DESIGNING A SOCIAL WEBSITE TO ENCOURAGE NETWORKING
AMONG WOMEN STUDENTS AT CONFERENCES

by

John Langewisch
A thesis submitted to the Faculty and the Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science (Computer Science).

Golden, Colorado
Date __________________________

Signed: __________________________

John Langewisch

Signed: __________________________

Dr. Cyndi Rader
Thesis Advisor

Signed: __________________________

Dr. Tracy Camp
Thesis Advisor

Golden, Colorado
Date __________________________

Signed: __________________________

Dr. Randy Haupt
Professor and Head
Department of Electrical Engineering and Computer Science
ABSTRACT

The percentage of women participating in computer science has been disturbingly low, and the number of computer and information science degrees earned by women has been on a downward trend. Several conferences have been put in place to address this issue, but networking at these conferences is still critical for women to gain the connections they need to succeed and remain in the field. This thesis evaluates various features of CONNECT (Creating Open Networks aNd Expanding Connections with Technology), a system designed to support networking activities at conferences, to assess their effect on assisting women with networking. Results from pre/post surveys as well as usage logging demonstrate that technology can be used to effectively increase women’s knowledge and confidence in professional networking. Results also showed that, while graduate student women tend to have an understanding of the importance of networking, many of them do not know how to network effectively. These women were able to use CONNECT effectively to develop relevant connections and establish appropriate communities, in addition to increasing their confidence and knowledge of how to network.
# TABLE OF CONTENTS

ABSTRACT ................................................................................................................................. iii

LIST OF FIGURES ...................................................................................................................... vii

LIST OF TABLES ......................................................................................................................... xi

ACKNOWLEDGEMENTS .............................................................................................................. xiii

CHAPTER 1 INTRODUCTION ....................................................................................................... 1
  1.1 The Shrinking Pipeline ........................................................................................................ 1
  1.2 The Importance of Networking ......................................................................................... 2
  1.3 Research Questions .......................................................................................................... 3

CHAPTER 2 LITERATURE REVIEW ........................................................................................... 4
  2.1 Networking Differences between Men and Women ....................................................... 4
  2.2 Building a Social Network that Facilitates Networking .............................................. 5
    2.2.1 Encouraging Participation with Social Learning .................................................. 5
    2.2.2 Recommendations and Peer Discovery .................................................................. 6
  2.3 Building and Sustaining Meaningful Connections ....................................................... 6
  2.4 The Effect of Social Network Visualization on Awareness and Usage ..................... 7
  2.5 The Effect of Visual Feedback on Attaining Goals ...................................................... 8
  2.6 Privacy in Social Network Sites .................................................................................... 9

CHAPTER 3 CONNECT HISTORY ............................................................................................... 10
  3.1 Barcode Scanning ........................................................................................................... 10
  3.2 Connections .................................................................................................................... 12
  3.3 Networking Survey ......................................................................................................... 14
  3.4 Primitive Schedule and Messaging .............................................................................. 14

CHAPTER 4 APPROACH ............................................................................................................. 16
  4.1 The Importance of Establishing Meaningful Connections ......................................... 16
  4.2 Features of CONNECT ................................................................................................... 16
    4.2.1 Modifiable Profile ................................................................................................. 17
    4.2.2 Searchable User Profile Index ............................................................................ 18
    4.2.3 Messaging System ............................................................................................... 19
    4.2.4 Suggested People to Meet .................................................................................. 20
**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Percentage of undergrad degrees awarded to women in different science/engineering fields</td>
<td>2</td>
</tr>
<tr>
<td>4.1</td>
<td>Modifiable CONNECT Profile</td>
<td>17</td>
</tr>
<tr>
<td>4.2</td>
<td>Search Tool with various search filters</td>
<td>18</td>
</tr>
<tr>
<td>4.3</td>
<td>A user's profile with contact options and highlighted common interests for user displayed in Figure 4.1</td>
<td>19</td>
</tr>
<tr>
<td>4.4</td>
<td>Inbox with messages grouped by conversation</td>
<td>20</td>
</tr>
<tr>
<td>4.5</td>
<td>Messaging Tool with full record of conversation with other user</td>
<td>20</td>
</tr>
<tr>
<td>4.6</td>
<td>“Suggested people to meet” and “people I met” lists</td>
<td>21</td>
</tr>
<tr>
<td>4.7</td>
<td>Goal in &quot;Started&quot; stage with tips on how to prepare for the goal</td>
<td>25</td>
</tr>
<tr>
<td>4.8</td>
<td>Goal in &quot;Prepared&quot; stage with tips on how to complete the goal</td>
<td>26</td>
</tr>
<tr>
<td>4.9</td>
<td>Goal in &quot;Completed&quot; stage encouraging user to complete more goals</td>
<td>26</td>
</tr>
<tr>
<td>4.10</td>
<td>Goals page with progress bar feedback and humorous encouraging remark</td>
<td>27</td>
</tr>
<tr>
<td>4.11</td>
<td>Goals page with completed goal and extended progress bar</td>
<td>27</td>
</tr>
<tr>
<td>4.12</td>
<td>Community Tool with interests (user's interests shown as stars)</td>
<td>28</td>
</tr>
<tr>
<td>4.13</td>
<td>Community Tool displaying user's connections</td>
<td>29</td>
</tr>
<tr>
<td>4.14</td>
<td>List of users shown in Community Tool graph</td>
<td>29</td>
</tr>
<tr>
<td>4.15</td>
<td>List of users in same interest area who are not shown in Community Tool graph</td>
<td>30</td>
</tr>
<tr>
<td>4.16</td>
<td>Community Tool displaying other user's connections</td>
<td>30</td>
</tr>
<tr>
<td>4.17</td>
<td>Schedule Tool including session details and option to specify attendance</td>
<td>31</td>
</tr>
<tr>
<td>4.18</td>
<td>My Schedule showing events current user has marked as “attending”</td>
<td>32</td>
</tr>
<tr>
<td>4.19</td>
<td>Attendees list displaying the users attending a specific event</td>
<td>32</td>
</tr>
<tr>
<td>4.20</td>
<td>Creation of a meal event using the Restaurant Tool</td>
<td>33</td>
</tr>
</tbody>
</table>
Figure 4.21  Search meal events with various search filters .........................................................33
Figure 6.1  SIGCSE 2013 attendees' general usage of CONNECT ..............................................46
Figure 6.2  Genders of users registered in CONNECT for SIGCSE 2013 ..............................46
Figure 6.3  Gender comparison of profile usage at SIGCSE 2013 ............................................47
Figure 6.4  "Has Met" social network for SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles) .................................................................49
Figure 6.5  "Has Met" social network for SIGCSE 2013 with cut-points highlighted in green .................................................................50
Figure 6.6  Percentage of Connection Status updates with similarities between the connecting user and the receiving user .................................................................51
Figure 6.7  "Wants to Meet" social network at SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles) .................................................................52
Figure 6.8  Usefulness of Search Tool at SIGCSE 2013 .................................................................53
Figure 6.9  Number of users searching with various search criteria ........................................53
Figure 6.10 Number of connections made as a result of using the Search Tool ...............54
Figure 6.11 Usefulness of the Messaging Tool at SIGCSE 2013 .................................................54
Figure 6.12 "Messaging" social network at SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles) .................................................................56
Figure 6.13 Percentage of messages sent with similarities between the two users ..........57
Figure 6.14 Usefulness of Schedule Tool at SIGCSE 2013 ..........................................................57
Figure 6.15 Usage of Schedule Tool by users who logged into CONNECT .........................58
Figure 6.16 Usefulness of Restaurant Tool at SIGCSE 2013 .......................................................58
Figure 6.17 Usage of Restaurant Tool by users who used the tool ........................................59
Figure 6.18 Overall satisfaction with CONNECT at SIGCSE 2013 ........................................59
Figure 6.19 Profile usage by attendees at Grad Cohort 2012 .......................................................62
Figure 6.20 Number of people met due to the Search Tool at Grad Cohort 2012 .............63
Figure 6.21 "Messaging" social network at Grad Cohort 2012 .................................................64
Figure 6.22 Overall satisfaction with CONNECT at Grad Cohort 2012 ..........................................................65
Figure 6.23 General CONNECT usage at Grad Cohort 2013 ........................................................................67
Figure 6.24 Pre/post survey results comparison for "It is hard for me to introduce myself to people at conferences" .........................................................................................................................68
Figure 6.25 Pre/post survey results comparison for "I feel confident that I can network effectively" ..........................................................................................................................................................68
Figure 6.26 Pre/post survey results comparison for "It is important for my future career goals to have good networking skills" ..............................................................................................................................................69
Figure 6.27 Pre/post survey results comparison for "It is important to me to make connections at conferences" ..................................................................................................................................................69
Figure 6.28 Pre/post survey results comparison for "It is important to me to meet other people with the same CS interest areas at conferences" .........................................................................................70
Figure 6.29 Pre/post survey results comparison for "I don’t really know how to make connections at conferences" ........................................................................................................................................70
Figure 6.30 Pre/post survey results comparison for "I like using technology to help me meet people at conferences" ..................................................................................................................................................71
Figure 6.31 Pre survey results for "I feel isolated when I attend conferences" .....................................................72
Figure 6.32 Post survey results for "Using the CONNECT system helped me understand the value of networking" ...............................................................................................................................................73
Figure 6.33 Post survey results for "Using the CONNECT system increased my knowledge of how to network" .....................................................................................................................................................73
Figure 6.34 Post survey results for "I felt comfortable using CONNECT to network with other conference attendees" ........................................................................................................................................74
Figure 6.35 Profile usage by users of CONNECT at Grad Cohort 2013 ..............................................................75
Figure 6.36 "Has Met" social network for Grad Cohort 2013 .................................................................................76
Figure 6.37 "Has Met" social network for Grad Cohort 2013; cut-points would be highlighted in green but no cut-points exist ......................................................................................................................77
Figure 6.38 Percentage of Connection Status updates with similarities between user who is connecting and user who is receiving connection ........................................................................................78
Figure 6.39 "Wants to Meet" social network for Grad Cohort 2013 .................................................................79
Figure 6.40  Usefulness of Goals Tool at Grad Cohort 2013 .......................................................... 80
Figure 6.41  Usefulness of Community Tool at Grad Cohort 2013.................................................. 81
Figure 6.42  Usage of Community Tool by users who used the tool .............................................. 81
Figure 6.43  Usefulness of Search Tool at Grad Cohort 2013 ............................................................. 82
Figure 6.44  Number of users performing searches with various search criteria ...................... 82
Figure 6.45  Usefulness of the Messaging Tool at Grad Cohort 2013 ............................................. 83
Figure 6.46  "Messaging" social network at Grad Cohort 2013 ......................................................... 84
Figure 6.47  Percentage of messages sent with similarities between the two users ........ 85
Figure 6.48  Overall satisfaction with CONNECT at Grad Cohort 2013 ........................................ 86
## LIST OF TABLES

| Table 4.1 | List of goals defined for Grad Cohort 2013 ..........................................................24 |
| Table 4.2 | List of default goal sets each user was randomly assigned........................................24 |
| Table 5.1 | List of survey questions distributed after the SIGCSE 2013 conference ........37 |
| Table 5.2 | List of survey questions distributed after the Grad Cohort 2012 workshop.....38 |
| Table 5.3 | List of survey questions distributed for the Grad Cohort 2013 workshop.......39 |
| Table 6.1 | Profile usage statistics by gender with statistical significance test results ......47 |
| Table 6.2 | "Has Met" statistics by gender at SIGCSE 2013 .........................................................48 |
| Table 6.3 | Number of "Has Met" connections made by each gender at SIGCSE 2013 ...48 |
| Table 6.4 | "Has Met" social network statistics for SIGCSE 2013 ..............................................50 |
| Table 6.5 | "Wants to Meet" social network statistics for SIGCSE 2013.................................52 |
| Table 6.6 | Messaging statistics by gender at SIGCSE 2013.......................................................55 |
| Table 6.7 | "Messaging" social network statistics at SIGCSE 2013.................................56 |
| Table 6.8 | Categorized survey results for "Please give one example of how CONNECT helped you network" .................................................60 |
| Table 6.9 | Categorized survey results for "Please provide any other feedback you have on CONNECT" .........................................................61 |
| Table 6.10 | "Wants to Meet" social network statistics for Grad Cohort 2012...............64 |
| Table 6.11 | Categorized survey results for "Please tell us why you didn't update your profile in the CONNECT system" ..........................................................65 |
| Table 6.12 | Categorized survey results for "If you used CONNECT, please give one example of how CONNECT helped you network with other attendees" ........66 |
| Table 6.13 | Categorized survey results for "Please provide any other feedback on CONNECT" ..........................................................66 |
| Table 6.14 | Statistical comparison of pre/post survey result means with statistical significance..............................................................72 |
| Table 6.15 | Statistical comparison of "Agrees" and "Disagrees" for CONNECT related networking questions with statistical significance | 74 |
| Table 6.16 | "Has Met" usage statistics for Grad Cohort 2013 | 75 |
| Table 6.17 | Number of connections made by users at Grad Cohort 2013 | 76 |
| Table 6.18 | "Has Met" social network statistics for Grad Cohort 2013 | 77 |
| Table 6.19 | "Wants to Meet" social network statistics for Grad Cohort 2013 | 79 |
| Table 6.20 | Message Tool usage statistics for Grad Cohort 2013 | 83 |
| Table 6.21 | "Messaging" social network statistics for Grad Cohort 2013 | 84 |
| Table 6.22 | Categorized survey results for "Please give one example of how CONNECT helped you network" | 86 |
ACKNOWLEDGEMENTS

I would like to thank Cyndi, my advisor, for her guidance throughout this research, her willingness and flexibility to critique my late hour revisions, and her patience with me in general. I would like to thank Tracy, my co-advisor, for her insightful questions about my research, her additional patience in the revision process, as well as her time for sending my resume to several business contacts. I would also like to thank the additional members on my committee, Dr. Lasich and Dr. Dave, for their additional input and perspectives on my research. I would also like to thank my co-workers, Caitlyn, Andrew, Peter, Jon, and Mykala for being an awesome group to work with as well as for their feedback on the features I was implementing. I’d like to thank the extra work of Jon for identifying the genders of users at the SIGCSE 2013 conference, as well as Mykala, Caitlyn, and Cyndi, for adding, critiquing, and polishing the tips used for the Goals Tool. This thesis was supported by the National Science Foundation (under #CNS-0940632). Any opinions, findings and conclusions, or recommendations expressed in this material do not necessarily reflect those of the National Science Foundation. Finally, and most importantly, I would like to thank my wife for putting up with the late nights, for keeping me under control during mini-disasters, and for forcing me to take breaks when she knew I needed it.
CHAPTER 1
INTRODUCTION

Networking has been recognized as one of the most important parts of building a career [1]. However, students at the college level often have little to no experience with professional networking. Due to this lack of experience, students may often find themselves isolated at conferences and may be dissuaded from participating or meeting new people. In addition to this, women represent a significantly smaller fraction of the population in computer and information science. This lack of representation only adds to the feeling of isolation and has motivated the creation of several conferences to stimulate and encourage the participation of women in computer science [1].

These conferences, including the Grace Hopper Celebration for Women in Computing, the Richard Tapia Celebration of Diversity in Computing, the CRA-W Graduate Cohort Workshop, and many regional celebrations, are all focused on eliminating the common barriers women have when entering the field of computer science. In addition, the conferences address the issue of retention in the field by providing a supportive community. A primary goal of these conferences is to recruit undergraduate and master’s students into advanced degrees. Effective networking is an important component of reaching this goal.

This thesis intends to explore the effect of a social website on the networking skills of women, as well as their attitudes toward networking with their peers. The CONNECT (Creating Open Networks aNd Expanding Connections with Technology) system has been deployed at a number of conferences to encourage networking and build a supportive community. The goal of this thesis is to evaluate the design of the CONNECT system to determine its impact on users' understanding of the importance of networking, knowledge of how to network, and overall confidence in their networking skills. In addition, this thesis compares the usage of the CONNECT system between professional men and professional women, and between professional women and graduate student women.

1.1 The Shrinking Pipeline

Based on the U.S. Census Bureau reports from 2011, the percentage of women in the U.S. is 50.8% [2]. However, only a small percentage of women earn degrees in the field of computer and information science. A lack of role models, a lack of mentoring, a lack of feeling like one belongs, and a lack of a supportive community have all been proposed as barriers to participation in computing [3]. These obstacles have caused a rather disturbing trend in the
demographic of the computer science field. With the demand for computing jobs increasing rapidly, the workforce needed to sustain and fill those jobs needs to be increasing at a similar rate. Since such a small percentage of women are participating in computer science, the field is missing a large potential source of labor.

As shown in Figure 1.1, the percentage of undergraduate degrees awarded to women in computing has been decreasing since the mid 1980’s, even though (1) other science and engineering fields have seen increases in the ratio of women earning degrees in their programs and (2) the percentage of undergraduate degrees being awarded to women in all fields continues to increase [4].

Figure 1.1 - Percentage of undergrad degrees awarded to women in different science/engineering fields

1.2 The Importance of Networking

Networking has been recognized as one of the primary contributing factors to establishing a successful career. In addition, networking is a significant part of conferences to give attendees (especially student attendees) the opportunity to connect with people similar to them and/or working in their areas of interest [3]. There are countless sites that describe networking tips which help to mitigate many of the common preconceptions about networking. But, networking continues to be a difficult skill to develop for many students. Many have
described the networking process as “fake” implying the person has difficulty feeling genuine when they know their ulterior motive is to try and get something from the person they are talking to.

In addition, those who have difficulty meeting new people in general have even greater barriers to overcome when attempting to network. According to Bernardo Carducci, director of the Shyness Research Institute at Indiana University, about 40% of all adults say they are shy [5] [6]. Shyness often keeps people from meeting new people, interacting in small groups, and initiating conversations. Simply put, without additional support, shy people typically won’t benefit from merely getting together with other people at conferences, event if those people have similar interests.

An understanding of the importance of networking can lead to a sense of anxiety when people recognize their networking skills are not as good as they would like them to be. This anxiety, in turn, leads many to approach networking with a negative perspective rather than seeing it as a positive opportunity to exchange information and skills. One of the goals of this thesis is to not only establish the importance of networking for women students, but to also create a more positive outlook with regards to networking.

1.3 Research Questions

This thesis aims to evaluate different techniques to eliminate and mitigate the barriers inherent in networking for women students. Specifically, this research explores the questions of whether we can leverage technology to:

- Assist a female conference attendee’s ability to make relevant personal connections at a conference?
- Assist female conference attendees with forming appropriate communities?

Desired outcomes are that these women:

- Increase their knowledge of how to network effectively,
- Gain confidence in their networking abilities, and
- Apply the networking skills they have acquired to actively make connections and exchange information.
CHAPTER 2
LITERATURE REVIEW

Ample research has been performed on the different ways in which men and women network. This research ranges from looking at the nonverbal communication differences between men and women to the differences in the approach to networking that men and women take. In addition, several articles have been written on the subjects of the differences between men and women in networking, the design of a platform that encourages social interaction, the methods for establishing meaningful, lasting relationships, the effect of visualizations on both goals and networking activity, and the privacy concerns inherent in social networks. This section covers previous research that has been done involving these subjects.

2.1 Networking Differences between Men and Women

Research has been performed analyzing the differences between how men and women network. Data gathered from about 12,000 online surveys have shown that men and women both desire the same outcomes when networking and both genders recognize the value and importance of networking [7]. However, the research also showed that the ways in which women and men approach networking is different. Women tend to use the “relational” approach when networking. This approach involves building relationships and getting to know people before focusing on the business aspect of networking [7]. Men, on the other hand, tend to use a “transactional” approach when networking. This approach involves men being very direct with those they network with, trying to highlight their own strengths while attempting to get something out of the connection [7].

Neither approach is necessarily right or wrong, as the research showed that there were specific advantages with both approaches. The men in the study tended to have a higher number of contacts in higher positions, and this often resulted in attaining a highly sought after position within a company. Women, on the other hand, were shown to have a smaller network compared to men, but they tended to have a much more personal relationship with the connections they made than the men. These women also tended to benefit more than men from referrals from their connections, in that the number of referrals per time spent networking for women was higher than for men [7].

This research demonstrates that it is more important to women to establish meaningful connections while networking than it is for men. Features of a social website targeted at helping women network more effectively must take this into account. Establishing relationships that are
long-term or that focus on collaboration of similar interests are some examples of networking that would be especially meaningful to women.

This difference in networking does not only affect women when networking; the desire for personal connections also carries over into the professional business world as women attempt to move up the corporate ladder. Research has examined the gender barriers of women striving for a higher position at their corporate office. Related specifically to networking, it was found that, while these women have a greater number of formal and informal networks compared to women in the past, they have been less successful at utilizing the full potential of those networks [8]. Women tend to rely on networks for social support while men use the networks to further their career growth. In addition, while these women’s participation in networking has increased over time, they are still not present in key networks, or networks that would further their career [8]. This continual lack of participation in key networks demonstrates how critical it is for women early in their professional career to understand how to network effectively.

2.2 Building a Social Network that Facilitates Networking

One of the primary challenges of a social network system is to encourage its users to be active within the network. On sites such as Facebook and Twitter, this involves users creating content. This content is then consumed by other users (e.g. reading posts, viewing pictures, etc.). In a professional setting, being active within the network typically involves users interacting with each other via email, texting, phone calls, or talking in person. There are several methods to encourage this type of activity in a social network system.

