



Post-Doctoral Application Management System

Functional requirements and application design document

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Version 1.0

Iteration 4

Prepared for Ms. Cathy Sandis (UP Research Office)
by Soft**Serve** Group

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13/08/2014	v 2.4	Added and updated use case diagrams and descriptions. Added and updated post conditions and also domain objects.	Mathys Ellis

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1 Project Repository

<https://github.com/mox1990/Project-Postdoc.git>

2 Document description:

2.1 Document purpose:

This functional requirements and application design document serves the purpose of providing a detailed breakdown of the SoftServe's Post-Doctoral application management system's expected functionality and how it will be realised in terms of application design. Further it defines the services contracts required by each of the stakeholders with the proposed software system. Thus this document serves as a contract between SoftServe and the client, Mrs Cathy Sandis of the DRIS of the University of Pretoria in terms of project functional requirements and realisation thereof.

2.2 Documentation methodology

The documentation and software development methodology used by the project adhere to the guidelines set out by the scrum agile methodology. Thus this document has undergone and will undergo various iterations that may extend or reduce the contents of the document.

This document was created using the requirement elicitation techniques and requirement definitions as specified by Klaus Pohl's book Requirements Engineering: Fundamentals, Principles, and Techniques [Dr.Phol, K., 2010]. The requirements, vision and scope were elicited from the following sources:

- Numerous interviews with the client.
- On-line research into UP Post doctoral applications.
- Correspondence with the UP IT department.
- Collecting and analysing various documents such as:
 - The initial project request document
 - Application forms
 - Renewal forms
 - CV templates
 - Approval and recommendation forms

2.3 Document conventions:

- Documentation formulation tool: LaTeX
- Modelling language: UML 2.0, ERD Crow-Foot notation

2.4 References:

- Dr.Phol, K., 2010, *Requirements Engineering: Fundamentals, Principles, and Techniques*, Springer, Heidelberg.
- DRIS homepage. [online] Available: <http://web.up.ac.za/default.asp?ipkCategoryID=1630> [Accessed on: 31 March 2014].

3 Functional requirements

3.1 Introduction

This section outlines the functional requirements for SoftServe's Post-Doctoral application management system. The required functionality, domain objects, process specification and use cases related to the functional requirements of the project will be discussed in this sections.

3.2 Required functionality

The following sections will discuss the required functionality of all the major services handled by the system. Namely:

- User gateway
- Application service
- Report services
- Notification services
- User account management services
- Audit-Trail services
- Archival services
- Imports and exports services
- Location management service
- CV management service

3.2.1 User gateway

The user gateway provides the access control services of the system and acts as a centralised gateway through which all users have to go in order to gain access to the system and its services.

- The gateway must provide a user login facility which allows the users to authenticate themselves using their account user name or email address and their account password.

- The gateway must insure that the correct user privileges are loaded before allowing the system to proceed.
- The gateway must insure that the user is allocated a session so that the system can identify the user.
- All internal stakeholders should be able to log in with their PeopleSoft account details once the system is integrated but until such time they should login with the credentials specified at the time of account creation.
- The gateway needs to facilitate user account recovery.

3.2.2 Application services

The application services encompasses the entirety of the application process undergone by prospective fellows namely new and renewal applications.

The main user of these services will be the prospective fellows who wishes to track their application progress or renew or apply for a Post-Doctoral fellowship. Other stakeholders will only make use of certain sub-services which are provided under the Application services. It should be noted that most of the different stakeholders' usage of the system will be focused in this set of services only.

As specified in the vision and scope document under section 7.1 the application process of each application is broken up into stages. These stages run concurrently until they reach the stage where the post-doctoral committee meeting is to take place. In this particular stage the applications are batch reviewed. After which all reviewed eligible applications are once again processed individually. In order to manage the work flow of the application pipeline a event will trigger after each stage is complete and the application(s) will be automatically forwarded to the next. Only the system administrator will have the power to forward or rewind any application through the stages. It should be noted that if the system administrator moves an application back then all the data of the stages that have been complete will be removed.

- **Application status levels:** Each stage the application goes through requires a different type of approval or check. Thus the status level of each stage in order of first to last, is highlighted below. Note * indicates this stage is only for new applications:
 1. **Open application** - This application is a newly created application.
 2. **Submitted application** - This application is submitted by the fellow and awaits referral.
 3. ***Refereed application** - This application has a completed list of referral reports from the specified referees.
 4. **Finalised application** - This application has been finalised by the respective grant holder.

5. **Recommended application** - This application has been recommended by the respective HOD.
6. **Endorsed application** - This application has been endorsed by the respective Dean's office.
7. **Eligible application** - This application has been checked for eligibility by the DRIS and has been found to be eligible.
8. **Funded application** - This application has been approved for funding and is complete.
9. **Completed application** - This application has passed its expiry date and has been completed.

Special application status levels are as follow:

1. **Declined application** - This is any application that has been declined by some authority in the process change.
 2. **Terminated application** - This application has been completed or ended by the DRIS before its expiry date.
- **New fellowship application service:**
 1. A prospective fellow should be able to open a new application.
 2. A prospective fellow should be able to add their CV in the required format.
 3. A specified grant holder should be able to add their CV in the required format. If they are a NRF A or B rated researcher they are not required to enter their CV.
 4. A owner of a CV should be able to add various qualifications and work experience to their CV.
 5. A owner of a CV should be able to update their CV if it has been created.
 6. Once the application has been finalised the CV will be locked until the application is complete or denied.
 7. A prospective fellow should be able to specify their intended grant holder.
 8. A prospective fellow should be able to specify their intended referees.
 9. A application should be made available for stakeholders such as the DRIS, HOD and Dean to deny or approve it at the correct stage in the process.
 - **Application renewal service:**
 1. A research fellow should be able to open a new renewal application.
 2. A research fellow should be able to add their progress report on all the work they have been working on.

3. A owner of a CV should be able to add various qualifications and work experience to their CV.
4. A owner of a CV should be able to update their CV if it has been created.
5. Once the application has been finalised the CV will be locked until the application is complete or denied.
6. A renewal application should be made available for stakeholders such as the DRIS, HOD and Dean to deny or approve it at the correct stage in the process.

- **Application Referees' report service:**

1. A referee should be able to login and create a referral report for the prospective fellow that has identified him/her.

- **Grant holder application finalisation service:**

1. A research fellow's grant holder should be able to finalise the renewal application of that research fellow.
2. A prospective fellow's grant holder should be able to finalise the prospective fellows application who he wishes to supervises.

- **HOD approval service:**

1. A HOD of a department should be able to login and approve, decline or ask for amendment of any pending applications.
2. A HOD of a department must be able to create a recommendation report for applications they approve.

- **Dean endorsement service:**

1. A member of the dean's office should be able to login and endorse the applications, that they approve of, with a motivation and be able to rank them.
2. A member of the dean's office should be able to login and deny applications that they disprove of.

- **DRIS approval service:**

1. A DRIS member who administers the process must be able to log in and review pending applications that need to be checked for eligibility and approve or deny them.
2. A DRIS member who administers the process must be able to create post doctoral committee meetings. And also be able to prepare the pre-documentation thereof.

3. A DRIS member who administers the process must be able to finally approve or deny the funding of any last stage applications and also be able to provide motivation and details thereof.

- **Application progress viewer service:**

1. A prospective fellow's application or a research fellow's renewal application status should be made available for their review if they have an application in the system.
2. The grant holder of an application should be able to view the status of the application.

- **Progress report management service:**

1. A research fellow should be able see which applications of theirs have outstanding reports.
2. A research fellow should be able to create any outstanding progress report for a particular application.
3. The number of progress reports for a particular application is equivalent to the number of years that application is active for.

- **Forward and Rewind Service:**

1. A DRIS member must be able to forward any application through the various stages in the application pipeline.
2. A DRIS member must be able to rewind any application through the various stages in the application pipeline.
3. Must allow the DRIS member to create forward and rewind report.

3.2.3 Report services

The report services provides the reporting generation service for the DRIS in order to extract valuable information and allow them to provide electronic and hard copy data for review or archiving. The DRIS is the only stakeholder that will make use of this service. Note reports are temporal objects and do not get saved by the system.

- The DRIS member must be able to access a report generation tool which effectively allows them to:
 1. Open new report.
 2. Select report data from the database.
 3. Generate report.
 4. View report.

- The DRIS member viewing the report must be allowed to export the report to either a pdf or a spreadsheet format.

3.2.4 User account management services

The user account management services provide each user who has an account on the system with the facilities to manage their account and also a facility for the system administrator to manage the accounts on the system.

- A prospective fellow will be able to create a new account if they don't have one.
- Any identified user that is not already on the system should be allowed to create a new account.
- If integrated with peoplesoft the system should be able to pull all the account information of personnel but until such time the system administrator will have to be allowed to create the accounts of all DRIS members, Dean's office members, HODs and post-doctoral committee members.
- A user should be able to modify their account details.
- An administrator should be able to modify any user account details.
- An administrator should be able to remove any user account.
- Allow the creation and activation of On-demand users which are users which don't have an account but need an account with other privileges than a prospective fellow account.

3.2.5 Notification services

The system will need to generate automated notifications that are sent internally and to the corresponding email of the recipient. To prevent spamming the system will only allow users with the correct security roles to make use of the service. It is important that this service runs asynchronously after it has been engaged since the service makes use of external systems that may be un-responsive. In case where the external systems fail this service needs to handle it.

- The system must be able to create a new notification.
- Stakeholders with the correct security roles must be able to create a new notification.
- A notification must allow for the specification of recipient.
- A notification must allow for the specification of a message.

- The service must allow the notification to be sent to both the user account and recipient's email address.
- The service must allow a batch of notifications to be sent.
- The service must be able to send emails not associated with any internal notification.
- The service must be able to see if there are any notifications that have an unsent email counterpart and attempt to resend it.

3.2.6 Audit-Trail services

The Audit-Trail services provide a means for the system administrator or DRIS members to view all the actions that were performed by a user of the system. It is important to note that the audit entries are read-only and can only be inserted by the system itself. The monitored actions are hard wired into the system so to prevent any tampering.

- An authorised user must be able to generate a report via the reporting services for the audit log.
- The system should be able to insert audit log entries when the monitored actions occur.

3.2.7 Archival services

The archival services of the system will be able to back up the current state of the database to a specified location. Further it should be able to remove old records from the working database that are no longer in use and store them in a location so that they can be retrieved on a on-demand basis.

- The system administrator needs to be able to perform an automatic archival of old data.
- The system administrator needs to be able to perform a backup of the current database.
- The system should be able to notify the system administrator of any possible archival data.
- The system administrator needs to be able to restore any backed up or archived data.

3.2.8 Imports and exports services

The imports and exports services of the system will allow the system administrator to export and import certain data. A sub-set of these services will also be made available to users of the appropriate security role.

- The system administrator will be able to export and import user accounts and their associated information and link to the on-demand user account creation service.

- The system administrator will also be able to import information of the departments and faculties for location purposes of users.
- The system administrator and authorised users will be able to import and export all the data associated with applications.

3.2.9 Location management services

The system will need to manage the current locations that exist with in the institutions that are registered with the system. A location is the concatenation of a department, faculty and institution. It may also be that the department is fictional and used as a simple place holder for cross departmental applications. Also if integration with peoplesoft is to occur it will allow this service to synchronise with it. This will be a system service and not be exposed directly to users

- The service must allow the creation a location via the imports.
- The service needs to be able to retrieve all institutions.
- The service needs to be able to retrieve all faculties in the institution.
- The service needs to be able to retrieve all departments under a faculty of a particular institution.

3.2.10 CV management services

Each grant holder, prospective fellow and research fellow will have a CV. Thus this service will provide the management there of. This will be a system service which will be used indirectly the users of the system.

- The service must be able to create and update a CV for a particular user.

