

Finance to Education

Architecture Design Document Part 1

Conceptual & Information Architecture



Trust the Process
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Conceptual Architecture:

Finance to Education is a non-profit organization who provides funding for students pursuing higher education. F2E currently does their entire process manually and needs to move to an automated Information Technology solution. In order to move F2E to an IT solution, we need to understand the context of the system as well as understanding the key structures and flow of the system. First, we look at the external actors with respect to the system under construction. After understanding the roles of the actors, we reiterate the lifecycle for a student within F2E's program. This allows us to construct a high-level component diagram of F2E's automated system. We then magnify every major subsystem for F2E.

System Context Diagram

F2E is a non-profit organization with many external actors, events, and relationships at specific levels. *Figure 1.1* shows a high-level overview of F2E using an automated system with five main external actors along with their descriptions.

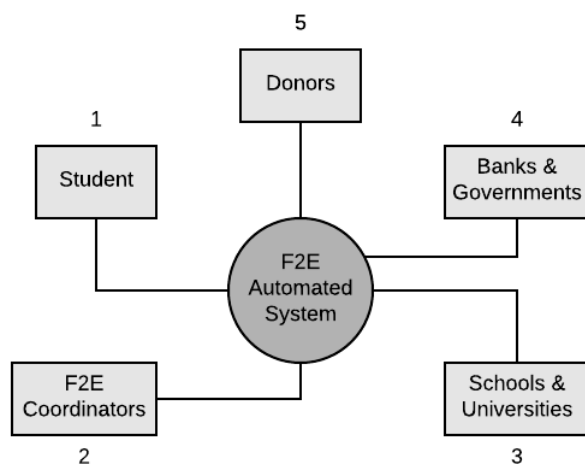


Figure 1.1

1. Students

- Student who needs funding
- Student who is receiving funding

2. F2E Coordinator

- Receives student's application
- Determines student's eligibility

3 Schools & Universities

- Provides higher education for the student
- Receives payments from F2E for the student

4. Banks & Government

- Banks receive money from F2E on behalf of the student
- Governmental regulation regarding money donations

5. Donors

- Provides financing money to F2E and student
- Receives information on student's progress

Overview of F2E Lifecycle:

A high-level abstraction of a typical lifecycle for a student who sends an application and receives funding is shown in *Figure 1.2*.

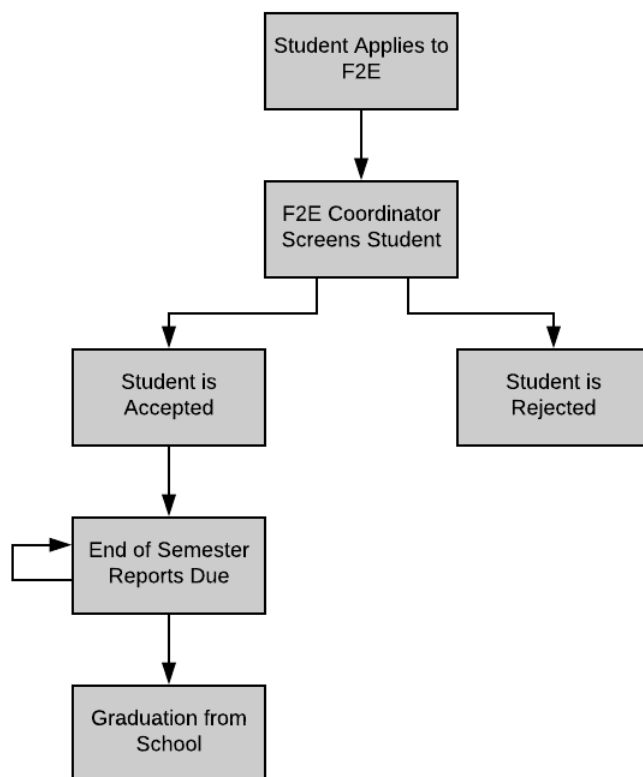


Figure 1.2

Component & Subsystem Models

A high-level overview of the entire F2E automated system is shown successively in *Figures 1.3 to 1.8* with explanations for each figure.