2.2.1 Encouraging Participation with Social Learning

Research has shown that, in many social networks, the contribution of users to the network depends largely on the contribution of those they are connected with [9]. Social learning theory [10] suggests people learn by observation in social situations, and they will begin to act like people they observe even without external incentives. As users see their friends post content, they in turn are more likely to post their own content. This research focused on a cohort of new users on Facebook over a two-week period of time. The results from the research revealed that users who were exposed to twice as many photo-upload stories as other users increased their own photo sharing by 2.2%. This outcome can be applied to the professional networking system in a similar way. If users are given the opportunity to see how people they know are making connections, it follows that they would be encouraged to network as well (potentially with the same people their contacts had already networked with).
2.2.2 Recommendations and Peer Discovery

One of the key components in networking successfully is identifying the most beneficial people to meet. Traditionally, applications like Facebook will use high numbers of connections to determine people you might already know but have not registered as a friend or contact. While this can be useful for ensuring a complete and accurate social network graph, it is less useful for those attempting to discover new people to meet.

One research study showed it was more effective to use areas of expertise or interest as a basis for recommending new connections [11]. Participants in this research appreciated the recommendations and explained their value through different examples, such as learning from the experience of other individuals in their field; becoming aware of others with similar expertise, projects, or roles, in another location or division; or locating a new “bridge” to a department or community they do not have contact with [11]. In addition, since those who are networking primarily want to focus on meeting new people, the familiarity network must be subtracted from the similarity network in order to create a recommendation the user could seriously consider.

When building a social website, it is important to recognize many of the different opportunities to allow users to discover new people. For example, the site could have recommendations based on interests, or there could be an opportunity to identify a group that a member is a part of that would allow for recommendations within that group. Care needs to be taken to avoid overlooking an important aspect of how someone could discover new people.

2.3 Building and Sustaining Meaningful Connections

One challenge students often have while networking is creating meaningful connections with their peers, faculty, or companies. One of the most common methods of addressing this problem is to focus on establishing more long-term relationships such as mentorships. Mentorships provide not only a connection to someone in the industry, but also someone the student can get advice from on a variety of subjects. Research has shown many people are willing to mentor, as they find it satisfying to advise others [12]. In addition, mentoring has shown to be a very important factor in retaining women in the computer science field [3].

Determining whether a connection between two people is meaningful is often a difficult task for a social network system. Care has to be taken to analyze and filter the type of relationship that exists between two people. If a user’s social links are the only measure of connectivity, the result is an inaccurate description of a person’s social network, because it assumes each connection is equally meaningful when, in fact, this is not the case. Research has shown that using interaction activity as the basis for assessing a connection creates a much
more accurate representation of meaningful peer connectivity on a user’s social network [13]. For example, rather than simply looking to see if person A is “friends” with person B, it is more useful to look at the number of private messages sent between person A and person B, whether there are any comments made by person A on person B’s content (or vice versa), and whether person A and person B are involved in similar groups.

2.4 The Effect of Social Network Visualization on Awareness and Usage

When one participates in a social network at conferences, it is often difficult to recognize opportunities to meet a valuable contact. Many times, this is simply because people do not know who is at the conference, or people are not aware of the connections they have to others through their own first-hand connections (weak connections). In order to increase communication and collaboration opportunities, members of a community must be aware of the social networks that exist within that community.

Research has described a social network monitoring system that enables users to register their interactions and visualize their social networks. The research showed that the visualization of the social networks, given as feedback to the users, appeared to have a positive impact on the group, augmenting their social network awareness [14].

Results from this research also indicated that, while users did respond positively to the visualization of their participation in the social network, some of the visualizations used were too complex for users to effectively understand the data. The research hypothesized this difficulty may have led to some negative side effects in the reflection and interpretation process. The authors recommended that attention be given to the complexity of information displayed to users so they are not overwhelmed with meaningless data [14].

The research also showed participants acknowledged an improvement in their awareness of the social networks in their community after using the tool. In addition, 57% of users considered their motivation to interact and help others had improved after using the system [14]. This result is highly encouraging, and shows people are motivated to contribute when they can easily see what they are contributing to. Without the visualization tool, it would have been difficult for many people to recognize where they could have continued to network. It should also be noted that, prior to using the system, the users were asked about their satisfaction with the level of communication and collaboration within the community. Overall, users longed for more interaction, justifying the use of the visualization tool [14].
2.5 The Effect of Visual Feedback on Attaining Goals

Setting networking goals has been a highly recommended practice by many [15] [16]. However, people often struggle to come up with quantifiable or attainable goals, resulting in the goals ultimately remaining unaccomplished. In order to encourage people to meet their goals, research has delved into analyzing the effect of visual feedback on the effort individuals put forth in accomplishing their goals.

A research endeavor was conducted that used five cases to evaluate the influence of visual goals on goal performance. The research involved comparing different aspects of visualizations such as “easy to visualize” (e.g., viewing data in charts and progress bars) and “hard to visualize” (e.g., viewing data in numbers or abstract metrics) [17]. The authors propose goal proximity increases effort because when the goal is near, a fixed increment of progress covers a greater proportion of the remaining distance than when the goal is farther away [17]. In addition, prior research suggests external representations (visualizations) can help reduce working memory, allowing individuals to focus more attention on the problem itself [18].

The results of the research showed that, while “hard to visualize” visualizations had little to no effect on the effort individuals put towards goals, the “easy to visualize” methods actually produced a greater sustained effort. However, this greater effort only evidenced itself when the user was closer to completing the goal [17]. As a result, attention needs to be given to the length or overall effort of goals such that individuals never feel “too far away” from the goal to accomplish it.

This research also analyzed the effect of splitting a goal into sub-goals. The study consisted of two groups of users who had to complete 20 tasks. The first set had all 20 visible (in a progress bar) and the other set had 5 visible at a time (the progress bar is full after 5 tasks are complete, and then it resets to 0). The results, surprisingly, showed individuals who were able to see the full 20 tasks were able to complete them faster than the individuals who had the tasks split into 4 groups [17]. This outcome demonstrates an important factor that the effect of visualization on goal performance is significant for consolidated goals, but not for sub-goals.

With this research in mind, a social website should put a large amount of emphasis on making it easy for users to have goals. In addition, the progress marked on the goals should be easy to understand, and should make users feel as if the final objective is reasonably attainable. Great care must be taken in design of visual feedback features so that users are not discouraged from accomplishing their goals.
2.6 Privacy in Social Network Sites

A major paradox with constructing a social network site is the issue of privacy within the network. From the social network’s perspective, it is best to have all information be public so the most data can be gathered from the network. However, from a user’s perspective, it is important to be able to manage the privacy of certain user attributes so a user is always in control of who sees his/her content. Research performed on one of the most common social network sites, Facebook, has shown that, while users understand the importance of privacy, there is still a disconnect between how public users expect their content to be versus how public their content actually is [19].

The study showed the default privacy setting for content (visible to everyone) only matched the users’ expectation for the default setting 20% of the time. In other words, 80% of the users indicated that “visible to everyone” was not the default setting they expected their content to have. In addition, the study showed the modified privacy settings only matched users’ expectations 40% of the time. This outcome implies that there was a gap in the users’ understanding of what certain privacy options did or did not do [19]. This research emphasizes the importance of ensuring the clarity of privacy options, as well as their ease of access. In addition, appropriate default privacy options need to be carefully considered to protect users from unwanted solicitation, while also still maintaining the “public” aspect of a social network.

Additional research has shown that, while users of a social network site will often say privacy is important to them, they will still continue to reveal a large amount of information (even if the privacy settings are easily managed). The research showed that the level of concern for privacy is slightly above neutral, indicating that users may not immediately consider privacy implications, or they simply may not care [20]. That being said, another study showed that young adults had a high tendency to manage their profile settings on Facebook, and also had high confidence in adjusting these settings [21].

Maintaining the balance between openness of the social network while also allowing users their privacy proves to be especially difficult in a research setting, due to the fact that the quality of the research results relies on the openness of the social network. This balance is important to take into consideration in order to ensure high quality results while also respecting users’ privacy.
CHAPTER 3
CONNECT HISTORY

The CONNECT system is a social networking platform targeted at creating connections between people attending CS-related conferences. Proposed objectives of CONNECT include [3]:

1. Educate users and increase the awareness of the power of networking to career/life.
2. Provide information on how to network at a conference and encourage attendees to think about the types of connections they want to make at the conference.
3. Help attendees set networking goals before a conference and encourage attendees to reach their networking goals while at a conference.
4. Motivate attendees to make relevant and meaningful connections at the conference through matching people with similar interests.

The CONNECT system has gone through several iterations of design in an attempt to accomplish these objectives and has been deployed at a number of conferences with varied results. Throughout these conferences, the design and implementation of CONNECT has changed substantially based on feedback and recommendations of attendees, in addition to analysis of the resulting influence on networking between attendees. This section covers a brief history of CONNECT, indicating what features were determined successful and what issues were encountered.

3.1 Barcode Scanning

For the initial deployments of CONNECT, attendees were given the option to participate in CONNECT as part of the registration process. Attendees who chose to participate were asked several questions related to their networking goals, including their role (e.g., Ph.D. student, Professor, etc.), roles of people they hoped to meet, and interest areas within computer science (e.g., Algorithms). The responses were used to set networking goals for each attendee [3].

CONNECT participants were assigned a user ID which was displayed as a bar code on his/her conference badge. When two (or more) attendees wanted to document a connection made, they signaled for a CONNECT SCANNER to scan their badges. At any given time, student volunteers were roaming the conference area with bar code scanners and wearing
shirts saying “I'M A CONNECT SCANNER.” The volunteer would scan the attendees’ badges, and a “connection” was logged that included the time stamp for the connection. In addition, attendees’ badges had colored ribbons attached to them with the intention of making it easy for others to identify their role in the conference. For example, a student might have a blue ribbon labeled “PhD” while a faculty member would have a yellow ribbon labeled “Faculty”.

At the end of each day, attendees received motivation emails that listed the attendee’s initial goals and the goals the attendee had satisfied at the conference thus far. The emails also indicated the type of people the attendee should try to meet the next day in order to continue reaching his/her professional networking goals. In addition, tips for addressing the difficulties of networking were sent to attendees. These tips gave specific suggestions for networking and provided links to other webpages for more information. At the end of the conference, each CONNECT participant received a formatted list of connections made during the conference including contact information for each connection.

In addition to the scanners, this version of CONNECT included a website that displayed all CONNECT participants. Contact information (e.g., email addresses) was not shared, but participants’ roles, interest areas, and a picture (if uploaded) were viewable. Since minimal personal information was displayed, the site was password protected by a single password that was used by all conference attendees.

This version of CONNECT was deployed at the Grace Hopper Celebration of Women in Computing (GHC) in 2008 and 2009 as well as the Special Interest Group on Computer Science Education (SIGCSE) 2010 conference. Overall, the reception and usage of the CONNECT system at GHC was a success, with 82% of surveyed attendees stating they used CONNECT for professional networking, 80% saying they were satisfied or very satisfied with the system, 78% indicating they would recommend CONNECT to others, and 71% stating they would use CONNECT again [1]. The majority of attendees (52%) indicated they met from 3 to 10 others based on their desired goals (roles or CS interest areas). However, there were a number of problems with this deployment that led in future iterations.

One of the major problems was the inability for people to find a CONNECT scanner when they needed one. With 66% of the users indicating that they could not find a scanner when needed at least once and 36% unable to find a scanner 3 or more times, it was apparent that the method of making connections needed to be more accessible. In addition, the colored ribbons used to identify roles at the conference were only effectively used by about half of the attendees to make a connection, with users suggesting alternatives such as considering more
general goals or identifying other attendees within their geographical region. This feedback implied that the way users identified others to connect with needed to be reevaluated.

One of the most useful features in this early implementation of CONNECT was the public display of users’ pictures on the site. Approximately 95% of the users who indicated that they had looked at pictures said that doing so was useful for making connections. That being said, only 45% of users uploaded a picture, and only 65% of users even looked at the pictures. This result demonstrated that there was an opportunity to expand on this feature, provided it was implemented in a much more accessible way.

The deployment of CONNECT at SIGCSE 2010 was less successful. Unlike the GHC conference, which is geared toward broadening participation in computing (especially female participation), the SIGCSE conference is geared toward professional educators. As such, the single password approach used for the participant website was not deemed adequate.

3.2 Connections

To address the issues with the lack of access to barcode scanners, as well as privacy concerns, the next iteration of the CONNECT system implemented a website where users could record “connections” that corresponded to the previously scanned connections. In this system, a user had to indicate a desire to connect, either via the website, an Android application, or an SMS text message. To ensure privacy, the second user in the “connection” had to confirm the connection on the CONNECT website before contact information was exchanged. In response to some of the suggestions from GHC, users could record a comment associated with a connection, to make it easier to remember the connection later.

This version of CONNECT included an editable profile and enhanced search options (e.g., by organization, research area, or role) and a primitive form of messaging. Specifically, a message could be sent with a connection request in order to give the connection some context, or to set up a meeting time and location with the other user.

In addition to the core features on the website, tutorial videos were put together to describe the usage of CONNECT on both the mobile and web platforms. Info cards were also given at the conferences to help users navigate the site and mobile apps. These info cards also explained how to use SMS text messages to make a connection request. Ribbons continued to be used to indicate peoples’ roles within the conference.

This version of the software was used at the Colorado Celebration of Women in Computing (CCWIC 2010) and Richard Tapia Celebration of Diversity in Computing (TAPIA 2011). A survey was sent to all CCWIC participants from the conference organizers, and 65
attendees responded. Of these, 72% participated in CONNECT, and about 35% indicated that CONNECT had helped them network, but a number of new issues were identified (e.g., it was difficult to remember to confirm connections, many users did not have Android or iPhone devices, and the SMS option was too difficult to use). At the Tapia celebration, 67% of attendees participated, and 72% were either satisfied or very satisfied. However, only 33 responses were gathered from this survey, and Tapia users also identified many of the same issues as at CCWIC.

A slightly updated version of CONNECT was also used at the Missouri, Iowa, Nebraska and Kansas Women in Computing conference (MINKWIC 2011), the Tri-State (Ohio, Indiana, Kentucky) Women in Computing conference (TRIWIC 2011), and the Kentucky Celebration of Women in Computing (KYWIC 2012). To address the issue with unconfirmed connections, a new Android “Scanner” app was added that enabled a CONNECT volunteer to use the SMS capability to quickly add a confirmed connection, similar to the way that bar code connections had worked. This feature proved not to be useful, as most conference attendees who were approached by the CONNECT volunteer declined making a connection (often because they were chatting with people they already knew). Since the availability of pictures was consistently noted as a positive aspect of the CONNECT system, the CONNECT team purchased a camera. Two CONNECT volunteers attended the TRIWIC conference, and attendees were encouraged to stop by the CONNECT table immediately after picking up their registration materials. Although no formal survey was done to evaluate CONNECT usage, informally the users appeared to appreciate the increased emphasis on pictures. The focus for CONNECT at this point changed from making “connections” (i.e., replacing business cards) to providing an online participant directory.

There were still some problems with this iteration of CONNECT. In reviewing the open-ended comments from CCWIC and Tapia, several comments received by users indicated that many had trouble seeing the advantage of CONNECT over a more common social networking site such as Facebook. In addition, when users were asked if they preferred CONNECT over using business cards, several comments indicated that business cards were more practical than logging into the CONNECT system to make a connection. This feedback indicated the need to move CONNECT away from the “point of connection” and more towards encouraging connections, offering advice on how to make connections, and creating opportunities to make connections. That being said, other users seemed to appreciate not having to organize and keep track of business cards while at the conference. This feedback indicates that perhaps
CONNECT could take the place of traditional business cards if the technology used at the “point of connection” was easier and faster to use.

3.3 Networking Survey

Given the issues with deployments at CCWIC, Tapia, and MINKWIC, it is reasonable to ask whether there is really a need for a system such as CONNECT and, if so, what features would be most effective. A survey was deployed at the TRIWIC 2011 and KYWIC 2012 conferences to answer these questions. Attendees at both conferences were primarily undergraduate women. The results of the survey indicate that there is a need for some type of networking support, with approximately 40% of surveyed users indicating that they find it difficult to introduce themselves to others at conferences, and 58% agreeing that they would like to make more connections at conferences, but they don’t really know how. Most did understand the value of networking, with 84% of surveyed users indicating that it is important to them to meet other people with the same interest areas in computer science. On top of that, 60% of the surveyed users indicated that they liked using technology to help them meet people at conferences. Features they thought would be useful included receiving networking tips via SMS, getting recommendations of people to meet, reviewing online profiles prior to the conference, and reviewing profiles with pictures after the conference. There was also some agreement that recording notes about people they met and playing a social networking game might have value. Students’ top goals for these conferences included job opportunities, finding a mentor, and meeting recruiters. Picking a research focus or getting help with research were less frequent goals. In addition, a number of the attendees had no real goals for the conference. These survey results demonstrate a significant desire to have a system like CONNECT that helps women conference attendees refine and achieve their networking goals.

3.4 Primitive Schedule and Messaging

The CONNECT team recognized that it would be beneficial to users to be able to send messages through the CONNECT site without giving out their personal contact information. This messaging system would allow users to make connections with each other, while also allowing them to keep their personal contact information private. A messaging system was implemented for the KYWIC 2012 conference, which allowed users to send messages to other attendees at the conference through the CONNECT site. However, this feature was used very little (13 messages sent by 9.09% of the participants) at this conference. Messaging in CONNECT was implemented again at Grad Cohort 2012 where it was used a bit more by users (82 messages sent by 11.23% of the participants). Several comments received about the messaging system
indicated it was difficult to use, and many messages sent were never delivered or users were unable to identify when they had a new message. This complaint was verified in the database and showed 91.46% of messages sent had no reply, which indicated a better interface was needed for messaging.

Even with the low implementation success rate of the messaging system for these conferences, the messaging system still received a large amount of positive feedback. Specifically, 90.48% of surveyed users indicated that being able to send messages to other conference attendees through CONNECT would be helpful in their networking endeavors.

A primitive schedule tool was also implemented for the KYWIC 2012 conference. Inspection of the CONNECT target audience (mainly conference attendees) indicated that it would be beneficial to give the users some way of keeping track of the conference’s events via the CONNECT system. This tool was implemented at the KYWIC 2012, Grad Cohort 2012, and RMCWIC 2012 conferences. The system consisted of a listing of the conference’s events for all three conferences; for RMCWIC 2012, functionality was also added to allow users to indicate whether they were attending an event or not. Due to the simplicity of the schedule at RMCWIC, this feature was not used much. Additional features added during this time included an optional Facebook link on a user’s profile, a sidebar listing that suggested people to meet, and refined email tips for networking effectively.
CHAPTER 4
APPROACH

The approach taken in this thesis to evaluate the previously mentioned research questions is to deploy the CONNECT system with a set of varying features that might encourage women to network more effectively. The features are then analyzed across different conferences for effectiveness in encouraging networking among individuals attending the conferences. In addition, an emphasis is placed on making meaningful connections rather than trivial indications of contact. The features that were implemented include modifiable profiles, a searchable index of users, a messaging system, a goals tool, a visual representation of the social network, email tips, a scheduling tool, and a group meal planning tool. This section gives an overview of these features and how they aim to accomplish the desired outcomes.

4.1 The Importance of Establishing Meaningful Connections

Before describing the features of CONNECT, it is important to define what is meant by a “meaningful connection.” One of the challenges many deal with while networking is ensuring the connections they make are meaningful. If contact information is exchanged but the connection is not pursued afterwards, a potential networking opportunity is lost.

A meaningful connection could be evidenced as a connection between two people that results in an exchange of ideas or information, a mentor-mentee relationship, an opportunity for an internship or career, a collaborative research opportunity, or an exchange of advice on some aspect of either individual’s professional life. Essentially, a meaningful connection is defined as a connection that occurs which has some beneficial impact for at least one of the individuals. If neither party experiences any benefit from the connection, then the connection is considered meaningless. Emphasizing quality of connections rather than quantity of connections is one challenge for developing technology-driven networking systems. It is difficult to quantify a meaningful connection due to the fact that so much depends on the actual interaction between two people, outside of the virtual networking system. Therefore, it is important that any system used to facilitate networking provides the means for easily creating and sustaining meaningful connections, even if these connections are outside of the system itself.

4.2 Features of CONNECT

This section describes the main features of CONNECT. The justification for the features is given based on prior research and feedback from previous iterations of CONNECT. Each feature is described in detail as well as the feature’s potential usefulness to users in networking.
4.2.1 Modifiable Profile

Information received from the conference registration file is used to initially set up each user’s profile with their name, email, location, and organization. We note that every user is given the option at any point to opt out of CONNECT if they do not wish to participate.

The login process takes users directly to the profile page, where they can customize their own information by uploading a photo, or marking their interest areas, roles, and objectives for the conference (Figure 4.1). The interest areas include items such as “Artificial Intelligence”, “Software Engineering”, and “High Performance Computing.” The roles include options such as “PhD Student”, “Teaching Faculty”, and “Researcher.” The objectives include items such as “Want to find a mentor”, “Looking to be a mentor”, and “Recruiting for education.” These interests, roles, and objectives are reevaluated for each conference, in order to appeal to the appropriate target audience.

![Figure 4.1 - Modifiable CONNECT Profile](image)

Users can also write a short paragraph about themselves and add a link to their Facebook page or personal web site. By giving users the option to share more information about themselves, it becomes easier for others attending the conference to recognize them or learn more about them. For example, someone who is looking for a mentor could see another person indicating they want to be a mentor. They might also notice the person has similar interest areas to them, and they would already know what the person looks like if the person had uploaded a photo.

