Conceptualizing a Mobile App for Foster Youth Transitioning to Adulthood: A Mixed-Method Approach

J. Jay Miller, Ming-Yuan Chih & Earl Washington

To cite this article: J. Jay Miller, Ming-Yuan Chih & Earl Washington (2016) Conceptualizing a Mobile App for Foster Youth Transitioning to Adulthood: A Mixed-Method Approach, Journal of Technology in Human Services, 34:2, 145-170, DOI: 10.1080/15228835.2015.1108260

To link to this article: http://dx.doi.org/10.1080/15228835.2015.1108260

Published online: 06 May 2016.
Conceptualizing a Mobile App for Foster Youth Transitioning to Adulthood: A Mixed-Method Approach

J. Jay Miller a, Ming-Yuan Chih a, and Earl Washington b

aCollege of Social Work, University of Kentucky, Lexington, Kentucky; bKentucky United Methodist Home for Children and Youth, Lexington, Kentucky

ABSTRACT
Despite the promise of mobile smartphone applications (apps) in addressing challenges faced by foster youth transitioning to adulthood, the literature is devoid of conceptual frameworks for the development of these apps. This article documents the process of using Concept Mapping to delineate a conceptual framework germane to developing an app to assist youth transitioning from foster care to adulthood, and explore differences in development priority areas among participants. Participant data was collected via qualitative brainstorming sessions, and analyzed using multidimensional scaling and hierarchical cluster analysis. This article explicates findings from this study, discusses implications, and identifies apposite areas for future research.

ARTICLE HISTORY
Received 28 August 2015
Accepted 12 October 2015

KEYWORDS
Concept mapping; foster youth; mobile application development

Introduction

Increasingly, practitioners and researchers from a variety of professions and disciplines recognize the potential of mobile smartphone applications (apps) in addressing social challenges. Evidence suggests that apps have had a positive impact on helping alcoholics maintain sobriety (Gustafson et al., 2014), assisting individuals to access mental (Kayyali, Knott, & Kuiken, 2013) and physical (Chen et al., 2012) health services, and preventing pregnancy among adolescents (Carvajal, Brittner, & Rubin, 2013), among a plethora of other impacts. Indeed, the development and utilization of mobile apps can be an efficient and powerful tool in assuaging challenges in a variety of social service systems (Jones et al., 2014): The foster care system is one such system.

Despite the promise of apps addressing challenges faced by foster youth, social work literature in general, and child welfare literature, specifically, is devoid of conceptual frameworks for the development and use of apps in social work practice with foster youth. In discussing apps in a broad context, Sadasivam, Tanik, and Willig (2008) concluded that literature must document adaptable conceptual models for developing mobile applications. Undoubtedly, more research is needed that examines the development of apps in
general (e.g., Luxton, McCann, Bush, Mishkind, & Reger, 2011; Price et al., 2014) and, particularly, in social service literature. This project seeks to contribute by uniquely addressing this limitation in the literature.

This study utilized Concept Mapping (CM) to delineate a conceptual framework necessary to develop a mobile app aimed at assisting youth transitioning from foster care to adulthood. CM is a participatory, mixed-method research approach (Kane & Trochim, 2007). Through multidimensional scaling and hierarchical cluster analysis, this method produces visual images that illustrate conceptual relationships among data (Anderson et al., 2006). After a brief review of pertinent literature, this article outlines CM procedures employed in this study, describes and discusses results derived from the process, reviews policy and practice implications derived from the data, and identifies areas for future research.

**Literature review**

**Emergence of mobile apps**

Smartphones have permeated every part of society (Boulos, Wheeler, Tavares, & Jones, 2011). Researchers estimate that nine in 10 adults have a cell phone, and that 64% of people (including 85% of young adults aged 18 to 29) in America own a smartphone (Pew Research Center, 2015). Young adults are among the heavy consumers of the Internet and online media (Coyne, Padilla-Walker, & Howard, 2013).

The emergent use of smartphones has led to increased use of apps. Preziosa, Grassi, Gaggioli, and Riva (2009) noted that there has been a rapid global “diffusion” of mobile apps in recent years. There are now over 1 million mobile apps available to smartphone users (Perez, 2014) and Gartner reports that over 100 billion apps were downloaded globally in 2013 (Lunden, 2013). With the increasing availability of relatively inexpensive smartphones (Doarn & Merrell, 2013), these numbers will certainly continue to rise and the development of new apps will continue to grow at a “feverish pace” (Godwin-Jones, 2011, p. 5).

**Use of mobile apps**

Let’s face it: there is a mobile app for nearly everything. In terms of academic and research literature, the health sciences fields (Public Health, Medicine, etc.) appear to be the most advanced in documenting the development, deployment, and evaluation of mobile apps (Freifeld et al., 2010). Perhaps, attention to the use of apps by these fields/disciplines can be attributed to changing policies, such as the implementation of the Affordable Care Act, which promotes and incentivizes efficient healthcare treatment delivery (Weinstein et al., 2014).
The literature in the professional areas noted previously is replete with papers that document the use and effectiveness of apps. For instance, Surka et al. (2012) utilized an app to assist public health workers in screening cardiovascular disease. These authors found that the use of the mobile app helped the assessments to be more efficient and accurate when compared to assessments completed via standard “paper-based” format. Others have documented the positive impact of apps on general physical wellness (e.g., Youm & Park, 2014), maternal health (e.g., Noordam, Kuepper, Stekelenburg, & Milen, 2011; Smith et al., 2014), treatment of eating disorders (e.g., Ambwanni, Cardi, & Treasure, 2014) and smoking cessation (e.g., Valdivieso-López et al., 2013), to name a few.

