Social-Spiritual Face: Designing Social Reading Support for Spiritual Well-being

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Techno-spiritual practices refer to the use of digital technologies to support various spiritual activities, such as scripture reading. While prior human-computer interaction studies largely focus on understanding techno-spiritual practices in both personal and ministry environments, there is a lack of design research that explores novel design opportunities, based on longitudinal field deployment. As an important techno-spiritual practice, this work focuses on scripture reading and investigates the design space of "social scripture reading," as it is often organized into small groups for successful behavior maintenance. We designed and evaluated BibleCell, a social scripture reading tool that supports personalized reading plans, scripture reading, and social sharing. After the third year of deployment, we performed a two-month user study in Korean Protestant churches to deepen our understanding of techno-spiritual practices in social contexts via in-depth interviews (n = 27). We report the major themes of social techno-spiritual practices, such as social motivators, social interaction patterns, and leadership roles. We discuss our findings using a novel design concept of social-spiritual awareness that considers both the social and spiritual aspects of interactions in social computing systems.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**.

Additional Key Words and Phrases: Techno-Spiritual Practices; Social Reading; Social Support; Social-Spiritual Awareness

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1 INTRODUCTION

Digital technologies, such as smartphones and social media, have been widely used to support various spiritual activities in religious communities, such as Bible reading and community building through what is known as "techno-spiritual practices" [7]. Buie's survey on spirituality-based mobile apps [13] revealed that representative techno-spiritual practices include functional support (e.g., digital scriptures, sermon videos, and educational materials) and social support (e.g., local community building and prayer requests). Prior human-computer interaction (HCI) studies on techno-spiritual practices have examined the adoption and usage of various digital technologies [34, 89] and explored novel design opportunities to facilitate spiritual well-being [41, 58, 88, 89].

In this work, among various religious activities, we focus on scripture reading in a social setting, which is an important part of many religions [4]. Many religions emphasize the importance of scripture reading as an essential spiritual practice for developing religious beliefs [37, 45, 57, 62, 80, 84]. In addition, scripture reading as a coping strategy can help buffer stressful life situations and offer positive social and mental well-being outcomes [23, 24, 48]. There are several reading planner apps (e.g., Bible Reading Schedule offered by Daily Bible Reading) that help users set daily reading goals and reminders. Social media (e.g., Facebook) or instant messaging apps are used to share each other's daily reading schedule and progress. However, it is still a challenge for many people who try to continuously practice scripture reading and try to read the entire scripture without giving up. Sustaining scripture-reading behaviors for prolonged periods is challenging, owing to the large volume, heterogeneity, and difficulty of the content. For this reason, scripture reading often occurs in the form of small groups that are typically organized to facilitate learning and spiritual growth at local churches [25, 57].

We see that this practice resembles goal-driven habit-forming behaviors, which have already been explored to support through various physical and mental health-related digital tools in persuasive technologies [31, 38, 73, 79]. For example, personal informatics tools such as fitness trackers automate self-tracking to facilitate self-reflection for habit building related to behavior change or maintenance (e.g., physical activity tracking and step count visualization for increasing physical activity [20]). Furthermore, these tools also provide various motivation-enhancing features such as social support and gamification (e.g., maintaining a leaderboard and sharing encouraging messages [20, 52]). Prior studies on spiritual well-being also used such persuasive mechanisms for behavior change or maintenance via self-tracking of spiritual states [86], prayer support tools [31, 88], and social presence and information sharing [16, 38, 70, 73]. Scripture reading in social contexts is common in diverse religions, but there is a lack of existing studies on exploring how to support *goal-driven social scripture reading in small groups*, which is often common in Protestant churches to promote Bible reading practices in Korean communities. We see a very interesting potential of this culture to be explored and supported through the design of a socio-technical system for scripture reading. How this unique religious context shapes the motivations and experiences of a goal-driven social activity in a group differently than those of other goal-driven social activities in different domains would open up new spaces for discussion and design opportunities for persuasive technologies.

This research area extends existing HCI studies on personal informatics and socio-technical system design [27, 67]. Scripture reading requires both instrumental and social support for successful behavioral engagement (e.g., self-tracking and information sharing) [41]. The goals of this study are as follows: (1) to explore how to support techno-spiritual practices of social scripture reading in small groups, and (2) to understand user experiences in social scripture reading with mobile technology that are differentiated from other goal-driven activities with technologies. In this work, we report our empirical results from a multi-year field study on the design and evaluation of

BibleCell, a social scripture reading tool. BibleCell supports small-group Bible reading by offering (1) a personalized reading planner (e.g., daily reading requirement) and digital scripture reading resources (e.g., text and audio), (2) a group dashboard for sharing group status, and (3) real-time social interaction (e.g., sharing reading progress and spiritual experiences in a manner similar to Facebook's timeline or wall). For system implementation, we iteratively designed a series of systems and solicited feedback on them, including a large-scale survey (n = 122). The system was released in mobile app stores (both Android and iOS) in 2016, and the system is currently used by thousands of people. After the third year of deployment, we conducted a two-month user study in Korean Protestant churches to deepen our understanding of techno-spiritual practices in social contexts via in-depth interviews (n = 27).

The major contributions of this study can be summarized as follows: First, we designed BibleCell as an exemplary system for supporting social techno-spiritual practices and found that it helps to explore the design space for supporting small-group work in spiritual contexts. Second, in-depth interviews revealed unique aspects of engaging in social techno-spiritual practices in small groups, such as spiritual practice support, cooperation, and competition as social motivators and leaders' role as the facilitator. Third, novel design implications for supporting social techno-spiritual practices were explored with the design concept of social-spiritual awareness that incorporates *social-spiritual faces* in small-group context as design elements.

2 BACKGROUND AND RELATED WORKS

2.1 Overview of Christian Religion and Protestant Churches in Korea

This study supports scripture-reading practices among Protestant Christians in South Korea. A brief history of Protestantism and scripture reading is reviewed. Protestant missionaries transplanted Protestantism in Korea in the early 1800s [61]. Protestantism and Roman Catholicism were not popular until the early 1960s, mainly due to Japanese colonial rule and Confucian doctrines that most Koreans had followed at that time. There has been a radical increase in the Korean Christian population in the 1960s, possibly related to modernization and industrialization in Korea [61]. According to the Korean Government's report in 2018 [46], 43.9% of the respondents answered that they had a religion, and among them, 62.9% were Christian (Protestant: 44.9% and Catholic 18.0%).

Like other religions, reading scriptures is significant and highly encouraged in Protestantism. Many studies have revealed that reading scriptures has various positive effects, such as extending religious knowledge [28], presenting role models for disciplining [76], and coping with daily stress or events [48]. For Korean Protestantism, reading the Bible has been traditionally regarded as an essential spiritual practice, because its early spread was by a small number of foreign missionaries, having different languages [43]. Therefore, the religious activities of earlier Korean Protestants often depended on the literal reading of the Bible. In addition, the Korean Protestants tended to emphasize group-based religious disciplines and activities [50]. Comiskey [19] defined a small group in a church as a group of people (4-15), who meet regularly for the purpose of spiritual edification and evangelistic outreach (with the goal of multiplication), who are committed to participating in the functions of the local church. Most Korean churches run organized meetings with colleagues or families led by church-appointed leaders and encourage each other's faithful life [50]. Diverse religious activities in Korean churches, such as reading/studying the Bible and sharing spiritual experiences, have been conventionally conducted in small groups.