As was mentioned, user privacy in a social network is important. For this reason, personal contact information, such as email, is made private by default. If the user chooses to share this information, he/she can easily change this option on the Profile page. There are also privacy options that are related to specific features of CONNECT. These options are covered with each corresponding feature.
4.2.2 Searchable User Profile Index

CONNECT offers a search page that allows users to browse through the entire listing of users or easily find others based on custom criteria (Figure 4.2). By using the Search Tool, users can create a custom search that filters the list of users to only display those with the specified criteria. Users can search by name (first or last), by location (country or state), by interest area(s), or by role(s). In addition, there are “quick search” options at the bottom of the interface that allow a user to view all attendees or people they have indicated they want to meet.

![Search Tool with various search filters](image)

If users have uploaded information about themselves, the Search Tool can provide a very effective method to discover new people. For example, there could be a student who is looking for more information about research in the field of artificial intelligence. He/she might consider asking a researcher, PhD student, or MS student questions about the field. By selecting the appropriate roles and interest area, the student can effectively obtain a list of the best people to ask about artificial intelligence. Taking advantage of the Search Tool may also enable the student to have more confidence approaching or contacting someone, since they already know about their shared interests. When viewing all attendees, the index of profiles also highlights (in bold) interest areas the logged in user has in common with other users (Figure 4.3).

To facilitate networking, a user can message another user, view that user's schedule (if it has been made visible), or switch the connection status from “Have Not Met” to either “Want to Meet” or “Have Met”. These options give the user the ability to keep a personal record of their networking contacts (new and old) at the conference. When a user marks another user as
having met them, a section on the side of the page labeled “People I Met” updates automatically. By providing an easy way to use these various features, it facilitates the networking process for the user.

4.2.3 Messaging System

As was described in the history of CONNECT, the messaging system was a feature highly desired by users. However, an unintuitive interface prevented many users from experiencing the full benefits of the messaging system. The messaging system was restructured, placing an emphasis on the ease of access for sending and receiving messages.

A user can see other users’ profiles on the search page. Once a user has identified a person whom they would like to meet, the user can click on the Message icon (Figure 4.3). Clicking the Message icon displays the other user’s profile and allows the user to send a short message to that user. CONNECT automatically sends a notification email to the other user indicating someone messaged them and directing them to their inbox (Figure 4.4) on the CONNECT site. There, the user can respond to the message.

The inbox groups all of the messages sent between two users into one section while showing the latest message that was sent in the conversation. It displays the picture of the other user, making it easier to identify the context of a conversation or to identify the person at the conference. The inbox also provides a link that allows the user to view the full conversation with the selected user (Figure 4.5). At this point, the user can respond to the original message and establish a potential meaningful connection.

By allowing users to message each other through the CONNECT system, it creates a safe environment to initiate a connection without encroaching on the privacy of any other users. Since networking should be a goal for all CONNECT users, and users registered in the
CONNECT system are expecting to network, the messaging system should provide a convenient way to network without feeling intimidated.

![Inbox](image1.png)

**Figure 4.4 - Inbox with messages grouped by conversation**

![Messaging Tool](image2.png)

**Figure 4.5 - Messaging Tool with full record of conversation with other user**

### 4.2.4 Suggested People to Meet

One of the challenges of networking is identifying the people that would be most beneficial to meet. CONNECT attempts to mitigate this barrier by providing a list of recommendations for people a user should meet. The recommendations are listed in a sidebar on several of the pages on the CONNECT site (Figure 4.6).
As was mentioned by Guy et al. [11], it is important to base recommendations not only based on the ties that a user might have, but on more meaningful attributes such as interests or matching objectives. The recommendations that are listed by CONNECT are determined by four criteria, where each criterion is ranked in the order:

1. Users A and B share at least one interest area (e.g., Algorithms), and one of A’s objectives (e.g., Find a mentor) maps to one of B’s objectives (e.g., Be a mentor).
2. A and B share at least one interest area.
3. A’s objective maps to B’s objective.
4. A’s country matches B’s country, but A’s organization is different from B’s organization.

More specific matches are preferred, so two people with an interest in algorithms such that one is looking for a mentor and the other is willing to be a mentor is a stronger match than just two people who are both interested in algorithms (criteria 2), or two people with matching objectives (criteria 3). In the absence of specific matches, the algorithm looks for other attendees who are in the same geographic region (a very loose criterion, whose purpose is to enable CONNECT to provide at least some random suggestions). The list of matching objectives used in CONNECT is as follows:
• “Looking for a mentor” matches “Willing to be a mentor” (and vice versa)
• “Looking for research experience” matches “Looking for research collaborators” (and vice versa)
• “Looking for research experience” matches “Willing to be a mentor” (and vice versa)
• “Want academic advice” matches “Willing to be a mentor” (and vice versa)
• “Want academic advice” matches “Recruiting for education” (and vice versa)
• “Want career advice” matches “Willing to be a mentor” (and vice versa)
• “Want career advice” matches “Recruiting for industry” (and vice versa)
• “Want career advice” matches “Recruiting for education” (and vice versa)
• “Looking for employment” matches “Recruiting for industry” (and vice versa)
• “Want to be part of a community” matches “Want to be part of a community”
• “Looking for research collaborators” matches “Looking for research collaborators”

For performance reasons, the algorithm stops evaluating criteria as soon as a predetermined number of suggestions are found.

These criteria attempt to generate relevant potential connections the user should consider pursuing. By eliminating the labor of discovering compatible users manually, the hope is users would be more receptive to meeting these recommended attendees. In addition, there is a high chance the suggested users are relevant to the user since they may have similar interests or their objectives match. This relevance may further encourage the user to establish the connection in the first place.

4.2.5 Email Tips and Reminders

Another challenge many have with networking is a lack of networking skill and general know-how. Previous implementations have used email tips catered specifically to each conference to help users network more effectively. Survey results from these conferences have indicated that users find these tips very useful when accomplishing their networking goals. This version of CONNECT attempts to assist users by sending emails that contain networking tips as well as reminders to update users’ information in their profile. The tips include specific advice about topics such as how to start a conversation, how to overcome shyness, and how to ask for what you need/want. The number and types of networking tips sent depends on the type and duration of the conference. For example, during SIGCSE 2013, tips were not utilized as heavily since the target population was more professional, but during Grad Cohort, networking tips were assumed to be more useful due to the large number of student attendees.
The desired outcome for these tips is that continual reminders, encouragement, and useful advice would allow attendees to feel more comfortable approaching new people. In doing so, it is hoped attendees will not only be able to network during the current conference, but that they would remember the skills and advice they learned and apply them to future professional networking endeavors.

In addition, the frequency of the emails was taken into consideration in order to avoid annoying users with too many emails or unnecessary information. Typically, the welcome email was sent a week before the conference. This email introduced users to the CONNECT system and encouraged them to log in and update their profile. A second email was then sent 2-3 days before the conference, encouraging users to log in, update their profile, upload a picture, and try out some of the features on CONNECT such as the Schedule Tool or Search Tool. A third email was sent the day before the conference, encouraging users to log in if they had not already, update their profile and picture, and try out other features of CONNECT before the conference. By using these three emails, the goal is to communicate the available features and usefulness of CONNECT to users while avoiding sending users too much unnecessary information. In addition to these emails, Grad Cohort 2013 also had a fourth email sent after the first day of the conference to encourage usage of CONNECT and networking in general.

4.2.6 Goals

One of the most commonly recommended practices to prepare for a networking event is to set goals. Since computing conferences may last only two or three days, it may be difficult to encourage people to set up their own networking goals. Furthermore, students may not have a good understanding of what networking goals are important. Thus, a set of predefined goals were developed. These goals are shown in Table 4.1. For the Grad Cohort 2013 workshop, it was considered reasonable for someone to meet or talk to at least five other people. Therefore, 5 predefined goals were given to users, and it was considered a “networking success” if someone accomplished all 5 of their networking goals (thereby networking with at least 5 people).

As determined by Huppke [7], women tend to focus on establishing more meaningful connections when networking than men. Keeping this in mind, many of the tips given for each type of goal put a strong emphasis on establishing a meaningful connection either through a shared passion, or through a long-term connection. In addition, one of the goals involved following up with someone the user met at the conference, reinforcing that meaningful connection.
Each user registered in CONNECT was assigned a set of goals to begin with. Four combinations of 5 goals were defined such that each set contained what was considered to be an even distribution of easy and hard goals, in addition to the goal “I want to follow up with someone I met after the conference.” This was done so that newcomers to the conference would not be overwhelmed by some of the more difficult goals, and previous attendees could focus on the goals more meaningful to them. The “follow up” goal was included in all of the sets to encourage the attendees to establish long-term connections. The default sets of goals are shown in Table 4.2.

<table>
<thead>
<tr>
<th>Default Goal Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 4, 6, 8, 10</td>
</tr>
<tr>
<td>2, 5, 7, 8, 10</td>
</tr>
<tr>
<td>3, 4, 6, 9, 10</td>
</tr>
<tr>
<td>1, 5, 7, 9, 10</td>
</tr>
</tbody>
</table>

If a user decides some of the predefined goals do not apply, or if they want to accomplish more than the predefined number of goals, the user has the capability of selecting other goals or creating additional goals. This feature allows users the flexibility of creating their own goals if they desire without putting too much burden on those that don’t have the time to set up their own goals.

Each of the goals has networking tips associated with it. To maximize the effectiveness for the target audience, the tips that are listed for each goal are written with the current conference in mind. These tips were gathered from a number of articles whose primary focus was providing guidance towards networking [15] [16] [22] [23] [24] [25] [26] [27] [28] [29] [30]
The goals feature has only been deployed at the Grad Cohort 2013 workshop thus far. All of the tips for preparing each of the goals are included in the Appendix A of this document.

Each goal has three separate stages with the image of a character that grows with each stage. These stages are “started”, “prepared”, and “completed”. Each stage can be described as follows:

1. **Started**
   
   The goal has been created and the character image is in its first “stage of development.” Tips are displayed to the user for how they might prepare for the specific type of goal they are trying to accomplish (Figure 4.7). For example, if the goal is to describe research to a peer, the preparation tips include information on how to hone your 30 second elevator speech. By giving the users explicit advice and instructions for preparing for their goal, the hope is they would feel more confident in accomplishing the networking goal. Once the user feels they are prepared, they are free to mark the “Prepare” section as completed, which moves the goal into its second “Prepared” stage.

![Figure 4.7 - Goal in "Started" stage with tips on how to prepare for the goal](image)

2. **Prepared**

   The user has indicated they feel prepared to accomplish the goal, and the character image is in its second “stage of development.” At this point, a new set of tips are shown to the user that give advice on how to complete the goal (Figure 4.8). Continuing with the previous example, the tips include advice on being ready to respond to anyone who asks about your research, and to ask the other person about their own research. By giving the users explicit advice and instructions for completing their goals, the hope is they would feel more confident in approaching the person they wish to network with. Each user then has the opportunity to accomplish the goal and check the “Finish the Goal” box, which moves the goal into its third “Completed” stage.
3. Completed

At this point, the goal is finished and the character image is in its final “stage of development.” The page then congratulates the user and directs the user back to the list of goals, encouraging the user to keep working to accomplish their other networking goals (Figure 4.9).

An incremental progress bar displays the user's progress in completing his/her goals (Figure 4.10). As suggested by Cheema et al. [17], users will make more effort to complete a goal when they see that they are close to completing it. As a user accomplishes his/her goals, the progress marker fills up, indicating to the user their “level of networking skill.” In addition, a humorous encouraging remark is given to the user as they complete more of their goals (e.g., “You are a charismatic clam!”, “You are an unprecedented umbrella!”). As the user completes each goal, the goal is moved to a “Completed” section on the goals page as a type of positive feedback for the user. In addition, the progress bar extends, displaying to the users their overall completion of their networking goals (Figure 4.11).
The completed icons for the goals can be displayed as “badges” on the individual users’ profiles on the search page. This feature could result in a social learning effect where people see others accomplishing goals, which then motivates them to accomplish goals for themselves. The badges can be made public or private via a setting on the Profile page. By default, the badges are made public in order to encourage social learning related to accomplishing networking goals.
4.2.7 Visual Representation of Social Network

As was described by Burke et al. [9], people will often increase their activity within a social network when they can see the results of their interactions with other people. To determine whether a visualization of the social network would encourage networking activity, a network visualization tool (the Community Tool) was added to CONNECT. Cadima et al. [14] also showed that the simplicity and relevance of the networking visualization is critical to ensure users are not overwhelmed or confused by the information. In order to achieve this level of simplicity, the Community Tool focuses only on displaying the social network of one user at a time. Displaying only a small section of the total social network should ensure the display is understandable, while still providing knowledge that allows users to be more aware of the social networks around them, and potentially identify the people with whom it would make sense to connect. In addition, a major premise for the Community Tool is that communities are based on interest areas. Basing communities on interest areas was shown by Wilson et al. [13] to be an effective and accurate description of the actual social network communities that exist.

When first viewing the Community Tool (Figure 4.12), the user sees a node representing each interest area. Interest areas selected by the current user are displayed as a star. The user can click on any interest area node. If the user belongs to that interest area, then a graph is displayed with that user as the center node (Figure 4.13). If an interest area node is clicked that the user is not within, the most connected user becomes the center node, indicating the person who would be most beneficial to know in that interest area.

![Community Tool with interests](image)

Figure 4.12 - Community Tool with interests (user’s interests shown as stars)
The graph depicts all of the center user's connections with differently styled edges. If the center user has indicated that they “have met” a certain user, the edge is green. If the center user has indicated that they “want to meet” a certain user, the edge is red. If the center user has sent a message to another user, then the edge is yellow. The nodes themselves show the user’s identification code. In addition, a list of the users shown in the graph is displayed beneath the graph (Figure 4.14). Beneath this list is another list showing the profiles of the remaining people also in the selected interest area (Figure 4.15). This feature allows easy access for the user to connect with someone who is in the selected interest area.
Other People Interested in Context-aware Systems

<table>
<thead>
<tr>
<th>Jon Waldow (JW02)</th>
<th>Mykala Miller (MM01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nebraska, Nebraska</td>
<td>Golden, PA, United States</td>
</tr>
</tbody>
</table>
| Organization: Connect | Organization: CS
g | Roles: (Not entered) | Roles: (Not entered) |
| Objectives: (Not entered) | Objectives: (Not entered) |
| ![Jon Waldow Card](image1) | ![Mykala Miller Card](image2) |

Figure 4.15 - List of users in same interest area who are not shown in Community Tool graph

If a user clicks on another node within the graph, the graph morphs such that the selected node is now in the center of the graph, with all connections to that particular user surrounding it (Figure 4.16). In this manner, a user can not only view his or her own connections, but also view the connections of people they have already connected with (people who are one connection away) within the same interest area. This feature effectively allows users to extend their network based on intermediary contacts.

Figure 4.16 - Community Tool displaying other user's connections

This in-between contact could be a gateway for conversation when initiating a new connection. Alternatively, a meeting could be set up (e.g., lunch or dinner) with all three party
members (the user desiring the connection, the in-between connection, and the one-away connection), which might encourage a more lighthearted and natural segue into the intended networking opportunity.

In addition to being able to click on the nodes themselves, an additional button is given to the user that allows them to see the network of the most connected person in that interest area. This button could assist the user if they are looking for the “best” person to connect with in an interest area. The person with the most connections would ideally be the person who knows the most people or has the most information passed through them in the network. By connecting with the most connected person, the user would then have “weak” access to all of that person’s connections. The Community Tool was first deployed at the Grad Cohort 2013 workshop.

4.2.8 Schedule

Typically at conferences, there is a list of events an attendee may attend. One of the problems attendees have is conveniently keeping track of the times and locations of the events they want to attend. The CONNECT system had a primitive Schedule Tool that simply listed the conference events, but there was no way for a user to indicate they were attending an event. The revised Schedule Tool (Figure 4.17) was implemented to accomplish a two-fold purpose. First, it allows users to mark which events they are attending in the conference event list. These events are then available to view on the “My Schedule Page” (Figure 4.18) where the location and time of day is shown with each event. This feature allows users to easily track when and where they are supposed to be.

![Figure 4.17 - Schedule Tool including session details and option to specify attendance](image-url)
The second purpose the Schedule Tool attempts to serve is to indicate to other users which events an attendee has chosen to attend. A user can choose to make his/her schedule public, which allows all CONNECT users to see which events that user is planning to attend. In addition, by making their schedule public, users’ profiles are also shown under the “Attendees” (Figure 4.19) page for specific events they are attending. This feature can lead other people who may be looking for a networking opportunity to attend the same event in order that they might meet the person. In addition, since both users are already attending the same event, it offers an easy way for the user looking to connect to start a natural conversation with the other user about the event. By using the Schedule Tool in this way, students may feel less intimidated about meeting someone since they already share a common interest (i.e., the subject of the event attended). The revised Schedule Tool was deployed at SIGCSE 2013 and the Grad Cohort 2013 workshop.
4.2.9 Group Meal Planning

Meals at conferences can provide valuable opportunities for attendees to network. To facilitate this type of networking, CONNECT has implemented a group meal planning tool, also known as the Restaurant Tool (Figure 4.20). The Restaurant Tool allows users to set up a meal event that they host for other users. A user can specify the date, the start time (which can be flexible), a description, the maximum group size, as well as the preferred food types.

Other users are then given the opportunity to search the list of hosted meal events. Events can be filtered by various criteria including date, time range, and preferred food type (Figure 4.21). Once users have found meal events that appeal to them, they can view the details and join the group. The details of the meal event display all of the members who are attending as well as a list of potential restaurants the host is considering. The details also include a short description of the restaurants including the relative price range.

![Create Meal Event](image)

**Figure 4.20 - Creation of a meal event using the Restaurant Tool**

![Search Meal Events](image)

**Figure 4.21 - Search meal events with various search filters**
The benefit of the Restaurant Tool lies in the fact that users can join meal events with people who have similar interests to them. Since the profiles of other users highlight similar interests, it becomes very easy for anyone to recognize a meal group where they would feel most comfortable networking. This feature was deployed at the SIGCSE 2013 conference.

4.2.10 Mobile Schedule and Goals Application

Attendees of a conference often find themselves in situations where it is impractical to access the full CONNECT website. While the site can be accessed via mobile devices, it is not optimized for mobile web interaction and, clearly, the CONNECT Schedule Tool is of little benefit if users cannot have easy access to it throughout the conference. To remedy this, the CONNECT system offers a mobile schedule application for Android devices that allows users to manage their schedule in a similar way to the website’s Schedule Tool.

After downloading and logging in to the CONNECT mobile application, users can browse the conference events, read event descriptions, and mark which events they are attending. Any actions they take on the mobile platform are immediately updated on the website, so their personal schedule is always consistent. This feature allows users to have their schedule on hand to easily see which events they are attending, when their next event is, and where the event is located. In addition, a map of the conference is available on the mobile platform so users can easily navigate to the appropriate location.

Similar to the mobile schedule, a mobile goals application was implemented to make it easier for users to keep track of their networking goals as they navigate the conference. Since many of the tips given by the goals consist of reminders on how to approach someone, it is useful to have this information in a mobile form. The mobile goals application behaves very similarly to the website’s Goals Tool. A user can view his/her goals, mark a goal as prepared or completed, and view his/her overall progress in accomplishing his/her networking goals. The goals part of this application was only deployed at the Grad Cohort 2013 workshop.
CHAPTER 5
METHODOLOGY

The methodology for evaluating the effectiveness of the various features in CONNECT includes the collection of data in two primary ways:

- Surveys taken by the participants before and/or after the conference and
- Logs collected by the CONNECT system that track specific behavior.

In addition, social network analysis is performed on the networks established by the users of CONNECT. This section outlines the target population, the collection methods for both the surveys and the logs, and the techniques that are used to analyze the social networks of the conference attendees who used CONNECT.

5.1 Target Population

The primary target population for this thesis is women students in the computer and information science fields who may not have an adequate understanding of the value of networking or who may not know how to effectively network. Due to the variety of conferences where CONNECT has been deployed, data has been gathered for a broader spectrum of people. While this limits the amount of variable control across different conferences, it is beneficial to examine the differences or similarities in behavior of different types of conference attendees. For example, networking that is done at a conference where students are the majority can be compared to networking done at a conference where professionals or faculty are the majority. By analyzing how these two groups compare and how they are influenced by the assistance of the same technology, insight may be gathered as to the effectiveness of the technology used. This thesis evaluates three comparisons of conference attendees:

- Professional women vs. professional men
- Professional women vs. graduate student women
- Graduate student women vs. graduate student women (from the same conference during different years)

The professional women vs. professional men comparison uses the data gathered from the SIGCSE 2013 conference. This comparison is used to evaluate the networking differences
between men and women. The professional women vs. graduate student women comparison uses the data gathered from the Graduate Cohort workshop (Grad Cohort 2013) and SIGCSE 2013. This comparison is used to evaluate the differences or similarities in networking habits between professional women and graduate student women. The graduate student women vs. graduate student women comparison uses the data gathered from Grad Cohort 2012 and Grad Cohort 2013. This comparison is used to evaluate different features deployed in the CONNECT system.

The SIGCSE conference is a conference that primarily focuses on education in computer science. Most of the attendees consist of professional men and women who present research, technology, and findings in the computer science education area. The purpose for analyzing this conference was to obtain a perspective on the networking habits of men compared to women. In addition, the analysis of this conference also allows the comparison of networking habits between the professional women at SIGCSE and graduate student women at the Grad Cohort workshops. By analyzing these different groups, the networking tendencies of women and especially graduate student women can be better understood.