In addition to physical health issues, a number of papers document the effectiveness of apps intended to deal with mental health challenges. For example, Reid and colleagues (2013) conducted a study that examined an app that was designed to assess and manage mental health challenges for adolescents in primary healthcare settings. These authors found that the app increased the understanding of the patient’s mental health, and assisted the primary care physician in making decisions about medication, diagnosis, and referral. Price and colleagues (2014) also examined the use of apps in mental health care. These authors surmised that the use of mobile technologies may allow service providers to supplement face-to-face contacts or allow clients to receive services in fewer visits, better inform clients and more actively engage them in their care, and increase the use of more evidence-based practices. Similarly, Boydell and colleagues (2014) explained that apps can have an impact on preventing issues stemming from mental health conditions in children and youth.

The social work literature in general, and the child welfare literature, specifically, is in the nascent stages of documenting the development and deployment of mobile applications. However, a review of relevant child welfare literature databases revealed no empirical articles associated with app development, deployment, and evaluation. Other articles have described apps to assist social workers in carrying out their jobs. For instance, an issue of Policy and Practice detailed Cúram’s (2011) mobile application to assist child welfare workers. Other examples include Guide to Social Work, an app designed to assist in preparing for the social work licensing exam (see: https://itunes.apple.com/WebObjects/MZStore.woa/wa/viewSoftware?id = 482157799&mt = 8), and the Savvy Social Worker, which is designed to help social workers stay abreast of new developments in practice (see: https://play.google.com/store/apps/details?id = org.csgeeks.swpractice&hl = en).

**The promise of apps with foster youth**

Annually, an estimated 26,000 young people exit foster care to adulthood, commonly referred to as “aging out” (U.S. Department of Health and Human
Research shows that these youth are more likely to experience homelessness (Courtney, Piliavin, Grogan-Kaylor, & Nesmith, 2001; Fowler, Toro, & Miles, 2009; Lenz-Rashid, 2004); lack community involvement (Buehler, Orme, Post, & Patterson, 2000); have a heightened risk for poor physical health (Takayama, Wolfe, & Coulter, 1998) and psychiatric disorders (McGuinness & Schneider, 2007); addiction (Osgood, Foster, & Courtney, 2010); and, have difficulty accessing mental and physical health care (Jones, 2014; Pecora, Jensen, Romanelli, Jackson, & Ortiz, 2009), when compared to their peers. Indeed, child welfare practitioners need to conceptualize, integrate, and evaluate innovative tools to allay these problematic outcomes.

Evidence from the literature suggests that apps can have a positive impact on assuaging problematic outcomes, such as those noted previously. For example, apps offer a constant presence (Chen et al., 2012). This presence can be especially pertinent for foster youth and alumni, many of whom lack consistent and supportive relationships (Courtney, Terao, & Bost, 2004; Miller & Owens, 2014). Additionally, apps have the capability of providing real-time information and updates, and can serve as a mechanism for care providers (e.g., social workers, counselors, therapists, etc.) to maintain contact with youth transitioning to adulthood (e.g., Luxton et al., 2011; Sadasivam et al., 2008). This is especially pertinent for foster youth and alumni. Many of these youth lack stable housing situations and maintaining contact with these individuals can be challenging. Based on previous studies (e.g., Ambwanni, Cardi, & Treasure, 2014; Price et al., 2014), apps can be a tool used to address these issues.

Research also suggests that apps can be beneficial in helping to address substance misuse and addiction. Exemplars include Gustafson and colleagues (2014) and Chih and colleagues (2013). Both of these studies concluded that apps were impactful in helping users obtain and maintain sobriety. This is a characteristic of mobile apps that can be especially impactful with foster youth and alumni, two groups who are disproportionately impacted by substance misuse (e.g., Morris, 2007). As well, apps can securely store important personal (e.g., health, mental health, etc.) information (Bouri & Ravi, 2014) and facilitate connections among communities of users (McTavish, Chih, Shah, & Gustafson, 2012), both aspects of which can address problems commonly faced by foster youth. Indeed, apps can be a valuable resource for foster youth and child welfare service providers alike.

The implications derived from this literature review are clear. While some professions and disciplines, such as Medicine, have burgeoning literature bases documenting the development and deployment of apps, others, such as Social Work, have lagged in this endeavor (e.g., Getz, 2012). This is particularly true as it relates to foster youth. Despite the promise of apps in addressing challenges faced by foster youth, there is a dearth in the literature in this area. More research is needed to examine the use of apps in general.
(e.g., Mohr, Burns, Schueller, Clarke, & Klinkman, 2013; Price et al., 2014), with particular attention to the development of apps for specific populations (Luxton et al., 2011; Sadasivam et al., 2008), such as foster youth and alumni. This study seeks to uniquely address this limitation in the literature by explicating a conceptual framework for app development from the perspective of foster youth.

**Study purpose**

The purpose of this study was to explicate a conceptual framework germane to developing an app designed to assist youth in the transition from foster care to adulthood. This aim in mind, this study was guided by one overarching research question: *How do foster youth and alumni conceptualize mobile apps that will help young people transition from foster care to adulthood?* An ancillary question included: *Is there a difference in the way that young people in foster care prioritize elements of this conceptualization when compared to foster care alumni?* By answering these questions, foster care practitioners and researchers will have a framework, from the perspective of youth and alumni, on which to base app technology development. Currently, there is no such framework documented in the literature.

