and hope.* Participants reported that prayer makes them feel better, stronger, more enlightened. Additionally, participants reported that prayer resulted in answers to their problems or help with certain situations and circumstances. The types of prayers that participants mentioned the most were asking for help with specific situations and circumstances, such as financial relief or for sickness.

Mood management. While mood management is one of the most common emotional gratifications of media use within the uses and gratifications theory, in this instance it is referring to the use of prayer, rather than entertainment media, to gratify participants' moods and feelings. This was true for both Catholic (C=21) and Muslim (M=14) participants who made multiple mentions of feeling at peace or more hopeful

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after praying. The quotes below are representative of how Catholic and Muslim

participants talked about their positive prayer experiences:

> Pains of any sort, psychological, physical, disappointments and fears, they just
>
> vanish and I am surrounded by something warm and comfortable. It is the same
>
> kind of feeling that I had when my mother put her arms around me when I was a
>
> little kid (Female Catholic Participant).

> So you feel happy maybe a day, two days, one week, two weeks, but eventually
>
> the happiness will fade. When it comes to prayer the happiness you get is
>
> unexplainable. You can't explain why you are happy, you know you've just been
>
> in prayer, you know you just thanked your Lord, but you can't explain the type of
>
> happiness (Male Muslim Participant).

Feelings of warmth, comfort, peace, happiness, and being "ok" were how participants

described the outcomes of prayer in their lives. Again, these are outcomes that

participants have had in the past and provide an understanding of how participants

understand and frame prayer and their expectations for how praying should make them

feel.

Answered prayers. Mood management comes in part through previous outcomes

of answered prayer. Participants, both Catholic (C=15) and Muslim (M=8), mentioned

experiences or times in their life when they prayed about something and got what they

needed. This theme connected to mentions of prayers about specific situations or

circumstances. One female Catholic participant talked about praying before a

competition and for God to help her through: "…I did mess up a little bit, but towards the end I actually made the group. I thanked prayer for that… to give me strength through all my flaws and just get through it." Another female Catholic participant mentioned how answers to prayers in the past reminder her she can get through anything:

> In the past during troubled times when I've asked God to help me, to give me peace, to help me through that situation, it has worked. I have gained peace and I've been shown that even though it seems like a crisis at the time, you can get through that, that everything can be worked through with God's help.

Muslim participants also mentioned answered prayers as a positive experience. One Muslim participant connected answered prayers to feeling a connection to Allah, which as mentioned earlier was the main way users framed the purpose of prayer.

> I was praying to do well in exams and Alhamdulillah, God gave me that. So by getting those results, I prayed a lot and I just really felt His presence, and that was a really positive experience for me because I really connected with Him (Male Muslim Participant).

Other participants mentioned praying about financial difficulties and how Allah helped them through tough times.

Participants framed positive prayer experiences as a way to feel at peace and as a way to cope with circumstances beyond their control. This sense of encouragement as a result of religious practice has been shown to be an important aspect of app use that can influence religious app users' identity construction (Bellar, 2016). Therefore, feeling

encouraged that prayers are being answered with or without app use is an important aspect of how participants understand the practice of prayer.

Negative prayer outcomes. Participants were also asked to talk about a negative prayer experience to explore what impediments or concerns participants may have while praying that the use of an app may help solve. Additionally, hearing about the negative experiences participants may have had while praying speaks to how the participants understand the practice of prayer. In contrast to positive prayer experiences, the majority of participants (N=40), both Catholic (C=21) and Muslim (M=19), denied ever having a negative experience. Rather, the negatives associated with prayer where attributed to personal failures or environmental issues. All of the participants who did mention a negative prayer experience (N=40) blamed it on their own personal failures that blocked or affected their prayers. The quotes from both Catholic and Muslim participants below provide good examples of this theme:

> I couldn't say I've had a negative experience. Really, maybe the only thing that would be negative is if I have, there had been times where I've done some introspection and blamed myself for things and felt condemnation. That has nothing to do with God. Nothing to do with whom I'm supposed to be. All that stuff comes from the old man, from who I once was and from the enemy because there is therefore now no condemnation for those who are Christ Jesus (Male Catholic Participant).

To be honest, the only negative thing is sometimes I get distracted. Not
distracted, as in I completely leave my *Salah*, my prayers, but as in, say I'm
praying and I start thinking about, I don't know, the next football game or
something unrelated. What I tend to do is repeat my *Salah*, I repeat my prayers
over again. That's not really negative, but I find it hard to concentrate (Male
Muslim Participant).

These personal failures are important for users and developers to negotiate meaning
within the mobile prayer context. It has been shown that even when apps did not meet
expectations, some users blamed themselves and their personal failures for not being
able to feel encouragement when using a religious app (Bellar, 2016). Therefore, even if
there is a design flaw or the affordances could be used in better ways to facilitate prayer,
users may blame themselves for a less than satisfactory prayer app experience based
upon their past negative experiences with prayer in general.

In addition to personal failures, both Catholic and Muslim participants also
mentioned location-based negative experiences. Most of these experiences referred to
praying in public and getting some kind of reaction from others in the area.

Negative experience would be praying out in public and having someone point
out that I was praying and make fun of my religion, so that would be a negative
experience. I remember it was like one time in the cafeteria that I prayed and
someone pointed it out and started laughing and making jokes. That would be a
negative experience (Male Catholic Participant).

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People weren't unfriendly, but it was something where I felt, as I was praying, I was sort of an attraction for people to look at. Some of them said some quite harsh words as to what their thoughts were. That was praying in a park, which I've not done since, due to the experience of people not understanding and being a little bit harsh with their words (Male Muslim Participant).

As mentioned in Chapter IV, mobile prayer apps can provide somewhat of a barrier between the user who is praying and the public. For instance, praying with digital rosary beads on a mobile device is less conspicuous than praying with the physical beads in public. For Muslims, apps may sometimes provide the option of using a silent alarm, such as a buzz or a flashing LED light, which alerts them that it is time for *salah*. Being able to control what type of alerts, whether the audio of the call to prayer or a silent buzz or flashing, could also help Muslims maintain privacy in connection to their prayer practice when they are in public. The technological and religious affordances found within the apps therefore, could help remedy some of the negative prayer experiences users had while praying in public.

Summary of how participants understand prayer. From the questions asked at the beginning of the app user test illuminate the ways in which participants understand prayer. For participants, prayer is framed as a way to communicate and give thanks to God/Allah. Muslim participants focused more on prayer as a duty, while Catholics focused on how prayer could be used to connect with others. Managing moods and getting answers to prayers were the two positive outcomes mentioned, while personal failures and environmental context were cited for negative prayer outcomes. This is

important because how participants understand prayer provides context for how they interpret and assess the way apps can and should be used for prayer. Based on the above reports, we see that most participants see prayer as an important part of their daily lives which helps them communicate with God/*Allah*, which in turn helps them feel more at peace and capable during times of uncertainty. Specifically, the data show that Muslim participants also focus on prayer as a daily duty that is obligatory and Catholics also see prayer as a way to connect with others. These findings may help illuminate what and how participants engage with both technological and religious affordances within the apps, which is discussed in more in depth in Chapter VI.

Prayer app expectations. All Catholic and Muslim participants' expressed prayer app expectations, or what they hoped the app would do for them, which revealed how participants' perception of prayer as a daily practice to communicate with God influenced what technological and religious affordances they expected to have on the apps. Specifically, having access to and keeping track of a prayer schedule (N=33) was the most referenced expectation by both Catholics and Muslims, which was reflected in the expectation for notifications, reminders, and alerts. The participants reported in the user tests that they expected the app to help them keep up with specific prayer times or remembering to take time out to prayer in their busy lives. For example, one male Catholic participant explained, "Hopefully I can find like, a schedule on this prayer app and help me keep track of my prayers and do a prayer count everyday." Therefore, understanding participants' prayer app expectations provides deeper understanding of

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how they perceived an app to be used within their religious practice as well as what technological and religious affordances they may actually engage with during app use.

As indicated by participants' reports in the user tests, the prayer app may be used to micro coordinate (Ling, 2004; Ling & Yttri, 2002) their religious lives. As explained in Chapter II, micro coordination refers to the ways in which mobile users have engaged mobile devices to plan and maintain their social interactions. Religious micro coordination is the ways in which religious users schedule and keep track of their daily prayer practice, which is a spiritual interaction with God. In this sense, scheduling daily prayer becomes a religious micro-coordinated activities that participants hope the app will be able to help manage. Prayer as communication with God is framed by participants as an important daily, religious activity that the mobile app helps them schedule and track.

Next, participants expected to have access to a variety of prayer options (n=30). Catholic participants wanted access to a daily prayer and devotion while Muslim participants noted the need for several daily prayer elements including the *adhan*, prayer times, and access to *duas*. Participants mentioned the expectation of having a variety of prayers and prayer categories, as well as other content such as devotionals or commentary that would help guide them during prayer (n=24). Prayer-related content that is organized in simple categories is important not only for easy navigation of the app, but also as a way to guide participants in prayers for specific situations or contexts. As mentioned in the previous sections, prayer for specific situations was the type of prayers participants mentioned most when discussing what they thought about prayer or

describing a positive prayer experience. More than just prayer categories and text, participants wanted some type of content, such as a devotional or other information that would help guide them in prayer, which in turn would lead to positive prayer outcomes.

About half of the participants, both Catholic and Muslim, also expected other religious content (N=24), which indicates the all-in-one prayer application design approach may be well received. It may also point to the desire to translate, transfer, or combine their offline religious practices with mobile digital formats. For example, if the app has access to the sacred text, devotions or commentary, and a suggested prayer, then many participants could complete daily religious practices from the app itself or in conjunction with offline books or artifacts.

Catholics participants wanted a variety of religious content and features, rather than content and features that focused solely on prayer. Within this theme Catholics mentioned access to the Bible and daily devotionals most often, followed by information about the Liturgical season, feasts and holidays, and order of mass. Content and features that help participants feel connected to the larger Catholic community is another interesting element identified within this theme. Some Catholic participants mentioned feeling connected to others in prayer as a possible prayer outcome, which is discussed at length in the previous section.

Muslim participants also wanted other religious content they expected to be on available included the *Quran*, holiday and event information, information on nearby *Halal* places. This is another indication that participants are interested in the multi-purpose prayer app design, which was outlined in Chapter IV. The mobile app is seen

then, not only as a tool for one religious practice, but also as a tool that could provide access to many different religious aspects of the participants' daily lives.

Finally, not only did participants want tools to help keep a regular prayer schedule, a variety of prayers and categories, and other religious content, they also wanted their prayer app to be convenient and easy to use (N=27). Most participants, with equal representation from both Catholics and Muslims, associated convenience with having access to all the content they would need in one app. Some participants referred to this as an all-in-one religious app. In addition to access to content and tools, the design of the app had to be clean and simple, prayers had to be easy to find, and prayer tools had to be intuitive.

Part one summary. Part one of this chapter presented findings from the participants' app user tests on how they framed or understood prayer as a religious practice and also how they expected to be able to use a prayer application. It was important to ask these questions first within the test so that the answers may illuminate which affordances, such as access to content and daily reminders and alerts, they sought out and why. To review, both Catholic and Muslim participants frame prayer as communication with God, which connects also to the developers' framing of prayer and is in line with the basic understanding of prayer as outlined in Chapter I. There was a slight difference between participant and developer framing of prayer: participants focused more on prayer as a means to show gratitude to God/*Allah* for the blessings he bestowed upon them. For Muslims specifically, prayer was also framed as a duty to be completed every day, which resulted in a connection with *Allah*. An important aspect for

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Catholics was being able to connect with others through prayer, although how this was accomplished was not always explicitly explained.

Praying was also closely linked to outcomes including mood management and getting answers to prayers. Participants spoke of how praying made them feel at peace, especially related to prayers about circumstances that felt beyond their control. This finding is important because prayer was a way for participants to be encouraged even when life was difficult. Encouragement was also a major theme in a previous study, which showed that the feeling was particularly important in helping app users build and maintain their religious identities (Bellar, 2016). Participants' accounts of negative prayer experiences were attributed to personal failures or to environmental issues beyond their control. As mentioned before, understanding these negative experiences may help illuminate how users engage with technological and religious affordances, while also contributing important insight for developers who want to help users find solutions to problems through mobile design.

Participants' prayer app expectations pointed to the desire to use technological affordances to micro coordinate their daily religious practices. Both Catholic and Muslim participants stressed the expectation to be able to have access to and schedule daily prayer. The technical features of reminders and alerts afford users the act of micro coordination for religious purposes. They also wanted access to a variety of prayer types, categories, and tools which to pray. Finally, some participants wanted access to more than just prayer affordances: they wanted to be able to access a variety of religious content and tools such as access to sacred texts and finding places of worship. All of

these expectations were connected to ease and convenience and having access to a multi-purpose app. Now that the participants' understandings of prayer and prayer app expectation have been explained, the next section shows what participants noticed about the user interface design, which is what signaled the availability of affordances to the user. The way an app looks and feels seems to significantly affect how a user expects to be able to interact with it, which in turn influences the way they understand how they are supposed to use it.

Part Two: Participants' Engagement with User Interface Design

In the second part of the app user tests, participants were asked to open the app and take a few minutes to look around while commenting on the interface. Specifically, they were asked how the app looked and felt, and what they liked or did not like about the design. They were not asked to look at any features specifically so that the results would focus on what participants naturally noticed. Participants were also asked to look at the customization features and highlight which ones would be most and least important for their prayer practice. Again, participants were not given any specific customization feature to look at so that their progression through the app would indicate their understanding of what customizations were and where they could be found. This part of the test was intended to show how the participants interacted with the design interface and how the design influenced their app engagement.

   User interface design. As mentioned in Chapter II, the user interface is the visual element that reveals the possible affordances to the user. If the user cannot

understand the interface, then the user will not be able to engage in the intended actions as developed by the designer. Therefore, interface design is an important aspect in all app use. When asked about the app interfaces, participants in this study referenced the intuitive layout the most (C=12, M=16). Aesthetic elements (C=14, M=18) were the next most prominent, followed by readability (C=8, M=4). Understanding what users think of when asked about the interface provides two main insights: (a) it reveals how users understand what an interface is, and (b) it illuminates what aspects of the interface are most important for the prayer app experience. Customizability, or the choices users can make to change the form and content of the app like color font size and layout, is another important aspect of the interface design and for the participants' prayer practice.

Intuitive layout. Participants mentioned the intuitive quality of the interface, or how easy the app was to use, most often by participants. *Intuitive*, or easy-to-use, refers back to Krug's first law of usability, "Don't make me think." Participants who described the apps in these terms felt as though they didn't need a lot of explanation in order to use the app features effectively. Sometimes they made simple statements like, "It's really kind of an intuitive layout," (Male Catholic Participant). Other participants went into more depth:

> Okay, the app looks really nice, really clear has a nice design and it looks really simple to use and convenient. So what I like about the app, um the app looking filled it feels really good and easy and simple to use (Male Muslim Participant).

Participants from both faiths who liked the layout sometimes related this ease-of-use and intuitive design to their faith itself. Two quotes below provide good examples:

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How the app feels, honestly, the app feels very Catholic. Feels very religious…
Most of the things that they have are self-explanatory. If you don't know them,
all you just need to do is click on them, and it has a lot to offer (Female Catholic
Participant).

Honestly the way that this application is laid out, I really like. If you look at it, it
does go in order by importance already. Prayer is the most important thing of
course, and then in order for you to pray you must know what direction you're
going to be praying towards, so the *qibla* is right next to it. Then of course,
basically the most three important things are right up on top; the prayer, the
qibla, and the *Quran*. Those are basically the most important things that you
should be doing or going through, throughout your day, every day (Female
Muslim Participant).

These quotes speak to the importance of layout. However, the simple nature of the app
interface is deceiving because a lot of code has been written to ensure a clear, concise,
easy-to-use feel. The intuitive layout translates not just on a design level, but also on a
religious one. It can speak to the feelings the participants have about their faith and the
way they feel when they open the app for prayer practice. The Muslim participant's
quote above highlights the thought the designers put into the layout – the three most
important practices of the faith are most prominent in the layout of the app homepage.
Good design then can lead the user into the religious practice; by the same token, bad
design can hinder them from religious practice.

Muslims participants were more favorable to the layout in the "Muslim Pro" app than the Catholic participants were to the layout in the "Laudate" app. Looking at the two homepage screens (*see* Figures 9 and 10 in Chapter IV), it is easy to the difference in design approach. "Laudate" lists the names of the sections in a section menu that users can scroll through, while "Muslim Pro" uses circular icons to indicate the different sections of the app. One Catholic participant said:

> I think maybe the interface needs to be worked on. This entire list of just
>
> scrolling through and seeing all these can be overwhelming and maybe this needs
>
> to be laid out in a better way ... In a way that helps guide the user into some of
>
> the experience of praying or finding out more about the Catholic Christian
>
> community and the Christian community (Male Catholic Participant).

Catholic participants who felt that the layout needed a better design most often mentioned feeling overwhelmed by the amount of content and options that were available. In this sense, the amount of content became a problem rather than a positive, even though participants expected to have access to a variety of prayers, as seen in the first part of this chapter. If content is not organized in an easy-to-access, uncomplicated manner, then it does not matter how much content there is: content that could be important for religious practice in a mobile space gets lost in cluttered interfaces.

Interface aesthetics. Although aesthetics is the second most mentioned element from the participant tests, users almost always spoke about aesthetic qualities first when asked about interface design. Two examples from a Catholic and a Muslim user below exemplify the general responses to interface design questions:

All right, let's jump over to the app. First impressions, honestly the look of it, it's

a little bland. I like the picture in the background. I think that's really cool, but I

think all the black, it's really plain, pretty bland. That makes the whole

production value of the app look a little low. It could use some improvement

there (Male Catholic Participant).

So far the app looks pretty good. It looks very well organized, very neat. The

color in this is pretty cool as well. It's not too in your face, but as well it's not too

... you're not going to notice it. Everything is well organized. The icons are pretty

good as well (Male Muslim Participant).

Most users noted the color and screen layout first and then mentioned background

images and icons as the most notable features. To be fair, it is easy to see from just

looking at the homepage of "Laudate" and "Muslim Pro" that the latter has a cleaner

design (*see* Figures 9 and 10). Therefore, most of the calls for improvement to the

interface came from Catholic participants, although there were a few who liked the app

the way it was. Most of the complaints from Catholic users were due to the bland color

scheme of the app, which included pastel color themes from which to choose. The app

opens either on the blue or yellow pastel theme and users have to navigate to settings to

change it. "Maybe the beige color would not work for it. The color of the ... That grayish

beige look might not work for it. Maybe all white would look better?," one male

Catholic participant said.

For other Catholic participants the colors and layout didn't look like a "professional" app. A male Catholic participant said, "Design wise it could definitely improve because it just looks like a web view thing right now and that doesn't look exactly professional." For this participant, the design felt more like a web page being translated to app form rather than being designed for the app platform overall.

Only a few Catholic participants liked the app as-is and noted that the muted colors and layout were peaceful and calming. One female Catholic participant described it as, "It's inspiring. There's a kind of peace in this interface that I really appreciate, and I really like it." Overwhelmingly though, Catholic participants wanted access to different color schemes and layouts.

Muslim participants, however, were positive about the aesthetic qualities in "Muslim Pro." The following quotes from Muslim participants are representative of the general comments about the interface aesthetics:

> Very friendly, very basic. I like the white background because that's plain and I can see the menu and things. It's very easy to locate it rather than sometimes you've got these apps with pictures in the background, and you've got maybe calligraphy in the background. (Male Muslim Participant)

> I love the whole green and white background. Love the little logos. (Female Muslim Participant)

The only suggestions for improvement came when they were asked specifically what they did not like. Even then it seemed as though the Muslim users had to really reach for areas in which to improve the aesthetic quality of the app.

> I think it's all very nice. Very nice structure, very nice layout, I think to be honest, it's perfect. Maybe change around… maybe play a bit with the colors… but to be honest I think it's very nice, very nice use of colors. Maybe the icons, maybe make them pop out a little more, because for example, the Prayers, it kind of blends in with the background. (Male Muslim Participant)

It is important to note that about half of the Muslim participants sounded surprised when they opened the app. This is not necessarily due to the quality of the design, although Muslim Pro is designed well. Rather, many participants noted that this looked better than a beta app, meaning that they were surprised this app was in the testing phase. This points to issues with recruiting participants from a pool that are used to completing tests with specific types of products or for specific purposes. Participants who mentioned this were predisposed to expecting an app that was not quite finished, which may have influenced their surprise and favorability of the completed look of the app.

Overall, Muslim participants were more pleased with the aesthetics of the app while Catholics had the most constructive criticism. Aesthetics are important because they can solidify whether the app is "professional" or "amateurish" based on the color choices and images used. Additionally, some participants wanted options to change the aesthetic elements to suit their personal preferences. Therefore, participants use the

aesthetic elements of the app to determine its quality and to be able to change them to

suit their personal needs, which is discussed in detail in a subsequent section.

Readability. In connection with aesthetics in general, and with color and font size

and type specifically, users remarked on whether or not the app text was readable.

Obviously, readability is important for how easy the app is to use and also on how useful

the app can be. If participants cannot read the icons or section names, then they do not

know what the icons do. If participants cannot read the text of the prayer, then it is

considerably more difficult to pray with the aid of the app. Of course this is also related

to customizability, or whether or not users could change the color and font type and size

to suit their personal needs (which is discussed at length in the next section). Readability

also speaks to accessibility: people with poor eyesight need specific options and tools

with which to change the text and/or access audio to make the text available. One

Catholic participant drew attention to this concern while scrolling and tapping on

different options in "Laudate":

> I can also do the, change the font face here. I'll say I want Helvetica. I guess this
>
> is more of, if you have problems reading or if you have problems with your eyes
>
> and you wanted a specific font size that you can see it. I guess this one is
>
> important… I guess that is really good. That is really essential, the font face and
>
> the font size (Female Catholic Participant).

A Muslim participant also made this observation after reading one of the *duas* from the

Muslim Pro app. He said:

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And also, when I was reading one of the prayers, I could change the background color as in the contrast of colors. That was very helpful as well, certainly for the visually impaired, or people with vision issues, that would be very helpful for them. (Male Muslim Participant)

Contrary to the last section about aesthetics, Catholic participants were more likely than Muslim participants to praise the readability of the app. Three participants spoke of the readability of the app as seen in the quotes below:

…it's easy to read. It's not really that hard on the eyes. I didn't really have to zoom in or zoom out to read litany. That was very good, as well (Male Catholic Participant).

I'm not going to mind if it's black versus the sepia as long as I can ... As long as it doesn't make it difficult to actually read what's on the screen (Male Catholic Participant).

The font, the readability, everything is good already. In my opinion, I don't need to change the theme for an app like this (Female Catholic Participant).

An important takeaway for designers then, is to make sure the default font and color scheme make it easy to read the app icons and section headings as well as text of prayers or devotions. Just as important is designing for accessibility. Every user will have different needs in terms of usability and designers would do well to reflect these needs in customizable elements such as color scheme and font size.

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For Muslim participants, there were fewer comments about readability. However, those that did remark on it noted some important issues due to the cultural and religious affordances of the app. To illustrate, *duas* were presented to users in a variety of ways: Arabic only, Arabic and English, and Arabic with English transliteration. Participants in this sample were very specific in how they wanted their text presented. For example:

> Sometimes I like to see all the words in a line. I don't like it being broken up like that. The letters are fairly readable. I would have ... This might be a personal preference, but I would have preferred the *kasrah* and *dammah* signs to be closer to the letters. That's just a personal preference (Male Muslim Participant).