3.3 Use case diagrams

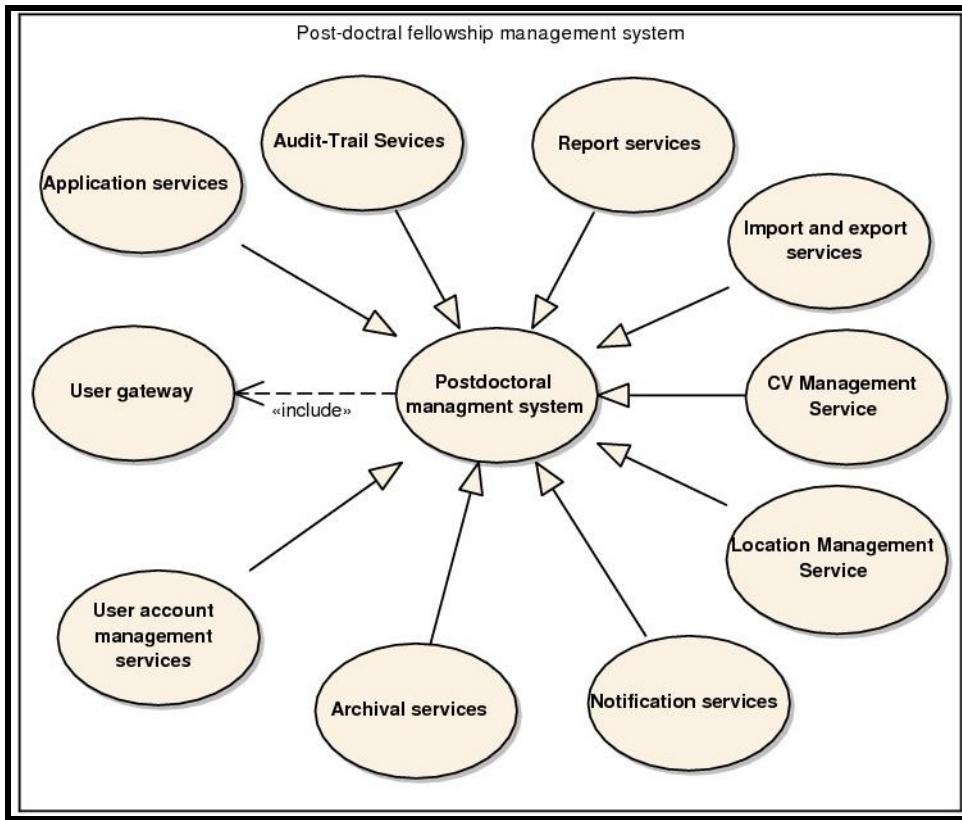


Figure 1: Use case diagram of Post-doctoral fellowship management system

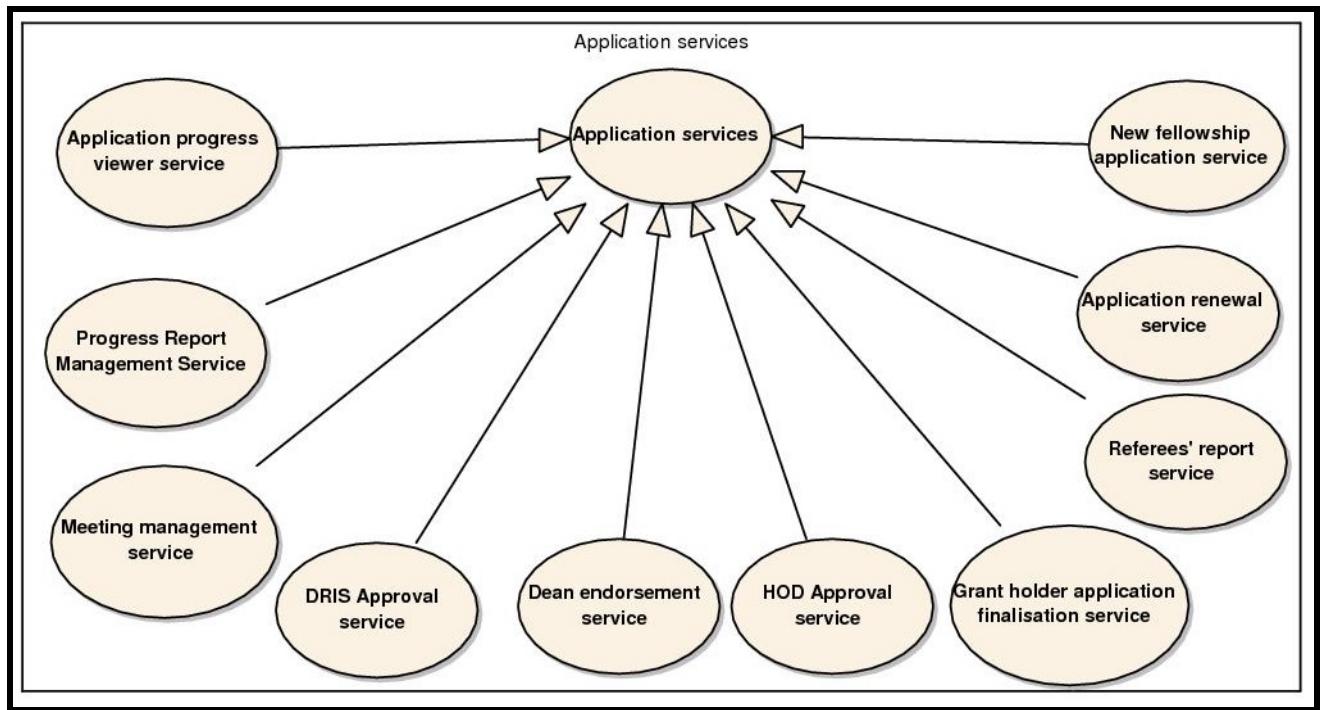


Figure 2: Use case diagram of Application service

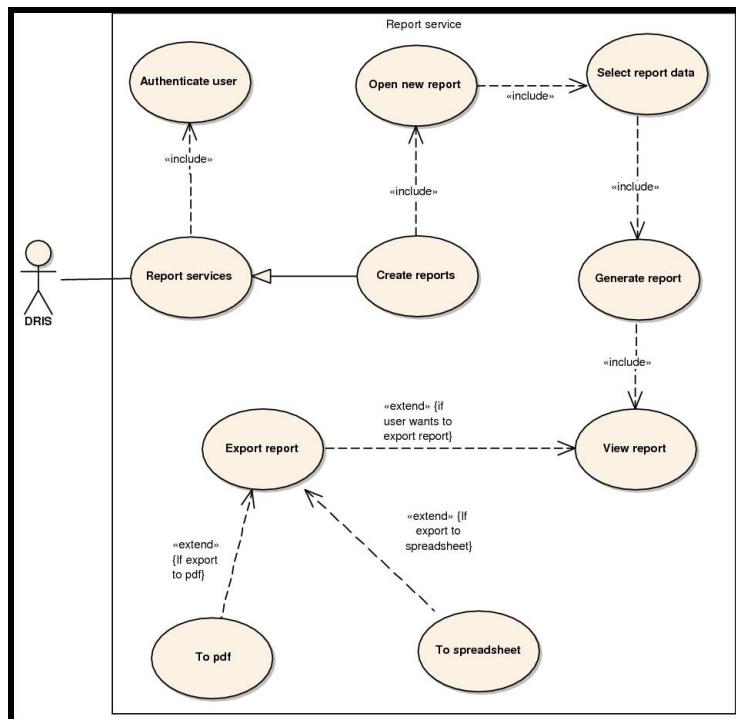


Figure 3: Use case diagram of Report service

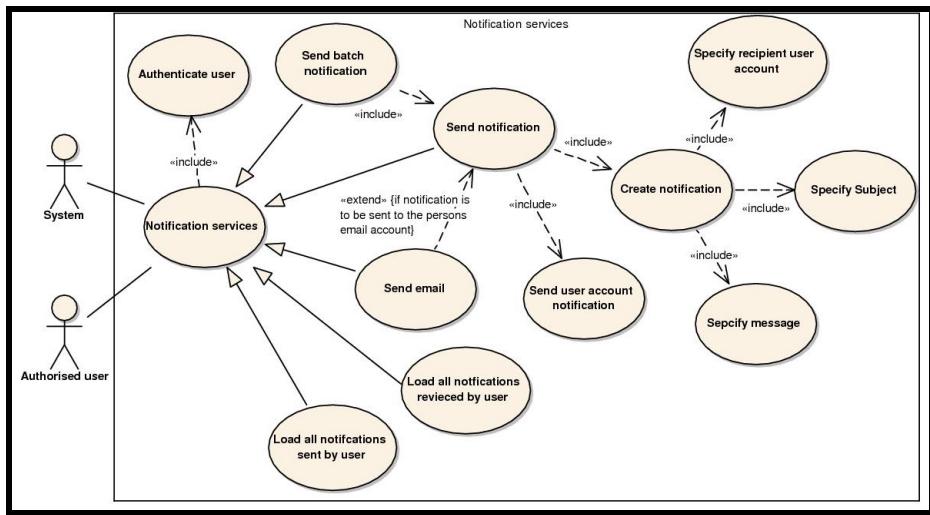


Figure 4: Use case diagram of Notification services

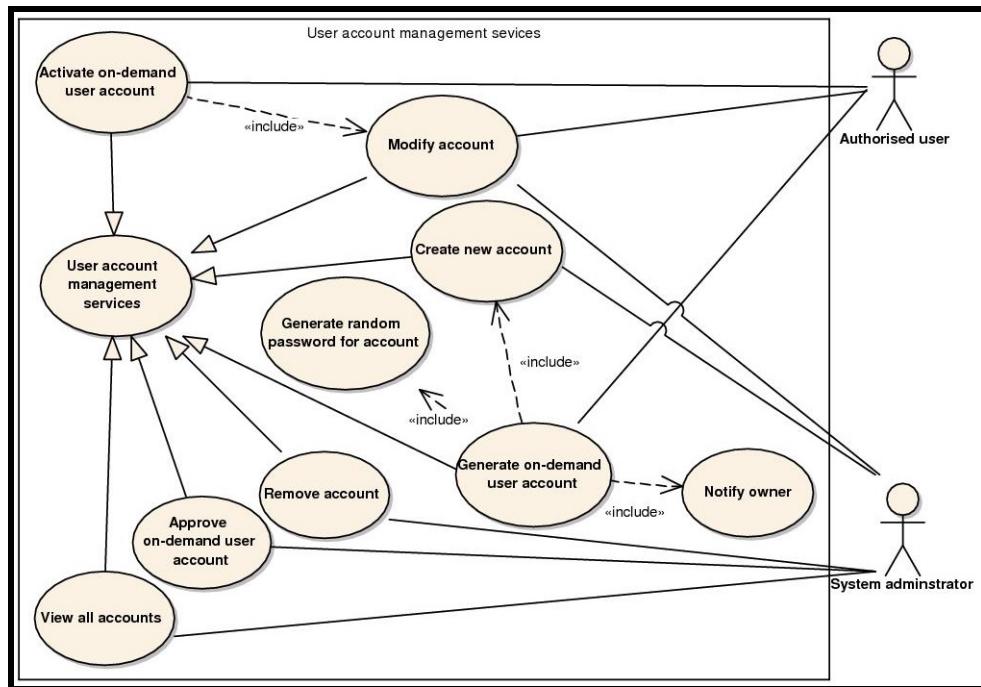


Figure 5: Use case diagram of User account management services

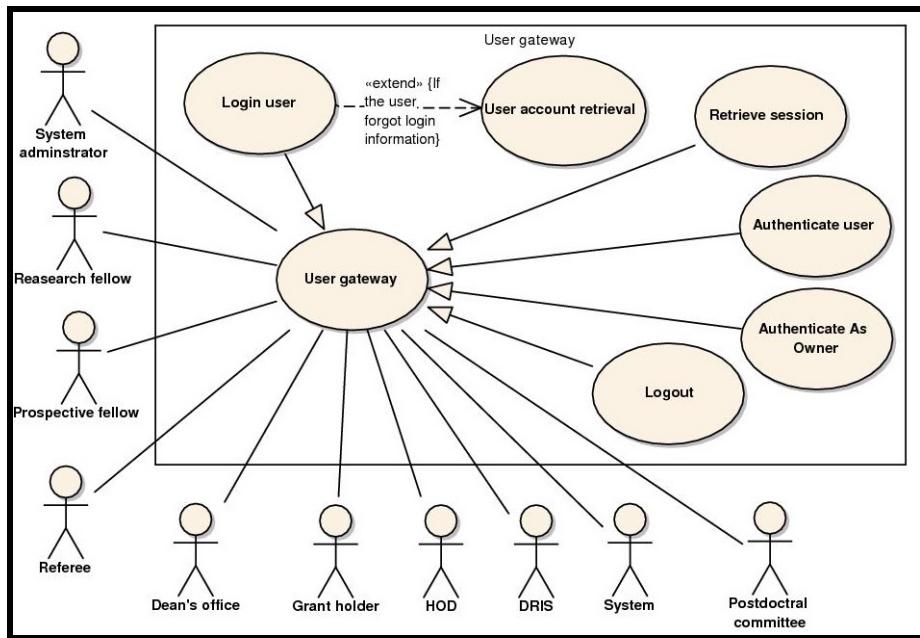


Figure 6: Use case diagram of User gateway

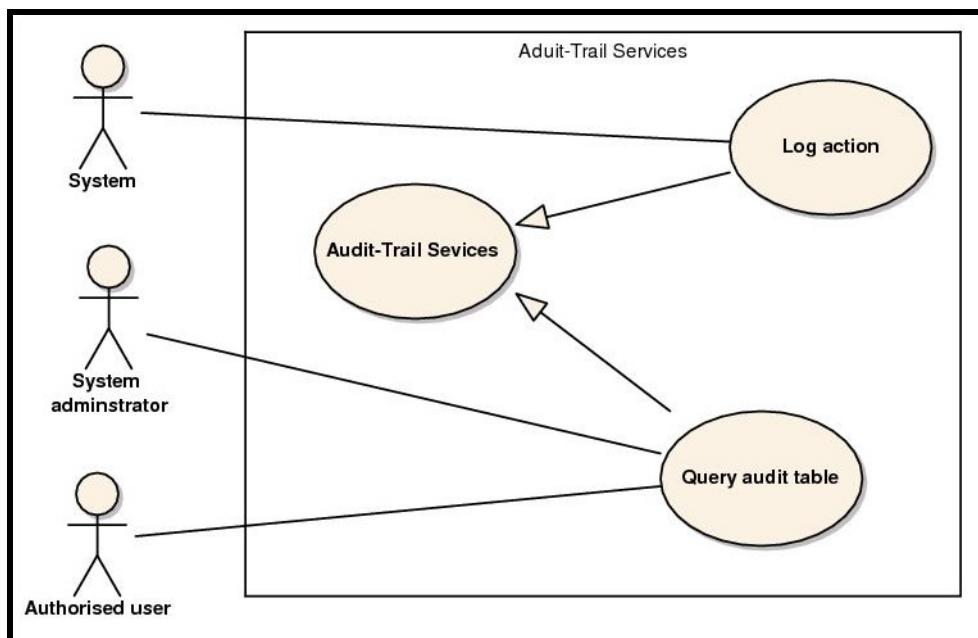


Figure 7: Use case diagram of Audit-Trail services

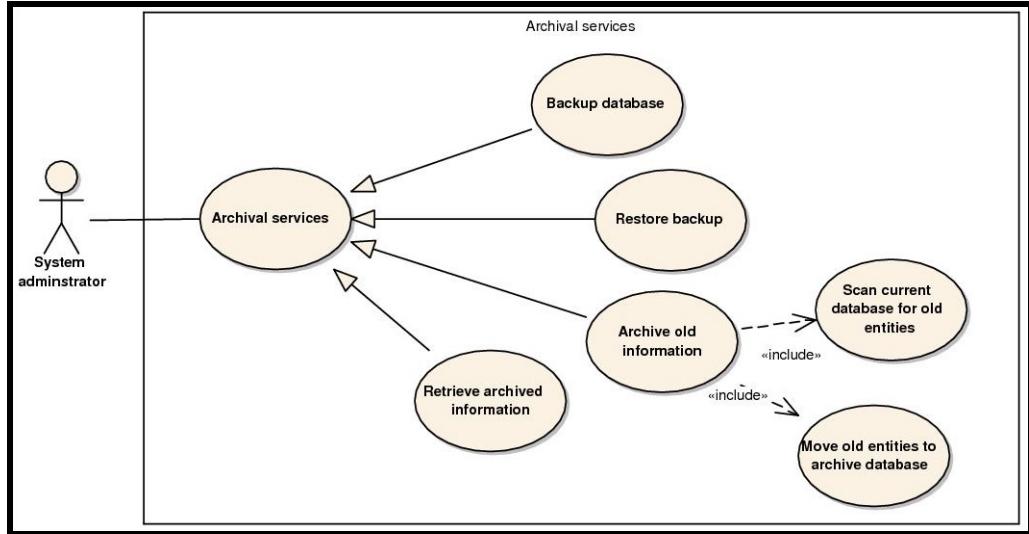


Figure 8: Use case diagram of Archival services

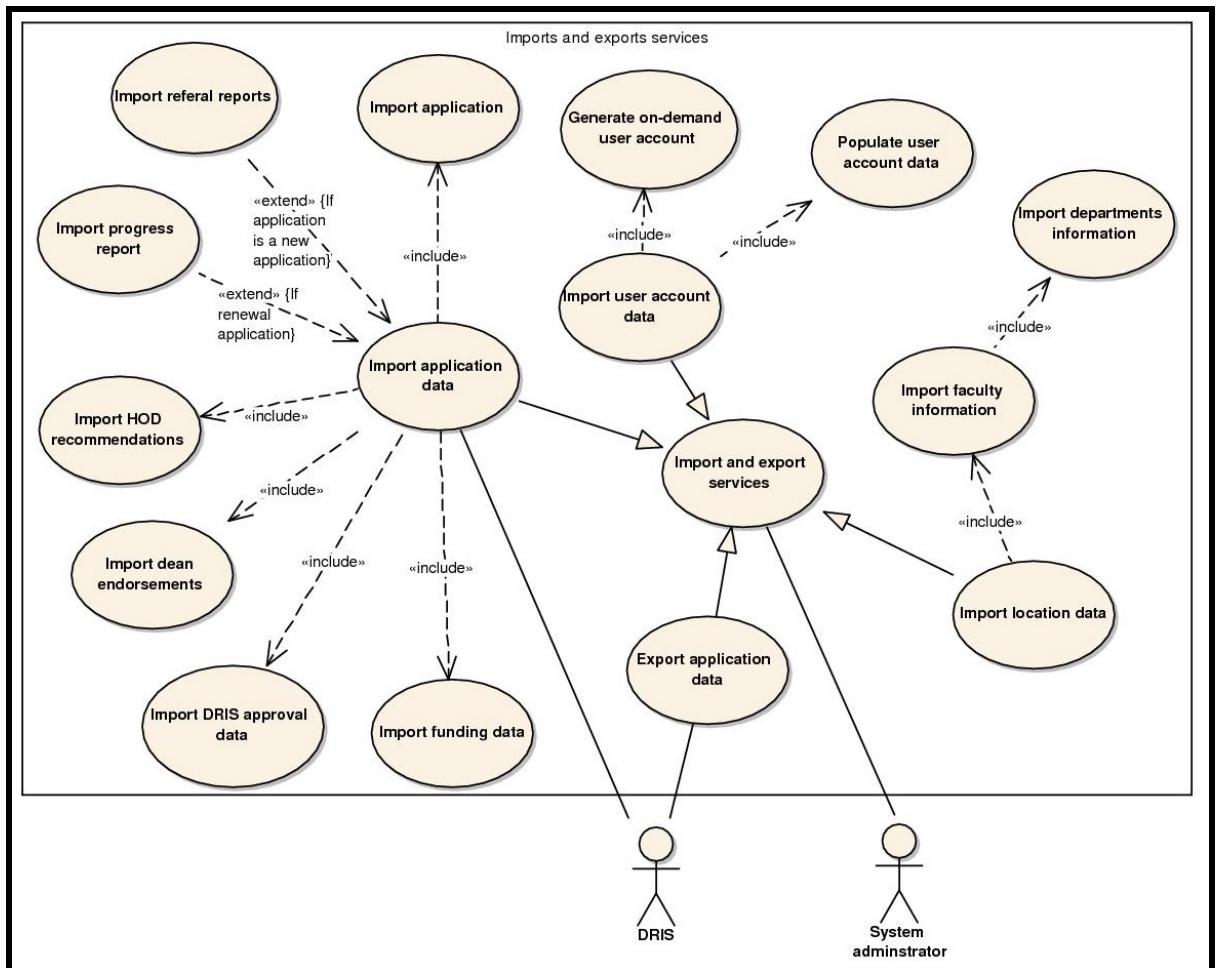


Figure 9: Use case diagram of Imports and exports services

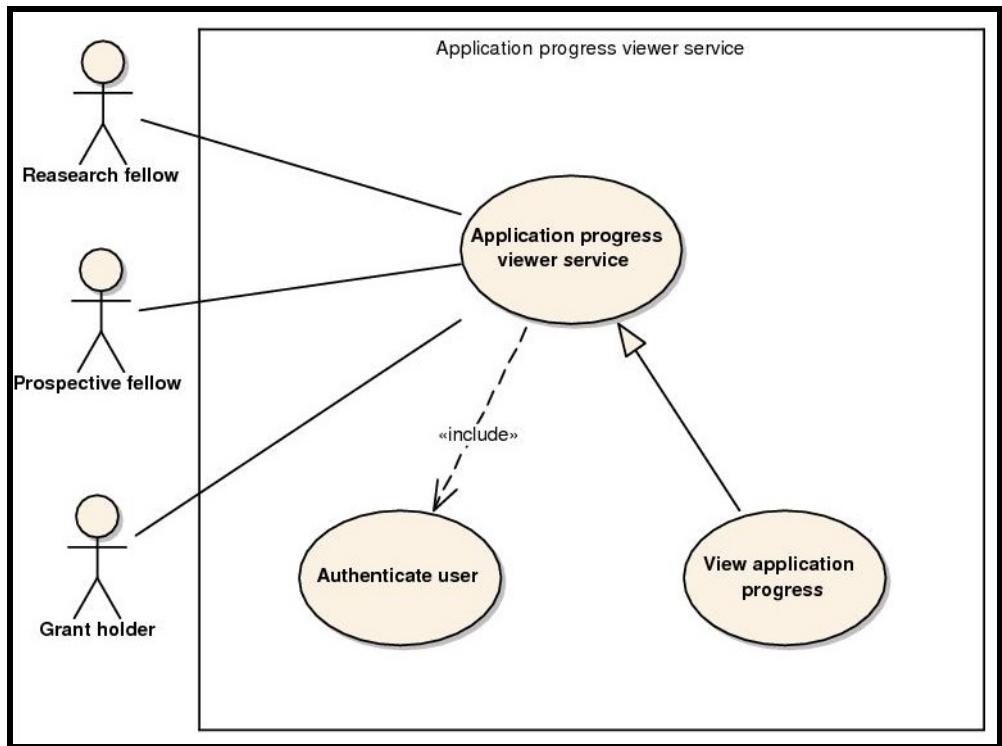


Figure 10: Use case diagram of Application progress viewer service

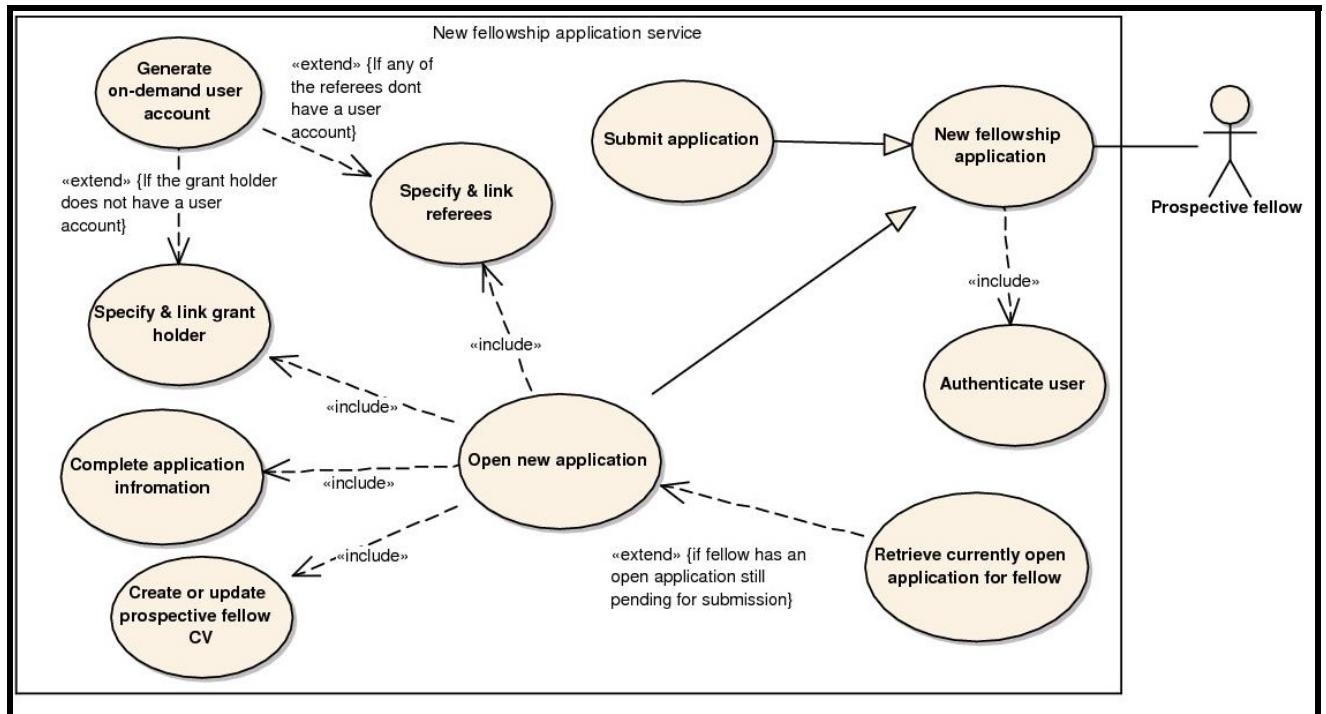


Figure 11: Use case diagram of New fellowship application service

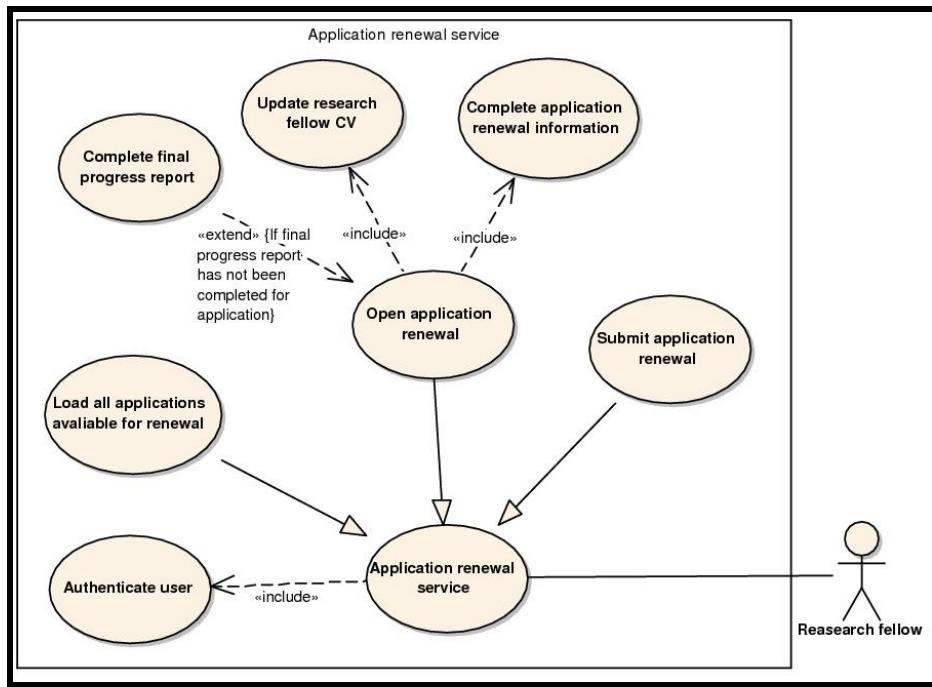


Figure 12: Use case diagram of Application renewal service

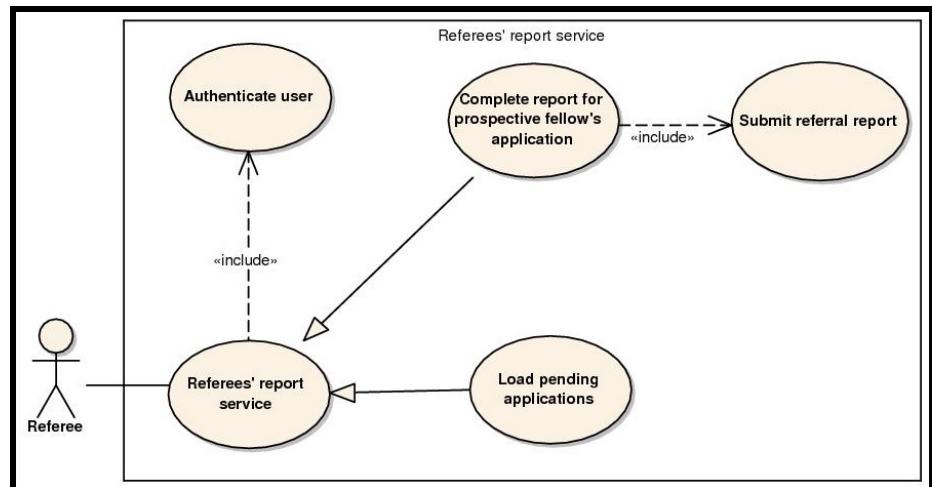


Figure 13: Use case diagram of Referees' report service

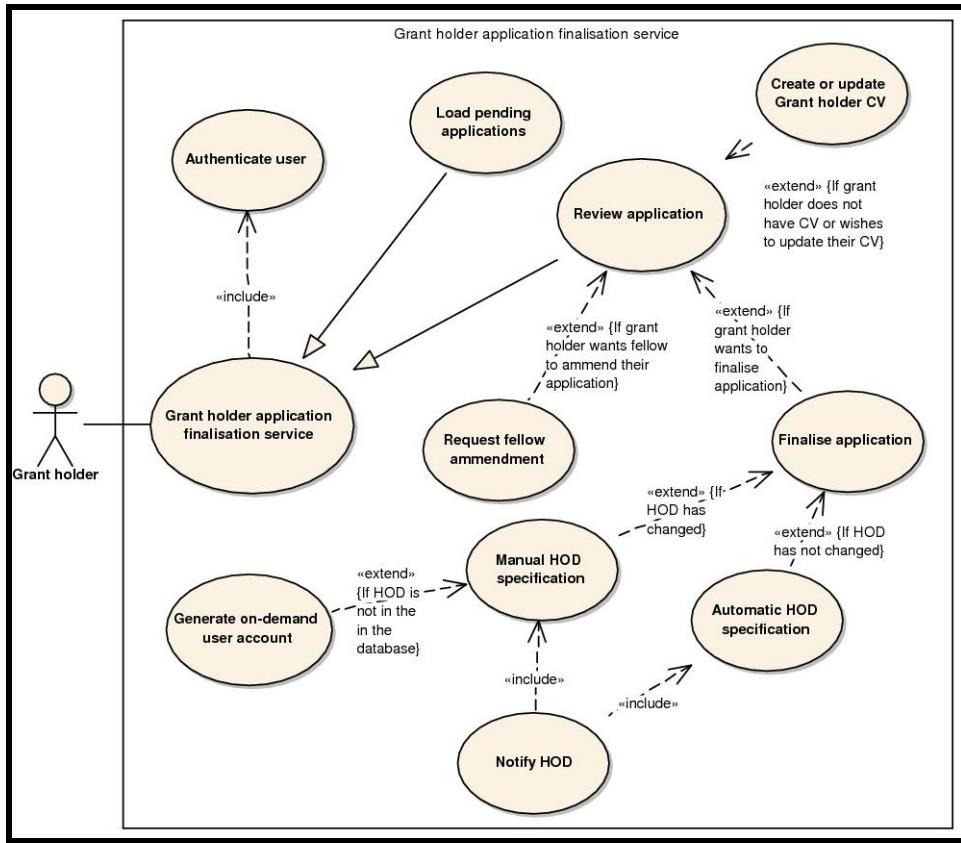


Figure 14: Use case diagram of Grant holder application finalisation service

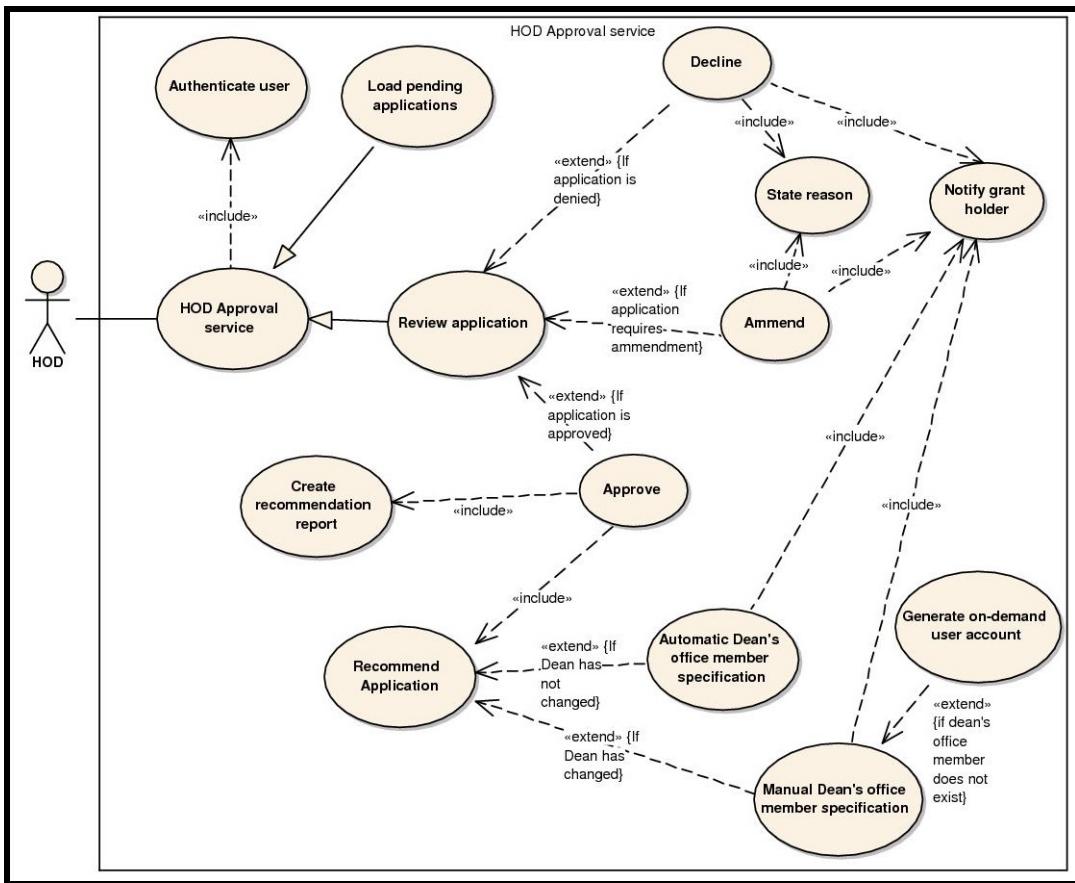


Figure 15: Use case diagram of HOD Approval service

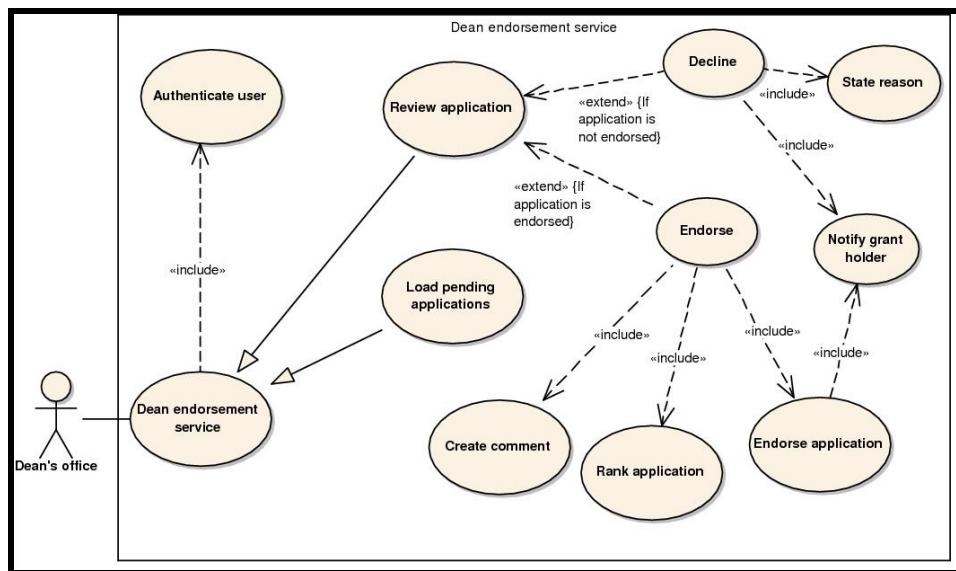


Figure 16: Use case diagram of Dean endorsement service

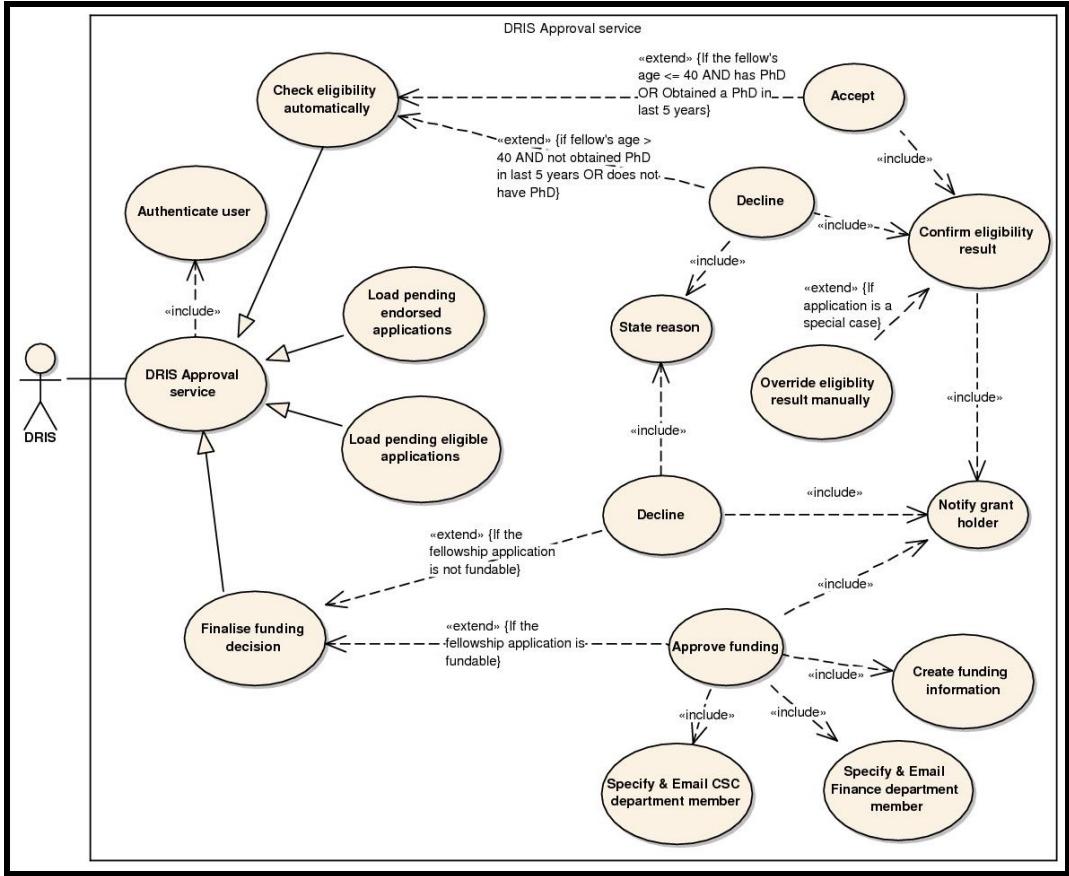


Figure 17: Use case diagram of DRIS approval service

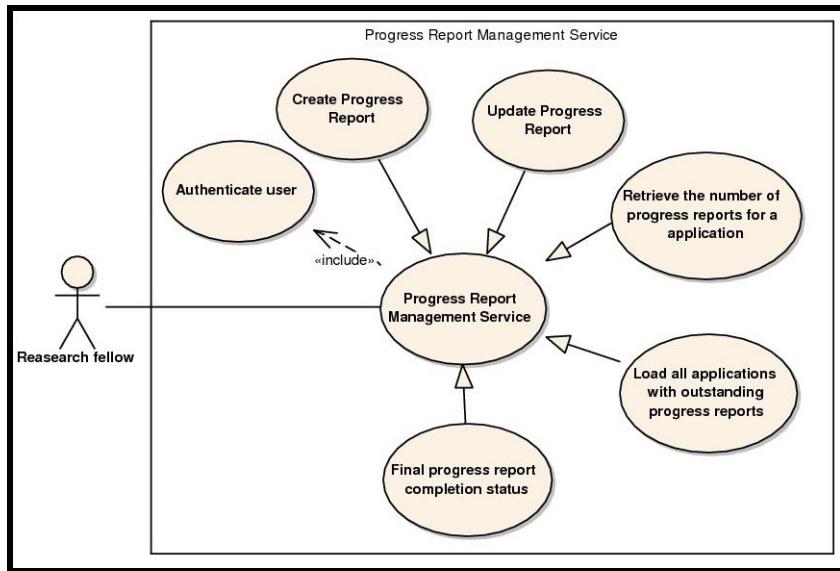


Figure 18: Use case diagram of Progress Report Management Service

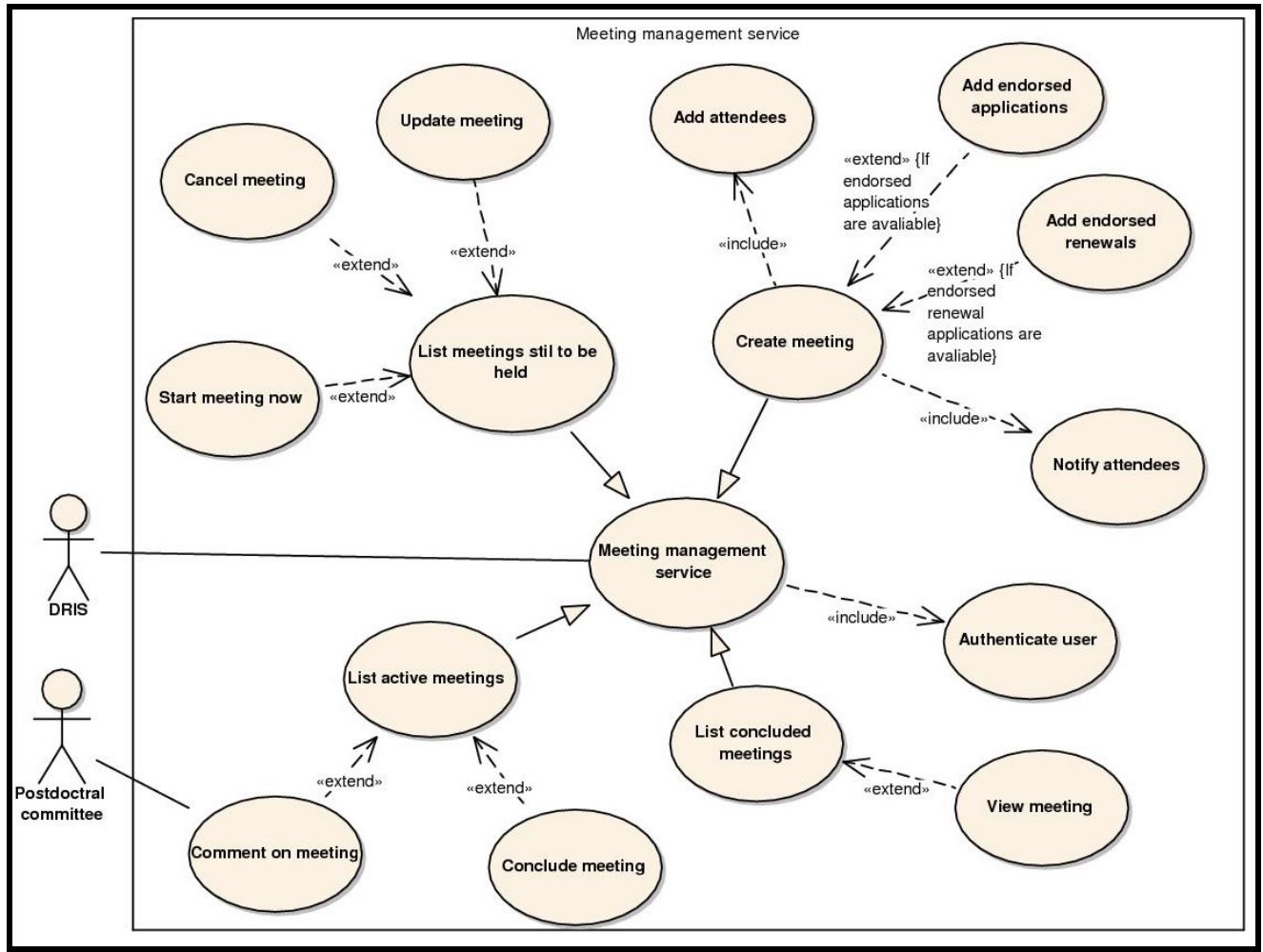


Figure 19: Use case diagram of Meeting management service

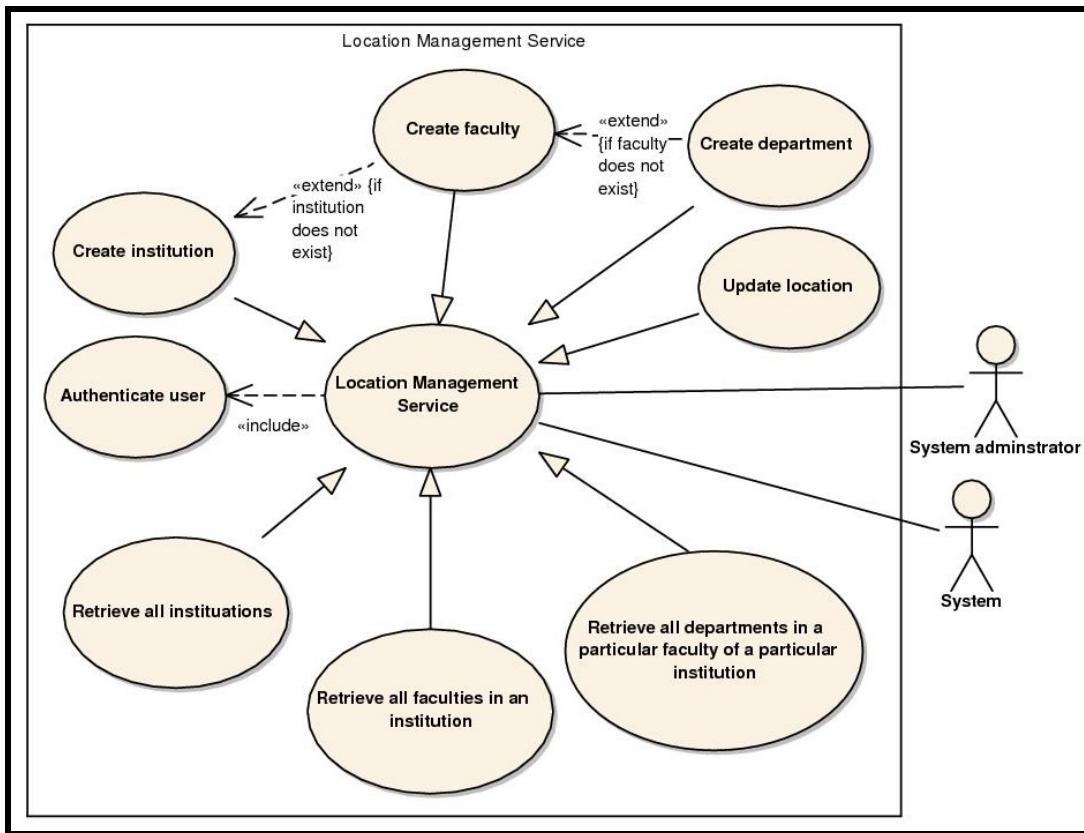


Figure 20: Use case diagram of Location Management Service

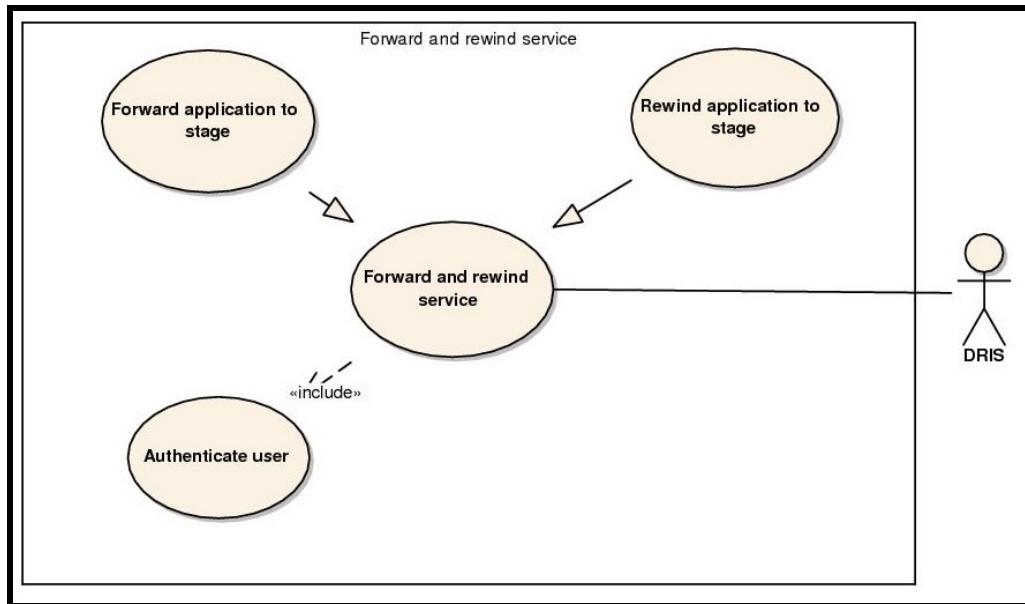


Figure 21: Use case diagram of Forward and Rewind Service

3.4 Use case prioritization

This section states the ranking in terms of priority of the service use case per use case diagram figure. The priorities are: Critical, Important and Nice to have.

- User gateway: Critical
 - Login user: Critical
 - User account retrieval: Important
 - Create prospective fellow user account: Critical
 - Generate on-demand user account: Critical
 - Activate on-demand user account: Critical
 - Authenticate user: Critical
- Application services: Critical
 - New fellowship application service: Critical
 - Application renewal service: Critical
 - Referees' report service: Critical
 - Grant holder application finalisation service: Critical
 - HOD Approval service: Critical
 - Dean endorsement service: Critical
 - DRIS approval service: Critical
 - Progress report management service: Critical
 - Meeting management service: Important
 - Application progress viewer service: Important
- Notification services: Critical
- User account management services: Critical
 - Create new account: Critical
 - Modify account: Critical
 - Remove account: Important
 - View all accounts: Important
- Audit-Trail services: Critical

- Log action: Critical
 - Query audit table: Important
- CV management service: Critical
- Location management service: Critical
- Report services: Important
- Imports and exports services: Important
 - Import user account data: Important
 - Import application data: Nice to have
 - Import location data: Important
 - Export application data: Important
- Archival services: Nice to have
 - Retrieve archived information: Nice to have
 - Archive old information: Nice to have
 - Backup database: Important

3.5 Use case/Services contracts

This section states the preconditions and postconditions of the each use case per use case diagram figure.

3.5.1 Preconditions

These are conditions that must be met by the system or user before they are allowed to use the use case.

- Application service
 - New fellowship application service: Can only be accessed if new applications are open, if the user has no open applications, and the applicant is under the age of 40.
 - Application renewal service: Can only be accessed if renewals are open and if the user is a research fellow that is still in possession of a fellowship.

