

# A Mobile Health Approach to Assist Veterans Reintegrating into Civilian Life

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A MOBILE HEALTH APPROACH TO ASSIST VETERANS REINTEGRATING  
INTO CIVILIAN LIFE

by

Rizwana Rizia

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## ABSTRACT

### A MOBILE HEALTH APPROACH TO ASSIST VETERANS REINTEGRATING INTO CIVILIAN LIFE

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Marquette University, 2016

Civilian reintegration is the process of transitioning from military service to civilian life. For any active or reserve member of armed force, reintegration into civilian life can be very challenging. The reintegration phase has far larger impact than just a change in profession. It is actually a change in every aspect of life, which includes changes in lifestyles, responsibilities, home life, communities and much more. If a veteran is unable to survive the challenges of civilian reintegration it can adversely impact his or her personal and social life. Furthermore, in the long run it may even result in serious psychological conditions. Considering these difficulties that are not always faced by the general civilian population, the U. S. Army describes the reentry and reintegration problem to be as important as preparing soldiers for combat deployment.

Recently community-based prevention models for healthcare are gaining attention since government agencies and services are unable to reach veterans in all walks of community life. Dryhootch(DH) is a veteran-led community organization in Milwaukee. DH has successfully implemented a veteran peer-mentor support program for reintegrating veterans based on the evidence showing the effectiveness of peer-mentorship for mental health problems. A technology-based support system for the DHs' peer-mentor program is an important area for exploration. It may help in reaching a large group of veteran population, especially tech-savvy student veterans on school campuses. In this thesis we have elaborated the challenges of designing, developing and deploying a technology-mediated intervention for a veteran to veteran peer-mentor program. Based on detailed field studies, we have designed and developed a mobile technology-mediated peer-mentor support system called iPeer for the DH veterans. iPeer provides a remote symptom monitoring system for the DHs' peer-mentor program along with a social support network for the veterans.

The goal of iPeer is to make the transitioning phase of the reintegrating veterans smoother. Although, the answer to the question that whether or not it helps during the reintegration phase is not immediately available. It requires years of observation of the life of reintegrating veterans through the iPeer system. Nonetheless, this thesis is an attempt to address how we can help the technology-mediated peer-mentor service become a success. The system requires data gathering from veterans, data storage in server and data visualization for mentors. For a successful technology-based service like iPeer the presentation of information is very important. We report on a set of experiments designed to identify the best possible representation of complex visual information in the user interface of the iPeer system. The first experiment focused on how to best present information of a "patient panel" showing symptom change among veterans to their veteran peer mentor. The second experiment explored the best approaches for displaying highly relevant, socially driven location-based information services to veterans.

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## LIST OF ABBREVIATIONS AND ELABORATIONS

<b>TERM</b>	<b>ELABORATION</b>
DH	Dryhooch of America
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
VA	Veteran Affairs
PTSD	Post-Traumatic Stress Disorder
DOD	Department of Defense
LBS	Location-Based Service
CES	Community-Engagement Specialist
MCW	Medical College of Wisconsin
UWM	University of Wisconsin-Milwaukee
MU	Marquette University
SS	Social Scientists
EMA	Ecological Momentary Assessments
AV	Alpha Version
UI	User Interface
HIT	Health Information Technology
HER	Electronic Health Record
CSCW	Computer Supported Cooperative Work

## **Chapter 1: Introduction**

According to a poll directed by the Washington Post and the Kaiser Family Foundation, more than 50% of the veterans from the Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) fight with physical and mental health conditions resultant from their service. They feel separated from their family and community. The study found that one in two veterans have seen a teammate attempted or committed suicide. Moreover, more than 1 million suffered from anger outburst or relationship issues. All these are considered to be warning signs of Post-Traumatic Stress Disorder (PTSD). Furthermore they feel that the government veteran serving agencies such as the Veteran Affairs Healthcare System (VA), The Pentagon and others are doing very “poor” job in addressing these reintegration related complications encountered by them (Chandrasekaren, 2014). Another research suggests that approximately 18.5% of the OEF/OIF veterans will be diagnosed with PTSD (Burnam, Meredith, Tanielian, & Jaycox, 2009). Besides, many campuses have lately seen a noteworthy growth of OEF/OIF veterans as a result of the G.I. Bill. Those veterans may suffer from impaired cognitive skills, problems with concentration, difficulty managing assignments, approaching instructors. Therefore, there is a necessity for facilities that may provide them with assistance to manage their complications (Church, 2009).

DH is a small non-profit organization in Milwaukee, WI, USA. It is independent of any government veteran serving institutions e.g. Department of Defense (DOD) and the VA. DHs’ mission is to help veterans reintegrating into civilian life by providing them with an informal network of peer support. Each DH member is a veteran who has experience with the complications of civilian reintegration (Dryhootch is Peer Support

...). DH offers services to veterans from all service eras. In order to reach varied range of veterans the organization has lately developed an interest in expanding its present peer mentor program to younger technology savvy veterans (i. e. OEF/OIF veterans). Most of the OEF/OIF veterans are younger than 29 and have needs for after-hours service availability. They are interested in modern communication mediums such as social media, smartphone apps etc. (Brown & DeBakey, 2009). Additionally, many reported reintegration related problems such as occupational issues, anger outburst occur in real world scenario and cannot be addressed through only hospital-based therapy [ (Sayer, Noorbaloochi, Frazier, Carlson, Gravely, & Murdoch, 2010), (Ackerman & DiRamio, 2009)]. The consequences for not being able to handle reintegration related stress can be severe and research identifies that the OEF/OIF veteran group are at high risk of developing mental illness [ (Resnik, Bradford, Glynn, Jette, Hernandez, & Wills, 2012), (Kaplan, McFarland, Huguet, & Valenstein, 2011)]. With an aim to serve this set of population DH has been focusing on restructuring its successful peer mentor program for digital delivery based on the identified needs of this population.

Based on the results of extensive studies we have designed, developed and deployed such a system, which was named iPeer by Dryhootch. The iPeer system is divided into two separate modules, (1) The Peer-Mentor app and (2) The Veteran app. The Peer-Mentor app is used by the veteran mentors of DH. This app provides them with features to add, remove the mentees they manage and also view a patient panel with a list of all their mentees and their overall status. The Veteran app helps the veterans receive weekly behavioral surveys and submit responses remotely. Along with a detail need assessment of such a system, in this dissertation, we describe the evolution of iPeer

through formal-informal meetings, collaborative design, focus group and one-to-one interviews with veterans. To the best of our knowledge it is the first mobile-based peer-mentor program for assisting reintegrating veterans. For the iPeer system the veterans are not only the primary users but also a crucial part of the technology design team.

## **1.1 Dissertation Focus**

In this dissertation, the first focus is on understanding the challenges of designing a technology-based solution for a special group of population as veterans. The next focus is on the design of a mobile-mediated peer-mentor support system that can solve the challenges faced by both veteran-mentors and veterans seeking assistance. The primary goal of the mobile-mediated system is to help mentors in managing symptoms of their mentees in a better way. Consequently, resulting in a better management of their limited resource e. g. time, human resource, managing records etc. In order to meet the primary goal the system needs to provide services that may encourage veterans to use it. The main contributions of the dissertation are as follows:

- Identifying the challenges of designing a technology-based intervention for veterans reintegrating into civilian life
- Development of an mHealth solution through collaborative design with DH's veterans for assisting reintegrating veterans. From this analysis of the collaborative design a number of issues emerged. These are presented as four significant themes that need to be addressed when designing a technology-based system for veteran mental healthcare.

- Detecting the best possible representation of mentees' risk symptoms through an experiment among veteran mentors with different levels of user interface.
- Proposing a veteran-specific location-based service (LBS) with real-time ratings from veterans. The LBS is expected to keep veterans interested in the system.

## **1.2 Major Contributions**

This section will briefly summarize the contributions of this dissertation.

***1.2.1 Challenges of Designing mHealth Solution for Veterans and Key Lessons from Collaborative Design*** Research suggest that there are specific psychological conditions such as low frustration tolerance, lack of patience that might be associated with most veteran population. Furthermore, as a result of war related consequences they may also suffer from impaired physical and cognitive conditions (Church, 2009). Therefore it is a great challenge to design technology-based intervention for them keeping their specific issues in consideration. Throughout the design and development of iPeer, we have been through failure and success in stages and learned important lessons that might help future researchers willing to build technology-based intervention for veterans. In this dissertation, we will introduce those challenges and key lessons.

***1.2.2 Detecting the best possible representation of mentee risk symptoms*** The Peer-Mentor app presents a list of all the mentees under the corresponding mentor. The list is supposed to convey visual or essential information about the mentee to the mentor. The information could be a red flag of early need of intervention. Research suggests that a red-flag-based electronic health record (EHR) management system can significantly reduce the risk of misinterpretations of available data (Sittig & Singh, A red-flag-based

approach to risk management of EHR-related safety concerns, 2013). Inefficiencies within information delivered to health-care providers may lead to misinterpretation (Murphy, et al., 2012). Evidence also suggests that improvement in vital sign monitoring system and clinical disaster recognition scheme may have outcome benefits (Devita, Smith, Adam, & Winters, 2010). Research also suggests that failure in communicating abnormal test results may decrease the likelihood of test-result follow-up (Sittig & Singh, Improving test result follow-up through electronic health records requires more than just an alert, 2012). Therefore the representation of mentee panel to the mentors is crucial. We conducted an experiment with three different user interface levels for the mentee panel among nine veteran mentors. In this dissertation, we will present a report on that experiment along with a proposal for a best possible mentee panel representation.

***1.2.3 Proposing a veteran-specific location-based service (LBS) rating system*** during the design phase of iPeer system most veteran mentors raised their concerns about how to keep veterans engaged within the system. A need for persuasive or re-engaging component was identified as crucial for the system. Since veterans often find it difficult to trust government service or anyone outside veteran community (Spelman, Hunt, Seal, & Burgo-Black, 2012) (Walker, 1981), a veteran rated LBS system was identified as crucial and important that may make the veterans come back to use the system. Social service directory like Impact 2-1-1 and Mental Health of America do not have any rating system (IMPACT 2-1-1 - IMPACT Inc., 2015) (Mental Health America., 2015). Other online LBS systems also do not provide veteran specific rating ( Health and Social Services, Service Directory, 2015). We interviewed veterans during collaborative design phase and in the University of Wisconsin-Milwaukee (UWM) veteran service center in



order to learn more about the importance of a veteran specific rating system for LBS services. We conducted experiments among 23 veterans in order to learn how the veterans perceive an LBS system where veteran ratings are clearly visible. As a final contribution to this dissertation we will present a report on those interviews and experiments.

### **1.3 Dissertation Organization**

The rest of this dissertation is organized as follows:

- In chapter 2, we will present a background on DH and a detail need assessment for the development of a mobile-mediated peer-mentor support program.
- In chapter 3, we will present the current state of the art for mHealth interventions. We will also report on the available mHealth interventions for veteran mental healthcare and the difference between those and the iPeer system.
- In chapter 4, we will provide a detail description of the design and development of the iPeer system. We will elaborate the challenges encountered by us during the design and present a report on the key lessons we learned for designing technology-based solutions for veterans. We will also present a detailed description of the methods involved and participants' information.
- In chapter 5, we will describe the experiments on the mentee panel user interface within the Peer-Mentor app. We will also introduce the desired characteristics of a mobile-based symptom management system for veterans.

- In chapter 6, we will investigate the necessity for a veteran rating system for LBS system. We will report on our findings based on interviews and experiments among veterans.
- In chapter 7, we have concluded the dissertation with the summary of achievements and future research directions.

## 1.4 Publications

### 1.4.1 Publications on *iPeer*

- **Rizia, R.**, Franco, Z., Johnson, N., Hooyer, K., Patwary, A. B. M. K., Ahsan, G. M. T., Curry, B., Flower, M. and Ahamed, S. I., “iPeer: A Sociotechnical Systems Approach for Helping Veterans with Civilian Reintegration”, In Proceedings of the 6th ACM Annual Symposium on Computing for Development (ACM DEV 2015), London, UK, November 30th -December 2nd , 2015.
- **Rizia, R.**, Franco, Z., Johnson, N., Hooyer, K., Patwary, A. B. M. K., Ahsan, G. M. T., Curry, B., Flower, M. and Ahamed, S. I., “Collaborative Design with Veterans: Identifying Challenges of Designing mHealth Solution for Veterans”, In Proceedings of the 17th IEEE International Conference on e-Health Networking, Applications and Services (Healthcom 2015), Boston, Massachusetts , October 14-17, 2015. (Short Paper)
- **Rizia, R.**, Franco, Z., Hooyer, K., Johnson, N., Patwary, A. B. M. K., Ahsan, G. M. T., Curry, B., Flower, M. and Ahamed, S. I., “Mobile Peer-Mentoring: An Approach to Make Veterans Seek Mental Health-Care Support a Normality”, In Proceedings of the 10th IEEE International Conference on Collaborative

Computing: Networking, Applications and Worksharing (CollaborateCom 2014),  
Miami, Florida, October 22-25, 2014. (Short Paper)

#### ***1.4.2 Publications on Location-based service***

- Rizia, R., Tanviruzzaman, M. and Ahamed, S.I., “KnockAround: Location Based Service via Social Knowledge”, In Proceedings of the 36th IEEE Annual International Computer Software and Applications Conference (COMPSAC 2012), Izmir, Turkey, July 16- July 20, 2012.
- “eVeteranCommunity: Sociotechnical Approach for Improving the Quality of Life of Veterans Reintegrating into the Civilian World” at the 2014 Anita Borg Institute Grace Hopper Celebration of Women in Computing. Phoenix, Arizona, USA, October 2014 (POSTER)

## **Chapter 2: Background**

“I was always connected with VA...They just give you pills ... psychologists had no idea what war does to you” – expressed by one of the veterans during our study. According to research many (Chandrasekaren, 2014) veterans have this “they don’t understand us” view when interacting with non-veteran population. With a mission to understand veterans and help them leave the war behind Dryhootch (DH) was established. DH states their key mission as, “helping the veteran & their family who survived the war, survive the peace” (Dryhootch is Peer Support ...). In this chapter, we will discuss the establishment and evolution of Dryhootch and their mission to frame this work from a socio-technical systems perspective that is grounded in a community engagement framework [(Appelbaum, 1997), (Wallerstein & Minkler, 2003)]. A detail on the necessity of technology-based intervention will also be presented.

