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Informatics 380: Information Systems Analysis and Design
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Final Proposal for UW Dream Project Mentee Intake System

Client Identification

We have been working with the UW Dream Project and our main contact is Jenee Myers-Twitchell (myersja@uw.edu), but we have also been in contact with other members of the organization. Amelia and Christina have both volunteered with the Dream Project. Amelia is transitioning to be in the high school lead position starting spring quarter.

After speaking with various people involved with the Dream Project, we understand the UW Dream Project to be an organization committed to helping first generation and low-income high school students attain a higher education. Dream Project believes that the power of education promotes empathy in students for those who have not been given the same opportunity as they have.

Students who are involved with the UW Dream Project help high school students prepare for college in many ways, such as conducting orientation meetings, getting high school students involved in extracurricular activities, helping select possible college options, prepare for SAT/ACT tests and more. Later on in the process, Dream Project mentors will assist high school students in filling out college applications, writing personal statements, submitting application for scholarships and financial aid, and all of the other final steps required to attend the college to which they are accepted.

High school student information must be added to the Dream Project database (DreamSIS) to track the progress of the students being mentored. Dream Project uses this information to continue to receive funding and grants.

Currently, the process of adding the high school students to the database varies between high schools and is not very efficient. The UW student mentors give the high school student a form to fill out, called an intake survey, and the mentors then give the completed survey to the high school lead for that high school. The high school lead is a UW student who manages everything that happens with that particular high school. After getting the survey back, the high school lead must input all the data by themselves. Sometimes not every part of the survey is filled out, the student handwriting is illegible, or the form gets lost and the student's information never makes it into the database.

Our goal is make the intake process the same for all high schools and students so that the forms will be standardized and easier to process by the UW Dream Project database and staff.

System Context Description

The system context description was written after asking several questions about the system as it currently exists and the other systems and regulations that affect the mentee intake system. Below are the answers to our questions and the analysis we performed using that information.

Who are the system's users?
"I would say our customers fall into 4 categories: Mentees, mentors, program staff/ leadership, and community volunteers. Mentees actually don't interact with DreamSIS at all at the moment, but they are affected in that DreamSIS affects a mentor's ability to work effectively with that student. Mentors are our largest customer: they are the ones using DreamSIS to keep track of all the data about their students. There are the program staff and leadership that use the data in DreamSIS to make decisions about the program and have information about the work we're doing. And finally, we technically use DreamSIS as an RSVP system for external volunteers as they come to FAEs and CAEs (events at high schools)."

Our Analysis:
Dream Project primarily utilizes this system, but it is also used by the high school students. The people within the Dream Project that utilize the system are the student recruiters, mentors who need to gain information about their mentees, and high school leads who manage all aspects of their respective high school's visits. These people all contribute to the overall mission of the dream project, that is to get more kids into college and to raise awareness among university students about the issues of educational opportunity and and social mobility. There are no customers, since Dream Project is a non-profit organization, however, the people they are helping with their efforts are first-generation and low-income high school students in the Seattle area who are trying to get into college.

What is the purpose of the intake system?
"The intake survey allows us to get them [mentees] into the Dream System, and I would say it's how we initialize our work with our mentees. We need accurate first names, last names, and birthdates so we can sync up with the National Student Clearinghouse to see where our mentees are going to college. Mentors also need emails and phone numbers so they can accurately contact their mentees."

Our Analysis:
The system's core purpose will be to successfully and efficiently transmit information from the high school student (mentee) to the mentor. This system will manage all information relevant to the student. This includes, but is not limited to, high school grades and classes, extra curricular activities, schedule, personal interests, potential college interests, SAT/ACT preparation information and scores, college application statuses and scholarship/financial aid statuses and more. These are the core pieces of information about the mentees that will allow the mentors to better help them get into college: the core value of this organization. The business process that is supported through this system is communication between mentors and mentees, which is currently the intake survey.

What industry and legal regulations apply?

“The Federal Educational Records Protection Act protects all student data we work with. It needs to be that only the people who need to see the information can see the information, that's the biggest part of FERPA. Educational data can't be stored anywhere outside DreamSIS (such as Google servers, email, etc.) as it's accessible by others.”

Our Analysis:
FERPA (Family Education Rights and Privacy Act) is an industry which may potentially regulate features of the system involved in the Dream Project. The system that our team is specifically targeting will not be majorly affected by FERPA, however its rules and regulations will still need to be considered when redesigning the system.

What software and hardware are you currently using?
“Software is 100% a Ruby on Rails project, with external dependencies bundled as "Gems." The source code is available at http://github.com/uwdreamproject/dreamsis. It is hosted through Amazon Web Services as a distributed application, we currently have three application virtual servers, two database virtual servers, and a haproxy load balancer.”

Our Analysis:
DreamSIS uses custom software written by Matt Harris, one of the founders of the Dream Project. The system is currently maintained by UW student Mitchell Harper. This information is not directly relevant since we are not re-writing any code, so all of the back-end software will remain the same.

What other systems does the mentee intake system interact with?
“It [the system] runs in the aws-west-2 data center, as part of Amazon Web Services (many apps worldwide are run here). It interacts with a status monitoring service to give status updates at uwdp.dreamsis.com.”

Our Analysis:
The system we are changing acts primarily between the students and mentors, so there are not lots of opportunities for system information transfers. The main separate system interaction for this system would be with UW technology systems and other Dream Project systems currently in place. The other systems that our system relies upon are those that are already in place by the mentors to receive information from the high school students. Other mentors have developed different systems for each high school that they have mentees attending. These separate systems are not necessarily digital, yet they still have lots of room for error and therefore need to be considered.

Do you use existing IT infrastructure?
“That's all managed through Undergraduate Academic Affaris, and there's not much to write home about. We have 6 workstations and printers, but that's really about it. We have various services we interact with such as dropbox, google docs, and smartsheet to manage the program, but they don't relate to mentee data. All mentee data goes through DreamSIS. We do interact with the National Student Clearinghouse to figure out where our mentees are going to college, and it's crucial as I said to have accurate birth firstnames, lastnames, and birth dates for each student.”