**Method**

**Concept mapping**

To meet the overarching goals of this study, the researchers employed CM. CM adheres to a sequential process that entails collecting and analyzing qualitative data via multidimensional scaling and hierarchical cluster analyses (Kane & Trochim, 2007). Through these analyses, visual representations of the data are constructed (Anderson et al., 2006).

CM is particularly suited for this study for several distinct reasons. For instance, this method has proven useful in myriad conceptualization and planning initiatives, including the area of child welfare (e.g., Brown, 2008). Further, this method has been utilized with foster youth and alumni as primary units of analysis (e.g., Miller & Owens, 2014). Additionally, CM is useful in analyzing differences in priorities among groups of participants (e.g., Miller & Jones, 2015). These characteristics of the methodology make it suitable for answering the aforementioned research questions. Other than child welfare, CM has been used in areas of public health (e.g., Gonzalez-Block, Rouvier, Becerril, & Sesia, 2011), education (e.g., Abrahams, 2010), mental health and well-being (Bedi, 2006), and community organizing (Ridings et al., 2011), to name a few. The application of this methodological approach for this study is unique. A review of academic and research databases revealed no
published studies that use CM to explicate a framework for developing a mobile app.

CM data collection processes involve three over-arching phases: (a) collection of qualitative data via brainstorming session(s), (b) sorting and rating the ideas, and (c) analyses and map interpretation (Baldwin, Kroesen, Trochim, & Bell, 2004). To organize and analyze the data, this study employed the Concept System Global MAX™ software (Concept Systems, Inc. Copyright 2004–2015—all rights reserved). Though CM has become increasingly popular over the last two decades (e.g., Rosas & Kane, 2012), some readers may be unaware of this method (Miller & Owens, 2014). Thus, the following paragraphs outline the CM processes applicable to this study. Additionally, to more clearly understand the process, information describing the participants is also included in this section of the narrative. The protocol described and utilized in the research was approved by a University Institutional Review Board (IRB).

Participants

A total of 23 (N = 23) participants took part in this study. Of those, 11 identified as foster young people; 12 identified as foster care alumni. For the purposes of this study, foster young people were defined as individuals 18 years of age or older, still committed to the state foster care system (Note: In the state in which this study occurred, youth are permitted to recommit to foster care until age 21.). Foster care alumni were individuals who had exited the foster care system. All participants were recruited via a nonrandom purposive procedure. E-mail fliers that included the inclusion criteria were sent out to youth and alumni agencies and groups and participants self-selected into the study.

Inclusion criteria included the identification as a foster young person or alumni (as operationalized previously), be age 18 years or older, be developmentally age appropriate, and currently own a smartphone. All participants consented to participate in the study, per the approved IRB protocol.

The typical participant in this study was 19.81 (Sd = 1.91; Mdn = 19; Mode = 18) years old, female (66.7%), and identified as White (52.4%) or Black (38.1%). Four point eight percent of participants identified as either Hispanic/Latino/Latina or other (did not specify), respectively. On average, participants reported spending 6.93 (Sd = 4.70; Mdn = 5.25; Mode = 2.0) years in foster care, with the longest tenure being 15 years. Most participants reported entering foster care due to caregiver neglect (71.4%) or abuse (28.6%). Participants reported a mean of 4.63 (Sd = 3.81; Mdn = 3; Mode = 1) foster care placements. Asked to rate their overall foster care experience on a Likert-type scale anchored at 1 with “Bad” and 5 with “Good,” the mean rating was 4.0 (Sd = .94; Mdn = 4.0; Mode = 5).
All participants in this study owned a smartphone. Most owned an Android device (57.1%), followed by iPhone (33.3%), and Windows (9.5%) devices. On average, participants had 15.24 (Sd = 10.4; Mdn = 14; Modes = 20, 15, 5, and 2) apps downloaded on their phone. Nearly half of the participants (47.6%) reported using their apps 10 or more times per day. Most often, participants used these apps for social media networking purposes (76.2%). With the exception of one person, participants agreed that mobile apps could be useful in helping foster youth transition into adulthood. The one participant reported being neutral on this idea.

**Brainstorming**

For CM, qualitative data is collected through focus-group type brainstorming sessions. These brainstorming sessions are guided by a focus prompt. This prompt is designed with the explicit goal of the study in mind. This study utilized the following prompt: “Pretend you are developing an app to help young people transition from foster care to adulthood. To best serve foster youth and alumni, this app should ...”

Participants took part in one of four different face-to-face brainstorming sessions (each participant took part in only one brainstorming session). The sessions were scheduled at a time most convenient for participants and the researchers facilitated each of the brainstorming sessions. During each of these sessions, the researchers utilized the focus prompt to solicit statements from the participants. As they were verbalized by the participants, the researcher collated the statements and the statements were shown on a projector so that the participants could see the statements. This allowed the researchers to clarify and edit the statements in real time. Upon completion of the brainstorming sessions, the researchers collated all of the statements into a final statement set. This final set included a total of 52 unique statements. All statements included in the final statement set, as well as the cluster names and bridging values, can be found in Table 1.

**Statement structuring**

Statement structuring includes the sorting and rating of each the statements in the final statement set. After the brainstorming sessions discussed previously, the researchers entered the statements into the Concept System Global MAX software (Concept Systems, Inc. Copyright 2004–2015—all rights reserved). This software was used for data management and analysis.