For this participant, the way Arabic was displayed on the page made a difference in the readability of the text. Another participant wanted access to different types of script. He said, "It would be nice if it was the Uthmani script, the Indo Pak script. That would be quite nice if I could change the script type." Designers who are developing religious apps for a variety of languages need to take even more care in designing text that users can customize in specific ways based on cultural and personal preferences, such as access to more than one type of script in Arabic. These customization issues as well as those related specifically to prayer are discussed in detail in the next section.

Customization. While some aspects of customization were present in the participants' reports above about the interface design, a deeper discussion of customization is warranted due to the nuances of participants' comments and the options available within the apps. Specifically, the user tests asked participants to explore the customization features and comment on which ones were most and least important for

prayer app use. The questions and task specifically did not define or give hints as to what customization features are, but rather left it to the participants to identify and explain. This was important because it provided insight into how participants think about customization, what they think it should do, and how they would or would not use the customization provided for in the apps.

For designers, user-initiated customization begins with the functionality of the design element to allow users to make changes to app form and function in different ways (Sundar & Marathe, 2010). Customization is a result of the user interacting with the system to "make changes to the form and content of the interfaces," (p. 301). This is not to be confused with personalization, which has been defined as the process which "changes the functionality, information content, or distinctiveness of a system to increase its personal relevance to an individual," (Bloom 2000, p. 313). The difference is that personalization is done by the system or program, which adapts based on user actions and choices. The user actively chooses customization features that change the content and structure of the app (Sunar and Marathe, 2010).

For the most part, participants were able to identify technological and religious affordances that were customizable under the settings option within the apps. Icons in the shape of gears and/or with the word "settings" demarcated the section of the app where users could access customization settings (*see* Figure 12). Most participants who were unsure of what the customization features were eventually found the settings icons in the apps. Two participants though, one Catholic and one Muslim, never touched the customization settings. Instead, they discussed customization as the actual affordances

available through the homepage. For example, one participant talked about the content

rather than the customization:

> The daily readings, that's probably more important to me, daily prayer,
>
> confession, prayers, my prayers, those are all very important to me. Everything
>
> else, I don't think is really relevant to me, to be honest (Female Catholic
>
> Participant).

> It offers a lot of customizability. It offers a few extra features you don't really
>
> expect from these. It offers great integration of many different services. Google
>
> maps, built-in Halal places app, the Quran right here, great translations, great
>
> everything, great setup (Male Muslim Participant).

Both of these participants are talking about sections listed on the homepage and are

equating them with customization. As described above, this is not how designers think

about customization. Perhaps the disconnect between what designers and users think

about customization features could be fixed by a brief tutorial when the user first opens

the app and shows them the options that are available.

Other than the two participants mentioned above, most participants discussed

customization as the changes they could make to technological or design features,

followed by the changes they could make to religious content. The first two subsections

below discuss how participants made sense of which technological features and religious

content customizations were important for their prayer practice. Finally, two more

participants discussed a lack of customization particularity to the app itself, such as
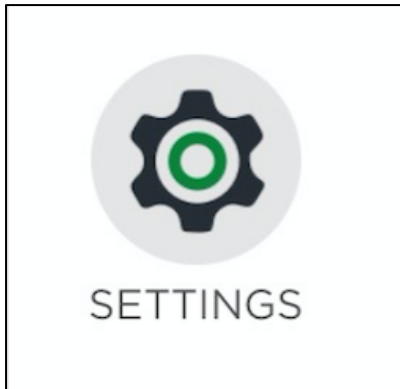
Figure 12: Settings. Example of the settings icon in Muslim Pro. Image reprinted from Muslim Pro.

changing the design layout and deleting content they did not want. These two

participants wanted a deeper engagement with customization than the apps offered,

which will be discussed at length in the last subsection.

     Customizing technological affordances. The majority of participants spoke about

technological features first (i.e. changes font color and size) followed by religious

content features (i.e. changing the actual prayer text by adding to or switching between

options, changing the prayer visualization, choosing to have a prayer pop-up before

engaging in the Bible, etc.). When asked what customization features were most and

least important for their prayer practice through the app, participants were split between

thinking customization of the theme and font was an important customization feature or

thinking it did not matter at all. Some said it was "brilliant" and really liked the fact that

they could change it to their preference. A few examples from participants who felt this way are presented below:

Looks like that's the theme color, oh okay. Let's try blue, okay blue that's what I wanted. Let's try Helvetica. Pinch zoom, (*Reading text on screen)* "Show pinch zoom on pages", okay, show pinch zoom. "Select with podcast player to use", oh okay, that's kind of cool….I mean, you guys have a lot of customization features in here. The ones that are probably important to me are theme, font face, font size, pinch zoom, and I guess podcast player (Male Catholic Participant).

For me, I'm going to say color theme is brilliant. I like it. It's very comprehensive (Female Muslim Participant).

Others participants said aesthetic customization was the least important of the features for their prayer practice and said they would keep the default settings. Again, here are two examples from both a Catholic and Muslim participant:

I think the ones that are least important for me are purely aesthetic, such as theme, font size -- maybe not font size, because I can definitely see a larger text being beneficial -- but maybe the font face and theme. I wouldn't call them to be essential (Male Catholic Participant).

Most important? Well I mean cosmetic changes are probably the least important (Male Muslim Participant).

Several participants also remarked on the necessity of being able to change the font size for accessibility reasons, as mentioned earlier in the readability section. The other technological affordances, such as choosing which podcast player to use or provided through customization features were, for the most part, ignored.

Customizing prayer content. Out of all participants, only seven from each faith mentioned specific customizations for prayer content specifically. For Catholics, participants mentioned customizing the digital rosary most often. "Laudate" has the following options to choose from: show all prayers, preserve Rosary order, touch closes window, prayer title duration (*see* Figure 13). The quote below shows how one Catholic participant talked through the Rosary settings and how those were more important than aesthetics to his prayer practice:

> I do like though, the Show Rosary and Chaplet Prayers, rosary prayer title, duration of rosary prayer title display, these are really interesting things to customize. For instance we have, 2, 4, 8-10 seconds... So let's do 4... So I think the items that pertains to how you perform your prayers are the ones that speaks the most to me, more than the aesthetics. (Male Catholic Participant)

In addition to changing rosary settings, the app also allowed participants to start a Bible reading with a prayer. This was the only other prayer related option for this app. One male Catholic participant said, "(*Reading the customization options)* Prayer before Bible, show or hide, okay that's kind of cool." Some participants were unsure of what this feature did:

Prayer before Bible, I'm not sure what that even is. I would probably click that to see what it does. For me, I wouldn't customize a whole lot, in all honesty. I would like to use the app as it is (Male Catholic Participant).

Only three Catholic participants mentioned the prayer before Bible reading option and then only in passing.

Muslim participants mentioned the option to switch the *adhan* recitation, calibrating prayer times, and the alert/reminder options (discussed at length in Chapter VI). Participants said they would like more options for the *adhan* recitation on the free version of the app rather than having to pay for more. "Maybe just a few more options for free users, like with the *adhans*, the different options there," (Male Muslim Participant). No mention was made about *duas*; the focus was on *salah.* Finally, only one participant mentioned the prayer calibration settings. Because praying at the right time is part of the duty of each Muslim, great importance is placed upon know the prayer schedules for the days and weeks. The location of the precant, or the person praying, is required to calculate the times and the app provides different options to choose related to this. One participant that noticed the calculation settings said:

Oh, I believe this is to re-calibrate the prayer times in case you're living in a different part of (City) than what this thing is checking. Prayer time conventions. Let's see what adjust the angle of the sun I believe. According to different international standards. I like this. This is very good (Male Muslim Participant).

To summarize, most of the participants equate customization with aesthetic settings such as color, theme, and font. About a fourth of participants from each religion

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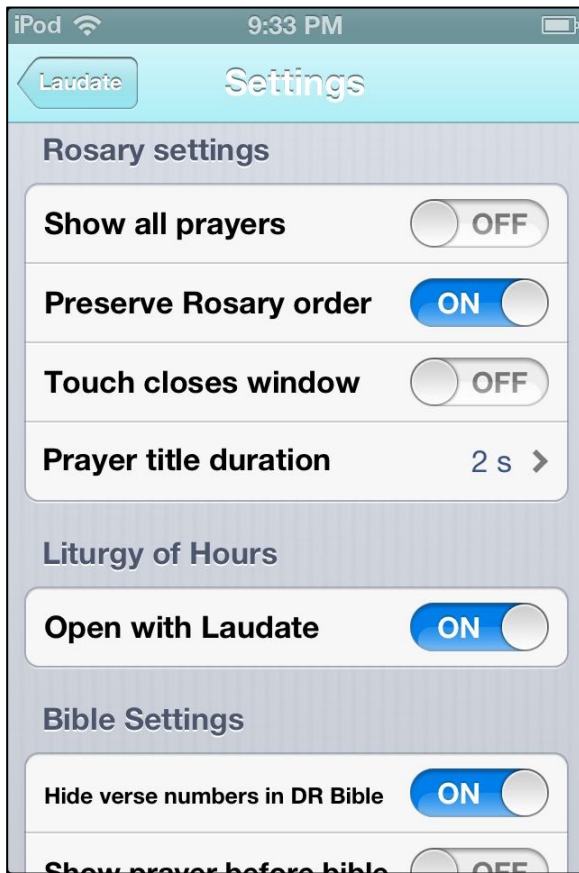**Figure 13: Prayer customization.** Image reprinted from Laudate shows some of the prayer customization features that users could select.

actually looked at the customization features specific to prayer practices. There are two

main reasons this could be: (a) users do not care about customization as long as they can

adequately read and access content and tools; (b) they do not know about them or how to

find them. The former speaks to the importance of good design through pleasing color palettes and adequate fonts. The latter speaks to lack of intuitive design or instruction. Developers could counteract this discrepancy by designing first-use only tutorials, or pop-up notifications pointing out interesting options during use.

Customizing the app itself. While most participants were concerned with aesthetics and some prayer customization, there were two participants, one Catholic and one Muslim, who wanted the option to customize the main homepage menu of the app. This speaks to an interesting negotiation of religious engagement through technology. To clarify, the participants wanted control of the actual religious content and layout design in general, not just the color and font size. For instance, the participants talked about being able to move the main sections of the homepage menu they would use most, and then delete other sections that they deemed unimportant. The Catholic user discussed these options in the following way:

> If something is more important to me like the calendar, if I want that to be most important, if I'm going to keep the same layout and put that on here… Maybe being able to move all of these items around so I can customize the ones that are more important to me. Maybe I don't really care about the liturgy of hours because I already know what all of them are, but if I want to know stations of the cross instead, I'd be able to move that to the top (Male Catholic Participant).

The Muslim user also wanted to be able to customize the "buttons" which served as the menu for the Muslim Pro app:

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Till now I only regret one thing about that application and the thing is that I was unable to customize the buttons according to my preference. Let me explain to you. I want to organize all these 9 circular buttons according to my preference, but I am unable to do it and that is what I am feeling bad about this app. I know it's a very small thing and it's not very important, but if a user would get to set those buttons according to his preference, he would get feeling that he owns this app. He would create a better relation with this app, but now what I feel is that this is just an app and I can only use this app but I don't have an option to make it special for me. That is what I think and I would like to be able to do (Male Muslim Participant).

To show the importance of the way these participants want to customize the app, the following quote provides some contrast. This Muslim participant felt the layout reflected the importance of each aspect in the *religion* and not necessarily their personal preference:

Honestly the way that this application is laid out, I really like. If you look at it, it does go in order by importance already. Prayer is the most important thing of course, and then in order for you to pray you must know what direction you're going to be praying towards, so the *qibla* is right next to it. Then of course, basically the most three important things are right up on top: the prayer, the *qibla*, and the *Quran*. Those are basically the most important things that you should be doing or going through, throughout your day, every day (Male Muslim Participant).

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The two quotes focusing on customizing the content and layout and the one quote showing the layout to be reflective of the religion itself through putting the most important aspects of the faith in prominent positions in the app layout illuminate two sides of a debate within digital religion studies: does design dictate religious practice, or does customization of technological and religious features allow individuals to decide which religious information and practices are more important? The latter is indicative of what some have called "pick 'n mix" religion that is available, thanks in part to mobile app technology (Wagner, 2012). To illustrate, the user, outside the purview of a priest or *imam* and the authority of the app developer (if they are not one in the same), chooses which aspects of the religious practice with which they want to engage. Researchers have argued that technology allows users to customize their religious practice, which results in the individualization of religion, or a democratization of religious practice.

This research argues that although technological and religious affordances in a mobile context may provide the opportunity for individuals to "pick 'n mix" their religious preferences, many do not. Only two, one from each religion, out of 45 total, pointed to the lack of customization that would allow them to place their own preferences of religious importance into the design of the app. Almost half of the Catholic and Muslim users explicitly said they would *not* change the default settings. Although technology may afford a more individualized, democratized engagement with religion, that does not mean that users will actually engage technology this way. More research needs to be done across the different types of religions to understand this complex negotiation with customization of religious mobile apps and whether or not it

does indeed lead to individualization of religion as a whole or if users are comfortable with the digital religious practice being designed for them by others.

Summary of user interface observations. Based on research on apps and from within the literature on usability and user interfaces, it can be said that good design leads to easy engagement with technological and religious affordances. Based upon participant reports, both apps were had an intuitive layout that made it easy for them to navigate to specific content and access specific features. This is important because if navigating through the app is difficult, users will not be able to get to the content and features that they need for their prayer practices. Additionally, participants were split on the aesthetics of the app: some participants said the color and font features matters and they wanted to be able to change it to suit their preferences, and other participants said they would be happy with the app as is. When participants did not like the colors and themes the app used it influenced whether or not they thought the app was professionally developed, which could influence how much they trust the app to have the correct content and features for religious practice. Readability was also an issue that participants remarked upon. Most said the readability was fine, but others pointed to the importance of being able to customize font size and color so that people with visual impairments would have access to the texts. Additionally, some Muslim participants who spoke different languages wanted access to more options and scripts that were available. All in all, customization was important to participants in terms of the technological features such as color theme and font options. For prayer purposes, only 25% of participants actually looked at the different customization options. This is important because it

illustrates how good design leads users to understand and engage customization options. However, this only points to the way participants understood the user interface design. The next section shows how participants actually engaged with the design to access certain technological and religious affordances.

Chapter Summary

In an effort to address how Catholics and Muslims engage different technological and religious affordances in their use of mobile prayer apps, this chapter presented the data from the first part of the app user tests which asked how users though about prayer, how they prayed, about positive and negative prayer experiences, and about their prayer app expectations. This chapter also presented data about how participants made sense of the user interface design and their customization options. The first part of this chapter explicates how participants understand the practice of prayer and what expectations they had for a prayer app. Both Catholic and Muslim participants reported prayer to be a daily practice to communicate with God/*Allah*. Participants' understanding of prayer mirrored the ways in which developers' framed prayer within the app descriptions, as discussed in Chapter IV. Specifically, Muslim participants also understood prayer to be a duty that must be performed in the correct way. Developers of Islamic apps also framed prayer this way in the app descriptions. In addition to framing prayer as a connection with God, Catholic participants also framed prayer as a way to connect with others, which is a bit of a departure from the way developers framed prayer within Catholic app descriptions. This difference may influence the ways in which sharing is afforded and/or constrained

through app design as well as how participants actually engage the affordance. Both

Catholic and Muslim participants understandings of prayer connected to their reported

expectations for a prayer app. Specifically, participants expected to use the app as a

religious micro coordination through prayer schedules and reminders and alerts.

Additionally, participants expected access to a variety of prayer content, features, and

tools. Finally, participants expected access to additional religious content, such as access

to the Bible or *Quran.* Therefore, participants' framing of prayer and their expectations

for a prayer app are important for understanding how they actually engage with

technological and religious affordances.

Part two revealed how users engaged with the app design and what customization

options were important for their prayer practice. For the most part, both Catholic and

Muslim participants perceived the app interfaces to be intuitive, or easy to use. Muslim

participants seemed to be more pleased with the aesthetic quality of the app than

Catholic participants. Therefore, participants were split between being happy with the

app theme and color and wanting access to customize these aesthetic qualities. When

participants were asked to look at the customization features and talk about which ones

were most and least important for their prayer practice, they talked first about

technological features followed by religious content options. Finally, only two

participants wanted to have more customization control of the app layout and content.

They wanted to be able to significantly change the layout and structure of the app

homepage by moving elements and deleting or adding content. As discussed, this may

point to an individualization of religious practice. However, because only two

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participants mentioned this, this research argues access to this level of customization may not result in users actually taking advantage of it.

Both parts of this chapter, framing prayer and app expectations, and interface design and customization, provide an important insight that may inform the findings from the participants actual engagement with technological and religious affordances for prayer, which are presented in the next chapter. For instance, based on these findings it can be expected that participants will engage with or be interested in reminders and alerts, specifically for religious micro coordination, or scheduling and keeping track of their daily communication with God. Additionally, wanting access to a variety of prayer content and tools may reveal more of an engagement with either prayer texts or interactive prayer tools. Therefore, the next chapter looks specifically at this engagement for further insights into how design and use are intertwined with technological and religious affordances.

REPORTING ON CATHOLIC AND MUSLIM USER TESTS OF PRAYER

APPS: PARTICIPANTS' ENGAGEMENT WITH TECHNOLOGICAL AND

RELIGIOUS AFFORDANCES

In the previous chapter we learned how Catholic and Muslims participants framed the

practice of prayer and how they expected to be able to use a mobile prayer app. Here we

focus on how participants actually engaged technological and religious affordances

when asked to find a prayer and to pray it out loud. This is important because it shows

the connection or disparity between what participants say they wanted in a prayer and in

what they actually used. Therefore, Chapter VI presents the analysis of user testing data

related to the "Laudate" and "Muslim Pro" apps, which underscores two core areas:

engagement with technological and religious affordances for prayer, and how

participants makes sense of that engagement within their larger understanding of

religious practice.

The first part of this chapter shows how participants actually engaged with

technological and religious affordances for prayer. In this part of the test, participants

were asked to find a prayer they were interested in praying, and to pray the prayer out

loud if they felt comfortable doing so. Participants were also asked to look at the

customization features and explain which ones were most and least important for their

prayer practice. These tasks and questions revealed which prayer design approach the

participants gravitated towards as well as how prayer tools were interpreted, which

speaks to the technological and religious affordances participants actually engaged with during prayer app use.

The second part of this chapter investigates how participants made sense of using a prayer app in their personal practice and their understanding of the larger relationship between technology and religion. In this part of the user test, participants were asked to talk about praying with the assistance of a prayer app and what was good and/or bad about it. The participants' answers are important for understanding the negotiation process religious users go through when deciding if, and how, to use technology in their religious lives. Understanding these negotiations also informs future engagement with new technologies that may become available for use during religious practice.

From the findings in these two sections and the findings from Chapters 4 and 5, we are able to consider how user engagement with apps, and user reports of their experience with these apps, reveals a number of common themes. First, using prayer apps for religious micro coordination of daily prayer practice is found within all three analysis chapters. Second, for the most part, both developers and participants frame prayer app use in the same way. Third, participants from both religions tended to engage more with features that were indicative of the translation approach to prayer app design as found in Chapter IV. Finally, most participants accepted the use of mobile apps within their prayer practice easily; the remaining few participants had more complex negotiations with integrating mobile apps into their prayer practice. These key findings are discussed in the final section of this chapter.

Part One: Participants' Engagement with Technological and Religious Affordances

After participants talked about the design of the app user interface, they were then asked to find a prayer they would be interested in praying and to pray it out loud if they felt comfortable. They were also asked to speak about any highs or lows along the way. These questions and tasks reveal data that answer the research question: how are users actually engaging technological and religious affordances in mobile prayer apps? Technological affordances within this research refer to actions that are allowed, constrained, or restructured through different design elements and features. Religious affordances, on the other hand, refer to the ways in which technological elements and features are combined with religious content to allow, constrain or restructure religious practices. By examining participants' engagement with technological and religious affordances, several key themes emerged from the data. First, the aspect of mobility, or of having access to prayer on a device wherever and whenever the participants wanted, pointed to the overarching affordance of convenience. Every participant mentioned this in one way or another. Second, Catholic and Muslim participants engaged in specific religious affordances in different ways that reflected their respective religious traditions. To clarify, Catholic participants focused more on prayer texts and information, which reflects on their expectation to have access to a variety of different prayers all in one app. Muslim participants focused most on the prayer tools and features that would help them pray at the correct time and facing the correct direction, which is reflective of how Muslim participants framed prayer as a duty to be performed and on the orthodoxy of practice that was emphasized by developers within the app descriptions. The sections

below speak in depth first to the overarching affordance of convenience the prayer apps provided users, and then specifically on the affordances engaged by participants of each religion respectively.

      Mobility: the convenience affordance. After users opened the app and began completing the tasks for the user test, every single participant mentioned the convenience of having a prayer app. Therefore, if this study is to answer Boase's (2013) call to focus on mobility, or the capability to have access to content and tools anytime anywhere, as a unifying affordance in mobile communication studies, then it must address the overarching affordance of convenience. Having information and tools at your fingertips wherever and whenever was the dominant affordance, within both technological and religious affordances, of mobile applications mentioned by participants. However, the quality of that experience may vary based on design, which was discussed in the previous chapter. Convenience, which directly relates to usefulness, was the prevalent theme throughout each part of the user tests and was mentioned by 41 of the 45 participants, 23 Catholic and 18 Muslim respectively. The convenience theme reverberated through the participants' answers about what they hoped the app would do for them, through their engagement with the app affordances, and in their final thoughts at the end of the tests. Convenience was discussed in three main ways: the amount of, and access to, *content*; the fact that this content can be utilized *on the go*; and the handiness of a *multiple-purpose* religious app design. Each of these themes is delineated in the sections below.

Content convenience. Forty-one out of 45 participants (C=23, M=18) mentioned their appreciation of how much content the apps had, and also the importance of having access to this content in one portable place. As mentioned in Chapter V during the discussion of the participants' app expectations, both Catholics and Muslims expected to have access to a variety of prayer content and tools. After participants opened the app and had a chance to look around at the features, comments usually focused on how impressed they were with the amount of content in the app. The following examples from Catholic and Muslim participants represent the general sentiments in this theme:

I'm impressed with this. This is a lot of information that I think would be nice (Female Catholic Participant).

I think it's very convenient, it's there, right there for you (Male Catholic Participant).

Anyway, there're a lot of features that I like. It's a pretty good app and convenient for someone who prays five times a day (Male Muslim Participant).

I like the fact that it has many, many prayers, probably all the *duas* or prayers listed in it. The fact that you don't have to remember every single one of them and you could just, say you don't remember it, the one of leaving the mosque, you could just open your app and read it (Male Muslim Participant).

Convenience through the availability of content is a common theme to mobile communication in general. The convenience of having access to information on one device is an affordance that has been noted across multiple app categories and types of mobile device engagement. Of course, convenience is not only access to content; it is access to content on one device that goes with the participant anywhere and can be used relatively at any time, as discussed in the next section.

On-the-go convenience. While the "on the go" theme is somewhat implied within the access to content theme, 15 of the participants (C=8, M=7) mentioned it explicitly. To clarify, on the go refers to having access to content anytime, anywhere. For some, this on-the-go convenience became important when they were travelling for their job or even on their daily commutes.

> I do have a traveling job, so I can get all these (prayers). I don't really have to search for these on the internet. I can have them on my phone…I don't really see a negative part to it to be very honest because I have access to this app, and I can use it whenever I am traveling (Male Catholic Participant).

> You can do it wherever you are, on the bus, on the train, in your car, you know? Definitely this is very good (Male Muslim Participant).

For Catholic participants specifically, the app changed the way they travelled because they no longer had to pack or carry prayer books with them.

> The good thing is I don't really have to carry my prayer book everywhere whenever I travel… I think that is the best part about using this app over here. I

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don't really have to carry my prayer book everywhere (Male Catholic Participant).