- Referees' report service: Can only be accessed if user is a referee.
- Grant holder application finalisation service: Can only be accessed if user is a grant holder to the specified application.
- HOD Approval service: Can only be accessed if user is a HOD for the department, the application is linked to.
- Dean endorsement service: Can only be accessed if user is a member of the dean's office for the faculty the department is linked to.
- DRIS Approval service: Can only be accessed if user is a member of the DRIS.
- Meeting management service: Can only be accessed if user is a member of the DRIS or post-doctoral committee member.
- Application progress viewer service: Can only be accessed if user logged as a prospective fellow, research fellow or grant holder. Also the user needs to have at least one application on the system.

- **Report service**

- Create report: If a user with the associated credentials has been authenticated as a member of the DRIS or with the correct security role.
- Open new report: If no report is currently open.
- Select report data: If report is open and data is available for report.
- Generate report: If data has been selected.
- View report: If a report has been generated.
- Export report: If user wants to export report and the user is busy viewing the report.
- To csv: If user wants to export report to a csv file.
- To pdf: If user wants to export report to a pdf.

- **Notification services**

- Create notification: If requesting user is the system or an authorised user.
- Specify recipient user account: If a notification is in its setup stage.
- Specify message: If a notification is in its setup stage.
- Send user account notification: If notification is ready to be sent.
- Send email: If notification is ready to be sent.

- **User account management services**

- Create new account: If requesting user has the appropriate security role or the system administrator.

- Modify account: If requesting user has the appropriate security role or is the owner of the account.
- Remove account: If requesting user has the appropriate security role.
- View all accounts: If requesting user is a system administrator.

- **User gateway**

- Login user: If requesting user is a user of the system.
- User account retrieval: If requesting user has forgotten their user credentials.
- Activate on-demand user account: If a user has been identified by an applicant and has a security token.
- Authenticate user: if user is logged in.

- **Audit-Trail services**

- Log action: If requesting user is the system.
- Query audit table: If the user has the correct security role.

- **Archival services**

- Retrieve archived information: If requesting user is a system administrator or the system.
- Archive old information: If requesting user is a system administrator or the system.
- Backup database: If requesting user is a system administrator.

- **Imports and exports services**

- Import application data: If requesting user is a system administrator or a DRIS member.
- Export application data: If requesting user is a system administrator or a DRIS member.
- Import location data: If requesting user is a system administrator.
- Import faculty information: If no such faculty is in the database already.
- Import departments information: If no such department is in the database and the faculty it relates to is in the database.
- Import user account data: If requesting user is a system administrator.
- Populate user account data: If the user account exists in the database and the data is valid.

- Import referral reports: If the application is a new application.
- Import progress report: If the application is a renewal application.
- Import HOD recommendations: If the application has a valid HOD recommendation.
- Import dean endorsements: If the application has a valid Dean's endorsement.
- Import DRIS approval data: If the application has valid DRIS approval data.
- Import funding data: If the application has a valid funding data and has been funded.

- **Application progress viewer service**

- View application progress: Can only be used if there are any applications made by the user or there are pending applications for their approval or recommendation.

- **New fellowship application service**

- Generate on-demand user account: If the prospective fellow has identified a referee or grant holder not on the system.