Once the statements were input into the software, participants were invited to take part in one of four statement structuring sessions (each participant only participated in one statement structuring session). All of the participants from the brainstorming sessions took part in the structuring sessions, which took place approximately one month after the first meeting. During the
Table 1. Clusters, statements, and bridging values.

Clusters 1 (with numbers) and Statements Bridging Values 2

<table>
<thead>
<tr>
<th>Cluster: Visual Layout</th>
<th>Statement</th>
<th>Bridging Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The app should have cool icons for each content area.</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>7. The app should be developed using mainly ideas from foster youth and alumni.</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>11. The app should be easy to navigate.</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>25. The app should have security features in case youth lose their phone.</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>26. The app should have a feature where users can receive technical assistance when using the app.</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>28. The app should be easy to use.</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>33. The app should not use up a lot of phone battery life.</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>36. This app should be updated frequently.</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>42. This app information should be secure so that it cannot be hacked.</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>44. The app should look cool.</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>52. The app should not have ads.</td>
<td>0.15</td>
<td></td>
</tr>
</tbody>
</table>

Mean Bridging Value 0.19

<table>
<thead>
<tr>
<th>Cluster: Tools</th>
<th>Statement</th>
<th>Bridging Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. This app should interact with the phone calendar to keep track of important appointments, such as medical appointments.</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>9. The app should have a place for youth to store information about previous foster homes they have been in.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12. This app should have games that youth can play.</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>19. This app should allow youth to store important personal information, such as social security number.</td>
<td>0.48</td>
<td></td>
</tr>
</tbody>
</table>

Mean Bridging Value 0.61

<table>
<thead>
<tr>
<th>Cluster: Accessibility</th>
<th>Statement</th>
<th>Bridging Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. This app should be available to foster youth and alumni, no matter where they live in [STATE NAME].</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>4. The app should also have a website for youth who do not have a cell phone.</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>10. The app should only be used by foster youth and alumni.</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>15. This app should have a strong marketing plan so that youth can find out about it.</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>31. The app should be free for foster youth and alumni to download.</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>32. The app should be limited to youth who are 16 years old or older.</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>37. The app should be able to be accessed on Wifi so that it doesn’t use cell phone data.</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>50. The app should be available on a variety of platforms, such as Apple and Droid.</td>
<td>0.30</td>
<td></td>
</tr>
</tbody>
</table>

Mean Bridging Value 0.24

<table>
<thead>
<tr>
<th>Cluster: Peer Connections</th>
<th>Statement</th>
<th>Bridging Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. This app should connect foster youth with foster care advocacy groups.</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>8. The app should allow youth to anonymously chat with other foster youth.</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>21. The app should allow foster youth to chat with mentors via the app.</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>30. The app should allow foster youth to directly connect with youth through the app.</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>40. This app should allow youth to upload information about their former social workers so they can access this info after they have left foster care.</td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td>45. The app should allow youth to post questions that everyone can see.</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>51. The app should have a function that allows foster youth to invite other users using their cellphone number.</td>
<td>0.97</td>
<td></td>
</tr>
</tbody>
</table>

Mean Bridging Value 0.89

<table>
<thead>
<tr>
<th>Cluster: Mentorship Guidance</th>
<th>Statement</th>
<th>Bridging Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. The app should allow youth to “check-in” with their social workers.</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>16. The app should include mentors that have been in foster care.</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>20. The app should include mentors that are knowledgeable about foster care.</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>23. The app should allow youth to connect with their attorney.</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>24. This app should allow foster youth to communicate with their social workers.</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>38. The app should have a list of mentors for foster youth.</td>
<td>0.44</td>
<td></td>
</tr>
</tbody>
</table>

Mean Bridging Value 0.54

(Continued)
structuring sessions, each participant was given a set of 3 × 5 index cards containing the final statement set (e.g., one statement per card). Each participant was asked to sort the set of statements into piles. Participants were instructed to sort the statements into piles “in a way that makes sense to you.” Ideally, participants sorted the statements into piles based on a perceived conceptual relationship among the statements. The sorting exercise was intended to examine meaning relationships among statements. In addition, participants are asked to name or label each of their sorted piles. Assumedly, participants labeled their piles based on a thematic relationship among the statements in the pile.

After the statements were sorted, participants were asked to rate the statements. For this study, participants rated each statement in the set on one variable: Importance. This variable was measured using a Likert-type scale ranging from 1 to 5, where 1 denoted “not important at all,” and 5 denoted “very important.” Once collected, participants’ sort and rating data were entered into the Concept Systems software referenced previously.

**Concept mapping analyses**

CM employs advanced multivariate analyses, namely multidimensional scaling and hierarchical cluster analysis, to analyze participant data. At the outset of the analysis, an individual binary similarity matrix for each
participant is computed. This matrix is based on the sort data collected during the statement structuring sessions noted previously and indicates via a 0 or 1 whether two particular statements were sorted together (e.g., if a participant sorted two statements into the same pile the matrix will indicate “1”; if not, it will indicate “0”). Then, the individual matrices are collated into one aggregate similarity matrix that examines how all participants sorted the data. The numeric range for the aggregate matrix will range from 0, indicating none of the participants sorted the two statements together, up to the number of sorters (e.g., participants) involved in the study. For instance, in this study the range for the aggregate matrix was 0–23, because the sample size for this study was 23.