Components of F2E

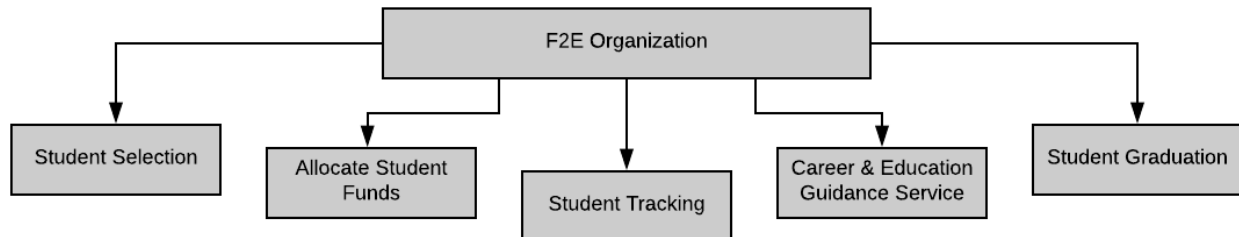


Figure 1.3

F2E as an organization can be broken down into these five main components: Student Selection, Allocate Student Funds, Student Tracking, Career & Education Guidance Service, Student Graduation. These are the most important aspects of their lifecycle derived from *figure 1.2*.

Student Selection Subsystem

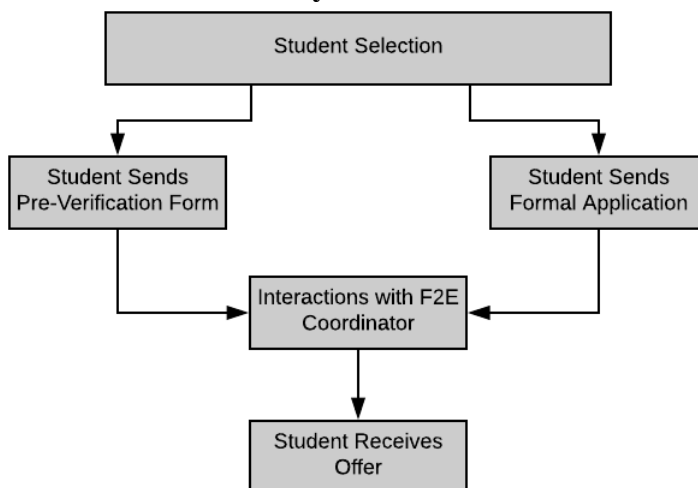


Figure 1.4

The first component of F2E's organization is the Student Selection. This component consists of the student sending a pre-verification form through the online application. The pre-verification form is looked over by a F2E coordinator. If the student meets the requirements then the F2E coordinator tells the student to send a formal application. Once the formal application is submitted, the same coordinator makes a decision regarding funding. The coordinator will then send an offer to the student which brings this subsystem to an end.

Allocation Subsystem

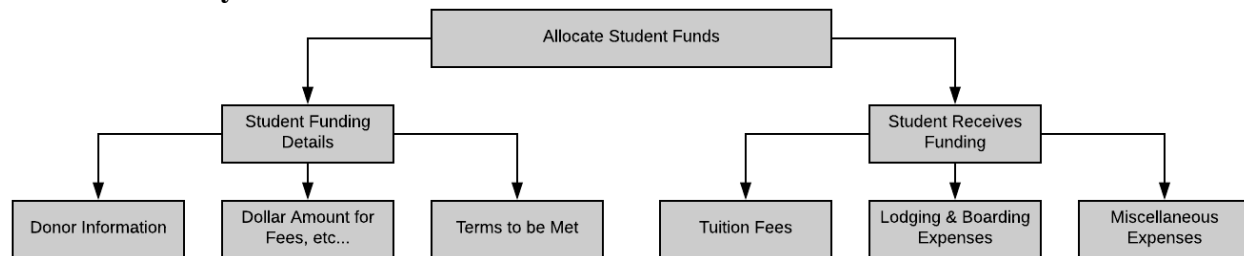


Figure 1.5

The second component of F2E's organization is the Allocation of Student Funds. This component assumes that the student received an offer from F2E and consists of two main subsystems. The first subsystem is notifying the student of the details of their funding. Funding details are sent out with three parts. The first part is the donor information. The second part is the actual dollar amount for fees, boarding, and other expenses. The third part is the terms to be met each semester in order to continue funding. These terms are tracked in the tracking subsystem. The second subsystem is the student actually receiving the funding. Funding is received for three things: tuition fees, lodging & boarding expenses, and miscellaneous expenses. Tuition fees are paid directly to the university whereas the other two funds are received via remittance into the student's bank account.