- Submit information: If all the application information is complete.

- **Application renewal service**

- Open new renewal application: If research fellow has a fellowship that is renewable.
- Submit report: If the progress report has been completed.
- Submit renewal application: If all the required information for the renewal has been entered.

- **Referees' report service**

- Load pending applications: If there are any pending applications for the referee and if the user was authenticated as the referee.
- Create report: If a application is selected from the list of pending applications.
- Submit referral report: If the referral report has been completed.

- **Grant holder application finalisation service**

- Load pending applications: If there are any pending applications for the grant holder and if the user was authenticated as the grant holder.
- Create Grant holder CV: If grant holder does not have a CV.

- Complete application form: If grant holder has selected any application that is still pending.
- Submit application: If all the required information has been entered

- **HOD Approval service**

- Load pending applications: If there are any finalised application available for approval and the grant holder of the application falls under department the HOD is in charge of and if user has been authenticated as the HOD.
- Application approval: If HOD has selected a application from the application list.
- Create recommendation report: If the application has been approved.
- Submit approved application's information: If the recommendation report has been completed.

- **Dean endorsement service**

- Load pending applications: If there are any approved application available for endorsement and the grant holder of the application falls under faculty of which the Dean's office is in charge of and the user has been authenticated as a member of the dean's office.
- Endorse application: If a application is selected from the pending list.
- Rank application: If the application has been endorsed.
- Create comment: If the application has been ranked.
- Submit endorsed application: If the required endorsement information has been completed.

- **DRIS approval service**

- Load pending applications: If the user is authenticated as a member of the DRIS and if there are any endorsed application available for eligibility checking or applications available for finalising their funding decisions.
- Check eligibility: If there are any endorsed application available for its eligibility check.
- Deny: If the prospective fellow is older than 40 and has not obtained their PhD in the last 5 years or if the prospective fellow does not have a PhD.
- Accept: If the prospective fellow is younger than 40 or is 40 and they have a PhD or if they have obtained a PhD in the last 5 years.
- Meeting management service: If a meeting is to be created or updated.
- Finalise funding decision: If the meeting regarding the application has been concluded.

- Create funding information: The application has been approved for funding.
- Deny: If the application's funding was denied.
- Approve funding: If the application's funding was denied.

- **Meeting management service**

- List options: If user is a authenticated DRIS member.
- Create meeting: If any eligible applications are available and the user selects the service from the options list.
- Add endorsed applications: If any new applications that are eligible are available.
- Add endorsed renewals: If any renewal applications that are eligible are available.
- List active meetings: If user is a authenticated post doctoral committee member.
- Record minutes of meeting: If the selected meeting has been listed.

3.5.2 Postconditions

These are conditions that must be met by the system and the data after the use case has been used.

- **Report service**

- Authenticate user: The user has been authenticated as a DRIS member.
- Open new report: A new report is active.
- Select report data: The data for the active report is selected.
- Generate report: The report is available for viewing.
- View report: The report is available for export and must be visible.
- To pdf: The report has been exported to a PDF file.
- To spreadsheet: The report has been exported to a spreadsheet file.

- **Notification services**

- Authenticate user: The user has been authenticated as the system or a user with the appropriate security role.