Our Analysis:
The biggest common technological infrastructure is UW-IT, which is used by students, mentors, and staff. Users must have a NetID to authenticate sign-on, so there is already a single sign-on authentication service in place. The organization already uses database servers as well.

Problem Statement

Dream Project mentors have expressed a variety of concerns with DreamSIS.. This system tracks information about individual students involved in the Dream Project, including college application progress, extracurricular activities, and scholarship/FAFSA completion status.

Costs associated with continued use of the current system:

One of the main complaints regarding the current system is that it can be an extremely tedious, confusing, and time consuming process. As a result, many mentors feel unmotivated to enter student information into the database. This is clearly an issue, because Dream Project's ability to receive funding relies on this data collection.

The root problem:

The format of the current data entry system is unmotivating and makes it difficult to accurately enter all necessary information for particular students. This issue is a result of many problems associated with the data collection and entry process. As a result, current and accurate student information frequently does not make it to the database.

The most common data collection process currently facilitated by Dream Project mentors involves mentors giving their mentees paper surveys with a variety of questions about their interests, progress, and plans for the future. The students are asked to fill out these surveys and return them to their mentors. Students often forget to give their mentors their filled out forms. When they do, they sometimes leave out important information and have difficult-to-read handwriting, making data entry even more complicated.

There are even more problems introduced once mentors actually receive student surveys and try to enter them into the database. Sometimes mentors don't know whether a student still needs to be added to the DreamSIS database; this is often caused by mentees joining late or having poor attendance.

FERPA also creates limitations involving admin access. Only high school leads have admin access, and thus are the only ones who can initially enter students into the database. High school leads are also responsible for assigning mentees to their respective mentors, which can be frustrating since many mentors have expressed a desire to be able to assign their own mentees. Mentees can only be entered into the database one at a time, becoming a frustrating and time consuming process for high school leads. Once mentees are added to DreamSIS, encouraging mentors to keep their mentees information current is often difficult since mentors are often discouraged by the complexity of DreamSIS.

Benefits associated with designing a new system:

Data entry is essential for the Dream Project to continue operating as it does. A new system could seek to simplify this process for mentees, mentors, and high school leads. As a result, less time would be wasted making sure all mentors are staying current with data entry, so more time could be spent working with and preparing to work with mentees. An improved data entry system could also allow Dream Project to more easily perform data analysis. This would make it easier for the Dream Project to receive funding as a result of reliable and standardized data that would be better trusted by potential donors. The success of a new system would be measured by an increase in the number data fields filled out in data entry forms and less time spent entering data.

Scope of the Project

We will not be installing new hardware or database platforms to store the mentee information, instead we are performing an analysis on what is already in place and how it can be improved given the analysis.

We will:

- Evaluate how mentee information is entered into DreamSIS: observe the current process and identify where miscommunications and/or errors are occurring.
- Identify key goals accomplished by the current system, and what we want the new system to accomplish.
- Identify direct and indirect stakeholders and what their values are with regards to the system.
- Identify constraints to the solution such as high costs of implementation, and laws concerning the access of information such as FERPA.
- Develop an alternative method to store mentee information in DreamSIS based on the goals of the organization, values of stakeholders, while still taking into account all constraints on the system.

Stakeholders

Direct Stakeholders

Mentees:
Mentees are the high school juniors and seniors receiving help with the process of graduating high school, making post-high school plans, and taking steps to reach these goals. Mentees currently interact with a paper-based data collection system and a change in this system would affect how they provide their personal information to the Dream Project.

Values, motivations, and concerns:
Mentees are primarily motivated to get into college. They are trying to manage college applications, FAFSA submission, and scholarship applications to make it possible for them to attend college. They are often daunted by the college admissions process, and they don't want the Dream Project process to be any more complicated than it has to be. They want it to be easy to provide their information with the least amount of duplication of data collection possible. They are relying on their mentor to contact them, so they also care that the information that makes it into the system is accurate. The current system requires them to write down their information on a piece of paper, which is fine with the mentees.

Mentors:
Mentors provide assistance to mentees in the post-high school planning process. They are both responsible for soliciting information from their mentees and entering this information into the DreamSIS database. They are responsible for actually acquiring information and populating the database and any change in the system would directly impact the way they do this.
Values, motivations, and concerns:
The mentors are the stakeholder group that interact most frequently with this system.Their job is to collect information from the mentees and make sure it gets put in the system accurately. They rely on accurate information, because the answers to the questions on the intake survey directly affect the way they interact with their mentee and the types of recommendations they make. They are frustrated with the current system because it is tedious and feels like a waste of time to manually enter the data from the paper surveys. The manual entry also creates problems for accuracy,because it can be difficult to read the handwriting on the surveys and it is easy to make a data entry error. This is the main way this system is currently falling short for the mentors, particularly because they need that information to be correct. The mentees have all developed their own individual system for interacting with their mentees, so they want the system to leave room for them to use it in their own way once the data is entered.

High school leads:
High school leads organize the interactions between mentors and mentees at their designated school. They are responsible for assigning mentees to mentors in the database since FERPA currently restricts mentors from doing so themselves. They are also responsible for ensuring that mentors are up-to-date with data entry and maintaining the correct status of mentors and mentees in the database.

Values, motivations, and concerns:

The high school leads are responsible for managing all aspects of the high school visits and managing the mentors. They work with the database to assign mentees to mentors and they are responsible for making sure the data in the database is accurate and up-to-date. They are required to follow FERPA regulations. High school leads are also the first line of complaint if things don't go well, so they want for their mentors to be happy with the system and for there to be as little error as possible. For them, the biggest problem with this system is the slow and inaccurate method of collecting and inputting data.

Dream Project staff:
This group of stakeholders refers to all who work directly as part of the Dream Project at the University of Washington but do not necessarily visit high schools themselves. They are responsible for acquiring funding, recruiting UW students into Dream Project, and overseeing Dream Project events. Since acquiring funding for the Dream Project is a large part of their job, they have significant interest in the state of data being stored about mentees. They interact with the system primarily through data analysis.