The Graduate Cohort conference is organized by the Computer Research Association’s Committee on the Status of Women in Computing Research (CRA-W). The conference primarily focuses on increasing the number of women participating in computer science and engineering research, especially at the graduate level. In addition, the conference focuses on increasing the degree of success the women experience both in their school/research as well as in the future. The conference also aims to provide attendees access to mentoring resources as well as provide attendees with the opportunity to build relationships and peer networks that will help them throughout their careers. This conference contains a majority of attendees who are in the target audience for this research. Therefore, the data gathered from this conference most accurately reflect the networking characteristics of graduate student women when using a social web site such as CONNECT.

5.2 Surveys

In order to account for the non-observable behaviors and/or attitudes of users, surveys were used in conjunction with each conference to gather feedback from conference attendees. These surveys are used to help make the comparisons described previously.

5.2.1 SIGCSE 2013

The survey for the SIGCSE 2013 conference was sent to all conference attendees by the conference organizers. The survey included 9 questions related to CONNECT, two of which
were open response. Table 5.1 contains the list of questions. Of the 1303 attendees, 425 participated in the SIGCSE 2013 survey (response rate of 32.62%). Of these, 290 (68.24% of respondents) indicated they participated in CONNECT. The results from these 290 were used to analyze the CONNECT system. There is one caveat however. The survey was designed such that a series of questions were skipped if users indicated that they had not used the Search Tool. As a result, only 196 of the responses contained valuable data for several of the questions.

Table 5.1 - List of survey questions distributed after the SIGCSE 2013 conference

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you participate in CONNECT, the online participant directory?</td>
<td>-Yes</td>
</tr>
<tr>
<td></td>
<td>-No</td>
</tr>
<tr>
<td>How useful did you find CONNECT’s Search Tool?</td>
<td>-Very useful</td>
</tr>
<tr>
<td></td>
<td>-Somewhat useful</td>
</tr>
<tr>
<td></td>
<td>-Not useful</td>
</tr>
<tr>
<td></td>
<td>-Did not use Search Tool</td>
</tr>
<tr>
<td>How many people did you meet or contact due to CONNECT’s Search Tool?</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>-1-2</td>
</tr>
<tr>
<td></td>
<td>-3-4</td>
</tr>
<tr>
<td></td>
<td>-5 or more</td>
</tr>
<tr>
<td>Please indicate how useful you found each of the following CONNECT features:</td>
<td>-Very useful</td>
</tr>
<tr>
<td>-People You Should Meet suggestions</td>
<td>-Somewhat useful</td>
</tr>
<tr>
<td>-Messaging Tool</td>
<td>-Not useful</td>
</tr>
<tr>
<td>-Schedule/My Schedule Page</td>
<td>-N/A (Did not try this feature)</td>
</tr>
<tr>
<td>How useful was CONNECT’s Restaurant Tool?</td>
<td>-Very useful</td>
</tr>
<tr>
<td></td>
<td>-Somewhat useful</td>
</tr>
<tr>
<td></td>
<td>-Not useful</td>
</tr>
<tr>
<td></td>
<td>-Did not use Restaurant Tool</td>
</tr>
<tr>
<td>How did you use CONNECT’s Restaurant Tool? (Please check all that apply)</td>
<td>-Set up a group meal</td>
</tr>
<tr>
<td></td>
<td>-Joined a group meal with people who had the same interests</td>
</tr>
<tr>
<td></td>
<td>-Joined a group meal with the food style I liked</td>
</tr>
<tr>
<td></td>
<td>-Joined a group meal with someone I wanted to meet</td>
</tr>
<tr>
<td>Please give one example of how CONNECT helped you network.</td>
<td>(Open response)</td>
</tr>
<tr>
<td>Overall, how satisfied are you with your use of CONNECT for SIGCSE 2013?</td>
<td>-Very satisfied</td>
</tr>
<tr>
<td></td>
<td>-Somewhat satisfied</td>
</tr>
<tr>
<td></td>
<td>-Not satisfied</td>
</tr>
<tr>
<td>Please provide any other feedback you have on CONNECT.</td>
<td>(Open response)</td>
</tr>
</tbody>
</table>
5.2.2 Grad Cohort 2012

The survey for the Grad Cohort 2012 workshop was sent to all conference attendees by CRA-W evaluation staff. The survey included 9 questions related to CONNECT, three of which were open response. Table 5.2 contains the list of questions. Of the 276 attendees at Grad Cohort 2012, 197 responded to the evaluation survey (a 71.38% response rate). The results from these 197 were used to analyze the CONNECT system at this conference.

Table 5.2 - List of survey questions distributed after the Grad Cohort 2012 workshop

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you update your profile in the CONNECT system?</td>
<td>-Yes</td>
</tr>
<tr>
<td></td>
<td>-No</td>
</tr>
<tr>
<td>Please indicate whether you agree or disagree with the following statement: The tips in the CONNECT emails were helpful for me to meet my overall networking goals.</td>
<td>-Strongly agree</td>
</tr>
<tr>
<td></td>
<td>-Agree</td>
</tr>
<tr>
<td></td>
<td>-Neither disagree nor agree</td>
</tr>
<tr>
<td></td>
<td>-Disagree</td>
</tr>
<tr>
<td></td>
<td>-Strongly disagree</td>
</tr>
<tr>
<td>Did you use the CONNECT search facility to learn of other people attending Grad Cohort?</td>
<td>-Yes</td>
</tr>
<tr>
<td></td>
<td>-No</td>
</tr>
<tr>
<td>How many Grad Cohort attendees did you network with (or attempt to network with) due to the search results (either through email or at Grad Cohort)?</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>-1-2</td>
</tr>
<tr>
<td></td>
<td>-3-4</td>
</tr>
<tr>
<td></td>
<td>-5 or more</td>
</tr>
<tr>
<td>Please indicate whether you agree or disagree with the following statements:</td>
<td>-Strongly agree</td>
</tr>
<tr>
<td>-The pictures of Grad Cohort attendees were valuable.</td>
<td>-Agree</td>
</tr>
<tr>
<td>-The tips in the CONNECT emails were helpful for me to meet my overall networking goals.</td>
<td>-Neither disagree nor agree</td>
</tr>
<tr>
<td>-Given the opportunity, I would participate in CONNECT again.</td>
<td>-Disagree</td>
</tr>
<tr>
<td>-I would recommend CONNECT to other persons hoping to network at a conference.</td>
<td>-Strongly disagree</td>
</tr>
<tr>
<td>Overall, how satisfied are you with CONNECT?</td>
<td>-Very satisfied</td>
</tr>
<tr>
<td></td>
<td>-Satisfied</td>
</tr>
<tr>
<td></td>
<td>-Dissatisfied</td>
</tr>
<tr>
<td></td>
<td>-Very Dissatisfied</td>
</tr>
<tr>
<td></td>
<td>-Didn’t Use</td>
</tr>
<tr>
<td>Please tell us why you didn’t update your profile in the CONNECT system (if the user did not update their profile)</td>
<td>(Open response)</td>
</tr>
<tr>
<td>If you used CONNECT, please give one example of how CONNECT helped you network with other attendees.</td>
<td>(Open response)</td>
</tr>
<tr>
<td>Please provide any other feedback on CONNECT.</td>
<td>(Open response)</td>
</tr>
</tbody>
</table>
5.2.3 Grad Cohort 2013

Two surveys were distributed to the attendees of the Grad Cohort 2013 workshop. The first was a pre-survey sent by the CONNECT team to all conference attendees asking 8 questions regarding their perceptions of their own networking skills and confidence. This survey gathered 152 responses from the 324 people who were planning to attend the conference (a 46.91% response rate). The results from this survey were compared against the second survey. The second survey was a post-survey distributed by CRA-W evaluation staff. The post-survey contained 17 questions about CONNECT, 7 of which were included in the pre-survey. (One of the pre-survey questions was omitted from the post-survey due to the question limit required for CONNECT-related questions. This question was “I feel isolated when I attend conferences.”) Table 5.3 lists all 17 questions, with the seven pre/post questions listed first.

### Table 5.3 - List of survey questions distributed for the Grad Cohort 2013 workshop

<table>
<thead>
<tr>
<th>Pre-survey and Post-survey Questions</th>
<th>Answer Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is hard for me to introduce myself to people at conferences.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>I feel confident that I can network effectively.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>It is important for my future career goals to have good networking skills.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>It is important to me to make connections at conferences.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>It is important to me to meet other people with the same CS interest areas at conferences.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>I don’t really know how to make connections at conferences.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>I like using technology to help me meet people at conferences.</td>
<td>Likert scale</td>
</tr>
<tr>
<td>I feel isolated when I attend conferences. (pre-survey only)</td>
<td>Likert scale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-survey Questions</th>
<th>Answer Options</th>
</tr>
</thead>
</table>
| Did you use CONNECT during Grad Cohort 2013? | -Yes  
- No  
- Prefer Not to Say |
| Using the CONNECT system helped me understand the value of networking. | Likert scale |
| Using the CONNECT system increased my knowledge of how to network. | Likert scale |
| I felt comfortable using CONNECT to network with other conference attendees. | Likert scale |
| Please indicate how useful each feature in CONNECT was to you with regards to networking.  
- Search Tool  
- Messaging Tool  
- Goals Tool  
- Community Tool | -Very Useful  
- Somewhat Useful  
- Not Useful  
- Did Not Use Tool |
| Overall, how satisfied are you with your use of CONNECT for Grad Cohort 2013? | -Very Satisfied  
- Somewhat Satisfied  
- Not Satisfied |
| Please give one example of how CONNECT helped you network. | (Open response) |
Most questions used a Likert scale with options Strongly agree, Agree, Neither disagree nor agree, Disagree, Strongly disagree and N/A. Other answer options are listed in the table. Of the 324 conference attendees, 211 responded to the post-survey (a 65.12% response rate) with 158 indicating they participated in CONNECT. The results from these 158 responses were used to analyze the effect of CONNECT and its features on the conference attendees.

5.3 Usage Logging

A logger was implemented for CONNECT that allows those with access to the database to view general usage of the CONNECT system. Logging usage data provides a different perspective on the system and creates an accurate picture of how participants are using the system. The usage data can be queried to generate statistics about the features used in CONNECT. The logger was not implemented at Grad Cohort 2012, so the data gathered from that conference is purely from the database.

The logger data includes a pre-defined “type” for the log, to make it easier to identify and classify (e.g., Message or Goals), the date and time the log was generated, the page on the CONNECT site and the executing file the log was generated from, the query string that was present when the log was generated, the user id code (if one was present), and a predefined data field used to specifically describe what action the user was taking. User ids are stored by the logger. For privacy reasons, the ids are never correlated with a specific person.

The features of CONNECT that generated logging information include the Search Tool, the Profile, the connection status indicators, the Messaging Tool, the Schedule Tool (with some mobile logging), the Restaurant Tool (for SIGCSE 2013), the Goals Tool (for Grad Cohort 2013), and the Community Tool (for Grad Cohort 2013). With the results for each of these features, it is easy to see actual usage data such as how users used the Search Tool, how many messages were sent by users to users with a similar interest, and other data. Most importantly, the data can give an accurate description of which features were used by participants the most, in addition to how those features were used.

Data gathered describing the number of messages sent or connections made by users were analyzed for mild and extreme outliers, to make sure that people who made a significantly larger number of messages or connections did not skew the average data. The mild and extreme outliers were identified by finding the four quartiles in the data and calculating the values for the inner and outer fences. Data that was outside of the inner fences was considered a mild outlier and data outside of the outer fences was considered an extreme outlier.
5.4 Social Network Analysis (SNA)

Social network analysis was used as another way to validate the data gathered by the surveys and logger. This section covers the reason for using SNA as well as the software used and the metrics that were measured for each network. In addition, a description of the networks that were analyzed is given.

5.4.1 Purpose of SNA

Social network analysis is often used in research to identify correlations between attributes and activity of actors within the network. It can be used to determine information flow with a network by using centrality metrics to identify key actors. It can also be used to characterize the overall network with cohesion metrics that indicate the overall level of connections in the graph. Finally, social network analysis can be applied to individual actors and how they interact within their own “ego network” (the people they are directly connected to) [32] [33] [34] [35].

This thesis focuses primarily on the use of cohesion metrics to analyze the social networks established by users in the CONNECT system. In doing so, information about how well users of the CONNECT system are networking can be determined. These cohesion measurements can then be compared across conferences to help understand the networking characteristics of different types of conference attendees.

5.4.2 UCINET

The software used to perform the social network analysis is UCINET by Analytic Technologies. UCINET is capable of performing social network analysis methods such as centrality measures, subgroup identification, role analysis, elementary graph theory, and permutation-based statistical analysis. The primary use of UCINET for this thesis is examining the cohesion measures of the various networks. In addition, UCINET comes bundled with the NetDraw software which provides visualizations of social networks based on various network attributes. These visualizations can help in identifying patterns in the data that would not be obvious otherwise [36].

The UCINET software takes adjacency matrix data where each row and column in the matrix represents a node, and the entry between the ith column and jth row denotes an edge or “tie” between the ith and jth nodes. These ties can be binary or valued to indicate a weighted connection between nodes. The resulting social network created by the adjacency matrix can be rendered by the NetDraw program where the shape, color, and size of nodes can be customized based on user defined attributes.
5.4.3 Social Network Analysis Metrics

Each of the social networks analyzed were measured using various cohesion metrics. These metrics include average degree, density, connectedness, average distance, diameter, and cut points. These terms are defined in this section.

5.4.3.1 Component and Main Component

A component in a social network graph consists of a group of nodes that are capable of being reached by any other node in the same component. A graph with a large number of components is considered to be more disconnected than a graph with a small number of components, because none of the nodes within a given component interact with any of the nodes in any other component. The main component is defined as the component with the largest number of nodes. The main component is often used for various distance metrics since distance metrics cannot be used on a graph with multiple components (i.e., the distance between nodes in different components is considered to be infinite).

5.4.3.2 Average Degree

Degree refers to the number of edges entering or leaving a node. Therefore, average degree consists of taking the sum of each node’s individual degree and dividing it by the total number of nodes in the graph. In the case of social networks, this typically denotes the average number of connections users have within the network. A higher average degree indicates a higher level of connections in the graph and a lower average degree indicates a lower level of connections. It should be noted that the average degree is dependent on the size of the graph. In other words, a smaller graph might have a smaller average degree for the sole reason that there are fewer nodes to connect with than a larger graph. It is important to keep this fact in mind when comparing networks that are significantly different in size.

5.4.3.3 Density

Related to average degree is the network’s density. Density is defined as the ratio between the number of existing edges in the graph and the number of potential edges in the graph. In other words, it is the ratio between all of the edges in the graph and the number of edges if every node in the graph was connected to every other node in the graph (making a complete graph). A higher network density indicates a higher level of connections. The density of a network is between 0 and 1.
5.4.3.4 Connectedness

The connectedness of the social network was also considered. The connectedness of the network is actually the inverse of the fragmentation of the network. Fragmentation of a social network is defined as the proportion of pairs of nodes that cannot reach each other. A higher fragmentation indicates a less connected graph. Another way to describe fragmentation is the level at which removing nodes from the graph would create additional components. The value for fragmentation ranges from 0 to 1 and the connectedness of a network is equal to one minus the fragmentation of the network. Therefore, if the fragmentation of a network is low, the connectedness of the network is high and vice versa.

5.4.3.5 Average Distance and Diameter

The average distance of a network is defined as the average geodesic distance between all pairs of nodes. If the average distance of a network is low, then the average node in the network is closer to other nodes in the network and indicates an overall cohesion of the network. It should be noted that this metric is highly dependent on the size of the network since a smaller network has a better chance of having a lower distance compared to a larger network. Therefore, this fact needs to be taken into consideration when comparing networks of different sizes. Closely associated with the average distance is the diameter of the network. The diameter is simply defined as the largest distance between two nodes in the graph. Again, this metric is dependent on the size of the network.

5.4.3.6 Cut Points

Cut points in a network are defined as nodes that, when removed, increase the number of components in the network. A cut point can often be viewed as a primary point of information traffic, since all data must flow through the cut point in order to get to the other parts of the network. Cut points can also be seen as the bridges between subgroups in the network. In the case of the social networks created in the CONNECT system, a cut point is a user who interacts with other users who, in turn, do not interact at all. Cut points are also evidence of a poorly connected graph. In the case of CONNECT, where users are all encouraged to interact with each other, a cut point is seen as a point where one user is interacting more often than other users.

All of these metrics were used to assess and analyze the overall networking activity of users in CONNECT. By comparing these metrics between conferences, it is possible to obtain insight on the effectiveness of CONNECT across different types of conference attendees.
5.5 Application of SNA

In the CONNECT system, there are three types of social networks that are created among users. These networks are the “Has Met” network, the “Wants to Meet” network, and the “Messaging” network. The “Has Met” network consists of the users whom other users have indicated that they “Have met.” Likewise, the “Wants to Meet” network consists of users whom other users have indicated they “Want to meet.” The “Messaging” network consists of the users who sent messages to other users, where the edges between represent a message sent from one user to another. All three of these networks are directed (having edges with direction) due to the nature of the connection that is made. In addition, since the actual activity in the network is done by those who initiate the messages or suggestions, the out degree of nodes (the number of edges traveling out of a node) is emphasized in visualizations. These visualizations show those actors who were the most active within the network.

As previously mentioned, some of the distance cohesion metrics (such as diameter and average distance) require the graph to be connected to avoid infinite distance problems. Thus, only the main component of each network (i.e., the component with the largest number of nodes) is analyzed when applying these metrics. In addition, visualizations were created that highlight features such as out degree and cut points.
CHAPTER 6
RESULTS

Three conferences were assessed with respect to female students’ ability to network effectively. These conferences are SIGCSE 2013, Grad Cohort 2012, and Grad Cohort 2013. In this section, the results from the surveys, data logging, and social network analysis are presented and compared. By using the results from these three sources of information, the objective is to create an accurate description of the behaviors of the conference attendees and how they network with CONNECT’s assistance.

It should be noted that all of the results gathered from the data logging and social network analysis are based on the usage of CONNECT itself. Therefore, the results only reflect the networking habits and general usage of attendees who actually used CONNECT.

As mentioned in the methodology, the social networks that are analyzed are the “Has Met” network, the “Wants to Meet” network, and the “Messaging” network. These networks display the overall networking activity in CONNECT. The “Wants to Meet” network can be seen as the level with which users use the CONNECT site to help them identify potential contacts (i.e., to plan their networking efforts). The “Has Met” network can be seen as a type of memory aid for users. The “Messaging” network indicates the active use of CONNECT to contact other users. These networks rely on the participation of users and their use of the connection status indicators (“Has Met”, “Wants to Meet”, and “Has Not Met”).

6.1 SIGCSE 2013

The features analyzed for SIGCSE 2013 do not include the two new features added for Grad Cohort 2013. These features include the Goals Tool and the Community Tool. The remainder of the features implemented for SIGCSE 2013 were assessed and compared to the usage of the same features in other conferences.

6.1.1 Participation

The SIGCSE 2013 conference consisted of 1303 people. Of this group, 1155 people were registered in the CONNECT system (88.64% of the people at the conference). Of the number of registered users, 684 people actually logged in to CONNECT (59.22% of users who were registered in CONNECT). Figure 6.1 shows the breakdown of SIGCSE attendees.

Manual analysis of SIGCSE 2013 CONNECT users was performed to determine the gender of a user in order to compare CONNECT usage in different ways (described previously). Using this analysis, it was determined that, of the 1155 registered users, 436 (37.75%) were
women, 635 (54.98%) were men, and 84 (7.27%) were unknown (Figure 6.2). Any user whose gender is unknown was omitted from the analysis.

![Figure 6.1 - SIGCSE 2013 attendees' general usage of CONNECT](image)

![Figure 6.2 - Genders of users registered in CONNECT for SIGCSE 2013](image)

### 6.1.2 Usage for Features

This section covers the usage of various features in CONNECT at SIGCSE 2013. The usage of each feature focuses on the 684 users who actually logged into the CONNECT system, since they were the only users who actually generated data.

#### 6.1.2.1 Profile

To use CONNECT effectively, users must be willing to share some information about themselves. Of the 684 users who logged into CONNECT, 598 (87.43%) updated their profile. In addition, 403 (58.92%) users either uploaded a photo or had a photo taken and uploaded for them and 197 (28.80%) users used the “About” feature to write a short description about themselves. Additionally, 540 of the 684 users who logged into CONNECT (78.95%) indicated
that they had at least one interest. Based on the gender percentages of the users, 51.83% of women updated their profile, 30.96% uploaded a profile picture, 13.99% used the “About” feature, and 47.02% indicated they had at least one interest. Similarly, 52.91% of men updated their profile, 41.26% uploaded a profile picture, 20.16% used the “About” feature, and 47.24% indicated they had at least one interest (Figure 6.3). While the difference between genders for uploading a profile picture is 10.3% and using the “About” feature is 6.17%, the percentage of men and women who updated their profile is approximately the same. These results were tested for statistical significance, with the results shown in Table 6.1.

