Research Higher Degree Logical Model

Prepared by:  
Thursdays **Group 4**

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Contents

[1. Derive relations 2](#_Toc386965571)

[2. Normalisation 2](#_Toc386965572)

[3. User transaction valIDation 2](#_Toc386965573)

[4. Check integrity constraints 2](#_Toc386965574)

[5. Review logical data model 2](#_Toc386965575)

[6. Check for future growth 2](#_Toc386965576)

[7. Develop Test Plan 2](#_Toc386965577)

[8. Section 2](#_Toc386965578)

[8.1. Subsection 2](#_Toc386965579)

[8.1.1. Subsubsection 2](#_Toc386965580)

# Derive relations

## Strong Entity types

|  |
| --- |
| **Applicant**(applicantID, fName, lName, prefTitle, sex, DOB, streetAddress, suburb, postcode, city, state, addressCountryISOCode, mobile, phone, email, nationalityCountryISOCode, isNZAUCitizen, englishProficient, studentID, dateAdded, enteredByStaffID)  **Primary key** applicantID  **Foreign key** addressCountryISOCode **references** Country(countryISOCode)  **Foreign key** nationalityCountryISOCode **references** Country(countryISOCode)  **Foreign key** enteredByStaffID **references** University Staff Member(staffID) |
| **Document**(docID, title, description, uploadLink)  **Primary key** docD  **Foreign key** docTypeID **references** Document Type(docTypeID)  **Foreign key** docStatID **references** Document Status(docStatID) |
| **Application**(applicationID, proposedStartDate, proposalSummary, requireMoreInfo, dateAdded, dateLastChecked, dateLastModified  **Primary key** applicationID  **Foreign key** filledByStaffID **references** UniversityStaffMember(staffID)  **Foreign key** proposalDocID **references** Document (docID)  **Foreign key** awardTypeID **references** AwardType (awardTypeID)  **Foreign key** loadLocID **references** StudyLoadAndLocation (LoadLocID)  **Foreign key** managedByStaffID **references** UniversityStaffMember(staffID)  **Foreign key** appIicantID **references** Applicant(applicantID) |
| **ApplicationStatus** (appStatID, status, description)  **Primary key** appStatID |
| **AwardType** (awardTypeID, award, description)  **Primary key** awardTypeID |
| **CorrespondenceMethod** (corrMethID, method)  **Primary key** corrMethID |
| **Type** (type, description)  **Primary key** type |
| **Degree** (name, type, yearCompleted, gpa, institutionName, instituitonCountryISOCode, applicantID, degreeDocID)  **Primary key** name, applicantID  **Foreign key** applicantID **references** Applicant(applicantID)  **Foreign key** InstituitonCountryISOCode **references** Country(countryISOCode)  **Foreign key** degreeDocID **references** Document(docID) |
| **DocumentStatus** (docStatID, status)  **Primary key** docStatID |
| **DocumentType** (docTypeID, type)  **Primary key** docTypeID |
| **UniStaffMemberGeneralStaffMember** |
| **PaymentMethod**(payMethID, method) // needs to be moved  **Primary key** payMethID |
| **Publication** (pubID, docID, applicantID, title, publication, issueNo, issueDate, onlineLink, otherAuthorsNames, language)  **Primary key** pubID  **Foreign key** docID **references** Document(docID)  **Foreign key** applicantID **references** Applicant(applicantID) |
| **Referee** (refID, applicationID, name, relation, phone, email, profession, academicLink, englishSpeaker, englishLiterate)  **Primary key** refID  **Foreign key** applicationID **references** Application(applicationID) |
| **ResearchArea** (forCode, description, researchArea, generalArea)  **Primary key** forCode |
| **~~RHDStaffMember~~** |
| **StudyLoadAndLocation** (loadLocID, loadLocation)  **Primary key** loadLocID |
| **~~Supervisor~~** |
| **UniversityStaffMember** (staffID, lName, fName, canSupervise)  **Primary key** staffID |
| **Visa** (visaID, docID, applicantID, visaStatID, originCountryISOCode, valIDFrom, valIDTo)  **Primary key** visaID  **Foreign key** applicationID **references** Application(applicationID)  **Foreign key** docD **references** Document (docID)  **Foreign key** originCountryISOCode **references** Country(countryISOCode) |