Values, motivations, and concerns:
The staff of the Dream Project are particularly motivated by the Dream Project mission statement and values - to help more students get into college and to raise awareness among university students about the issues of educational opportunity and social mobility. They want to see good numbers and total FERPA compliance.One important way that they track the number of students from the Dream Project who go to college is by comparing their lists with the National Student Clearinghouse database. For this, they need accurate student first names, last names, and birthdates. They need accurate numbers so they can show those to potential donors as a sign of the need for and success of the Dream Project. Dream Project staff are also operating under a limited budget and need the project to cost as little as possible.

<u>Indirect Stakeholders</u>

University of Washington as a whole:
This refers to UW administration that does not participate in Dream Project directly and to UW's reputation. UW receives notoriety for success in programs like the Dream Project and would be interested in the success of a program that brings positive attention to the University of Washington.

Values, motivations, and concerns:
The University of Washington partially funds the Dream Project, so they want to see that their money is being put to good use. They rely on success statistics, which again requires accurate data and tracking of students.

Program donors:
Although they do not interact with the database directly, they see the results of database analysis done using DreamSIS. They may base their decision to fund or continue funding Dream Project largely (or completely) off of DP's ability to show tangible effects of their presence on high school students. The data they may be interested includes but is not limited to: number of students taking the SAT, number of students applying for FAFSA, and number of students attending colleges or similar institutions post-high school.

Values, motivations, and concerns:
Program donors are interested in seeing data such as the number of students in the Dream Project taking the SAT, applying for FAFSA, or attending college. This affects their decision

about whether and how much to donate to this program. An effective mentee intake survey is an important first step in providing these important statistics.

High school staff (teachers and administration):
They do not currently interact with the system, but interact with mentees and possibly Dream Project administration to ensure the program is running smoothly and successfully. It is important to take high school staff into account because they may fear that a changed system would give them the burden of extra work. However, an improved system could make their job easier by limiting need for damage control since it would potentially be easier for students to be self-accountable.

Values, motivations, and concerns:
They are motivated by the Dream Project values, but also want to avoid taking on extra work that they don't have time for. Many of them fear a change in any system because it often requires additional training and damage control.

Requirements

Highest Priority:

- **Hassle free system of providing mentee information.** This requirement ensures that mentees will be encouraged to easily input their information into the form for the mentors to help them.
- **Ability for mentors to easily collect mentee information.** This requirement ensures that the mentor can easily collect information from the mentee.
- **Ability for mentors to easily input mentee information, edit mentee information, and add additional mentee information** (activities, FAFSA completion date, colleges applied to, etc.) This requirement ensures that the mentor can access mentee information later on to edit or update the information to keep it consistent.

Medium Priority:

- **Accurate personal mentee information in database.** This requirement is to maintain consistency and accuracy of the inputted information about the mentee.
- **Ability for high school leads to easily assign mentees to mentors**. This requirement is to enforce the proper assignment of mentors to mentees, as well as to make the process more efficient and smooth.
- **Ability for high school leads to ensure mentors are able to do their jobs.** (inputting and updating mentee information.) This requirement is more for high school leads to track mentor progress throughout the process, not as much for the actual mentees and mentors.

Lowest Priority:

- **Mentee privacy protected.** This requirement ensures that the mentee information will be private and secure. This requirement is not as important to the mentee since they are providing their information to so many different organizations, however it is still very important to us as systems designers so as not to violate any FERPA regulations.
- **Assurance from Dream Project staff that all information in the database is up to date and reflects the impact Dream Project is making** - show donors that Dream Project is effective. The dream project staff is the overarching term for everyone involved in the system but who do not directly interact with the mentees. They still need to be updated on mentee data and progress.