All the prayers that I have compiled all through the years even though the prayer books that I received ... I can see that the prayers are here. It's like they are compiled in just one app, so it will be very convenient for me instead of leafing through my prayer books or bringing them to the church (Female Catholic Participant).

Having access to content whenever, wherever is a dominant affordance related to mobility. No longer are users tied down to their home computers or to Wi-Fi access if they have mobile data plans. They simply download an app on their phone and access it when they are on the go. When talking about convenience, some participants also noted the multi-functional religious features on each of the apps and how it could be used for more than prayer.

Multi-purpose convenience. Twelve Muslim participants and two Catholic participants (N=14) tied the convenience of the app not only to prayer practice but also to their religious lives as a whole. The two quotes below explicitly state the significance of the multi-purpose design approach to religious app design:

It truly is a mobile, digital version of church (Female Catholic Participant).

A lot of apps are just, you know, made solely for this purpose, but this app has so

much more. It has pretty much everything you need to do with Islam, to be

honest (Male Muslim Participant).

Of course, the two apps chosen for the user tests were specifically selected because they

contained multiple ways to engage prayer as well as other features for religious

practices, such as reading the Bible or *Quran*, doing daily devotionals, or finding *Halal*

places to eat. It is interesting to note that only 14 participants mentioned this in their

responses, and 12 of those were Muslim participants. However, this research is unable to

claim that participants wanted multi-purpose apps because the other types were not

specifically tested and evaluated.

The three themes – access to a lot of content, on the go, within a multi-purpose

app design – underscore the overarching affordance of convenience as explained in the

section above. However, this research is interested in how the convenience of mobility

specifically influences or interacts with the prayer practice. What technological and

religious affordances are most appealing, how do users actually engage affordances, and

how does this engagement shape the way users think about religious practice in a mobile

space? The following sections delve deeper into the religious affordances most engaged

by the participants during the user tests.

Engagement with religious affordances. As previously discussed in Chapter V,

interface design influences the way users engage with different affordances on the

mobile app. It reveals what and how users understand the actions they can and cannot

take. This section then looks specifically at what religious affordances that resulted in

engagement with prayer users noticed most, and how they went about choosing a prayer that was interesting to them through religious affordances. As mentioned previously, both "Laudate" and "Muslim Pro" were chosen because they included all three prayer design approaches. For the translation design approach, both apps have the digitized texts of prayers that would normally be found in sacred texts and other prayer books. For the mobile-prayer environment approach, both apps had technological and religious affordances that were combined to make the app a part of the prayer practice – that is the mobile device was actually used, touched, and manipulated during prayer rather than just being read. Finally, both apps fit within the multi-purpose design approach as they had multiple other religious affordances, such as reading sacred texts and getting more information through religious calendars, in addition to prayer elements. This is important to note because what affordances participants engage with may be indicative of the type of approach that is most useful for them in their prayer practices.

In this phase of the test users spent more time looking at the content rather than focusing on the interface design, as discussed in a previous section. Overwhelmingly, 43 participant, 23 Catholic and 20 Muslim, noted how both apps had "a lot" of prayers and prayer-related features, such as audio, *qibla* compass, and search among others. Catholics participants talked the most about how many prayers were included within the app. Muslim participants focused somewhat on the different types of prayers available (i.e. *salah and duas),* but more specifically on tools that made those prayers easier to perform. The similarity in the findings from both Catholic and Muslim participants reflects the participants' expectation to have a lot of options to choose from within the

app. The differences in Catholic and Muslim participant engagements are indicative of the traditional prayer practices of each religion, as will be shown in the subsequent sections. The two sections below look first at how Catholics engaged with religious affordances that influenced their prayer practice, and then on Muslim engagement.

   Catholic participants' religious affordance engagement. Catholic participants were most impressed with the *variety of prayers* (C=17) available through the app and also that they would be able to get *guidance in what to pray* for different reasons and instances (N=8). At times, participants noted the large amount of content listed on the homepage. One Catholic participant said:

> In fact, it kind of exceeds my expectations a little bit in terms of the content
> available to me. The different types of prayers. The different types of novenas.
> Just the sheer amount of things that I can do with this app. I thought it would just
> help me with rosaries and daily readings and some basic prayers, but it's very
> comprehensive (Male Catholic Participant).

Another participant went a little deeper into the app and actually engaged the search function to look for content. She talked as she navigated through the results:

> There's even the rosary, the prayers. Let me see the prayers. There's also the one
> for the children. Okay, I wonder how you can search, because I can see there are
> groups here. Miscellaneous group and children group, basic group. Okay, let me
> see. This one is nice. There's even a group for the prayers. I like to look at
> children's prayers, so they're all here. Then just click on it and there's the prayer

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here. So far, I like everything about it. Very organized and as I've said, all of my

prayer books are all here in this app (Female Catholic Participant).

The quote above also points to why access is so important within the mobile context. For

this participant the app made the content from all of her prayer books available on her

mobile device. This connects with the expectations of the app and the overarching

affordance of convenience, as users do not have to carry a large amount of physical

books in order to have access to the same amount of prayers.

Overall, for the Catholic participants, the "Laudate" app met the expectation to

have access to a variety of prayers. Another participant noted this sentiment:

Before I started this or before I looked at the app, I was just expecting maybe just

a little reminder, either a prayer of the day or just a reminder for me to pray. As

I've seen, there's more to it. There's a lot to it than what I have expected (Female

Catholic Participant).

All of this content worked provided some of the participants with inspiration to pray and

as a quick way to find new ideas for prayer of which they may not have been aware. One

male Catholic participant talked about the way the app may influence his daily practice:

The good thing about it, I feel, this way it directs you toward something. It can

assist you meaning that… or doing something to get a prayer if you're thinking,

"What would be a good prayer for the day," it can spark that curiosity or give you

a spark to go find something to pray about.

Therefore, the app does more than just provide content; it provides some guidance or

inspiration for what to pray about or to encourage the user to pray in new or different

ways. Another participant noted the way accessing prayer content through this app could help in a similar way:

> I guess it's good because it gives you some direction. As far as any confusion you may be feeling, any ... direction I guess, is the main thing that the app would offer. When you're looking for some sort of higher guidance, I guess looking at this app could offer that (Male Catholic Participant).

Another participant spoke about how this would be a good feature for group prayer in a physical setting with others:

> It was good. It definitely enforces *using* versus *to strengthen the prayer*. Sometimes you don't know what to pray about so it's good to have a guideline, just to have that. Say if you're praying in a group or it's like a group prayer, then you can use a verse to do that prayer which would be good (Male Catholic Participant).

This participant noted the difference between using the app to find a prayer and using the app to strengthen prayer. This can be interpreted as engaging religious affordances not just to read prayer texts, but also to be guided in prayer when he was uncertain of how or what to pray. The participant called attention to the fact that it may be easy to just open the app, read a prayer and be done for the day. However, the "Laudate" app guided him into prayer if he was uncertain what he wanted to pray about. For him, the app went beyond just reading the prayer content to actually using it to enhance a prayer experience in a group setting. For Catholic participants, the app gave them access to a lot of different prayers, which worked to give them new ideas or perspectives on how to pray.

To summarize this section, having access to a variety of prayers was a key religious affordance that was made possible through prayer content, or texts of prayers, and design, ways to look up specific prayers and daily prayers for guidance in what to pray. Participants' observations about all of the different prayer texts available connected to the developers' app descriptions, which touted a long list of prayers that were available on the app. Therefore, developer descriptions and user perceptions aligned in this regard. For participants, a key outcome of having access to a variety of prayers is finding inspiration for when they were unsure of what to pray. The sheer variety made participants more comfortable in being able to find or search for what they needed at any given moment. Some participants referred to this as being guided in the prayer practice.

Find a prayer to pray. As part of the user tests, participants were asked to find a prayer that they would be interested in praying. There was no attempt to guide them toward a certain prayer or feature. Rather, participants were asked to explore the app and find something that they thought would be interesting for their prayer practice. In the user test instructions, participants were asked to pray this prayer out loud if they felt comfortable doing so while being recorded. Six Catholic participants mentioned discomfort or uncertainty about praying out loud during the test. However, even when the participants were uncomfortable praying during the test, the types of prayers they looked for did speak to how they would engage with religious affordances. This discomfort is important both for understanding how participants may pray with an app and also for evaluating the user testing method, both of which are discussed in the

following sections. Before that discussion, the next section presents findings from Catholic participants who were drawn mostly to the daily prayer feature (C=14) listed in the homepage, and how other participants chose to search for a specific prayer (C=10) through the prayer menus.

Daily prayer. Fourteen out of 24 of the Catholic participants went straight to the daily prayer feature with little to no hesitation when they were asked to find a prayer. The fact that participants were drawn to the daily prayer feature in "Laudate" is not necessarily surprising. After all, findings from the prayer app descriptions and user expectations all point to the key goal of maintaining a daily prayer practice. Therefore, when participants were asked to find a prayer it makes sense that most of them were drawn to this feature. One participant was on the homepage and went straight to the daily prayer feature which was at the top of the page:

> Daily Prayer. Let's see what that one… (*Praying the prayer*) Almighty God and
> Father of light, your eternal word leaped down from heaven in the silent watches
> of the night. Open our hearts to receive his life and increase our vision with
> the rising of dawn that our lives may be filled with His glory and peace.
>
> That's nice. That's a powerful prayer. That's great (Male Catholic Participant).

This was the daily prayer that many of the participants read because the user tests were completed on the same day in late December. It is a simple, short prayer that is meant to guide the users' daily prayer focus. Some of the participants connected the significance of the prayer to the time of year, which at the time of the tests in December, was just before the new year. This is significant because participants were tying the daily content

to the time of year, which reminded them to be reflective of starting anew. One participant said:

> …this Daily Prayer here is very good. This is all good,
>
> especially for the upcoming new year, to open our hearts and receive His
>
> life (Female Catholic Participant).

Another participant echoed the sentiment that this prayer was well chosen during the time just before the new year. She said:

> I like this prayer. It's relevant especially today that another year is ending. It
>
> reminds us to open our hearts and to believe in God. As I've said, every
>
> time I pray, I feel secured that God is watching over me and my family and
>
> He just gives me peace (Female Catholic Participant).

Even just reading a simple prayer like this worked to reassure and speak to this participant. She feels secure and reminded that God is keeping her and her family safe. Another participant echoed these sentiments:

> This is probably applicable, too, for today being December 31st and going in to
>
> New Year about how He watches over us and that He will increase our vision
>
> with arising at the dawn, just so that you know with the new year, hopefully I
>
> can be a little more aware of God's path for me and what I need to be doing with
>
> my life. That's really quite relevant, that's neat, I'm glad that I picked that one
>
> (Female Catholic Participant).

This type of engagement with the daily prayer and the resulting experience for the participant is important to note. Feeling secure, safe, and at peace were all associated

with a positive prayer experience, which participants talked about in the first section

Chapter V. Therefore, it can be argued that even a short daily verse that is read from the

phone, much like one that may be read from a book, is enough to result in a positive

prayer experience. The mobile app is capable then, even through the simplest of designs,

to evoke a positive experience for users.

*Search for pray*ers. Positive prayer app experiences were also found for

participants who chose to search for a specific prayer instead of going to the daily prayer

feature. Ten Catholic participants chose this route and found a variety of different types

of prayers that were reflective of the their current concerns as well as how they have

prayed in the past. One participant chose to look for Latin prayer options on the app:

> Let's find my prayer, let's see what you offer. You have Latin prayers, which
>
> are fine. I can understand Latin even though it's been decades since I
>
> studied it. (*Praying in Latin*). Lots of prayers in Latin. Pretty sure these are
>
> used in my Catholic church, the Vatican, in all Catholic churches. (*Praying in*
>
> *Latin*) (Female Catholic Participant).

Two things stand out in this example: first she looked for a Latin prayer which she had

studied in the past, and second she mentioned that she was sure these prayers were the

same as those used in the Catholic church. The former is important because it shows that

past experiences with prayer may influence the user when they are searching for prayers

in through a new medium – in this case the mobile app. She had a familiarity with Latin

prayers and wanted to see what was available to her through the app. While not explicit,

this connection to past experiences is important for designers to take into consideration

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when designing app features and content. Knowing the audience will help developers engage users through features they are more likely to understand. Second, she referred to these prayers being used in church, which is an implicit reference to traditional religious authority. While she does not indicate she would say the prayers if they were not used in the church, it seems to make her more comfortable that she is saying a prayer that has been sanctioned. The reference to traditional religious authority here is interesting because it shows that this is an element that users will pay attention to and that may influence how they engage the religious content. It is important to note that the prayer page she was on in the app did not make any overt references to traditional religious authorities, such as the Vatican, the Pope or other religious leaders and organizations – it was something that the user inferred from her own knowledge of Latin prayers.

This same participant spoke with emotion in her voice as she discussed what praying the Latin prayers through the app meant to her:

> I just feel love all over me, it's as if the Holy Spirit… I'm pretty sure it's around me, actually, sure that it's with me all the time. I feel… that I feel every time after I pray even in my own prayer. This is a written prayer, it doesn't diminish its value for me. Especially if it's in Latin…(Female Catholic Participant).

Much like the daily prayer feature, searching for prayers with personal relevance also resulted in a positive prayer experience. The fact that the prayer was written in digital text, that she was accessing it through an app, did not diminish the outcome of the prayer for her, which was to feel the love of the Holy Spirit around her. Again, these positive experiences show that, contrary to some who believe that digital spaces are not

conducive to religious practice, mobile prayer apps can and do result in positive experiences for some users.

Discomfort praying out loud. As mentioned previously, six Catholic participants did not feel comfortable praying out loud during the user test. It is important to hear their voices because it can illuminate limitations of the app and also limitations with the method of collecting data. First, some participants just said they were uncomfortable and moved on to the next task in the test. There was no data really giving an indication as to why they were uncomfortable. For example, one female Catholic participant said, "I'm not really comfortable hearing other people, letting other people hear me pray out loud." Another female Catholic participant gave a bit more context but not much. She said, "Although I generally do not pray out loud, other than with my children, I guess I could do so." These participants expressed their discomfort but chose to go ahead and complete the task.

Other participants, however, took some time to explain their hesitation further. For these participants, prayer is a very personal practice and not one they are necessarily comfortable sharing, either with others or through the user test. One participant chose to pray silently and discussed why:

> Okay, let me try this one (*picking a prayer*). All right. I'm just going to go ahead and read this my head, I'm not really comfortable... I never really pray out loud whenever I do, so it just feels weird to me mumbling that (Male Catholic Participant).

For this participant, praying out loud was not something he normally practiced. Doing so, especially within the context of a user test, made him uncomfortable. However, he was independent enough within the testing environment to pick a prayer to say silently and to explain his choice.

Another participant went into more depth with his answer about why this task made him uncomfortable. It speaks to the relationship he has with prayer as a whole as well as to the specific context of the user test. He said:

> Prayer to me is a personal thing. Religion is something that I take personally. I don't know if I am comfortable with doing so during a recording of a test. I do apologize. It's just not something that I do for ... I just don't do it under this particular circumstance. Did you complete the task successfully? I'm going to go ... No, which is why I don't pray or I'm just not into prayer under these circumstances. Over all, this task was an easy task. There wasn't anything I couldn't perform, but that's just something I take personal (Male Catholic Participant).

There are two important issues within this example. First, he considers prayer to be a personal practice. Therefore prayer is a private practice. Second, he related this discomfort specifically to the user-testing environment. This is important because it highlights problems in the way religious and media researchers design and implement user tests in future. In this case, the test could have been written differently in order to provide more context or options so as to make the participants more comfortable in

making choices during the test. The following text illustrates alternative instructions that may put the participant more at ease:

> Please pick a prayer you are interested in and pray it out loud if you are comfortable. If you are not comfortable praying out loud, you may pray silently or choose to forgo this step in the test. Please explain which option you choose and why.

While the phrase "if you feel comfortable" was included in the original text of the test and did give the participant the option to decline, the tone of the participants' voices and ways in which they expressed this discomfort was palpable. Having participants' best interests at heart is an ethical issue all researchers should keep in mind during the development of the method, the execution of collecting data, and in writing up the results. These Catholic examples show more care needs to be taken to give participants more ways to decline during a recorded test in which the researcher is not physically present.

So far, this discussion has been about the Catholic context, and how participants were drawn to the daily prayer feature and to searching for specific prayers they were interested in praying. Participants who chose the daily prayer feature noted that the prayer related to the time of year, which was toward the end of December and the beginning of the new year. Being drawn to the daily prayer feature may be connected to the participants' expectation for the app to remind them to pray daily. Therefore, there is a connection between participants' app expectations and the first feature they chose when asked to find a prayer. The daily prayer content may act then as a form of religious

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micro coordinating feature for participants who are concerned with scheduling and reminding themselves to communicate with God. Those who searched for a prayer rather than gravitating toward the daily prayer feature, were looking for prayer texts that were familiar to them, such as the female Catholic participant who searched for Latin prayers. Because the participants gravitated toward finding prayer texts, it may indicate a preference for the translation design approach to prayer in which prayers are copied from the offline to digital formats. Finally, some participants had issues with this part of the user test. They did not feel comfortable praying out loud which may indicate how they will also pray with the app. It also highlights the need to be more aware of participant choice and comfort into consideration when designing the methodological protocols used within data collection.

Therefore, this section has highlighted that Catholic participants understand prayer as a daily practice. The prayer app then becomes a conduit to pray daily through the daily prayer features and through searching for specific prayers or guidance in prayer. Access to a variety of prayers, a daily prayer feature, and the ability to search for prayers result in the affordances of scheduling or remembering to pray daily. As such, Catholic participants were drawn to the translation design approach that provided access to prayer texts and basic tools. Even though participants mainly gravitated toward the translation design features of prayer text, some did notice and comment upon the interactive rosary feature of the app, which indicated at least some interest in the mobile environment approach to design in which the device becomes a part of the prayer

practice through touching the screen and or engaging other interactive features, which is discussed in the next subsection.

   Interactive Rosary. None of the participants chose the interactive rosary when asked to look for a prayer they would be interested in praying, but 20 out of 24 participants did at least mention it during the user tests, although the mentions were brief. As previously explained, participants were not guided to a specific prayer or prayer feature during the user test. Rather, the point of the task to find a prayer was to see what participants noticed and gravitated toward. Most participants briefly mentioned the interactive rosary option as they scrolled through the homepage or looked at the customization features. For example, this is how one male Catholic participant mentioned the interactive rosary as he narrated his movements through the home screen of the app: "From the home page, I can get to multiple things. I can share a daily readings, bookmarks, calendars, rosary, confession prayers, Stations of the Cross, prayers. You name it. I can go to that from the home page." Participants mentioned the interactive rosary feature in passing and they only two followed through to see what it was. Another male Catholic participant said, "This is an interesting feature, the show rosary and chaplet. I would definitely make use of that. I say my rosary fairly often." So there was interest for participants, but very few actually sought the rosary out specifically.

   The two participants who did engage with the interactive rosary features more in depth seemed to be impressed. One participant came across the rosary by way of looking

at the customization settings. He chose the option to tap on each bead and then navigated

to the rosary option to see what it looked like (*see* Figure 14).

> (*Making selections in settings*) Show rosary and chaplet prayer. We want each
>
> tab on the bead. Let's go and see now. Let's go to the rosary. (*Navigates to the*
>
> *rosary option).* All right. All right. *(tapping each bead starting with the crucifix).*
>
> It proceeds automatically. All right. That's nice. That is pretty cool. I didn't know
>
> I could do that. It automatically tells me which bead to click. That is pretty nice.
>
> Wow. Oh, wow. That's nice. I think I like the bead feature (Male Catholic
>
> Participant).

This was generally the reaction that participants had when they interacted with the rosary

feature. Another participant found the rosary beads and the option to hear the audio of

the prayer through the customization features. Here is her response to the interactive

rosary:

> The Rosary, okay, single image version of the Holy Rosary. (*Looking at the*
>
> *interactive rosary beads*) Let's see, oh, God, they are beauty (sic). Chaplet Divine
>
> Mercy, check a single image version of the Chaplet. Podcast, okay, let's see.
>
> Chaplet of Divine Mercy from ... Let me play this and see what happens. (*Plays*
>
> *the podcast of the rosary).* Wonderful, I love the voice. I love that voice. Of all
>
> the customization features that I've seen, Rosary podcast is important to me… I
>
> need more time to get into it. Your application is the best thing I've had about
>
> prayer so far. It is the first too, so I don't have any comparison, but the experience

is overwhelming. It gives me enthusiasm about exploring it (the app) and getting
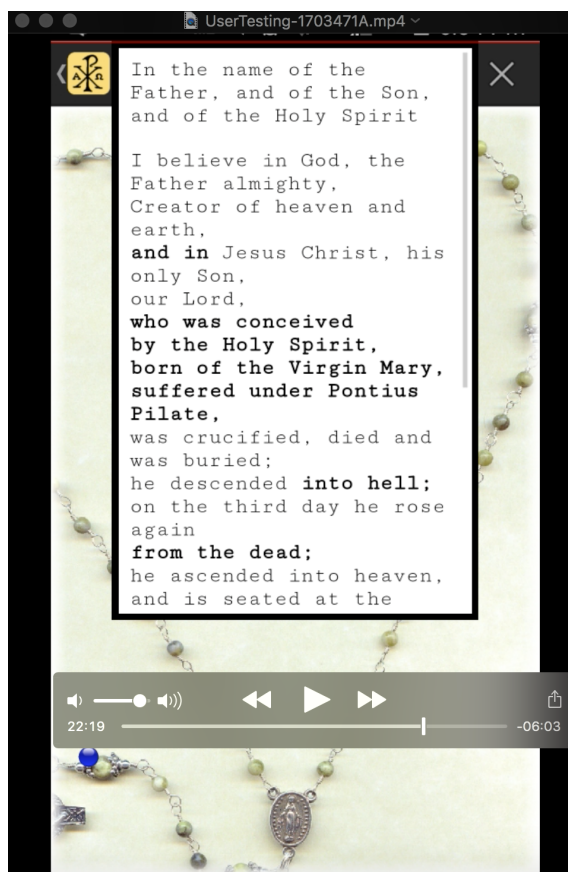
one of my own (Female Catholic Participant).

Figure 14: Interactive Rosary. This image shows a screenshot of the video from a male Catholic Participant as he engages with the interactive Rosary. Image from video of user test.

This participant was especially enthusiastic when she found the media options in addition to the digital rosary beads. The options made her excited to explore more of the app and see what other features she could find.

Most participants did not navigate this deeply into the app to actually see all of these options. While it may be inferred from this data that participants were not interested as much in the digital rosary, the design of the app and layout of the home screen may be responsible. For instance, the "rosary and chaplet" option on the homepage was not visible when the app was opened. Participants had to scroll down the page to see it. If they did choose this option, they had to navigate through two more app pages before actually seeing the digital beads and media options. Therefore, having these types of interactive features is important, but making them visible in the interface is key to getting participants to engage with them. Otherwise it may take too much time and effort to see what is available.

The lack of engagement with the interactive rosary could also be due to the time limitations of the user test. Tests are only supposed to last around 15-20 minutes; otherwise the researcher must pay more per test. The rosary itself takes at least 10 to 20 minutes to pray and therefore was not necessarily a viable option for participants. Therefore, the time limit placed on the user tests may have restricted the type of data the researcher was able to collect.

Summary of Catholic participants' religious affordance engagement. Catholic participants most often pointed out how many different types of prayers were available on the app. They noted that having access to a variety of options made them

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feel optimistic about find inspiration to pray when they were uncertain. When asked to find a prayer they were interested in, the majority of participants chose the daily prayer feature or searched for specific prayers. This type of engagement speaks to the effectiveness of the translation design approach within this app. However "Laudate" also had elements from the mobile-environment design approach, which was not mentioned as much by Catholic participants. Therefore, this may point to an understanding of prayer in mobile contexts by participants that aligns with the translation approach to design. The mobile app is a tool with which to provide access, but not necessarily to use as a part of the prayer practice.