- Send notification: A notification has been stored and sent.
- Create notification: A notification has been stored internally.
- Specify recipient user account: The notification has a a recipient.
- Specify message: The notification has a message.

- Send user account notification: The message is sent to the user.
- Send email: The message is sent to the email specified email address.
- Send batch notifications: A batch of notifications have been stored and sent.
- Load all notifications received by user: All the notifications that were received by the user are available.
- Load all notifications sent by user: All the notifications that were sent by the user are available.

- **User account management services**

- Create new account: A new user account is added to the system.
- Modify account: The specified user account is updated.
- Remove account: The specified user account is disabled and pending removal from the system.
- View all accounts: All user accounts have been loaded and are available for viewing.
- Generate on-demand user account: A dormant user account has been created on the system with a random password.
- Generate random password for account: A random password has been created and associated with account.
- Notify owner: A notification has been sent the owner of the account.
- Approve on-demand user account: The pending user account has become dormant.
- Activate on-demand user account: The dormant user account has become active.

- **User gateway**

- Login user: User is verified and logged in.
- User account retrieval: An recovery email is sent to the user account that has been queried for recovery.
- Logout: A user’s session has been invalidated and the user is no longer accessing any services of the system.
- Retrieve session: The user’s session data is available.
- Authenticate user as owner: The current user has been authenticated as the owner of the object.
- Authenticate user: The user is confirmed to be logged in and has the security role expected by the system.

- **Audit-Trail services**

- Log action: A user action was recorded in the audit table and cannot be changed by user nor by the system.
- Query audit table: An valid response to the query was returned.

- **Archival services**

- Retrieve archived information: The current working database has been repopulated with the selected archive database data.
- Archive old information: Any old information in the current working database has moved to the archived database.
- Scan current database for old entities: All old entities in the current working database have be identified.
- Move old entities to archive database: All old entities are no longer in the current working database but in the archive database.
- Backup database: The database has been backed up the specified location.
- Restore backup: The current working database has been repopulated with the backed up data.

- **Imports and exports services**

- Import application data: All the specified application data is now in the database.
- Export application data: All the specified application data has been exported.
- Import location data: All the specified location data is now available in the database.
- Import faculty information: The specified faculty is now in the database.
- Import departments information: The specified department is now in the database.
- Import user account data: The user account has been created on the system and the user is notified of this.
- Populate user account data: The data of the user has been imported into the new user account.
- Import referral reports: The associated application's referral reports are in the database.
- Import progress report: The associated application's progress report is in the database.
- Import HOD recommendations: The associated application's HOD recommendation is in the database.

- Import dean endorsements: The associated application's dean endorsement is in the database.
- Import DRIS approval data: The associated application's DRIS approval data is in the database.
- Import funding data: The associated application's funding data is in the database.

- **Application progress viewer service**

- Authenticate user: The current user was authenticated as a grant holder or research fellow or a prospective fellow.
- View application progress: The application progress of the specified user application is visible.