Behavioral Analysis

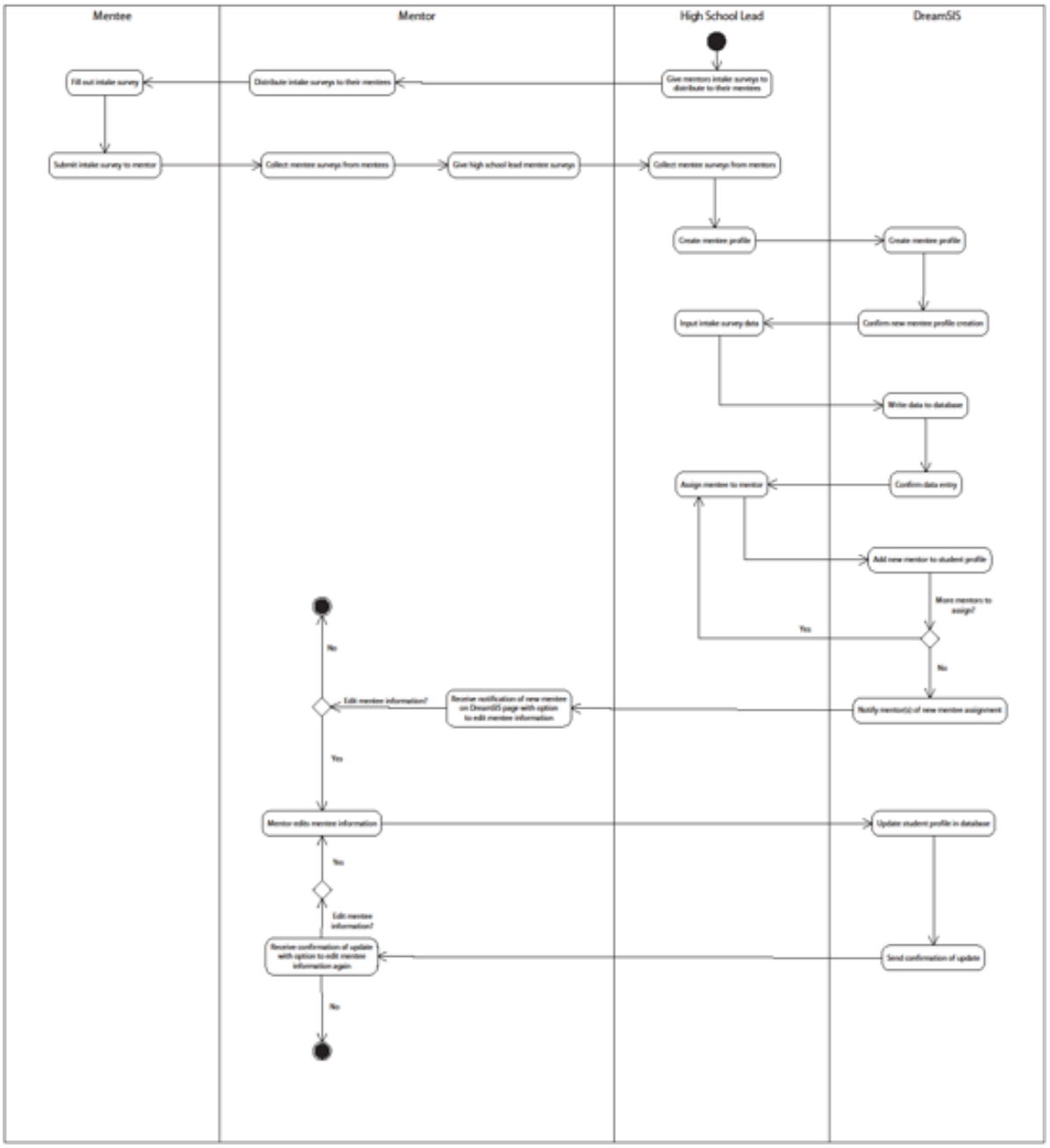

Figure 1: Existing Activity Diagram

Behavioral Analysis:
An inefficiency that is immediately visible when looking at the activity diagram is the number of times the intake surveys and the mentee information changes hands before being put into DreamSIS. High school leads must give the intake surveys to mentors, who will give the surveys to mentees, who will fill them out and then give them back to their mentors, who will then finally give the surveys back to their high school leads. The high school leads will then enter all the information for each mentee form the intake surveys. Allowing the information

to change hands so many times is a problem because intake surveys could get lost along the way, meaning information on that particular mentee might never make it into DreamSIS.

Another huge issue that was brought up by many high school leads is that the paper-based system leads to a huge amount of error. It is very difficult for the high school leads to read the handwriting of mentees at times, meaning the information being put into DreamSIS could be unreliable. Having a paper based system also leads to the issue of the mentees not fully completing the forms. Often the mentees leave many answers blank for one reason or another. This is not a critical problem, but it is better to have more information on each mentee.

As shown in the screenshots attached, the order of points on the intake survey does not match the order of points on the online form that the high school leads fill out for each mentee. This creates the difficult task of finding the answer to each question on the input form somewhere in the intake survey. If one chooses to enter the information on the intake survey in order, they must scroll up and down through the input form to find each blank to fill in. This makes the task of inputting mentee information take much longer for high school leads to complete than it would if DreamSIS's dataform were organized such that it mirrored the order and layout of the intake surveys.

It is also clear from the activity diagram that the process of pairing mentors and mentees could be made more efficient. Currently high school leads can only assign mentees to mentors one at a time. Meaning if a mentee has multiple mentors the high school lead must assign each mentee to each individual mentor. At schools with around 200 mentees and 40 mentors this task gets extremely tedious and time consuming.

Behavioral Suggestions:
Our first proposed change is to allow mentees to directly their own information into DreamSIS. Mentees at many of Dream Project's partner high schools are provided with their own laptops or visits take place in computer labs. Since mentees have this technology access, it is possible for them to log onto DreamSIS under the supervision of their mentors and put their information into the input form directly, eliminating the need for high school leads to do so. This system eliminates the process of passing the intake survey from the high school leads to the mentors to the mentees and back again. In addition, the error due to not being able to read handwriting would be completely eliminated since the mentees would not have to write anything down. Their information would be input straight into DreamSIS, there would be no chance for any errors due to changing hands to occur.

The biggest improvement that would be seen using this system is a huge time saver for high school leads. They would no longer have to painstakingly enter all the information for every single mentee by hand. The elimination of the intake survey also takes care of the problem of the intake survey not matching the input form on DreamSIS. This is the ideal scenario. However, there are still some schools at which mentees do not have computer access. At these schools, the high school leads and mentors would still need to use the paper intake survey system. To optimize this version of the system, we propose changing the order of the questions asked on both the input form in DreamSIS and on the intake surveys. Modifying the orders on both forms would allow for the order of information to be input to be the same on each, so that it wouldn't require having to scroll up and down through the input form to find the information desired. It would also allow for putting the information that is most critical to be input at the top of the intake survey and input form. The information that is least critical could be put at the bottom. This would ensure that the mentee information that Dream Project most needs will be provided.

Finally, we also propose a system that will optimize assigning mentees to mentors. Instead of assigning one mentee to one mentor at a time, high school leads should be able to select all the mentees for a particular mentor at one time and assign them all at once. This would eliminate the mammoth task of assigning 200 mentees to 40 mentors.