Although there were a few participants who tried the digital rosary, which is an example of a mobile prayer environment approach to design, most only engaged with the religious affordances that featured the translation approach. This could be due to several reasons. First, it could be an indication and reflection on the overall approach to the use of technology in the faith. In Catholic contexts, technology is seen as tool that can be used for specific religious purposes. The mobile app then would be just one more tool in the Catholic user's life in which to practice religion. There is not too much of a departure from reading prayers in a prayer book to reading them as digital text within the app. The practice is simply translated from one to the other. There are some differences though, including how the content is engaged through reminders and alerts and through sharing with others. These differences are discussed in depth in subsequent sections.

Second, this could be due to the design of the app. Access to the variety of prayer texts was laid out in such a way in the interface that the translation aspects of prayer

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were front and center. To get to the digital rosary, users had to navigate through two different levels of app pages to find it. There was no explanation when opening the app or in the information section that tells users the interactive rosary was available. Therefore, these findings point back to the claim that good design matters in what affordances are actually engaged and what affordances remain unseen by users.

Third, the lack of engagement with features that reflected the mobile environment design approach, such as the interactive rosary, could also be due to the limitations of the user testing environment. The tests were only allowed to take between 15 and 20 minutes, which limits the type of data that can be collected. Therefore, participants may have been drawn to the daily prayer rather than the rosary because they knew the rosary would take too much time to complete. Therefore, taking all of these factors and findings into consideration, Catholic participants may be more interested in reading daily prayer texts and finding specific prayer texts than actually using the app during the prayer practice. However, more research needs to be done on how users interact with the design, which leads to engagement with different types of affordances and design approaches.

Muslim participants' religious affordance engagement. Muslim participants used the term "a lot" as well within their user tests. However, instead of referencing prayer texts, participants noticed prayer tools found in "Muslim Pro." The app had a multi-purpose app design approach, which included prayer elements that mirrored both the translation approach, such as access to prayer timetables and *dua* texts, and the mobile environment design approaches, such as audio and other interactive features, as

well the multi-purpose approach, such as other religious content and features like the *Quran* and *Zakat*. For the translation approach, "Muslim Pro" has the text of all the *duas* that users can look up and read as well as access to basic prayer timetables. For the mobile environment approach, the *adhan* function of the app used audio to call the Muslim to prayer through their phone and different audio features. The app can also be used to listen along to the *salah* during the prayer practice. This section first looks at how Muslim users engaged with affordances about prayer times (M=21) for *salah* the most, followed by their use of the *qibla* compass (M=18), and how they changed *adhan* options (M=12). When asked to find and prayer to pray out loud if they were comfortable, most participants chose specific *duas* (M=12), which literally means invocation or supplication to *Allah*. Eight of the 21 Muslim participants were either confused about the task or were uncomfortable praying out loud. The discomfort with this task mirrors that of the Catholic users, but there are different reasons for the discomfort, such as confusion between *salah* and *duas* as well as issues with the testing environment. Each of these themes, *salah, qibla, adhan, duas,* and discomfort with praying out loud, is discussed in depth in the sections below.

Salah times. All 21 Muslim participants talked about having the correct times for their daily *salah*, which mirrors the developers' app description that emphasized praying daily and at the correct time, as discussed in Chapter IV. This is not a shocking finding considering the five daily prayers are seen as the mainstay of the faith, or as the "essential obligation of Muslim worship" (Abu-Raiya, 2013, p. 682). As previously reported, Muslim participants expected the app to provide access to specific prayer times

based on their location. Therefore, the fact that Muslim participants noticed the prayer times and features first is not unexpected. However, it is important to note how participants talked about technological affordances that provided access to the prayer times and the tools through which to pray correctly. Included in this section then is the references participants made to the *qibla* compass and the *adhan.* All of these religious affordances are necessary to complete the required daily prayers in the correct way.

While Muslim participants expected to have access to the prayer times, they were not expecting the level of detail with which the app provides that information. When the app is first opened after downloading, it asks the user to set their location. Some of the participants skipped this step and therefore the prayer times were not set for them. However, setting the location did not seem to be confusing and the participants navigated through the task easily. After setting the location, one participant narrated his thoughts about the prayer times as he investigated the feature (see Figure 14):

> Let me see prayer times, what does it show here (*swiping through the prayer times at the top of the app*)? Oh, okay so - that's cool, they have a little sun, too. A little sundial to show what time to what time. That's really neat, actually. Oh, so you can just go like "How's it going to be tomorrow?" Okay, so I know that Maghrib is at 4:50 tomorrow. And the day after that, 4:50, also. Can I go forward? Okay, 4:51, that's cool. Okay. It's a really cool app, actually. It's a lot of stuff within it (Male Muslim Participant).

Figure 15: Interactive Sundial. Cropped image of a male Muslim Participants' mobile screen as he engages with the interactive sundial. The clear circle near the number 20 on the calendar shows where the participant is touching the screen at the time of use. Image from video of user test.

This participant noted one of those details in the design that may not be necessary, but

which does add another level of engagement – the sundial. At the top of the app where

the prayer times are listed there is a little graphic of the placement of the sun in the sky,

which is how the correct prayer times are calculated. As the user swipes to see all the

times for the day, the sun dial moves to show the position of the sun in the sky (*see*

Figure 15). According to some of the participants' reports from the user tests, this was

both impressive and helpful. One male Muslim participant said, "It has a little, how do

you say, description above all the prayers that shows how the sun rises and sets which is

pretty helpful." This is important because it speaks to a difference in designing to

translate the prayer times from offline to the mobile context versus creating prayer times

that are more interactive. A basic app using the translation approach may just list the

times in a table, which the app also had. However, "Muslim Pro" went beyond the basic

translation and created an interactive environment in which participants could engage in

finding the times and getting information. It gave information in multiple ways and

displayed the prayer times in ways unique to the mobile environment. The app also

showed a countdown timer to the next prayer on the page, which helped participants plan

their daily routine around the prayer times in an easy way. One participant describes this

feature:

> And when at each prayer time ends, it's nice to hop on the app, see when the
>
> prayer time is coming so I know whether to stay home or go out because for
>
> example, *Asr* is an hour away. So, I have time to go out and still make *Asr* prayer
>
> when I get home (Female Muslim Participant).

This instance exemplifies how religious apps can serve as a religious micro coordination.

The participant is keeping track of the times in which she needs to communicate with

Allah and notes how access to the times through the prayer app will help her do this.

Again, religious micro coordination differs from Ling and Yttri's (2002) understanding of micro coordination, in that the user is coordinating the religious practice of prayer, which is communication with God. Nevertheless, users have busy lives in which they are trying to work, spend time with friends and family, and meet their religious obligations. The app then serves as a tool with which to coordinate all of these social and religious activities in a convenient way.

Another way the app serves this function is by automatically updating the location as the user moves from place to place. Another participant see this as the app being fully customizable to her:

I like that no matter where I'm at, it's customizable to me. If I'm traveling, I don't have to worry about changing anything in the phone. The app will automatically read where I am as long as I have my location on. It will go ahead and give me what I need. If I leave the place where I'm at now, there is no way I'm gonna know the prayer times, unless I'm looking at the application or going online and looking (Female Muslim Participant).

Again, we see how the app becomes an important part of the practice by providing the necessary information the participant needs to meet her religious obligations. Therefore, Muslim participants gravitated first toward checking the prayer times. However, prayer time information was designed within the app to be engaged with in different ways, rather than only read off of a basic timetable. In addition to praying at the correct time, Muslim participants were interested in making sure they prayed in the correct direction as well, which is discussed in the next section.

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Qibla compass. When participants were asked what customization features were most important to their prayer practice, 18 Muslim participants navigated to the *qibla* compass first. The *qibla* compass shows the user the direction of *Kabba*, a holy site in Mecca that all Muslims are supposed to face during daily prayers. App developers also highlighted this feature in the app description as an important tool to maintain an orthodoxy of practice, or ways in which to prayer correctly according to the Muslim tradition, so that the prayer is seen as valid. Praying in the correct direction affects the validity of the prayer and therefore is an important feature for Islamic prayer apps to have.

There were some participants who only mentioned *qibla* in passing while listing off the features that were important or that they saw on the app interface. However, others went more in-depth in their observations. One such participant described his movements as he looked at the app features:

> Okay. So, I see it asks for my location, which it did set. I see a compass on here so I guess it tells you which way to face while praying, which is actually cool. I don't know if there's any other prayer app that has this actually (Male Muslim Participant).

Participants also noted another interesting design detail related to the *qibla* compass. On the homepage where users access the compass tool, the icon works as a miniature compass indicates the direction. Therefore, if the user knows the settings are accurate and working, they only need to glance at the compass icon to get a sense of the direction. A Male Muslim participant noted this feature and said, "I like how there's a mini-Qibla

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compass just in the interface without actually clicking on it. That's very nice, like a mini pop-up. I really like that." Again, the designer's attention to detail makes a difference in how participants interpret the app as helpful to their religious practice.

Some of the participants had some trouble at first when checking the *qibla* on their devices. One participant had trouble setting the direction and others questioned whether the direction they were getting was correct. Here is an excerpt from one test as the participant tried to set up the compass:

The *qibla*, it's telling me ... I'll have to hold my phone flat. I'm not entirely sure as to what's going on. I don't know how to use this one. (*Reading directions on screen)* Compass interface, move away from the interface or re-calibrate your device. That could be due to something. It would be nice actually to have a tutorial how to calibrate my device, because I'm not entirely sure of how to calibrate my device (Male Muslim Participant).

Therefore, just having the *qibla* feature is important, but making sure it is easy to use and that it works properly is paramount. Not every participant had problems with this, which could point to the issue being related to the specific device through which the participant is accessing the app. That being said, if the app is to be useful for prayer practice, Muslim participants particularly need to have a clear sense of the accuracy of the features because of the importance of their orthodoxy of practice. Therefore, after checking *salah* times, Muslim participants navigated to the *qibla* compass to make sure they were praying in the correct direction. Both seeking out the correct prayer times and the correct direction in which to pray reflects back to the developers' app descriptions,

which emphasized an orthodoxy of practice. Therefore, these tools are important to engage for participants to pray in the correct ways to ensure that their prayer is valid. In the same vein, participants next discussed the reminder and alert settings for different prayers throughout the day.

Adhan: the call to prayer. The *adhan,* or the call to prayer, is an important app feature that is linked to the prayer times. The *adhan* is an alert to Muslims that it is time to pray and it is used help Muslims set their focus on the tenants of the Islamic faith, which helps them move to the right frame of mind in which they need to pray. Offline, a *muezzin,* or the person whose job it is to recite the call to prayer, recites the *adhan* from the top of the mosque. Sometimes loud speakers or a microphone are used so everyone can hear. However, in non-Muslim countries there is no public call to prayer. The app is one way to still have this important aspect of the prayer practice even if the Muslim is not living in a country where this is the daily practice.

Twelve participants mentioned the *adhan* in passing, as part of a long list of features that were available through the app. For example, one participant read off the app features as they looked through the homepage:

> That sound ... *Dhuhr* notification ... default ... *Dhuhr* notification changed to *adhan*. That is the *adhan*. That's great. I believe that the app, whether I'm running it or not, it's just going to go off. Unless, of course, I have my phone on silent, and disable it (Female Muslim Participant).

In this example, the participant was looking at the different prayer times and options for getting a notification that it is time to pray. Participants usually mentioned it briefly, but

were glad it was available. There were a few participants that looked more in depth at the feature when asked to look at ways to customize the app. One participant narrated his thoughts while looking at the *adhan* customization features:

I like the fact that it has many, I'm guessing voices of *muezzin*, instead of having an adhan to pray you could have a long beep, saying your outside or something. LED Notification that's nice. Vibrate, Use alarm volume, I like the fact that you don't have to come into the app to set the volume (Male Muslim Participant).

For this participant, it was important to be notified of the time to pray and to be able to customize which *muezzin* would be reciting the call. Participants also have the option to be notified by a buzz or by an LED light instead of hearing the full *adhan*. Participants who may be out in public during the call to prayer were particularly keen on this feature. Two options for silent alerts to prayer relate back to the negative experiences some participants mentioned when praying in public. The vibration or light alerts allow for the participants to be notified to pray without calling attention to themselves in public.

Additionally, the app provided options for choosing different *muezzin*. However, if the Muslim participants wanted to change the *muezzin,* they only had a few options unless they upgraded and paid for the full version of the app. One participant mentioned this while explaining how he was customize the *adhan* alerts:

There's a lot of *adhan* and most of them are locked, I believe those I need to purchase or something. There's a pre-*adhan* reminder, I don't think I'll use that. I think the only thing I'll use is actually the notification, and I think I would turn off the *Fajr* notification and I won't use the *adhan* notifications because the

adhan… I wouldn't like turning on the *adhan* on my phone. I would use it at home though, but I would turn ... I think the only thing that I would use here is the default notification sound. I think I can turn it on and off (Male Muslim Participant).

There are several important elements in this example. First, the participant notes that there are only so many *adhan* options to choose from unless they upgrade to the premium version of the app. Options are limited if the user is not willing to pay. Second, the participant notes which prayers they would use the *adhan* for and which they would not. He thought using it at home would be ok, but if he were out in public he would want to turn it off. This speaks to the issue of privacy in public spaces that the app allows for when using an app for religious practice. The options may allow the users to feel more in control of their practice through customization depending on context and the participants' preference. In this sense then, the *adhan* is connected to the reminders and alerts that are available through the app, which is discussed in depth in a subsequent section.

Find a prayer to pray. During the user tests, Muslim participants were also asked to find a prayer in the app that they were interested in praying and to pray it out loud if they felt comfortable. As in the Catholic tests, no direction was given to the participants about what type of prayer to choose. Rather, the question was meant to illuminate what aspect of prayer the participant first gravitated toward and to see how they engaged with it through the app. A little more than half of the participants naturally gravitated toward *duas* (M=12), but the others were either confused or said they were uncomfortable

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(M=9) praying out loud and moved to the next task. The responses to this question were driven less by what aspect of prayer the participants were interested in and more by the rules that Muslims must follow while praying, as will be explained in the sections below.

Duas. When asked to find a prayer that they were interested in, 12 participants looked to the *dua* section of the app. *Duas*, as mentioned previously, are the supplications and/or invocations to *Allah* that can be found in the *Quran* or other holy texts such as the *Hadith*. There are *duas* for virtually every time of day and for every occasion. Reciting *duas* at different times during *salah* is also required as part of the daily prayer practice. However saying *duas* specifically are not obligatory like the *salah*, but they are important an important part of prayer within the faith.

One participant did not hesitate when asked to find a prayer. She said, "I'll just find the prayer. I'll go into the *duas*. I'll go into the morning and evening, so we'll just say before sleeping…So I'm just going to read the prayer silently now." She found the prayer easily with no issues navigating to the section or finding the prayer she was interested in. Another participant was more descriptive of the *duas* available:

> Let's see in *duas* as well. Okay, this is before entering the toilet. (*Reading dua in Arabic).* It means, "In the Name of Allah, O Allah, I seek protection in You from the male or female unclean spirits." Okay, I like that. I like how it tells you what you should do when you wake up. Oh, yeah, this one, I need to know this one (*Reads dua in Arabic).* And it tells the translation, "Praise to Allah Who gives us life after He has caused us to die to Him is Him to..." Or whatever, we die again. "And to Him is the return." Okay, we return to Him (Male Muslim Participant).

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Again, there was no hesitation for this participant when asked to find a prayer. He actually read several prayers and noted that they were important ones to know for him. Of course, this engagement is reflective of the translation design approach. The *dua* text is digitized and is available to read on the app. Another participant chose to look up a *dua* that would speak to his personal situation:

> Okay. ... Let's see. Let's look at one of the *duas*... (*Reading in Arabic)*. I really
> like this *dua* for anxiety and sorrow, something I really deal with, just anxiety in
> general. I'm a very anxious person. This *dua* is really nice. Very important (Male
> Muslim Participant).

This example points to something that is invisible – the intuitive design. This participant had never opened this app before the test and was able to find a *dua* that related specifically to his personal situation. The navigation was effortless and it was easy for him to find what he wasted and pray.

Translating *duas* into digital text within the app differs a bit in the Islamic context because not all users may be able to read Arabic. "Muslim Pro" provided the options to read *duas* in Arabic, English, and in the transliteration (i.e. when the words of one language are represented phonetically in another language; Arabic sounds written in the English alphabet). This was very important for one participant who did not speak Arabic. When he was asked to pray out loud, he thought not knowing Arabic would be a barrier to him.

> I personally don't read Arabic. I usually memorize my prayers, so it's not really
> possible for me to do that, I don't think, but I'll go ahead for a shot anyways.

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(*Looking through the dua options)* Oh, wow, it actually has English translations. I've never actually spent the time to go through and understand *Tahaijud*. I believe that's one of the longest prayers in the entire book. That's great. I want to go through that. (*Reading a prayer)* They are those whom descend blessings from Allah, and Mercy, and they are the ones that receive guidance…(Male Muslim Participant).

For this participant, seeing the option to read the English translation meant that he could take part in reading and studying the *dua*. The design options here show that the developers took time to make sure different types of users would have access to the prayers.

There were some limitations however. One participant noted that there was no audio available and that they would like to be able to listen to recitations of the prayers as well as to have access to the text. He also noted that changing the text options for *duas* would be helpful as well.

Okay, "Seeking forgiveness and repentance", let's listen to this. Can I hear this? No we can't hear it. But I can read it. There's a translation. I'm just going to read this. The thing I did think is the typeface. It would be nice if it was the Uthmani script, the Indo Pak script. That would be quite nice if I could change the script type. Usually in these sorts of apps, you can hear it. You can change the colors so it kind of contrasts, that would be good. But usually you can hear it. The sound is on, but I can't listen to it unfortunately. That's a bit disappointing, but I can't listen to it (Male Muslim Participant).

Audio provides another level of engagement in prayer that app users want access to, according to the participant. The translation approach is helpful, but some participants wanted more interactive features that may push the design approach from translation to a mobile prayer environment. Some participants are not hesitant to make the mobile app a part of the prayer practice in increasingly interactive ways, which speaks to an understanding of technology and religion as compatible and adaptable within personal practices.

Confusion and/or discomfort. When asked to pray out loud, eight Muslim participants were uncomfortable doing so. Much like the Catholic participants, Muslim participants hesitated to pray specifically within the test environment. Here are two examples of participants who declined to pray out loud:

> I don't know about actually just sitting here praying just for the app, that's kind of weird (Male Muslim Participant).

> Unfortunately, I'm not very comfortable in actually performing any of these prayers (Male Muslim Participant).

The participants said it felt weird to pray for the app test and, in one case, referred to it as a performance. Therefore, providing more context within the user test descriptions may work to either defer some of this hesitation or to provide the participants more agency in declining to participant during part of the test.

Other participants who were uncomfortable seemed confused about what they were being asked to do. They were unsure if the task was referring to *salah* or *duas* and

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therefore declined to participate in this part of the test. For example, one participant talks through his confusion:

> Now…now I'm confused about the task. Okay find a prayer, okay prayer. Prayer but its not the time, so I don't know. I do this thing that I have to do this task, but I don't feel comfortable doing this and it's not an easy thing to do like that (Male Muslim Participant).

When listening to the audio of this participant you can hear the uncertainty in his voice. He is trying to figure out what exactly is being asked of him but he does not relate the task to praying a *dua*. Rather he thinks he is being asked to pray *salah,* for which there are very specific rules and guidelines. Two other participants communicated similar uncertainty. This is important in two ways. First, it is interesting that the participants did not think about *duas* as a prayer in which that they could engage for the task. Their minds never connected *duas* to the prayer practice. Maybe this was because they were nervous and just did not think about *duas*, but it could also be because they see *salah* as the main prayer practice and *duas* as secondary or unrelated. Understanding the disconnect would speak both to how the participants understand prayer and how developers would may need to adjust design based upon those understandings.

Second, these examples highlight an issue with the way the question was asked in the user test. While it made sense at the time not to lead participants to a specific type of prayer to see what they would be drawn to, the Islamic context is more complex because the differences between *salah* and *duas*. To explain, while both *salah* and *duas* are elements of prayer within the faith, the latter is more prevalent due to its obligatory

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nature, or the requirement to pray at certain times and in certain ways. It makes sense that the Muslim participants would be hesitant to engage in praying *salah* outside the prescribed times. *Duas,* although sometimes used as a part of the *salah* practice, are not obligatory in and of themselves. Rather, *duas* can be an additional way to pray outside of *salah*. The test question for some participants did not make sense. Therefore, researchers must craft user questions and tasks more carefully according to the religious and cultural practices of the participants being studied.

Summary of Muslim participants' engagement with religious affordances. The way Muslim participants engaged with religious affordances mirrors the faith's emphasis on daily practice. First, Muslim participants were most concerned with *salah* rather than *duas*. This makes sense because the five daily *salah* are obligatory for all Muslims while *duas* are not. Therefore, Muslim participants engaged with the prayer time affordances the most and were particularly surprised by the detail in the design, such as the sundial graphic. Next, participants engaged with the *qibla* compass, although a few had a hard time calibrating their devices to get an accurate reading. This is very important for Muslim participants because it is required to pray in the right direction for *salah* to be valid. Finally, in relation to *salah,* participants referenced the various *adhan* and the options to customize it by choosing the *muezzin,* and the alert sounds and signals. Again, most participants were pleased with the attention to detail and options available through the app. Finally, when asked to pray a prayer on the app, most participants easily found *duas* they were interested in and prayed them out loud. There

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were a few who were unsure of what the task was asking them to do, and/or were not comfortable praying during the user test.

Therefore, taking all of these engagements into account, Muslim participants were most concerned with prayer tools rather than prayer text. Specifically, Muslim participants were first concerned with *salah*, the times, direction and call to prayer options. This would be indicative of a translation approach to prayer app design because the app is simply digitizing prayer times, compasses, and *adhans* from the offline to the digital context. However, because of the interactive features developers used within the app, such as the sundial and interactive elements with prayer times, the mini-*qibla* compass, and the various choices in *adhan,* participants engaged with these features in more interactive ways, which could be considered on par with a mobile-environment approach. It is important to note that at the time of the user tests "Muslim Pro" did not have the digital *tasbeeh*, or prayer beads, available on the app. However, a recent update has included them within the app. Therefore, these findings in this section were limited in that participants did not have access to the interactive prayer beads, which is indicative of the mobile environment approach.

Summary of Catholic and Muslim participants' engagement with religious affordances. One of the key difference between the Catholic and Muslim participant observations is that Catholic participants were more likely to note the prayer texts available on the prayer apps, while Muslims participants were more likely to note the prayer tools, such as the *qibla* or the *salah* time features, that allowed them to pray at the correct time and in the correct way. For Catholic participants, the daily prayer and

searching for prayers were the main ways they engaged with the app. This may be indicative of a tendency to engage more with translation design approach affordances, such as reading prayer texts, rather than engaging with mobile environment approach affordances, such as the interactive rosary. Muslim participants engaged mostly with the prayer tools the app offered for *salah.* They noted the detailed features that allowed them to see the prayer times as well as how to set the direction for *qibla* and be alerted by the *adhan*. When asked to find a prayer to pray, most Muslim participants sought out the *dua* features, which indicate an engagement with the affordances of the translation approach design. However, some participants indicated they wanted access to more interactive features, such as audio, which also points to a desire to engage with the mobile environment approach.

Finally, a few Catholic and Muslim participants expressed discomfort or confusions when asked to pray a prayer out loud during the user test. For Catholics, some were just uncomfortable praying out loud. Similarly, Muslim participants were either not comfortable praying out loud, or were confused about praying *salah* when it was not the right time. In both cases, participants' discomfort with the tasks highlights the need to be more clear in phrasing questions and tasks as well as in providing additional ways for participants to decline to answer a question or complete a task within the user tests.