2.2 Techno-Spirituality

The use of information technology such as the Internet and mobile phones in spiritual domains has evolved slowly over the last few decades [63]. Bell [7] claimed that such a slow change is possibly

due to the tension between technological advances and spiritual life traditions. Campbell [14] illustrated the spectrum of information technology adoption and use (non-use) practices that people engage in, such as negotiating (e.g., home automation and the Kosher Phone), limiting (e.g., social media fasting [70]), and refusing (e.g., medical recommendations) [22]). In practice, information technologies, ranging from mobile apps and social media to Internet of Things and home automation, have been widely used to support diverse religious practices, through what is known as techno-spiritual practices [7]. People use diverse mobile apps for a variety of spiritual purposes, including prayer sharing, meditation, and Bible reading [41, 58, 88]. In the Orthodox Jewish faith, home automation (e.g., scheduled lighting control) promotes spiritual experiences, owing to the delegation of device control to the home automation system [85].

Prior studies have examined techno-spiritual practices in both personal and ministry environments [34, 89]. Wyche and Grinter [89] showed that in the home environment, individuals valued specific religious material artifacts, domestic routines, and technology use more than their secular counterparts. They suggested that information technologies should recognize and support spiritual practices and consider system designs for reflective, context-aware, and enduring use (known as extraordinary computing) [89]. A prior study also highlighted that information technologies facilitate faith-related mindfulness and increase social engagement (or embeddedness) and that faith-based decisions can be made to select appropriate media content to consume (or watchfulness) [87]. Beyond individual or domestic use, information technologies have been used to support ministry work, including improving worship engagement (e.g., visual aids with projection), coordinating the religious community (e.g., extending pastoral care past regular business hours), and broadening the scope of outreach [34, 90].

Our study aims to broaden existing scholarship on information technology use in religious contexts, by examining BibleCell, a mobile app for supporting a goal-driven group activity of small-group bible reading, as a new techno-spiritual practice in social settings.

2.3 Design for Supporting Techno-Spiritual Practices

Faith-based design refers to the design of products, including interactive systems that support spiritual practices [33]. When designing interactive systems, a prior study showed that providing necessary spiritual or religious experiences to users is closely linked to user satisfaction (known as spiritual/religious user experiences) [68]. Bellar [8] identified that user experiences such as ease of use and convenience are key for promoting mobile app usage for religious purposes. Furthermore, interactive technologies can bring transformative experiences (e.g., profound change) or transcendent experiences (e.g., mystical experiences and connecting with greater beings) (known as transcendence user experiences) [11]. A prior study highlighted that information technologies generally offer various practical values such as stimulation, information, and communication; however, these technologies may also interfere with achieving transcendent experiences (e.g., by causing divided attention during meditation due to digital distraction) [58]. Despite such concerns, Bell's seminal work showed the diversity of techno-spiritual practices such as spiritual messaging and online confession services [7]. Recently, Buie [13] surveyed commercial apps and services from the mobile app stores that support various techno-spiritual practices; representative categories include references, planners, videos, educational materials, prayer support, stories, trivia quizzes, and teachings/sermons. Prior HCI studies explored designing novel interactive technologies for supporting techno-spiritual practices such as prayer support (e.g., Sun Dial for informing prayer timing/locations by leveraging sacred imagery [88], and prayer companion for sharing prayer requests [31]) and online social presence (e.g., AltarNation for adding a social presence to prayers [38] and shared moments for sharing meditation experiences [73]). Recent advances in artificial intelligence and robotics have helped researchers build intelligent spiritual agents/coaches that aim to

provide *theomorphic experiences* (i.e., technologies that "carry the shape of something divine" [79]). For example, Buddha is a chatbot that supports answering questions and recommends guidance or spiritual advice [65]. Our work extends prior studies by exploring novel design spaces to support the techno-spiritual practices of small-group Bible reading.

2.4 Social Computing: Spirituality, Social Action, and Well-being

Prior studies have demonstrated that information technologies can help community building and offer increased social capital by strengthening one's connection to religious activities and encouraging spiritual support among believers [40]. Online communities bring new opportunities for engaging in faith-related activities, including providing a venue for faith-related question answering [75]. In addition, online communities engender an "always-on" (or "always available") virtual social presence with community members, thus facilitating religious community-building activities such as sharing ideas and exchanging prayer requests [17] and enabling online-offline interactions, such as sharing church activities and broadening outreach [16]. For this reason, existing studies have examined the community-specific influence of technology on social action and well-being. In a mosque fundraising campaign via SMS, Rifat et al. [69] found that religious framing resulted in increased donations when compared to secular altruistic framing. Stowell et al. [74] explored a community-sourcing approach for mental health intervention that leveraged existing social support and social structures within the church community, such as health experts and church leaders, to design crowdsourcing tasks. The present work also explores an opportunity to design a novel social computing system for supporting small-group Bible reading, which can facilitate community building and spiritual well-being [16, 38, 70, 73].

2.5 Digital Scriptures and Social Reading

Community-wide scripture reading is common in various religions for spiritual well-being [10], for example, Judaism's Parshat Shavua for public reading of the Torah (1-year plan) [45], Islam's Quran reading during the 30 days of Ramadan [84], and Christianity's church-level Bible reading campaigns (e.g., 60-day challenges, or 1-year challenges) [57]. This kind of community-wide scripture reading is considered as social reading, which broadly refers to the practice of reading and discussing books. Stein taxonomized social reading as follows [72]: (1) informal, face-to-face discussion (synchronous, ephemeral), (2) informal, online discussion (asynchronous, persistent), (3) formal, face-to-face discussion (synchronous, ephemeral), and (4) formal, online discussion (synchronous or asynchronous, and persistent). Traditional social Bible reading can be best classified as a face-to-face synchronous activity. Owing to the recent popularity of digital books and ebooks, the use of digital scriptures with mobile devices is prevalent. For example, Dyer [26] found that Christians often use both digital and print forms of scripture, and mobile apps have helped improve everyday Bible engagement. Hutchings [41] analyzed the characteristics of two digital Bibles (i.e., YouVersion and Glo Bible) and showed that digital scriptures offer various "persuasive features" that help improve engagement, including online discussion and reading plans. As Kutzner et al.'s survey showed [49], online discussion on digital books (e.g., sharing reviews or feelings) is a critical feature of social reading platforms. Our work builds upon prior HCI and CSCW studies that aimed to design interactive technologies to support techno-spiritual practices such as prayer support and spiritual experience sharing. We focused on designing a mobile service that supports online small-group Bible reading, specifically, scripture reading, reading planning, and progress/experience sharing for group awareness. Our system design and field study aimed to deepen our understanding of spiritual user experiences regarding small-group social computing systems in spiritual contexts.