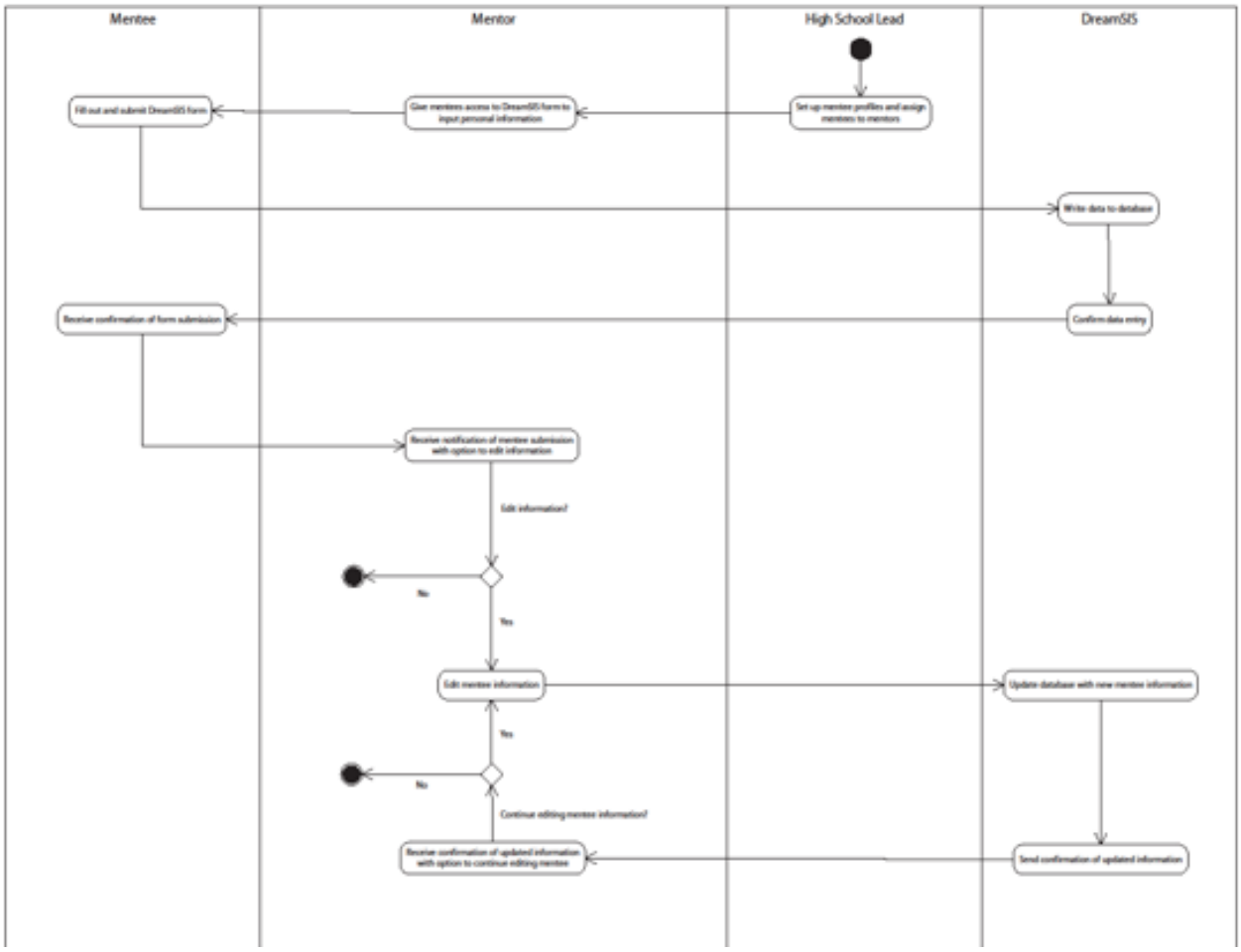

Figure 2: Suggested Activity Diagram

Structural Analysis

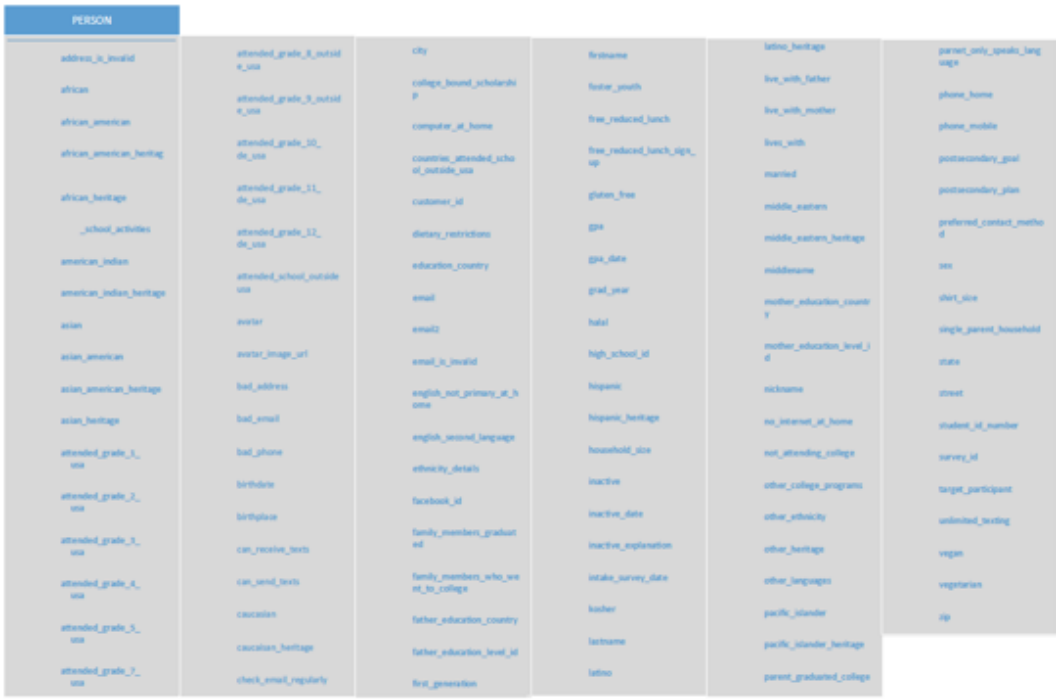

Figure 3: Existing Entity Relationship Diagram

Structural Analysis:
The DreamSIS database has several tables that track information about high schools, visits, and other aspects of Dream Project organization. All of the information about mentees, however, is stored in this person table. The person table has other attributes that are not relevant to mentees, and those have been removed from the above diagram for clarity. This is the first major problem with the DreamSIS database structure. There are several types of people (mentees, mentors, high school leads, and other staff members) that have very different attributes and roles. This makes the Person table hold too much information and do too much work. It also requires any software that is written to go with the database to determine what type of person is being described in each record.