Tracking Subsystem

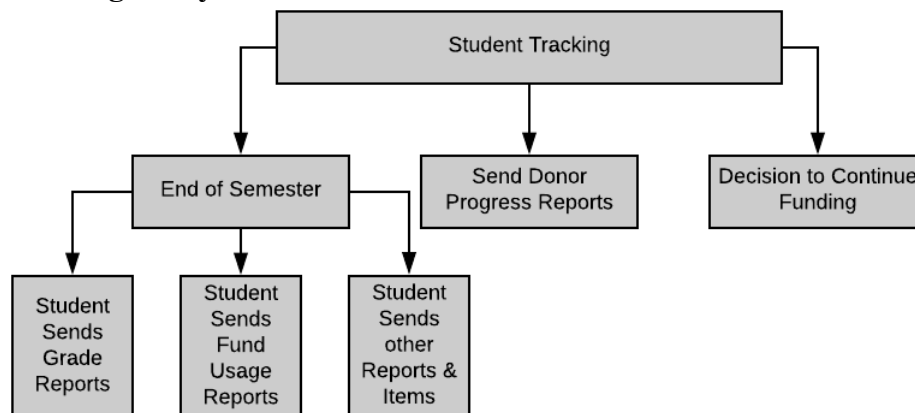


Figure 1.6

The third component of F2E's organization is the Student Tracking. This component assumes that the student is receiving funding and terms have been laid out. Student Tracking is done at the conclusion of a semester. At the end of the semester the student has to send three different semester reports. The first reports are the grades earned by the student. The second report is the fund usage reports. The third report are any other reports or items specified by the terms for funding previously. F2E will send the donor progress reports on the student for the semester. F2E coordinators will compile all the reports and make a decision on whether the student will receive funding for the next semester. The student tracking component continues till the last semester for the student.

Career & Education Guidance Service Subsystem

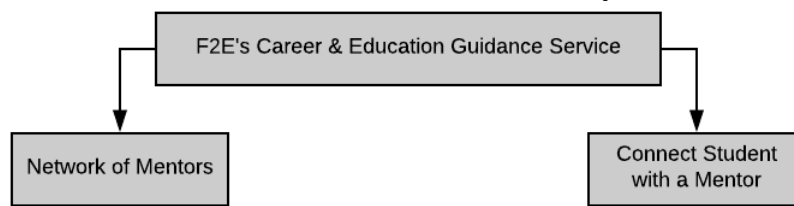


Figure 1.7

The fourth component of F2E's organization is the CEGS. This component assumes that the student is receiving funding and that their school semester is in progress. CEGS aims to provide the student with a wealth of resources throughout the semester. They allow for their network of mentors to be accessible to students and F2E administrators. This component also connects students with a mentor when they request one or it is deemed necessary.

Graduation Subsystem

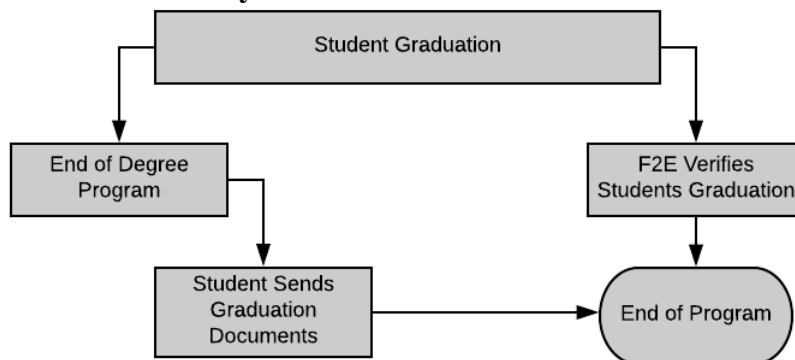


Figure 1.8

The fifth component of F2E's organization is the Students Graduation. This component assumes that the student is in their last semester of their degree program and has met the terms set forth in all previous semesters. There are two main parts for this component which will signify the end of the program. The first part is at the end of the degree program the student sends their schools graduation documents. F2E receives these documents and verifies that the student graduated from their program. Once F2E verifies the student has graduated, it signifies the end of the F2E's involvement with the student.