![Profile Usage at SIGCSE 2013](image)

**Figure 6.3 - Gender comparison of profile usage at SIGCSE 2013**

<table>
<thead>
<tr>
<th></th>
<th>Men %</th>
<th>Women %</th>
<th>T value</th>
<th>Degrees of Freedom</th>
<th>P value</th>
<th>Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updated Profile</td>
<td>52.91%</td>
<td>51.83%</td>
<td>0.348</td>
<td>1069</td>
<td>0.7281</td>
<td>No</td>
</tr>
<tr>
<td>Updated Picture</td>
<td>41.26%</td>
<td>30.96%</td>
<td>3.429</td>
<td>1069</td>
<td>0.0006</td>
<td>Yes</td>
</tr>
<tr>
<td>Used “About” Feature</td>
<td>20.16%</td>
<td>13.99%</td>
<td>2.602</td>
<td>1069</td>
<td>0.0094</td>
<td>Yes</td>
</tr>
<tr>
<td>Had at Least One Interest</td>
<td>47.24%</td>
<td>47.02%</td>
<td>0.071</td>
<td>1069</td>
<td>0.9435</td>
<td>No</td>
</tr>
</tbody>
</table>

### 6.1.2.2 Connection Status Indicators

The “Has Met” connection status indicator was used by 22.37% of the CONNECT users who logged in. When comparing genders, 53 women (12.16%) indicated they “Had Met” one or
more people and 94 men (14.8%) indicated they “Had Met” one or more people. When comparing the average number of “Has Met” connections a user had made, results showed that, of the users who made at least one “Has Met” connection, men had an average of 4.57 “Has Met” connections (excluding mild and extreme outliers), and women had an average of 4.69 “Has Met” connections (excluding mild and extreme outliers). When taking into account the percentage of men and women at the conference, the difference in the percentage between men and women who made “Has Met” connections is only 2.76%. In addition, when we examine the number of women and men on the receiving end of the “Has Met” connection, we find that 300 men (47.24% of the male attendees using CONNECT) and 229 women (52.52% of the female attendees using CONNECT) were indicated by others as “Has Met.” This result shows that the difference in the percentage between men and women who were indicated by others as “Has Met” was only 5.28%. Overall, it can be seen that the level of networking activity in CONNECT between men and women is very similar (Tables 6.2 and 6.3). The majority of users (both male and female) identified only one or two “Has Met” connections, although a few (2 women and 11 men) identified 22 or more.

### Table 6.2 - "Has Met" statistics by gender at SIGCSE 2013

<table>
<thead>
<tr>
<th>Used “Has Met” Indicator</th>
<th>% of Gender</th>
<th>Received “Has Met” Indication</th>
<th>% of Gender</th>
<th>Average Number of “Has Met” Connections (with one or more connection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>94</td>
<td>14.80%</td>
<td>300</td>
<td>47.24%</td>
</tr>
<tr>
<td>Female</td>
<td>53</td>
<td>12.16%</td>
<td>229</td>
<td>52.52%</td>
</tr>
</tbody>
</table>

### Table 6.3 - Number of "Has Met" connections made by each gender at SIGCSE 2013

<table>
<thead>
<tr>
<th>Number of “Has Met” Connections Made</th>
<th>By Total Users</th>
<th>By Women</th>
<th>% of All Women</th>
<th>By Men</th>
<th>% of All Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>19</td>
<td>4.36%</td>
<td>28</td>
<td>4.41%</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>7</td>
<td>1.61%</td>
<td>14</td>
<td>2.20%</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>4</td>
<td>0.92%</td>
<td>7</td>
<td>1.10%</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>5</td>
<td>1.15%</td>
<td>6</td>
<td>0.94%</td>
</tr>
<tr>
<td>5-6</td>
<td>10</td>
<td>1</td>
<td>0.23%</td>
<td>9</td>
<td>1.42%</td>
</tr>
<tr>
<td>7-8</td>
<td>11</td>
<td>4</td>
<td>0.92%</td>
<td>6</td>
<td>0.94%</td>
</tr>
<tr>
<td>9-12</td>
<td>9</td>
<td>4</td>
<td>0.92%</td>
<td>5</td>
<td>0.79%</td>
</tr>
<tr>
<td>13-16</td>
<td>11</td>
<td>7</td>
<td>1.61%</td>
<td>4</td>
<td>0.63%</td>
</tr>
<tr>
<td>17-21</td>
<td>4</td>
<td>0</td>
<td>0.00%</td>
<td>4</td>
<td>0.63%</td>
</tr>
<tr>
<td>22-33</td>
<td>7</td>
<td>1</td>
<td>0.23%</td>
<td>6</td>
<td>0.94%</td>
</tr>
<tr>
<td>More than 33</td>
<td>6</td>
<td>1</td>
<td>0.23%</td>
<td>5</td>
<td>0.79%</td>
</tr>
</tbody>
</table>
The “Has Met” social network for SIGCSE 2013 (Figure 6.4) gives a good visual indicator as to the overall connectedness of those who used this feature, as well as a look at the primary actors in the network. In the diagram, pink circles represent women, blue squares represent men, and black triangles represent an unknown gender. The nodes in the network are sized by their out degree (the number of people a user has indicated they “Have Met”).

![Figure 6.4 - "Has Met" social network for SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles)](image)

From a more general perspective, the connectedness of the “Has Met” social network shows an indication of the strength of the network. The graph shown next (Figure 6.5) consists of the main component of the “Has Met” network, and highlights the cut-points in the network. For this network there are only two cut points (shown in green) in the main component of the “Has Met” network. As explained previously, these cut-points represent points where, if the node was removed, it would increase the number of components in the graph (i.e., it would split the network into separate, unconnected networks). With only two cut-points in the graph, this network would be considered fairly strong. Additional metrics for the “Has Met” network are shown in Table 6.4.
As can be seen, the average user has a little less than four connections to other users. This fact results in a network density of 0.006, which is relatively low. This result may be due to the fact that SIGCSE 2013 attendees are a fairly well-established community, and many participants already know a large number of attendees, making it less important for them to network via CONNECT. Survey data collected at past regional conferences indicated a strong desire among the undergraduate students to build their networks. It is not clear to what degree that is also true of the attendees at a professional conference such as SIGCSE.

Additional data was also gathered on the similarities between the users in a “Has Met” connection. This data is shown in Figure 6.6. An individual connection may be counted in multiple categories (e.g., a connection between two professors interests in algorithms would count as a similar interest and a similar role). It should be noted that a large percentage of the users at SIGCSE 2013 were from the United States, so the high percentage of connection

Table 6.4 - “Has Met” social network statistics for SIGCSE 2013

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes in Network</td>
<td>611</td>
</tr>
<tr>
<td>Size of Main Component</td>
<td>591</td>
</tr>
<tr>
<td>Average Degree</td>
<td>3.637</td>
</tr>
<tr>
<td>Density</td>
<td>0.006</td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.936</td>
</tr>
<tr>
<td>Average Distance</td>
<td>4.155</td>
</tr>
<tr>
<td>Diameter</td>
<td>9</td>
</tr>
</tbody>
</table>

Figure 6.5 - "Has Met" social network for SIGCSE 2013 with cut-points highlighted in green
status updates occurring within the same country is most likely coincidental. To verify this hypothesis, additional data shows that 92% of the attendees were from the US, 2% from Canada, and 5% from another country (or did not have a country listed). The remaining 1% did not have a country listed. These statistics imply that the high level of connections between users in the same country is simply due to the high number of attendees from the United States.

Figure 6.6 - Percentage of Connection Status updates with similarities between the connecting user and the receiving user

The statistics for the “Wants to Meet” social network are reported briefly in Table 6.5 along with the visualization of the social network (Figure 6.7). Pink circles represent women, blue squares represent men, and black triangles represent unknown genders. The nodes are sized by out degree. This data indicates that some SIGCSE 2013 users were indeed using the “Wants to Meet” connection indicator to help them identify which users they wanted to connect with. However, the “Want to Meet” connection status indicator was not used very extensively at SIGCSE 2013. Only 7% of users who used CONNECT at SIGCSE 2013 used the “Want to Meet” indicators, and the feature was only used 193 times throughout the conference. After the conference, only 169 “Want to Meet” connections remained implying that users may have used the feature to help them keep track of who they wanted to network with, and then changed the connection to a “Has Met” connection. Further data results show that only about 8 users might have used the feature in this way. The “Has Met” feature was used much more with 23% of
users who logged into CONNECT using the “Has Met” indicator. The “Has Met” feature was used by 157 users with 1160 of the connections remaining after the conference was over.

Figure 6.7 - "Wants to Meet" social network at SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles)

Table 6.5 - "Wants to Meet" social network statistics for SIGCSE 2013

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes in Network</td>
<td>177</td>
</tr>
<tr>
<td>Size of Main Component</td>
<td>112</td>
</tr>
<tr>
<td>Average Degree</td>
<td>1.853</td>
</tr>
<tr>
<td>Density</td>
<td>0.011</td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.408</td>
</tr>
<tr>
<td>Average Distance</td>
<td>4.113</td>
</tr>
<tr>
<td>Diameter</td>
<td>12</td>
</tr>
</tbody>
</table>

6.1.2.3 Search Tool

In the survey for SIGCSE 2013, users were asked how useful they found the CONNECT Search Tool. The results showed that 46.9% of users found the Search Tool either somewhat useful or very useful, while 20% indicated the Search Tool was not useful (Figure 6.8). About 33% of users either did not answer or indicated they did not use the Search Tool. Of the surveyed attendees who actually used the tool, roughly 70% found it useful and 30% said it was not useful.
The logged user data indicates that 306 users used the Search Tool in some way. It should be noted that, while 67% of the surveyed users indicated they had used the Search Tool, only 45% of users who logged into CONNECT used the tool. As shown in Figure 6.9, the logged data indicated that the search criteria for the users consisted primarily of searches by first and last name. This fact shows that users using the Search Tool most often were searching for someone they already knew or someone they had met or wanted to meet at the conference (e.g., a presenter or paper author).

Users who used the Search Tool were also asked how many people they met as a result of having used the Search Tool. The results, shown in Figure 6.10, indicate that about 41% of the users who used the Search Tool did not meet or contact another person as a result. Of those who used the search tool, 40% met or connected with one or two people, although 18% connected with 3 or more.
Several open response comments on the CONNECT system indicated that users would prefer alternative criteria for searching such as by school or affiliation, or by keywords within the “About” field. In addition, it should be taken into account that 32.41% of users did not use the Search Tool.

### 6.1.2.4 Messaging Tool

In the survey for SIGCSE 2013, users were asked how useful they found the Messaging Tool. The results showed that about 38% of users found the Messaging Tool either somewhat useful or very useful, and about 14% indicated the Messaging Tool was not useful (Figure 6.11). About 47% of users either did not answer or indicated they did not use the Messaging Tool. Of the surveyed attendees who actually used the tool, roughly 73% found it useful and 27% said it was not useful.
Results from the logged data show that 166 users (24.27% of users who logged in to CONNECT) sent at least one message. In addition, comparing the messaging results between men and women shows that 67 women (15.37% of all females registered in CONNECT) sent messages and 93 men (14.65% of all males registered in CONNECT) sent messages. The percentages between both genders is very close, indicating the difference in messaging activity between the two genders is negligible. In addition, comparing the average number of messages sent by each gender shows that, after removing mild and extreme outliers, 1.89 messages were sent by women on average and 1.83 messages were sent by men on average. These results indicate, again, that the level of messaging usage by each gender was about the same. The data is shown in Table 6.6.

<table>
<thead>
<tr>
<th></th>
<th>Used Messaging Tool</th>
<th>% of Gender</th>
<th>Total Number of Messages Sent</th>
<th>Average Number of Messages Sent (excluding mild and extreme outliers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>93</td>
<td>14.65%</td>
<td>248</td>
<td>1.83</td>
</tr>
<tr>
<td>Female</td>
<td>67</td>
<td>15.37%</td>
<td>268</td>
<td>1.89</td>
</tr>
</tbody>
</table>

The “Messaging” social network for SIGCSE 2013 (Figure 6.12) is shown with women represented as pink circles, men represented as blue squares, and unknown genders represented as black triangles. The nodes are sized based on the out degree of the node (the number of messages sent by that user). It can be seen that a fair amount of networking was done via the Messaging Tool in CONNECT. In addition, the figure illustrates that there were cases where a single user sent an unusually high number of messages to other users.

These cases tended to be classified as outliers when measuring the average number of messages sent by a user, and were therefore excluded from the measurement. However, it is important to know of these events’ occurrence to obtain an accurate picture of the usage of messaging during the conference. For example, it was reported after SIGCSE 2013 that one member sent invitations to all of the international attendees for a group meal. These emails were sent through the CONNECT messaging system, and would account for an abnormally high level of messaging for that user.

Figure 6.12 shows there are several smaller network components completely detached from the main component of this network graph. The higher number of components indicates a lack of cohesion in the network. However, since attendees have the freedom to connect in other ways besides messaging through CONNECT, this lack of cohesion may be considered...
incidental. In addition, it is unreasonable to think that all users would contact all other users (resulting in a perfectly cohesive network). Additional metrics for the main component of the messaging network are shown in Table 6.7.

![Figure 6.12 - "Messaging" social network at SIGCSE 2013 (women: pink circles, men: blue squares, unknown: black triangles)](image)

<table>
<thead>
<tr>
<th>Table 6.7 - &quot;Messaging&quot; social network statistics at SIGCSE 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nodes in Network</strong></td>
</tr>
<tr>
<td><strong>Size of Main Component</strong></td>
</tr>
<tr>
<td><strong>Average Degree</strong></td>
</tr>
<tr>
<td><strong>Density</strong></td>
</tr>
<tr>
<td><strong>Connectedness</strong></td>
</tr>
<tr>
<td><strong>Average Distance</strong></td>
</tr>
<tr>
<td><strong>Diameter</strong></td>
</tr>
</tbody>
</table>

Additional data was gathered from the logger regarding the similarities and relationships between the senders and the receivers of the messages. This data is summarized in Figure 6.13.
6.1.2.5 Schedule Tool and Mobile Schedule Application

The Schedule Tool was one of the more popular items at the SIGCSE 2013 conference. In the survey, users were asked how useful they found the Schedule Tool. The results showed that about 48% of users found the Schedule Tool either somewhat useful or very useful, and about 17% indicated the Schedule Tool was not useful (Figure 6.14). About 35% of users either did not answer or indicated they did not use the Schedule Tool. Of the survey attendees who actually used the tool roughly 74% found it useful and 26% said it was not useful.

Data gathered from the logger showed that about 58% of users who logged in used the Schedule Tool to view the conference events. Additionally, about 46% of users used the tool to read the descriptions of events and about 34% of users who logged in used the Schedule Tool to actually mark the events they were attending. The Mobile Schedule had 114 downloads;
users of the Mobile Schedule Application viewed the conference schedule over 4000 times, and looked at descriptions of events about 1700 times. In addition, 542 users used the Mobile Schedule Application to indicate which events they were attending. The usage data is summarized in Figure 6.15.

![Usage of Schedule Tool](image)

**Figure 6.15 - Usage of Schedule Tool by users who logged into CONNECT**

### 6.1.2.6 Restaurant Tool

The Restaurant Tool, for the most part, went unrecognized during the conference. In the post-survey, users were asked how useful they found the Restaurant Tool. The results showed that about 13% of users found the Restaurant Tool either somewhat useful or very useful, and about 6% indicated the Restaurant Tool was not useful (Figure 6.16). Additionally, 82% of users either did not answer or indicated they did not use the Restaurant Tool. Of the survey attendees who actually used the tool roughly 68% found it useful and 32% said it was not useful. In addition, users were asked how they used the Restaurant Tool (if they used the tool in the first place). The results are shown in Figure 6.17.

![How useful was CONNECT’s Restaurant Tool?](image)

**Figure 6.16 - Usefulness of Restaurant Tool at SIGCSE 2013**
6.1.3 Overall Response

The overall response to CONNECT at SIGCSE 2013 was fairly positive. As illustrated in Figure 6.18, about 67% of the surveyed users who said they used CONNECT indicated they were very satisfied or somewhat satisfied with their usage of CONNECT at SIGCSE 2013. Additionally, 23% of the users indicated they were not satisfied with CONNECT, and about 10% of the surveyed users did not answer the question.

Surveyed users were also asked two open response questions. The first question was, “Please give one example of how CONNECT helped you network.” This question received 129 responses, which were summarized into 13 categories (Table 6.8). One of the most notable
results from this question is that SIGCSE 2013 attendees primarily used the CONNECT system to identify people they already knew who would be attending the conference. This result is most likely due to the existing community that attends SIGCSE.

The second question users were asked to respond to was “Please provide any other feedback you have on CONNECT.” The 113 results from this question are summarized in Table 6.9. With about 42% of the responses containing either positive feedback or recommendations for future design, and about 35% of the responses containing negative feedback, it appears that the SIGCSE community sees potential from CONNECT, but recognizes that there is still room for improvement. Several of the recommendations involved focusing on bringing more functionality to the mobile platform. Other recommendations indicated that, if awareness was raised about CONNECT, people would be more inclined to use it.

Table 6.8 - Categorized survey results for "Please give one example of how CONNECT helped you network"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying who was attending the conference</td>
<td>29</td>
<td>“I was able to learn that individuals I knew would be attending so that I could look for them.”</td>
</tr>
<tr>
<td>Negative</td>
<td>25</td>
<td>“It really did not help me connect.”</td>
</tr>
<tr>
<td>Making connections in general</td>
<td>14</td>
<td>“Someone contacted me through CONNECT and I ended up meeting them and establishing a relationship.”</td>
</tr>
<tr>
<td>Didn't Use</td>
<td>13</td>
<td>“I didn’t use it enough to effectively use it for networking”</td>
</tr>
<tr>
<td>Identifying people who would be good to meet</td>
<td>8</td>
<td>“I was able to find people I wanted to meet and it made my networking more efficient.”</td>
</tr>
<tr>
<td>Used Messaging Tool to meet others</td>
<td>6</td>
<td>“I messaged people from my area back home in order to have meetings with them.”</td>
</tr>
<tr>
<td>Finding others with common interests/research area</td>
<td>5</td>
<td>“College senior contacted me about 6-12 teaching since she saw I had taught 9-12.”</td>
</tr>
<tr>
<td>Viewed attendees of events</td>
<td>5</td>
<td>“Allowed me to see some of the people that would be in workshops I was planning to go to.”</td>
</tr>
<tr>
<td>Used Schedule Tool to keep track of schedule</td>
<td>4</td>
<td>“It helped me keep track of the sessions I wanted to attend.”</td>
</tr>
<tr>
<td>Used Restaurant Tool to meet others</td>
<td>3</td>
<td>“I was able to organize a lunch with three people, but I feel like nobody was using it for that purpose.”</td>
</tr>
<tr>
<td>Name with face</td>
<td>3</td>
<td>“Picture of attendee helped identify them in a crowd.”</td>
</tr>
<tr>
<td>Identify and learn more about people met during the conference</td>
<td>3</td>
<td>“After meeting someone new, person CONNECTed with me so we can potentially do a collaboration together.”</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>“Helped keep my students organized”</td>
</tr>
</tbody>
</table>
Table 6.9 - Categorized survey results for "Please provide any other feedback you have on CONNECT"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>11</td>
<td>&quot;Please expand! I'd love to see this improve and be used!&quot;</td>
</tr>
<tr>
<td>Recommendations (Mobile)</td>
<td>6</td>
<td>&quot;It needs an iPhone app. I would have used CONNECT for real if it let me have a personalized program on my iPhone.&quot;</td>
</tr>
<tr>
<td>Recommendations (More Advertising or Incentive)</td>
<td>5</td>
<td>&quot;There should be better promotions and announcement at the general sessions about it&quot;</td>
</tr>
<tr>
<td>Recommendations (Schedule)</td>
<td>6</td>
<td>&quot;It would be nice to be able to print the schedule I created for myself in CONNECT.&quot;</td>
</tr>
<tr>
<td>Recommendations (Other)</td>
<td>19</td>
<td>&quot;should have a forwarding to the email or text.&quot;</td>
</tr>
<tr>
<td>Negative (Technical Issues)</td>
<td>16</td>
<td>&quot;I had some trouble connect to the CONNECT system and with slow response to the server at different times.&quot;</td>
</tr>
<tr>
<td>Negative (Interface)</td>
<td>5</td>
<td>&quot;It was difficult to figure out how to use it.&quot;</td>
</tr>
<tr>
<td>Negative (Not Worth It)</td>
<td>7</td>
<td>&quot;I don't see the value.&quot;</td>
</tr>
<tr>
<td>Negative (Needs More Participation)</td>
<td>3</td>
<td>&quot;Good idea, but more people need to fill in their background info&quot;</td>
</tr>
<tr>
<td>Negative (Too Many Emails)</td>
<td>2</td>
<td>&quot;Registering to CONNECT appeared to increase the level of spam e-mail I received.&quot;</td>
</tr>
<tr>
<td>Negative (Other)</td>
<td>7</td>
<td>&quot;I didn't get any Connections.&quot;</td>
</tr>
<tr>
<td>Didn't Use</td>
<td>19</td>
<td>&quot;I just didn't take time to explore its features&quot;</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>&quot;Neutral. It wasn't terribly useful, but it wasn't burdensome either.&quot;</td>
</tr>
</tbody>
</table>

6.2 Grad Cohort 2012

The data gathered from Grad Cohort 2012 does not include the newer features in CONNECT, such as the Schedule Tool, Restaurant Tool, Goals Tool, and Community Tool. However, the comparison between the usage of the site in general, the Search Tool, and the Messaging Tool, gives an idea of what was effective in the past, as well as what improvements were made between Grad Cohort 2012 and Grad Cohort 2013.

6.2.1 Participation

The Grad Cohort 2012 workshop consisted of 276 attendees, all of whom were registered in the CONNECT system. This high rate of participation is valuable in getting an accurate description of the attendees’ networking habits.