3 SYSTEM DESIGN

Reading through the whole Bible is often encouraged as a spiritual discipline in Christian communities. However, the Bible's volume is considerable, and it is not an easy task for an individual to finish successfully. Many Christian communities have diverse practices and strategies for helping their followers read through the Bible, and these are closely related to the *principles of persuasive system design* [64].

A local church typically organizes small groups to help group members read successfully through the Bible. The benefits of social support for enacting behavior change or maintenance have been well documented in prior studies. Social learning [20] can occur by observing other members' reading behaviors and progress. Cooperation [51] and competition [47] within a group can help individuals accomplish their reading goals. Members can offer *dialogue support*, such as praise [78], rewards [71], and reminders [51] via online interactions. Beyond social support, local churches often recommend various tools to facilitate Bible reading, such as digital Bibles and audio Bible apps, which can reduce the primary task load [51]. Paper-based reading planners are often distributed to help individuals better manage and track their ongoing reading schedules.

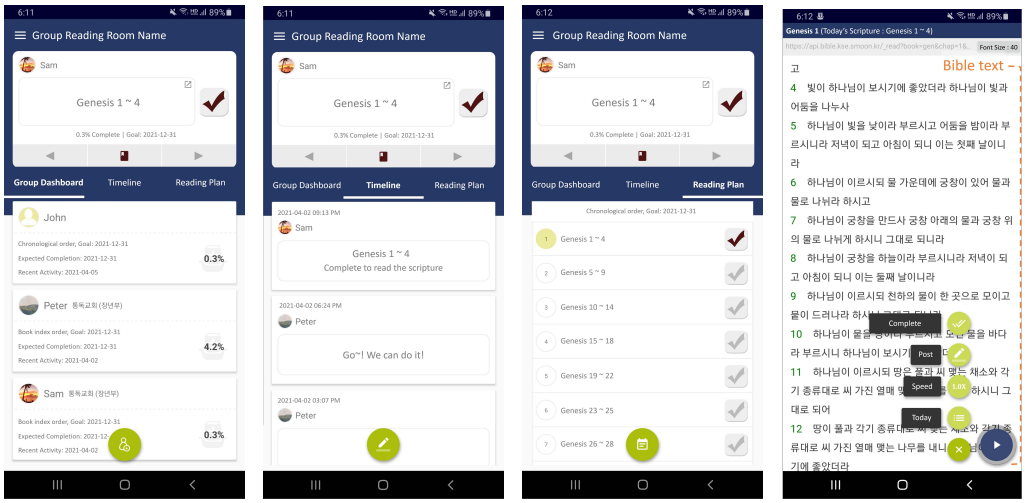
In this study, we built BibleCell, a mobile app that helps small groups of users to read the entire Bible. BibleCell's design was inspired by the Bible reading practices common in Christian communities. The key functions include (1) social support, (2) dialogue support, and (3) primary task support. We conducted iterative prototyping to improve the usability and sociability of BibleCell.

BibleCell was developed iteratively via two iterative tests as means to improve our design. The first prototype mainly focused on sharing individual reading progress and was implemented as an Android app. The first iterative test was conducted with a small group of Bible study members (n = 7) from a large university (including two of the authors) and collected user feedback for further improvement. The second prototype was implemented based on the feedback from the first implementation. Key updates pertained to improved reading support (e.g., showing Bible texts).

We conducted the second iterative test by deploying the early prototype at a large Protestant church (see the Method section for detailed information). This research prototype deployment during the two-month-long bible reading campaign was approved by church management. This field test had two main objectives: (1) to minimize technical issues and build a reliable system for preparing the main experiment, and (2) to understand the user experience from a real-world field test and finalize the components of BibleCell. We surveyed the small group leaders (n = 122, 32 females) who used the second prototype with their cell group members for two months. The survey contained open-ended questions for app improvement regarding each feature, for example, a reading room, reading timeline, and reading planner. Small group leaders varied in their age groups (20s: 2, 30s: 5, 40s: 50, 50s: 50, 60s: 10, more than 60s: 1, no response: 4) and their prior experience as small group leaders (less than 1 year: 31, 1 to 2 years: 3, 2 to 3 years: 9, 3 to 4 years: 3, 4 to 5 years: 8, more than 5 years: 58, no response: 10). Consequently, the BibleCell design was finalized by improving general usability issues and considering additional user needs, based on reports from the second pilot study. The final app was implemented as both Android and iOS apps and released to each app store. In the following subsections, we describe the details of BibleCell design and its history of changes.

3.1 Reading Room and Group Dashboard as Social Support

BibleCell provides a group reading room, enabling members of small groups to share their reading goals and progress. Using the app, a user can create a group reading room and invite members. It is possible to simultaneously have multiple reading rooms with different users. Users can specify their own reading plans, such as reading orders and schedules. According to our survey results, a user



(a) Group Dashboard (b) Timeline (c) Reading Plan (d) Bible Tools

Fig. 1. User Interface of BibleCell (with translated text)

can choose one of the following orders: (1) the order of books of the Bible, (2) the chronological order of books of the Bible, and (3) the M'Cheyne Bible Reading Plan [59]. The M'Cheyne Bible Reading Plan was developed by Scottish pastor Robert Murray M'Cheyne. We incorporated this plan because it is one of the most popular Bible reading plans used today.[1] A reading schedule can then be set by specifying either the amount of reading to be done each day (e.g., five chapters per day) or a target day by which the user wants to finish reading through the entire Bible. When the user inputs the number of Bible chapters to read per day, BibleCell shows the expected end date. In contrast, if the user sets a target day, BibleCell automatically sets the number of chapters to read per day by equally dividing the number of verses by the number of days before the target.

Our first prototype mandated all group members in the same reading room to follow the same reading plan specified by the room owner. This decision was made to help group members compare and evaluate their reading progress by establishing common ground. However, results from the first pilot study showed that individual preferences for reading order and schedule often differed within a group. Those who were far behind the original schedule wanted to reset their schedule for better planning. To reflect such needs, the final design allows each user to set and modify their own reading plans.

Figure 1 shows the user interface of the group reading room. At the top, the Bible chapters that the user has to read that day are presented (called "Daily Scripture"). The check button helps to record whether the daily reading requirement has been completed. The reading room menu has three tabs: (1) group dashboard, (2) timeline, and (3) reading plan. The Reading Plan tab shows a list of assigned Bible chapters for each day and whether a user has completed them. The Group Dashboard tab summarizes each member's reading status (e.g., plan, expected end date, and progress ratio). In our first prototype, the members were sorted based on their current reading progress, in descending order. However, the pilot study revealed that this design placed too much pressure on some users (i.e., it was too competitive among high-ranking members and could cause embarrassment if one

[1]This plan helps people to read through the Bible as it provides predefined daily reading assignments with a mixture of multiple books, that is reading the Old Testament, New Testament, and Psalms or Gospels every day.

was too behind the schedule); thus, the members were ordered based on their last names. The Timeline tab lists either recent reading events (e.g., if a member has completed their daily reading requirement) or messages posted by members, in reverse chronological order.