Recap

By looking at the system context diagram, it shows the five main external actors with respect to the automated system: Donors, Students, F2E Coordinators, Banks/Government, and Schools/Universities. The subsequent lifecycle diagram, component and subsystem models show the conceptual view of F2E. Conceptually F2E can be explained by the above diagrams. We will use our knowledge of the conceptual view to demonstrate an understanding of what and how information will be collected, stored, processed, transmitted, presented, and used for each subsystem in the information architecture section of this document.

Information Architecture:

After understanding, conceptually, how F2E operates we need to determine how information flows. Information and data can flow in many ways. Some examples are stagnant data flow, data which is used throughout the lifecycle of the program, data which is accessed and or available at certain points or by certain actors during the lifecycle. Since F2E does everything annually, this solution has to be a complete top down model. This section is broken down into four parts. The first part are the conceptual data models in the form of Entity Relationship Diagrams for the five major sections: Student Selection, Student Allocation, Student Tracking, Career & Guidance Education Service, and Graduation. The second part takes all the entities that exists and lists out attributes associated with each. The third part introduces the primary and foreign keys that exists for each entity. The fourth part ties all the information together with the Non-Functional Requirements in the Business Requirements Document.

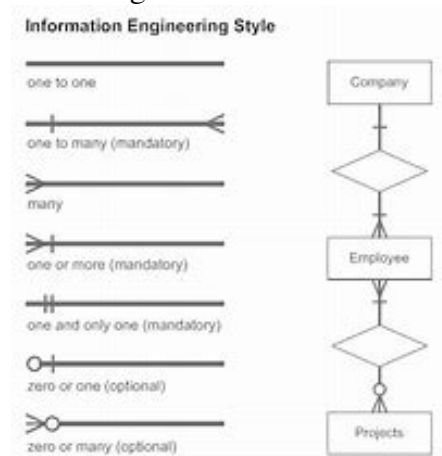
Conceptual Data Models

The conceptual data models will show the high-level structure of F2E's lifecycle in five main sections: Student Selection, Student Allocation, Student Tracking, Career & Education Guidance Service, and Graduation. Each section will begin with an Entity Relationship Diagram and be followed with a list of entities and key relationships.

Relationships will be shown in the following form:

(Entity action quantity Entity)

ERD Diagrams will follow the Information Engineering Style shown below:



Assumptions:

- Donors fund many students
- Students can be funded by multiple donors
- F2E Coordinators serve many students
- Each Student is a single individual in the ERD
- Student only has one bank

ERD for Student Selection

Student selection is the first part of F2E system. It precedes the allocation of student funds. Student selection is responsible for the initial application the student sends along with the formal application. A F2E coordinator is assigned to determining the student's eligibility. The offer is introduced in the allocation of student funds section.

Entity Relationship Diagram:

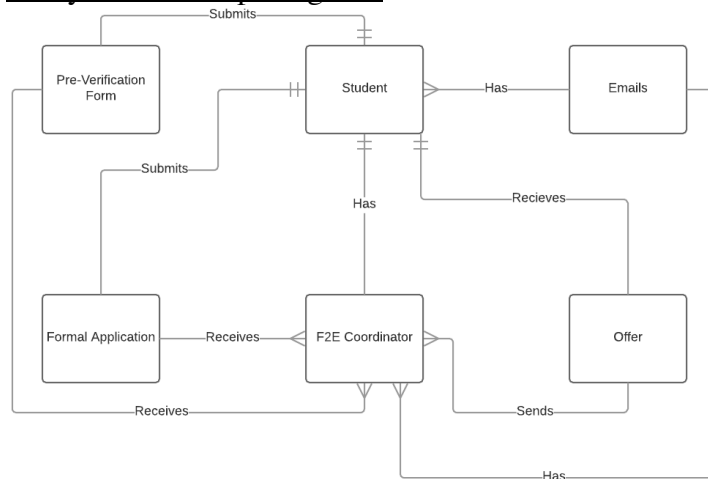


Figure 2.1

List of Entities:

1. Student
2. F2E Coordinator
3. Pre-Verification Forms
4. Formal Application
5. Emails
6. Offer

Key Relationships:

- **Student** has *one and only one* **F2E Coordinator**
- **Student** submits *one and only one* **Pre-Verification Form**
- **Student** submits *one and only one* **Formal Application**
- **F2E Coordinator** receives *many* **Pre-Verification Form**
- **F2E Coordinator** receives *many* **Formal Applications**
- **Student** receives *one and only one* **Offer**
- **F2E Coordinator** sends *many* **Offer**
- **Student** has *many* **Emails**
- **F2E Coordinator** has *many* **Emails**

ERD for Allocate Funds

Allocation of student funds follows student selection and precedes student tracking. Allocation of student funds is responsible for giving the funding details and physically giving the funding money to the student.