6.2.2 Usage for Features

This section covers the usage of various features in CONNECT at Grad Cohort 2012. Results are taken from survey data gathered after the conference, general data gathered from
the CONNECT database, and social network analysis data gathered from the usage network created in CONNECT during the conference.

6.2.2.1 Profile

Of the 276 users who used CONNECT, 210 (76.09%) updated their profile. In addition, 138 users (50.00%) either uploaded a photo or had a photo taken and uploaded for them. In addition, 82 users (29.71%) used the “About” feature (called the “bio” at Grad Cohort 2012) to include a short description about themselves. In addition, 220 of the 276 users (79.71%) selected at least one CS interest area. The data are summarized in Figure 6.19.

![Profile Usage at Grad Cohort 2012](image)

Figure 6.19 - Profile usage by attendees at Grad Cohort 2012

The survey for Grad Cohort 2012 asked users if they updated their profile in the CONNECT system. Of the 186 responses to this question, 158 (85.4%) of users said they updated their profile and 27 (14.6%) users said they did not. Obviously, the actual data usage from the system gives a more accurate picture of the activity of the users. While survey takers may have accurately reported their actions, the response rate was not 100%.

6.2.2.2 Search Tool

In the survey for Grad Cohort 2012, users were asked if they used the CONNECT Search Tool to discover other people attending Grad Cohort. This question gathered 158 responses. The results showed that 80.9% of the surveyed users used the Search Tool to discover other people attending, and 19.1% did not.

Users who used the Search Tool were also asked how many people they networked with as a result of having used the Search Tool. This question gathered 127 responses. The results,
shown in Figure 6.20, indicate that 27.8% of surveyed users indicated they met 1-2 people, 25.4% indicated they met 3-4 people, and 41.3% indicated they networked with 5 or more people. In addition, less than 6% of the users who used the Search Tool said they did not meet or contact another person as a result.

![How many people did you meet or contact due to CONNECT’s Search Tool?](image)

Figure 6.20 - Number of people met due to the Search Tool at Grad Cohort 2012

Users were also asked how valuable the pictures of attendees were at the conference. This question gathered 157 responses with 78% of users either strongly agreeing or agreeing that the pictures were valuable. Only 1% of users disagreed that the pictures were valuable. (We note that 21% of the surveyed users indicated that they neither disagreed nor agreed that the pictures were useful.) In addition, one of the open responses gathered from the survey recommended having a search filter for school.

**6.2.2.3 Messaging Tool**

No survey questions were given to users regarding the Messaging Tool. However, several of the open responses indicated that the messaging within CONNECT at Grad Cohort 2012 did not work well. Specifically, 28% of the responses to the question “Please provide any other feedback on CONNECT” indicated that the responder had problems with the messaging system. Many users indicated having trouble figuring out if they had a message from someone else. Data collected from the database after the conference indicated that, of the 82 messages that were sent by users, 75 of them (91.46%) never received a response. While it is possible
that the response was via email or other method, it is highly unlikely that 91.46% of the messages took this approach.

The “Messaging” social network established at Grad Cohort 2012 is show in Figure 6.21. The nodes have been sized by out degree. Figure 6.21 shows that the “Messaging” social network is relatively sparse with very few bidirectional connections. Only 31 users (11.23% of all users) sent at least one message. Additional metrics for the main component of the messaging network are shown in Table 6.10. The table shows the average user involved in a conversation sent or received a little fewer than two messages during the conference. From a general perspective, there were relatively few members (5–6) actively messaging in this network. Most users tended to send only one or two messages.

![Figure 6.21 - "Messaging" social network at Grad Cohort 2012](image)

<table>
<thead>
<tr>
<th>Nodes in Network</th>
<th>81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Main Component</td>
<td>50</td>
</tr>
<tr>
<td>Average Degree</td>
<td>1.778</td>
</tr>
<tr>
<td>Density</td>
<td>0.022</td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.387</td>
</tr>
<tr>
<td>Average Distance</td>
<td>4.884</td>
</tr>
<tr>
<td>Diameter</td>
<td>13</td>
</tr>
</tbody>
</table>
6.2.3 Overall Response

The response to the CONNECT system at Grad Cohort 2012 was generally positive. Specifically, 86% of the surveyed users indicated they would like to use CONNECT again at a future conference and 82.7% of the surveyed users said they would recommend CONNECT to others hoping to network at a conference. Users asked about their satisfaction with the CONNECT system indicated that 90% were either very satisfied or satisfied, less than 6% were dissatisfied or very dissatisfied, and approximately 5% did not answer the question. The results are shown in Figure 6.22. Surveyed users were also asked three open ended questions. The first question asked why a given user did not update their profile, and the results are shown in Table 6.11. The second question asked users how CONNECT helped them network. The responses are summarized in Table 6.12. Finally, the third question asked for additional feedback on the CONNECT system. The responses are summarized in Table 6.13.

![Overall, how satisfied are you with CONNECT?](image)

Figure 6.22 - Overall satisfaction with CONNECT at Grad Cohort 2012

Table 6.11 - Categorized survey results for "Please tell us why you didn't update your profile in the CONNECT system"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Issues</td>
<td>2</td>
<td>&quot;I was unable to log in with the user name and password sent to me (it told me the password was incorrect), and just kept being to scatterbrained to remember to ask for a new one.&quot;</td>
</tr>
<tr>
<td>Not Worth It</td>
<td>4</td>
<td>&quot;It doesn't seem necessary to me.&quot;</td>
</tr>
<tr>
<td>Lack of Time</td>
<td>2</td>
<td>&quot;The reason was that I was too busy with some paper deadlines before the workshop and I could not update my profile.&quot;</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>&quot;Seemed rather inorganic.&quot;</td>
</tr>
</tbody>
</table>
Table 6.12 - Categorized survey results for "If you used CONNECT, please give one example of how CONNECT helped you network with other attendees"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find people with similar research/interest areas</td>
<td>32</td>
<td>&quot;I used it to search for people related to my research area before the conference.&quot;</td>
</tr>
<tr>
<td>Find information for those they'd like to contact</td>
<td>14</td>
<td>&quot;Search the people by name or field, find their contact information. And send them emails or add them on Facebook.&quot;</td>
</tr>
<tr>
<td>Match name with a face</td>
<td>13</td>
<td>&quot;Because it was difficult for me to remember all names, but I could remember the faces, so I went to CONNECT and look for pictures and when I found the faces of the colleagues I talked to, I could email them.&quot;</td>
</tr>
<tr>
<td>Find people working in nearby location</td>
<td>7</td>
<td>&quot;I found out the people from my school who were attending the workshop. 2. Later I used it to find the attendees I met there by their pictures.&quot;</td>
</tr>
<tr>
<td>Understand a person's research/interests</td>
<td>4</td>
<td>&quot;It helped me understand their area of research before making initial contact.&quot;</td>
</tr>
<tr>
<td>Identify people attending the conference</td>
<td>4</td>
<td>&quot;Simply having the list of attendees well before the conference was valuable&quot;</td>
</tr>
<tr>
<td>General connections</td>
<td>4</td>
<td>&quot;I used CONNECT to find a way to connect to the speakers and I find attendees’ pictures there.&quot;</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>&quot;search other attendees Facebook&quot;</td>
</tr>
</tbody>
</table>

Table 6.13 - Categorized survey results for "Please provide any other feedback on CONNECT"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>2</td>
<td>&quot;CONNECT is key to networking.&quot;</td>
</tr>
<tr>
<td>Technical Issues (Messaging)</td>
<td>7</td>
<td>&quot;I had sent messages to many people through CONNECT. But no one was aware that I had sent them messages. I was not able to find where to check for the messages too. It could have been great if the interface was clearer and a message notification was sent to the member's email.&quot;</td>
</tr>
<tr>
<td>Technical Issues (Other)</td>
<td>4</td>
<td>&quot;Everytime I try to logon, I have to reset my password. That is frustrating!&quot;</td>
</tr>
<tr>
<td>Recommendations (More advertising/incentive)</td>
<td>4</td>
<td>&quot;The last email sent by Cyndi Rader where the suggestion of how to use CONNECT was made very clear (look people up, make a list, etc) was super useful. I wish it had been sent earlier.&quot;</td>
</tr>
<tr>
<td>Recommendations (Mobile)</td>
<td>2</td>
<td>&quot;A mobile app would be good so that it would be easier to share contact information when we were sitting and chatting, most namely at breakfast/lunch/dinner.&quot;</td>
</tr>
<tr>
<td>Recommendations (Other)</td>
<td>6</td>
<td>&quot;It is better to add a search term about school.&quot;</td>
</tr>
<tr>
<td>Negative (UI)</td>
<td>4</td>
<td>&quot;The interface could have been more usable&quot;</td>
</tr>
<tr>
<td>Negative (Other)</td>
<td>5</td>
<td>&quot;In my area of CS it is more common to use Twitter to keep in touch professionally, even Facebook or LinkedIn would be better. CONNECT was just too buggy and slow, too much of a pain to add my information into, and didn't provide any features that aren't already in other networks that I use.&quot;</td>
</tr>
</tbody>
</table>
As shown in Table 6.13, the primary issues for users were the level of bugs in the site (especially in the Messaging Tool) and the lack of features that separated CONNECT from other social network applications. In addition, survey responders expressed a desire for a better user interface design.

6.3 Grad Cohort 2013

Like Grad Cohort 2012, this workshop contains a majority of attendees who are in the target audience for this research. Therefore, the data gathered from this conference most accurately reflects the networking characteristics of graduate student women when using a social web site such as CONNECT. Features that were added for this conference include the Goals Tool and the Community Tool. These two tools are evaluated by the post survey to determine their effectiveness in encouraging the attendees to network. All of the other tools that were present at SIGCSE 2013 (except for the Restaurant Tool) are also compared. In addition, the social network analysis metrics used to analyze the SIGCSE 2013 data is applied to the social networks at this conference. In doing so, a comparison can be done of professional women vs. graduate student women.

6.3.1 Participation

The Grad Cohort 2013 workshop consisted of 324 attendees, all of whom were registered in the CONNECT system. Of the number of registered users, 255 people logged in to CONNECT (78% of users who were registered in CONNECT). Only 2 attendees also opted out of CONNECT. Figure 6.23 shows the usage of CONNECT by Grad Cohort 2013 attendees.

![Grad Cohort 2013 Attendees](image-url)

Figure 6.23 - General CONNECT usage at Grad Cohort 2013
6.3.2 Pre/Post Networking Skills Survey

Two surveys were distributed to attendees of Grad Cohort 2013, each of which contained questions related to the attendees’ perception of their own networking skills and confidence. The pre-survey gathered 152 responses and the post-survey gathered 211 responses. Of the 211 who responded to the post-survey, only 158 indicated that they used CONNECT. The results for the networking skills questions, therefore, reflect the responses from these 158 people only. The results for these questions are shown in Figures 6.24 - 6.30.

![Figure 6.24 - Pre/post survey results comparison for "It is hard for me to introduce myself to people at conferences"](image1)

![Figure 6.25 - Pre/post survey results comparison for "I feel confident that I can network effectively"](image2)
Figure 6.26 - Pre/post survey results comparison for "It is important for my future career goals to have good networking skills"

Figure 6.27 - Pre/post survey results comparison for "It is important to me to make connections at conferences"
Figure 6.28 - Pre/post survey results comparison for "It is important to me to meet other people with the same CS interest areas at conferences"

Figure 6.29 - Pre/post survey results comparison for "I don’t really know how to make connections at conferences"
We note the results from these surveys are from two independent sets of users. Thus, an "independent groups T-test between means" is used to compare the pre and post survey results. This comparison is done by finding the average and standard deviation of the user responses (where Strongly agree = 1, Agree = 2, etc.) and then performing the T-test using the mean, standard deviation, and population size from the pre and post survey results. The difference between the means is considered statistically significant if the P-value of the T-test is less than the $\alpha$-level of 0.05. The results from the statistical significance tests are shown in Table 6.14.

Unfortunately, the sample size (152 for the pre-survey and 158 for the post-survey) is not large enough to represent the conference population (324) with less than 5% precision. While the sample size is large enough to represent the conference population with 6% precision, statistically significant differences between pre and post survey questions can only suggest the shifts of attitudes and opinions of the entire group. Therefore, the P-values shown in Table 6.14 indicate the “potentially statistically significant” differences between the pre and post survey results.
Table 6.14 - Statistical comparison of pre/post survey result means with statistical significance

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Survey Mean</th>
<th>Pre-Survey Standard Dev.</th>
<th>Post-Survey Mean</th>
<th>Post-Survey Standard Dev.</th>
<th>P</th>
<th>Potentially Statistically Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is hard for me to introduce myself to people at conferences.</td>
<td>2.8684</td>
<td>1.1831</td>
<td>3.2229</td>
<td>1.1908</td>
<td>0.0090</td>
<td>Yes</td>
</tr>
<tr>
<td>I feel confident that I can network effectively.</td>
<td>2.8947</td>
<td>1.0043</td>
<td>2.5962</td>
<td>0.9489</td>
<td>0.0075</td>
<td>Yes</td>
</tr>
<tr>
<td>It is important for my future career goals to have good networking skills.</td>
<td>1.4013</td>
<td>0.5306</td>
<td>1.4936</td>
<td>0.6169</td>
<td>0.1596</td>
<td>No</td>
</tr>
<tr>
<td>It is important to me to make connections at conferences.</td>
<td>1.4539</td>
<td>0.5500</td>
<td>1.5192</td>
<td>0.6473</td>
<td>0.3401</td>
<td>No</td>
</tr>
<tr>
<td>It is important to me to meet other people with the same CS interest areas at conferences.</td>
<td>1.6267</td>
<td>0.7004</td>
<td>1.6516</td>
<td>0.8264</td>
<td>0.7753</td>
<td>No</td>
</tr>
<tr>
<td>I don’t really know how to make connections at conferences.</td>
<td>2.7171</td>
<td>1.0574</td>
<td>3.2516</td>
<td>1.0419</td>
<td>0.0000</td>
<td>Yes</td>
</tr>
<tr>
<td>I like using technology to help me meet people at conferences.</td>
<td>2.4564</td>
<td>0.9479</td>
<td>2.2922</td>
<td>0.9561</td>
<td>0.1300</td>
<td>No</td>
</tr>
</tbody>
</table>

An additional question was asked in the pre-survey that did not have a matching question in the post-survey due to the limits placed by the survey organizers on the number of questions related to CONNECT. The results from the pre-survey for this question are shown in Figure 6.31.

Figure 6.31 - Pre-survey results for "I feel isolated when I attend conferences"
In addition to the questions distributed in the pre-survey, the post survey also included 3 additional questions related to how CONNECT helped attendees network at the conference. The results from these questions are shown in Figures 6.32 - 6.34.

**Figure 6.32 - Post survey results for "Using the CONNECT system helped me understand the value of networking"**

**Figure 6.33 - Post survey results for "Using the CONNECT system increased my knowledge of how to network"**

73
In addition, a one sample T-test was used between the percentages of those who agree or strongly agree with the questions and those who disagree or strongly disagree, in order to determine if there is statistical significance present. As shown in Table 6.15, all three questions had P-values less than 0.05.

<table>
<thead>
<tr>
<th>Question</th>
<th>Agree %</th>
<th>Disagree %</th>
<th>P</th>
<th>Statistically Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the CONNECT system helped me understand the value of networking</td>
<td>41.77%</td>
<td>20.89%</td>
<td>0.0071</td>
<td>Yes</td>
</tr>
<tr>
<td>Using the CONNECT system increased my knowledge of how to network</td>
<td>38.60%</td>
<td>21.52%</td>
<td>0.0269</td>
<td>Yes</td>
</tr>
<tr>
<td>I felt comfortable using CONNECT to network with other conference attendees</td>
<td>53.80%</td>
<td>10.13%</td>
<td>0.0000</td>
<td>Yes</td>
</tr>
</tbody>
</table>

6.3.3 Usage for Features

This section covers the usage of various features in CONNECT at Grad Cohort 2013. The usage of each feature focuses on the 255 users who actually logged into the CONNECT system, since they were the only users who actually generated data.
6.3.3.1 Profile

Of the 255 users who logged into CONNECT at Grad Cohort 2013, 246 (96.47%) updated their profile. In addition, 165 (64.71%) users uploaded a photo and 120 (47.06%) participants used the “About” feature to write a short description about themselves. Additionally, 239 of the 255 users who logged into CONNECT (93.73%) selected at least one CS interest area. The data is shown in Figure 6.35.

![Profile Usage at Grad Cohort 2013](image)

Figure 6.35 - Profile usage by users of CONNECT at Grad Cohort 2013

6.3.3.2 Connection Status Indicators

The “Has Met” connection status indicator was used by 39.22% of the CONNECT users who logged in (or used by 30.86% of the women registered in CONNECT). When analyzing the average number of “Has Met” connections a user made, results showed that, of the users who made at least one “Has Met” connection, the average number of “Has Met” connections made by users was 8.72 (excluding mild and extreme outliers). In addition, when we examine the number of users on the receiving end of the “Has Met” connection, we find that 271 (83.64% of the women registered in CONNECT) were indicated by others as “Has Met.” The data is shown in Tables 6.16 and 6.17.

<table>
<thead>
<tr>
<th>Table 6.16 - &quot;Has Met&quot; usage statistics for Grad Cohort 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Used “Has Met” Indicator</strong></td>
</tr>
<tr>
<td>Female</td>
</tr>
</tbody>
</table>
Table 6.17 - Number of connections made by users at Grad Cohort 2013

<table>
<thead>
<tr>
<th>Number of “Has Met” Connections Made</th>
<th>Total Users</th>
<th>% Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>6.27%</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>3.53%</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>2.35%</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0.78%</td>
</tr>
<tr>
<td>5-6</td>
<td>9</td>
<td>3.53%</td>
</tr>
<tr>
<td>7-8</td>
<td>16</td>
<td>6.27%</td>
</tr>
<tr>
<td>9-12</td>
<td>14</td>
<td>5.49%</td>
</tr>
<tr>
<td>13-16</td>
<td>8</td>
<td>3.14%</td>
</tr>
<tr>
<td>17-21</td>
<td>14</td>
<td>5.49%</td>
</tr>
<tr>
<td>22-33</td>
<td>5</td>
<td>1.96%</td>
</tr>
<tr>
<td>More than 33</td>
<td>1</td>
<td>0.39%</td>
</tr>
</tbody>
</table>

The “Has Met” social network for Grad Cohort 2013 gives a visual indicator as to the overall connectedness of those who used this feature, as well as a look at the primary actors in the network. In Figure 6.36, the nodes are sized by their out degree (the number of people a user has indicated they “Have Met”).

Figure 6.36 - "Has Met" social network for Grad Cohort 2013
From a more general perspective, the connectedness of the “Has Met” social network shows an indication of the strength of the network. The graph shown in Figure 6.37 consists of the main component of the “Has Met” network. Interestingly, there are no cut points in the main component of the “Has Met” network. As explained previously, these cut-points represent points where, if the node was removed, it would increase the number of components in the graph (i.e. it would split the network into separate, unconnected networks). With no cut-points in the graph, this network would be considered very strong. Additional metrics for the “Has Met” network are shown in Table 6.18.

Figure 6.37 - "Has Met" social network for Grad Cohort 2013; cut-points would be highlighted in green but no cut-points exist

<table>
<thead>
<tr>
<th>Table 6.18 - &quot;Has Met&quot; social network statistics for Grad Cohort 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nodes in Network</strong></td>
</tr>
<tr>
<td><strong>Size of Main Component</strong></td>
</tr>
<tr>
<td><strong>Average Degree</strong></td>
</tr>
<tr>
<td><strong>Density</strong></td>
</tr>
<tr>
<td><strong>Connectedness</strong></td>
</tr>
<tr>
<td><strong>Average Distance</strong></td>
</tr>
<tr>
<td><strong>Diameter</strong></td>
</tr>
</tbody>
</table>
One prominent feature of this network is that there are only two components (the main component and a second component, consisting of only 2 nodes). The low number of components indicates that conference attendees are not just networking with singular, highly-connected individuals, but are networking with a variety of individuals at the conference.

Additional data was also analyzed on the relationship between the user updating his/her connection status and the user on the receiving end of the connection. This data is shown in Figure 6.38.

![Connection Status Updates at Grad Cohort 2013](image)

Figure 6.38 - Percentage of Connection Status updates with similarities between user who is connecting and user who is receiving connection

The statistics for the “Wants to Meet” social network are reported briefly in Table 6.19 along with the visualization of the social network (Figure 6.39). Nodes are sized by out degree. At the end of the conference, 36 attendees had a “Want to Meet” indicator, which shows that at least 36 attendees were using this feature to help them remember which attendees they wanted to connect with.

Similar to SIGCSE 2013, the “Want to Meet” connection status indicator was not used very extensively at Grad Cohort 2013. Only 17.25% of users who used CONNECT used the “Want to Meet” indicators, and the feature was only used 144 times throughout the conference. After the conference, only 109 “Want to Meet” connections remained implying that users may
have used the feature to help them keep track of who they wanted to network with, and then changed the connection to a “Has Met” connection. Further data results show that only about 14 users might have used the feature in this way. The “Has Met” feature was used much more extensively with 40% of users who logged into CONNECT using the “Has Met” indicator. The “Has Met” feature was used by 102 users with 920 of the connections remaining after the conference was over.