### **2.1 The Mission of Dryhootch**

Dryhootch (DH), is a veteran-led community organization in Milwaukee, WI. DH has established an informal peer support network to assist veterans through the civilian reintegration process. The peer-support services of DH are led by veterans who have previously dealt with the challenges of civilian reintegration. During its opening days, DH members organized over 100 community events profoundly joined by veterans. A mobile coffee van was used to keep veterans engaged in conversation. Later the organization has expanded in several locations (six in Wisconsin and three in other states) (Dryhootch is Peer Support ...). Since research evidence demonstrates the effectiveness of peer-mentor program for mental health-care (Ensher, Thomas, & Murphy, 2001), DH

initially focused on establishing a veteran-to-veteran peer-support network. DH offers peer-support services to veterans from all military service periods, and all branches of military service. However, they started to realize that student veterans were facing several difficulties in receiving those services in spite of their huge significant interest. Most student veterans need social support and referral services on college campus that are available after normal business hours. Also, they are comfortable in using electronic communication approaches e. g. social media, computers, smartphone apps etc. Traditional Veteran Serving Organizations such as VA, have evolved to primarily provide services for older veterans as those who served in WWII, Korea, Vietnam, and the Cold War aged into retirement. They typically do not offer communication or service modes that are preferred by student veterans (Brown & DeBakey, 2009). However there is an increase in the rate of suicide and mental health related issues among Operation Enduring Freedom (OEF)/ Operation Iraqi Freedom (OIF) veterans. Veterans from these service eras are the youngest group (Kaplan, McFarland, Huguet, & Valenstein, 2011). DH and its partners have recently been focusing on better recognizing the requirements of this group of veterans and designing specific services for them.

### ***2.1.1 Introduction to Dryhootch and Partners***

For over five years DH has established a partnership with several community and academic organizations. The key focus of this partnership is to provide mental healthcare for veterans by recognizing warning signs. The collaborating organizations within this partnership include faculty from the Milwaukee VA Medical Center, the Medical College of Wisconsin (MCW), the University of Wisconsin-Milwaukee (UWM) and the Marquette University (MU). The MCW brought expertise in community-engagement

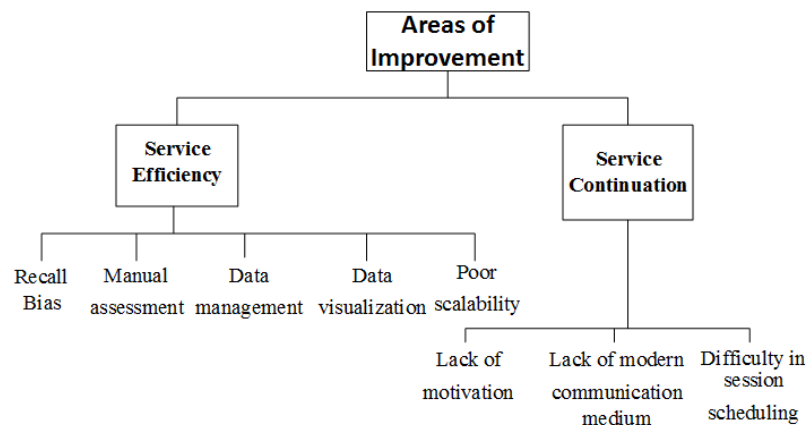
processes. The Community-Engagement Specialists (CESs) from this medical college had post-doctoral training in Community Based Participatory Research (Wallerstein & Minkler, 2003). They also had experience with community-academic partnerships for health ( McNall, Reed, Brown, & Allen, 2009). The UWM has the largest number of veterans on campus of any college campus in Wisconsin (Military & Veteran Services at UWM, 2015) and contributed the veteran population for research. MU developed the mHealth intervention and contributed in Human-Computer-Interface (HCI) research.

## **2.2 mHealth Intervention for Dryhootch: A Need Assessment**

For several years, DH's peer-support program was providing dedicated veteran mentors to veterans seeking assistance. The mentoring process required mentees to meet their mentors in any mutually agreed location. The mentees are required to fill-in a survey questionnaire. Apart from verbal discussion on the mentees current state, the mentors used those survey answers to understand any warning sign that might be risky for the mentees. The mentoring process also develops a trusted relationship between the mentors and the mentees. This process worked very well for older veterans who are retired and have plenty of time to spend with their mentors. However, when it comes with younger veterans it appeared they do not have enough time and motivation for such program. They are busy with schools and readjusting into the new life after service deployment (Church, 2009). Soon DH and its partners identified that it is necessary to reach the large number of younger veteran population by addressing their particular needs and preferences. DH and its partners identified few improvement areas for their peer-mentor program that might help student veterans to accept it. Several formal and informal meetings among veterans, CESs and social scientists (SS) helped in identifying

those areas. CESs and SSs also studied some research outcomes in order to understand the needs and limitations of the student veterans (Franco, 2013) (Ackerman & DiRamio, 2009).

DH began to search for technology-augmented methods in order to meet the specific needs of younger veterans. They also started to recognize the existing limitations of their paper-based peer support program. The identified two main areas for improvement were, (1) Service efficiency and (2) Service continuation [see Figure 1].



**Figure 1: Improvement Areas**

### *2.2.1 Service Efficiency*

DH has long been using paper-based, manual approach to assess veterans seeking assistance [see Figure 2]. Veteran mentors are required to meet their mentees in order to acquire survey data with this manual approach. The mentors then evaluate the survey responses from their mentees using their judgment. Although this approach works very well for older veterans as most of them are retired and have flexible schedules (e.g.

veterans from Cold War and Vietnam Service periods), it is inefficient due to several reasons.

#### *2.2.1.1 Recall bias*

The self-reported survey responses by the mentees during their scheduled appointment with their mentors may be biased by memory-recall ( Shiffman, Stone, & Hufford, 2008). Moreover, veterans trying to readjust into civilian community often find themselves fighting with cognitive problems such as judgment, attention, concentration, information processing, sequencing, short-term-memory, slower thinking. Situation may get worse when added with psychiatric problems such as, depression and behavioral problems (Church, 2009). Recalling exact incidents from memory are often mixed with ambiguity.

#### *2.2.1.2 Manual assessment*

The paper-based approach requires mentors to visit each of their mentees to get survey data. They need to evaluate the survey responses using their own judgment and experience. As a result the process becomes inefficient at times because veteran mentors also struggle with attentional problems. These factors reduce the utility of the paper-based approach (Church, 2009).

#### *2.2.1.3 Data management*

The manual approach makes data management very difficult as survey responses are stored in filing cabinets. The cabinets could be left unlocked accidentally. This may result in disclosure of confidential information. Also, information retrieval and data analysis for research purposes is challenging and is not done although the mentors



recognize that the longitudinal data being obtained could provide useful early-warning information about impending problems with the veterans they serve.

#### 2.2.1.4 Data visualization

Data in the paper versions are not rapidly transformed into meaningful information for peer mentors that can guide their interactions with veterans. Moreover, evaluating a veteran over broader time-lengths is difficult. DH and several of the peer mentors have expressed that if they could view summary data from the weekly assessments in chart format, they might be able to identify veterans who are at risk of having problems more easily. “Having an overall status or progress representation would be very helpful to view changes week by week in veterans, but right now we have no way to easily do this” – said one of the mentors.

Loss of interest  
Unhappiness

Section 5

Instructions: For each of the following statements, please indicate the likelihood that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from Extremely Unlikely to Extremely Likely, using the following scales:

	Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely
Getting a job's income at the lower rates	1	2	3	4	5	6	7
Drinking heavily at social events	1	2	3	4	5	6	7
Disagreeing with an authority figure on a major issue	1	2	3	4	5	6	7
Engaging in unprotected sex	1	2	3	4	5	6	7
Leaving your young children alone at home while running an errand	1	2	3	4	5	6	7

This concludes our survey. Thank you again for participating in this research.

**Figure 2: Paper-based Surveys with Psychiatric Symptom Focus**

### *2.2.1.5 Poor scalability*

With the current DH approach the number of mentees ranges from 5-20. Optimally, it should not exceed 15, but occasionally it does. When the number gets large, it becomes very difficult for them to manage all of the face-to-face meetings with their veterans. This often requires setting up appointments to meet, travel to multiple locations to meet with different veterans, adjustments to the mentors work/school schedule, etc.

## **2.2.2 *Service Continuation***

The paper-based approach makes it difficult for many veterans to continue with the peer-mentor service even though they might have early interest for it. We will describe the main reasons now.

### *2.2.2.1 Lack of motivation*

Many veterans from the recent wars in Afghanistan and Iraq express low motivation to seek out services that are purely mental health oriented. Their needs are often broader and focused on improving reintegration in college, rebuilding family relationships, and obtaining/maintaining gainful employment ( Berglass & Harrell, 2012). Going to outpatient mental health visits, or even in person visits with veteran peer mentors can be low because of this instrumental focus.

### *2.2.2.2 Lack of modern communication medium*

For some veterans with significant social difficulties, interacting with a computer based system is reported as more tolerable than interacting directly even with a veteran

peer mentor. For example, we had communication from one veteran saying he would not participate in the study until the app was ready because he did not want to interact with people.

#### *2.2.2.3 Difficulty in session scheduling*

Veterans on college and school campuses are busy with school, work and family responsibilities. The existing DH peer mentor program is capable of providing some after-hour services to match class schedules of student veterans, but technology based solutions have been noted by DH management as a needed tool to better manage after-hours access to DH services.

## **Chapter 3: Related Works**

Veterans returning with traumatic combat experience often face difficulty in civilian reintegration. Maladaptive responses to war experiences are frequently expressed and anxiety and stress are often reflected in their behavior. Even for non-combat veterans returning home from service often means starting all over again with relationship, jobs, healthcare, education etc. The primary focus of iPeer is to provide peer-support program to veterans trying to readjust back home. From the mission of DH and iPeer we identify three main area of relevant literature: (1) Civilian reintegration problems faced by veterans, (2) mHealth solutions for mental healthcare and available mHealth solutions for veteran mental healthcare and (4) Effectiveness of peer-mentoring for mental healthcare. We will now present a detailed literature review for each of this area.

### **3.1 Veterans and Civilian Reintegration**

During the design and development of the iPeer, we visited DH several times for field study, developing relation with veterans, focus groups and interviews. During one such visit we asked one of the veteran mentors to describe the reintegration problem as faced by him. The mentor was a 26 years old OEF veteran. His description is given below,

“From the day you enter bootcamp until the day you leave the service, all you ever do is to find ways to conquer any obstacles that may lead you to loose. You are trained physically to overcome that obstacle; we do exactly what the leadership guys tell us to do, follow their instructions. Now when we come to classroom atmosphere, we have to use this (pointing to his head, indicating intelligence) to succeed, which we are not used to. Coming back to classroom

after service, where we used to succeed for years, we are now put in a situation which we cannot conquer. We are not used to losing, we are used to winning. When you tell us to go in classroom where we have to maintain a C average, where we can see others who are even younger than us are getting A's, we feel stupid. We cannot go back, we are trapped here. We just feel like we have wasted five years of our life. That's when we start getting dark, start drinking".

### ***3.1.1 Problem Review***

When veterans return home after months spent at war, they have to start a new fight readjusting to civilian life. Family and community reintegration can be impaired by both physical and psychological injuries. One survey reported that 49% of veterans reported problems with community activity participation, 42% found it difficult to reunite with spouse and partners and 25% had difficulty with jobs. Other reported problems with OEF/OIF veterans were difficulty in anger management, dangerous driving and legal issues. In addition, there is a possibility for the development of chronic PTSD among a high proportion of veterans (Resnik, Bradford, Glynn, Jette, Hernandez, & Wills, 2012).

Recently, a large number of OEF/OIF veterans have enrolled in college and school campuses by using their GI-Bill (veteran education) benefits (Church, 2009). According to a study veterans have higher suicide risk than non-veterans. Furthermore, severe cases of mental illness, substance abuse, financial and relationship related problems are more likely to be found among younger veterans than older veterans (Kaplan, McFarland, Hugueta, & Valenstein, 2011). Research found that 93% of the younger veteran participants reported difficulties in college campus environment. The veterans at school campuses find it difficult when trying to connect with younger civilian

classmates who they believe to be not having as huge life experience as the veterans. Veterans also feel that they lack some needed skills for academic environment. Difficulties in concentrating, lack of basic course works are a few of them (Plach & Sells, 2013). Furthermore, responses due to flashback from war experiences are sometimes reflected in their behaviors. One of the OEF veteran mentors from DH described such experience as,

“During the Afghanistan war I saw streets crowded with people. But just before attacks people start to rush into their homes and the streets become empty. At this moment we have to be very alert and conscious. This experience keeps coming back at college campus where corridors are full of students before class starts. But just when the class starts people rush into the classroom and we go back into a very alert state. I remember sitting back in the classroom and one day I counted all the tiles in the ceiling [in order to not react].”

One of the study found that 96% of veterans who went through VA services showed their interest in receiving assistance during the civilian reintegration period. Some of these study participants were diagnosed with PTSD or probable PTSD (Sayer, Noorbaloochi, Frazier, Carlson, Gravely, & Murdoch, 2010). Another research reveals that a large portion of the OEF/OIF veterans are under the age 29. In order to improve healthcare services among these younger OEF/OIF group of veterans modern modes of communication such as smartphone apps, internet services and social network sites are necessary (Brown & DeBakey, 2009). Organized direction is needed to ensure psychological and physical wellness of veterans going through civilian reintegration (Demers, 2011). Because government agencies like, Department of Defense (DOD), the

VA do not have enough reach into all the communities where the veterans live in, there is an increasing focus on community-based prevention models for the healthcare of veterans ( Berglass & Harrell, 2012).

### **3.2 mHealth for Mental Healthcare**

Mobile Health Care (mHealth) applications are very suitable for remote tracking of progress and analysis of conditions. They can also be used for treatment and management of healthcare (Tentori & Reddy, 2012). Insufficient human and physical resources for healthcare support are the main reason behind the advancement of mHealth field. Within a very short period of time mobile phones have made a rapid entrance into the most parts of the world. As a result, this ubiquitous device became very popular for healthcare interventions (Istepanian, 2012).

Conventionally psychiatric interventions occur in clinic settings. Several inconvenience associated with the clinic-based approach often make patients to discontinue with services with clinical psychologists and psychiatrists. This results in an incomplete course of treatment (Fletcher, Tam, Omojola, & Moshoka, 2011). These complications may be reduced by using mHealth interventions because it can be used to monitor chronic mental health conditions such as PTSD. Furthermore, mobile phones provide an appropriate platform for conducting Ecological Momentary Assessments (EMAs). In clinical psychology EMAs are used for collecting self-reported data beyond a clinic visit. EMAs collect subject's behavioral data from their natural environment via real-time repeated sampling ( Shiffman, Stone, & Hufford, 2008). Mobile technology

provides a reliable way for administering EMAs as clinic visits are often unreliable due to recall-bias.

### ***3.2.1 mHealth for Veterans***

As part of their health care facilities, the VA has accepted mobile health activities that will use technologies to expand clinical care beyond the traditional office visits (McLeroy, Norton, Kegler, Burdine, & Sumaya, 2003). In order to support veterans, caregivers and VA care teams, the VA mobile health has released a series of secure mobile applications (Pai, 2013). Several of these have a focus on PTSD treatment.