Entity Relationship Diagram:

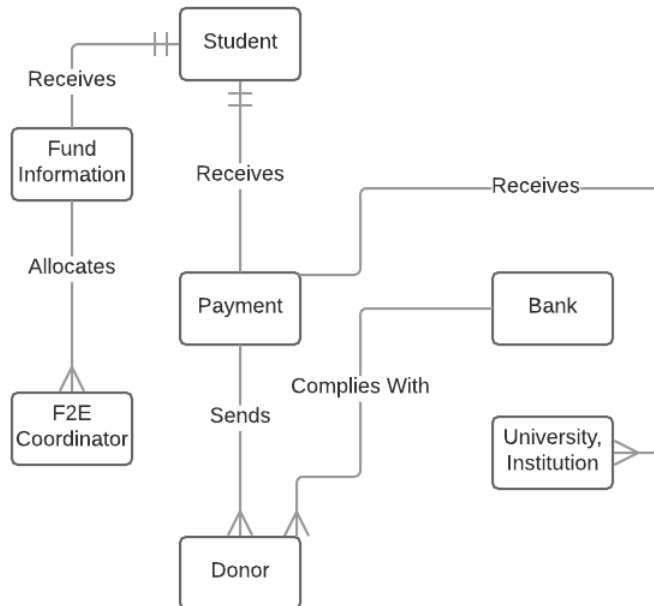


Figure 2.2

List of Entities:

1. Student
2. Donor
3. F2E Coordinator
4. University/Institution
5. Bank
6. Fund Information
7. Payment

Relationships:

- **Student** receives *one and only one* **Fund Information**
- **Student** receives *one and only one* **Payment**
- **F2E Coordinator** allocates *many* **Fund Information's**
- **Donor** sends *many* **Payments**
- **University/Institution** receives *many* **Payments**
- **Donor** complies with *many* **Banks**

ERD for Student Tracking

Student tracking follows the allocation of student funds and precedes the career & education guidance service. Student tracking is responsible for determining if the student meets the terms set forth previously. It includes the student sending in various reports and a F2E coordinator verifying the student meets expectations.

Entity Relationship Diagram:

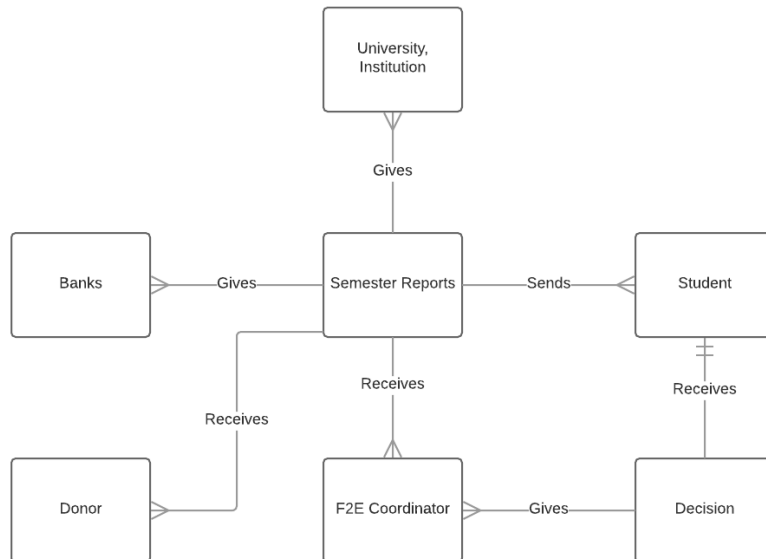


Figure 2.3

List of Entities:

1. Student
2. Donor
3. F2E Coordinator
4. University/Institution
5. Semester Reports
6. Banks
7. Decision

Relationships:

- **Student** sends *many* **Semester Reports**
- **F2E Coordinator** receives *many* **Semester Reports**
- **University/Institution** gives *many* **Semester Reports**
- **Banks** give *many* **Semester Reports**
- **F2E Coordinator** gives *many* **Decisions**
- **Student** receives *one and only one* **Decision**
- **Donor** receives *many* **Semester Reports**

ERD for Career & Education Guidance Service

Career & Education Guidance Service follows student tracking and precedes graduation. CEGS is responsible for connecting a student with a mentor and vice versa. The F2E coordinator plays a role in connecting one another.