![Figure 6.39 - "Wants to Meet" social network for Grad Cohort 2013](image1)

![Figure 6.39 - "Wants to Meet" social network for Grad Cohort 2013](image2)

Table 6.19 - "Wants to Meet" social network statistics for Grad Cohort 2013

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodes in Network</td>
<td>97</td>
</tr>
<tr>
<td>Size of Main Component</td>
<td>87</td>
</tr>
<tr>
<td>Average Degree</td>
<td>2.227</td>
</tr>
<tr>
<td>Density</td>
<td>0.023</td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.805</td>
</tr>
<tr>
<td>Average Distance</td>
<td>4.76</td>
</tr>
<tr>
<td>Diameter</td>
<td>11</td>
</tr>
</tbody>
</table>
6.3.3.3 Goals Tool and Mobile Goals Application

In the survey for Grad Cohort 2013, users were asked how useful they found the CONNECT Goals Tool. The results show that 43% of users found the Goals Tool either somewhat useful or very useful, 20% indicated the Goals Tool was not useful (Figure 6.40), and approximately 34% of users indicated that they did not use the Goals Tool. Of the surveyed attendees who actually used the tool, roughly 68% indicated it was useful and 32% indicated it was not useful.

![How useful did you find CONNECT's Goals Tool?](image)

**Figure 6.40 - Usefulness of Goals Tool at Grad Cohort 2013**

The logged user data indicates that 135 users (52.94% of users who logged in) used the Goals Tool in some way. Additionally, 28.89% of users who used the Goals Tool “prepared” at least one goal and 22.96% of users who used the Goals Tool completed at least one goal. However, only 1.48% of the users (2 attendees) who used the Goals Tool actually indicated that they had completed all 5 goals (where having 5 goals completed was considered 100% completion for the overall conference). Users who used the Goals Tool completed approximately 2 goals on average.

6.3.3.4 Community Tool

In the survey for Grad Cohort 2013, users were asked how useful they found the CONNECT Community Tool. The results show that 60% of users found the Community Tool either somewhat useful or very useful, 10% indicated the Community Tool was not useful, and about 27% of users indicated that they did not use the Community Tool (Figure 6.41). Of the
surveyed attendees who actually used the tool, roughly 86% indicated it was useful and 14% indicated it was not useful.

The logged user data indicates that 119 users (or 46.67% of users who logged in) used the Community Tool in some way. Specifically, 65.55% of users who used the Community Tool viewed their own connections and 47.90% of users who used the Community Tool viewed another user’s connections. In addition, 45.38% of users who used the tool viewed the “most connected” user’s connections (Figure 6.42).
6.3.3.5 Search Tool

In the survey for Grad Cohort 2013, users were asked how useful they found the CONNECT Search Tool. The results show that 81% of users found the Search Tool either somewhat useful or very useful, 4% indicated the Search Tool was not useful, and about 13% of users either did not answer or indicated they did not use the Search Tool (Figure 6.43). Of the surveyed attendees who actually used the tool, roughly 95% found it useful and 5% found it not useful.

![How useful did you find CONNECT’s Search Tool?](image)

Figure 6.43 - Usefulness of Search Tool at Grad Cohort 2013

The logged user data indicates that 224 users (or 87.84% of users who logged in) used the Search Tool in some way. As shown in Figure 6.44, the logged data indicates that the search criteria for the users consisted primarily of searches by country and state. This result shows that users using the Search Tool most often were looking for someone from their same location to network with.

![Search Criteria for Users](image)

Figure 6.44 - Number of users performing searches with various search criteria
6.3.3.6 Messaging Tool

In the survey for Grad Cohort 2013, users were asked how useful they found the Messaging Tool. The results show that about 59% of users found the Messaging Tool either somewhat useful or very useful, about 6% found the Messaging Tool not useful, and approximately 34% of users either did not answer or indicated they did not use the Messaging Tool (Figure 6.45). Of the survey attendees who actually used the tool, roughly 91% found it useful and 9% found it not useful.

![Figure 6.45 - Usefulness of the Messaging Tool at Grad Cohort 2013](image)

Results from the logged data show that 84 users (or 32.94% of users that logged in to CONNECT, which is 25.93% of all conference attendees) sent at least one message. In addition, the average number of messages sent, after removing mild and extreme outliers, was 2.29 messages. The data is shown in Table 6.20.

<table>
<thead>
<tr>
<th>Used Messaging Tool</th>
<th>%</th>
<th>Total Number of Messages Sent</th>
<th>Average Number of Messages Sent (excluding mild and extreme outliers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>84</td>
<td>25.93%</td>
<td>264</td>
</tr>
</tbody>
</table>

The “Messaging” social network for Grad Cohort 2013 is shown in Figure 6.46. The nodes are sized based on the out degree of the node (i.e., the number of messages sent by that user). As shown in Figure 6.46, a fair amount of networking was done via the Messaging Tool in CONNECT. Contrary to the Grad Cohort 2012 workshop, the distribution of messages sent is much more even. Additional metrics for the main component of the messaging network are shown in Table 6.21.
Additional data was analyzed that indicates the relationship between those who sent messages and those who received messages. The data is summarized in Figure 6.47, and shows that the number of messages sent to users in the same country is about 77%. This result implies that 23% of the messages sent were sent to someone from a different country. Since 91% of the attendees at Grad Cohort 2013 were from the US, and 9% of the attendees were from Canada, one might expect to see a higher number of messages sent to people within the same country. Additional analysis showed that 180 messages were sent from a user in the US to another user in the US, and 29 messages were sent from a user in the US to a user in Canada. In addition, 25 messages were sent between users in Canada, and 34 messages were sent from users in Canada to users in the US. Thus, in total, 63 of the 268 messages (or 24%) were sent between US and Canadian users.
6.3.3.7 Schedule Tool and Mobile Schedule Application

Due to the nature of Grad Cohort 2013, the Schedule Tool did not have a survey question associated with its usefulness. That is, the event schedule at Grad Cohort is quite fixed, with many of the same attendees going to the same events. Therefore, allowing users to indicate whether they were attending a specific event is not of any benefit. For this reason, the Schedule Tool was stripped of some functionality to make it simpler for users to only keep track of the day’s agenda. The Mobile Schedule Application was also stripped of functionality to only allow users to view the conference events without indicating attendance.

Basic usage statistics show 56.86% of users who logged in used the web based Schedule Tool to view all events, and 30.59% of users used the web based Schedule Tool to read descriptions of events. With respect to the Mobile Schedule Application, people used the Mobile Schedule to view all events 339 times. The application itself was downloaded 22 times.

6.3.4 Overall Response

The overall response to CONNECT at Grad Cohort 2013 was very positive. As shown in Figure 6.48, about 90% of the surveyed users indicated they were very satisfied or somewhat satisfied with their usage of CONNECT at Grad Cohort 2013, and 9% of the users indicated they were not satisfied with CONNECT. In addition, surveyed users were asked one open response question. This question was, “Please give one example of how CONNECT helped you network,” and it received 72 responses. See Table 6.22 for details. One of the most notable results for this question is that attendees of this conference primarily used the CONNECT system to discover new people to meet who have similar interests. This result is most likely due to the nature of the attendees who have few preexisting connections.
Figure 6.48 - Overall satisfaction with CONNECT at Grad Cohort 2013

Table 6.22 - Categorized survey results for "Please give one example of how CONNECT helped you network"

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>No. Responses</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding others with common interests/research area</td>
<td>12</td>
<td>“I could find other people who work in my research area”</td>
</tr>
<tr>
<td>Keep track of connections</td>
<td>10</td>
<td>“I could look up all the people I had met and remember them because of CONNECT”</td>
</tr>
<tr>
<td>Putting a name with a face</td>
<td>8</td>
<td>“By browsing the photos, it helps me recall the names of those I met on the conference.”</td>
</tr>
<tr>
<td>Access to contact info</td>
<td>7</td>
<td>“It was nice to be able to follow up after meeting someone at a session and easily find their contact info in CONNECT.”</td>
</tr>
<tr>
<td>Identify and learn more about people met during the conference</td>
<td>5</td>
<td>“I was able to find all the people that I introduced myself to during the cohort using connect.”</td>
</tr>
<tr>
<td>Connecting after the conference</td>
<td>5</td>
<td>“I was connected by the people that I met in the conference after conference finished.”</td>
</tr>
<tr>
<td>Connecting prior to the conference</td>
<td>3</td>
<td>“I messaged ppl before going. So, when I went to the conference, I was able to meet them easily”</td>
</tr>
<tr>
<td>Identifying people who would be good to meet</td>
<td>3</td>
<td>“Was able to search and find the profile of one other person who was similar to me.”</td>
</tr>
<tr>
<td>Making connections in general</td>
<td>9</td>
<td>“I was able to connect through Facebook with one of two other social science/CSCW peers I found.”</td>
</tr>
<tr>
<td>Negative/Criticism/Recommendation</td>
<td>7</td>
<td>“I could find very few people in my specific field using connect.”</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>“Goals tool had tips about how to reach my goals!! That's my favorite part of the tool that other tools don't offer.”</td>
</tr>
</tbody>
</table>

Overall, how satisfied are you with your use of CONNECT for Grad Cohort 2013?

- Very Satisfied: 56.96%
- Somewhat Satisfied: 32.91%
- Not Satisfied: 9.49%
CHAPTER 7
ANALYSIS

This section examines the theoretical and practical implications of the results presented. It addresses whether the research questions were answered, and if the desired outcomes were achieved. In addition, the differences in networking habits between men and women and between students and professionals is discussed and analyzed for any implications on the design of a social website. Finally, the implications for social sites that encourage networking among women are discussed.

7.1 Effect of CONNECT at Grad Cohort 2013 and SIGCSE 2013

The research questions this thesis addresses are whether we can leverage technology to:

- Assist a female conference attendee’s ability to make relevant personal connections at a conference?
- Assist female conference attendees with forming appropriate communities?

In addition, desired outcomes are that women:

- Increase their knowledge of how to network effectively,
- Gain confidence in their networking abilities, and
- Apply the networking skills they have acquired to actively make connections and exchange information.

The pre and post survey results from Grad Cohort 2013 address these questions directly. After the conference, users indicated that it would not be as hard for them to introduce themselves to other people at conferences. Users also indicated they were more confident that they could network effectively after the conference had ended. In addition, users indicated that they felt comfortable using CONNECT to network with other conference attendees, implying that the CONNECT system was a factor in raising women’s confidence in networking effectively.

Since the Grad Cohort workshop focuses mainly around encouraging attendees to network with their peers, it is possible that the conference itself, rather than CONNECT, is responsible for users feeling more comfortable with networking. However, given the usage results of the
CONNECT site, it is still reasonable to say that CONNECT had a positive impact on the networking activities of conference attendees. Survey results also indicated that, after the conference, users believed they had increased knowledge of how to make connections at conferences, and they generally agreed that the CONNECT system increased their knowledge of how to network. To fully evaluate the impact of CONNECT in future studies, it would be important to examine conferences where the main focus is not networking itself, but another subject (e.g., artificial intelligence or high performance computing). In addition, Grad Cohort 2013 attendees are primarily women graduate students. Having an all-women networking event could be very different from having a networking event with mixed genders. In future studies it would be valuable to ask similar pre and post survey questions at a networking event where attendees are both male and female, and determine if the female networking confidence response is consistent.

The general results show that using a social website to facilitate networking is effective in assisting women with knowing how to network and building their confidence in networking effectively. Usage results of the CONNECT site also showed that attendees were indeed making relevant connections by using the Search Tool with various search criteria to discover who was relevant, and by using the Messaging Tool to initiate those relevant connections. These results answer the first research question, showing that technology (in the form of a social website) can be used to assist female conference attendees’ ability to make relevant personal connections at a conference.

In order to see whether the CONNECT system was useful to female attendees in forming appropriate communities, we need to evaluate attendees’ actual usage of the system. One of the hypotheses that influenced the design of CONNECT is that communities form around interest areas. This hypothesis was confirmed by the usage of the Messaging Tool, Search Tool, and Connection Status Indicators. Users who used the Messaging Tool at Grad Cohort 2013 and SIGCSE 2013 tended to send messages to users who had a common interest with two thirds of the messages sent at Grad Cohort 2013 and almost half of the messages sent at SIGCSE 2013 being sent to someone with a common interest. The Search Tool was not as heavily used for finding users with a common interest in either conference. However, this outcome could have been due to the bold highlighting of common interests in each user’s profile. The highlighting may have made it less necessary to search by interest area since the common interest areas were already easy to see. A third of the connection status updates at SIGCSE 2013 and half of the connection status updates at Grad Cohort 2013 were with a user with a common interest. These statistics give evidence that users of CONNECT were using the
different features to identify and connect with appropriate communities based on their common interests. Therefore, it can be said that the CONNECT system was able to assist female conference attendees in forming appropriate communities.

A second hypothesis used when designing CONNECT was that communities would form around roles (e.g., looking for others who have the same role because experiences are similar, looking for others with greater experience in order to gather information, looking for others based on potential future employment opportunities, etc.). This hypothesis was neither confirmed nor disproved by usage of the Messaging Tool, Search Tool, and Connection Status Indicators. We do know that a little less than half of the messages sent at Grad Cohort 2013 and less than a fifth of the messages sent at SIGCSE 2013 were sent to users who had a similar role. The number of roles at each conference could impact this result, as Grad Cohort 2013 only had 4 different roles and SIGCSE 2013 had 18 different roles. Future studies should focus on this hypothesis to determine if there is a correlation between the communities the users form and the role the users are a part of.

In addition to interest areas and roles, results showed that communities also tended to form around geographical regions, especially for students. While it is possible that the establishment of these communities was coincidental due to the large number of attendees from the United States, it is also possible that geographical location is an important factor for students trying to make relevant connections. The relation between geographical location and relevance of connections is an area of interest that could be examined further in future studies.

Results also indicated that women graduate students tend to have a good understanding of the importance and value of networking. Both pre-survey and post-survey results from Grad Cohort 2013 indicated that it is important for the attendees’ future goals to have good networking skills, and that it is important to them to make connections at conferences. Users also indicated that it was important to them to meet other people with the same CS interest areas at conferences. These results demonstrate that it may not be as important for CONNECT to emphasize the value of networking to women. Women already understand how important it is to have good networking skills. In addition, users were consistent both before and after the conference indicating that they liked using technology to help them meet people at conferences. This result indicates the desire for a system like CONNECT, which women can use to network more effectively.

One important discovery is that the definition of a “relevant” connection is very different between conferences. Attendees of the SIGCSE 2013 conference had a much higher tendency to use CONNECT to determine if people they already knew were attending the conference and
to maintain their existing connections. This conclusion was shown in the open responses for SIGCSE 2013, where several surveyed users indicated they used CONNECT to see if someone they already knew would be attending the conference. Relevant connections for a professional conference such as SIGCSE should therefore include existing connections, as well as new connections. This result is fairly different from Grad Cohort 2013 where a “relevant” connection is most likely someone the user meets for the first time at the conference. The open response from Grad Cohort 2013 showed that most users used CONNECT to find others with a common research or interest area. Implementations of a networking social website used at a conference need to take care to establish what a “relevant” connection means in the context of the conference.

7.2 Networking Comparison: Men vs. Women

The SIGCSE 2013 conference offered an opportunity to compare the networking characteristics of men and women at conferences. While research has shown that men tend to dominate the networking domain more than women, results from this conference were not quite so drastic. In many cases, the networking level of men and women (based on their percentages) was very similar. For example, about the same percentage of men and women updated their profile and marked interest areas for themselves. In addition, it was shown that the percentage of each gender that used the connection status indicators was almost the same (15% men vs. 12% women), and the average number of connections made with the connection status indicators was also almost identical (4.57 men vs. 4.69 women). Also, the percentage of each gender that used the Messaging Tool was very close (14.7% men vs. 15.4% women) and the number of messages sent by each gender was almost identical (1.83 men vs. 1.89 women). None of these differences were statistically significant.

Although there were many similarities in the level of networking between men and women at SIGCSE 2013, there were a few areas where one gender “outperformed” the other. One example is the Profile usage. The percentage of men who updated their profile picture was higher than the percentage of women who updated their profile picture by a statistically significant amount. In addition, the percentage of men who used the “About” feature was higher than the percentage of women who used this feature by a statistically significant amount. This outcome may have to do with the level of comfort that men have compared to women when posting personal information about themselves, including pictures. It is unlikely that this result is based on gender differences in usage of social websites because, in every other category, women used the site and its features just as much as men did. Additional review of literature
[37] [38] provides research that women are more likely than men to have a private profile and share less personal information with others. Our result with CONNECT adds further evidence to this claim.

The overall similarity between genders tends to contradict the results of previous research that shows men typically have a significantly more active role in networking than women. It is possible that, due to the nature of SIGCSE, this tendency is mitigated. That is, because SIGCSE is focused around computer science in education, education could be a subsector of computer science in which women are more prone to interacting with other members in the community (and men may be less prone to exclude women).

### 7.3 Networking Comparison: Professional vs. Student

Since one of the primary goals of this research is to learn how to establish better networking habits among female students, it is important to see where the differences are between a professional woman, who has likely been successful in establishing her own professional network, and a female student, who may have very little exposure to networking in general. One of the more interesting vantage points that can be analyzed in this research is what types of people the conference attendees are trying to connect with.

At the SIGCSE 2013 conference, it was apparent that users tended to not be as interested in establishing connections with people they had never met before. Open response results and usage statistics for the Search Tool both show that SIGCSE attendees most often used CONNECT to identify people they already knew, to see if these existing contacts would be at the conference, and to see if they could meet up with them at some point. This outcome likely occurs because many of the attendees at SIGCSE have connections from previous conferences, and have a higher priority on maintaining and building on those existing connections than on establishing completely new connections.

Grad Cohort, on the other hand, consists of an audience of mostly students, who have had little to no professional networking experience. These attendees have no choice but to try and meet new people, since their professional network is much less developed. As a result, the way in which the students network is significantly different from how the professionals at SIGCSE network. Grad Cohort attendees were much more likely to take suggestions from CONNECT. This outcome is indicated by the higher percentage of messages and connection status indications that were involved with a user who had been suggested by CONNECT as someone who would be good to meet. Specifically, SIGCSE 2013 attendees used the connection status indicators 5.13% of the time with someone who had been suggested by
CONNECT, while Grad Cohort 2013 attendees used the indicators 9.92% of the time with someone who had been suggested. SIGCSE 2013 attendees sent a message to someone who had been suggested by CONNECT 4.34% of the time, while Grad Cohort 2013 attendees sent a message to a suggested user 21.97% of the time. Both of these results are statistically significant and show that the Grad Cohort 2013 attendees were much more open to the recommendations given by CONNECT than the SIGCSE 2013 attendees.

It is, of course, possible that the CONNECT matching algorithm suggested people that the SIGCSE 2013 attendees already knew, causing them to be less responsive to the suggestions. In fact, this possibility was mentioned in one of the open responses for SIGCSE 2013. Ultimately, it is impossible to determine whether a user was messaging or connecting with someone they already knew, or if they were relying on the recommendations of CONNECT. Either way, it can still be said that CONNECT was facilitating networking, whether that was to maintain existing connections or to establish new connections.

7.4 Grad Cohort 2012/2013 Comparison

Between Grad Cohort 2012 and Grad Cohort 2013, several changes were made to the CONNECT system based on user recommendations, research, and survey data taken from other conferences. This section compares the two conferences, examining what changes to the CONNECT system made the most positive impact.

The feature that generated the most negative feedback at Grad Cohort 2012 was the Messaging Tool. Not only was the “Messaging” social network fairly sparse, but it appeared, based on the open responses, that the tool was either not functioning properly, or did not have a sufficient method for indicating to users when they received a message. Only 11% of users at this conference sent messages, and only 9% of the messages sent ever received replies. Given this poor success rate, the implementation of the Messaging Tool for CONNECT was polished in a few different ways. First, the tool was changed so that it would send an email alert to a user when they received a message. The email would link the user back to the CONNECT site where they could then respond. Second, the Inbox link in the menu bar on the CONNECT site was changed to have a visual indicator when a user had one or more unread messages. Finally, the message interface was redesigned to look more modern as well as to give meaningful information about the messages a user received, grouping conversations with individual users on the Inbox page, and showing the last message in the conversation. All of these improvements appeared to have a positive impact on the usage of the Messaging Tool at Grad Cohort 2013. At Grad Cohort 2013, 59% of users found the Messaging Tool either useful
or very useful and only 6% found it not useful. In addition, 26% of the users actually used the Messaging Tool with 80% of the messages receiving a reply. This outcome is a 71% improvement in message response and a 15% improvement in usage compared to Grad Cohort 2012.

The other primary shortcoming voiced by attendees at Grad Cohort 2012 was the lack of features that distinguished CONNECT from other social websites like Facebook or LinkedIn. This feedback was taken into account, and several unique features were designed that could be used to network more effectively at these conferences. In the case of Grad Cohort 2013, the Goals Tool and Community Tool were added in the hopes of allowing users various options for getting networking assistance. The Goals Tool primarily focuses on helping users learn how to network effectively as well as to reinforce the value of networking. The Community Tool focuses more on user discovery and identifying those who a user could network with. Both tools were relatively well received with 43% of users indicating they found the Goals Tool useful and 60% of users indicating they found the Community Tool useful.

The number of people who updated their profile between Grad Cohort 2012 and 2013 increased by 20%, with 96% of users at Grad Cohort 2013 updating their profile. In addition, the number of people who uploaded a photo of themselves also increased by 14%.