A member user can send an invitation message to join the group reading room via a mobile messenger, SMS, or email. When the user who installed BibleCell on the device accepts the invitation message, the app is executed and shows the page to specify a reading plan in the group reading room. If BibleCell is not installed, the invitation redirects users to the app stores.

3.2 Reading Timeline and Notifications as Dialogue Support

BibleCell is also designed to provide dialog support to facilitate interactions among members. Specifically, the "Timeline" displays reading event logs, including events such as completing the reading of the daily scripture (e.g., who read which parts) and new members' participation. In addition, members can leave messages on the timeline. For example, the user can comment about personal inspiration from that day's verses or encourage other members to read the Bible. Furthermore, the final design includes push notifications to increase social interactions among members. Whenever the timeline is updated (e.g., when someone has finished their daily reading or shared a message), push notifications are broadcast to every member in the group. Notifications only contain key activities without containing detailed information (e.g., "Alice reads the Bible"). We allow users to enable or disable notifications for each reading room to control their level of distraction.

3.3 Reading Planner and Auxiliary tool as Primary Task Support

BibleCell provides convenience in planning and achieving goals. The app interface was changed to emphasize what the user had to read each day by placing the daily scripture with the complete button at the top of the screen. The Reading Plan tab helps users monitor their progress and modify the current plan. BibleCell improves users' reading behavior by linking the current chapters to read via a mobile website, as shown in Figure 1d. Users can also listen to the audio Bible and control its playback speed.

4 METHODS

4.1 Participants and Backgrounds

We conducted an in situ study to understand BibleCell app usage and user experience. To recruit target users effectively, we chose a large Protestant Christian church in South Korea that regularly holds a Bible reading campaign every summer. Note that the pilot test reported in the previous section was conducted in this church.

This church's denomination is the Presbyterian Church, which is the largest Protestant Christian denomination in Korea (over 60% of all Protestant denominations) [46]. This church has 5,000 or more people on average weekend attendance; this size is classified as a megachurch [83]. A large fraction of adults participate in small groups for bible studies. Male/female cell groups typically consist of 4-8 members, and family cell groups consist of 8-12 members (4-6 families). There are over 200 family cells and 100 male/female cells. Each cell group has a leader appointed by the church. Cell group membership is managed by the associate pastors; membership shuffles after two to three years after pastors consult with the cell leaders. There are weekly offline gatherings for bible studies. Offline schedules vary according to the needs of each cell. For example, family cells typically meet at a member's house every Friday evening for approximately two hours. Small group leaders run bible studies, and leaders take weekly training sessions on the study materials. Note that the COVID-19 pandemic mandates online small group gatherings, but this study was conducted

before the pandemic. Small group gatherings are roughly synchronized with K12 schedules in that there are winter (January–February) and summer (July-August) vacation periods. There are no weekly gatherings during the breaks.

A bible reading campaign traditionally happens in every summer break. Note that bible reading campaigns are popular in most Presbyterian churches in Korea. The church recommends a default two-month reading plan (i.e., reading 20 chapters per day), which is advertised in the church service bulletin every week. Cell leaders encourage their members to read through the bible; for example, leaders ask them to participate in the campaign before the break starts, and during the break, they use various communication channels because of a lack of offline gatherings (e.g., text messages, calls, or ad-hoc meetings). After the break, those who successfully complete bible reading receive a church coupon worth about 8.3 USD that can be used in the church bookstore and cafe. According to church statistics, about one-third of the members typically complete bible reading during the campaigns (e.g., 1,500-2,000 members).

At the beginning of the campaign, we introduced the BibleCell app and its installation manual to the church. App deployment to the local church was approved by the church management. We informed the pastors and the small group leaders that the app was deployed as part of the research project for designing new technologies for promoting spiritual wellbeing. Brief statements about user research were included in the information section of the app. Church members could voluntarily install and use BibleCell without any further instructions. After approximately two months of the campaign, we performed a survey to understand the participants' general contexts related to Bible reading in this local church and to invite people who are interested in a follow-up interview study. The survey contained several questionnaires that were chosen to understand their Bible reading practices in the small-group contexts (e.g., the willingness to read the Bible and small group engagement). These aspects were considered because Bible reading with BibleCell could be dependent on general willingness to read the Bible, and group engagement could influence social reading behaviors. A total of 310 BibleCell users in the church responded to the survey. First, participants' willingness to read through the Bible was fairly high. We used three five-point Likert scale questions on generalized intention (GI) from the theory of planned behavior [30] by slightly modifying them to fit the Bible reading context (e.g., "I expect to read through the Bible."). On average, the participants' GI score was 4.49 (SD = .84), indicating that they strongly wanted (expected/intended) to read the Bible. Second, the participants actively engaged with small groups in the church. We used five five-point Likert scale questions on engagement in the Group Climate Questionnaire (GCQ) [56]. Most of the participants (strongly) agreed with statements like "The members liked and cared about each other." (M = 4.02 SD = .71). Detailed survey results are summarized in the Supplementary Material.

4.2 BibleCell App Deployment

We noted that BibleCell satisfied the essential requirements for an in situ study, namely its strong usability and app reliability. Because we deployed BibleCell on both App Store (iOS) and Google Play (Android), a total of 13,376 users have installed BibleCell for four years (from June 2016 to July 2020). The rate of app installation typically increases at the beginning and middle of the year (January and July), possibly related to general plans of Bible reading for a year. For all the reading plans logged in the data, the users showed 44.6% of the completeness ratio on average, and 22.1% of the reading plans were successfully completed. On average, there are 2.6 members in a group reading room. For participants from the target church during the summer breaks, the group size corresponds to the actual group size (e.g., 8-12 users for the family cells and 4-8 users for male/female cells). Most users prefer to read books in the order presented in the table of contents

(84.0%), followed by chronological order (14.2%), and M'Cheyne (1.8%). Most users prefer to read four to five chapters a day, making it possible to complete the entire reading in a year.

During the study period, 1,248 church members used BibleCell. 92.9% of them followed the reading plan in chronological order, and the number of members per group was 2.16 on average. Their daily completeness ratio (60.4%) and proportion of those who finished reading through the Bible (37.5%) were higher than the overall average. These are possibly related to the local church's summer campaign of two months, which requires approximately 15-20 chapters per day. Among these users, 310 participants, who responded to our survey, evaluated the usability of BibleCell. We used the USE questionnaire [55], which is a widely used scale for usability evaluation in various domains [1, 5]. BibleCell showed high usability in terms of usefulness, ease of use, ease of learning, and satisfaction (M = 4.16, SD = .89).