When different people are split up into different tables, the mentee table still holds too much information. Certain types of attributes on the mentee intake survey (such as race) are restricted to certain values and would be good candidates for enumerations. There are other groups of attributes (such as family education history and whether the mentee's education has been outside of the United States) that would be better to group in their own tables.
Unfortunately, we talked to Mitchell who is involved with the database, and there are too many stored procedures and existing database objects that use the database as it is for it to be feasible to change the location of these particular attributes. We understand that Dream Project is a non-profit with a limited budget and are recommending limited structural changes.

Structural Suggestions:
The biggest suggestion we can make for clarity and performance is to use inheritance to make user a supertype, with mentee, mentor, and high school leads all being subtypes. This allows the information that is important regardless of the person's role to be stored in the

user table, while each of the subtypes have only the attributes that are important to them. This will make it easier to write applications using the DreamSIS database in the future and improve database performance. It also requires only minimal changes to the existing functions and database objects.

Below is an example of what the new structure would look like. The attributes have been truncated in this version for readability, but we have included the full version as an attached document. The mentee table will include all of the attributes in the structural diagram in the above section. The mentor and high school lead tables will include only the attributes that are relevant to those roles. Exactly what those attributes are is outside the scope of our knowledge for this project.

For future projects, we suggest making race/heritage its own table with an enumeration to restrict values for race and write-in text value for heritage. We also suggest making education outside of the United States its own table. Another candidate for its own table would be family educational history. These would make updates faster and groups together relevant information, reducing the need to comb through the entire database.

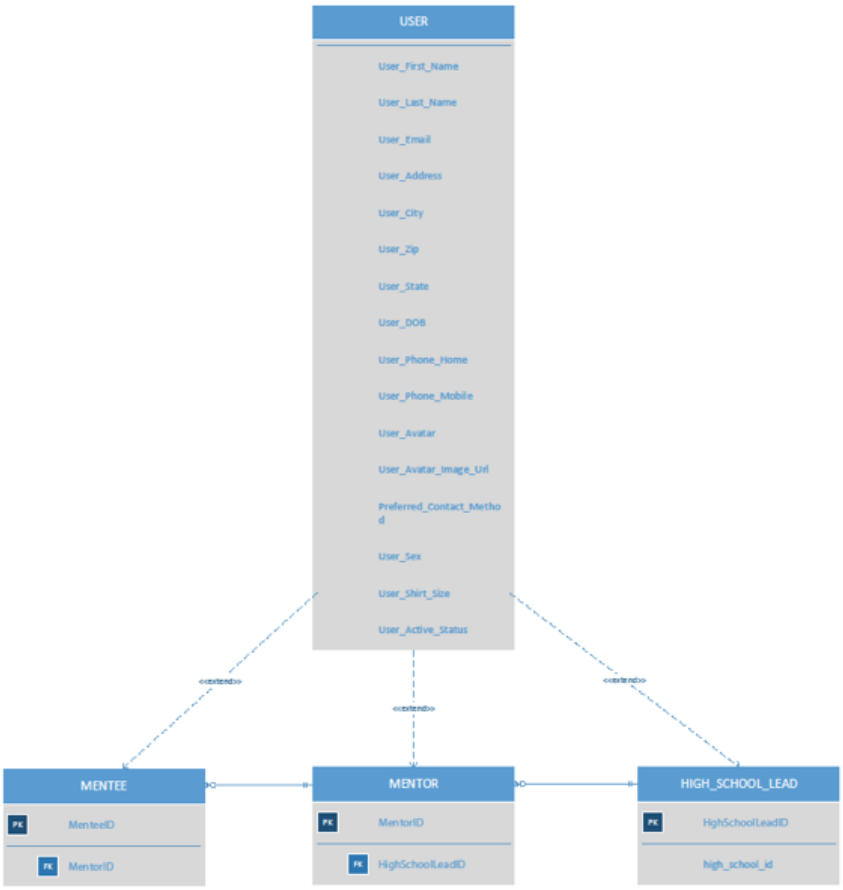

Figure 4: Suggested Entity Relationship Diagram

Security Analysis

People who use this system are generally authenticated by signing on through the UW single sign-on service. By signing on through the UW single sign-on service, the system gains access to who they are with the user's name, address, current status within the UW and any other affiliations that may be associated to their UWNetID. Additional information of this nature may include the user's current class schedule if they are a registered student, as well as current or past job statuses and wages. A user may also sign in using their Google, Facebook, Twitter or LinkedIn information. The system gains similar information about the user through the relevant information provided by these separate sign-on services. Because of this, no users are allowed to not be authenticated before accessing the DreamSIS database.

After being authenticated the system also knows what level of access the user has. If a UW student is a Dream Project mentor, they have access to their high school page and their list of mentees. Admins have access to every school and their mentors as well as all the event sign up pages. High school leads have specialized access for their particular school which allows them to create mentee profiles and assign the mentees to their respective mentors.

To do anything on DreamSIS, every type of user must be authorized. In order to sign up for events, community volunteers must obtain authorization through any of the providers listed besides the UWNetID. In order to sign up for events and edit their mentees, mentors must be authorized. In order to create events and view and edit any other information about mentees, all admins must be authorized. High school leads must also be authorized before they can make any changes to their specific high school groups.

STRIDE Analysis of Possible Security Threats

Spoofing:
Currently, it is possible to log into the DreamSIS system with a Dream Project mentor or high school lead's UW netID and password, or other password based authorization. Mentors and high school leads do have a significant amount of power in how data about their mentees is stored. Thus, if someone could hack into the mentor or high school lead's myUW account, they potentially would be able to change data regarding students in that individual's school or mentor group. It would be possible to impersonate the mentor or high school lead simply through being able to access to myUW credentials. Of all the possible threats to the system, this is probably the most likely **very likely**.

Tampering:
Modifying resources without authorization is likely not a huge issue for this system. Authorization is strictly enforced in DreamSIS since Dream Project has to follow laws like FERPA. Because of this, it is difficult to see resources that are out of your authorization level. Mentors, mentees, and high school leads all see different information when they log into DreamSIS, and their access level is strictly enforced. It's not possible to tamper with the system unless they are compromising the security of the system in other ways, like spoofing. However, since DreamSIS is accessed online, a hacker could possibly find other ways to access the data that is, for example, flowing over an open network. Overall, this security breach is **not likely**.