Another recommendation received from attendees of Grad Cohort 2012 was to make the interface “prettier.” While this is a rather subjective term, work was done on making the CONNECT site have a more modern look and feel. It would be difficult to quantify the effect the new look and feel had on the usage of the site given collection of features that were implemented alongside the update. But the number of negative open-ended responses that mentioned the user interface decreased from 4 to 1. It may be beneficial in future research to examine how the look and feel of a site influences its usage.

7.5 Impact of Features

After deploying CONNECT at SIGCSE 2013 and Grad Cohort 2013 (as well as 10 other smaller conferences) and gathering survey data related to the usefulness of each feature, the effectiveness of the various features in CONNECT has been established. Users have consistently indicated that the Searchable Tool is useful when accomplishing their networking goals. This outcome is indicated by both the open response and the general survey data. However, users continue to give recommendations for the Search Tool that should be taken into consideration. Users have suggested alternative search filters as well as full text searches. Ultimately, the results show that the Search Tool may need to be updated to behave like many
of the more common search features on websites today. For example, Amazon utilizes a full
text search feature that narrows down the user’s search results. In addition, a sidebar contains
different types of filters to further narrow the search results (e.g., price, brand, etc.). By
restructuring the CONNECT Search Tool in a way that is familiar to people, users may be much
more attracted to using the feature. Users have also indicated the benefit of having a modifiable
profile with a picture of the user. Several open response results from multiple conferences have
indicated the usefulness of being able to associate a name with a face and easily identify others
with common interests.

The newest features implemented for Grad Cohort 2013 included the Community Tool
and the Goals Tool. The Community Tool received a fairly positive response at Grad Cohort
2013. This response indicates that users (specifically graduate student women) like having
multiple ways of discovering other people to meet. In future studies, where the Community Tool
is being used by a more diverse population, it would be beneficial to compare the usage of the
tool to Grad Cohort 2013 to see if the usage stays consistent. Similarly, the Goals Tool gathered
a fairly positive response with one open response saying, “Goals tool had tips about how to
reach my goals!!! That's my favorite part of the tool that other tools don't offer.” It is likely that
the reason this feature received attention was due to the nature of the Grad Cohort workshop,
where attendees are encouraged to network. This feature may not be as applicable to a
professional environment where attendees have already had exposure to professional
networking and would not necessarily need the tips given by the Goals Tool. In fact, such a tool
might be seen as condescending by users at such a conference. The Goals Tool can continue
to be studied for future conferences like Grad Cohort or regional conferences aimed at
graduates/undergraduates, and additional analysis can be done examining the effectiveness of
the different types of goals, and the tips associated with them.

The usage results for the connection status indicators also revealed that people tended
not to use the “Want to Meet” connection status indicator to identify those who they wanted to
network with. Most users simply marked users with a “Has Met” connection, completely skipping
the “Want to Meet” connection status. It is likely that the “Want to Meet” connection status
indicator is not necessary in helping people make connections. It is also possible that marking
an individual as someone you “Want to Meet” doesn’t have enough meaning in the system to
make it useful for users. Perhaps if additional information was displayed to users about who
they had marked as “Want to Meet,” the indicator would be of more benefit.

A large number of users indicated via the open response questions that having the
CONNECT features in mobile form would be beneficial. However, the usage of CONNECT
cannot completely rely on having a mobile device since many users do not have smartphones. Additional suggested features related to having a mobile application for CONNECT included connecting via QR code, having real-time locations for other users, and exchanging information via Bluetooth connection. Having the system on the mobile platform would allow several users to have the convenience of the CONNECT system without having to retreat to their computer every time they made a connection.
CHAPTER 8
CONCLUSION

Women are underrepresented in the computer and information science fields, and the percentage of undergraduate degrees awarded to women in computing has been decreasing since the mid 1980's. To address this issue, several conferences have been developed to encourage retention of women in computer science. These conferences provide women valuable opportunities to network with each other and establish a professional network. This thesis examines the question of whether technology can be leveraged to assist women in networking at conferences by forming relevant connections and appropriate communities.

The CONNECT system was developed to help women (and general conference attendees) network more effectively at conferences. Data has been gathered on the usage of CONNECT from several conferences starting in 2008 to the present day. The data was gathered via surveys asking users the usefulness of various features, as well as what barriers the users encountered while networking at conferences and what features would help them network effectively. The need for a technology like the CONNECT system was confirmed by surveys deployed at the conferences.

As the CONNECT system was deployed at various conferences, the set of features continued to evolve in order to more effectively help users reach their networking goals. The most recent version of the CONNECT system includes a Goals Tool, Community Tool, and Schedule Tool along with an improved Search Tool, Messaging Tool, Connection Status Indicators, and the modifiable Profile. These features were designed based on the results of prior deployments of CONNECT as well as findings from other researchers. The CONNECT system was deployed at SIGCSE 2013, where professional men and women attendees used the system, and at Grad Cohort 2013, where graduate student women used the system. Data from these conferences were gathered in the form of usage logging and pre/post surveys.

The survey results suggest that, after using CONNECT at Grad Cohort 2013, the graduate student women had a better knowledge of how to network effectively and also had an increased confidence in their networking skills. The logged data shows that, when using the CONNECT system, graduate student women were able to establish relevant connections and find appropriate communities. The communities established at Grad Cohort 2013 tended to be around interest areas. In addition, attendees of Grad Cohort 2013 showed an interest in using different methods for user discovery; that is, attendees used several different mechanisms (i.e.,
Within CONNECT to identify relevant connections.

The results from SIGCSE 2013 also show that, contrary to prior research results, the level of networking between men and women using CONNECT was very similar, with the only significant differences being that men were more likely than women to upload photos and provide short descriptions of themselves. In addition, the SIGCSE 2013 attendees tended to use the CONNECT system to maintain existing connections, whereas the Grad Cohort 2013 attendees tended to use CONNECT to establish new relevant connections. Determining what different users see as a “relevant” connection impacts which features are most effective. In designing a social networking site like CONNECT, these results should be taken into account.

8.1 Limitations

The manner in which CONNECT was deployed and the ways in which data was collected limit the generality of the results. Additional study would be required to remove uncertainty in the results. The limitations of this study are listed here:

- Logging of usage data was not implemented for Grad Cohort 2012, so few one-to-one comparisons could be done on usage between Grad Cohort 2012 and Grad Cohort 2013.

- The surveyed users for Grad Cohort 2013 were independent between the pre and post survey. In addition, the sample size of those responding to the questions was not sufficient to establish statistical significance. Thus, some inaccuracies may exist in the results. In the worst case, completely different users (with differing opinions on networking) could have taken the pre and post surveys. All survey results comparing the self-perceived networking skills of attendees at Grad Cohort 2013 therefore only suggest the trends in the opinions and attitudes of the entire community at the conference. Future studies should associate the pre and post survey responses with specific respondents, so that a direct comparison of attitudes before and after the conference can be obtained. Ideally the sample size for future studies would also be large enough to ensure statistical significance, although this is difficult to ensure, as it depends upon users’ willingness to respond to surveys.

- Data for this research were gathered primarily from two venues (SIGCSE and Grad Cohort). The networking behavior and opinions of attendees reported in this thesis apply only to those specific conferences. In order to get a broader view of the effect of
CONNECT on women and their networking characteristics, a wider range of conferences would need to be analyzed.

- The CONNECT social networks (has met, want to meet and messaging) are completely dependent on the usage of the system. No attempt has been made to analyze networking activities that were independent of the CONNECT system.

8.2 Recommendations for Future Work

This study has uncovered several interesting ideas related to how women network at conferences. Since many of these ideas fall out of the scope of this thesis, future study should be performed in order to obtain more information. Future work could include the following:

- A study of a conference where networking is not the primary focus (e.g., High Performance Computing, Robotics, etc.) would be beneficial. Ideally, the population would primarily consist of women students in order that a close comparison could be made to Grad Cohort.

- A study of a conference where the population primarily consists of men and women students would be beneficial. By comparing results from this type of study to the results of Grad Cohort, it would give an accurate comparison of how men and women network differently, especially at the graduate level.

- Future studies could examine more closely how the role of an individual at a conference influences their networking interactions with other roles. This research demonstrated that there could be some correlation between networking communities that are established and the roles of the individuals involved.

- A study examining the relation between geographical regions and networking activity could uncover additional information regarding what type of connections women students find relevant. This study showed that there was some correlation between geographical location and the networking activity of women graduate students. Do women take location into account when networking with others?

- A study could be done examining the effect of “look and feel” on the usage of a site. Does having a better looking webpage increase user activity? What aspects of the user interface make users feel most comfortable with using a site?

- Future studies should be performed on the usage of the Community and Goals Tools at different conferences. Are these tools used consistently with different types of attendees? Are some tips associated with the Goals Tool more effective than others? What goals did users choose to complete?
• Future iterations of CONNECT should examine the effect of a more complete mobile platform. User recommendations have indicated that having CONNECT on the mobile platform would be beneficial. Would it make a significant difference in the level of activity of attendees if a mobile version of CONNECT was implemented?

8.3 Summary

It is apparent from the results gathered that the CONNECT system was able to assist the women at Grad Cohort 2013 with making relevant connections and forming appropriate communities. In addition, the data provides a good description of which features in CONNECT are the most useful for users. These features should continue to be analyzed and improved upon as CONNECT continues to be deployed at future conferences. In general, it has been shown that technology can indeed be leveraged to assist women with networking at conferences. It is hoped that, by using this technology, women would feel more a part of the computer science community and the level of retention of women in the field would increase in order to meet rising industry demands.
REFERENCES CITED


APPENDIX
GOALS TIPS

Goal: I want to overcome my shyness

Prepare Tips:

- **Did you know**: According to Bernardo Carducci, director of the Shyness Research Institute at Indiana University, about 40% of all adults say they are shy. Shyness has three components: excessive self-consciousness, excessive negative self-evaluation, and excessive negative self-preoccupation.
- **Understand why you're shy**: What situations cause you to feel uncomfortable? What are you thinking in those situations? It may help to remember that the rest of the world is not watching and evaluating everything you think, do and say.
- **Identify your strengths**: You may not be the most gregarious person in the group, but maybe you can engage one other person in a stimulating conversation about a topic that's of interest to both of you.

Complete Tips:

- **Focus on other people**: As Dale Carnegie said, the best way to be interesting is to be interested. If you’ve just met someone, ask questions. What research areas does she think are interesting? How far along is she in her program? How does she manage her time?
- **Imagine being successful**: Close your eyes, relax, put on your favorite music, and visualize yourself being comfortable in a social setting. Tell yourself you are capable. Words have incredible power, thinking positive thoughts can have an impact.
- **Don't even try to be perfect**: Remember your goal is not to impress people, but to make connections. Don't compare yourself to others. Some people are naturally witty and engaging, but most of us just want to be accepted for who we are.
- **Practice, practice, practice**: Like all skills, improving social skills just takes practice. You may need to encourage/force yourself. Next time you're in a conference session or classroom lecture, turn to someone next to you and introduce yourself.
Goal: I want to network with my peers

Prepare Tips:

- **Things to consider.** Although networking may seem insincere or fake, like you’re trying to take advantage of someone, in reality networking done well benefits both parties.
- **Consider the other person first.** Networking is a 2-way street. Before you ask for favors or pursue your own goals, get to know the other person. Networking means building relationships; you need to be genuinely interested in the other person. If you’re not, don’t fake it! Find another person who shares more of your interests or has a more comfortable style.
- **Set reasonable expectations.** Talk to people you think are interesting, just to see what you can learn. Don’t expect that every contact will immediately have a positive result.
- **Be proactive:** make a list of people you want to contact.

Complete Tips:

- **Start with a simple conversation.** Find something to compliments. Focus first on being friendly and helpful. Everyone has some expertise to share. Be open and generous with your knowledge (but not pushy!), and you’ll often find people respond in kind.
- **Be a good listener.** If you’re not listening, then you’re not learning.
Goal: I want to be an active member of a community

Prepare Tips:

- **Help others make connections.** If you know two people who have similar interests, offer to introduce them! Maybe you've met two people who love to ski, or know all about birds or flowers, or just love to discuss the future of technology. You can introduce them (then they can decide if it's a relationship worth pursuing).

- **Broaden your network.** Don't dismiss anyone as irrelevant. Maybe HCI isn't really your field of interest, but at some point you may be building a new system and realize that's expertise you need. It will help if you already know someone in that area.

Complete Tips:

- **Make building your network a priority.** Set a concrete goal, such as contacting one person a day, or one person a week. Sending a quick email to keep in touch doesn't take much time, and having lots of connections can be very advantageous. Need someone with expertise in AI? Call Jane. You need someone who understands data mining? Here's Sally's email.

- **Learn the art of email communication.** If this is a new contact, keep the first email short. Most people are busy, and may be inclined to press delete when faced with a five-paragraph email from someone they don't know. People will generally be more receptive to a short email that starts with a brief (sincere) compliment such as: "I really enjoyed your talk" or "I read your paper on X."

- **Quantify how much time you're going to take.** Once you've established the reason for the contact (e.g., inquiring about a paper), clarify the scope of your request. One option is to specify the number of questions (e.g., "I just wanted to ask two questions about X"), another is to put an estimate on the amount of time (e.g., "I'd like to ask a few questions about X, it should only take about 10 minutes."). Even busy people are likely to say "OK" if they know the time requested is minimal.
Goal: I want to feel less isolated when attending conferences

Prepare Tips:

- **Think of easy questions.** A simple "May I join you" is often effective. Follow this with comfortable ice breakers, like "Where are you from?" or "What's your favorite part of the conference so far?"
- **Jump in.** You may be tempted to hold back when arriving at a social setting (e.g., a break between sessions, or a meal). But if you wait until most people are already in groups, it may feel more awkward to join in. It's better to arrive at the beginning of the event and find someone to talk to.

Complete Tips:

- **Smile.** If you look approachable, others are more likely to come over to talk to you. And the act of smiling will help calm your nerves.
- **Don't overcompensate.** If you're uncomfortable in social settings, you may think you have to be the most charming, engaging person to be successful. Sometimes this leads people to hijack conversations. A better approach is to really listen to what others are saying, and join in appropriately.
Goal: I want to find a mentor

Prepare Tips:

- **Know the benefits of having a mentor**: A mentor has experience that directly or indirectly relates to your situation. A mentor can tell you what to expect, provide encouragement, give advice, and help you learn the ropes.

- **Figure out what you want**: Write down a list of what you want to learn or what you need. A mentor will be much more receptive if you are specific, and thinking about what you want will help you find a more appropriate mentor.

- **Find someone**: A mentor is typically someone who already does what you want to do (e.g., if you want to pursue a graduate degree, find someone who has a graduate degree; if you want to work in a particular field, find someone who works in that field). You can use the search functionality in CONNECT to find people who share an interest in your field of study.

Complete Tips:

- **Start small**: Mentors tend to be busy people. Don’t just ask “will you be a mentor?” The first step is to get to know the person, to determine whether you are compatible and have similar interests. Start with a general conversation, then ask whether they have time to answer a few specific questions.

- **Be open to alternatives**: Sometimes people are too busy to be a mentor, or maybe you just don’t “click.” Don’t be discouraged, just look for someone else. Remember that lots of people can be mentors, even peers or colleagues who are only slightly ahead of you.

- **Establish a relationship**: Mentoring relationships evolve over time. It’s up to you to take the initiative. Along the way, think about qualities you have that would encourage a mentor to invest time in you. Are you creative? Have strong analytical skills? Able to write in a compelling fashion? How can you put those skills to use for your mentor, so that the relationship is beneficial for both of you?
Goal: I want to describe my research to a peer

Prepare Tips:

- **Why is this important?** In any endeavor, it's good to be able to describe succinctly what you're doing. In a business setting, you might focus on how you're contributing to the bottom line. In a research environment, you should think about your contribution to the field. It takes time to really understand your contribution, and the process of describing your research interests will often lead to new insights. The person you're talking with may have even information that will be useful to you!

- **Learn what makes a successful elevator speech.** Your 30-second elevator speech is the hypothetical pitch you give to a "rich executive" who meets you in an elevator and offers you millions of dollars if you convince her that your research is worthwhile. When developing your elevator speech, you should consider your audience, your own skills, what problem you want to solve, what you want from the listener. Write it down! A successful elevator speech should be no more than 90 words long.

- **Practice your elevator speech:** So you've figured out how to describe your work in a concise way, but does your speech have impact? Practice saying it aloud. Does it excite you? Would it excite someone else?

Complete Tips:

- **Be ready to respond to anyone:** A common conversation starter is to ask the other person what they do. If someone asks you, take this opportunity to confidently describe your work and why it is exciting for you. Then pay attention to how the other person responds and what questions they ask. (If they change the subject immediately, maybe you need to work on that speech!)

- **Ask them first:** Ask other people what they do, and listen to how they describe their work. You may be able to polish your elevator speech by listening to others, and they'll often reciprocate by asking the same question.
Goal: I want to share a paper with a peer

Prepare Tips:

- **Find your shared passion**: It's the best feeling in the world to discuss your passion with someone who is equally as passionate about the same thing. Keep an eye out for those people who appear as excited about your interests as you are.
- **Find a good paper**: If you have already read a paper that you would like to discuss, great! If not, find a paper, presentation, or lecture that gets you excited. Make a list of points you want to discuss or even how you would expand on the work. Planning ahead will keep you informed on the subject and can lead to a very natural discussion with someone else.

Complete Tips:

- **Ask if the other person is interested**. Even if the two of you share the same research interests, you might want to check before sending a paper. A simple message saying something like: "I read this paper on X and was reminded of our conversation, would you like a copy?"
- **Share the paper**. Obtain a digital copy of the paper, and email it to the other person. You may want to elaborate (briefly), such as "I think the methodology used in this study might apply to the research we discussed" or "there's a really novel approach to solving problem X."
- **Follow up**. If you are on the receiving end of the paper, it's good to follow up. At a minimum, a simple "Thanks for the paper" is in order. Time permitting, continuing the conversation with a brief comment about the paper will help to cement your relationship.
Goal: I want to describe my research to a faculty member

Prepare Tips:

- **Find someone in your field:** When describing your research to a faculty member, you may want to ask them for any resources, advice, or suggestions they might have on your work. This guidance will be most valuable if the faculty member is knowledgeable about your field of study. Do some research on the work he/she has done in the past, and see if it applies to your topic area. If you can't find someone doing research directly related to your research, you may be able to find someone who could recommend a faculty member to you.

- **Know your expectations:** When approaching a faculty member to describe your research, it is important that you know what you want or need from them. On the other hand, think of ways you might be able to benefit the other person. Could you involve them in the research? Could you contribute to their field in a significant way? People are much more willing to help when they know there is something in it for them.

Complete Tips:

- **Introduce yourself:** One of the easiest ways to start a conversation with a faculty member is simply to introduce yourself. Rather than jumping right into your research, asking how the faculty member is doing gives them a chance to converse with you before you tell them more about your work.

- **Be considerate of their time:** Faculty members are often busy and it is important to respect their time. Before diving into a description of your research, you should ask if now would be a good time. If not, let them pick a time that is more convenient for them.

- **Don’t take "No" personally:** People sometimes won't follow up on a connection simply because they afraid of imposing on the other person's time. What do you have to lose if you contact someone? The worst that could happen is that they say "no" or ignore your request. If they do, just realize that everyone has limited time, so don’t take it personally. And remember, if you don’t hear “no” once in a while, you aren’t asking enough!
Goal: I want to follow up with someone I met after the conference

Prepare Tips:

- **Get contact information**: Following up with someone after a connection is probably one of the most important things you can do. Make sure that you have some way of contacting the person so you can continue the connection!
- **Personalize the connection**: When following up with someone, take some time to evaluate your connection with them. Are you asking them for help with your research? Did you meet a new colleague and friend? Approach the follow up appropriately for each different type of connection.

Complete Tips:

- **Nurture your relationship**: You've done all the work to make this connection. Don't let it slip away! Next time you see the person, make a point to greet them and even have a short conversation. If you don't have contact information for someone, send them a message through the CONNECT system and make sure you can contact them in the future.
- **Show your interest**: People aren't likely to stay connected if they don't think the other person is interested in keeping in touch. Show that you are interested! If they provide advice or leads, follow up on them, then send a quick update (e.g., "Hey, thanks for telling me about X's work, I've read a couple articles and they seem very relevant.").
- **Honor the networking code**: If you want others to return your phone calls or emails, you need to do the same. And remember that, just as people are helping you, it's important for you to help others. If you've successfully completed qualifying exams, reach out and help others do the same.
- **Get involved in something real**: Sometimes the best networking opportunities involve working together on something. Research is a collaborative effort, start to make those connections as soon as you can.
Goal: I'm new to networking; I just want to get started

Prepare Tips:

- **Set realistic, achievable goals.** When you prepare to attend an event, set specific goals. Maybe you want to find out a specific piece of information, such as whether it's harder to balance work/family life in academia or business. Maybe you're trying to figure out a research interest, and your goal is to ask at least 5 people about their research topics.
- **Go with a friend.** Social events are often more comfortable if you know at least one person. If you're at a conference with people you don't know, try to form a quick bond with your roommate(s). Then you can start out the event together (but don't stay together the entire time!)

Complete Tips:

- **Don't apologize.** Asking for someone's time is not an imposition (as long as you're considerate about what you're asking).
- **Say the person's name.** People like to hear their own name, and it will help you remember it, too.
- **Do the other person a favor.** The other people in the room may feel just as awkward as you, so do them a favor and start a conversation. Remember that networking is just another term for forming valuable relationships. So take the pressure off yourself to “network” and concentrate first on just talking to as many people as you can.