4.3 Semi-structured Interviews

After the campaign, we conducted semi-structured interviews with 27 participants (four women). To recruit the participants for the interviews, we used a snowball sampling method, which is a non-probability sampling technique [32]. Our interview began with 13 participants. We asked the following questions: (1) how they used BibleCell, (2) what features in BibleCell helped them read the Bible, and (3) how they perceived sharing their status of Bible reading with group members via features such as the timeline, dashboard, and push notifications. We further recruited 14 more participants to deepen our understanding of the spiritual experiences of BibleCell use. Of the 27 interviewees, 17 were group leaders, and we denote leaders and members as "L" and "M," respectively.

All interview sessions were recorded and transcribed to capture the original, nuanced responses from our participants. We performed inductive analysis [66] to gain a detailed understanding of the user experiences of BibleCell. We read through each transcript carefully for familiarization with the participants' responses. We annotated the transcripts by labeling relevant words, phrases, or sentences that contained meaningful expressions [35]. We then classified the labeled codes into groups with similar themes across the different interviews. After generating the initial themes, we reviewed the themes and iteratively analyzed the labeled codes and themes using affinity diagramming. This process was repeated until an agreement on the finalized themes was reached by the researchers. Note that we observed that the labeled codes tended to be quickly saturated after coding several participants in both the first and second rounds of interviews.

5 RESULTS

Our results revealed several insights into techno-spiritual practices in social contexts. After discussing the overall experiences of spiritual well-being related to BibleCell use, we elaborate on how social sharing influences group behaviors for goal achievement such as motivating group members and facilitating competitive and cooperative social reading activities in religious contexts. Furthermore, we present the role of group leaders as a facilitator such as encouraging, helping and modeling.

5.1 Overall Experiences for Spiritual Well-being

The participants often mentioned that they could *make a habit of reading the Bible*. Participants responded that the accessibility to the texts of the Bible and the app features that made for convenient Bible reading, such as listening to the Bible, helped them read the Bible more often and easily. One participant said, *"Using BibleCell, I was able to read the Bible anytime and anywhere. I could experience God's grace of living with the Bible in my life."* (L13). Participants also responded that they could form a habit of reading the Bible because they could easily make reading plans, read a

scheduled portion every day, and track their reading progress. One participant stated, *"BibleCell helped me to set a schedule for reading the Bible and informed me of my daily reading goals, so I was challenged with a renewing mind every day, and I could achieve my final goal of reading the Bible."* (L11). Another participant said, *"I was able to look at my reading progress and cheer myself up."* (L10).

Participants addressed that sharing reading progress through push notifications to in-group members motivated and encouraged them to read the Bible. One participant mentioned, *"Both receiving push notifications telling other member's reading and sending my reading behaviors via notifications were motivational, and it encouraged me to read the Bible."* (M9). Participants perceived a sense of accountability through transparent sharing of reading progress. One participant said, *"I felt responsible for reading the Bible because the promise to myself and the progress of reading the Bible has become public."* (M10).

Another experience for spiritual well-being was related to bringing reflection opportunities, which helped participants *read the Bible carefully and gain spiritual insights*. For example, participants mentioned that they could easily recollect what they had read by recording their impressions along with the verses on the group timeline. One participant responded, *"I could recall the Bible verses by writing down the words that were gracious for me."* (M10).

Participants mentioned that they often perceived increased spiritual well-being when group members shared the verses and impressions. One participant said, *"I left the Bible verses and the gracious experiences that God gave me on the timeline. I thought that it was better to share the grace."* Another participant commented, *"I felt more gracious to see graceful Bible verses posted in the timeline by members."* (L14). Participants also mentioned that social reading promoted interactions among group members. One participant said, *"It was difficult for our members to meet each other during a non-gathering period [a summer break], but there was an opportunity to communicate through BibleCell. As we talked about BibleCell use, we inquired after each other."* (L6). In some cases, online reading helped the participants engage in offline gatherings. One participant said, *"Visited a café of a library with a deaconess and read the Bible together."* (L5).

5.2 Social Sharing as Motivators

BibleCell provides social sharing features, and a user's reading progress is transparently shared among the members of a small group (e.g., overall progress in the dashboard and daily completions via push notifications). We found that our participants had mixed feelings with regards to social sharing, in that they experienced either motivation or a sense of burden depending on their current reading progress.

In general, participants responded that they were motivated when they received push notifications indicating that a member in the group had finished the Bible for the day. One participant said, *"There were situations like, when I saw the app, I thought, 'Oh... the leader read it again!,' and I read the Bible a little more during lunchtime."* (M1). Another participant mentioned, *"We know each other's situation to some extent. And when I see someone (who is busy) read the Bible a lot, I thought I also should read the Bible more as soon as possible."* (L3). Participants also stated that they were motivated to read the Bible when they checked the leading progress of members in the group. One participant said, *"One or two members were ahead of me in reading the Bible, and that's what motivates me to read."* (L1). Participants were motivated to read the Bible by observing group members who read the Bible consistently, regardless of their progress. One participant mentioned, *"I thought I should read the Bible when seeing a person who's behind in reading the Bible, but he reads it steadily."* (M2). Finally, participants were motivated to read the Bible when observing new believers tried hard to read the Bible as one participant said, *"If members who just came to church read the Bible eagerly, those who have lived in faith for a long time were challenged. They read the Bible thinking, 'Oh, I should do it too.' "* (L8).

The stimulation provided by the app can engender a burden. Interestingly, we found that the degree to which participants perceived a burden was associated with their reading progress. For example, if a participant was reading the Bible well according to their plan, push notifications notifying that other group members read the Bible served as a reminder to read the Bible (i.e., no burden). However, participants felt burdened when they were in a situation where they were behind their schedule. We found two sources of perceived burden, i.e., the amount of reading assignments and transparent progress sharing. First of all, participants were burdened with the *amount of the Bible* they had to read in order to catch up. One participant said, *"There was a burden about the amount of the Bible to read because I myself hadn't read it [...] It was not a burden for such a push feature."* (L1). This participant also mentioned, *"Seemingly, it can be said that the app's push function itself becomes a burden. However, more fundamentally, it seems that it is not the burden of the push function but the burden of not actively being synchronized in the Bible reading."* (L1). Another burden was caused because participants were *concerned that others would see how well they had read the Bible*. One group leader said, *"Group members can see how the leader reads the Bible. It was a burden, and it had the effect, like whipping me."* (L6).

We found that the burden participants perceived was a strong motivator to encourage Bible reading. Participants perceived the religious burden of reading the Bible, because they thought that as Christians, they should read the Bible for their spiritual formation. Furthermore, they made a social commitment in the small groups to read through the bible during the campaign. One participant said, *"I felt like a sacred burden and worried at first, but later, when I had time to read it all, I kept up with the progress. I enjoyed reading the Bible while following the progress."* (M4). Another participant commented, *"There may be a burden because the reading progress is visible. However, if someone made a spiritual decision, he or she needs to read the Bible regardless of that."* (L5).