Once generated, the aggregate matrix is analyzed using multidimensional scaling (MDS). MDS is a set of computations that delineate data structure in space (Kruskal & Wish, 1978). For CM, MDS operates using a two-dimensional solution, which produces coordinates for each of the statements in the final statement set. Said another way, MDS analyzes the way that the data was sorted to come up with coordinates that can be illustrated in a two-dimensional space, along x and y axes.

After the MDS analysis is complete and each statement is represented in a two dimensional space, these coordinates are used as input to initiate a hierarchical cluster analysis (HCA). HCA is used to configure the conceptual domain in CM (Kane & Trochim, 2007). For this study, the hierarchical cluster analysis used the two-dimensional coordinates derived from the MDS analysis as input data. In turn, HCA analyzes that data via Ward’s (1963) algorithm (Rosas & Camphausen, 2007). Pragmatically, this process combines coordinates, or statements, into clusters. Ultimately, these clusters form a Cluster Map.

**Results**

The final cluster map entailed a seven cluster solution. The clusters included in the final map were: Accessibility, Peer Connections, App Layout, Notifications, Connection to Resources, Tools, and Mentorship Guidance. The labels for these clusters were selected based on names provided to piles by participants during the statement structuring phase noted previously. Cluster names represent the overall conceptual meaning, or theme, of the statements included in that cluster. Figure 1 illustrates the final cluster map.

The key statistic for the MDS analysis is the stress value. The stress statistic is a key indicator of the goodness of fit between the point cluster map and the computed similarity matrix. Stress statistic can range from 0–1. Values closer to 0 indicate a strong relationship between participant data and the computed data. For this study, the final solution merged after seven iterations and the
final stress value was 0.1597. This statistic indicates that the final MDS solution was a good fit for the data (e.g., Kunkel, Cook, Meshel, Daughtry, & Hauenstein, 1999). Or, that the location of each point within the two-dimensional space was a good representation of how the data was sorted by participants.

HCA analysis computes a bridging statistic, ranging from 0–1, that indicates how often a statement is sorted within a particular cluster (Donnelly, Huff, Lindsey, McMahon, & Schumacher, 2005). Low bridging values indicate that a statement was sorted within a particular cluster at a higher rate than statements with higher bridging values. Low bridging values suggest that there is consensus for how participants sorted statements into piles. Said differently, low bridging values for statements/clusters suggest that participants agreed that statements in that cluster should have been sorted together. There is a high level of conceptual cohesion among statements/clusters with low bridging values. The opposite is true for statements/clusters with higher bridging values. Values closer to 1 indicate little or no agreement regarding how statements within a cluster should have been sorted. Cluster, Statements, and Bridging Values for this study are included in Table 1.

As indicated in Table 1, the Connection to Resources cluster had the lowest bridging value of .08. That means that participants sorted these statements into this cluster at a higher rate than other clusters. Conversely, the Peer Connections cluster had the highest cluster rating, with a bridging value of .89. This means that statements in this cluster were not sorted together at high rate, in comparison to other clusters.
**Pattern match**

A pattern match is a pairwise comparison of statement ratings, by cluster, between two specified variables (Kane & Trochim, 2007). For this study, pattern match analyses were initiated to explore differences in importance ratings between two distinct groups that participated in this study: current foster young people and foster care alumni. As discussed previously, each participant rated each of the statement in the final statement set on the variable of importance. Specifically, participants were instructed to rate each statement on its importance to the development of the app relative to the other statements in the set. Figure 2 shows the pattern match graph for this study.

As illustrated in Figure 2, statements contained in the Accessibility cluster were rated the highest in terms of importance for both current foster young people (M = 4.47) and alumni (M = 4.58). Conversely, the Mentorship cluster had the lowest importance ratings for foster youth people and alumni with mean ratings of 3.38 and 3.42, respectively. The correlation coefficient statistic for importance ratings between foster young people and alumni was 0.96, indicating that there was a high level of agreement in ratings between both groups.

To further examine differences in the ratings of the statements comprised in each cluster, t-tests were initiated to examine differences in the ratings of foster young people and foster alumni for each cluster. As

![Figure 2. Pattern match. App = application.](image-url)
expected based on the pattern match graph in Figure 2, the results denoted that there were no significant differences in cluster ratings between the two groups. The cluster ratings and results of the t-tests for each cluster are denoted in Table 2.

### Bivariate go-zone graphs

In addition to the visual representations of data discussed previously, the researchers computed bivariate “go-zone” graphs for each cluster with ratings from the foster young people on the X-axis and the ratings from the foster care alumni on the Y-axis. These graphs are divided into quadrants and demarcate go-zones for statements with ratings above the mean on the rating variable (e.g., importance). For example, Figure 3 is the go-zone graph for the

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Foster young person ratings (Mean)</th>
<th>Foster alumni ratings (Mean)</th>
<th>T-test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>4.47</td>
<td>4.58</td>
<td>(t(14) = −0.3461, p &gt; 0.05)</td>
</tr>
<tr>
<td>Peer Connections</td>
<td>4.29</td>
<td>4.40</td>
<td>(t(12) = −0.3601, p &gt; 0.05)</td>
</tr>
<tr>
<td>App Layout</td>
<td>3.97</td>
<td>4.08</td>
<td>(t(20) = −0.2667, p &gt; 0.05)</td>
</tr>
<tr>
<td>Notifications</td>
<td>3.86</td>
<td>4.25</td>
<td>(t(6) = −1.0552, p &gt; 0.05)</td>
</tr>
<tr>
<td>Connection to Resources</td>
<td>3.81</td>
<td>3.95</td>
<td>(t(22) = −0.6316, p &gt; 0.05)</td>
</tr>
<tr>
<td>Tools</td>
<td>3.56</td>
<td>3.54</td>
<td>(t(6) = 0.0424, p &gt; 0.05)</td>
</tr>
<tr>
<td>Mentorship Guidance</td>
<td>3.38</td>
<td>3.42</td>
<td>(t(10) = −0.1127, p &gt; 0.05)</td>
</tr>
</tbody>
</table>

Note. App = application. *Not significant.