Two Key Technological Affordances of Prayer Apps for Catholics and Muslims

Within both the Catholic and Muslim participants' users tests, two key technological affordances stood out in the analysis: scheduling and remembering to pray daily, and sharing prayer texts or other content through the app to connect with others. Reminders and alerts are the features that enabled scheduling and remembering to pray and are important to explore more in-depth because they were prevalent within the developers' app descriptions, as described in Chapter IV, as well as within participants' app expectations, as expressed in the user tests and described in Chapter V. Reminders and alerts were also available in 36 out of the 65 prayer apps analyzed, and participants' mentioned their presence or lack of presence during their app user tests. Reminders and alerts also reflect ways in which technological affordances can be used as a tool for religious micro coordination of prayer and other religious practices and thus provide interesting insight into the role religious apps may play in daily religious practices.

Connecting with others through sharing prayer texts or information over social networking sites is another technological affordance that stands out in the analysis due to the few mentions it received in both the developers' app descriptions and by the participants app user tests. Even though developers did not mention sharing as much within the app descriptions, sharing content through social networking sites was a feature found in 42 out of the 65 apps analyzed in Chapter IV. The ability to share information is often touted as an interactive digital affordance that brings people together and allows for interaction within the users' various networks. Engagement, or lack of engagement, with sharing could reflect how users understand the solitary or

communal nature of prayer within their faith. It could also be indicative of the lack of clear design that renders sharing visible to app users. Therefore, it is important to see how users engaged or did not engage these affordances during their user tests.

Scheduling and remembering to pray through reminders and alerts. Twenty-six participants (C=6, M=20) mentioned reminders and alerts as an important part of the app. Nineteen Muslim participants mentioned the reminders and alerts feature available on "Muslim Pro." Indeed, there were many options for Muslim users within the app, such as choosing the *adhan*, using audio or light features, turning alerts on and off based on location, and customizing the type of alert used for each prayer. Only six Catholic participants mentioned reminders and alerts. This is probably due to the fact that "Laudate" does not have a reminder or alert option. The Catholic participants that mentioned reminders and alerts did so when asked how the app could be improved. This is important because Catholic participants also mentioned the expectation of scheduling and remembering to pray daily through the app. The sections below look first at how Muslims engaged the feature, and then at how Catholic participants discussed the importance of having the feature for their prayer practice.

It is important to note within this section, users often referred to reminders and alerts as notifications. As mentioned in Chapter IV, reminders and alerts can be considered a type of notification, but it was prevalent enough within the app textual analysis to warrant its own category. Therefore in this section, the term *notification(s)* is/are specifically referring to reminders and alerts.

Muslim participants' engagement with reminders and alerts. Muslim participants mentioned the importance of reminders and alerts when asked about their app expectations, and it was a feature that they noted often during the test. As mentioned previously, the reminders and alerts for prayer times had several options including the *adhan.* Within this theme, Muslims mentioned the sound control customization of reminders and alerts the most followed by the ability to change the reminder and alert for different prayers.

Being able to control the sound of the reminders and alerts was key for Muslim participants. They related this control to being respectful of others and maintaining their own privacy when in public settings. Therefore, the reminder and alert affordance was able to be customized to personal preferences and specific prayers. One participant explains why being able to control the sound of the notifications was important for him:

> Adjust notification for each prayer time… *Fakir*, *Maghreb*, *Isha'a*. What I like
> here is that the *Dhuhr* and *Asr* is being turned off. I'm assuming, maybe that's
> because ... it could be due to the fact that most people are in classes at that time
> or that's when they are at work. So, it kind of shows respect, because you don't
> want your phone going off loud while you're in an environment that doesn't suit
> that circumstance. So, so far so good (Male Muslim Participant).

For this participant, adjusting the sound control of the reminder was important to be respectful of others around him in public settings. Another participant described this control as providing flexibility:

It definitely offers flexibility for when I want any reminders, anything at all, which I really like because some apps don't let you do that and then you end up having your phone screaming five times a day. This is definitely great (Male Muslim Participant).

These examples are important because they show the need for detailed design that allows for individualized control. Reminders and alerts are often a basic feature with an on/off switch and may have a way to choose the sound that accompanies it. However, the "Muslim Pro" developers went beyond the basics, providing individualized reminders and alerts for different prayers as well as multiple ways to customize the alert, such as which *adhan muezzin* to choose, what sounds or buzzes to choose, as well as whether to be alerted through the LED light on the device. For participants, having this amount of control through the various options made them more comfortable using the reminders and alerts through the app, which may lead to more comfort engaging with the app during the actual prayer practice. Indeed, one male Muslim participant said the reminders were the most important feature to his prayer practice, "but having reminders such as the *adhan* reminder and using alarm volumes and things like that, the prayer names, those are the most important."

These descriptions of the reminders and alerts show how important they are for the Muslim participants in this study. The detail in the design and the options available gave the participants control to schedule and remember to pray in different contexts. This is important because it fulfills the participants' expectation of being reminded to pray so that they can maintain their daily practice. It also is reflective of a religious

micro coordination, as mentioned earlier. Much like mobile devices have been shown to be a tool in micro coordinating every day routines (Ling, 2004), the reminder and alert affordance provides users a way to coordinate their religious communication with God. Praying daily at the right time is the result of religious micro coordination, which is of utmost importance in the Muslim context. Therefore, the prayer app becomes instrumental in navigating daily life and maintaining daily religious practice.

Importance of having reminders and alerts for Catholic participants. As mentioned previously, "Laudate" did not have a reminders or alerts. Rather, the design of the app used a "daily prayer" section within the app to encourage praying on a consistent schedule. Much like the Muslim participants, Catholic participants mentioned the expectation to have an app that would provide reminders and prayer schedules so that they would remember to pray more consistently. Interestingly, only six of the 24 Catholic participants noticed the lack of reminders and alerts within the app. The participants who mentioned the lack of the reminder and alert feature only did so when asked how the app could be improved. One participant was quite detailed in his thoughts about adding this feature:

> I think if you start off the focus by saying "we're going to start prayer, here's a reminder to pray." Pushing something to remind you because it might get buried in a lot of people's apps, whether it's gaming or text messaging or checking their email, looking for a prayer might not be the first thing to pop into their mind unless it's pushed to them (Male Catholic Participant).

For this participant, the prayer app may get "buried" on his phone in the midst of all the other types of apps he has on the phone. So, he suggested a way for the app to give a daily push reminder (i.e. a notification that pops up on the device whether the app is open or not) to open the app and look at the daily prayer. Another participant explained what he was looking for:

> One thing I notice is that there's nothing here to set maybe a reminder or set someway for this to automatically notify me each day when the new prayer arrives, so maybe that would be useful here. Being able to set some time, say like I set, for an instance if I had an option maybe to say "Okay, everyday at 6 am send me a reminder when this prayer is released." Something of that nature. That way I can pray at the same time everyday (Male Catholic Participant).

The daily reminder was important for these participants. It is interesting that the other participants who did mention the feature when they were talking about what they expected from an app, did not mention it during their actual engagement with the app. Perhaps having the "daily prayer" feature was enough for the other participants to help keep them on a daily prayer schedule. However, more longitudinal studies need to be done in order to see how the daily prayer app is engaged long term.

To summarize this section, reminders and alerts were mentioned in the developers' app descriptions, were present within 36 of the apps analyzed, and were mentioned by participants either when discussing their expectations for the app and/or during their engagement with the app. The reminder and alerts can work as a way to micro-coordinate religious communication with God within the bustle of daily life. They

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are also a way to be respectful of others when in a public setting. While the reminders and alerts were a way for the individual to engage the app, another key technological affordance, aloud the participants to engage with others through the app, as discussed in the section below.

Connecting with others through sharing on social media. As mentioned previously, sharing was not highlighted within the developers' app descriptions in iTunes, but it was an affordance found within 42 out of 65 apps in the sample. Interestingly, many participants did not engage with sharing during the app user tests. When sharing was mentioned, participants briefly noticed it and then they moved on. For example, one male Catholic participant listed it along with other features on the app: "All right. You have the creed over here, as well. That's nice. All right. That looks good. I can share that with someone if I want using social media. All right. Looks good. All right." Most of the mentions were very brief like this one. There was no real discussion about the option just a mention that it was there. When asked to look at the customization features, none of the participants mentioned sharing as important to their prayer practice.

Additionally, there were a few participants (n=5) who did not realize the affordance was available in the app and mentioned it when asked how the app could be improved. This is important because it shows a lack in clear app design; participants did not even notice the feature was available. For instance, one participant said:

Actually since it is an app, I kind of think that you'd be able to post to social

media, like Facebook. Maybe you have daily verse that you would like to share

with your friends, family, followers. You should be able to just share that on Facebook or twitter or whatever you might use. Maybe you want to spread the word or you want to spread the word about the app. And you want to share that. So you have friends who are also Muslim or within the same religion as you. You want to send it out to them and have them sign up or download the app too. So that they can see all of the benefits that you have. I didn't see an option to share or log in via social media. I think that would be a little cool as well. That's the only limitations I've seen so far (Male Muslim Participant).

To be clear, all of the share options mentioned in the example above were available within both apps. Therefore this is an important example because it may speak to the app design. Perhaps participants did not mention this affordance as much because the design did not adequately display it on the interface. Figure 16 shows how both apps presented the sharing features. In "Laudate" the share button was located in the footer toolbar on the right hand side of the screen. It wasn't really hidden, but it blended in with the other options in the menu. In "Muslim Pro" the share feature was hard to see. If the participant were reading a *dua*, they would have to touch the three dots as the top left of the text. Then participants would have to know they needed to touch the purple circle with the arrow in it in order for the share options to pop up.

Of course, the lack of attention sharing received could also be because participants were not interested in sharing their prayer practice with others. Recent studies on Evangelical Christians showed that participants thought of their religious practice as private (Bellar, 2016). The participants in that study also mentioned the share
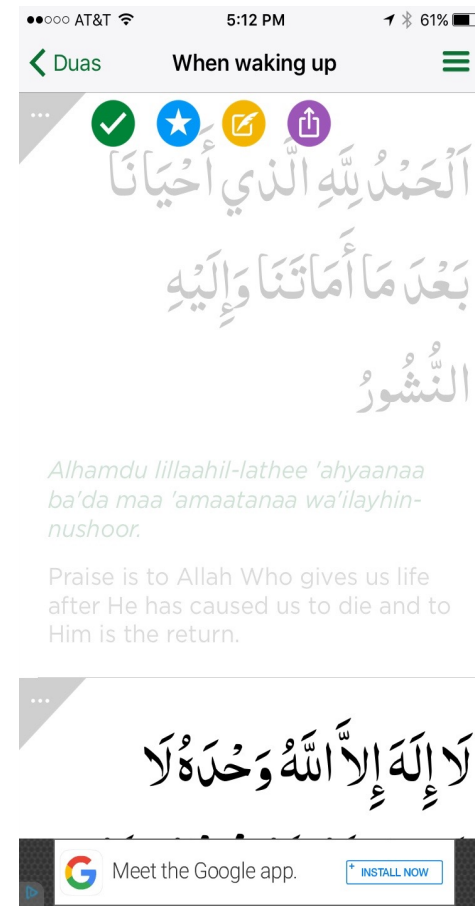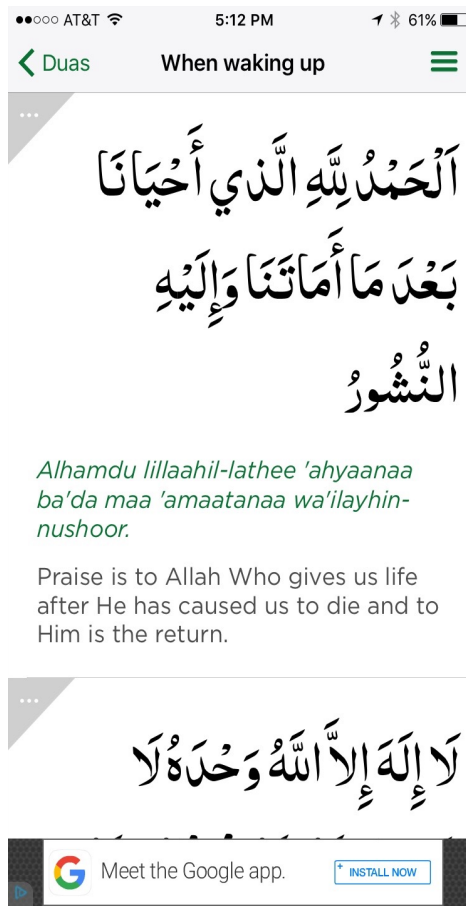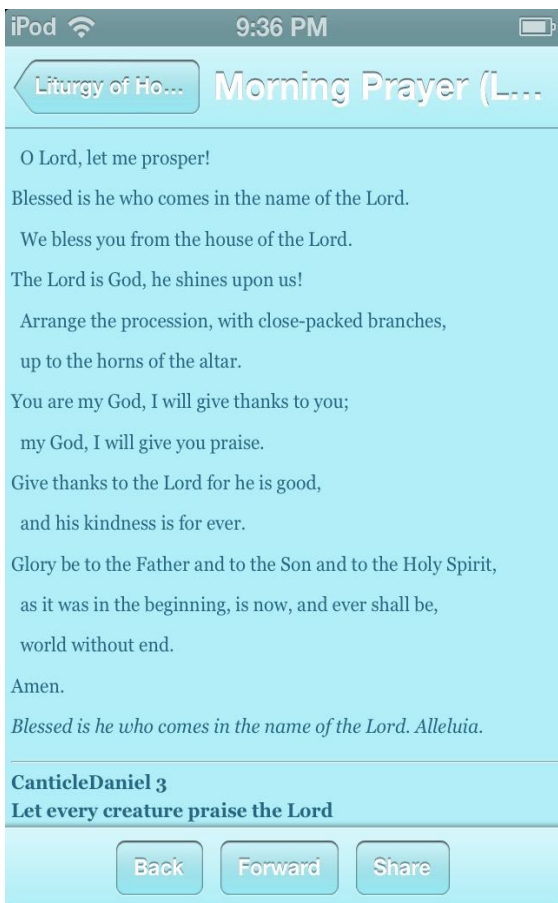
Figure 16: Sharing. The image on the right shows a typical prayer screen with the share feature listed at the bottom of the screen. It is somewhat hard to see and blends in due to the color choices. The center and left images shows the steps a user must go through to find the sharing feature. First, the user must touch the gray triangle on the left hand side of the scree (see center image). This opens features for the user to engage (see left image). The purple icon with the square and arrow is what the user must touch to share the prayer text. Right image reprinted from Laudate. Center and Left image reprinted from Muslim Pro.

feature but rarely engaged with it. Therefore, the lack of interest in sharing prayer apps or content within the current research seems to support the finding that some religious practices are not suitable for sharing through religious apps. However, more needs to examine the sharing affordance in more depth across different religions and different religious practices to make more specific claims about sharing content.

Summary of part one. Both Catholic and Muslim participants seemed to gravitate toward the prayer features that are indicative of the translation design approach. Catholic participant focused most on the type of texts that were available to them for prayer. They navigated toward the daily prayer feature and searched for specific prayers when asked to find a prayer to pray out loud. However, some Catholic participants did notice the interactive rosary feature even if they did not engage with it. This could be due to the unclear design that rendered the feature invisible, or due to the limited time users had in the user test. It does indicate though that there is some interest in engaging with more mobile environment design approaches. Finally, a few Catholic participants were uncomfortable praying out loud within the test environment. The uncertainty and discomfort shows more care needs to be taken within this type of user test to provide participants with multiple ways to decline participation in specific tasks.

Muslim participants engaged most with the *salah* times, *qibla,* compass, and *adhan* reminders and alerts. While these features indicate a translation approach to prayers, they were designed to engage more interaction with the participants rather than merely reading information. For instance, the sundial interactive graphic gave participants a unique way to understand and engage with *salah* time information. When

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asked to find a prayer to pray, most Muslim participants navigated toward the *duas* within the app, which are also indicative of the translation approach design. This makes sense within the religious understanding between *salah* and *duas*. *Salah* are the five daily obligatory prayers that can only be said at certain time and in certain ways, whereas praying *duas* is more flexible. There were also some participants who were confused about the question in this part of the user test. They either did not understand *duas* to be a prayer practice or they were uncomfortable praying out loud in the testing environment. Again, this finding shows the importance of tailoring the questions to the specific cultural context as well as providing participants multiple options so that they understand the question or feel comfortable declining to participate in the task.

Therefore, both Catholic and Muslim participants engaged with translation approach religious affordances, such as reading prayer tests and accessing tools to use before prayer. However, there were indications that participants were interested in more mobile design approach features through interactive rosaries and audio engagement during *salah* and *duas*. Therefore, a key finding from this research shows that participants engage with translation design approach either because they understand prayer apps replace offline prayer texts and tools, or because the design of the app limited participants' understanding of the more interactive features available.

This section also examined two key technological affordances: scheduling and remembering to pray through reminders and alerts, and connecting with others through sharing. Muslims participants mentioned the reminder and alert feature the most and were impressed by the variety of options they had, such as selecting different *adhan*

alerts, vibrating alerts, and LED light alerts. Participants also liked that they could set different types of alerts for different prayers. While Muslim participants had a lot of options, Catholic participants did not. The "Laudate" app did not provide any reminder and alert options. Rather, "Laudate" structured a daily prayer practice by providing a daily prayer feature. Catholic participants only noted the lack of reminders and alerts when asked what the limitations of the app were. Therefore, reminders and alerts are an important feature as seen within app descriptions, the apps themselves, participants' app expectations, and participant engagement with apps. Reminder and alert engagement also indicates the use of prayer apps as a type of religious coordination, or a way in which the mobile device becomes important for organizing the participants' everyday lives so that consistent communication with God takes place when and where it is subscribed to.

Finally, part one of this chapter also highlighted the importance of the connecting with others through sharing. Although sharing was not explicitly mentioned within most app descriptions, it was found in 42 out of 65 apps. Participants in the user tests also had the option to share different types of content through social media, such as Facebook or Twitter. However, participants only mentioned this feature in passing and did not indicate that it was particularly important for their prayer practice. Some participants did not even notice the sharing features, and mentioned them as something that the app should have when asked about app limitations. This lack of engagement from participants may indicate that they are not interested in sharing prayer related activities through social media, which would mirror similar findings of Evangelical Christians'

engagement with religious apps (Bellar, 2016). However, the lack of engagement could also be due to design issues: the affordance is sometimes hidden within the user interface. Therefore, designers may need to rethink how they are designing ways to share information and content through religious apps.

Part Two: Participants' Understanding of Using Mobile Apps for Religious Practice

The final phase of the user tests asked participants to reflect upon what it means to use a mobile prayer app. How participants understand their prayer app use reflects on the ways they adopted, rejected, or reshaped the technology, as highlighted within the Religious Social Shaping approach. The RSST argues that the way participants understood and engaged with the prayer app is based on their previous understandings and experiences of prayer within their religious community. Therefore, participants' app experiences within the user test provide a basis for their future engagement with new technologies and religious practice. Each experience and understanding of a technology builds upon past experiences and informs new experiences.

While there were some similarities among Catholic and Muslim participants in relation to how they made sense of using a mobile app for prayer, their responses to this question are better served by looking at them within each religious context separately. Part one of this chapter showed how participants engaged with technological and religious affordances; part two reflects upon participants make sense of this engagement in relation to their religious lives. This is important because it provides insight into how

religious individuals negotiate with integrating relatively new mobile technologies into their religious practices. The following sections explore how Muslim and Catholic participants talked about their feelings related to using a mobile app for prayer and how these feeling speak to the larger issue of the relationship between technology and religion.

Muslim participants' negotiation with mobile prayer app use. For the most part, Muslims participants reported that "Muslim Pro" was beneficial for their prayer practice. To illustrate, one male Muslim participant said it simply: "Technology is moving on. We should use whatever is available." Indeed, some participants compared accepting mobile apps as a means for religious practice to Islam's history of engaging with and using media. For example, a female Muslim participant said:

> This is where technology comes in. Technology has become integrated into praying as well. I think it's great. I feel like our religion goes back to 1400 years ago, but the Muslims have made enormous progress with technology. Keep in mind, that if prayers can be attended to at its required time, and if an app is going to support you during that, then it's absolutely awesome. (Female Muslim Participant)

For this participant, the past use of and progress with technology encouraged and validated the use of mobile apps for prayer in her current life. She also noted that if technology helps Muslims complete their daily prayer in the correct way, then it should be used. Therefore, these two examples show a wholesale acceptance of technology as appropriate and useful for religious practice.

Even if Muslim participants did not state their acceptance of the religious apps in such explicit terms, they did have positive feedback about how the apps could help their prayer practice. For example, this quote from another participant speaks to this positive view of technology through affordances for remembering to pray daily and for having access to prayers on the go, as discussed earlier in this chapter:

Well, like I said to you, it's good because sometimes you need it, you know? Sometimes you need to ... sometimes you might not memorize the specific prayers for the specific times, places, etc. The fact that they're there for you is a reassurance that if I forget this word, or if I don't know this prayer then I can always just read it here, you know? That's the good thing. And like I said to you, people who are new to the religion, people who might not speak the great Arabic but who want to read the prayers, without going out of their way and probably feeling too shy to ask somebody, the app's already here and you can do it in the comfort of your own home. You can do it wherever you are, on the bus, on the train, in your car, you know? Definitely this is very good. I really respect the creator this app because they definitely put in an effort just to get it across to different people with different knowledge abilities (Male Muslim Participant).

This example is representative of the comments most participants made about praying with an app, in that they pointed to the technological affordances of accessibility and ease of use to support their prayer-related concerns. Similarly to the previous participant, other participants mentioned the app would be useful for those new believers. Another male Muslim participant said, "The good thing about praying with assistance on an

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application is that it helps to guide you through a lot of important things to know. For younger Muslims, they're not as knowledgeable and the app does help to guide through that." Therefore, the app provides a reference for newer adherents of the faith to make sure they pray at the correct times and in the correct way.

A few participants did not give a wholesale stamp of approval for app use. Instead they offered their idea of how the apps should be used in different times and places. Therefore, they negotiated through good and bad outcomes of app use to create and justify their own use of apps for prayer. For example, one talked about restrictions of using apps for entertainment, but concluded that using the app was appropriate for him:

> Talking to the bad (of using the app). *Allah* have (sic) always restricted us from using stuffs for entertainment. Allah have always praised to live a simple life and using a prayer applications especially for prayers can create issues with that belief. Because according to me, smartphones are also way of entertainment. It's useful but it's also a way of entertainment and using these electronic items while performing prayers is, I think…would be considered not good. But even though I would use this app because of its usefulness and its mobile phones, and smartphones are also considered as useful stuff. The things that are useful to human life and important for human life I think are allowed to use in my life. I would use this app (Male Muslim Participant).

This participant is grappling with using his phone for both entertainment and for prayer. For instance, having a prayer app next to a game app on his phone may feel

incompatible. However, he points to the inherent usefulness of the app for prayer and determines that this type of use is appropriate.

Two other participants created their own set of rules for app use and determined when it would be helpful or harmful for their prayer practice. For these participants, the app should be used to prepare for prayer, but should not be used within the prayer itself. One participant explained:

> I'd use it. I'd use it a lot actually. Especially when I'm praying, I'd use it. I never usually use my phone when praying.... I don't really associate it with my *Salah*, but right after this (praying), I'd probably use this a lot more. It'd be on all the time, telling me when to pray with the alarm. I'd do everything that it sets out (Male Muslim Participant).