We found that some users formed negative attitudes toward the social sharing of Bible reading. Our participants occasionally mentioned someone else's stories. One participant said, *"Many people liked to share the reading progress via push notifications, while unexpectedly, some people threw doubt on it."* (M1). Our participants also said that some group members installed BibleCell but did not share their progress at all. Instead, they individually reported to the group leader later that they finished reading the whole Bible. One participant said, *"They didn't mark it as read. Instead, they reported to the leader that they had read the whole Bible after the entire period of group reading Bible was over."* (L5).

5.3 Social Reading as Competition vs. Cooperation

Our participants perceived reading the Bible as a behavior of competition or/and cooperation. Participants considered social reading as a *competition in good faith* and stated that they could read the Bible more by competing with group members. One participant said, *"I looked attentively at the percent value indicating the reading progress. It was a competition in good faith."* (L1). Another participant commented, *"I checked whether other members were following to catch up with me. If they almost caught up with me, I moved forward quickly (by reading the Bible). Like this, it has the effect of competing in good faith with each other."* (M2). Interestingly, participants perceived a sense of competition differently according to how similar their reading progress was to one another. In other words, participants felt more competitive toward members with similar progress to their own and did not feel competitive toward members with whom they had significant differences in progress. One participant responded, *"Those who've read 30 percent don't compete with those who've read 70 percent. [...] In fact, when compared to such a person, reading one more chapter doesn't change the situation."* (M3). One participant who perceived social Bible reading as a marathon said, *"Like a marathon race, I was competitive with those close to me. In a way, this is a competition in good faith, so it seemed to have an effect of making more effort."* (M5).

Participants generally viewed social Bible reading as a cooperative group activity, being aware that it was the group's *shared goal*—everyone in the group was reading the Bible together. Participants mentioned that they felt a feeling of pervasive togetherness and a sense of connectedness even though interactions through the app were asynchronous. One participant said, "*I think we made an effort with the goal of completing the Bible reading together.*" (M5). Another participant responded, "*I felt like we are reading together, or we are doing something together. While feeling that kind of atmosphere, I was able to continue reading the Bible without stopping.*" (L7). Participants also felt guilty or ashamed when their reading progress lagged behind the group's progress. One participant said, *"If I got left behind the (group's) progress, I felt guilty while thinking, 'Oh, I should read,' and I read the Bible to catch up with the progress."* (L4).

Interestingly, participants responded that they were motivated to read the Bible because all members should achieve a shared goal together (i.e., reading through the Bible within the campaign period), rather than being frustrated even if they were lagging behind in the competition. One participant said, *"In my case, rather than trying to give up or feeling frustrated when I was a little behind, I read the Bible steadily because everyone reads the bible together and all group members are busy but diligently reading the Bible."* (M2). Another participant commented, *"Although I may not be able to finish reading the Bible, I would feel that I am reading the Bible together within a group, so I think they would continue without giving up."* (L2).

5.4 Group Leader as a Facilitator

We found that the leaders of these small groups played an important role as a facilitator by (1) regularly checking the progress of group members and encouraging members, (2) leading the reading schedule as a role model and sharing related information, and (3) helping members to set/adjust reading schedules. To do so, small group leaders used diverse communication tools, such as group rooms and instant messaging.

Leaders regularly monitored the group dashboard to check the reading progress of all members. They noted that the dashboard was useful in terms of management because it helped them to keep track of their group members' reading state without contacting individual members. Group leaders mentioned that it was difficult to check the reading progress of members before using BibleCell. For example, one group leader said, *"In the past, I couldn't check the reading progress of members properly because I checked the progress by exchanging messages like, 'I've read so far' using KakaoTalk."* (L8). After checking the dashboard, they regularly encouraged members to continue reading by posting encouraging messages on the timeline. They also used existing communication channels, such as a group chat room in KakaoTalk. One participant said *"I usually posted an encouraging message in a group room once a week. In addition, I posted the message when most of the member's reading progress was lagging behind, or someone caught up with their own reading progress."* (L1). Another participant mentioned, *"I sometimes captured and copied my reading progress, and uploaded it to the group chat room [in KakaoTalk]."* (L6). Several strategies of promoting Bible reading were used. Leaders indirectly encouraged all members by publicly praising specific members who caught up with the group's reading progress. For example, one participant said, *"Rather than delivering a message directly to members who do not read, I encouraged the members by praising someone who leads their reading progress well."* (L7). Alternatively, leaders individually contacted those who were lagging behind via private channels such as a phone, instant messenger, or an offline meeting. This was mainly employed to lower the burden or embarrassment of the user who was falling behind. One participant said, *"In the group room, the message was shared, so I thought that the target member who needs encouragement might feel embarrassed. So, I mainly used the KakaoTalk messenger to talk personally."* (L2).

Most leaders felt pressured to be role models by leading the reading. One participant said, *"Since other members can see my reading state, it seems that I felt a burden if I could not meet the goal. As a result, this feeling of pressure has been a positive whip for me."* (L2). When leading the reading, some leaders shared supplemental materials that were useful for improving the contextual understanding of difficult passages. One participant said *"Our leader usually initiated and led the Bible reading. So, if our progress was at the stage of reading Genesis, the leader shared the related materials on Genesis in advance in the group room. In this way, the leader took the lead, so other members and I naturally followed the leader and proceeded in reading."* (M2).

Leaders helped members to set or adjust their reading goals according to the overall progress of each member. When members were far behind schedule, leaders asked them to adjust their goals (e.g., by extending the deadline or narrowing the reading scope, such as reading only the Old Testament). This personalized adjustment was made to encourage members not to give up. One participant said *"When the reading progress passed the middle point, I encouraged our members not to give up, even if we failed to achieve our initial goal. I recommended reading together even by reducing the amount of reading a little."* (L6). Another participant said *"I encouraged our members to read as much as we can because it may be too burdensome to us to assume that we should unconditionally continue reading. I encouraged that even if we can't finish it completely, let's practice and train reading through the Bible together with the help of the BibleCell app."* (L2).

Note that the leaders mainly used the group room for one-way broadcasting rather than interacting, which tended to set a norm on group room usage (e.g., group announcements or spiritual testaments). One primary reason was that the broadcast nature was considered burdensome, including for the leaders. In fact, for casual conversations, our participants generally preferred using existing group chat rooms in KakaoTalk over using the group room in BibleCell due to the relatively lower burden and rich textual communication support available in KakaoTalk (e.g., emoticons), as one participant commented, *"KakaoTalk is a channel we've been using so far, so I'm familiar with it. In addition, it seems that it is easy to express or convey emotions by using various emoticons."* (M1).

6 DISCUSSION

To summarize, BibleCell brought several benefits for spiritual well-being by helping users to form reading habits, self-reflecting on scripture verses, and facilitating group engagement. Social sharing helped to stimulate consistent reading behaviors, but some users felt burdened when lagging behind the schedule. Social spiritual reading was considered a cooperative group activity, but it also brought some level of competition towards personal goal achievement. Leaders generally played a vital role by encouraging, leading, and helping group members in social spiritual reading. In this section, we reflect upon our findings by considering the goal and group characteristics of social spiritual reading for persuasive technology design. Furthermore, our findings on user engagement in social spiritual reading helped us to explore *social-spiritual aspects of faces* and *the social-spiritual awareness* as new design spaces of socio-technical systems in religious contexts.