VAs' National Center for PTSD and the DODs' National Center for Telehealth and Technology (T2) deployed an app named PTSD Coach (Support for PTSD: PTSD app at Real Warrior). Upon completion of a self-assessment of PTSD symptoms, this app provides personalized feedback and a symptom tracking option. It helps users diagnosed with PTSD to manage their symptoms. The app provides coping suggestions, self-help techniques, and a connection with a network of people who can provide the user with emotional support. PE Coach is another app developed by the VA (PE Coach(PTSD Support App): Mobile Health Marketplace, 2015). This app supports the clinical therapeutic intervention of Prolonged Exposure (PE) psychotherapy sessions. PE Coach helps the patients with PTSD to learn how to process their memories and modify their behavior through a technique called imaginal exposure. This app is used with PE therapy provided by clinical professionals. MindApps released eCBT Trauma to help people diagnosed with PTSD (Grohol, 2010). Similar to PTSD Coach it helps users who are experiencing a trauma to assess their symptoms, graph their symptoms over time and email a caregiver. PTSD Support was developed by Mobile Roadie to help veterans and



their families learn and understand PTSD (PTSD Support by Mobile Roddie). The app mainly provides information and suggestions about dealing with PTSD with the help of news, videos, links, mailing lists etc. PTSD Eraser is another app that supports simple guided meditation. It is a simple audio intervention with no interactivity. There are some other apps that help PTSD symptom management such as: Breathe 2 Relax, T-2 Mood Tracker etc. (T2 Mood Tracker: t2health, 2013) (Breath2Relax: t2health).

There are several other apps for supporting mobile mental health services, which are not specifically for PTSD. Examples are: Online Care, Care4Caregiver, PFA Mobile, CBT-i Coach and Stay Quit Coach. Online Care lets veterans and their professional care provider to have online consultation. The app helps in expanding the VA services beyond clinic visit. Care4Caregiver is designed specifically for caregivers to manage their stress level. CBT-i Coach is designed to support a type of psychotherapy called Cognitive Behavioral Therapy (CBT). PFA Mobile is an app for the families of survivors to provide psychological first aid (PFA). Stay Quit Coach helps the veterans with PTSD to quit smoking (Pai, 2013). A mobile app with wearable sensors was proposed as a just-in-time intervention for CBT (Fletcher, Tam, Omojola, & Moshoka, 2011). Many researches advise the use of information technology with VA services in order to reduce healthcare cost and improve self-management ability. However, current literature shows no report on the effects of the VA mobile apps for veteran mental health. Nonetheless, reports on VA mHealth services suggest that patients and caregivers are interested in using technology to improve health management (Darkins, Ryan, Kobb, Foster, Edmonson, & Wakefield, 2008).

### **3.3 Peer-mentoring for Mental Healthcare**

According to Ensher et al (Ensher, Thomas, & Murphy, 2001) mentoring can be defined as a dyadic relationship where the mentor is a senior and experienced person providing guidance to another less experienced person. Davidson, et al., suggest that people who were able to overcome any kind of mental health problem successfully can support and guide others who are fighting with same type of mental health problems. A person can gain hope and motivation for a better life from a peer program (Davidson, Chinman, Kloos, Weingarten, Stayner , & Tebes, 1999). Some research also presented the importance of a mutual support groups in order to improve the quality of life of people who are experiencing suffering (Borkman, 1990) ( Katz, 1981). Jacobs, et al. advise that in mental healthcare systems, self-help groups can play vital role ( Sutcliffe, 2005). For young populations with special needs, electronic mentorship can be very effective. E-mentoring provides a way to communicate while hiding any disability. Electronic medium such as internet, email and online discussion groups provide a way to overcome barriers or time and distance and thus makes e-mentoring very effective (Shpigelman, Weiss, & Reiter, 2009).

### **3.4 Discussion on Related Works**

The mobile apps developed under the administration of VA primarily focus on PTSD. A significant difference between them and DH's iPeer project is, these apps have their focus on diagnosable mental health conditions. In contrast, iPeer is focused less on acute psychiatric or psychological conditions that these other apps target, and more on the psychosocial process of civilian reintegration. Notably, the available apps for veterans are

focusing on “treatment” while iPeer is focusing on “prevention” by identifying readjustment difficulties earlier so that they cannot go out of control and convert into psychiatric issues [see Table 1]. This is vital as comparatively few veterans (15-20%) will be diagnosable (Burnam, Meredith, Tanielian, & Jaycox, 2009) with PTSD but most will meet some form of readjustment difficulty while transitioning back to civilian life (Sayer, Noorbaloochi, Frazier, Carlson, Gravely, & Murdoch, 2010). There is another app called POS REP which was developed with the focus of preventing mental health problems rather than treating conditions (Position Report (Pos Rep)). Though both iPeer and POS REP share similar motivation, they have differences, (1) iPeer provides dedicated trained peer-mentor support to any veteran seeking assistance, (2) iPeer tracks the status of the participating veterans through weekly surveys and the surveys do not focus on clinical psychiatric assessment techniques and (3) POS REP only connects with other veterans using the app within perimeter range. There is another app that helps user track their mood and it is called T-2 Mood Tracker. This app does not provide any mentor support or veteran network support (T2 Mood Tracker|t2health). By providing direct peer-mentor support that other apps have not taken before, iPeer takes a sociotechnical systems (Appelbaum, 1997) approach for mental healthcare.

App Name	Focus	Method	Peer-mentor Support
PTSD Coach	PTSD treatment	Self-help suggestion and information	No
PE Coach	PTSD treatment	Support for psychotherapy Session	No
eCBT Trauma	PTSD treatment	Self-help suggestion and information	No
PTSD Support	PTSD treatment	Provide resources related to PTSD in different forms	No
PTSD Eraser	PTSD treatment	Guide through meditation	No
T-2 Mood Tracker	Track mood	Rate moods, track and graph results over time without mentor support	No
POS REP	Prevention of readjustment related mental illness	Social network of veterans within perimeter	No
iPeer	Prevention of readjustment related mental illness	Veteran peer-mentor support	Yes

**Table 1: A comparative study between the mHealth applications for veterans**

## **Chapter 4: Design and Development of iPeer**

The primary focus for the development of iPeer was to implement a technology-based support system for DH's peer-mentor program that will address the findings of the initial need assessment. However, soon after the first deployment the research team and DH realized that the system also needs to be faithful to the essence of its original human driven process. This led to a yearlong design research and development of the system. In this chapter we will describe all the stages of design and development of iPeer.

### **4.1 Stage One: Finding of Methodological Complications**

In this section we will describe the preliminary design and development stage of iPeer.

#### ***4.1.1 Methods***

This stage consists of formal project discussion meetings between DH founders and CESs, formal meetings between technology team and CESs, informal meetings between CESs, SSs and key DH members ( McNall, Reed, Brown, & Allen, 2009). The requirement gathering phase became a continuous and unbounded process. The CESs talked and met veterans at DH to informally discuss and systematize the DH veteran peer mentorship process in a way that was faithful to the intentions of DH. Earlier, one of the DH's veteran-mentor specified their requirement saying, "Make us an app that helps out with peer mentorship". The mentors' initial expectation was that they would provide the broadest level guidance, with the details left up to the technical team. At this point CESs began to act as requirement translator between DH and the technology team.

### ***4.1.2 Requirement Finding***

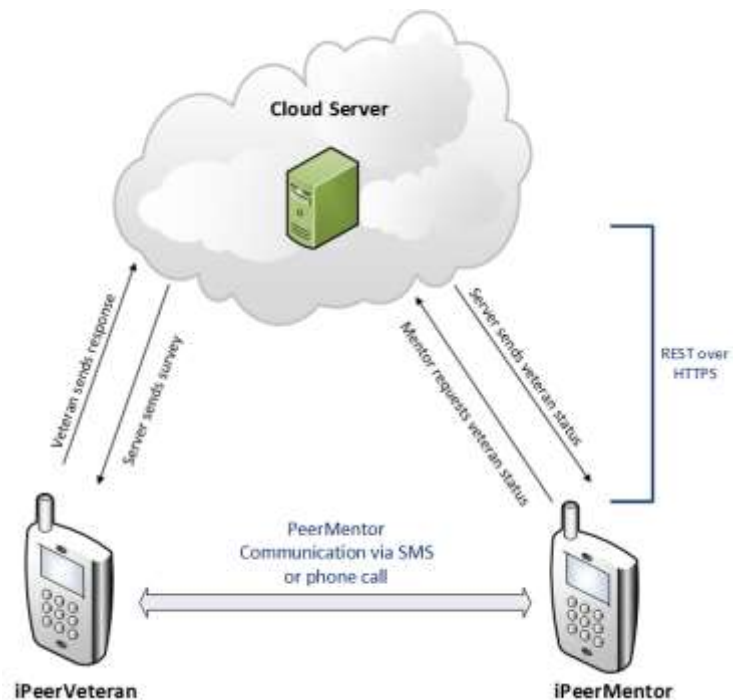
The initial requirements for the application can be outlined as, (1) Veterans should receive surveys on their mobile devices on a regular basis, (2) Veterans should be able to easily contact their peer mentors when needed, (3) Peer-mentors should be able to add mentees from their mobile devices, (4) Mentors should be able to review the survey responses of their mentees on their mobile devices. The initial findings helped the technology team design and develop an alpha version (AV) of the system [see Figure 3]. The system is composed of a smartphone and two applications that run on the phone. “iPeerMentor” is the app for the peer-mentors and “iPeerVeteran” is the app for the mentees. There is a cloud server that manages data communication between mentors and mentees and stores data that can be shared among mentors, mentees and researchers. The AV was deployed among the mentors and their mentees on UWM campus.

### ***4.1.3 Outcome***

Before the deployment of the AV, several workshops were conducted among the mentors, researchers and the development team, to study the usability of the system. During these workshops the technology team installed the app on the mentors’ and researchers’ phone. They were asked to navigate through the app and comment on the usefulness, ease-of-use and the system functionalities. This small scale pilot evaluation gave the development team some positive feedback and confidence to deploy the system. Some comments on the app were, “I am now able to see panel of mentees” – says one mentor. “I like the call/text option, it’s now easy to contact with my mentee. I don’t need to find his contact information” – says another mentor. “The snapshot of mentee status is really great. I can now just enter in the app and access all my mentees’ status” – says one

mentor when he was able to view the system generated mentee status on the app. “The mentee app gave easy access to survey questionnaire” – says another mentor about the mentee app.

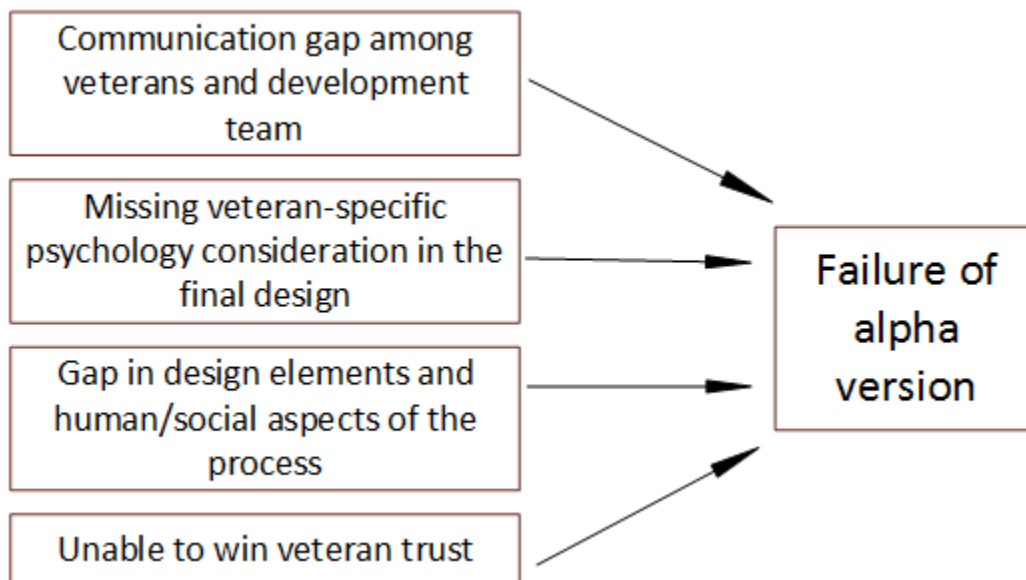
The initial feedback about the AV gave the researchers the impression that the mHealth product was effective. Finally the AV was deployed for replacing the paper-based DH peer-mentor program. Even though it seemed to be a big step and success towards our outlined goals, the deployment of the AV failed with a series of complaints about the app, reported from both veterans and mentors.



**Figure 3: System Architecture**

#### 4.1.4 Discussion on AV Failure

The AV deployment failed partly because of the software limitations and partly because of the low frustration tolerance and anxiety typical to veterans (Church, 2009). Several veterans and mentors reported that the app was “not working at all” when problems transitioning from wifi to roaming data caused errors. For example, many mentees reported that they were not comfortable with the survey process. They were answering a lot of questions and seemed concerned about where the data was going. In short they were lacking motivation to fill in those surveys. They were missing the comfort of actual, face-to-face peer-mentorship. A process that should simulate and to some extent mimic human interaction was needed in this system.



**Figure 4: Summary of AV failure**

Given their low frustration tolerance (Church, 2009), veterans soon started to become frustrated with the app. This revealed that there was a communication gap between veterans and system developers. Initially, DH peer mentors overestimated the



usability of the AV because they did not have a well-organized plan to actualize the functionality of the app. Furthermore, they were excited to see some version of the app deployed.

The AV of the app was an opportunity for several teams to get together and take some first steps toward understanding the problem space and start thinking collaboratively. It also showed that DH's idea of the peer-mentor app was notional, rather than requirements driven. We needed to help them to visualize the project in detail to a certain extent. Figure 4 summarizes the failure of the AV. As a result we understood the need for Community Collaborative Design Research in order to develop iPeer.

## **4.2 Stage Two: Community Collaborative Design of iPeer**

In this section we will describe the Community Collaborative Design Research that we adopted for iPeer.

### ***4.2.1 Literature Review on Healthcare Information Technology System Design***

A study of health information technology (HIT) suggests that Electronic Health Records (EHR) hold a great promise for patient information management. However several other studies also provide insight into many sociotechnical factors important in designing EHR. For example, negative unintended consequences, unexpected changes in clinical settings, knowledge gaps at the intersection of human behavior and health IT etc. (Lanham, Sittig, Leykum, Parchman, Pugh, & McDaniel, 2014). Another study reveals that although HIT is able to improve efficiency, patient safety and outcome, if not properly aligned with the workflow features of HIT can lead to rejection of the system. The findings of this study suggest that HIT applications should be designed to support the

needs of different type of users. It should also support disease specific needs, efficient data transfer, and easy searchable, viewable and accessible interface. The study also reveals that alternate ways of displaying longitudinal patient data should be investigated too. Another important finding of this study is that organizational and personal opposition to technology should be addressed to encourage acceptance (Unertl, Weinger, Johnson, & Lorenzi, 2009).

Another study describes the importance of sociotechnical-systems approach by ensuring effective blending of both social and technical sub-systems of an organization. According to this research failure to address social needs of any organization can result in unexpected outcome. This research focuses mostly on the interface between user and technology. According to them if the interface is designed without considering the sociotechnical issues, it can lead to failure. The challenges of UI design should be handled to make sure the technical system maps with user needs (Maguire, 2014). Another research suggests that health care provider's mental model may perceive information differently from HIT. This means that their mental model may require different details to reach specific conclusion that might not be presented in ways that is easy for them to perceive (Smith & Koppel, 2014). Research also demonstrates that healthcare works are done collaboratively and Computer Supported Cooperative Work (CSCW ) as a field has been concerned with designing systems to support collaborative healthcare works. In other words, designing technology-based solution involve complex sociotechnical challenges. Thus collaborative design in CSCW in HIT is a very common practice [(Fitzpatrick & Ellingsen, 2012), ( Coyle & Doherty, 2009)].