Repudiation:
Since every change a user is allowed to make to DreamSIS requires a login, in most cases, it's easy to trace who is responsible for making changes to the database. For example, a mentor would never be accused for tampering what school a mentee is assigned to since they do not have authorization to assign mentees to schools. It would be clear that the high

school lead at that respective school was responsible. All actions in DreamSIS require login, so there are tracks left to every change made in the database. It is impossible to cover one's tracks because of the importance of authentication and authorization level in DreamSIS. Thus, repudiation is **not likely**.

Information Disclosure:
DreamSIS contains a large amount of sensitive data protected by FERPA. Thus, confidentiality is extremely important and authorization is strictly enforced. Although it is difficult to breach DreamSIS's security itself, it is possible that its users could leak information through other means, such as taking screenshots of mentee's personal information and sending this information in non-secure ways. This would not involve a direct compromise of the system. Rather, it requires a breach in trust among the system's users. However, especially considering the fact that information disclosure can be unintentional and a result of users not fully understanding the level of sensitivity DreamSIS possesses, this security breach is **likely**.

Denial of Service:
This is not likely since DreamSIS is so secure and authorization is required to access the site in any form. However, it is potentially possible for users within the system to deny service to those with a lower authorization level. Again, this is a breach in the trust of the system's users rather than the system. It would be difficult for outsiders to do this, or even have the motivation to do it in the first place. Thus, this security breach is **not likely**.

Elevation of Privilege:
Again, since DreamSIS is fairly secure, it would be difficult for a user to infiltrate the system and do this without also employing another form of STRIDE security issues, particularly spoofing. However, if a hacker could successfully spoof their identity and log in as an administrator, they could potentially elevate privilege of users in the system by incorrectly giving a mentor the privileges reserved for high school leads, for example. However, this is unlikely since the motivation to do this is low. Even if someone is interested in gaining access to data in DreamSIS, they are unlikely to be motivated to elevate someone's privilege since this is likely to get noticed. Clearly something is off if a mentee suddenly has the same permissions as a mentor, for example. This makes elevation of privilege **not likely**.

<u>Mitigation Strategies of Security Threats</u>

Spoofing:
DreamSIS already leverages the University of Washington single sign-on authentication service, which handles authentication in the most secure way. Even spoofing is the most likely form of attack, DreamSIS is already adequately protected against them. If certain actions require greater security, the Dream Project could choose to use digital signatures as a way of making sure that the person making changes to the database is who they say they are and to verify that the transaction hasn't been tampered ith in any way.
Tampering:
The best way for DreamSIS to guard against tampering attacks is to make sure that any data flowing over an open network is encrypted so that it can't be intercepted and changed along the way. DreamSIS is already using strict authorization measures to ensure that personal information is kept safe under FERPA regulations. Mentees, mentors, and administrators all have different permission levels, so they are not able to tamper with information outside of their authorization level.

Repudiation:

Since no actions within the DreamSIS database can be made without authenticating through the University of Washington authentication service, there is a record of each user. Their actions are logged and those logs should be audited to determine that no abnormal activity is occurring. A user should not be able to claim that they did not perform a particular action, because it is contained in the log. This is not a likely attack, but if it becomes more of a concern, implementing a digital signature requirement would help safeguard against this as well.

Information Disclosure:
To prevent information disclosure by outside parties, it is important to make sure that any place the private data is stored or transferred is encrypted. DreamSIS itself is protected, but it is also important to train employees and volunteers about the sensitivity and importance of this information. They need to understand that the data can only be stored in certain ways, and should not be stored in an unencrypted format on their own devices or in a non-FERPA compliant cloud service such as Dropbox.

Denial of Service:
This is probably the least likely form of attack, but if it becomes a concern, DreamSIS can implement filtering and throttling measures. If large numbers of requests and data are coming through, those requests can be throttled down to the speed at which the database can process them. This may slow down valid requests during peak times, but will prevent users from flooding the database with useless requests. DreamSIS already requires users to authenticate, so anyone attempting a denial of service attack would be quickly discovered and dismantled. Denial of Service attacks are also low-priority because they do not result in the release of sensitive information.

Elevation of Privilege:
DreamSIS requires strict authentication and permissions are restricted by authorization levels, so the database is already adequately protected from elevation of privilege attacks. Employees and volunteers should also be trained that they should not, for any reason, allow anyone else to use their login credentials or perform an update on behalf of someone else, which guards against the social engineering side of elevation of privilege attacks.

<u>Suggested Breach Response Strategy</u>

If the Dream Project, or more specifically the DreamSIS Database, were to have a security breach, they should immediately stop inputting more data into the database to mitigate the exposure of private data. Almost all of the data in the database is private information about mentees, mentors, volunteers and/or employees. The Dream Project should notify those persons whose data was possibly encountered during the breach swiftly, as well as inform them that the Dream Project is trying to solve the problem as fast as possible.

If a breach were to occur, it would be difficult to calculate which percent of the data was wrongly accessed. Because of this, I believe that the Dream Project should notify all possible victims through email, which would include information about what they can do in the meantime to protect themselves, and how the Dream Project is working to solve the problem. There is no need to notify the press in this situation. The data in the DreamSIS database does not concern anyone besides the mentees and persons who are trying to help them with their education process. Thankfully, the database does not store any financial or personally critical data which could endanger any victim of an attack besides home addresses, high school locations or possibly social security numbers of employees.

Cost/Benefit Analysis of Possible Solutions

Option #1

Summary:
Option #1 is a two step process designed to improve Dream Project's data entry system. It involves reorganizing the layout of the data entry related portion of DreamSIS, as well as altering the current process of data collection and entry into the database.