**Figure 3.** Go-zone graph for the connection to resources cluster.
Connection to Resources cluster and serves as an example of go-zone graphs for each of the clusters identified in this study.

Statements in the top right quadrant, or go-zone, were rated above the mean for importance by both foster young people and foster care alumni. As Figure 3 illustrates, an example of a statement in the go-zone for the Connection to Resources cluster is statement 48: “The app should include information about the legal rights of foster youth.” Contrariwise, statements in the lower left quadrant were rated as being less important to both groups. An example of a statement in this quadrant is statement 5: “The app should include resources about homelessness.” Statements in the lower right quadrant rated above the mean for importance for foster young people, but not foster care alumni. Statements in the top left quadrant rated above the mean for foster alumni, but not foster young people.

**Interpretation session**

A key phase of the CM process is the Interpretation Session. This is a meeting in which the results and visual representations of the data are presented to participants to ensure that the products of the research process adequately represent their perspectives. In essence, this meeting serves as “member checking” related to analyses associated with collected data. During this follow-up meeting, participants reported that the data accurately reflected their perspectives related to the overarching goal of this study.

**Discussion**

The purpose of this study was to explicate a conceptual framework for developing an app designed to assist youth in the transition from foster care to adulthood, and examine differences in priorities of foster young people and foster care alumni related to this framework. To this end, this study has had a positive impact on these overarching goals. The following paragraphs outline salient discussion points congruent with addressing the overarching research questions. Additionally, this section briefly addresses some of the main points derived from the process of employing CM for this study.

**Research question 1: How do foster youth and alumni conceptualize mobile apps that will help young people transition from foster care to adulthood?**

As to be expected, data suggest that youth conceptualized the framework of the app, specifically content, based on needs. Several clusters in the conceptualization, such as Peer Connections, Mentorship Guidance, and Connection to Resources demonstrate this assertion. Other clusters indicated a concern
for apps designed for foster youth and alumni to be visually appealing, function in an efficient way, provide real-time information, and foster a sense of community and connection among the users. The following paragraphs outline pertinent aspects of each of the content and function components identified by the participants, and how these concepts align with existing literature.

**Peer connections**

One pertinent component of the conceptual framework, in terms of content, was related to youth peer connections. Specifically, statements related to this idea can be found in the Peer Connections cluster. Research shows that youth value being able to connect with peers who have shared similar experiences (e.g., Miller & Owens, 2014). Data from this study suggest that youth viewed the ability to connect with other foster youth as a pertinent component of the app. This dynamic may also be associated with the fact that many participants in this sample indicated that they use apps mostly for social media purposes. In any event, the development of an app for young people in and from foster care may consider implementing mechanisms that allow youth to virtually connect to other users. These data may also indicate that app development should focus specifically on this population, and that apps developed for purposes outlined in this article, should be restricted to users in and from foster care.

The fact that participants viewed the app as a vehicle to connect with other peers is not surprising in that it is consistent with their current life stage. The average age of participants in this study was approximately 19. Classic human development theories, such as that of Erikson (1959) (e.g., Intimacy vs. Isolation Stage) and Bowlby (1969) discuss the concept of young adults seeking out meaningful relationships. The desire to connect with peers may be particularly strong for people in and from foster, as they may have lacked those types of connections earlier in life. Though dated, these theories, as well as others, do provide a foundation for understanding these data and underscores the importance of strong and healthy peer networks for individuals in this life phase. Apps can certainly assist in fostering the development of these connections and networks, particularly among individuals who have experienced foster care.

**Connection to resources**

The conceptual framework explicated by participants in this study indicates the need to more efficiently connect to a host of resources to assuage problematic transitions from foster care to adulthood. Among these resources identified in the Connection to Resources cluster are health
and mental services. As discussed in the literature review, foster youth and alumni are disproportionately impacted by mental health challenges and lack access to quality treatment providers (Pecora et al., 2009). Recent policy provisions, such as the Affordable Care Act, have expanded health coverage to youth and alumni for longer periods of time, thus making the need to foster connections between these individuals and service providers all the more important. These data demonstrate that developing and utilizing apps aimed at facilitating these connections to treatment providers may be a worthwhile approach to meet this need of the population.

Other resource needs identified by the participants are consistent with the literature. Exemplars include access to legal services and housing, which a host of authors (e.g., Lenz-Rashid, 2004; Taylor, 2009) have identified as being pertinent for transitioning foster youth. As discussed previously, data from this study suggest that mobile technologies, specifically apps, may be a way of uniquely addressing these needs.

**Functionality and accessibility**

Participants in this study identified several issues related to users who may, or may not, have access to an app designed to assist transitioning youth. For instance, statements in the Accessibility cluster include Statement 10: “The app should only be used by foster youth and alumni” and Statement 3: “This app should be available to foster youth and alumni, no matter where they live in [STATE NAME].” These statements indicate that participants may have had concerns permitting “nonfoster care” (meaning individuals who have not been in foster care) users to have access to the app.