To clarify, the participant is saying he would not use the phone during his actual *salah*. Rather, he would use the phone to remind and alert him to the times to pray and the direction, etc. Therefore, for him it is ok to use the app as precursor to prayer and as a guide post-prayer; it is not ok to use it during the prayer practice itself. Another participant said something similar when asked what he thought about praying with the assistance of a prayer app:

> I don't think I would like to pray with assistance of an application. I would use this application to remind me of the timings of the prayers but praying does not need assistance of application for me. I don't think that's how I will use the application to pray in assistance with the application. I don't know if it's good or bad, I didn't try it and I will not try it. What I think is that the application will be

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good at reminding me of different prayer timings and all other features that's

included (Male Muslim Participant).

For these two participants, the app is separate from the practice. Even though there are

features that provide a mobile prayer environment, these participants were not

necessarily comfortable using it that way. This speaks to a negotiated use of technology.

Even though there are technological and religious affordances available for use during

prayer, the participants were not necessarily engaging with those technological and

religious affordances.

Similarly, there were participants who were concerned that they already relied

too much on technology. Therefore, they wanted to use the app for prayer but worried

that they may become even more dependent on technology within their everyday lives.

As one participant said:

As you may realize, today's day and age we've come to a point where we're very

much dependent on our phones. It's not just a basic phone. It's a smartphone.

We're constantly on it, and we're constantly interacting with our phones…. You

are still prioritizing what is important to you, which is prayer. But, you're still

getting your other tasks done as well. You're able to attend to your other chores

and duties and responsibilities (Female Muslim Participant).

Again, the good and the bad aspects about technology are being dealt with in the

participant's comments. Being dependent on her phone may be problematic, but at least

she is getting things done and prioritizing prayer at the same time. In addition to

worrying about being dependent upon technology, another participant pointed out that

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the elderly may also judge him for being reliant on his phone for religious purposes. He said:

> I guess the only thing that's bad is maybe you would rely on it too much. Or at least I know a lot of the elderly people in my religion would kind of look at you weird that you're using an electronic device to help you pray. That's the only bad thing I can actually see about it are the looks from elders who aren't as tech savvy as most (Male Muslim participant).

Here again is the issue of age in relation to the technology. It was seen as good when used by younger Muslims to learn, but could also be looked down upon by the less tech savvy, elderly, religious adherents.

Finally, it is interesting to note that only one participant mentioned an *imam* as a source for guidance in this issue. This is significant because traditional religious authorities, such as *imams,* were used to frame the authenticity of app use by developers within the app descriptions, as mentioned in Chapter IV. However, there were few references to religious authorities within the apps themselves and within the participants' answers in this part of the test. The one Muslim participant who mentioned an *imam* said:

> Most of the time, like every prayer, I know if you go to the mosque, the *Imam* will tell you, "Pray as if this is your last prayer," and I think that's how they all feel. You should…focus on the prayer directly and not on anything else (Male Muslim Participant).

Importantly, this participant uses the *imam* to show how praying with an app may be problematic because Muslims should focus only on the prayer. Therefore, the app may draw focus away from the prayer. This example is the only one that mentioned the religious authority of an *Imam* in connection with participants' thoughts on praying with an app. This could be just a coincidence of this particular set of participants. However, it could also be indicative that participants are unconsciously buying in to the app's algorithmic authority, or the way the app presents information as true and/or how it structures users' actions. Not questioning or thinking about the instructions of a religious leader could be evidence of a move toward the individualization of religion in a minor, but important, way.

The Muslim participants mostly accepted religious app use outright. They noted that technology has been used in the past and if it is helping and not hurting religious practice, then it is ok. Other participants had a negotiated response and noted the bad and good aspects of using a prayer app. For these participants, app use and prayer should be kept separate. Finally, only one participant mentioned his *imam* as a source for negotiating the use of prayer apps. This lack of reference to religious authorities by the other participants could be indicative of a reliance on algorithmic authority over religious authority.

Catholic participants' framing of prayer app use. Similarly to the Muslim participants, most of the comments about understanding the use of an app for prayer were positive. Some participants did explicitly state their support app use for religious practice. For example, one female Catholic participant said, "It truly is a mobile, digital

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version of church." Another male Catholic participant echoed this sentiment saying, "It almost became like a portal into my belief." These are all-encompassing statements that show an understanding of the compatible relationship between mobile apps and religious practice. This compatibility points to a symbiotic relationship between technology and religion as a whole. Participants who accepted technology and religion as compatible seemed to use the mobile app for prayer without concern. For these participants, there was no real downside into using the app for or during prayer. One participant who engaged in an emotional prayer during the app test explained that she felt love no matter the mode of her prayer: "I feel love all around me. I feel, that I feel every time after I pray. In my own prayer… this is a written prayer, but it doesn't diminish its value for me." For this participant, reading the prayer through the app did not impede her prayer experience. Therefore, she and other participants like her accepted and used the mobile app for prayer practice.

Other participants were not as explicit in their feelings that the app and religious practice were compatible. However, much like the Muslim participants, their positive view about using technology for religious practice was implied through their positive appraisals of different technological and religious app affordances. For example, one participant pointed to the large amount of content available through the app:

In fact, it kind of exceeds my expectations a little bit in terms of the content available to me. The different types of prayers. The different types of novenas. Just the sheer amount of things that I can do with this app. I thought it would just

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help me with rosaries and daily readings and some basic prayers, but it's very

comprehensive (Male Catholic Participant).

While this participant did not state his explicit endorsement of prayer app use, his

comment implicitly advocated for app use when his expectations were exceeded.

Similarly, most participants implied a compatible relationship between technology and

religion through statements that endorsed the technological and religious affordances

available through the app.

However, there were a few participants who felt uneasy or uncomfortable with

mixing the sacred practice of prayer with the secular object of a mobile device. For these

participants, adding a mobile app into their prayer practice felt uncomfortable. One

participant explained these conflicting feelings:

Now, there is potentially a downside as well and that is that... I still feel that my

belief, my religion, the way I interact with my religion, so to speak, it feels weird

-- I don't know how to phrase this differently than that, and so if I'm not finding

the right word -- It feels a little bit confusing or weird to bring a digital device

into a habit that is so steeped in tradition. I mean, my parents were of Catholic

faith and me and my wife are -- I guess we've never used electronic devices as

part of exercising our religious activities. For me, it's a little bit of a different way

of looking at it. It's not bad. It's just that it feels -- It doesn't feel natural for me

that when we pray, I'm grabbing my phone. It's almost as if I want to distance

myself from the modern distractions, so I want to distance myself from

computers and tablets and phones. By bringing the phone into a prayer, I feel like

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it could potentially bring some of that unwanted disturbance... in an environment

that I want to keep clean from any sort of disturbing text or calls. I'm not sure if I

explained this correctly, but it feels like it's infusing an element that normally I

try and exclude from intimate moments like praying (Male Catholic Participant).

This example is representative of the few Catholic participants who felt some unease

with mixing technology and prayer. There are several important elements in the quote to

break down. First, the hesitancy with which he describes his uneasy feelings is apparent;

it takes him a while to figure out how to communicate the uncertainty of combining

technology with religion. Part of this unease stems from a lack of experience with using

technology for religious practice. It was a new experience for him, and therefore, he was

instantaneously processing the implications it may have on his religious life. Another

participant also experienced this discomfort:

I don't want to say it was awkward praying while using my phone, but I would

say that it wasn't the same as praying without my phone and just by myself with

my eyes closed, and connected with God. It just didn't feel the same. I think, I

don't know, I like that it has the prayer, and I think that I like that it gives it to

you like that. I just feel weird reading a prayer from my phone (Male Catholic

Participant).

Part of the unease, then, stems from the act of praying with a phone in hand, which is a

new experience and a departure from their previous offline prayer practice. For some,

the intrusion of the phone into an established offline religious prayer practice may be too

much of a change from the norm.

Second, the merging of sacred and secular was troubling for some participants. Some participants thought the religious and secular worlds had been kept separate within their offline religious practice, so to incorporate a secular object that is used for religious purposes felt inappropriate. For one male Catholic participant, the offline practice felt more sacred: "I guess the act of reading a prayer off a book page feels a little more sacred than reading it off my phone screen where I go on Facebook or I use Snapchat or something." The same device is being used for two different, and sometimes opposing purposes. For this participant, Facebook and Snapchat are separate from his religious life and therefore he connects his phone with the secular. So when suddenly he is asked to use it for the sacred, it feels wrong. It remains to be seen whether participants who feel this way will try to use the app or will revert to offline prayer practices.

Third, participants who felt the separation of the sacred and secular said they did not feel the same connection with God when using the app as they did with technology-free prayer. Therefore, instead of helping the participant connect with God, it hindered a connection. One participant said:

> What's bad about this, I would say is that you sort of loose the connection that you get from hand-free or just time alone with God. I sort of feel like using a cellphone is taking away that, not entirely of course, but is not giving you the full connection that a conventional prayer would give you. That's just my personal opinion (Female Catholic Participant).

Incorporating the app into a prayer practice feels awkward, which leads to unease and a disconnect in their communication with God. Of course the point of prayer is to

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commune with God, so if the phone is causing this disconnect during the prayer practice, it may be safe to assume that the user will not maintain their prayer app use for long. However, more research needs to explore long-term use of apps in religious contexts to see if this is the case.

Finally, other participants were not concerned so much with using an app for prayer, but rather with the context in which the phone was being used. Private prayer app use was ok; public prayer app use was not. Therefore, participants negotiated app use by developing their own rules for use. One participant told a particularly vivid story of an experience where a religious leader was using his phone during mass.

First off, I wasn't a big fan of the guy to begin with, let's just put that out there, but then, you see this guy in church, supposed to be a youth leader and he's sitting there on his phone and everyone is just like, what is this guy doing? That's just really aggravating. I later found out it had like the rosary or something on it and it was sort of a rosary counter or it had readings on it. I'm not sure exactly what it was, but it turned out it was some sort of thing for an aid, sort of thing. That's (church) not really the place for that. ... I honestly thought that when that guy was using it, I was just kind of like, he's just showing off right now. Okay, sweet man, you got your little app on your phone, but you know, church is not really the place for that. Anywhere else, yeah it's fine, you can do whatever you want, but I don't know. It was just distracting (Male Catholic Participant).

There are three important elements presented in this example. First, the participant felt that church is not the time or place at which to use your phone, even for religious

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purposes. Therefore, if the user is in private and not going to be a distraction to other worshipers, app use is fine. However, in corporate worship with others, the phone is too much of a distraction and needs to be put away. Second, the example involves a religious leader, who may be held to a higher standard than other church attendees. It is appalling to the participant that a religious leader would be such a distraction in church. Religious leaders, the participant felt, should be an example in public for how others should act. Third, there was an accusation that the religious leader was showing off by using technology in church. Therefore, the phone was being used as a status symbol, which is not appropriate for religious leaders or in a place of worship.

To be clear, opposing use of mobile apps in church is a minority view represented within the participant user tests. For example, other participants wanted to incorporate the phone even more into the physical church scene. One participant said:

Perhaps this might replace when you're at church instead of your pamphlet, your handout you get at church, you might just follow through the order of the mass. This would be maybe for a newcomer in the Catholic faith who doesn't really understand the order of the mass (Male Catholic Participant).

Therefore, for this participant use of technology was fine in the physical setting of corporate worship and could be adopted for use within other Church activities. Therefore, religious apps may cause some social disturbance when used in public worship when some users do not see a problem with it and others find it distracting.

To summarize, within the Catholic participant group there is a mix of acceptance of technology for religious practice, discomfort with incorporating a new technology

within an established offline practice, and concern over the time and place of app use in general. Therefore, most of the Catholic participants accepted the use of mobile applications for prayer outright and indicated a symbiotic relationship between technology and religion. A few Catholic participants struggled with the line between the sacred and secular; using their phone for games and entertainment on the one hand and then using it to pray on the other felt weird and wrong. Finally, a few participants had a negotiated view of mobile app use for prayer and developed rules that prohibited use in Church.

Chapter Summary

In part one, this chapter presented data from the user tests that asked participants to find a prayer they were interested in and then and to pray it out loud. Results from this data show that Catholic participants were more likely to note religious affordances that provided access to prayer texts and information. For instance, most Catholic participants chose the daily prayer feature when looking for a prayer for the test. Choosing the daily prayer feature is in line with their expectations that the prayer app would help them remember to pray daily. Other Catholic participants searched for specific prayers. Both the daily prayer feature and searching for specific prayers led Catholic participants to prayer texts specifically. Reading prayer texts is characteristic of the translation design approach as discussed in Chapter IV. Therefore, this may indicate that Catholic participants are more likely to engage with technological and religious affordances that provide translation features. However, the lack of engagement with more interactive

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features, such as the interactive rosary, could be due to limitations with app or with the amount of time users had to complete the user tests. For example, the interactive rosary option was not readily apparent on the homepage. Rather, participants had to scroll down and go through several levels of app pages to see the interactive rosary, which could have been why it was not engaged with more. Additionally, Catholic participants only had twenty minutes with which to complete the user test; the rosary takes 10-20 minutes to pray and therefore users may have avoided a longer prayer when choosing one for the test.

Muslim participants tended to focus on the religious affordances that worked as tools with which to pray in the correct way. For instance, participants were most likely to engage with the *salah* times, the *qibla* compass, and the *adhan* alerts. Additionally, when asked to find a prayer to pray, most Muslim participants chose a specific *dua,* which was presented in Arabic, English, and transliterated text. Again, engaging in these specific religious affordances points to a translation design approach. The app is used to find prayer text and information but not used within the actual prayer practice. However, when engaging the text and information, some Muslim participants mentioned wanting access to more interactive tools, such as audio and other media options. Therefore, Muslim participants may also be interested in engaging with religious affordances that are designed within a mobile environment approach.

Part one concluded with an in-depth exploration of two key technological affordances, remembering to pray through the use of reminders and alerts, and connecting with others through sharing prayer content on social media sites, such as

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Facebook and Twitter. Muslims participants had more options for reminders and alerts and were surprised by the amount of customization available in terms of using an audible alert, a vibrating alert, or a silent alert using the LED light on their device. Although Catholic participants did not have access to reminders and alerts, they did engage with the daily prayer feature, which could also be seen as an affordance that helps them remember to pray daily. Still, Catholic participants mentioned the lack of reminders and alerts and said they should be added to the app to improve its functionality. Connecting with others through sharing was also a key technological affordance because of the *lack* of engagement from participants. While sharing was available on 42 out 65 apps examined in Chapter IV and was also available on both the Catholic and Muslim apps tested, participants only mentioned it in passing and none of them actually engaged the feature. The implications of this lack of engagement are twofold: maybe participants are not interested in sharing their personal prayer practice through social media features on the app, or maybe participants did not really notice the features because they were buried within the user interface design. More research needs to be done to understand how religious participants understand the sharing features and how they want, or do not want, to share religious practices within mobile app contexts.

Part two sought to explain the different ways participants processed using a prayer app for religious practice, which also illuminates how participants may understand the relationship between technology and religion as a whole. The majority of both Muslim and Catholic participants did not see a problem with using religious apps for prayer. Indeed, participant reports from both faiths indicated a symbiotic relationship

between religion and technology. However, there were a few participants from both faiths that did have some reservations about using prayer apps. Muslim participants who took this view often mentioned that app use and prayer should be kept separate. Some Catholic participants similarly had mixed feelings about mixing the sacred practice of prayer with secular mobile technology. This was especially the case for participants who said they felt uncomfortable and ill at ease using their phones within an established offline practice. Finally, some participants negotiated mobile prayer app use by developing rules for when and where to use them. For Muslim participants, as mentioned before, the app and prayer should be separate; for Catholic participants use in church should be restricted.

Key Findings from Chapters V and VI: User Testing Reports on App Engagement

By looking at the findings reported in Chapters 5 and 6, we find several important themes emerging. Religious micro coordination is the first key finding that was touched on in each of the four parts of the analysis. Religious micro coordination refers to the ways in which religious mobile apps help users plan, schedule, and track their religious communication with God/*Allah* on a daily basis. Participants expected religious micro coordination affordances to be available in the app through prayer schedules, and reminders and alerts. The reminders and alerts feature was emphasized in the design of "Muslim Pro" through multiple options and customizations as discussed in part two. Muslim participants also engaged these features the most through the *salah* times and reminders and alert options. The Catholic app, however, did not have a reminder and

alerts function. Participants either found the daily prayer option to be an adequate feature to keep a daily schedule, or they mentioned the lack of this feature when asked how the app could be improved upon. Finally, when participants were framing their app use, Muslims mentioned how the app use was separate from the prayer, which points to a functionalist understanding of how the app should be used in religious practice. Therefore, the app is made of offline content that is translated into digital features to be used as a tool, but not necessarily for prayer itself.

The second key finding showed that, for the most part, participants' app expectations and developers' app descriptions aligned in the way prayer was framed. The main understanding of prayer for both religious participants was to communicate with God/*Allah*. This shows compatibility between common understandings of prayer within both religious traditions and within how technology is to be used for religious purposes. There were a few key differences though. Participants placed more emphasis on giving thanks to God/*Allah,* which could be an important frame for developers to understand and implement within their descriptions and design. Second, Catholic participants also mentioned how they hoped the prayer app would connect them with others in the faith. Developers rarely mentioned this in the app descriptions. However, they do provide means to connect digitally with app sharing affordances through social media networks. Sharing affordances were available on both apps; however, participants either mentioned it in passing or did not notice that it was available. This highlights either an understanding of prayer as a private practice, or an inadequate user interface design.

Third, participants from both religions tended to engage translation design features, such as accessing prayer text and information when they were asked to find a prayer to pray during the test. Catholic participants gravitated toward the daily prayer feature, while a few searched for specific prayers. None of the participants looked at the interactive rosary option. Muslims participants used the app mostly to get information about prayer times and directions, and to set *adhan* reminders and alerts. They focused on prayer app features rather than prayer texts. However, when asked to find a prayer, more than half of participants looked up specific *duas*, which also reflects a translation design approach. Therefore, these findings show participants who are more interested in the translation approach than the mobile environment approach to prayer app design. This could point to functionalist approach to understanding the relationship between technology and religious practice, meaning that prayer apps are used merely as a tool rather than as an integral part of the prayer practice. It is used to aid practice, but does not necessarily become part of the practice itself.

Finally, the way participants understood their engagement with prayer apps during the user tests underscored how they framed the relationship of technology and religion. First, most participants of both faiths seemed to accept technology use for prayer practice outright. There were explicit and implicit statements supporting this view. In this case, it seems as though the users are taking the algorithmic authority of the app at face value. Their framing of prayer aligned with that of the developers and they are not questioning the inherent choices and actions being presented by the app.

However, a few participants within both faiths took a more nuanced view of prayer app use, such as time and place restrictions. For these participants, apps could be used privately but should not be used during corporate worship. There was also a fear of relying on technology too much, which could interfere with the participants' connection with God. Also, only one participant from either faith mentioned any guidance in their use from traditional religious authorities such as priests or *imams*. This could be reflective of users being drawn to the practice of picking and choosing their own understandings and practices for religious practice and app use outside the purview of religious authorities. In these cases, religious app use could be seen as encouraging or leading to the individualization of religion in some respects. For example, participants are able to individualize the content and tool they are more interested in using, which leads to a different practice for different users based on individual preferences. However, more work needs to be done on the role religious authorities play in religious users choices and engagement with religious mobile apps.

These two findings - users who readily accept the app and its meanings and actions, and those few users who question and want to reshape the technologies - underscore an important theoretical assumption with the SST and RSST frameworks: the relationship between technology and society is reciprocal. That is, technology has the capability to influence users in certain ways, while users have the agency to accept, reject, and restructure technology to fit their needs. Algorithmic authority seems to underscore the technologies ability to control the definitions and actions taken by the participants who readily accepted the technology. In this case, technology is influencing

users understandings and actions. However, there were those participants who questioned the underlying assumptions of the role of technology in certain contexts and they created rules and regulations of use to address their concerns. They reshaped the app's use based on social and cultural expectations and norms and therefore negotiated their use of the technology. Finally, the two participants who wanted to restructure the app itself, point to the ability of users to reshape technology. They questioned the content that was included in the app and the structure in which it was presented. They wanted more control over the meanings and actions that the app was structuring. These findings show the reciprocal process of the relationship between app and user, technology and society. In some cases, the algorithm structures action and meaning; in other cases, users negotiate with meanings and actions and may seek ways to reshape the technology itself.

These findings are also important because they provide greater insight into how prayer apps communicate and construct prayer through technological and religious affordances, and also into how participants engage those technological and religious affordances during prayer app use. Therefore, the findings add to literature on mobile communication by showing how religious mobile apps are used within a specific group for an important cultural practice. It also contributes to the literature on religious mobile apps, which thus far has focused mostly on textual analysis of religious apps and self-reported data from users after app use. The contribution to this literature is twofold: first, it shifts the focus from simply analyzing the apps to the app users' decision making, which needs to be studied in more depth. Second, it provides a view of user engagement

at the time of app use, instead of only relying of self-reported data from interviews and surveys. Finally, the findings contribute to the literature on affordances by identifying and defining the technological and religious affordances found in Catholic and Islamic prayer apps, and showing how users interpret these affordances during their religious app engagement.

CHAPTER VII

CONCLUSIONS AND DISCUSSION: IMPLICATIONS OF FINDINGS FROM ANALYSIS OF CATHOLIC AND ISLAMIC APPS AND THEIR USERS

The use of mobile devices within peoples' everyday lives is growing every year. In fact, use of mobile devices for internet surpassed that of desktops in 2014 (comScore Mobile Metrix, 2016). Additionally, those who use mobile phones spend 90 percent of their time on apps when using their mobile devices (Flurry Analytics, 2015). Mobile apps touch many different aspects of life including, as this dissertation argues, religious life. This research has explored certain ways the ever-increasing use of mobile devices is intersecting with different religious contexts. By addressing questions about how apps communicate and construct prayer practices through technological and religious affordances, and also how users actually engage with those affordances during prayer app use, we have learned that although there are three different design approaches found within the prayer apps studied, participants mainly engaged with only one of those approaches in their actual app use. Also, issues of religious authority and algorithmic authority came into play in the app descriptions, the app design, and more implicitly within the user tests. Additionally, religious micro coordination is a key affordance found both within the religious apps and as an important aspect for users as reported in their user tests. While religious micro coordination was a highlighted affordance, connecting with others through sharing on social media was not. These key findings

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contribute to the mobile communication, digital religion, and affordances literature in specific ways that will be fully reviewed in the following sections.

Answers to the central research questions are derived from the application of two methods: an in-depth textual analysis of 65 (C=36, M=29) prayer application iTunes descriptions and of the apps themselves, and 45 user experience tests with Catholic and Islamic participants interested in using prayer applications. Specifically, this research answers two questions:

RQ1: How do Catholic and Islamic prayer apps communicate and construct prayer experiences through mobile app design, specifically in the technological and religious affordances offered?

RQ2: How do Catholic and Islamic users engage different technological and religious affordances while using a prayer app?

One of the main arguments of this research is that it is necessary to examine both the technology and users in conjunction with one another to answer these questions and to uncover the unique processes of design and use within religious mobile applications. Only looking at apps may provide an indication of what affordances are available through the technology, but it does not give insight into how, or if, users actually engage those affordances. In this instance, the Religious Social Shaping of Technology framework helped to illuminate the assumptions this research makes about the nature of the relationship between technology and religion: it is reciprocal and nuanced. RSST emphasizes that each religious tradition has unique moral economies that influence if, and how, religious groups adopt, reject, or negotiate the use of new media technologies,

which was seen in how participants made sense of their religious app use within the context of the user tests. RSST also influenced the method and analysis as it highlights the need to look at technology and the historical and cultural practices of the religious group separately in order to understand how technology is appropriated, negotiated, and/or reshaped by religious groups. Therefore, the theoretical assumptions in RSST helped to shape the study design and the analysis of participants app use. To further clarify, rather than taking technology as a given, or that technology determines action, RSST highlights the negotiation process of religious technology use and how it leads to framing future technology use within religious groups, which was also revealed within this research in the participants engagement with technological and religious affordances and how participants made sense of that use for their religious practices. Therefore, the second main argument of this research is that there is a reciprocal relationship between religious app design and use; even if certain affordances enable or constrain action, users have the agency to negotiate with and reshape affordances to meet their individual needs.