We noticed that there were some issues related to data being handed off between many different actors in order to collect mentee information and submit it to the DreamSIS database. This process currently requires that high school leads give intake surveys to mentors, who then give their mentees these intake surveys, who then fill out the intake surveys and return them to their mentors, who then give return the filled out forms to high school leads, who are finally responsible for inputting this data into DreamSIS (note that this process varies slightly from school to school). Option #1's primary strength is limiting the number of handoffs in this process, which will hopefully increase the likelihood of data making it into the system consistently and accurately.

In order to resolve this issue, we propose a new interface to DreamSIS that will allow mentees to input personal information into DreamSIS themselves. We realize this must be FERPA compliant, and thus, mentees would have a much more restricted view of DreamSIS than their mentors and high school leads in order to protect the privacy of other mentees. However, a mentee would have access to a page within DreamSIS that allows them to, at minimum, fill out the information that is currently transmitted via paper intake survey. Mentees would fill out this DreamSIS form during Dream Project visits, under mentor supervision, so that mentors can confirm that mentees have indeed filled out their surveys as is required.

We are aware that some schools Dream Project works with already provide their students with technology (such as laptops, desktops, or tablets), so in many cases, the execution of this option is very attainable. In schools where technology is not readily available, mentors could be asked to bring devices that they would then used to help their mentees fill out these online surveys.

Aside from the new form viewable by mentees previously mentioned, option #1 also entails a change in the form mentors and high school leads see on DreamSIS. We noticed that the DreamSIS data entry page is fairly long and makes it somewhat difficult to see what information is of high importance, and what information is supplementary/optional. Our suggestion is to introduce an all-new layout to the data entry form, organized in a way that makes it easier for mentors to update mentee information, thus motivating mentors to keep data up-to-date.

When mentors log into DreamSIS and select a mentee whose information they would like to update, they should be directed to a form that is reasonably short in length and highlights the most important data to be filled in. This is likely to include basic information like name, date of birth, contact information, demographics, and basic parent/guardian information. This page is intended to highlight what data Dream Project *imperatively* needs about each student as a basis for effective data analysis.

The top of this page will also have several tabs that allow a mentor to add more detailed information about mentees. These tabs may be labelled things like "Post-High School Plans and Goals," "Scholarships and Financial Aid," "Hobbies, Interests, and Activities," etc. and is

intended to be an extension of the information that is absolutely required. This will make it easier for mentors to understand what information is essential, and what information is optional, which will in turn make DreamSIS data entry a much less overwhelming process for mentors and high school leads.

Costs and Benefits:
This option does require a custom solution designed around the current DreamSIS system. A significant amount of what is required for this option already exists; for the most part, DreamSIS would simply need to be reorganized and enhanced. However, realizing that the solution *does* need to be custom, it is likely to have a medium range price point. It will also require a shift in the Dream Project data entry protocol, and require administration to effectively communicate the changes in the system to high school leads, especially in regard to the changes relative to actual Dream Project visits.

The benefits associated with this option are potentially very significant. Our goal in redesigning the current data entry system was to make a system that encourages more frequent and accurate data entry, which will potentially result in better data analysis and better funding opportunities for Dream Project as a whole.

The first part of this option addresses a change in the way data is initially entered into the system. Since mentees can directly enter their own information into DreamSIS, they are more likely to hold themselves accountable for completing the survey, rather than telling mentors that they lost or forgot their intake surveys. This will also save mentor and high school leads' time since they do not have to read the paper form and attempt to interpret student responses in order to submit them to the system. Making data entry a one-step process will limit the likelihood of someone making a mistake as data is handed off between the many actors involved in the current multi-step process of data entry.

This option will also make it easier to update mentee information, since the DreamSIS data entry form will be simplified and better organized. This will increase mentor motivation to keep DreamSIS up-to-date since they are less likely to feel overwhelmed or confused by the layout alone. Overall, more accurate data entry and more frequent updates to mentee information has the potential to result in more accurate data analysis which is essential in keeping Dream Project thriving.

<u>Option #2</u>

Summary:
This option requires fewer changes than option #1, but still enhances the current Dream Project data collection and entry system. Option #2 does not change the process through which information is collected from mentees. If Dream Project were to move forward with this option, the process of handing out paper based intake surveys to students would remain the same. We recognize that there may be challenges associated with having mentees fill out the forms through DreamSIS themselves, which is not required with this option.

As was briefly stated, the process of collecting data would remain unchanged under this option; mentees would still have to submit paper intake surveys to their mentors, and a mentor or high school lead would be responsible for submitting mentee information to DreamSIS.

The DreamSIS interface is the focus of change for option #2. Under this option, we would suggest that Dream Project updates the way mentors and high school leads edit data in DreamSIS. As suggested under option #1, when a mentor goes to edit or upload a student's information, the first thing they would see is a form with space to fill in information that is *absolutely necessary* for Dream Project to have about a mentee. This form would look incredibly similar to the paper intake survey, which would require either reorganization of the DreamSIS data entry form, or the intake survey itself. Option #2 also entails categorizing data fields using various tabs that allow a mentor to click around and select what type of information they will be inputting.

Costs and Benefits:
Again, this option requires a custom solution to the problems currently faced by Dream Project. DreamSIS is already well developed to suit Dream Project's needs, so it is important to build on the existing system rather than attempt to reimplement what already exists and, for the most part, coincides with Dream Project's needs and values. There is likely a cost associated with implementing this option which would probably have a low-medium price point since most work required for this option involves rearranging the layout of the data entry portion of DreamSIS.

The other cost is any training or time spent learning the new layout of DreamSIS, however, we expect that mentors will cumulatively save time in the data entry process with this solution, even if they have to spend a few more minutes getting accustomed to this form.

The benefit of this option lies primarily in time saved inputting mentee information into DreamSIS. This new layout will be designed to make transferring data from the paper intake surveys to DreamSIS more straightforward and efficient. Currently, intake surveys are organized differently than the DreamSIS data entry form, so mentors spend a lot of time searching for the correct data field that mirrors the question on the intake survey. Changing the way this is done will save mentors a significant amount of time in the process data entry, as a result motivating them to update mentee information more frequently. This will lead to more consistency and accuracy in Dream Project's data.