## Weak Entity types

|  |
| --- |
| **Checklist** (applicationID, addressConfirmed, degreeConfirmed, visaConfirmed, proposalConfirmed, hasResearchArea, hasPrimarySuper, payMethConfirmed, refrereesConfirmed, engProfConfirmed)  **Primary key** applicationID  **Foreign key** applicationID **references** Application(applicationID) |
| **Correspondence** (corrID, date, summary, message, applicaitID, staffID, corrMethID, toUniversity  **Primary key** corrID  **Foreign key** applicantID **references** Applicant(applicantID)  **Foreign key** appStatID **references** ApplicationStatus(appStatID)  **Foreign key** staffID **references** UniversityStaffMember(staffID) |
| **Decision** (decID, date, comment, applicationID, staffID)  **Foreign key** applicationID **references** Application(applicationID)  **Foreign key** staffID **references** UniversityStaffMember(staffID)  **Foreign key** decTypeID **references** DecisionType |

## One-to-many binary relationships

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
| authored |  | Applicant | 1 | ApplicantID | Publication | 0..\* |
| submits |  | Applicant | 0..1 | ApplicantID | Application | 1..\* |
| corresponds with |  | Applicant | 1 | ApplicantID | Correspondence | 0..\* |
| holds |  | Applicant | 0..1 | ApplicantID | Degree | 0..\* |
| lives in |  | Country | 1 | CountryISOCode | Applicant | 0..\* |
| nationality of |  | Country | 0..1 | CountryISOCode | Applicant | 0..\* |
| has a |  | Visa Status | 1 | VisaID | Visa | 0..\* |
| has a |  | Document Status | 1 | DocStat | Document | 0..\* |
| of |  | Document Type | 1 | DocTypeID | Document | 0..\* |
| will pay using *(non-identifying)* |  | Payment Method | 0..1 | PayMethID | Application | 0..\* |
| has a *(non-identifying)* |  | Application Status | 1 | AppStatusID | Checklist | 0..\* |
| has a *(non-identifying)* |  | Decision Type | 1 | DecTypeID | Decision | 0..\* |
| Decides2 *(non-identifying)* |  | University Staff Member | 1 | StaffID | Decision | 0..\* |
| will supervise |  | Application | 1 | ApplicationID | Supervise as | 0..\* |
| will supervise2 |  | University Staff Member | 1 | StaffID | Supervise as | 0..\* |
| Manages *(non-identifying)* |  | University Staff Member | 0..1 | StaffID → ManagedByStaffID | Application | 0..\* |
| fills out |  | University Staff Member | 1 | StaffID →FilledByStaffID | Application | 0..\* |
|  |  |  |  |  |  |  |

## One-to-one binary relationships

### Mandatory on both sides

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

### Mandatory on one side

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

### Optional on both sides

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

## One-to-one recursive relationships

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

## Superclass/subclass relationships

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

## Many-to-many binary relationship types

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
| Oversees2 |  | Research Area | 1 | FORCode | University Staff Member\_Research Area2 | 0..\* |
| works in2 |  | Research Area | 1 | FORCode | University Staff Member\_Research Area | 0..\* |
| works in |  | University Staff Member | 1 | StaffID | University Staff Member\_Research Area | 1..\* |
| Oversees |  | University Staff Member | 1 | StaffID | University Staff Member\_Research Area | 1..\* |
| in2 |  | Research Area | 1 | FORCode | Application\_Research Area | 0..\* |
| In |  | Application | 1 | ApplicationID | Application\_Research Area | 1..\* |
| flags |  | University Staff Member | 1 | StaffID | University Staff Member\_Application | 0..\* |
| flags2 |  | Application | 1 | ApplicationID | University Staff Member\_Application | 0..\* |

## Complex relationship types

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

## Multi-valued attributes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relationship name** | **Rel.ship**  **number** | **Parent relation** | **Parent multiplicity** | **Foreign Keys** | **Child relation** | **Child multiplicity** |
|  |  |  |  |  |  |  |

Should we add a Application to Document relation to deal with nonspecific documents?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Entity Name 1** | **multiplicity** | **Relationship Name** | **multiplicity** | **Entity Name 2** | **Rel#** |
| **Application** | 1 | Has a non-specific | 0..\* | Document | **2.5** |