### 4.2.2 Methods

We went through an iterative and cyclical design process where each iteration consists of improvement on the understanding of system needs, design, developing prototype and testing by mentors (Complete Beginners Guide to Design Research). The active participation of the mentors ensured input of target-user's requirements and experience with the current DH approach (Collins, Joseph, & Bielaczyc, 2004). Notably, the mentors were all veterans ranging from the quite distant past Cold War Era (1976–1991) to the OEF/OIF (2001-present) veterans. The iPeer project brings together a wide range of stakeholders with different expertise. Hence, the Community Collaborative Design Process merges with the current shift in design thinking and methodology from an object perspective to a human needs perspective (Christiaans, 2007). In order to follow the ideas of collaborative design, we conducted focus groups and one-to-one interviews to gather views and thoughts about the iPeer system from broader range of veterans.



**Figure 5: a) mentors trying the app on their phone, b) mentor presenting their design suggestions**

#### 4.2.2.1 Partners of the Community Collaborative Design

DH, the Medical College of Wisconsin (MCW), the University of Wisconsin-Milwaukee (UWM) and The Marquette University (MU) have each brought unique

expertise in the design and development for iPeer. Faculty from the Milwaukee VA Healthcare System hospital are also involved in some aspects of this project. DH initiated the peer-mentor support program. MCW brought knowledge and understanding in community engagement processes. The CESs from MCW had received post-doctoral training in Community Based Participatory Research. They had significant practice in dealing with community-academic partnerships for health (Wallerstein & Minkler, 2003). The CESs worked as relationship negotiators and translators between the veterans, mentors and the computer programmers ( McNall, Reed, Brown, & Allen, 2009). UWM contributed largest population of veterans for research and MU contributed by mapping the plan into a mHealth application.

#### *4.2.2.2 The iterative and cyclical design process*

Mentors, CESs and the development team had weekly tech meeting during this process. At these meetings the development team presented the application, mentors and researchers tested, asked questions and provided feedback. To enhance engagement and understanding, the mentors and research team were provided with a technical handout. The day following the tech meeting the CESs met with the team of mentors to evaluate the app. Each meeting brought some user interface recommendation based on the mentors' cultural experiences as target users. The result of this design assessment was then presented in the following tech meeting which led to the next level of development.

During the next tech meeting mentors described their experience with the app and suggested feature modifications to the technology team. We adopted multimedia presentations with photos, drawing, videos, stories etc. to enhance communication. Figure 5 illustrates few images of this community collaborative design process.

This collaborative design process started on January 2014 and is still going on. It proved to be very comforting for the veterans. In the meantime, we conducted two focus groups with broader range of veterans in order to collect their views about the system. The reason for conducting these focus groups was to reach older and younger veterans who were unable to attend weekly design meetings on a regular basis.

#### ***4.2.3 System Components Derived from Collaborative Design***

The collaborative design approach helped the development team identify primary user interface (UI) elements for the iPeer system. After several months (January 2014 – July 2014) of design research the technology team was able to develop the very first version of the app for supporting DH's peer-mentor program. This version was used to gather more views and thoughts from veterans through focus groups and interviews.

The iPeer system is composed of a server side tool and two client modules, one for the mentors (iPeerMentor) and one for the mentees (iPeerVeteran). The server side tool manages data communication and saves research data. We will now describe the UI elements of each client module.

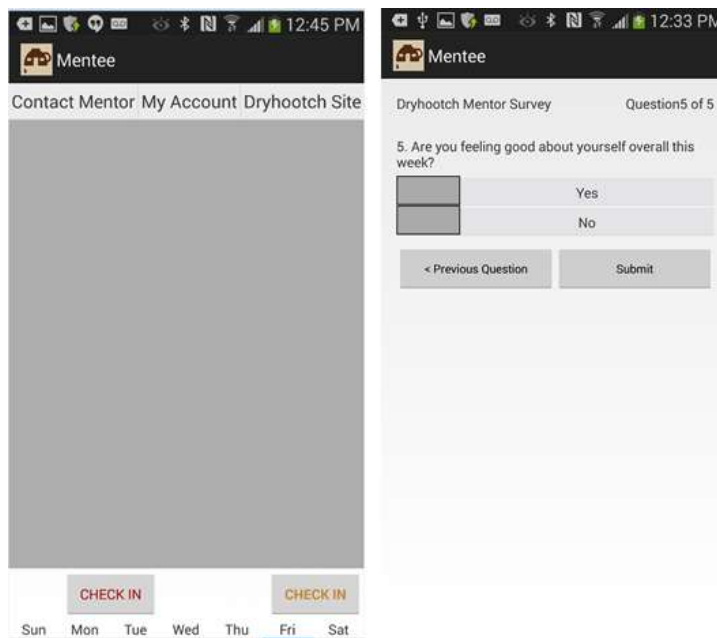


Figure 6: a) Check-in process in the mentee app, b) survey screen

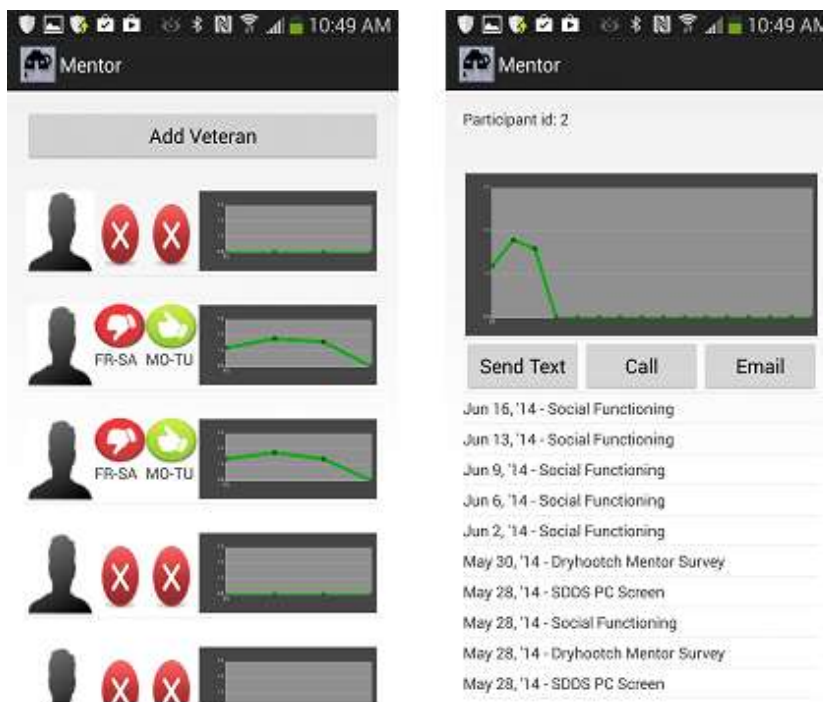


Figure 7: a) List of mentees, b) details of a mentee on iPeerMentor

#### *4.2.3.1 iPeerVeteran Module*

This module is for the mentees. The mentees receive the survey twice a week. The survey was also designed by veteran mentors and researchers in order to reduce psychiatric symptom focus. It took several months just to refine the survey items collaboratively among the partners so that the veterans can interact with the app more comfortably. The survey is available during two time slots, Monday-Tuesday and Friday-Saturday. The allotted time at the beginning of the week and at the end of the week approaching the weekend was identified as important to capture data by the mentors. The app home screen has two “check-in” options available [see Figure 6(a)] for each of the time-slots. The mentees get access to the available survey after selecting the “check-in” button. If a mentee misses a survey, the text color on the “check-in” button becomes red. The “contact mentor” menu item at the top left gives the mentees the call or text options.

#### *4.2.3.2 iPeerMentor Module*

The iPeerMentor module is used by the mentors. The app home screen holds a list of all the mentees managed by the mentor. In the list, each mentee is represented by three items. (1) An image of the mentee; (2) two icons that represents the survey responses for the ongoing week and (3) a graph that illustrates the status of the survey responses over past several weeks [see Figure 7] (For the current version mentors wanted it to correspond to the responses of the previous four weeks. In the future we plan to have scrollable view representing results over longer time-periods). In order to have a quick look mentors had an interest to have icons representing survey responses for the ongoing week. After extensive discussion with the peer mentors we decided to have three symbols (1) a red-thumbs-down, (2) a green-thumbs-up or (3) a red-cross-mark. The red-thumbs-

down indicates undesirable answers, a green-thumbs-up represents positive answers and a red-cross-mark indicates that the survey was not taken. Communication is done by mentees and mentors via email, text or phone-call by easy to locate buttons.

#### ***4.2.4 Responses and Feedback from Veterans***

Soon after the development of the early version of the iPeer system, we started to conduct focus groups and interviews to understand the veterans' response to the app. The primary motivation for these focus groups was to get feedback about the app UI from veterans who were not able to participate in the design meetings. We will now describe the overall responses from the veterans throughout the whole design and development phase. This includes the design meetings, focus groups and interviews.

##### *4.2.4.1 Methods*

Table 2 presents a summary of the methods and participants involved in the design research.

- *Discussion with the collaborative design participants*

Each weekly design meeting with veteran mentors contributed useful feedback in the app design. The early meetings were audio recorded with the permission from the veterans and transcribed later by the researchers.



<b>Method</b>	<b>Timeline</b>	<b>Focus Area</b>	<b>No. Of Veterans Participants</b>	<b>Military Service Period</b>	<b>Data Accumulation Process</b>
<b>Community collaborative design in technology lab</b>	January 2014 – till now	System requirement	10 Veteran Peer-mentor	OEF/OIF, Cold War	Weekly meeting and interviews over an 18 month period
<b>First focus group in a Dryhootch center</b>	July 2014	Collect feedback	15 Veteran mentors and mentees	Vietnam, OEF/OIF, Cold War	Close room audio and video recording, conversational session, simulation of mentoring session
<b>One-to-One interview (Follow up first focus group)</b>	July 2014	Collect feedback from older veteran	1 Veteran mentor	Gulf war	Notes on conversation
<b>Second focus group in a university veteran service center</b>	October 2014	Collect feedback from younger veterans	7 Student veterans	OEF/OIF veterans only	Audio record conversations and notes on responses on usability

**Table 2: Summary of Participants for Design Research**

- *Focus group*

A focus group was organized among veterans, SSSs, CESs and technology team at one of the DH service centers in order to accumulate responses from the veterans about the app. Ten mentees and five mentors were invited. At the beginning of the focus group one of the developers gave a presentation about the app. Later the veterans were grouped into hypothetical mentor-mentee dyads. They were assisted by developers to review the app. A second focus group took place at UWM veteran service center on 10/28/2014. There were total 7 OEF/OIF veteran mentees present during this focus group. We received some feedback that helped us understand the expectation of the younger veterans from the iPeer system.

- *One-to-One Interview*

After the first focus group we conducted a one-to-one interview with a gulf war era veteran. He was 53 years old and has been a mentor for one year. The reason for choosing him for interview was because he was older, not tech-savvy and showed doubt about technology-based intervention during the focus group. We wanted to understand how he would view the app.

#### *4.2.4.2 Responses from the Collaborative Design*

A veteran mentor said, “I feel very relaxed now, as I don’t have to find time for appointments ... I can see their survey responses through my mobile-device”. This discloses the point that iPeer would significantly decrease the load on mentors allowing them to manage approximately 20 veterans. With the paper-based approach, mentors cannot rapidly refer to baseline scores to see how their veterans are doing over wider time

periods (0, 6, 12 week). “My mentee may not be doing well this week for some reason ... I need to see if this is just momentary or consistent. I need something that I can have a glance and know her overall status” – says one mentor. The graphical display [see Figure 7] gives the mentor a representation of their veterans’ status over a range of time.

#### *4.2.4.3 Discussion on Feedback from Focus Group*

During the first focus group several veteran mentors raised their concern about the effectiveness of the technology-based peer-mentoring. One senior veteran mentor said – “I prefer face-to-face peer-mentoring. I cannot trust a device”. Again another veteran responded – “But this might work for younger veterans. They share everything publicly”. Another veteran added – “Facebook is used extensively by OEF/OIF veterans, often these FB groups for veterans never involve face-to-face contact”. However, most of them agreed that the app will work well for introverted veterans. One of the mentors mentioned that he has to commute to visit his mentees and realized that the app would enable better communication. It was also noted that the app may support mentors to organize large collection of mentee information. However, most of them agreed that some form of visual and voice communication is required. In order to increase approachability some veterans proposed availability of on-call mentors for crises. “I would receive a call at 3AM in the morning if my mentee needs me. But still there should be some backup available in case of emergency.” – says one of the mentor. Presence of secondary mentors was recommended on standby in the absence of the primary mentor. At the end of the discussion session a survey question was asked – “How many of you ... feel like this technology can augment the Dryhootch peer mentor program vs. How many feel like the peer mentor program can only be done face to face?”. Unanimously, all of the 15

veterans agreed that the technology could augment the existing social process. However, they also noted that the technology should not substitute social collaboration.

#### *4.2.4.4 Response from the One-to-One Interview*

The main goal of this interview was to gain standpoint about the technology-augmented peer-mentor service from an older veteran. When he was asked about his preferred way of peer-mentoring he said:

“I prefer face-to-face approach. Peer to peer support is personal, with younger guys ... they already know each other, they are on Facebook, they know what they ate that day ... they share everything, but the 35-60 year olds are more people persons. And the over 60 are dinosaurs. Veterans feel more connected when you talk to them face to face, it's about trust. They become more comfortable with me after 3 or 4 meetings ... we can talk about more personal stuff ... It's like any relationship.”

Then we asked him if the technology can anyway be helpful to the face-to-face relationship. He said:

“The app will help monitor on a more regular basis. At a glance we can know who's having issues ... because people isolate when they have issues, so it will be vital, especially if a person is suicidal, to know right away what that persons state is. For example, I've had the experience where people have texted me that all hope is lost and I've been in a loud place or not heard the beep go off and noticed it 20 minutes later.”

From his above comment it becomes obvious that the technology can help in reducing the loads from the mentors. Then he went on saying:

“I'm realizing how vital my phone is to me ... the vets I'm assisting. Other vets call us to say they are on the verge of drinking ... or doing what's getting them in trouble. If we have the app we can get to them quicker. And we need their address in there. Then that's where face to face comes in. We need that face to face, especially in crisis mode.”

This comment helps us realize that technology-augmented process can help improve the level of communication. In addition he added:

“The app will be great for alerts. We could end up with 300 or 400 people that we only see once every six months, that's hard to keep track of. We get a thumbs down and we know, hey I have to pay attention to this guy ...”

This helps us identify how the data visualization feature helps in improving the mentors' awareness about their mentees' status.

#### ***4.2.5 Lessons Learned from the Collaborative Design***

Several themes emerged from our study of the collaborative design. We used inductive thematic analysis to outline the core themes ( Braun & Clarke, 2006). We present these as four important themes that need to be addressed when developing a sociotechnical system for veteran mental healthcare. Those issues can be outlined as, (1) Avoiding psychiatric labels, (2) understand the jargon of the social system, (3) Understand the psychology of the veteran community and (4) Establish trust among the veteran community and researchers.