- **New fellowship application service**

- Authenticate user: The current user was authenticated as a prospective fellow.
- Open new application: A new application has been created and has a status level of open. The prospective fellow is associated with the application.
- Retrieve currently open application for fellow: The current open application of the prospective fellow has been loaded.
- Create prospective fellow cv: The prospective fellow's CV has been created and associated with the prospective fellow.
- Specify and link grant holder: The grant holder's user account is associated with the application. Grant holder has been notified.
- Specify and link referees: The referees' user account is associated with the application. Referees have been notified.
- Submit application: The applications status is now submitted.

- **Application renewal service**

- Authenticate user: The current user was authenticated as a research fellow.
- Open new renewal application: A new renewal application is open and stored in the system.
- Complete final progress report: The final progress report associated with the renewal has been completed and stored in the system.
- Update research fellow CV: The research fellow's CV has been updated.
- Complete application renewal information: The application's information is complete and stored. The application associated with the research fellow.

- Submit application renewal: The application status has been set to referred. Grant holder is notified.
- Load all applications available for renewal: All the applications of the research fellow which are available for renewal (3 months from expiration) have been loaded.

- **Referees' report service**

- Authenticate user: The current user was authenticated as a referee.
- Load pending applications: Any applications that need a referral report from the specified referee must be listed.
- Create report for prospective fellow: The report is complete and ready to be submitted.
- Submit referral report: The referral report has been finalised and associated with the application. If it is the last referral report then the application's status is changed to refereed and the Grant Holder of the application is notified.

- **Grant holder application finalisation service**

- Authenticate user: The current user was authenticated as a grant holder.
- Load pending applications: Any applications that need to be finalised from the specified grant holder have been loaded.
- Create or update grant holder cv: The grant holder's CV is stored and associated with the grant holder or is updated.
- Review application: The application details have been loaded.
- Request fellow amendment: The application's is has reverted to submitted.
- Finalise application: The application is now a finalised application. The HOD of the relative department is notified.
- Manual HOD specification: The HOD has been manually specified and notified. If the HOD does not exist in the system a user account has been created for them.
- Automatic HOD specification: The HOD has been automatically selected based on location data and has been notified.

- **CV management service**

- Authenticate User: The user has been authenticated as the System.
- Create CV: A CV has been stored on the system and associated with the user.
- Update CV: The specified CV has been updated.
- Does CV exist: The status of the CV existence in the system is available.

- **HOD Approval service**

- Authenticate user: The current user was authenticated as a HOD.
- Load pending applications: Any applications that need to be approved by the specified HOD must have been loaded.
- Decline: The specified application's status is changed to declined and a decline report is associated with the application.
- Amend: Application's status is changed to refereed. Amend request has been associated with the application.
- State reason: The reason for the action is associated with decline report or amend request.
- Notify grant holder: A denied, amend or recommended notification has been sent to the Grant holder of the application appropriately.
- Approve: The application has a recommendation report associated with it and its status has changed to recommended.
- Review application: The application details have been loaded.
- Create recommendation report: The recommendation report is associated with the application and the Approval is ready to be finalised.
- Recommend application: The application status is changed to recommend. A notification is sent to the grant holder.
- Manual Dean's office member specification: The Dean's office member has been manually specified and notified. If the Dean's office member does not exist in the system a user account has been created for them.
- Automatic Dean's office member specification: The Dean's office member has been automatically selected based on location data and has been notified.

- **Dean endorsement service**

- Authenticate user: The current user was authenticated as a member of a dean's office.
- Load pending applications: Any applications that need to be approved by the specified dean's office have been loaded.
- Review application: The application details have been loaded.
- Decline: The specified application's status is changed to declined and a decline report is associated with the application.
- State reason: The reason for the action is associated with decline report or amend request.

- Notify grant holder: A denied or endorsed notification has been sent to the Grant holder of the application appropriately.
- Endorse: The specified application has been endorsed and has a endorsement report associated with it. The DRIS members are notified.
- Rank application: The application has a rank associated with it.
- Create comment: The application has a endorsement comment associated with it.
- Endorse application: The application endorsement is finalised and the application status is now endorsed and the DRIS are notified as well as the grant holder.

- **DRIS approval service**

- Authenticate user: The current user was authenticated as a member of the DRIS.
- Load pending endorsed applications: Any applications that need to be checked for eligibility by the DRIS have been loaded.
- Load pending eligible applications: Any applications that need to have their final funding decision made by the DRIS have been loaded.
- Decline: The application eligibility has been automatically declined and is ready to be confirmed.
- Notify grant holder: A decline or eligible or approved funding notification is sent to the Grant holder of the application.
- Accept: The application eligibility has been automatically accepted and is ready to be confirmed.
- Decline: The specified application's status is changed to declined and a decline report is associated with the application.
- State reason: The reason for the action is associated with decline report or amend request.
- Check eligibility automatically: The application has been checked for eligibility and been confirmed by the DRIS member.
- Confirm eligibility result: The application's status has been changed accordingly.
- Override eligibility result manually: The automated eligibility check's result has been inverted accordingly.
- Approve funding: The application status is now changed to a funded.
- Create funding information: The application has its funding information associated with it.
- Notify grant holder: A notification is sent to the Grant holder of the application that it is successful.

- Specify and email CSC department member: A customizable email has been sent to the specified CSC department member.
- Specify and email Finance department member: A customizable email has been sent to the specified Finance department member.

- **Progress report management service**

- Authenticate user: The current user was authenticated as a research fellow.
- Create progress report: The progress report has stored in the system and is associated with the application.
- Update progress report: The specified progress report has been updated.
- Retrieve the number of progress reports for a application: The number of progress reports for a application is available.
- Load all applications with outstanding progress reports: All applications with outstanding progress reports have been loaded.
- Final progress completion status: The completion status of the final progress report for an application is available.

- **Meeting management service**

- Authenticate user: The current user was authenticated as a member of the DRIS or the Post doctoral committee.
- List meetings still to be held: All meetings still to be held at the time have been loaded.
- List active meetings: All active meetings at the time have been loaded.
- List concluded meetings: All concluded meetings at the time have been loaded.
- Create meeting: A new meeting is open for modification.
- Add endorsed applications: An endorsed new application has been added to the agenda of the meeting.
- Add endorsed renewals: An renewal application has been added to the agenda of the meeting.
- Add attendee: A attendee have been added to the meeting.
- Notify attendees: A notification is sent to all the meeting attendees.
- Comment of meeting: The comment has been associated with meeting.
- Start meeting now: The specified meeting has started.
- Conclude meeting: The specified meeting has been concluded.

- Cancel meeting: The meeting has been cancelled and removed from the system. The attendees have been notified.
- Update meeting: The meeting has been updated. The attendees have been notified.
- View meeting: The meeting is loaded and being viewed.

- **Forward and Rewind Service**

- Authenticate user: The current user was authenticated as a DRIS office member.
- Forward application to stage: The application has been moved to appropriate status.
- Rewind application to stage: The application has been moved back to the appropriate stage. All higher stage data has been removed from application.

3.5.3 Request and result data structures

The system will be following a object oriented approach due it being the paradigm of the Java programming language. Therefore the input and output structure will mainly be in the form of objects. Also the objects that will be produced and used inside the system will adhere to the domain objects specification found below.

3.6 Process specifications

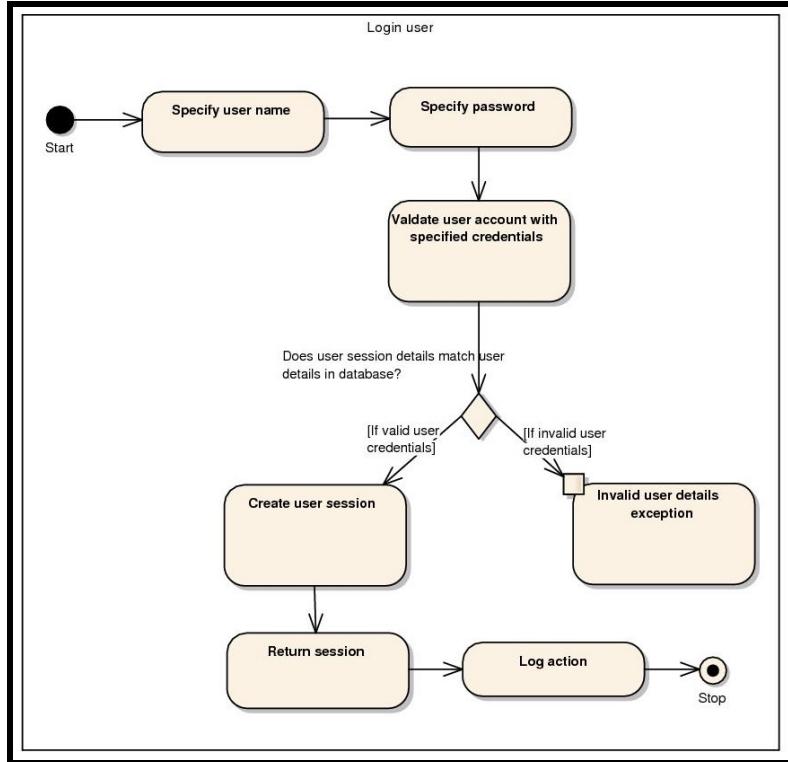


Figure 22: Activity diagram of the Login user use case.

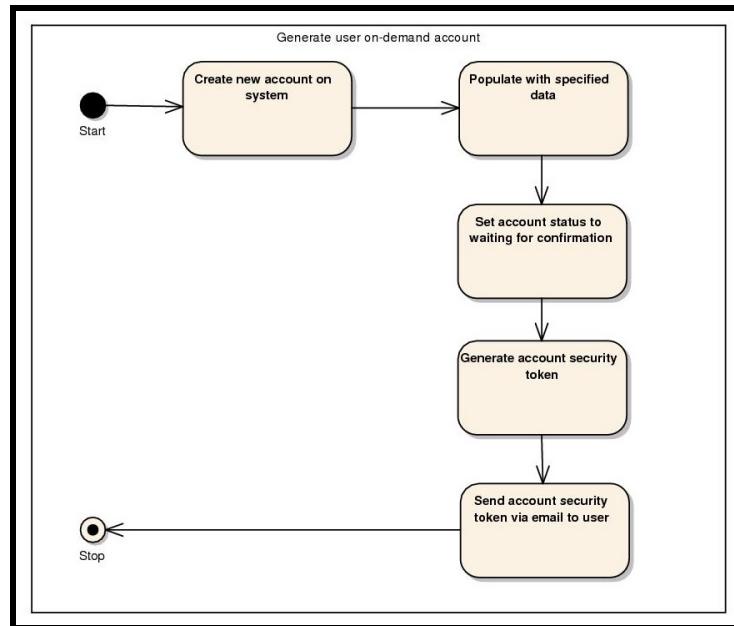


Figure 23: Activity diagram of the Generate user on-demand account use case.

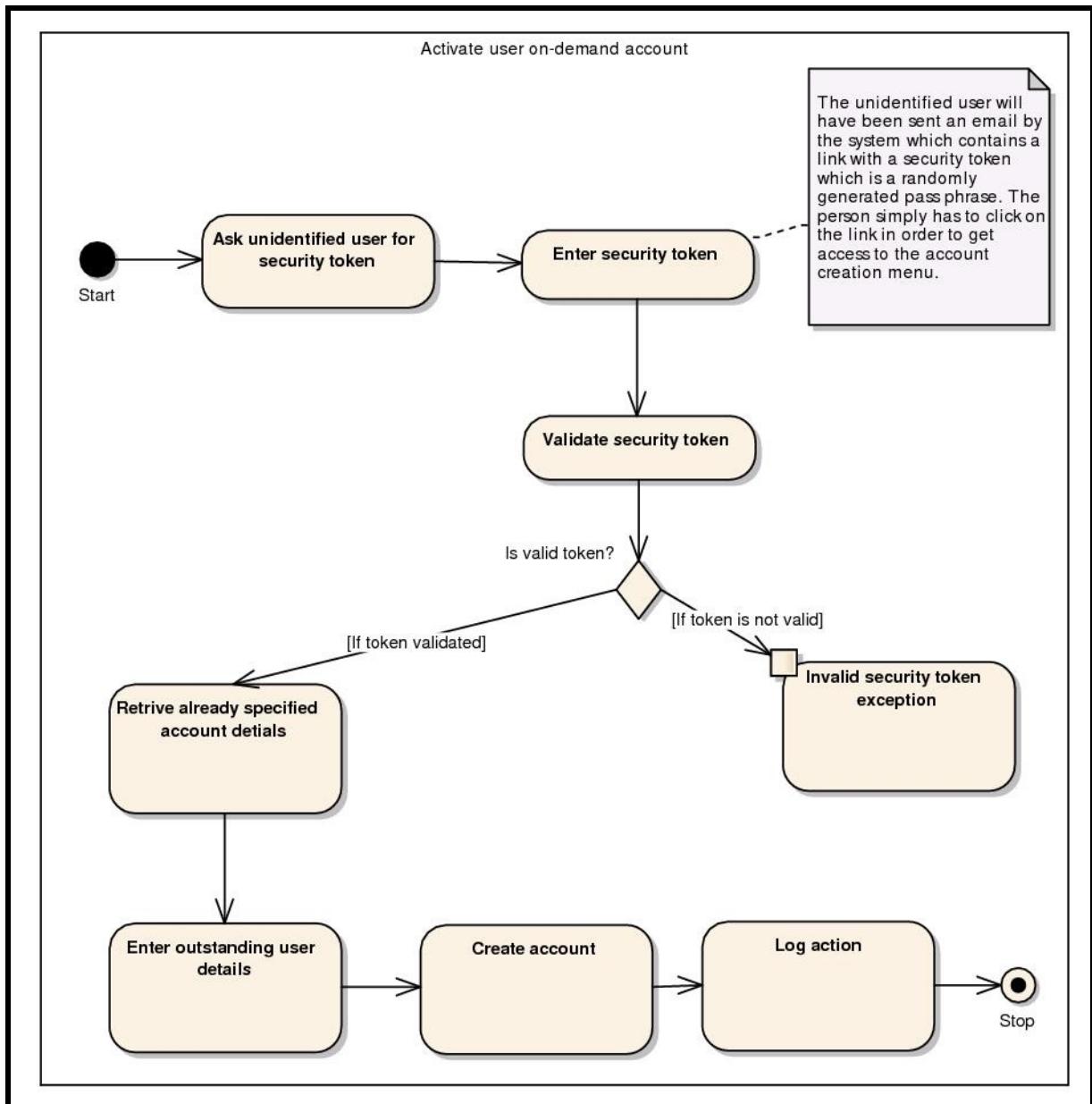


Figure 24: Activity diagram of the Activate user on-demand account use case.