6.1 Reflection on Goal and Group Characteristics for Persuasive Technology Design

Persuasive technologies for promoting physical, mental, and spiritual well-being have been actively investigated in previous HCI studies [31, 38, 73, 79]. We contrast how social reading in a spiritual setting differs in terms of group and goal characteristics, and then relate our findings to social comparison and cooperation with those in other well-being domains.

A small group in religious settings typically has a leader whose roles include spiritual caregiving and role modeling [25, 57]. BibleCell offers social support features for leaders and members, as a form of online care or e-coaching [2, 9]. Social spiritual reading with BibleCell is closely related to the concept of computer-supported coordinated care (CSCC) in the elderly care domain [21].

CSCC attempts to leverage sensing and data sharing to help older adults sustain autonomy and the caregivers to offload caring activities and maintain primary daily activities [15, 21]. Similarly, social spiritual reading with BibleCell lowers the burden of tracking members' reading processes and facilitates social sharing of reading progress and spiritual experiences.

Reading through scripture has several unique aspects of goal setting as opposed to elderly care or health coaching scenarios. Goal setting in social reading is similar to physical activity promotion in that there are daily portions to achieve proximal goals (e.g., daily step count vs. chapter count). While maintaining daily behaviors is similar, social spiritual reading has a specific end goal; that is each group member finishes a reading assignment within a fixed period of time (e.g., 2 months). As part of the church-wide reading campaign in a church, there is an implicit *group goal* in which all group members (including the leaders) are encouraged to complete their reading goals for spiritual formation as a group. Unlike a church's simple fixed schedule (e.g., reading 20 chapters per day), individual reading schedules can be personalized in BibleCell, for example, setting a deadline and choosing preferred reading orders (e.g., New Testament first). The daily reading portion was automatically set based on user preferences. Unlike physical activity goals, failed daily goals in social scripture reading can be caught up later, which provides flexibility in behavior planning.

Our findings showed that these goal and group characteristics in spiritual contexts resulted in unique user experiences related to social competition and cooperation. A recent systematic review of social features in mobile health interventions has shown that the effectiveness of social features is mainly attributed to group membership and social competition [77]. The major concerns related to social comparison or competition were that participants may be only interested in their own progress [60], and competition could result in undesirable outcomes (e.g., emotional and health) [6]. These issues were less concerning in our small-group context. The leader and members of the small group provided social support. A leader as a facilitator encouraged group members to make individual efforts to finish their reading assignments, or sometimes adjusted individual goals for continued participation (e.g., extending deadlines or reducing books to read [44]). Our finding about *competition in good faith* highlighted that group members used social sharing features to increase their goal awareness and commitment. Social spiritual reading was also regarded as *a cooperative group activity* for spiritual formation as a group. So far, group-level cooperation has only been observed when there is team-based competition (e.g., group-based step count competition [18] or phone use limiting competition [47]). In general, group activities in religious contexts are largely cooperative for spiritual formation, because spiritual and religious beliefs and practices have a mixture of social-spiritual aspects, that is the *internal (spiritual) aspects* (e.g., a sense of meaning of life, personal engagement of religious practices and rituals, and relationship with a superior being) and *external (social) aspects* of spiritual edification (e.g., social support from a religious community) [39]. As shown later, these unique characteristics bring new design opportunities for supporting social-spiritual awareness in persuasive technologies.

6.2 Gaining or Not Losing Social-Spiritual "Face" as the Nature of Motivation

Completing a goal-driven activity in a group is many times more effective because of the peers in the group. Wanting to receive a positive evaluation from peers is normally related to the concept of "face" which is the public image a person tries to keep to maintain their social identity in the society or culture to which they belong to [82]. In general, the concept of "face" has two aspects, namely a social and moral aspect. The social aspect of face focuses on one's own demonstrated abilities and talents through which they may gain or lose the status related to the people they have social relationships with (also known as impression management). This is a commonly shown aspect that many researchers utilize as a motivator to maintain performance when people are practicing physical activities in a group [52, 53].

We discovered that our target participants showed rather different behavior than what we can normally explain through the "social face" phenomenon. A noticeable phenomenon we observed was that our participants disliked the explicitly visualized ranking of their progress, which was excluded in the revised final version of our design. The person who took the role of a facilitator in the group tended to encourage the members individually rather than publicly, particularly when that member was behind in their reading. Most participants were cautious neither to judge nor be judged by other members. Although it is true that some participants mentioned that their motivation for reading was also influenced by the desire to surpass other members' reading performance, our users mostly mentioned that their motivation was not simply to win but to *fulfill their commitment to do well*. They also mentioned the *desire to do well together as a group* rather than individually. When they were behind (i.e., with respect to their own schedule or the progress of others), they tried to interpret such a situation as a chance to stimulate themselves to catch up. The constant tension, namely to do as good as or better than others in performing the goal activity versus caring about the group as a whole, were the key characteristics driving their performance. This finding is the main departure from the user experiences of social comparison or competition in other domains of well-being.

Initially, we thought that this may be related to "moral face," which is more pervasive in the Eastern culture. The moral aspect of "face" focuses on other people's evaluation of one's moral character [42]. "Moral face" cares for not ruining one's moral integrity, and our findings surfacely look related to this phenomenon. It may be possible that the religiously oriented context may emphasize the importance of the moral aspect, which may enhance such a phenomenon more than "social face." However, what we could not explain with these "face" phenomena was the repeated mention of feeling *graceful toward God* through scripture reading activity. This aspect of motivation is difficult to explain only by the extrinsic phenomena of social and moral faces.

According to the psychological study of religion, an individual's religious motivation largely consists of intrinsic and extrinsic dimensions [3]: intrinsic motivation denotes sincere beliefs in a religion and attempts to follow its teachings and maintain the relationship with a superior being. This could be related to the fact that the participants feel graceful toward God, and extrinsic motivation is related to the use of religion for personal benefits or social capital, which could be related to what people felt through the social and moral faces. In general, spiritual well-being requires a mixture of both internal support (e.g., spiritual beliefs and practices) and external support (e.g., active help from other members in a religious community) [39]. Furthermore, small groups were organized for spiritual formation, and members were normatively committed to group purposes and activities both internally and externally [81].