#### *4.2.5.1 Find an indirect route without psychiatric label*

The collaborative design approach gave us an opportunity to conduct open discussions with veterans about the available veteran mental healthcare apps. Many younger veterans indicated they are not likely to use the apps released by VA because of their psychiatric focus. One of the veteran mentors stated his opinion,

“We are always being labeled. We look for ways to stay out of labeling.

That’s the VA stance. We go in there, we are told that we have PTSD and need to make psychiatric appointments and that’s when we stop going there. Staying away from labeling would help the mentees to adopt the service”.

Furthermore, during the second focus group many OEF/OIF veterans mentioned that the apps released by VA are too focused on psychiatric symptoms. A total of 7 veterans were present during the focus group and all of them expressed that they are not likely to use a system that is too focused on treating psychological conditions. They would like to have the option to disable app features they are not comfortable with. This is the main reason that the VA apps are not very attractive to the veterans. Also, current literature only shows interventions for veterans focusing on specific psychiatric treatment. iPeer does not have any feature that directly addresses psychiatric treatment. Initially for the AV, the chosen survey questions were all evidence-based and validated from standard psychometric scale (Blais & Weber, 2009), e. g., “The possibility of drinking heavily at a social function”. Several mentees reported that they were not comfortable with this type of questions and as a result the question format was redesigned by the researchers for the later version, e. g. “How stressful has this week been?”. The

lesson here is, **veterans are more comfortable with interventions that are focused on instrumental outcomes rather than psychiatric labels.**

#### *4.2.5.2 Understand the jargon of the social system*

After the AV failure, the researchers were trying to figure out the essence of the peer-mentor process at DH. They met mentors at DH weekly and during this period one of the veteran mentor summarized the peer-mentor process as,

“Well, I check-in with my mentees, they check-in with me. I see how they are doing and connect with them if they need it”.

It helped the researchers to transition from seeing the EMA data collection points as research driven, to reflect instead an actual social process between the mentor and the veteran. This “check-in” approach [see Figure 6(a)] provided a chance to augment the social aspects of the dyadic interaction while also collecting data, thus honoring the sociotechnical system view of technology design (Appelbaum, 1997).

During the first focus group one of the mentors asked, “Can you develop a relationship through technology?”. The mentors at DH did not want the veterans to feel like they are filling in surveys for research. The “check-in” is analogous to the business process of peer mentorship when it is not augmented by technology ( Sutcliffe, 2005). Additionally, veterans use the word “check-in” in the DH peer-mentor program. As a result using the word “check-in” to access surveys makes them feel more like they are providing the information to the peer mentor.

During the second focus group the OEF/OIF veterans expressed that they would like to see NCOs (Non-Commissioned Officers) or other trusted roles available at all

times to answer requests to connect. NCO is a term to describe a military rank between enlisted personnel and officers. They are generally well respected by soldiers, while officers may not be. The lesson learned is, **incorporate the social aspect of the process by using jargon sensitive to the veterans.**

#### *4.2.5.3 Understand the psychology of the veterans experiencing mental health issues*

When the AV was released, it failed on a mentor's device who was using an older Android version which had keypad instead of touch screen. When she was offered to use a newer device she refused and said,

“I deal with anxiety (caused by her deployment) and my hands sweat. Touch screen does not work for me. I want to use a phone with keypad”.

The AV failed on her phone due to backward compatibility issues. The app frustrated her. This incident shows that due to war related deployment, veterans have to deal with specific psychological issues that civilians do not have to deal with. Those psychological issues have implications for how they experience and use technology. Most of the veterans that we talked with during our study mentioned that they believe civilians do not understand how war effects the psychology of a veteran. So a system designed without participation of veterans is very likely to be rejected by veterans. In order to avoid design failure a group of veterans who have experience with veteran specific psychological issues are essential during the design phase. They will be able to assist researchers to understand their psychological conditions. Mutuality and consensus among veterans and researchers on app design is a necessity. Top down design from the



perspective of researchers or technologist without the veteran voice will create significant gaps in design that limit uptake.

Research suggests that collaborative design with Mental Healthcare Professionals (MHCP) may help in avoiding repeated evaluation where accessing target user is challenging (Doherty, Coyle , & Matthews , 2010) ( Coyle & Doherty, 2009). In those studies it was also noted that access to people experiencing mental health conditions is very limited it is difficult to include them as part of the collaborative design team. However, effective collaborative design team formation is very important. Our study reveals that veteran mentors who have experienced mental health conditions in the past and have recovered can be a stable partner in the design team and can represent the target users. This is an important nuance to a traditional collaborative design stance, which often suggests that only the target population is of value in the design process. There are times when a proxy group can offer important insights that allow for culturally tailored design to proceed when the costs associated with getting the actual population into the design discussions are high.

The important lesson for us: **Veterans who are a bit farther in the process of civilian reintegration (i.e. in peer mentor roles) may effectively serve as proxies for those who are earlier in reintegration because the mentors have also experienced the early stages of this process and are more able to engage in a long term collaborative design conversation.**

#### *4.2.5.4 Establish trust among the veteran community and researchers*

Veteran mentors believe that trust among veterans and those who interact with veterans is important. One of the mentors expressed,

“I believe in government conspiracy ... They only care as long as we are fit for deployment. I and many others find it very hard to trust anyone. They may exploit our private information”.

Research suggests that community-academic partnership may enhance public trust ( Christopher, Watts, McCormick, & Young, 2008). DH had several academic partners for more than 5 years. Still, some veteran mentors lost their trust on the technology team and the researchers after the initial AV release. The main reason is veterans are known to suffer from low frustration tolerance (Church, 2009)and bugs in the system were perceived as increasing the chances of information security failure, regardless of any actual risk. After the AV deployment, several veterans were frustrated with the app and considered the project a failure. As the collaborative design process started, the mentors could see how the app was evolving. During the weekly design meeting the technology team showed the mentors and the researchers how to use iPeer. They went through iPeer for 15-20 minutes under the supervision of the developers. This instant training had the benefit of developing trust among the veterans and reducing their frustration. They were able to see that their thoughts were valued and that they were assisting in building up the system in a way they want it to work. A mentor who was frustrated with the AV said during the collaborative design,

“I am now sure this is going to be a superb app. You people are doing an excellent work and I love to see its progress”.

During the second focus group the OEF/OIF veteran mentees also expressed their interest in periodically answering questions about app improvement suggestions. This clearly demonstrates their interest in actively participating in the app design process. When they see that their opinions are valued they are more likely to be engaged with system. This is an example of improved patience. Our derived lesson here is, **given the trust issues endemic to this population, facilitate active participation of the veteran community in decision-making to increase trust and reduce the effects of veteran specific behavioral issues for a long term project.**

### **4.3 Stage Three: Formal Usability Study**

The yearlong collaborative design practice established trust and understanding among all the participants. At this point a stable version was ready for deployment. While there were discussions going on for the beautification of the UI and suitable time for deployment among veterans, the researchers decided to study the usability of the app UI in more detail. The reason for this study was to understand how the efficiency of the mHealth services delivered to reintegrating veterans for a veteran-to-veteran peer-mentor program be improved by optimizing the app UIs within this sociotechnical system. After several discussion sessions we were able to point out two features that are crucial for the sustainability of iPeer, (1) efficient representation of the list of mentees (mentee panel, see figure 7(a)) in the mentor app and (2) motivational component in the mentee app for increasing the use of the app.

### ***4.3.1 Mentee Panel UI in the Mentor App***

Figure 7(a) contains a sample mentee panel screen for the current version of the iPeer. The mentee panel contains a list of all the mentees managed by the corresponding mentor. The mentee panel is a very important feature in the mentor app for several reasons. **First**, it gives the mentor a glanceable display to view the status of all of the mentees managed by him; **second**, it assists mentors sort out mentees based on case severity. Here severity refers to mentees requiring different levels of attention; **third**, it helps the mentors in detecting early warning signs for their mentees; **fourth**, it helps the mentors decide how to use their limited resource and focus only on mentees requiring immediate attention.

Due to the broader impacts of the mentee panel UI, we decided to conduct a usability experiment on the mentee panel in order to find a best possible representation of that particular screen. In chapter 5 we will describe the details of this experiment along with results.

### ***4.3.2 Motivational Component in the Mentee App***

“Our main motivation is to make the veterans feel that they are not alone...” – said one of the DH mentor during the collaborative design. The mentee or veteran app is crucial for keeping veterans engaged within this peer-support network. From the very beginning of the collaborative design phase the mentors expressed their concern about how to increase the use of the system. The need for a motivational or persuasive feature in the mentee app was identified as essential. As a consequence, we started to brainstorm several strategies that could accomplish this goal.

One of these strategies was to develop a rating system for measuring veteran friendliness for location-based services (LBS). Both the researchers and mentors from DH agreed that a veteran specific LBS rating system might motivate the veterans to use the system and it would serve an important area of need for veterans, who often need information about the quality of available social services. It might even help the veterans engaged within a network of other veterans who are not interested in direct peer-mentoring process. But before going into actual development of such a system a thorough background study was necessary. As a result, we conducted a detailed study with prototype and experiment among veterans. We will discuss the details of the study along with results in chapter 6.

## Chapter 5: Usability Study of the Mentee Panel UI

In this chapter we will discuss the experiment with the mentee panel UI [Figure 7(a)] that we conducted among DH veteran mentors. The main motivation behind this experiment was to determine an efficient representation of the mentees in the mentor app. An efficient mentee panel UI would provide the mentors the essential information with minimal visual representation. The key benefit of such UI is twofold, **first** it would help the mentors detect early warning signs in their mentees precisely and **second** it can reduce the cognitive load on the mentors who are monitoring a number of veterans at a time using the system, a process that may also be impacted by the mentors' own veteran status.

### 5.1 Background

Since its beginning, DH mentors have been using paper-based surveys in order to understand the mental health condition of the veterans seeking peer-support. This approach requires the mentees to fill in the survey answers. The mentors read the answers and using their own experience and judgment along with discussion with the mentees tries to anticipate their status. This portion of the peer-mentoring is crucial. The mentors' accurate interpretation will help identify early warning signs of mental illness or anticipate any kind of disaster in their mentees. However, for a veteran to veteran peer-mentoring process, the mentors themselves are also veterans who struggle with attentional problems, cognitive problems such as judgment, concentration, information processing, slower thinking etc. (Church, 2009). For a special population like veterans where both the mentors and the mentees have specific conditions, designing UI for

technology can be very challenging. A study for designing an efficient, easy to interpret, while information rich mentor UI appeared to be a must need at this stage. To accomplish this we set out to identify the key aspects of the UI that were most essential for the mentors' tasks.

Essentialism can be defined as a view that treats objects as if they have essences or underlying natures that make them what they are. Examples of such objects are animal, people or even concept (Barrett, 2001). Researches propose that learning any process or value can be enhanced from simplified visuals. It also suggests that essentialized visual elements help learners recognize and understand core essence much faster and improves focus on the most important details. For example, use of icons and line drawings are considered to be useful strategies for simplified visuals ( Peters , 2013).

A systems' failure to convey essential information may result in users' failure to obtain critical information from a display. This can occur even when the designer intended to make the information highly visible. This research suggests that the simple act of seeing can be the users' first step in gaining information (Varakin, Levin, & Fidler, 2004). Use of dashboard to visualize large amount of data in condensed form as a decision support system for management in organizations has also been proposed in literature. Dashboard or panel characteristics include visualization of select data, monitoring and interaction ( Adam & Humphreys, 2008) (Dixon, Jabour, Phillips, & Marrero, 2014). The idea of using multi-layer user interface is also gaining popularity. In multi-layer user interface, a user only moves into higher layers when needed. The lower layers are composed of essential system elements (Shneiderman, 2003).

The peer-mentor app presents a list of all the mentees under the corresponding mentor [Figure 7(a)]. The list is supposed to convey visual or essential information about the mentee to the mentor. The information could be a red flag of early need of intervention. Research suggest that a red-flag-based electronic health record (EHR) management system can significantly reduce the risk of misinterpretations of available data (Sittig & Singh, 2013). Inefficiencies within information delivered to health-care providers may lead to misinterpretation (Murphy, et al., 2012). Evidence also suggests that improvement in vital sign monitoring system and clinical disaster recognition scheme may have outcome benefits (Devita, Smith, Adam, & Winters, 2010). Research also suggests that failure in communicating abnormal test results may decrease the likelihood of test-result follow-up (Sittig & Singh, 2012).

## **5.2 Designing the Experiment**

The current UI in the mentor app was designed during the collaborative design [Figure 7(a)] phase. We discussed each feature of this UI in section 4.2.2.2. However, during the collaborative design phase, many mentors along with researchers proposed several other type of representation of the mentee panel UI. There were agreements and disagreements. After several levels of discussion the researchers decided to conduct a detailed usability experiment with the mentee panel UI. The expected outcome from this experiment was to find out an UI for the mentee panel that would work practically well for most of the mentors. Here “practically well” means, given a mentee panel screen the responses about the mentees would be similar for most of the mentors.



### **5.2.1 Methods**

Before describing the method for this experiment, we would like to outline the expected tasks from the mentee panel UI. From the mentee panel UI, a mentor is expected to perform the following tasks,

- 1) Try to detect early warning signs of crisis
- 2) Determine if there is immediate need to reach out to particular veterans who are in acute mental health situation
- 3) Make a decision about how to best use limited resources

However, the outcome of the above mentioned tasks varies greatly from person to person and in this case from veteran to veteran. Several facts may influence their decision. Two such facts are, (1) the mentor's ability to handle load or stress for a certain time period, mentor's personal relation with the mentees, (2) mentees' ability to manage relation with mentor etc. There is no correct or wrong decision for the mentors. What we actually wanted was some sort of representation of the mentees that would assist the mentors to take their decisions easily by reducing their cognitive load. Consequently, finding an optimal solution for this UI appeared to be impractical. As a result we decided to approach the problem with heuristic methods ( Gigerenzer & Gaissmaier, 2011) (ROMANYCA & PELLETI, 1985). We decided to take a heuristic approach that assumes a working solution at hand and moves backward ( Pólya, 1945). We took the screen in figure 7(a) as the current solution and decided to design two other screens by changing the current solution based on suggestions from veterans in the earlier phase.

### ***5.2.2 Experiment Details***

We created 3 different levels of mock screens for the mentee panel UI. Each level of screen contained 10 fictional mentees in a list. We created the mock screens as web pages. We used web technologies such as HTML, CSS and JavaScript for creating the screens. On the backend we used PHP scripts and MySQL database. The scripts were used to capture responses from the mentors and storing them in MySQL database. We used the same cloud database as was used by the iPeer project. We did not save name or any personal information. We used numeric identifier as participant id.

The list displayed each mentee in a way that the symptom severity was visible to the mentor. Three different levels of symptom severity were defined *a priori* by the research team: low, moderate and high. Notably, the mentors may interpret symptom severity differently. Based on feedback from the peer mentors about “real world” scenarios, we would expect the mentors to text or ignore the mentees with low symptom, call the mentees with moderate symptoms, and meet face-to-face the mentees with high symptoms.