Entity Relationship Diagram:

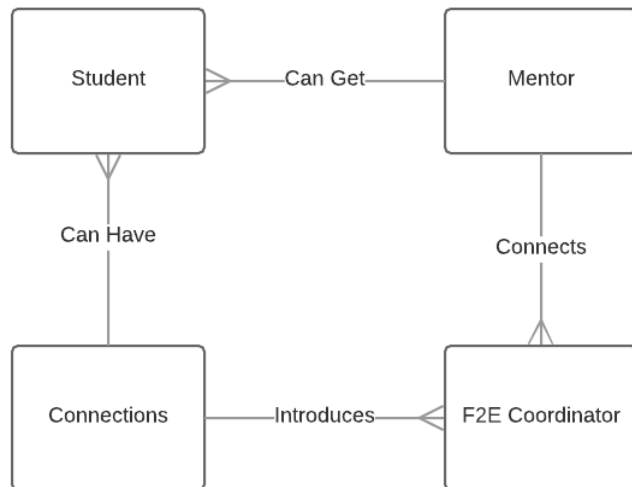


Figure 2.4

List of Entities:

1. Mentor
2. F2E Coordinator
3. Student
4. Connections (Mentor & student connections)

Relationships:

- **Student** can have many **Connections**
- **Student** can get many **Mentors**
- **F2E Coordinator** connects many **Mentors**
- **F2E Coordinator** introduces many **Connections**

ERD for Graduation

Graduation follows the CEGS and is the final part of F2E's system. Graduation is when the student is at the last semester of their degree program. The student is required to send in graduation documents and the F2E coordinator verifies the documents with the university.

Entity Relationship Diagram:

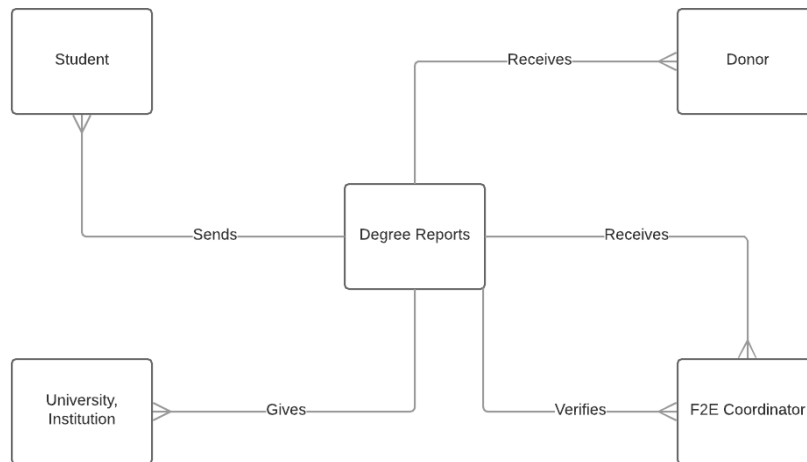


Figure 2.5

List of Entities:

1. Student
2. F2E Coordinator
3. Donor
4. University/Institution
5. Degree Reports

Relationships:

- **Student** sends *many* **Degree Reports**
- **F2E Coordinator** receives *many* **Degree Reports**
- **Donor** receives *many* **Degree Report**
- **University/Institution** gives *many* **Degree Reports**
- **F2E Coordinator** verifies *many* **Degree Reports**

Logical Data Models

The logical data model will show a list of all unique entities along with their key, multivalued, and derived attributes. It will then introduce the primary and foreign keys along with explanations for each. Same assumptions as conceptual data model.

Entity, Keys, Attributes, Data Type will be formatted as follows:

Entity Name		
Key	Key Attribute	Data Type
Key	<u>Multivariate Attribute</u>	Data Type

List of Unique Entities, Keys, Attribute & Possible Data Type

Student		
PK	StudentID	Integer
	Name	String
	Email	String
FK	DegreeID	Integer
FK	<u>MentorID</u>	Integer
FK	CoordinatorID	Integer
FK	<u>DonorID</u>	Integer
FK	UniversityID	Integer
FK	BankID	Integer
FK	<u>MessageID</u>	Integer
FK	OfferID	Integer
FK	<u>DecisionID</u>	Boolean
FK	<u>FundID</u>	Integer
FK	<u>ConnectionID</u>	Integer
FK	<u>PaymentID</u>	Integer
FK	VerificationID	Integer
FK	ApplicationID	Integer
FK	FundTerms	String
FK	ReportID	Integer