Maybe it would be better to add a single document relation that matches a document (that includes its applicant) to an application and remove all other document relations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Entity Name 1** | **multiplicity** | **Relationship Name** | **multiplicity** | **Entity Name 2** | **Rel#** |
| **Application** | 1 | Confirmed by | 0..\* | **ApplicationDocument** | **2.5** |
| **ApplicationDocument** | 1 | Confirmed by2 | 0..\* | **Document** | **27.1** |
| **Applicant** | 1 | Details by | 0..\* | **Document** | **1.6** |

?

# Normalisation

# User transaction valIDation

# Check integrity constraints (Sam)

The following type of integrity constraints have been added to the logical model to protect the database from becoming incomplete, inaccurate, or inconsistent.

## Required data

The not null attributes IDentified in section 3 of the conceptual Documentation have been specified in the diagram. Since by default attributes in VP UML are null-able the specific null-able attributes changed are:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Applicant** | | **Degree** | | **ResearchArea** | | |
| fName | 1.1 | name | 4.1 | FORCode | | 9.1 |
| sex | 1.4 | type | 4.2 | Description | | 9.2 |
| email | 1.15 |  |  | researchArea | | 9.3 |
| dateAdded | 1.20 |  |  | generalArea | | 9.4 |
| **Application** | |  |  | **University Staff Member** | | |
| dateAdded | 2.3 |  |  | staffID | | 12.1 |
| dateLastChecked | 2.4 | **Document** | | lName | | 12.3 |
| dateLastModified | 2.5 | Title | 5.1 |  | |  |
| awardType | 2.7 | uploadLink | 5.3 | **Visa** | | |
| **Checklist** | | documentType | 5.4 | VisaStatus | | 13.3 |
| applicationStatus | 3.1 | documentStatus | 5.5 | **Correspondence** | | |
| addressConfirmed | 3.2 | **Publication** | | date | | 14.1 |
| degreeConfirmed | 3.3 | title | 7.1 | Summary/message | | 14.2 |
| visaConfirmed | 3.4 | publisher | 7.3 | corrMeth | | 14.4 |
| proposalConfirmed | 3.5 | issueDate | 7.5 | toStaff | 14.5 | |
| engProfConfirmed | 3.6 |  |  | **Decision** | | |
| hasResearchAreas | 3.7 |  |  | date | | 15.1 |
| hasPrimarySuper | 3.8 | **Referee** | | decType | 15.2 | |
| payMethConfirmed | 3.9 | name | 8.1 | **SuperviseAs** | | |
| refereesConfirmed | 3.10 | relation | 8.2 | primarySupervisor | | 16.1 |
|  |  | email | 8.4 |  | |  |
|  |  | Profession | 8.5 |  | |  |

Note that some of these attributes are moved to separate entities in the next section, in these cases the foreign key will be not null. Furthermore any attributes added to one of these entities will also be not null-able and unique.

## Attribute domain constraints

The attribute domains as IDentified in section 4 of the conceptual documentation have been added to the diagram in the form of the following new entities.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Entity Name** | **Aliases** | **Description** | **Occurrences (select multiplicities)** | **Entity #** |
| Application status | - | A list of application status and who manages the application | a set number of predefined status reusable by all Applications | 17 |
| Award Type | - | The Award sought by the Application | a set number of predefined Award types reusable by all Applications | 18 |
| Correspondence Method | - | How the applicant and staff member corresponded | set number of predefined correspondence methods reusable by all correspondences | 19 |
| Country | - | A list of possible countries the application can live in or be a citizen of. | A set number of predefined countries reusable by all applicants | 20 |
| Decision Type | Change Type | The types of decisions a RHD Staff Member can make about an Application | A set number of predefined decisions types reusable by all decisions | 21 |
| Document status | - | Official and translation status of a document associated to an Applicant | a set number of predefined documents status reusable by all Documents | 22 |
| Document Type | - | The type of document | a set number of predefined document types reusable by all Documents | 23 |
| Payment Method | - | The proposed method of payment for the RHD | a set number of predefined payment methods reusable by all Applications | 24 |
| Study Load and Location | - | The proposed study load for the RHD and the location of the RHD | a set number of predefined study loads and locations reusable by all Applications | 25 |
| Visa status | - | The applicants visa status | a set number of predefined visa status reusable by all Visas | 26 |

Attributes were added to each entity such that,

* Status entities have a status and a description attribute,
* Type entities have a type and a description attribute,
* Method entities have a method attribute and
* The Country entity has a name attribute while Study Load and Location has a LoadLocation attribute.