#### ***5.2.2.1 Example Scenario***

Each mock screen for the mentee panel UI displayed 10 fictional mentees. 3 of them showed what the research defined as low symptoms, 4 showed moderate symptoms and 3 showed high symptoms. There is was an action choice drop down menu beside each mentee in the list. The action choices contained the options: text, call, meet and other as options. The mentors were asked to choose action for each of the mentee in the list. The screens contained a save button at the bottom. Once the mentors completed their

action choice they clicked on the save button and their selections were recorded in the backend database along with their participant id.

As soon as their action choice was recorded, the researchers asked them follow-up questions about the reason of their choice. The researchers took written notes on the reasons for choice. We had 3 different levels of mentee panel UI and we showed 5 mock screens for each level of UI. We will describe each level in the next section. The reason for using 5 screens for each levels can be outlined below,

- We wanted to record average responses from the mentors. The mentors may response to the same scenario differently at different setup. We needed their response in general as an average
- In real life, the mentors may face different scenario in the mentee panel screen. We wanted to show them few such variations.
- We wanted to detect any pattern or consistency in the mentors' responses in detecting case severity.

### ***5.2.3 Experimental Conditions***

For our experiment we used 3 levels of UI conditions. We moved from an UI with maximum information availability towards an UI that was fully essentialized with minimal elements [The necessity of UI essentialization is described in section 5.1]. In this case UI levels were also defined by the researchers. We took the UI in the latest app version [see Figure 7(a)] as reference and moved forward from it. For three of the UI levels, we only changed the UI representation. All other information such as survey scores and veteran information were the same. Table 3 summarizes the 3

experimental conditions. We will now describe each of the 3 UI levels of the mentee panel.

<b>UI Level</b>	<b>Presence of Trend Indicator Icon</b>	<b>Graph Type</b>	<b>Veteran Information (Name, Photo)</b>
Maximum Information Availability	Yes	Monochrome	Yes
Partially Essentialized UI	Yes	Monochrome	Yes
Fully Essentialized UI	No	Colored	Yes

**Table 3: Summary of Level of UIs for Experiment**

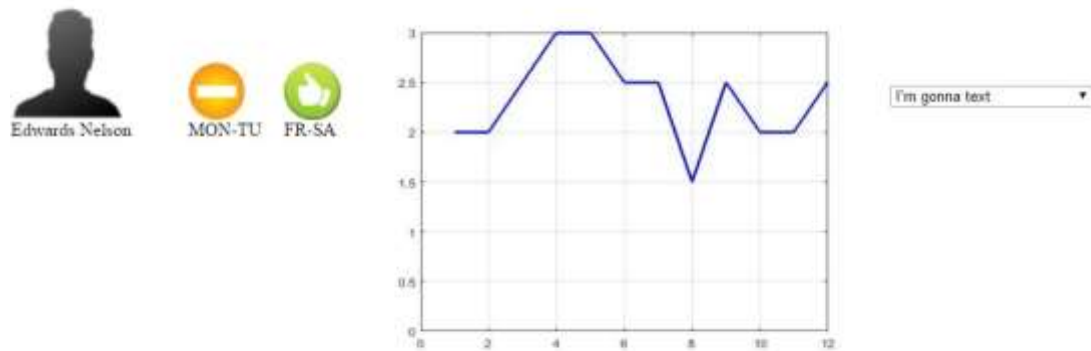
#### *5.2.3.1 Maximum Information Availability*

This is similar to the current app UI with a very little modification [see Figure 8].

This condition contained the following UI elements:

- a. A graph representing the survey responses from the past 12 weeks. For each survey submission a score is created. The score varies from 0 to 3. The graph plots scores from each survey submission. For this condition the graph was monochrome.

- b. Two icons representing the two survey responses from the ongoing week. The icons may show a thumb-down, a thumb-up or a neutral sign. A thumb-up indicated an improvement from the past response, a thumb down indicates a declination from the past response and neutral sign represents no change or very little change.
- c. An image of the veteran and name.
- d. An action choice drop box for the purpose of this experiment only. The mentor will select what he wants to do with this particular mentee.



**Figure 8: Mock Screen for Maximum Information UI**

#### 5.2.3.2 Partially Essentialized

This level of screens is similar to the maximum information availability level. There is only a small difference. Figure 9 represents a sample for this UI level. The UI element for this condition is the following,

- a. A graph representing the survey responses from the past 12 weeks. For each survey submission a score is created. The score varies from 0 to 3. The graph

plots scores from each survey submission. For this condition the graph was monochrome too.

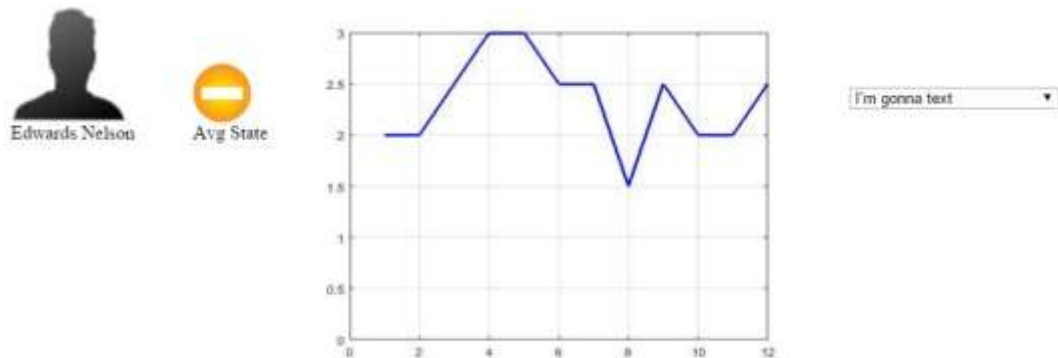
- b. One icon that represents the average trend of the score graph. A thumb-down indicates that for the average time the veteran showed declination in the graph, a thumb-up indicates the veteran showed improvement for the average number of times and a neutral icon represents the veteran stayed on similar score level most of the time.
- c. An image of the veteran and name.
- d. An action choice drop box for the purpose of this experiment only. The mentor will select what he wants to do with this particular mentee.

#### *5.2.3.3 Fully Essentialized*

This level of UI has significant difference than the former two levels. This level contains minimum number of UI elements and still tries to convey warning signs. The UI elements for this level are outlined here,

- a. A colored graph representing scores from the survey responses for the past 12 weeks. The graph contains three colors representing three different conditions. A green colored segment represents an improvement, an orange colored segment represents a minor or no change condition and a red colored segment represents a declination. The suggestion for some kind of colored representation came up several times in the collaborative design meetings. Several mentors requested to put on some kind or red/colored signal in the graph for ease of visualization.
- b. An image of the veteran and name.

- c. An action choice drop box for the purpose of this experiment only. The mentor will select what he wants to do with this particular mentee.



**Figure 9: Partially Essentialized Mentee Panel UI**



**Figure 10: Fully Essentialized Mentee Panel UI**

#### ***5.2.4 Defining Levels of Symptom Severity***

Each of the mock screens contained a list of 10 veteran mentees. We designed their curves in a way so that 3 of them can appear as showing “warning signs or high risk”, 3 of them appear as showing “doing well” and 4 of them appear to be “confusing”. Our expectation from the mentors was that for “high risk” group they would choose to meet, for “doing well/lowest risk” group they would choose to skip or just text and for

the “confusing” group they may choose to call first. Again, for a peer-mentoring process there is no right or wrong answer. It is about human relation and interaction (Haggard, Dougherty, Turban, & Wilbanks, 2011). However, our goal was to see if the UI can in anyway makes their decision process easier and whether or not they agree with our assumptions on case severity. Table 4 summarizes the levels of symptom severity for the mock screens.

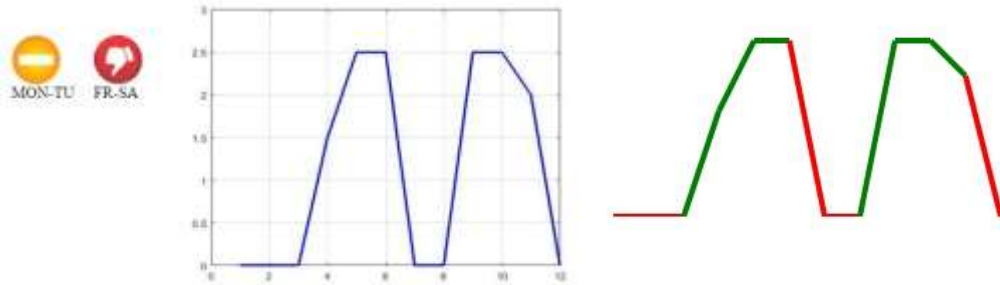
<b>Symptom Level</b>	<b>No. of Veterans in One Mock Screen</b>	<b>Expected Action from Mentors</b>
High Risk Symptoms or Warning Sign	3	Meet face-to-face
Low Risk Symptoms or Doing Well	3	Text or ignore
Confusing	4	Call and may be followed by meet

**Table 4: Summary of Symptom Severity in Each Mock Screen**

#### *5.2.4.1 High Risk or Warning Signs*

In the mock screens we defined veterans showing high risk symptoms by giving the graph 3 or more sharp downward trends. Figure 11 shows such graphs.

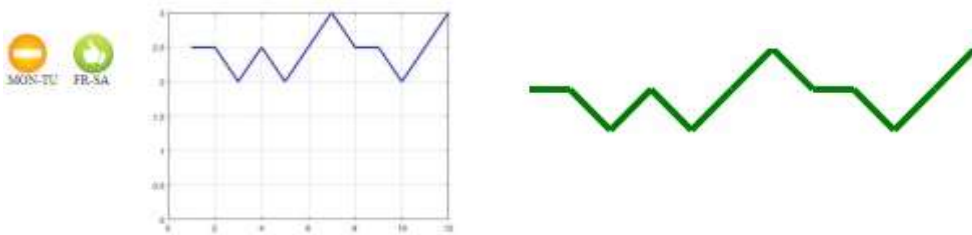




**Figure 11: Sample Graphs Showing High Risk Symptom (a) Monochrome Graph, (b) Colored Graph**

#### 5.2.4.2 Low Risk Symptoms

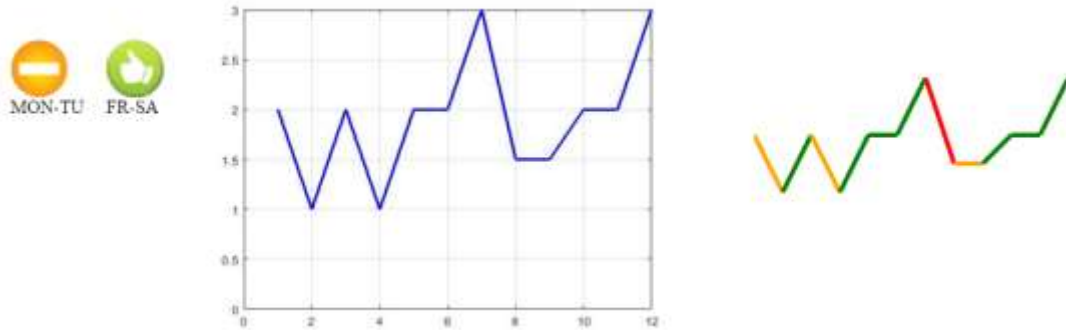
In our mock screens we defined low risk symptoms as, graphs that had only one or two small declinations and overall staying on the same score level [see Figure 12].



**Figure 12: Graphs Showing Low Risk Symptoms, (a) Monochrome Graph and (b) Colored Graph**

#### 5.2.4.3 Confusing Symptoms

In our mock screens we defined confusing symptoms as, graphs that may have one or no sharp declinations and several small declinations [see Figure 13].



**Figure 13: Graphs Showing Confusing Symptoms (a) Monochrome Graph and (b) Colored Graph**

### *5.2.5 Testable Hypothesis*

We decided to test two main hypotheses from this experiment:

1. With the UI carrying maximum information, mentors will not have to search for much additional information about ambiguous severity veteran (ambiguous risk veteran). Thus, the discovered accuracy of maximum information UI condition will be considered the “gold standard” for the subsequent hypotheses.
2. Essentialized interface will result in increased efficient decision making as compared to the non-essentialized or partially essentialized interface

### *5.2.6 Conducting the Experiment*

After finalizing the design of the 3 UI levels, we developed mock screens for each of the levels. For each levels we developed a total of 5 mock screens. Once the mock screens were ready, we conducted this experiment among the 9 veteran mentors.

### *5.2.6.1 Methods*

We had one-to-one interview session with each of the 9 veteran mentors. Each of these interview sessions included at least one researcher and one veteran mentor. For some of those sessions more veteran mentors and researchers were present. During the interview, we first explained the mentor about the current UI of the mentee panel. Afterwards, we told them that they will be given 3 different types of such screen and each type of screen will be given in 5 different forms. For each of the screens, they need to decide what they want to do with each of the mentees on the list. They needed to look into the graph and the trend indicator icons (if present) in order to make decisions. They had 4 different choices for each of them. They chose to text, call, meet or they selected the 'other' option. When they select other, it means they choose to ignore the mentee for now.

Once they were done making their decision, we saved their responses in the server. We recorded their decision along with the time taken to make the decision in seconds. After that we asked them follow-up questions about their choices. The questions included, (1) the reason behind their choice of text, call and meet options, (2) whether they have any specific criteria for detecting warning signs, (3) how they can make this peer-mentoring a success, (4) whether or not they have any specific suggestion.

After going through all the screens we asked their opinion about each level of UIs. And finally we asked them which of these screens they liked the most. The responses for the follow-up questions were noted by the researcher. In the next section, we will analyze the results of our findings.

## 5.3 Findings

Once the experiments were done, we started to analyze the responses from veterans. We decided to take two different approaches to discuss our results, **first**, compare veterans' answers for sorting out case severity with our assumptions on case severity and **second**, conduct thematic analysis on veterans' responses about the experimental screens.

### *5.3.1 Sorting of Veteran Mentees on Case Severity: Veteran Response Vs. Our Assumption*

We will perform separate comparison analysis for all of the UI levels while using the same methods for analysis.

#### *5.3.1.1 Refining the Data*

During the experiment, one of the important issues that we noticed is (by asking questions after each screen), mentors completely ignored the trend indicator icons while taking their decisions. We had trend indicator icon in maximum information UI [see Figure 8] and partially essentialized UI [see Figure 9]. For both the UIs the mentors took their decision by only looking into the graph and ignored the icons. The graph of both the maximum information UI and partially essentialized UI were the same. Because, few mentors showed lack of patience for performing the same experiment with similar graph, we did not force everyone to respond on the partially essentialized UI. As a result partially essentialized UI contains less data than the other two.

### *5.3.1.2 Methods*

We decided to measure the agreement between mentors' responses and our definitions of case severity. The primary purpose of this test is to quantitatively measure which UI responses are more close to our interpretations of case severity. Better agreements in interpreting case severity means both researchers and mentors are getting similar benefits from that particular UI. For this case 'benefits' may refer to detecting risk level in mentees.