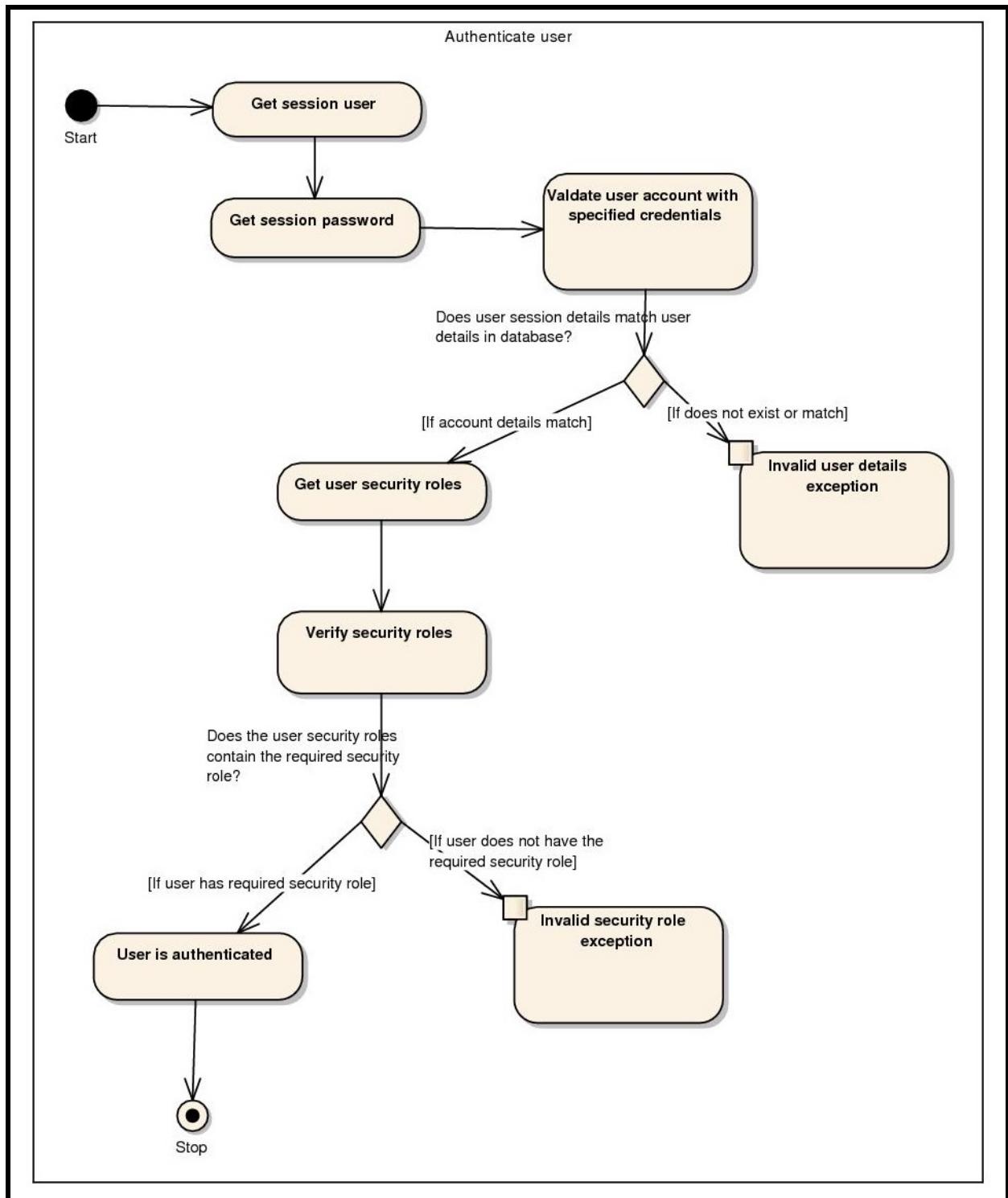


Figure 25: Activity diagram of the Authenticate user use case.

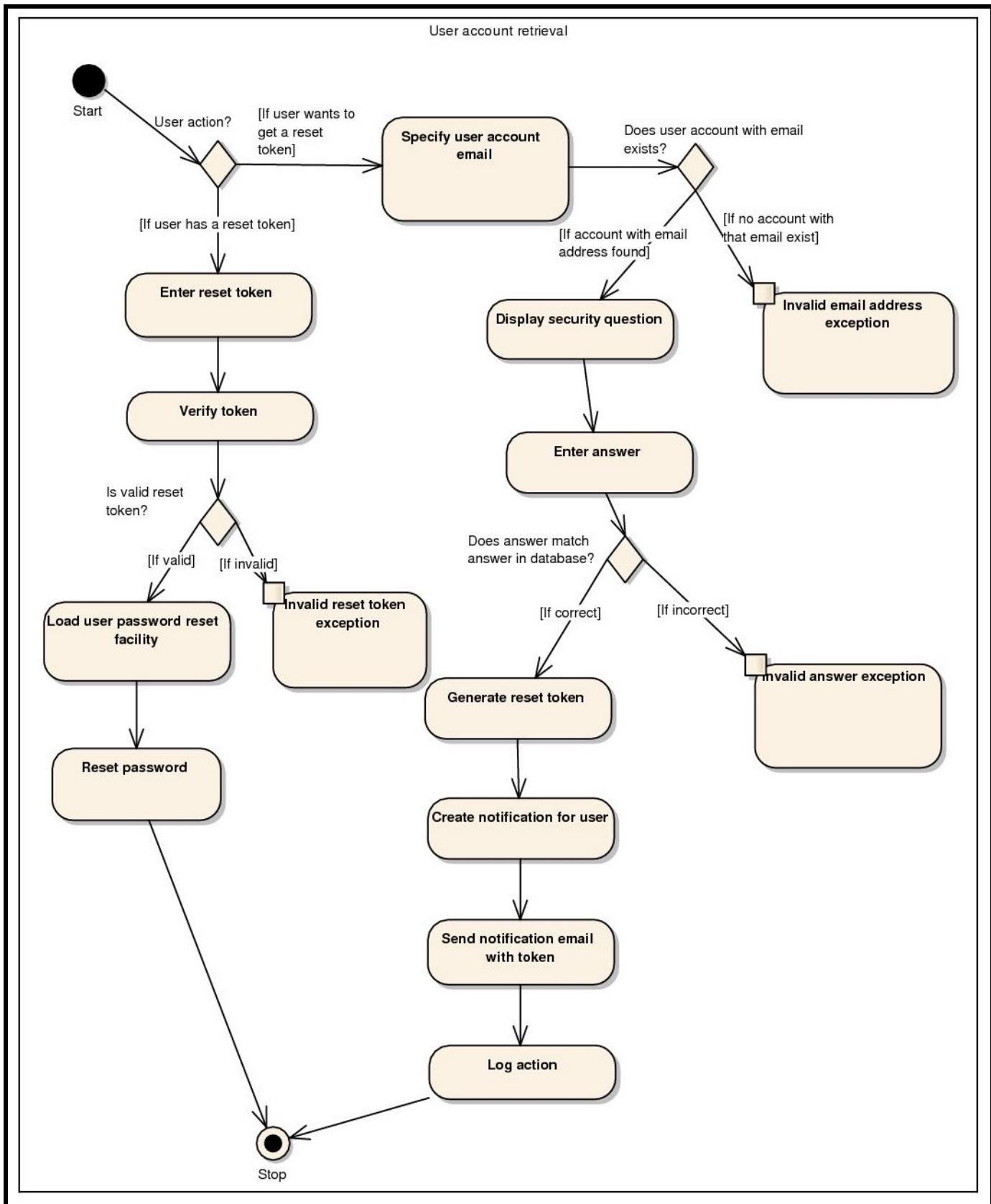


Figure 26: Activity diagram of the User account retrieval use case.

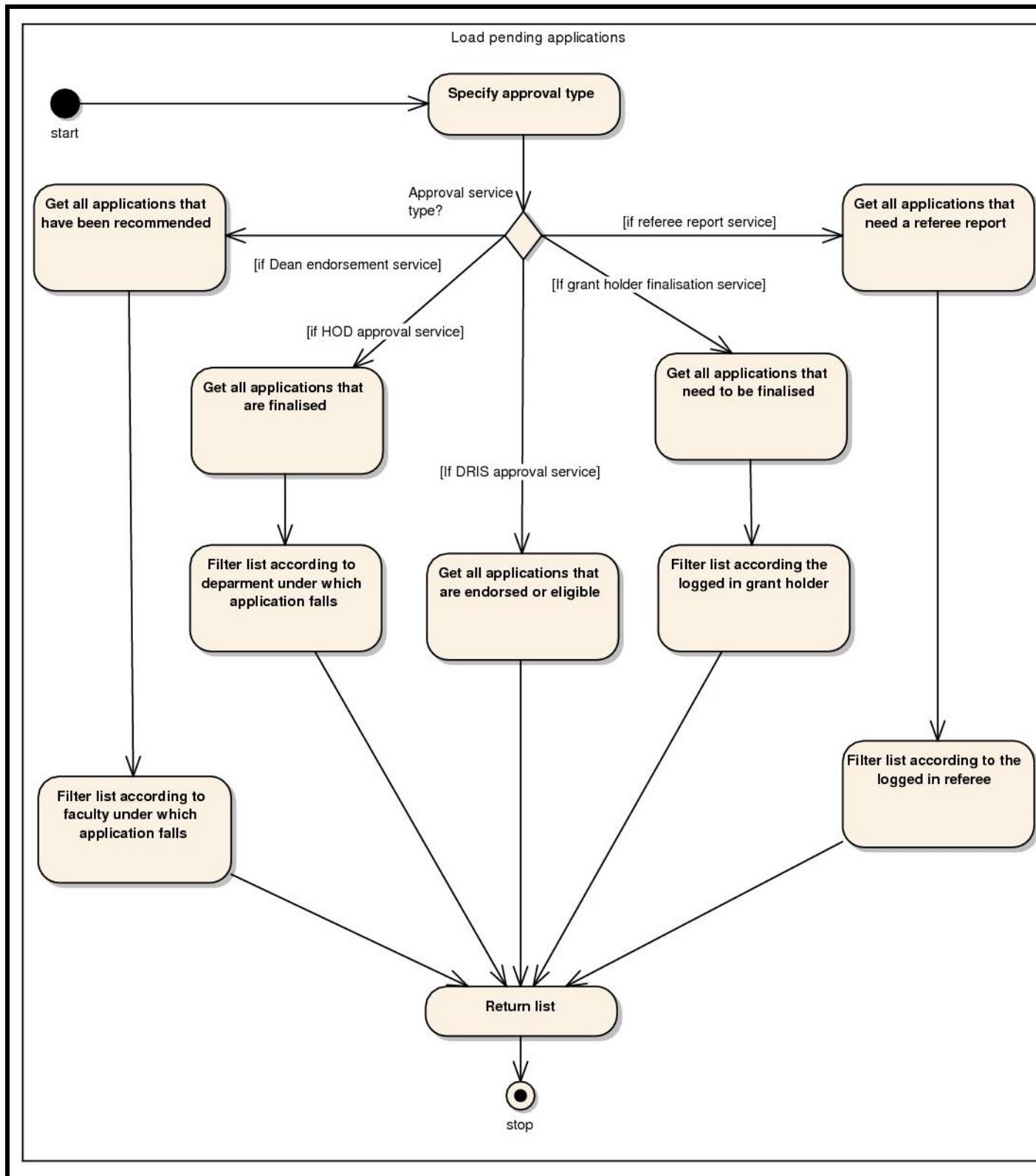


Figure 27: Activity diagram of the Load pending applications use case.

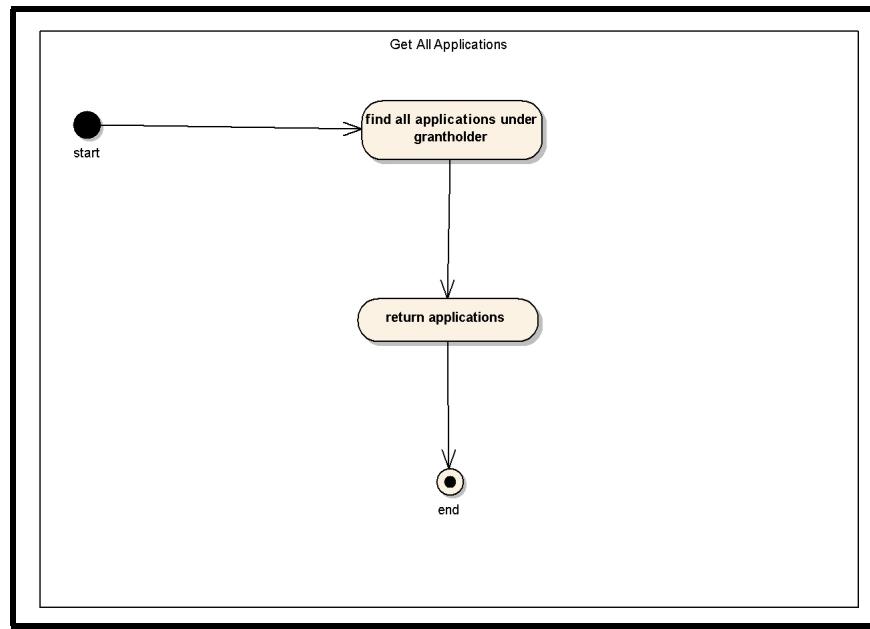


Figure 28: Activity diagram of the Get All Applications use case.

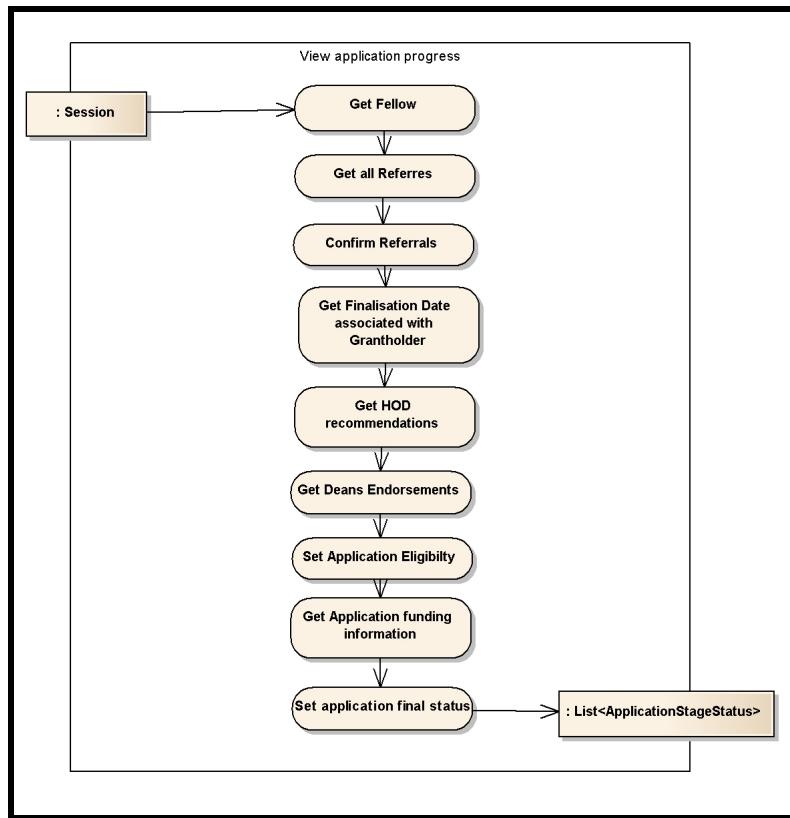


Figure 29: Activity diagram of the View application progress use case.