While adopting the main assumptions of RSST, this study also challenged and extended the theoretical framework in different ways. First, RSST traditionally examines the communal negotiation and framing of new media. This research extended the framework by focusing on private individual negotiations and framing, rather than on the communal level of analysis. Therefore, the findings point to a more individual level of understanding when it comes to religious users' engagement with prayer apps. Second and more specifically, this research intervenes within the negotiation phase of RSST by

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showing how participants understood and engaged with different technological and religious affordances during the user tests, and by how they made sense of that use within their individual religious perspectives.

Through the theoretical understandings of the RSST framework and its application to examining individual negotiations with prayer apps, this research contributes to four different areas of study: mobile communication, digital religion, affordances, and qualitative methods. In order to show these contributions, this chapter first highlights four key findings: how developers used references to traditional religious authority and relied upon algorithmic authority within app descriptions and the apps themselves; participants' use of technical affordances for religious micro coordination; participants' lack of engagement with sharing features to connect with others in the faith; and the differences between Catholic and Muslim engagement with religious affordances, which were related to the translation approach to prayer app design. Second, this chapter provides concrete answers to the research questions listed above through a discussion of how prayer is constructed and communicated within religious apps through technological and religious affordances and how participants' engaged those technological and affordances during use. Third, this chapter discusses how the findings from this research contribute to mobile communication, digital religion, the literature on affordances, and qualitative research design methods. Finally, the chapter concludes with suggestions for future research.

Discussion of Key Findings

Four key findings surface from this dissertation. First, findings from both the textual analysis and the user tests highlight interesting ways in which traditional religious authority and algorithmic authority are presented within the app descriptions and design. For instance, developers often referred to pastors and *imams* to authenticate app use, while at the same time they also relied upon algorithmic authority by either not mentioning religious authorities and/or by referencing app awards and user ratings. This finding contributes specifically to the digital religion literature on how issues of authority (Cheong, 2012) are understood and presented within new media environments. Second, the ways in which prayer app reminders and alerts provide users with the ability to micro coordination their religious practice warrants discussion surrounding the notion of how mobile devices becomes a tool to plan and organize everyday life. This finding provides more nuance to our understanding of micro coordination (Ling, 2004; Ling & Yttri, 2002) as presented in the mobile communication literature. Third, social networking affordances on mobile devices are often touted as enabling broad interactions among people with similar interest and connections. However, the ways in which sharing is communicated within the app descriptions, constructed within the apps themselves, and engaged by participants, indicate that access to social networking sites is an extra feature rather than an essential element for prayer app use. Fourth, Catholic and Muslim participants gravitated toward religious affordances that mirrored the translation approach to prayer app design. However, Catholic participants focused more on religious affordances related to prayer texts and Muslim participants focused more on

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religious affordances related to prayer tools. Participants gravitated toward features that allowed them to translate prayer texts and tools from offline forms to mobile digital forms, rather than engaging in more interactive technological and religious affordances. The sections below discuss these key findings in depth.

Traditional religious authority and algorithmic authority. Issues of authority were found within both the textual analysis and the user tests. To review, traditional religious authority is defined by the hierarchical roles of leaders within bounded religious organizations as well as to sacred texts that are used as guides to religious life (Cheong, 2012). In the word cloud data from the prayer app iTunes descriptions, Catholic app developers used references to traditional religious authority in app descriptions to justify the credibility of the content found within the apps. For instance, developers would cite specific religious leaders, such as the Pope, and/or specific religious organizations that are well known, such as the Vatican and Loyola Press. Islamic app developers used more references to the *Quran* as their source of religious authority, but also made references to specific *imams* and other leaders in the faith.

A lack of references to traditional religious authority along with mentions of awards and user ratings underscored a reliance on algorithmic authority to claim the app's authenticity for religious practice. Algorithmic authority refers to the ways in which software constructs and guides specific actions and provides or restricts access to information that is considered true by merit of its inclusion (Lustig & Nardi, 2015). Some app descriptions did not contain any references to traditional religious authority. This lack of acknowledgement of traditional religious authority figures worked to

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establish the app as the source of adequate content by virtue of its inclusion in the software. When developers choose not to reveal the sources of their content or to acknowledge key traditional religious authorities within the descriptions, the user must make judgments about the veracity of app content and the authenticity of religious practice with mobile apps through other means. To clarify, if the content was included in the app, there was an implicit assumption that it was correct and authentic, as per the definition of algorithmic authority listed above. Sometimes apps used both traditional religious authority references and algorithmic authority through references to awards and user ratings. In these cases, noting the success of the app through listing awards and touting user ratings and reviews within the app descriptions also established algorithmic authority.

Within the apps themselves, references to traditional religious authorities was rarely explicitly present, such as listing the citations for content or referencing respected theologians or *imams*. If present it was usually relegated to a list of sources and associations in the "about" or "information" pages on the app. Only a few apps actually contained citations or references within the content itself. Therefore, algorithmic authority took precedence within the app design, merely by merit of the information or affordances inclusion in the design. Perhaps it is enough for developers to establish a link to traditional religious authorities within the app descriptions and not as a feature of the app itself. If this is the case, more research needs to be done on how users are making choices for what apps to download and use and how religious authority and algorithmic authority play a role in those choices. This research, however, only found

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that traditional religious authority was used to supplement algorithmic authority within the app descriptions, but was peripheral within the apps themselves.

Interestingly, only one Muslim participant and one Catholic participant explicitly referenced a traditional religious authority source during the app user tests. The Muslim participant mentioned an *imam* when answering a question about the good and bad aspects of using a prayer app. The Catholic participant mentioned the use of Latin prayers within the Church after choosing a Latin prayer for a portion of the user test. Of course the lack of references to religious authorities could be due to the lack of references to traditional authorities within the apps themselves. For example, one app listed the source of the prayers under the prayer text. If that text was not present, which it generally was not in the Catholic apps specifically, then that may be why participants did not mention religious authorities. This could also be because participants were not asked to comment on the credibility or authority of the app for religious practice within the user tests. Therefore, participants' attention was on app features rather than the apps' source of content. Additionally, a few instances in the Muslim user tests could be considered implicit references to algorithmic authority. When participants remarked upon the accuracy of the prayer times or the *qibla* compass, there is a sense that the accuracy of the features provided lends authority and authenticity to the app for prayer practice. Also, in Catholic user tests, participants sometimes referenced how the design was lacking and looked unprofessional. These aspects of app affordances and design (i.e. the accuracy of the tools and the sophistication of design) could increase participants' view of the credibility of the app for religious practice. Once users are comfortable with

the design and accuracy of the technological features, the authority and authenticity of the content may be taken at face value.

This lack of reference to traditional religious authority from the users within the user tests, and the participants' tendency to engage with the translation design features rather than interactive features, poses an interesting juxtaposition between algorithmic authority and religious democratization. On the one hand, all of these things may seem to point to the dominance of the algorithmic authority of the app, rather than the reliance on traditional religious authorities that prescribe religious practice. Additionally, if algorithmic authority is structuring action and determining the veracity of information based upon its inclusion within the app, then can there be true agency on the part of the user to negotiate and reshape religious practice through mobile apps? This research posits that both are happening simultaneously – technology, through its algorithmic authority is structuring action, but users are also negotiating with and reshaping technology in certain instance. We see this in the ways that users made sense of their app use. Some were uncomfortable and negotiated app use within public and private contexts by creating and advocating for rules of use. Others felt a lack of connection and may have rejected the use of technology within their religious practice outright. Both of these examples point to agency within the negotiation process. To speak to reshaping the technology, only two participants within the user tests mentioned a desire to change what content the app contained and to change the structure within which the content was presented. This is very clearly a desire to reshape, to restructure, the technology to fit their personal needs. In these cases we may well be seeing the democratization of

religious practice through technology. However, there was more indication for the dominance of technology, as most of the participants accepted the technology outright and did not question or request changes to the form or function of the apps.

Future research on religious authority implications for religious app design and use should keep these implications in mind. First, research on developers should dig deeper into the process with actual developers, rather than only looking at the artifact of app descriptions and apps for clues about design choices. This relates to notions of authority because it would reveal if religious authorities were sought out or not in the development stages and would provide more insight into how developers related to religious authority or used their own religious knowledge to build and design the app. Second, research on app users should include questions and tasks that provide more insight into how they evaluate the app and what types of authority are recognized when users are making choices about which apps to use and how to engage with different technological and religious affordances. Finally, researchers must find a way to understand the balance, or lack of balance, in the relationship between app and user, between design and agency. More inquiries need to be made into how apps provide user agency as well as how app design can adjust to user wants and needs based on ratings and reviews.

Religious micro coordination. The functional uses of mobile phones to organize everyday social tasks and goals are well documented (Ling & Yttri, 1999; Ling & Yttri, 2002; Ling, 2004; Campbell & Park, 2008). Therefore, it is perhaps not surprising that developers and users would emphasize the importance of being able to schedule and be

reminded to pray on a daily basis. As mentioned in Chapter II, religious micro coordination differs from Ling and Yttri's (2002) conceptualization in that the users are coordinating a religious communication with God. This religious communication that is coordinated through the mobile app reminder and alert features could be solitary or communal prayer. Although, solitary prayer was the most prevalent type mentioned within the app user tests. In religious micro coordination, there is no back and forth between God and the user about the time of meeting, but rather the user organizes their prayer communication within all of their daily activities and contexts. The technological affordances of reminders and alerts and the daily prayer feature in the Catholic app are prominent within the prayer app descriptions, the app themselves, and the participants' user testing data. Within the app descriptions, developers mentioned reminders and alerts to encourage users to pray more often and consistently. In this case, part of the function of the mobile app is to help users create religious space and time through the convenience of anytime, anywhere access to content and tools that help users communicate with God. Interestingly, in the analysis of the apps themselves, only 36 of 65 apps (C=23, M=13 had a reminder and alert feature. Also, the majority of participants in this research did mention the expectation of having access to scheduling and reminder affordances. Therefore, religious practices are included in those tasks and goals that users want to coordinate with God and others in their daily religious lives. It is important to note, although the "Laudate" app that was used in the Catholic tests did not have access to reminders and alerts, it did have a daily prayer feature that users indicated would meet their daily religious communication with God. Also, when asked how the

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app could be improved, some Catholic participants noted the lack of reminders and alerts that would help them with religious micro coordination activities.

Religious micro coordination may also be important for understanding how mobile apps can solidify users' identification with, and participation in, an imagined community. While Andersons's (1983) concept of imagined community does not exactly fit here in terms of nationality and imagination, we can draw on it to understand the role media may play in helping users imagine other member in their community, in this case a religious community. When participants' are using apps for religious micro coordination, they are organizing activities that are being undertaken by imagined others within the religious community. For instance, a Muslim participant who is listening to the *adhan* alert on his phone and begins the process of communicating with God, is doing so in tandem with millions of others in their faith tradition simultaneously. Therefore, religious micro coordination can be considered a form of social coordination, in the sense that the activity being organized is also one that is being undertaken by the imagined community, as the multitude of religious believers communicate with God through prayer. It is important to note that participants in this study did not necessarily state that they felt this sense of community when using the app for religious micro coordination. However, there were undercurrents of this connection particularly within the Catholic participants' framing of prayer as a connection with others. Additionally, there were a few apps from the data presented within Chapter V that provided a snapshot of the number of people praying through the app at the same time. These subtle indications warrant future research on how religious micro coordination and prayer app

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use may impact religious mobile app users understanding of their own religious identities in relation to the larger imagined community of religious app users.

Customization is another interesting finding related the religious micro coordination functions of reminders and alerts. Muslim participants often remarked on the ways they could customize prayer reminders and alerts to pray, which speaks to the personalization (Ling, 2004; Castells, 2007) and individualization of religious practice because users can choose how they want to be alerted in different contexts and for different prayers. Of course, these affordances look somewhat different within Islamic prayer apps because the schedule is rigid. However, apps can help the user adapt to specific places and times by automatically calculating prayer times based on their location and by giving the user more control over the type of alert they receive for each prayer. It remains to be seen whether or not this type of personalization or individualization of religious practice through religious micro coordinating features of mobile phones is indicative of larger shifts of religious understandings and practices. It has been suggested however, that micro coordinating features of the mobile phone in the Arab world has helped individuals circumvent surveillance of the so-called religious police (Ibahrine, 2008). Therefore, the importance of reminders and alert as a means of religious micro coordination is also seen as important to developers and users within this study. This mirrors and also extends other findings on micro coordination found within the mobile communication literature.

Sharing with others. The technological affordance of sharing indicates an interaction of some sort by more than one party. In this research, sharing surfaced as

major technological affordance within 42 out of the 65 apps analyzed within the textual analysis (C=26, M=16), although it was rarely mentioned in the app descriptions. As defined in the literature review in Chapter II, technological affordances are those elements that enable, constrain, and sometimes restructure possible actions; in this case the feature to utilize social media options such as Facebook and Twitter afforded the user the action of sharing content. Some apps had the option to share content, such as prayer texts or prayer times, while others gave users the option of sharing information about the app itself with their friends. In the latter case, sharing became a type of word-of-mouth advertisement for developers or to share the app with others. Most apps provided access to social networking sites through which to share prayers and information. Facebook and Twitter were the most common sites included in the app design. However, developers also often included non-social networking features such as sharing information through texting or email. While sharing was available in many Catholic and Islamic apps, there usually was no indication of how to use the affordance and often times they were hidden by inadequate interface design. It seems as though developers know that sharing is an important feature, but they are not really clear on how or why users engage the affordance for religious practices.

Within the user tests, participants did not focus much on the sharing affordances. Rather, when sharing was mentioned, it was in passing as participants were reading off features they saw on the app. In some cases, participants did not even see the sharing affordance, but mentioned how adding sharing through social networking sites would be a feature that would improve the quality of the app. There could be several reasons for

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participants' lack of engagement with sharing affordances. First, during the test users were asked to talk about which features were most and least important for their prayer practice. The test did not specifically guide them toward the sharing affordances that were available in the app. Perhaps if the questions in the user test were more explicit about which features to engage and discuss there would be different results. However, for those participants that did mention it, there was no real indication of how they would use it within the prayer practice. It was just another feature contained within the app and participants did not discuss or engage it more deeply. This could be because sharing is not an important part of participants' prayer practice, which mirrors findings on religious apps in the digital religion literature (Bellar, 2016), or because participants are not sure how to incorporate sharing into their prayer practice. Finally, the lack of engagement with the sharing affordance could be due to the lack of clear design in the user interface. The need for a clearer representation of the sharing feature in the app interface is clearly indicated for those participants who did not notice the feature but mentioned it as a limitation of the app.

Sharing seems to be an affordance that is important enough to include in prayer app design, but there is no clear indication for why, or how, it should be used within or in connection to the prayer practice. Future research needs to look more in depth at how religious content and information is shared through social networking sites and specifically within religious apps. Additionally, past studies have shown a reluctance to engage in sharing religious practices through apps (Bellar, 2016). Therefore, the more personal, private religious practices such as prayer may not be seen as one to be shared

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online. However, prayer is not only a private practice. People pray in community in person and online, mostly through the sharing of prayer requests. More careful study of the practice of communal prayer needs to take place before it can adequately be designed into mobile app practice or understood from a digital religion perspective. This research has found that within Catholic and Islamic prayer apps, sharing seems to be an extra feature rather than an essential affordance.

To summarize, reminders and alerts were the dominant tech affordances noted by users, which allowed them to coordinate their religious prayer practices. The references to reminders and alerts in both portions of the test where users spoke about their app expectations and when they commented on the customization features and options shows that participants are concerned with managing and remembering their prayer practices within their busy lives on the go. While reminders and alerts dominated the affordances discussed and engaged by users, sharing app content or prayers was not noted in any specific or significant way. Future research should observe how sharing is understood and implemented by developers and the contexts in which users engage the affordance in religious practices.

Catholic and Muslim participants' engagement with religious affordances. Religious affordances, as defined in the literature review chapter, are the actions that are enabled, constrained, and/or restructured through technological elements. These actions through technological elements are then combined with religious content, which result in engagement with religion in some way. During the app user tests Catholic and Muslim participants were asked to find a prayer that they were interested in praying and then to

pray that prayer out loud if they felt comfortable. The participants' choices and actions during this portion of the test highlighted the religious affordances with which Catholic and Muslim participants engaged. Catholic participants were more concerned with access to the daily prayer feature, which highlights again the religious micro coordination of scheduling time to pray, or communicate with God. Muslim participants were more concerned with finding *duas,* or invocations and supplications to *Allah,* within the prayer app. For participants of both religions, this highlights their proclivity to engage with translation design approach features, such as providing printed texts of prayers, which is described more in-depth in the section below.

Answering the Research Questions

From highlighting these key findings and the overall findings in the previous chapters, we can now address the core research questions of this study. Specifically, the first research question relates to the ways Catholic and Islamic prayer apps construct prayer experiences through specific technological and religious affordances. The second research question addressed how Catholic and Islamic users engage these affordances through their prayer app usage. These issues are specifically addressed in the sections below. There were similarities in the way Catholic and Muslim developers and users framed prayer as a practice to communicate with God/*Allah.* Developers and users framed this communication with God/Allah as an important daily practice and highlighted the necessity of apps to help users micro coordinate their religious practice. However, there were also important differences, such as how Muslims framed prayer

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also as a duty to be performed where Catholics mentioned it as a way to connect with others. The following sections first present how developers communicated and constructed prayer through technological and religious affordances, and next how participants actually engaged, and made sense of their engagement, with technological and religious affordances.

Communicating and constructing prayer through technological and religious affordances. Developers and participants framed prayer as a daily practice designed to communicate with God/*Allah*. Both developers and users also frame mobile prayer app use as a convenient and easy means to access prayer texts and use digital tools with which to remember to pray on a daily, consistent basis. As previously mentioned, traditional religious and algorithmic authority are used to justify app use for religious practice. Developers used specific technological and religious affordances in different combinations. An analysis of the prayer app affordances within the apps revealed three key approaches to prayer app design, which are discussed in the subsections below. It is important to note that these three approaches to design were not mutually exclusive. Rather app developers often combined both the translation and mobile environment approach within one app and at times were presented alongside other religious elements that facilitated different religious practices, such as reading the Bible or *Quran*.

Translation design approach. The translation approach to prayer app design used digitized forms of prayer text and some technological features to structure prayer practice. This design approach indicates an understanding of the relationship between

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technology and religion as separate. That is, the app is used as a way to read and learn a variety of prayers rather than actually using the app within the prayer itself. Therefore, prayer text and information is translated from offline prayer books to digitized prayer apps. Apps within this design approach structures the use of prayer apps as separate from the actual prayer practice. However, that does not mean users will engage apps that are designed for translation in a functional way. Users could still choose to engage with the app and features during their actual practice. This is important to note, because it may indicate a proclivity of religious app users to engage with the app as intended by designers, rather then negotiating and/or reshaping the design. In this case, it suggests compatibility between the designers' intentions and the users' expectations, which may result in use without critically thinking through the ways in which it is being integrated into their religious lives.

    Mobile prayer environment. This design approach indicates a more interactive approach to prayer app design. It differs from the translation approach in that structures user engagement with prayer texts and technological affordances *during* the prayer practice itself. In the translation approach, users can decide how they use the app. The mobile environment design approach structures in-prayer use of the app. It does this by incorporating interactive affordances such as audio podcasts, videos, and graphics that are listened to, watched, or touched during prayer. This design approach indicates the view of the relationship between technology and religion as compatible and intertwined. There is no hesitation of incorporating digital, and what some may view as secular, tools into a religious practice. Participants who were engaging with or speaking about the

more interactive app features also seemed to negotiate or experiment more with their app use in different contexts, such as public or private worship. This suggests that when religious apps provide different ways of engaging a religious practice through the mobile context outside of the users' normal routines, this is because users are more open to negotiate or experiment with their responses to the technology.

Multi-purpose religious app. This design approach seeks to create an all-in-one religious app experience of which prayer is only one of the foci in the design. Designers of multi-purpose apps use the translation approach, the mobile environment approach, or both within multi-purpose apps. The difference is that it also offers other religious content and affordances, such as studying sacred texts. The prayer elements within these apps can be simple or complex depending on the overall goal of the app. This approach indicates a reciprocal understanding of the relationship between technology and religion. It seeks to provide users with access to multiple tools for their religious lives and offers different types of prayer engagement. Having more access to different types of tools and design features may indicate that such users have more agency in deciding what their personal religious practice may look like. Indeed, when access to an all-in-one app becomes available, users often choose and use these apps outside the purview of traditional religious authority. There is a tension in flexibility, between what the design allows, and what users can actually do to reshape their prayer app experience, based on the personalized preferences offered. If the designers are structuring religious action through technological and religious affordances and the users engage these actions without questions, it could be argued that the algorithmic authority of the app may have

more power in this dynamic. If the users are not questioning the algorithm, or the content and structure of the app, then it seems as though the algorithm becomes the authority rather than the user or other religious figures, especially if traditional religious authority is relatively obscure within the app description and app content. However, the users, as shown in this research, do have the agency to determine how and when and if they will use the app for religious practices. Even more, many users provide ratings and reviews that may influence the design updates that result in a reshaping of app content and structure, although ratings and reviews were not specifically studied within this research. The tension between structure and agency is always there: more research needs to be done on the interplay between algorithmic authority and user agency in the context of religious mobile apps.

Catholic and Muslim participants' engagement with technological and religious app affordances during app use. Multi-purpose religious apps were chosen for the app user-testing phase of this study because they offered both the translation and mobile environment approaches to prayer. The tests helped illuminate which type of prayer design users were more likely to engage as well as which affordances were most and least important for their prayer practices. Additionally, participants spoke about their feelings related to using an app for prayer, which indicated different types of negotiation and framing for both Catholic and Muslim participants.

Both Catholic and Muslim participants seemed to gravitate to those affordances that indicated a translation design approach. Catholics most mentioned the variety of prayer texts that were available on the app. Muslim participant focused on the prayer

features that would help them pray at the right time and direction. When Catholics were asked to find a prayer to pray, most chose the daily prayer feature. When Muslims were asked to find a prayer to pray, most gravitated toward the *duas*, which are prayer texts that can be found in the *Quran* and *Hadith.* Both of these types of prayers are examples of the translation approach. There really are no interactive features present other than the text of the prayer. For Catholic participants this may be because the interactive options of the mobile environment approach were not as readily visible within the app design. Also, the interactive features mostly focused on the rosary, which is a longer prayer that participants may not have wanted to engage in during a test. For Muslims, they noted the options to personalize the *adhan*, but did not engage with any other interactive features. This could also be due to a lack of design or instruction on how to use the more interactive features. Both Catholic and Muslim participants engaged the translation design approach affordances more than the interactive mobile environment affordances. It cannot be determined if this was out of a lack of interest in the interactive affordances or out of issues with the visibility of the affordances within the app design.