### *5.3.1.3 Measuring percentage agreement on UI levels*

We calculated percentage of agreement for each of the veteran mentors to show agreement with our interpretation. We measured the percentage agreement for each veteran on each UI level. We then took the average of the percentage agreement for each mentor and the finally computed the group average agreement on each UI. Total number of mock screens for each UI level is 5 and each mock screen contained 10 veterans. So for each mentor we took the percentage agreement for their responses for 50 veterans on each UI level. Table 6 summarizes the percentage agreement based on UI level.

### *5.3.1.4 Measuring percentage agreement on severity levels across UI levels*

Our next step in data analysis was to measure percentage agreement on each severity level. We decided to compare agreement between mentors' interpretation and researchers' interpretation separately for low, ambiguous and high severity symptoms across three UI levels. Table 5 presents a summary of the experimental setup. Table 6 & 7 represents the results.

<b>Severity Level</b>	<b>Low</b>	<b>Ambiguous</b>	<b>High</b>
<b>Number of veterans on each screen</b>	3	4	3
<b>Number of veterans across all UI</b>	45	60	45

**Table 5: Summary of experimental setup**

	<b>Agreement Percentage for Maximum Information UI (%)</b>	<b>Agreement Percentage for Partially Essentialized UI (%)</b>	<b>Agreement Percentage for Fully Essentialized UI (%)</b>
<b>Group Average</b>	47.5	46.7	55.75

**Table 6: Computing Percentage of Agreement on 3 Different UI Levels**

	<b>% agreement for Low Severity (across all UI)</b>	<b>% agreement for Ambiguous Status (across all UI)</b>	<b>% agreement for High Severity (across all UI)</b>
<b>Average</b>	59.87	33.39	63.86

**Table 7: Percentage Agreement Based on Severity Levels**

## **5.4 Discussion on Data Analysis**

We will now present our observation on the data analysis in terms of our initial hypothesis [see 5.2.5].

From the group average of agreement on UI level [see table 6] we can see that fully essentialized UI has much closer agreement than the other two [averaged agreement score = 55.75, range 40-72]. The agreement score for maximum information UI and partially essentialized UI are pretty close [ Maximum information UI: averaged agreement = 47.5, range 42-58; and Partially Essentialized UI: averaged agreement = 46.7, range: 35-63]. From the group average of severity level [see table 7] our results show that mentors percentage agreement for ambiguous risk veterans is 33.39. This indicates that for ambiguous risk veterans, 66.61% of the times most mentors have categorized them either as low risk or high risk. Their interpretation for low and high severity veterans is much closer to our interpretation [59.87 and 63.86 respectively]. From our interview data we found that the decision also depends on the relation between mentor-mentee. The mentors might just choose to text if he/she is younger and does face-to-face meeting less frequently. Texting might be a check-in for them to decide whether to move forward or not. A few older mentors prefer face-to-face communication regardless of sever graphical symptoms.

## **5.5 Discussion on Qualitative Data**

Several themes emerged from our discussion with the mentors during the experiment session. We recorded the comments from the mentors by writing it down on papers. We then coded analyzed the comments from paragraph to sentence level. We will now present this analysis in terms of usability themes of the mentee panel UI.

### ***5.5.1 Graphical display helps in early intervention even for apparent low risk severity***

When mentors were selecting their choice of action we asked them the reason of their choice. All of them responded they were choosing based on the curves in the graph. Most of the times whenever they see any sharp drop at the end of the curve or closer to the end, they would choose to follow-up even if the overall curve seemed fine. The reason explained was that

“any fresh downward curve is a risk ... it can be prevented by immediate intervention”.

One of the mentors explained,

“If someone shows no downward slope over most of the time and then sudden downward, it is also a high risk for case him. A person who has been taking stress over a long period may suddenly outburst.”

Furthermore, some mentors were able to visually classify their mentees by deciding on a baseline. They might choose someone below 1.5 score needs regular intervention. Someone going down below the baseline may need immediate intervention. The graphical display helped them settling on a trend line and prioritize their mentees.

### ***5.5.2 Graphical display makes decision making easy even if the mentors are not able to focus fully***

During our experiment one of the mentor mentioned he did not sleep well the night before and needed a break for some minutes in between experiments. He stepped out of the room, took few steps of walk and then got back to the screen. It appeared even



in a condition when he was not able to concentrate continuously and needed break, the graph helped him decided who to call and meet. The graphical display also proved to be helpful for mentors who themselves are busy in school or job. Two of the mentors appeared to be too busy during the experiment and were checking their phone for time several times.

### ***5.5.3 Mentors may perform even better with UI they do not like***

During the experiment we showed the mentors fully essentialized UI after we showed them the maximum information UI and partially essentialized UI. We found many of them considered fully essentialized UI as not the one they would preferred. The reasons were (1) it gives too much information; (2) “it does not give visual feeling” (according to the statement by one mentor). However, a few mentors thought the colored graph was easy for decision making.

Although, some mentors expressed their dislike for the colored graph our analysis showed that 7 out of 9 veterans showed increased agreement score for the colored graph, 1 out of 9 of them were colored blind. Thus, only 1 out of 8 veterans, who were able to perform the colored graph test showed lower agreement for colored graph.

### ***5.5.4 Putting some weight on mentees makes decision easier***

One of the mentor expressed he would prefer to see some average score in place of the trend indicator icons for the maximum information UI and partially essentialized UI. According to him and some other mentor the icons does not give any overall picture and not much helpful. An average score might be helpful. Few other mentors selected a baseline score for them at the beginning and took decisions based on that baseline. This

observation makes it clear that putting some numeric weight to the mentees helped in easy decision making. By numeric weight, it means the score corresponding to each submitted surveys along the Y axis.

#### ***5.5.5 No fixed definition of accuracy***

During our discussion with the mentors, we found some of them would choose to meet most of the time. The reasons are, (1) they are older and more comfortable with face-to-face communication, (2) they are retired and have enough time for their mentees, (3) they believe in fully engaging with their mentees by regular meeting. On the other hand, some of them showed more interest in texting and calling than meeting. The reasons are, (1) they themselves are very busy and do not have enough time, (2) they feel they may choose to meet later depending on how the mentee wants or what kind of relation they have with their mentee.

The above reasons demonstrate that the effectiveness of peer-mentoring depends on the relationship and nature of the mentor and the mentee. There is no correct answer for how to decide actions. But the UI can be so designed that it may make the decision making efficient.

### **5.6 Conclusion on Mentee Panel Experiment**

This section will try to present the conclusion of the mentee panel experiment in terms of the hypothesis stated in section 5.2.4. According to our first hypothesis,

*With the UI carrying maximum information, mentors will not have to search for much additional information about ambiguous severity veteran (ambiguous risk*

*veteran). Thus, the discovered accuracy of maximum information UI condition will be considered the “gold standard” for the subsequent hypotheses.*

From our experimental result we can see that mentor’ interpretations were more close to our definition for low and high severity level. Our experiment shows that for maximum information UI, the group average percentage agreement for ambiguous risk veteran is 30.56%. On the other hand the same group average for fully essentialized UI is 43.75%. The result shows that for maximum information UI, the mentors categorized ambiguous veterans most of the time as low or high risk veterans. They did not seek for more information. But for fully essentialized UI the agreement is closer to the research interpretation.

According to our second hypothesis,

*Essentialized interface will result in increased efficient decision making as compared to the non-essentialized or partially essentialized interface.*

The experimental result on UI level, it can be seen that mentors percentage agreement for fully essentialized UI was closer to our definition than maximum information UI or partially essentialized UI. However, as we discussed from our interview responses, the interpretations were greatly dependent on mentors’ perspective about mentoring and relationship with the veterans. Still the quantitative result shows better agreement with research interpretation for fully essentialized UI. This result will be used in future for further modification of the mentee panel UI.

## **Chapter 6: Veteran Rating as a Measure of Veteran**

### **Friendliness**

During the collaborative design several mentors and researchers raised their concern about user engagement. Few mentors asked if we can design some motivational component that would make the veterans come back to the system over and over again. As a consequence researchers along with mentors started to investigate what system could attract veterans and increase use of the system. Several times veterans raised the issue of ‘lack of service directory’ that may be able to serve their specific interest. There are already many Location Based Service (LBS) directories available on the web and as Smartphone app. Several of them like Yelp allow user ratings (Yelp, 2004). So we proposed a special rating system for LBS directories. The rating system would let veterans rate services based on how veteran friendly the service is and help other veterans search for services that would meet their custom needs. Our prior experience with AV failure made us cautious this time and we decided to go for a thorough field study with prototype before going for actual development. The purpose of the field study is to understand why and how such rating system may help veterans.

In this chapter we will discuss the details of the field study, experiment with prototype and responses from veterans on ‘veteran specific rating system for LBSs’.

### **6.1 Background**

“There are too much information on the web... you do not know what’s good and what’s not” ----- One of the OIF veteran

One of the key challenges that veterans often encounter during civilian reintegration phase is to connect with resources that serve their best interests. These include Veteran Affairs (VA), and other governmental services; educational services including GI-Bill and community resources. They need to search through a vast pool of service directories. Consequently, finding location-based service resources that may serve their best interests is one of the many reported problems from veterans (Chandrasekaren, *After the Wars: A legacy of pain and pride*| Washington Post, 2014).

Several social networks are available which allow their veteran members to share stories, pictures, and memories with fellow veterans. Few of them even provide a directory of community resources (GreenZone Social Network) (Veteran.com., *Veteran.com | Military Veteran / Veterans : Army - Navy - Air Force - Marine Corps.*). Impact 2-1-1 (IMPACT 2-1-1 - IMPACT Inc., 2015) and Mental Health of America (Mental Health America., 2015) and VA's national resource directory (Department of Veterans Affairs, O. National Resource Directory - eBenefits. [Ebenefits.va.gov](http://Ebenefits.va.gov).) have online directory of social services. Both civilian and veteran population use these directories for searching social services. Vets101 is a service that provides career planning tools along with information services for veterans. Vets 101 gives a tailored list of top benefit (Seal, et al., 2010) programs after completing of a short anonymous survey. The list might be appropriate for veterans. Veteran benefit experts and experienced technologists have designed these tools ([Vets101.org](http://Vets101.org)., Home.). Apart from these, VA's social work services offer guidance to veterans on taking advantage from VA services. Several other city, state or county based social service directories are also accessible [[Servicedirectory.saccounty.net](http://Servicedirectory.saccounty.net)., Health and Social Services, Service

Directory.), (Vsc.cuyahogacounty.us., Social Work Case Management - Veterans Service Commission)]. However, these resources do not provide any assistance that might help with veteran specific issues. For example, a homeless shelter that provides services to anyone, but pays special attention to veteran needs, a financial service center who offers several benefit packages for veteran, a school campus that has dedicated veteran center and helps them in best possible way etc. In other words, from the current available social service directories there are no way to measure or judge “how veteran friendly a service provider is”.

Hence, the researchers along with DH began to form the idea of a LBS rating system specific to only veteran communities. The expected advantage of such LBS are twofold, **first** it will provide a service rating system that veterans can trust and **second** it will motivate the veterans to use the iPeer system. Research suggests that veterans often find it hard to trust government service or people outside of the veteran community [(Spelman, Hunt, Seal, & Burgo-Black, 2012), (Walker, 1981)], a veteran specific rating for LBS can encourage the usage of the system. The main idea is, veterans who have previously went through a service will be able to rate that service based on their personal experience. They will be rating the system on veteran specific needs or criteria. Since many veterans feel that non-veterans do not understand the psychology of veterans, the rating system is expected to be trusted and accepted by veterans.

Therefore the researchers along with mentors coined the term ‘veteran friendliness’ for rating a service based on how much they can offer to veterans. Our major contribution is, proposing a rating system that will demonstrate veteran friendliness for services and will help veterans find services based on their custom needs.

## **6.2 Study Design**

Once we decided to conduct extensive study on the rating system, we began to investigate how to define ‘veteran friendliness’. We decided to proceed step by step. **First**, we need to investigate what kind of services are important for reintegrating, **second**, we need to figure out the criteria for measuring how veteran friendly a service is and **third**, in which way a rating system for showing veteran friendliness can help reintegrating veterans. Once we finalized the steps we began to finalize methods for each steps.

### **6.2.1 Methods**

We conducted our study in three phases, (1) this phase involved an early informal meeting among veterans and researchers in UWM veteran service center. (2) The second phase involved a formal meeting among researchers and veteran mentors followed by development of prototype. It took place at MU and was conducted after weekly collaborative design meeting. (3) The third phase involves experiment with prototypes. We developed prototype screens for the LBS with ratings. We conducted a total of 5 focus groups in order to gather responses from veterans. A total 23 veterans participated during the whole study period. Table 8 represents a summary of the participants throughout the phases of this study.

## **6.3 Phase One: Requirement Gathering Meeting at UWM**

This phase started with questions around importance of location-based resources for veterans. We started to find answers to questions like, “what type of location resources are most important for reintegrating veterans” and “whether or not veterans

actually need any rating system for veteran friendly services”. In order to find answers we visited the veteran center at UWM once. We communicated one DH mentor (who also works at the center) prior to our visit. During our visit several student veterans were visiting the center and 3 of them participated in the conversation voluntarily.

Phase	No. of Veteran Participants	Data Accumulation Process
1	4	Meeting with veterans and notes were taken by researchers
2	3	Notes and white board drawing with screen capture in the meeting
3	16	Prototype presented and transcription of one-to-one interview

**Table 8: A Summary of Study Phases**

### **6.3.1 Findings**

From the discussion with veterans, we were able to form a list of services important for reintegrating veterans. Example of such services is, hiring services, health-care services, educational institutions, financial services, drug and alcohol rehabilitation centers etc. We then asked, “what type of problems do veterans face when seeking such services?”. One of the veterans explained the problems with respect to healthcare services. According to him a service which never treated any veteran would not understand how to deal with combat veterans. He went on saying that combat veterans have different levels disability. Many of them might not have driving permit and travel time and distance is important for them. Veterans with alcohol and drug issues are also unable to travel long distance. Another veteran mentioned,

“Wait time might be an issue for veterans dealing with anxiety or stress disorder”.



When we asked them why they think such rating system might be useful, one of the veterans summarized as,

*If the service providers have experience in dealing with veteran specific issues they might get good ratings from veterans. Few examples of such issues are, issues with combat veterans, anxiety issues, substance abuse issues etc. The ratings will help other veterans recognize services that may meet their custom requirements.*

Although DH mentors are actively assisting veterans in finding community resources, they have limited human resource. A rating system for veteran friendly services will offer an easy accessible approach for finding community resources.

## **6.4 Phase Two: Design Meeting and Prototype Development**

The first phase gave us supportive qualitative evidence about the necessity of a rating system for veteran friendly services. Our next step was to determine, how a service can be rated for veteran friendliness. Therefore, we started to discuss with DH mentors about the ways to rate a service for veterans. In this phase we had two formal meetings. The purpose of the first meeting was to find the veteran specific conditions against which a service provider may get ratings from veterans. The second meeting involved design decisions for a prototype for experiment with veterans.

### **6.4.1 Findings**

This phase has two separate outcomes, **first**, we were able to identify the set of criteria for rating a service for veteran friendliness and **second**, we finalized the design of prototype and developed it for experiment.