## Multiplicity

The multiplicities IDentified in section 2 of the conceptual documentation have been added to the diagram. The additional multiplicities for the attribute domain entities IDentified in section 4.2 have IDentified in the following table and added to the diagram.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Entity Name 1** | **multiplicity** | **Relationship Name** | **multiplicity** | **Entity Name 2** | **Rel#** |
| **Applicant** | 0..\* | Lives in | 0..1 | Country | **1.6** |
| 0..\* | Nationality of | 0..1 | Country | **1.7** |
| **Application** | 0..\* | Seeks | 0..1 | Award Type | **2.5** |
| 0..\* | will pay using | 0..1 | Payment Method | **2.6** |
| 0..\* | Study using | 0..1 | Study Load and Location | **2.7** |
| **Checklist** | 0..\* | Has a | 1 | Application status | **3.1** |
| **Correspondence** | 0..\* | Using | 1 | Correspondence Method | **14.1** |
| **Decision** | 0..\* | Has a | 1 | Decision Type | **15.1** |
| **Document** | 0..\* | Has a | 1 | Document status | **5.6** |
| 0..\* | of | 1 | Document Type | **5.7** |
| **Visa** | 0..\* | Has a | 1 | Visa Status | 13.1 |

## Entity integrity

The primary keys IDentified in section 5 of the conceptual documentation have been added to/updated in the diagram. The additional primary keys for the attribute domain entities IDentified in section 4.2 have been IDentified in the following table and added to the diagram

|  |  |  |  |
| --- | --- | --- | --- |
| **Entity Name** | **Primary Key** | **Alternative Key** | **Entity#** |
| Application status | appStatusID | status, description | 17 |
| Award Type | awardTypeID | award, description | 18 |
| Correspondence Method | corrMethID | method | 19 |
| Country | CountryISOCode | name | 20 |
| Decision Type | decTypeID | type | 21 |
| Document status | docStatID | status, description | 22 |
| Document Type | docTypeID | type, description | 23 |
| Payment Method | payMethID | method | 24 |
| Study Load and Location | loadLocID | loadLocation | 25 |
| Visa status | visaStatID | status | 26 |

## Referential integrity

The primary key of each child relation (called entity name 2) has been added to the parent relation (called entity name 1) in the form of a foreign key as specified by the entity relationship table in section 2 of the conceptual documentation and the entity relationship table in the above section 4.3.

It should be noted however that the attribute domain relations IDentified in section 4.1 that replace null-able attributes will add their primary key as a null-able foreign keys in the parent relation. More specifically Award Type, Country, Payment Method and Study Load and Location can all be null in the applicant/applicant entities because they may not be known at the time of the initial input of the entry. Similarly anything that can be potentially backed by a document will have a null document ID foreign key.

## General constraints.

Currently there are no high level constraints that will affect the valIDity of the logical model. There are however pseudo constraints through the checklist whereby an application cannot have certain application statuses unless the corresponding checklist attributes are true.

# Review logical data model ()

The Logical data model will be reviewed with Paul, the head of the Research Higher Degree Office to ensure that I meets all their requirements and is a true (or as close to possible) representation of the data requirements as specified by the Research Higher Degree Office and the staff members who will use the database.

# Check for future growth ()

The initial setup for the database has been consIDered in the context of the minimal amount of information required to define an entry for any of the strong entitles IDentified in section 1 of the conceptual documentation. This is primarily expressed through the choice of null-able attributes

………… blah

n terms of the limited not null values, large attribute domains and multiplicities as specified by sections 4.1, 4.2 and 4.3. More specifically values are allowed to be

…… more stuff

# Develop Test Plan

# Section

## Subsection

### Subsubsection

Diagram improvements

* Add data types
* ID names