Participant framing of religious app use. The majority of both Catholic and Muslim users accepted the use of prayer apps wholeheartedly. There was an understanding in their framing of technology and religion as compatible. Therefore, there was an unfettered engagement of prayer apps with no negative consequences mentioned for those specific participants. However, not all of the participants were comfortable engaging in prayer app use and pointed to specific areas of concern. For some, there were clear boundaries between private and public app use. A few

participants told stories about how app use in a place of worship was distracting and how there should be a separation of technology from the actual practice of prayer. For these participants, there were clear time and place restrictions. For others it was awkward or uncomfortable to integrate a mobile device into their established offline prayer practices. Participants mentioned a disconnect between using a secular device for a religious practice. Therefore, mixing the sacred and the secular was not compatible for these participants. Sometimes the result of this disruption of the mobile app for prayer purposes is feeling disconnected from God/*Allah*. The main goal of prayer is to connect and communicate with the divine. For some users the app was too much of a distraction to their communications with God during prayer. Therefore, there are those who see technology use for religious practice as compatible, and those who have more complex negotiation processes with engaging the technology for prayer.

To answer the research questions concretely, prayer was most often translated into the mobile context through the digitization of prayer texts and tools. Within Catholic and Islamic prayer apps, prayer was communicated as a way to connect with God/*Allah* on a daily, consistent basis through the construction of various technological and religious affordances (*see* Appendix C). These technological and religious affordances were combined in different ways, which created three common approaches to prayer app design: the translation approach, the mobile environment approach, and the multi-purpose religious app approach, which were not always mutually exclusive but could be combined in different ways. Data from the user tests revealed that participants were more likely to engage with the technological and religious affordances used within

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the translation approach to prayer app design. This approach may be indicative of a functionalist understanding of the relationship between technology and religion in the context of religious prayer apps. To clarify, the functionalist understanding sees the app as a tool to be used *outside* the actual prayer practice. It is a tool that is differentiated, instead of integrated, into the actual practice. This does not mean that participants were not interested in the more interactive features that were indicative of the mobile environment approach, where the app became apart of, and was used within, the prayer practice. For example, some Catholic participants found and engaged the digital rosary, while some Muslim participants mentioned the need for more multi-media engagement with the prayer texts.

As mentioned in previously, these findings indicate that if there is compatibility between the designers' framing of prayer, and the users' framing of prayer and app expectations, app use is more likely to be readily accepted. That is, if designers and users have the same basic definition and understanding of prayer practices, the acceptance of the app is more likely. Whether or not traditional religious authority or algorithmic authority plays a greater role in users' app choice and use remains to be seen. What this study does show is that both traditional religious authority and algorithmic authority are at play within app descriptions and within the apps themselves. For example, some app description used references to traditional religious authorities such as theologians and *imams* to justify or verify the apps content and structure, while others did not mention any religious authority, but instead chose to highlight algorithmic data such as app awards and ratings and reviews to justify app content and structure. Participants rarely

mentioned traditional religious authority or authenticity of the app during the tests, which could indicate a reliance or acceptance of the algorithmic authority of the app. There were a few participants, though, that did question app use within public and private worship as well as create rules and boundaries for that use. This indicates a negotiation with elements of app use that are problematic. Finally, there were two participants who mentioned wanting to control app content and structure for themselves. While only two participants mentioned this, it is indicative that some users are interested in having more agency in their religious app use, which points to a reshaping of the technology for their personal use. All of these findings taken into consideration with each other represent the tension between the reciprocal relationship between society and technology, specifically within the context of Catholic and Islamic religious prayer apps.

Contributions

This dissertation used the RSST framework to explore the relationship between technology and religion in the context of Catholic and Islamic prayer application design and use. While this study did not complete the formal four-part analysis suggested by the framework, it did draw from the major underlying assumptions about the reciprocal nature of technology and religion, and the negotiated use of technology by religious communities. This research offers unique application of the RSST framework by applying it not solely to the communal negotiation processes, as it was designed, but by using it to explore individual negotiations of religious app use. Specifically, this

dissertation extended the RSST framework by showing the unique negotiation and framing of individual religious app users.

This research also contributes to the field of mobile communication by exploring an understudied area of religious mobile apps and how they may first disrupt the everyday lives of religious users, but then are negotiated and integrated into everyday religious routines through design and use choices. Mobile communication literature highlights the importance of understanding these disturbances (Ling, 2004) in social life as well as how users understand and integrate, or reject, mobile technology (Goggin, 2007; Ito et. al, 2005; Wallis, 2013). There were two examples of disruption and negotiation within the data: first, in the app descriptions when developers admonished users not to use the apps in church, and second, in the user tests when users talked about rules for use in public and private spaces. These examples point to a social turbulence in that the rules of decorum, especially within places of worship, are being breached. For some uses, they accept the technology outright. For others, there is a need to create rules for use within specific public contexts. A good example of this is the Catholic participant who was upset by the youth pastor's use of the mobile device during mass. This example also has several layers of hierarchy that are at play. First, the Youth Pastor is seen as a religious leader or authority and therefore should know better about using his mobile during mass. The second hierarchical layer at play is that of status. By using a new technology, the youth pastor is displaying his access to the funds necessary to have this technology, and as the participants put it, is showing off his use of it in church. For the participant, these two hierarchical roles, religious authority and social status, are at odds

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especially within the context of public worship. This underscores a view of technology and public worship as incompatible. The youth ministers role places him in a place of religious authority who should demonstrate this understanding, according to the participant, rather than trying to achieve a higher social status by "showing off" his technology in worship.

These rules for use as displayed in the app descriptions and within some of the participants' user tests, show a need to make sense of, and keep separate, different contexts. As Ling (2004) points out, when the phone is present in public spaces, a third space is entered by the user and by those around them. In a sense, the user's mobile space is intruding on the public. However, it is interesting to note that most participants, both Catholic and Muslim, accepted the technology outright and some even advocated for more use within public worship. Tension remains between the mobile and offline in more formal contexts. It is apparent that users in everyday contexts are negotiating the blurring of these lines. This points to the relational, integrated nature of the relationship between technology and society as individuals more readily accept and combine their offline and online religious practices both in public and in private.

We also see within the design of the apps and the reminders and alert customization features that the Muslim participants highlighted, a negotiation with technology in instances of social turbulence. People are highly flexible to adapt the technology and the rules for use within different social contexts (Ling, 2003, p. 143; Ito et. al, 2005). The developers and users are integrating and using technological affordances to build and maintain decorum in different social contexts. For example,

many Muslim participants noted how easy it was to change the audible *adhan* alert to prayer on the phone. Some mentioned how they would use certain alerts depending on whether they were in a public place, such as work or the bus, or whether they were at home in private. We see then an adaptation in the design and the use of technology so as not to break decorum in public spaces.

There is also a different kind of turbulence for some of the participants – a personal rather than social disturbance. They are trying to manage their feelings of "weirdness" about using an app during their prayer practice. In this sense, the disturbance is in their personal prayer practice and they noted a disturbance in their connection with God. In these cases, we may be more likely to see a rejection of mobile app technology for prayer practices. A longitudinal survey of these participants may help to shed light on whether or not these specific participants integrate, reshape, or reject the technology for their personal practice. More research needs to be done on the integration of mobile app technology into private and public spaces to understand the ways in which mobiles may be causing social and/or identity turbulence and also the ways in which private use may lead to more enmeshment of offline and online contexts in public worship.

Additionally, the findings related to religious micro coordination through prayer app affordances also contribute to the mobile communication literature. Specifically, the findings revealed how important micro coordinating prayer practice was for both developers and users and how it was tied specifically to reminders and alerts. This extends the literature on micro coordination by showing how a specific cultural group

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understands and engages mobile prayer app affordances to schedule and remember to communicate with God regularly. More research should be done on how religious micro coordination is different from micro coordination of other daily activities, and also on how other religious practices may be micro coordinated through technological and religious affordances.

This research also contributes to digital religion; a field of study on how religious practices shift and evolve in online environments, while acknowledging that religious practice is always connected to offline contexts as well (Campbell, 2012; Lövheim & Campbell, 2017). This research extends knowledge within this field by showing how mobile apps provide new ways to engage in religious practice, and how shifting practices to mobile spaces results in unique understandings and constructions of prayer practices for Catholic and Muslim users. This research continues the approach of religious apps studies that focus on the technology (i.e. apps), but it also extends that research beyond the technology to include inquiry about users. As previously discussed, most religious app studies used content analysis of the apps as texts to make claims about what they offered to religious practice. This study does the same in relation to prayer applications, but also examines how users actually engaged prayer apps at the time of their use through user experience tests. By providing insight into the relationship between the technology and the user, this study adds to the field of digital religion.

Additionally, this research adds to the literature on affordances by identifying, defining, and giving examples of the technological and religious affordances in Catholic and Islamic prayer applications. As discussed in the literature review, affordances are

understood not only as the features found within technology, but the actual practices that emerge and are enabled by those features. The findings contribute to this literature by identifying the affordances developers highlighted in app descriptions and designed into prayer apps, as well as how actual users perceive and engage with those affordances. In Chapter Four, the technological and religious affordances found within the 36 Catholic and 29 Islamic apps were identified and explained. This list and explanation can be used in future research to delve deeper into how these specific affordances are designed and used within religious apps. The list also provides a more comprehensive understanding of affordances as a whole within the mobile communication literature. This research also shows how these affordances are combined in different ways that indicate specific approaches to prayer app design. The translation approach, the mobile environment approach, and the multi-purpose religious apps approach provide greater understanding of which affordances are emphasized and combined in different ways according to how developers may understand the practice of prayer in mobile spaces. This research contributes to a broader understanding of what affordances are available, and how those affordances are combined in different ways that result in specific design approaches. Additionally, Chapter V and 6 show how Catholic and Muslim participants understood and engaged these affordances. Specifically, Catholic and Muslim participants were drawn to translation design approach features, such as access to prayer texts, information, and tools. However, the lack of engagement with more interactive tools as presented within the mobile environment approach could be due to the lack of clear interface design or the time limitations within the user tests. Therefore, this research

provides more insight within the affordance literature on two different religious groups, different app design approaches that combine technological and religious apps in different ways, and different aspects of user engagement with technological and religious applications.

This research also enhances approaches to qualitative research design in communication and media studies by implementing a multi-method approach that included a tool not traditionally used within these fields. Indeed, the multi-method approach of textual analysis and user experience tests worked to push the fields of media studies and digital religion to look at the relationship between mobile design and use in conjunction with one another. User experience methods, though used within information sciences studies to understand usability, have not been implemented in media studies specifically to gain more in-depth understandings of social and religious practices surrounding mobile devices. Those studies that do collect and analyze data from users typically rely on self-report methods such as surveys, interviews, and focus groups. Seeing a video of the screen and hearing audio of the users engagement with the prayer apps provide a more nuanced view of engagement with technology, rather than relying solely on self-report methods after use has occurred. The user tests are designed with interview questions and tasks to uncover both how users are engaging mobile apps and also how they understand that engagement within their own lives. Therefore, this research offers a unique insight into how this method can be used within future mobile media studies.

The findings of this study also underscore some limitations of the user experience testing method. First, during the pre-test questionnaire, some UserTesting users were able to participate in the test even though they did not meet the requirements. For instance, the screener questions were supposed to remove any potential participants who were not Catholic or Muslim. However, one person was still able to enter and complete the test. During the test, this participant made mention of the fact that he was not Catholic and his data was removed from the sample. Next, participants who have completed other user tests through the website were predisposed to a certain formats and tasks. This may have biased their answers because they were treating the test as they would those they had done in the past. The introduction to the test attempted to offset this predisposition by describing the test as part of a dissertation project that was trying to understand how people used prayer apps. However, more in-depth explanation may be warranted for future research that uses the method for a study other than usability.

In addition to problems with the screener questions and the experience of the participants with previous tests, there were issues with the way some of the questions and tasks were phrased. As discussed in Chapter VI, some participants were uncomfortable praying out loud during the tests. Although the participants were informed that they did not have to pray the prayer out loud if they were uncomfortable, more context and opportunities to decline to participate on that question and task could have been made available to participants. Also, some Muslim participants were confused when they were asked to pray out loud because it was not time to pray and there are strict guidelines to follow when praying. While some Muslim participants did navigate

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to the *duas* for this task, others were unsure of what was being asked of them. Questions must take the differences in the type of prayer, and more specifically, guide participants when cultural nuances arise. Hence, there are limitations and issues that can be addressed when using this method for future research.

Finally, the user tests were limited both in the amount of time participants had to complete them and in the fact that the test itself set up an artificial environment. The tests were designed to take 15-25 minutes and UserTesting participants were aware of the time limitation of the tests. This means the tests only provide limited, initial impressions of the participants' understanding of, and engagement with, the prayer apps. Additionally, the researcher was not present during the tests and could not ask further questions or for clarification of answers. While the tests did provide important insight into this initial use and impressions of the prayer apps, which showed the tendency of users to gravitate toward the translation design approach, it does not provide insights into long-term, daily use.

Future Research and Implications

Overall this dissertation outlines the reciprocal relationship between design and use of mobile prayer applications in Catholic and Islamic contexts. The findings are significant and have implications for researchers who use the RSST framework and who study mobile communication, digital religion, and affordances. First, for researchers who use RSST it shows the importance of including individual as well as communal analysis. Future studies should focus on how offline resources are tied to individual framing and

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engagement with religious apps. We need to understand more thoroughly how offline resources are influencing religious practice through technology. Second, this research provides an in depth look at the social turbulence (Ling, 2004) and the ways in which religious mobile apps are integrated into the lives of Catholic and Muslim users by showing what affordances they engage and also how they make sense of that engagement. Additionally, mobile communication researchers benefit from this study because it confirms past findings of, and provides more nuance for, our understanding of micro coordination (Ling, 2004; Ling & Yttri, 2002). Specifically, this study adds to the micro coordination literature by defining and providing example of religious micro coordination. The findings also show how Catholic and Muslim participants understand reminders and alerts and interpret these features during app use. Therefore, this study contributes to mobile communication researchers by providing insight into the religious social turbulence of mobile apps in the lives of actual users, and how those users engage with features that help them micro coordinate their religious practices.

Third, the findings are significant for digital religion studies by extending our insight into how religious practices evolve in online contexts and how they are simultaneously connected to offline religious resources and practices (Lövheim & Campbell, 2017). It does this specifically in two areas: religious app design and religious app use. In religious app design, the findings provide digital religion researchers insight into the technological affordances that developers used in conjunction with religious content to create religious affordances within Catholic and Islamic apps. Researchers can use the list of affordances generated and the insight from how developers used them

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within specific design approaches to prayer apps to compare and contrast them within different types of religious apps and within different types of religions. The findings also extend digital religions scholars' understanding of how traditional religious authority and algorithmic authority are engaged within design and use of religious apps. This researcher also offers new findings into the digital religion literature that show how Catholic and Islamic participants actually engaged with, and made sense of, affordances during app use through the innovative use of user testing methods. The findings provide insight and instruction for researchers in media studies, mobile communication, digital religion and affordances interested in implementing user-testing methods within their own research. Finally, for those who study apps, religion and technology, and mobile communication, this dissertation furthers our understanding of the broader relationship between technology and religion by uncovering and explaining the complex interplay between religious app design and religious app use through technological and religion affordances.

Based off the findings from this research, there are several avenues of inquiry for future study of religious mobile apps that include: app development, design features of different types of religious apps and affordances, and different aspects of app use. More research is needed that collects and analyzes data from actual app developers and on the development process itself. While this research identified three basic types of developers (i.e. individuals, religious organizations, and secular organizations), there may be more types, as well as nuances that need to be uncovered from within the different types. This is important because different types of developers may have different motivations for

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designing the apps. Also, different developers will also have varying levels of competency in design and in religious knowledge. Both of these characteristics will affect the design process, and the types and ways in which affordances are used to create a mobile space for religious practice.

Additionally, more research is needed to identify different design features and approaches being implemented in other types of religious apps, such as sacred texts and religious games. This research argues that the core values and understanding of religious practice will drive the design and the affordances that are engaged. New ways of presenting and interacting with information are being developed rapidly. Therefore it is important to identify these new affordances and how they are communicated and constructed in a mobile space. This needs to be done across religions and across different types of religious practice. Also, more attention needs to be paid to specific affordances such as reminders and sharing. There are complex processes at play in how these affordances are understood and implemented that were beyond the scope of this research. Identifying and understanding affordances within different types of religious apps and from different religions will increase our understanding of the relationship between design and use and the larger relationship between technology and society as a whole.

Finally, researchers need to continue to use and develop innovative ways to collect and analyze data from a variety of different users. This research looked specifically at Catholic and Islamic users, but future research should include a variety of religious audiences within and beyond the major world religions. Longitudinal studies

are needed to understand engagement with different religious affordances overtime and their long-term influences on religious practice. Also, attention needs to be paid to different types of users, such as young, old, novices, and experts to see how they are understanding and practicing religion in mobile spaces and how that practice interacts and intersect with offline resources and contexts. There are myriad complexities and possibilities afforded to users across a variety of contexts that need to be examined from a mobile, digital religion, and affordances perspectives.

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APPENDIX A: CODING LIST FOR RELIGIOUS APP TEXTUAL ANALYSIS

The coding lists below were derived from concepts in the literature review. While these are codes I will be looking for in the texts, there may be others that emerge from the data.

Design and Technological Elements

- Shortcuts
    - push notifications
    - reminders
    - calendars
    - bookmarks
    - navigation (buttons, swiping, etc.)
- Informative feedback
    - pop-up cues
    - noise cues (beeping, dinging, music etc.)
    - error messages
- Closure (tasks with beginning, middle, end)
    - check boxes
    - list of accomplishments
- Consistency
    - common use of colors, graphics, tools etc.
- Reversal of actions
    - memory
    - WI-FI connection
- Reducing errors/short-term memory load
    - limited steps to complete action
    - alternative modes of instruction (sound, voice recognition)
- User configurations
    - app size
    - screen brightness
    - motion detection/control
- App speed
    - time it takes to start, stop, resume
    - top-down interactions (information in full or hierarchically)

- Change outputs
    - upload user content (photos, prayers, journals)

- Aesthetics
    - colors
    - layout
    - graphics

Religious Elements

- Prayer
    - textual descriptions
    - rules or instructions
    - pictures/graphics depict prayer practices
        - reading prayer text
        - typing a prayer
        - audio of a prayer
        - prayer counter
        - sharing prayers with others, save prayer requests
- Tools
    - search prayers
    - save prayers (bookmark, favorites)
    - share (email, texting, SNS)
    - highlighting
    - compass to pray in direction
    - different prayer recitations
- Contexts
    - personal use
    - offline communal use (in church) online communal use (SNS, website)

APPENDIX B: SCREENER QUESTIONS, USER TEST TASKS, AND POST TEST QUESTIONS

Screener Questions
1) Please indicate if you are a member of any of the following faiths: Christian - Catholic*, Christian - Protestant, Muslim - Sunni*, Muslim - Shia*, Muslim - Other*, Buddhism, Wicca, Hindu, Judaism, I am not religious, Other/Prefer not to respond

2) How frequently do you pray? Multiple times a day*, At least once a day*, Multiple time a week*, A few times each month*, Less than once a month*, Other/None of the above

3) How uninterested (1) or interested (5) would you be in using a mobile phone application for prayer? 1 - Not at all interested, 2 - Not particularly interested, 3 - Neutral, 4 - Somewhat interested*, 5 - Extremely interested*, Other/None of the above

User Test Tasks
Task 1: Before you start using the app, please tell us: What do you think about prayer? How often do you pray?

Task 2: Describe a positive experience you've had while praying.

Task 3 Describe a negative experience you've had while praying.

Task 4: What are you expecting from this prayer app? What do you hope it will do for you?

Task 5: Open the app. Take a few minutes to look around. Talk out loud about what you're thinking during this process. What do you notice about the interface (what the app looks like)?

Task 6: How does the app look and feel while you are using it? What do you like or not like about it?

Task 7: Now, find a prayer in the app that is relevant to you. Please take some time to pray this prayer, silently or out loud, if you feel comfortable doing so. Speak out loud about any highs or lows along the way.

Task 8: (Success: Yes, No) Did you complete the task successfully?

Task 9 (Rating Scale: very difficult to very easy) Overall this task was:

Task 10: Talk about praying with the assistance of an application. What is good and/or bad about it?

Task 11: Look at the customization features and talk about which ones are most/least important for your prayer practice.

Task 12: (Rating scale: very negative to very positive) Overall, how negative (1) or positive (5) has your experience been with this application? **Please explain your rating aloud.**

Task 13 (Multiple Choice: It meets my expectations, It exceeds my expectations, It falls short of my expectations, Other/None of the above) Did this application, meet exceed, or fall short of your expectations? **Please explain your rating aloud.**

Task 14 (Written response): In the space below, please provide 3 words or phrases you would use to describe your experience with this application.

Task 15: From your perspective, what are the limitations of the app? What would you like to be able to do with it?

Post-Test Questions
1. What was the most frustrating thing about your experience?

2. What other ideas do you have about how it could be improved?

3. What did you like about it?

4. Would you be interested in participating in future studies about religious apps OUTSIDE of the UserTesting platform? If so, please provide your email in the space below.

APPENDIX C: LIST OF RELIGIOUS AND TECHNOLOGICAL AFFORDANCES

List of religious and technological affordances found within the textual analysis of the 65 prayer apps analyzed			
Main Category	**Sub Category**	**Description**	**# of Apps w/ Element**
General Prayer Affordances	*Prayer Visualizations*	Images including backgrounds, icons, and interactive graphics; text design such as fonts, page decorations, etc.	63
	Prayer Navigation	Alphabetical order; Begin new prayer; Checklist - Checkmark; Choose prayer; Parts of prayer; Prayer menu; Prayer name; Preview prayer; Select date; Shake phone or jump to random prayer	57
	Prayer Instructions and Info	About prayer; Number of others in prayer; Prayer citation/reference; Prayer definition; Prayer examples; Prayer FAQs; Prayer instructions; Prayer outcome; Prayer purpose	52
	Sharing	Content, Social Media, and Other	42
	Prayer Settings and Tools	Add/import/export personal prayers; Apply settings to all prayers; Automatic prayer settings; Calculation methods; Select Call to Prayer (azan); qibla compass; find related prayers; access transliteration	40
	Reminders and Alerts	For daily or specific prayers, on specific dates, locations, interruption reminders, repeat alarms, audio alerts, text alerts.	26
	Prayer Customization	Select mysteries; Select opening and closing prayer	32

Main Category	Sub Category	Description	# of Apps w/ Element
	Prayer Media options	Audio; Video, Player Toolbar; Media settings, Image tools	29
Other Religious Content	*Catholic*	Bible, canticles/hymns, Saints, Commentary, Devotions, History, Inspirational quotes, Dogmas, Vatican documents, Calendars	27
	Islamic	Articles of Faith, Information on Five Pillars, Hadith, Halal, Holy Places, History and information on religious figures/imams, user comments, zakat calculator, Calendars	17
General Design Affordances	*Global Navigation (Krug, 2014)*	App name/graphic, developer name/graphic, contact information, search	63
	Primary navigation (Krug, 2014)	Breadcrumbs, Menus and Menu Changes, Headings, Tool bars, Obvious links	63
	Button and Touch Navigation	Back and forward buttons to navigate pages; scrolling, swiping or tapping	63
	Shortcuts (Krug, 2014)	Icon links to content or settings, "go to" or "Home" buttons, tags	62
	App Information/Instructions	App statistics, version number, memory specifications or navigation instructions	52
	Utilities	Add content, download content, highlight content, edit content, create notes, print content, reload/refresh/restore content, and save content; "More options"	46
	Settings	Browser, WI-FI/cellular, download options, language options	43
	Notifications (out of app; determined by app, not user)	Alerts, sounds, icon badges that pop up on the phone when the user is not in the app. Pop-up boxes that contain info about new content, etc.	39

Main Category	Sub Category	Description	# of Apps w/ Element
	Customization	Display, Fonts, Themes	32
	"You are here" indicators (Krug, 2014)	Dot trackers, highlights, status bars	31
Advertisements	*Type*	Footer Banners, popups, in menu options	43
	Content	Upgrade/Remove Ads, other religious apps, other religious products, in-app purchases, donate to religious organizations, non-religious products, and buy ad space.	43