#### *6.4.1.1 Identifying Criteria for Rating Veteran Friendly Services*

We were able to outline a set of criteria for rating a service for veteran friendliness after a meeting with DH mentors. 3 of DH's mentors contributed their thoughts in outlining the criteria. Table 9 summarizes the set of criteria and questions for each criteria. The veterans will be asked to answer the questions for each criteria for rating a system and based on their answers an organization or service will be rated. We did not decide on the answer format yet. We leave this part as implementation detail for future work.

- **Example Scenario**

A veteran visits Vets Place Central – a service provider for alcohol and drug recovery. The phone then prompts a message:

"You have decided to seek out services for alcohol and drug recovery, and have gone to Vets Place Central (one of the service providers), your phone detects this location and provides a suggestion of a related service that you might like to use based on your choice to use Vets Place Central".

Then the veteran will be presented with list of service providers. The phone then says, "How likely would you be to suggest this service to other veterans". The phone will then show the list of questions from table 8. If the veteran wishes to share his review he will then be able to publish his rating and answers.

#### *6.4.1.2 Prototype Design and Development*

At this stage we decided to develop a prototype and conduct experiment among veterans with the prototype. From our initial research, we understand that LBS with

rating should have two components, (1) the first component should allow veterans to rate a service based on the criteria in table 9 and (2) the second one should allow veterans to search for services and show veteran ratings on the search result. We decided to develop mock screens for the second component. The reason is the second component would help us understand how veterans actually perceive the rating system and how it helps them during their reintegration period. Researchers along with some DH mentors designed the mock screen during one session of the collaborative design meeting.

<b>Criteria for Organizations</b>	<b>Questions for Veterans</b>
Veteran cultural competence training	Do you believe the provider knew about veteran culture?
Veteran staff	Did they have veterans on staff?
Have veterans in service provision roles	Were you screened for veteran status?
Trained in trauma-care	Did they ask you for your veteran medical history?
Trained in evidence-based combat PTSD	<ul style="list-style-type: none"> <li>• Did they ask if you are a combat veteran?</li> <li>• Did they have screening of combat treated service?</li> </ul>
Veteran referral/support	<ul style="list-style-type: none"> <li>• Did you feel your military service was honored?</li> <li>• Did they have non-triggering environment?</li> </ul>
Veteran family support	Did their service included your family?
Veteran peer-support	Did they have veteran peer-support?
Quality of service	Respectful, helpful and timely service

**Table 9: Criteria for Rating Veteran Friendly Services**

We developed 4 mock screens showing search results for (1) financial services, (2) healthcare services, (3) educational institutions and (4) drug and alcohol rehabilitation

services. Each mock screen contains list of corresponding services. Figure 14 shows a sample item in a list of services.

Each service in the list contains several features, (1) separate veteran rating along with civilian rating, (2) veterans will be able to view ratings against each criteria [table 1] by clicking on the question icons beside veteran ratings, (3) veterans will be able to directly ask for opinions from other veterans in their area through the app; the 'Wanna ask around' button will connect them with the phone of other available veterans and they will be able to chat with them, ask for their direct opinion. This feature is especially helpful for introverted veterans who are more comfortable with digital communication. (4) Each item will also have separate reviews from veterans who have been there. The button "It's great" will show reviews from veterans who rates it the highest and the button "It's OK" will show reviews who gives average ratings.

## **6.5 Phase Three: Experiment with Prototype**

The final stage of our study involved experiment with prototype among veterans from DH and from UWM campus. The purpose of this experiment was to determine how the rating system can help the veterans and how the veterans respond to the rating system. In this chapter we will discuss the details of the experiment with findings.

### **6.5.1 Methods**

We conducted 5 focus groups with veterans. 2 of them took place at DH, 1 at a coffee shop, 2 at UWM veteran service center. Total 16 veterans participated in this phase. Table 10 presents a summary of the focus group participants for this phase.

During the focus group we started with discussion about the iPeer project. Then we took turns with each veteran for the experiment. Before introducing the prototype we asked them about their experience during the reintegration period. We specifically asked their experience with financial, educational, healthcare and rehabilitation services. Their responses were written down with their permission. After this discussion we explained them about the rating system and showed them the mock screens of search results. Once they confirmed they understand the concept of veteran rating, we showed each of the 4 mock screens one at a time. The veterans were then asked to select one service from each list. They were explained how to record their response. Soon after they made their selections, we asked them follow-up questions. The questions included, (1) the reason behind their selection, (2) whether or not they liked the rating system and (3) if they think the rating system would be helpful in anyway.



**Figure 14: Prototype of Location-based Service with Veteran Ratings**

<b>Military Service period</b>	<b>Age Range</b>	<b>No. of Participants</b>	<b>Current Occupation</b>	<b>Familiarity with web technology and LBS</b>
Vietnam era	60 – 70	5	<ul style="list-style-type: none"> <li>• 4 of them retired, 1 receiving peer-support to recover from trauma, other 3 voluntarily mentoring and fundraising for DH</li> <li>• 1 of them peer-support specialist at DH</li> </ul>	<ul style="list-style-type: none"> <li>• 3 of them never used any LBS but is familiar with web technology</li> <li>• 2 of them familiar with Yelp and uses web technology for research of any kind</li> </ul>
<ul style="list-style-type: none"> <li>• OEF/OIF</li> <li>• South-west Asia</li> <li>• Africa</li> <li>• active military service only veterans</li> <li>• marine veterans</li> </ul>	20-35	11	<ul style="list-style-type: none"> <li>• 15 of them full-time student</li> <li>• 1 of them works in a non-profit organization</li> </ul>	<ul style="list-style-type: none"> <li>• All of them well familiar with web and internet technology</li> <li>• 4 of them used LBS a lot of times</li> <li>• 5 of them familiar with LBS and used several times</li> <li>• 2 of them believes they never used any LBS</li> <li>• 1 of them tries to avoid web and internet as he believes it takes up a lot of time</li> </ul>

**Table 10: Summary of Focus Group Participants**

### **6.5.2 Findings**

Soon after the experiments, we carried on an inductive thematic analysis on the focus group data using methods explained in a research work ( Braun & Clarke, 2006).

We coded the qualitative data from the experiment at the sentence to paragraph level.

Later we outlined themes across the data set. We will now present the summary of our analysis in the form of advantages offered by ratings of services based on veteran friendliness.

#### *6.5.2.1 Help in Finding Comfortable Services*

From the discussion with veterans during the focus groups, we found that reintegrating veterans seek comfort and respect. A rating system demonstrating veteran friendliness is able to assist in finding services that other veterans might have found comforting in the past. One of the veterans from the Vietnam service era explained his experience with uncomfortable services as,

*“VA medical service was embarrassing...I hated to go to the VA hospitals, they treated us like dirt...but it was between 70s and 90s... they had this horrible reputation... now the situation has changed a lot...but I did everything to avoid VA”*

Another veteran who chose to go for familiar healthcare service instead of VA explained,

*“If I had not have my insurance, I would have to go to the VA, because most veterans cannot afford other service...But VA services was horrible in the 70s, 80s, and 90s... I had insurance and I preferred to go to the family clinic”.*

One of the OIF veterans expressed his interest in reviews and ratings for VA’s quality of service. He said,

*“There should be a way so that veterans could tell how their experience was about the VA”.*

When was asked what he mean by quality of service he said wait-time, treat with respect etc.. Most of the younger veterans said that they are satisfied with current VA services. However, few of them expressed that they do not trust VA. They go for VA service as it is free and the only option they have. One of them mentioned,

*“Sometimes there are rude staff on desk or over phone who would think you are being over dramatic”.*

Most of the student veterans expressed that if they can afford it, they would choose services highly rated by veterans for healthcare.

#### *6.5.2.2 Help through Phase of Insecurity and Vulnerability*

During the focus group at DH one of Vietnam era veteran described his state during reintegration phase as extremely vulnerable and full of insecurity. He said,

*“The insurance companies were ripping us off...they sold us life insurance that was meaningless...we were vulnerable...we had to pay for it”.*

Another veteran explained his vulnerable condition as,

*“I was wounded and had to go in the hospital for long time...I was always connected with VA...They just give you pills ... psychologists had no idea what war does to you...emotional pains, spiritual pains they do not know how to deal with it...but they helped you financially”.*

Another Vietnam era veteran who was kicked out of his school during service period shared his story,



*“At Vietnam I got letter from my school...they kicked me out of the school with a 0.0 GPA ... I was laughing at that time... after return it wasn't funny anymore... they said they would readmit me but I had to start with a 0.0 GPA...I decided not to go there and went to another school well reputed among veterans...”*

He mentioned that if there was a rating system that could demonstrate veteran friendliness, it could help him find veteran friendly schools. Another OIF veteran explained vulnerability as,

*“I was diagnosed with PTSD in 2008...when I got back home all of my friends already graduated from school...I was trying to catch up, looking for job....it was physically difficult for me to go to school...I had anxiety attacks...flashbacks...”*

According to him at this stage it is very difficult to take decisions. Sometimes they just go for what is available. He went for VA treatment for a long time as it was free and he thought he did not have any other option. He described it as follows,

*“when you are offered services from VA it is difficult to reject...we were pretty young...we could not address problems immediately...it took 10 years for me to switch to alternative treatment, before that I went through classic treatments like exposure therapy...”*

However, he feels that younger OEF/OIF veterans these days are more likely to choose alternative service and thus the rating or review system may help them a lot. According to him,

*“OEF/OIF guys going to look for school, healthcare, VA healthcare and alternating services...Older vets think VA is the only authentic option... they don't*

*look for alternating services...they are happy with current VA service as they did get worse in the past...they think VA is the ultimate service ... I looked for alternative service because VA therapy and medicines were not giving me relief”.*

### 6.5.2.3 Reduce Reintegration Stress by Making Decisions Easy

Student veterans use their GI Bill (Stanley, 2003) to pay tuition. During the focus groups we met 10 student veterans and all of them agreed that they had selected their school based on opinions from other veterans. They preferred a school where the staffs maintain latest knowledge on available veteran benefits.

*“I would prefer a school who stays up to date with GI bill benefits, who has staff that keep the information up to date ... It would be too much to stay up to date personally...They need to know what benefits veterans are entitled to... I do not want to take the risk of going down”,*

said one student veteran. Another veteran mentioned,

*“I went to military after high school... When I got back and started school I felt my learning curve has missing segments... I would choose a school high rated by veterans... if veterans have rated it high they might have found it helpful that could fill in the gap in the learning curve.”*

Another 22 year old said,

*“I picked my school because it has mix community of ages... There are few students who are 18 but there are also students older than me in the freshman*

*classes. It helps a lot and reduces discomfort of studying with only younger classmates”.*

Another OIF veteran shared his experience with long wait time issues. According to him a review prior to select any service would help a lot veterans with specific conditions such as anxiety, low tolerance issues etc. His described his experience as,

*“I needed to go to urgent care in Columbus, OH...I have never been there before...after check-in I had to wait for doctors for 3 hours...a review or rating would prepare you in advance for what you should expect...”*

### **6.5.3 Discussion**

When the veterans were asked to choose from a list of services most of the time they preferred services highly rated by veterans. Few exceptions were, (1) distance and coverage for healthcare, (2) prior familiarity matters, (3) few students took average of both veteran and civilian rating as they believed there are more civilians than veterans. When they were asked, ‘why they chose service with high veteran rating’ one of them said, “I trust only veterans”. Another one said, “I believe veterans will report accurately and honestly”. Another veteran explained, “I would ask veterans to go to VA for financial help for education...VA will pay but we the veterans can recommend what to choose...lots of younger veterans are there who don’t want to directly talk with older veterans...but we can recommend schools...we can recommend through this app”. One more reason was, “High veteran rating means they are good with veterans...If I know they are good with veterans I would definitely go there...”. The most common reason for

trusting veteran judgment over everything else is that all of them believe people who never went to war do not understand the effect war has on veterans.

## **6.6 Summary**

Our study on ‘why and how to rate services based on veteran friendliness’ included 23 veterans over a short period of time. Nonetheless, our results are promising and exhibit value in exploring the development of a veteran-rated LBS. However, future work is needed to connect the rating system to an actual service directory, collect veteran ratings in real-time and study the use of the app in real-world.

## **Chapter 7: Conclusion and Future Works**

In this chapter, we will summarize the key achievements and possible future works for this dissertation.

### **7.1 Research Achievements**

Recent study of civilian reintegration issues shows that, the mental health needs of reintegrating veterans are addressed after they have become florid. Typically, the veteran or their family recognizes the need for outside help after a sentinel event –legal problems, job loss or family dissolution. However, research suggests that generalized anxiety and depression are prevalence among veterans ( Berglass & Harrell, 2012). Study reports that mental healthcare utilization among veterans is also not adequate (Franco, 2013). DH initiated the veteran-to-veteran peer-mentor program and we started to develop a technology augmentation for the program. This thesis reports on a study as an effort to find out how to design the technology augmented service so that veterans can get the best use of it. We will not summarize the main achievement of this thesis:

#### ***7.1.1 Identifying the main challenges for designing mHealth solution for veterans***

Throughout the collaborative design and development cycle we encountered many unexpected responses from veterans. These responses and feedbacks helped in identifying some design challenges for developing technology-based solution for veterans. These challenges were never addressed in literature. This thesis has presented those challenges as one of the main contributions.

### ***7.1.2 Tools for the mentors for easy detection of mentee case severity***

One of the most essential components of the iPeer app is the mentee panel UI. We have discussed the importance of this UI in chapter 5. Throughout the design phase of iPeer, most mentors and researchers were concerned about how the design of this UI can be made most efficient. Throughout this dissertation, we conducted experiment with mock screens made from different proposals for this UI. The proposals were made by both the mentors and researchers throughout the design phase. The experimental results gave us both quantitative and qualitative evidence on most effective UI based on the current proposals. These evidences will be used in to modify the app for future versions. We present the experimental results as another contribution.

### ***7.1.3 Identifying the need for a veterans specific rating system for location-based services***

iPeer is an app to help out the veterans during their civilian reintegration phase. In order to make the best use of the app, the veterans need to stay connected with it. As a result, a motivational component is crucial for the success of the system. This dissertation presented a rating system specific to veterans as a proposal for such a motivational system. Chapter 6 described the field study that was conducted in order to accumulate evidence in support for such a system. The study shows that veteran showed positive responses for such a system. We presented the complete background study with prototype development as one of our contributions.

## **7.2 Future Research Direction**

Throughout the design and development phase of iPeer, many different ideas emerged that we plan to include as future work.

### ***7.2.1 Incorporate changes in the mentee panel***

In the future version, we will be incorporating changes suggested by the mentee panel UI experimental results. A scale within the graph will be included. Also, the option for showing the graph as colored or monochrome will also be made available.

### ***7.2.2 Long term data analysis***

Long term data analysis is another part of the future work. We would like to record, which graphical display the mentors use and how efficient their selection is based on time and scalability.

### ***7.2.3 Implement the rating system by collecting actual veteran ratings***

We would like to collect actual veteran ratings for different services by incorporating a rating tool within the app. Analysis on the rating data will reveal how the veterans may rate services and the view of others towards the ratings.

### ***7.2.4 Implement a feedback system for the veteran app***

We would like to also implement a feedback system for the veteran app. Through this system the veterans can report on any issues they may face within the mentoring process.

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