Interestingly, this notion is congruent with some existing literature pertaining to foster youth. For example, Rogers (2011) stated that foster youth and alumni are often “extremely protective and secretive” about having been in foster care (p. 416). This secrecy, in part, can be attributed to the negative stigma associated with being in foster care (Gilligan, 2000). These things in mind, it makes sense that youth and alumni participants in this study may feel more comfortable using an app where all users have the common experience of having been in foster care.

Another pertinent aspect of accessibility related to the conceptual framework is the idea that youth are cognizant of the financial implications of utilizing apps. Though many apps are free, others often have cost associated with downloading them. As well, apps can utilize large amounts of data, thus increasing the amount of monthly data packages and phone bills. Statements in the Accessibility cluster, such as Statement 31: “The app should be free for foster youth and alumni to download”; Statement 4: “The app should also
have a website for youth who do not have a cell phone”; and Statement 37: “The app should be able to be accessed on Wifi so that it doesn’t use cell phone data,” indicate that participants are cognizant about the costs associated with app usage. This awareness is not surprising, given the problematic financial circumstances of some youth exiting care (e.g., Jim Casey Youth Opportunities Initiative, 2012).

**Research question 2: Is there a difference in the way that young people in foster care prioritize (e.g., rank) elements of this conceptualization when compared to foster care alumni?**

In terms of prioritizing clusters related to the app, data indicates that there is no difference in importance ratings between youth and alumni. There were no significant differences in ratings for clusters between the two groups. With the exception of ratings for statements in the Notifications cluster, foster young people and foster care alumni rank-ordered statements/clusters in a similar way (see Figure 2).

Though the difference in the Notification cluster was not statistically significant, foster care alumni did rank statements in this cluster higher than did foster young people. This may be due to the fact that individuals still in foster care may be receiving more notifications about services, or have better access to information, than young people who have exited foster care. Authors have suggested that alumni may no longer be connected to social service systems, and as such, may not have access to information as readily as individuals who are still involved in the system (e.g., Geenen & Powers, 2007). These rating data may be reflective of this dynamic as apps have proven useful in allowing for the ubiquitous transfer of information both to and from the app user (e.g., Luxton et al., 2011; Sadasivam et al., 2008).

Participants in this study viewed accessibility to the app as paramount to the development of the app. Simply put, data suggest that participants wanted to ensure that youth and alumni had access to the app. Statements in the Accessibility cluster were rated the highest, in terms of importance, by both groups. As such, data in these clusters could be particularly helpful in developing apps for the purposes specified in this article.

One thing to keep in mind when discussing the rating data is the context in which the statements were rated. Several clusters may be rated lower than expected. For instance, given the current landscape of literature associated with foster care, one may have surmised that clusters such as Mentorship Guidance and Connection to Resources would’ve been rated higher. Ideas in these clusters have been identified as paramount to successful foster care outcomes (e.g., Geenen & Powers, 2007). However, it is pertinent to note that participants were asked to rate each statement in relation to each other
statement in the set. As one of the participants aptly summarized during the follow up meeting:

It is not that the app looking cool isn’t important or mentorship isn’t important, it’s just that these things are not as important as other things. Accessibility has to be the most important. If you can’t use the app, none of the other stuff really matters.

CM processes

In terms of process, CM proved extremely useful in conceptualizing a framework relevant to developing an app. For this study, CM offered a sequential, rigorous research process that was easily understood by the participants. Because of adherence to this process, this article offers a framework that can be easily adapted and tested in other areas of app and technology development with a wide array of populations. This in mind, other researchers may consider replicating and documenting similar efforts with different populations in other practices and disciplines.

Perhaps of most importance for this particular study population is the participatory nature of the research approach. CM is a method that uniquely encourages participants to access their own voice through brainstorming, structuring, and interpretation phases (Miller et al., 2012). This is particularly pertinent for groups that have historically not been able to actively and meaningfully participate in research endeavors, which is true of foster youth and alumni (Brown & Campbell, 2007; Goerge, Wulczyn, & Fanshel, 1994). This may be useful for researchers interested in exploring the development of technologies for other marginalized or oppressed people.

Lastly, the analyses and outputs associated with rating clusters included in the conceptualization can be valuable to practitioners and researchers involved in technology development. Specifically, pattern match and other rating data can identify areas of priority for alpha or other multiphase testing. This may be particularly useful in social services, where development resources may be limited.

Limitations

As with any research effort, this study is not without limitations. Specifically, issues of reliability and validity are present. For this methodology, validity is assessed in how well the map accurately mirrors reality (Trochim, 1989). Reliability refers to the ability to replicate aspects of the study, such as idea/statement sorting, production of maps, pattern matches, and so forth (Jackson & Trochim, 2002).

Results from this study must be examined within the confines of these limitations. Factors such as: the participant constellation, state in which the
participants were in foster care, and overall foster care experiences may have impacted the way that youth conceptualized this app. Further, though the sample size for this study was ideal, additional participants may have offered other ideas or ratings not present in the current data set. Readers should certainly take these factors into account when assessing the applicability of this study to other contexts.

Because this study was conducted with foster young people and alumni in one state, results from this study may not be generalizable to other states. As well, the priorities identified by these two groups may differ in other geographic locations or for youth who have interacted with other service delivery systems.