F2E Coordinator		
PK	CoordinatorID	Integer
	Name	String
	Email	String
FK	<u>StudentID</u>	Integer
FK	<u>MessageID</u>	Integer
FK	<u>ConnectionID</u>	Integer
FK	<u>VerificationID</u>	Integer
FK	<u>DonorID</u>	Integer
FK	<u>ApplicationID</u>	Integer
FK	<u>ReportID</u>	Integer

Donor		
PK	DonorID	Integer
	Name	String
	Email	String
FK	<u>MessageID</u>	Integer
FK	FundID	Integer
FK	PaymentID	Integer
FK	<u>ReportID</u>	Integer

Degree Reports		
FK	UniversityID	Integer
FK	StudentID	Integer
FK	BankID	Integer
FK	FundID	Integer
FK	FundTerms	String
	GradeReports	String
	FundReports	String
	Transcript	String
PK	DegreeID	Integer

Semester Reports		
FK	UniversityID	Integer
FK	StudentID	Integer
FK	BankID	Integer
FK	FundID	Integer
FK	FundTerms	Integer
	GradeReports	String
	FundReports	String
	OtherReports	String
PK	ReportID	Integer

Mentor		
PK	MentorID	Integer
	Name	String
	Email	String
FK	<u>StudentID</u>	Integer
FK	<u>CoordinatorID</u>	Integer

University/Institution		
PK	UniversityID	Integer
FK	StudentID	Integer
FK	BankID	Integer
FK	CoordinatorID	Integer
	UniversityName	String

Bank		
PK	BankID	Integer
PK	AccountID	Integer
FK	StudentID	Integer
	BankName	String
FK	PaymentID	Integer

Connections		
PK	ConnectionID	Integer
FK	StudentID	Integer
FK	CoordinatorID	Integer
FK	MentorID	Integer
	<u>Messages</u>	String

Payments		
PK	PaymentID	Integer
FK	BankID	Integer
FK	StudentID	Integer

Formal Application		
FK	StudentID	Integer
PK	ApplicationID	Integer
	ApplicationBody	String
FK	<u>CoordinatorID</u>	Integer

Pre-Verification Form		
FK	StudentID	Integer
PK	VerificationID	Integer
FK	<u>CoordinatorID</u>	Integer
	VerificationBody	String

Messages		
FK	StudentID	Integer
FK	MentorID	Integer
FK	<u>DonorID</u>	Integer
FK	CoordinatorID	Integer
PK	MessageID	Integer
	MessageBody	String

Fund Information		
PK	FundID	Integer
FK	StudentID	Integer
PK	FundTerms	String

Offer		
FK	StudentID	Integer
PK	OfferID	Integer
	OfferBody	String

Decision		
PK	DecisionID	Boolean
FK	CoordinatorID	Integer
FK	StudentID	Integer

Recap

The conceptual data models show the high-level relationships between entities in the five main parts: Student Selection, Allocate Funds, Student Tracking, CEGS, and Graduation. There are lots of redundant entities in the five parts, so we had to delve deeper into the attributes and keys in the logical data model. Overall, the information architectures magnify elements in the conceptual architecture to get a better idea about how the information looks from a conceptual and logical level.

Glossary:

Term	Description
F2E	Finance to Education
IT	Information Technology
CEGS	Career & Education Guidance Services
NFR	Non-Functional Requirements
BRD	Business Requirements Document
ERD	Entity Relationship Diagram
PK	Primary Keys
FK	Foreign Keys
ID	Identification

References:

1. "Entity Relationship Diagram." Entity Relationship Diagram - Everything You Need to Know About ER Diagrams. Accessed February 06, 2018. <https://www.smartdraw.com/entity-relationship-diagram/>.
2. Primary and Foreign Keys. Accessed February 06, 2018. <http://condor.depaul.edu/gandrus/240IT/accesspages/primary-foreign-keys.htm>.
3. Singal, Rahul. *TrustTheProcess-Deliverable1*. PDF.
4. "The beginner's guide to Lucidchart." Lucidchart. May 19, 2017. Accessed February 06, 2018. <https://www.lucidchart.com/pages/beginners-guide-to-lucidchart>.