This theological background on motivation helped us to propose the concept of the *social-spiritual aspects of face*, which incorporates a *spiritual aspect* in the social face when users participate in spiritual group activities. Our participants often mentioned that reading the Bible itself is the channel for them to think about and experience God. Unlike other types of behavior-change goals, the criteria of success here are not simply to achieve the visible goal (i.e., reading the entire Bible), but the process itself as spiritual formation seems to be more relevant [54, 90]. As we mentioned in our findings, the burden of reading by falling behind did not make them simply give up. The facilitators adjusted the goals for those people who were behind, and they often mentioned the importance of continuing the Bible reading practice to set the "right" relationship with God. The fact that our participants cared about spiritual aspects (i.e., *their relationship with God*) makes our case different from what we normally expect for the other types of behavior-change goals, such as increasing and maintaining physical activities. In religious small groups, the relationship with others was further governed by the motivation to form the *right face toward God* for spiritual formation (e.g., successfully completing Bible reading as a group, or not giving up on the reading

practice), which seems to require a new perspective for group dynamics [29]. Competition among individuals is not to win over others. What matters is to *cooperatively* support each other to keep their practice right towards God, and the role of group facilitators is to guide them to be aware of the importance of the practice itself in relation to God.

Beyond the "self-surveillance" of spiritual states via self-tracking [67], this observation clearly shows that the design of the tools to support group-based spiritual practices, like our application, should enable people to feel a tangible connection *with* others and facilitate intimate group interactions *in* the invisible spiritual being. Our results showed that users' motivations in BibleCell were related to spiritual and social faces because app usage facilitated internal and external support [39]. However, we also highlighted that care must be taken when designing social sharing features of group activities and goals in small group techno-spiritual practices; for example, our participants did not like explicit ranking and judgment from other peers. This finding on the behaviors of small groups brings new insights into existing research on designing for spiritual and transcendence user experiences [12, 68, 88] and social-spiritual practices [17, 54, 70]. In other words, the social-spiritual aspects of the face should be carefully considered to enable internal and external support in social computing systems for small religious groups becauses sharing group activities motivated users both internally and externally. This insight opens up a new design dimension of "social-spiritual awareness" when we design technical support for group-based spiritual formation activities. In the following, we reflect upon our design of BibleCell from the perspective of social-spiritual awareness and suggest a design guideline on enabling proper levels of internal and external support.

6.3 Triggers of Social-Spiritual Awareness for Togetherness

We investigated a novel form of *social techno-spiritual practices* for small groups that prior HCI work did not examine [31, 38, 73, 88]. Our results further showed that *the social-spiritual face* facilitated by social awareness features motivated our participants to be accountable for their online reading activities within a group as part of their spiritual formation. Our participants felt the presence of other members simply through their perception of the notification alarms of others completing the planned reading tasks through our application. Even though they were reading the Bible at different times, these notifications were enough for them to feel that they were connected with the other members and that they were reading the Bible together. Users often mentioned a feeling of pervasive togetherness and a sense of connectedness, although our system does not provide any explicit space for rich and synchronous online interactions. Therefore, our system facilitates *social-spiritual intimacy* that co-located (i.e., "in person") face-to-face activities are difficult to offer due to spatial and temporal limitations (or even health concerns during pandemics). They often mentioned that they felt like they were accompanying other members in this reading journey only by simply being aware of others' progress through our application.

We learned that, in the case of group-based spiritual practice, the activity itself for the group (e.g., reading the Bible for our case) becomes the medium for being connected with others in the group, and simple features of enabling their awareness of others' participation (e.g., notification and progress dashboard) were enough for users to feel a sense of togetherness. Participants expressed appreciation for expanding their experience simply by participating in this group reading task and being notified of others' progress. We realized that it is not necessary for users to be heavily forced or supported to develop a group mindset because it is often naturally in place.

The design strategies for supporting small-group spiritual practices may differ slightly from those for other online community activities [17, 54, 70]. Although it is not clear whether enhanced group interaction support can still be useful for this spiritually motivated group, we discovered that such efforts might be less important for this type of group. More importantly, it seems to support them to focus on core tasks (e.g., reading the Bible) and to feel that they are not the only

ones doing the tasks. Instead of heavy social interaction triggers and features common in real-time groupware [36], the focus should be on supporting *minimal social awareness* of what and how the group members are doing for *accountability*, as well as providing room for each member to reflect upon their own progress and to be reminded of spiritual formation by reading the Bible.

Doing the same task (e.g., reading, praying, and sharing) as a group should be supported to grow in God for spiritual formation instead of simply achieving the goal quickly or efficiently. Furthermore, it is very important to be careful with this type of group to avoid situations in which they may judge or be judged by others. The subtle nuance and spiritual values that this type of group cares about must be taken into account. We believe that these values can be supported through nuanced and simple sharing and communication features instead of rich and complex features. This design principle of *social-spiritual awareness* allows group members to more flexibly and freely develop their own strategies for sharing and communicating methods that are customized for their own group characteristics. We believe that lightweight, open-ended sharing features are the core strategies for supporting *social-spiritual awareness*, thus facilitating the togetherness of spiritually motivated groups.

6.4 Limitation

We used a snowball sampling method to recruit interview participants for the main study, which made it difficult to control the ratio of gender, and a gender imbalance may limit generalizability. We re-reviewed the interview data and found that user experiences of spiritual well-being and social sharing with BibleCell were similar across genders. However, the current study lacks generalizability because the majority of participants are male, and thus, a follow-up study with a balanced sample must be conducted to ensure generalizability. In addition, the survey was solicited by sending emails to the registered participants. The survey did not include demographic information, and the results may be limited because general user experiences, such as usability evaluation may vary according to participant characteristics (e.g., tech-savvy group and gender).

Another limitation of our research is related to the leading nature of the questions used in the interviews of the main study. For example, we asked participants what features in BibleCell helped them read the Bible. This type of question that asks the system's positive aspects may lead to responses in a specific manner and bias our findings. During the interview, however, we were also able to collect neutral or negative responses from the participants (e.g., sense of burden) because we also asked about the general experiences of BibleCell use and perception of sharing the status of Bible reading with group members (e.g., timeline, dashboard, and push notifications). Note that negative responses were also received during the iterative tests (lab and field), which were also reflected in our final BibleCell design. Overall, we acknowledge the leading nature of the interview questions. Furthermore, it would be an interesting direction for future work to deepen our understanding of negative experiences (e.g., social-spiritual burdens related to social-spiritual faces).

7 CONCLUSION

Social scripture reading is one of the major spiritual rituals in many religions. We built and deployed BibleCell—a social scripture reading tool that supports personalized reading planning, scripture reading, and social sharing. Our system design contributes to the body of existing work that considers the use of technologies for spiritual well-being and techno-spiritual practices. After a multi-year deployment, we performed in-depth interviews to deepen our understanding of the social aspects of techno-spiritual practices. Our findings revealed novel insights, such as the mixed roles of social awareness and cooperation/competition among members as motivators and burdens and leaders' role as facilitators. We extended the existing concept of face to religious contexts

as the concept of social-spiritual face, which serves as an important theoretical underpinning of "social techno-spiritual practices." Furthermore, we discuss the novel design space of social-spiritual awareness. Despite large religious populations, understanding and building technologies for spiritual wellbeing have received little attention in the HCI and CSCW communities. Our work lays the foundation for socio-technical system designs for social techno-spiritual practices. We call for further studies on social-spiritual awareness that promotes behavior change and the maintenance of spiritual well-being.

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