Lastly, some researchers and participant groups may experience CM as a time-consuming undertaking. This is a challenge/limitation that must be acknowledged. For this study, the brainstorming and structuring sessions lasted approximately two hours each, respectively. Future studies must take into account the burden for participants when involved in similar, future studies.

Implications

Current findings, particularly when examined in the context of existing literature, offer several implications for human service practice, policy, and future research. The following section discusses a few of these implications.

Human service practice

Undoubtedly, the current study lends credence to the notion that mobile apps can be beneficial to practice with foster youth and alumni. Based on participants’ perspectives for the overall conceptual framework for this technology, an app may be useful in administering screening assessments and brief interventions, facilitating connections to resources, including physical and mental health providers, and fostering the development of social networks, peer and otherwise. All of these characteristics meet a uniquely identified need of the foster population, as evidenced in the previous literature review.

For child welfare practitioners, the challenge of developing technology in general, and apps, specifically, may be best addressed through multidisciplinary collaborations. Though child welfare practitioners may be best suited to provide subject matter expertise related to the content and functionality of apps, many of these practitioners may not have the skill set to develop the technology. After all, few human service educational or training programs focus on technology development. Additionally, despite the recognition and
promise of technology in human service arenas (e.g., Gelman & Tosone, 2010), child welfare service providers have been somewhat slow to embrace and document technology utilization, as evidenced by the dearth in the current literature. As such, partnering with individuals in tech professions (e.g., computer science, coders, etc.) may go a long way in developing and implementing these technologies. Public–private partnerships may also be promising in this area.

Practitioners who do engage in app development should take into account data from this study. Of particular concern, may be issues related to accessibility as identified in the Accessibility cluster. Cost to user, operating platform, and alternative access points (e.g., Web sites) are all factors that will unquestionably impact usage. Thus, practitioners and developers should be conscious of these issues when assessing feasibility and functionality associated with building apps for use in practice.

**Human service policy**

There are several policy considerations for the use of mobile apps with child welfare populations. Perhaps most importantly, are considerations pertaining to privacy and information sharing. In a recent study by the Pew Research Center, Madden, Lenhart, Duggan, Cortesi, and Gasser (2013) reported that many app users, particularly teens, have avoided certain apps due to privacy and information sharing concerns. Others have expressed similar sentiments related to security and privacy (e.g., Hoog, 2011). Worries associated with information privacy, hacking, and accessibility by “other” parties are certainly evident in the current study.

Based on existing literature, and the current study, individual practitioners and agencies need to develop, and adhere to, strict privacy protocols and delineate clear policies regarding how data that may be transferred via an app will be used. As well, individuals and agencies involved in the use of apps may cogitate a plan to issue user agreement policies and procedures, specifically pertaining to reportable information (e.g., threats of suicide, reports of child maltreatment, etc.). All policies and protocols that guide the use of apps need to be clearly communicated to the users.

**Human service research**

Implications for research on the use of apps in the field of human services abound. One obvious implication is to use the conceptual framework explicated via this study to develop a mobile app. Then, the impact of the app could be researched. Variables may include user satisfaction, impact on accessibility to resources, and criticality to transition from foster care, among others. As well, this study could be replicated in other areas, or with other
at-risk populations (e.g., homeless youth, teens struggling with substance misuse, etc.) and those data could be compared to the current study.

Another key area of research could be to assess the impact of the use of mobile apps when compared to more Web-based resources. For example, researchers might examine variables associated with peer networks (e.g., size of network, strength of network, etc.) developed via mobile apps and compare those to peer network developed via Web-based sites and platforms (Facebook, Foster Club, etc.). Such a study may shed light on the best way to go about fostering and developing such networks. The same type of analyses may be undertaken to examine differences in access to resources, health providers, and so forth.

An important point, specifically related to research, is that the implications of this study extend beyond the premise of simply conducting research about app usage and foster youth. Developing and implementing apps with this population can become a tool for researchers. Individuals who have exited foster care have limited access to institutional structures (Hill, Davis, Prout, & Tisdall, 2004), thus limiting access to this population once they have left care (Williams, McWilliams, Mainieri, Pecora, & La Belle, 2006). Though the federal government has created initiatives, such as the National Youth in Transition Database, to obtain and maintain outcome data related to this population, challenges persist. While the research ethics of such endeavors should be carefully scrutinized, apps may provide a unique way to maintain access and collect research data (via quick survey instruments, narrative check-ins, etc.) from user populations in general, particularly alumni who have left care.

**Conclusion**

This article sought to uniquely contribute to the literature in two ways. First, this article explicates a conceptual framework for developing a mobile app to assist youth in transitioning from foster care to adulthood. This framework is essential to ensuring the quality and effectiveness of apps designed to meet the need of this population. Second, this article documents the process of using CM to delineate this framework. Indeed, this methodology proved useful and can be adaptable for future studies in a variety of professions and disciplines.

As evidenced by this study, participants can contribute valuable information to the development of technologies designed to meet social service needs, particularly mobile apps. As O’Malley and colleagues (2014) aptly summarized, it is “vital that the end user is considered throughout the app development process” (p. 2). For this research, CM offered a structured way to meaningfully include participant perspectives in a planning process. Of course, the next logical step in this line of inquiry is to develop and test
an app using the framework explicated in this article. However, if the promise of any technologies in social services in general, and in child welfare specifically, is to come to fruition, practitioners and researchers must integrate the perspectives of clients and users into development efforts. This article offers a framework to do just that.

References