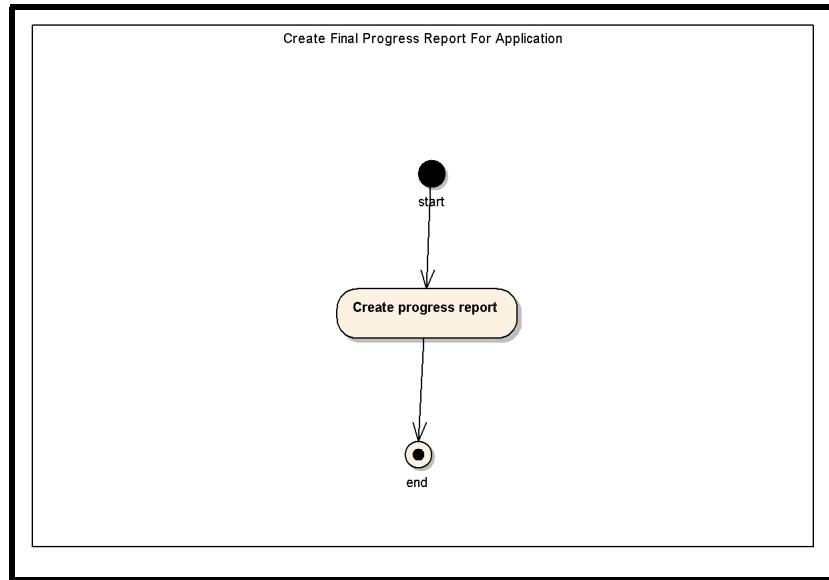


Figure 30: Activity diagram of the Create Final Progress Report For Application use case.

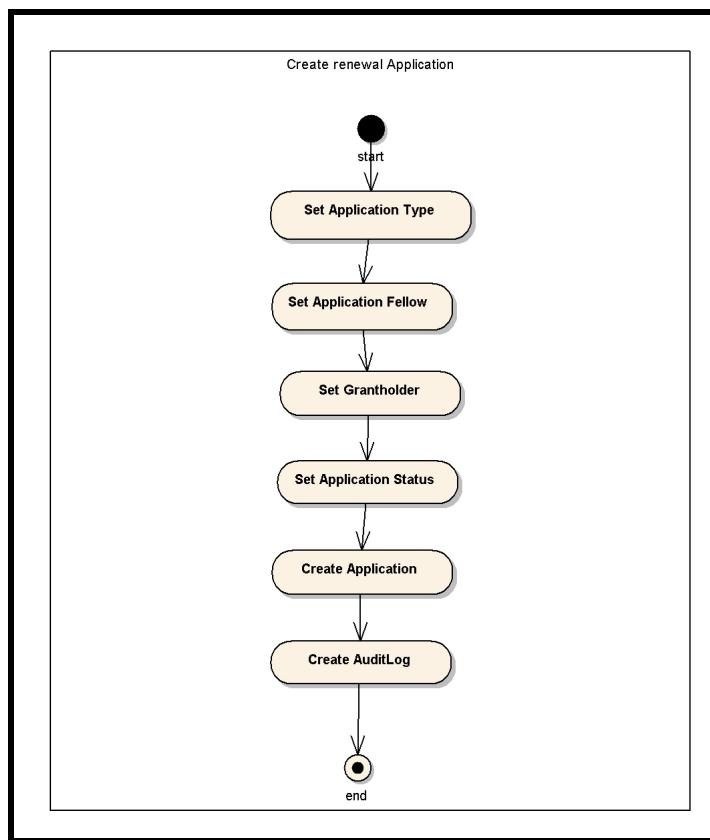


Figure 31: Activity diagram of the Create renewal Application use case.

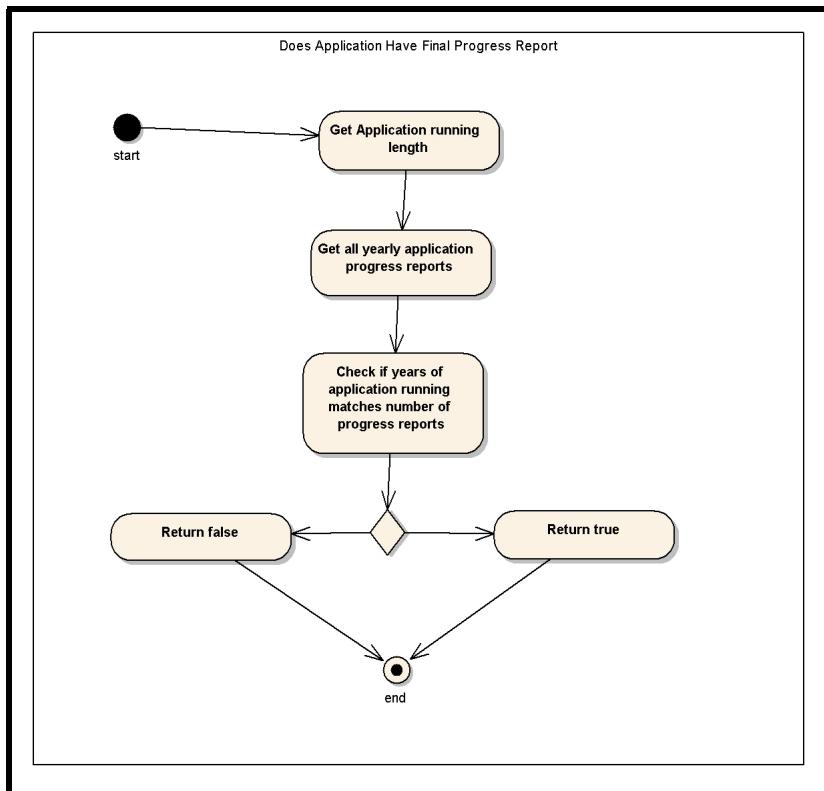


Figure 32: Activity diagram of the Does Application Have Final Progress Report use case.

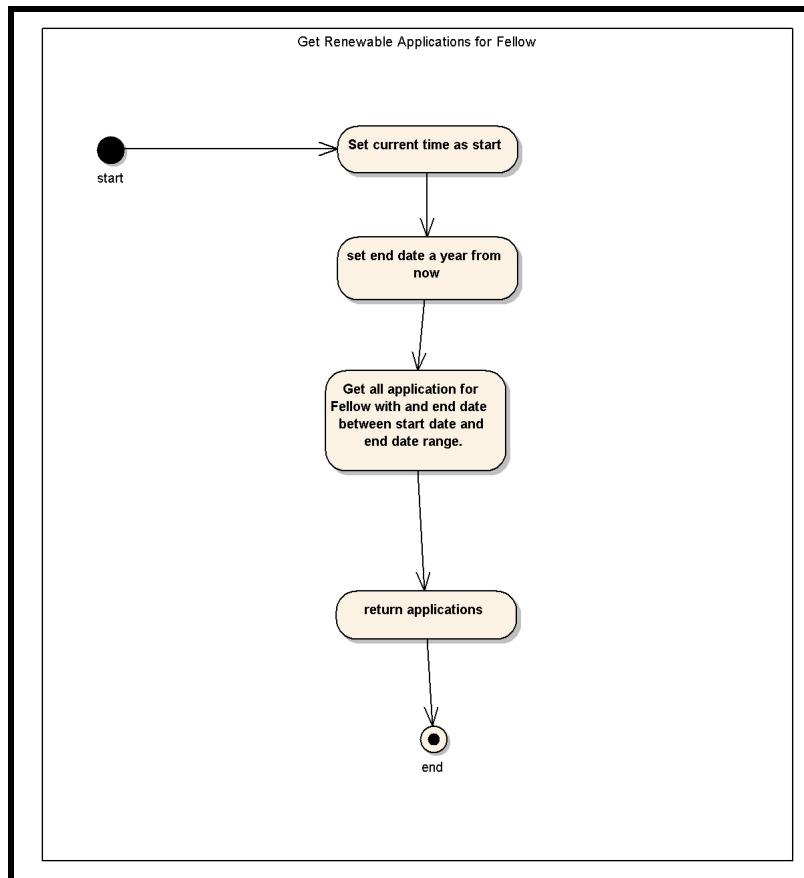


Figure 33: Activity diagram of the Get Renewable Applications for Fellow use case.

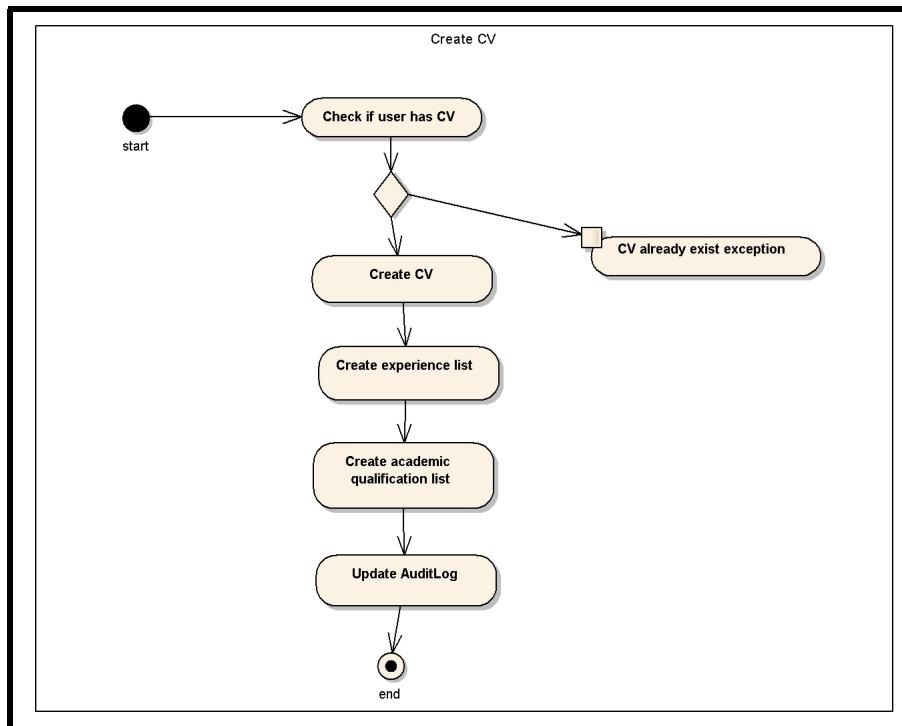


Figure 34: Activity diagram of the Create CV use case.

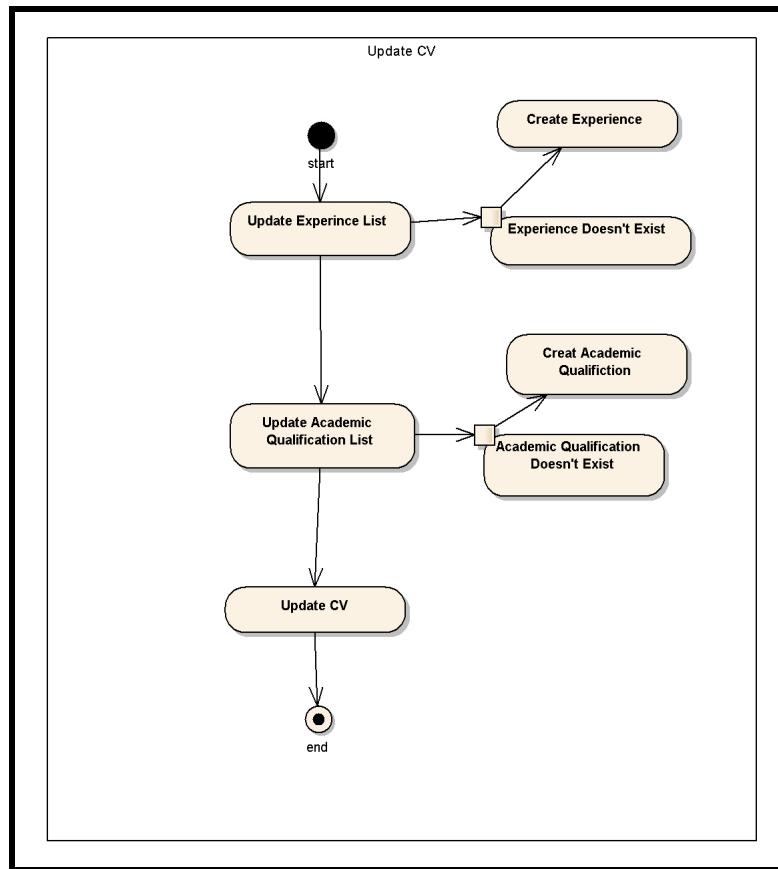


Figure 35: Activity diagram of the Update CV use case.

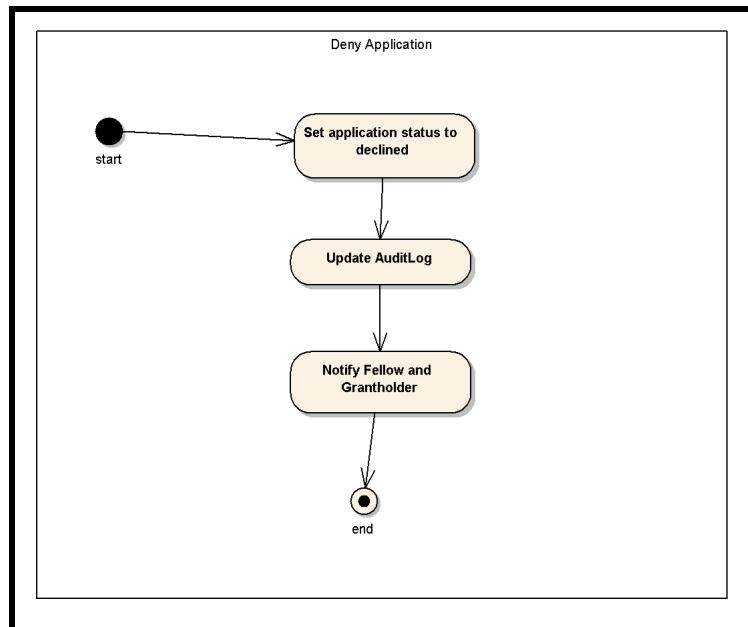


Figure 36: Activity diagram of the Deny Application use case.

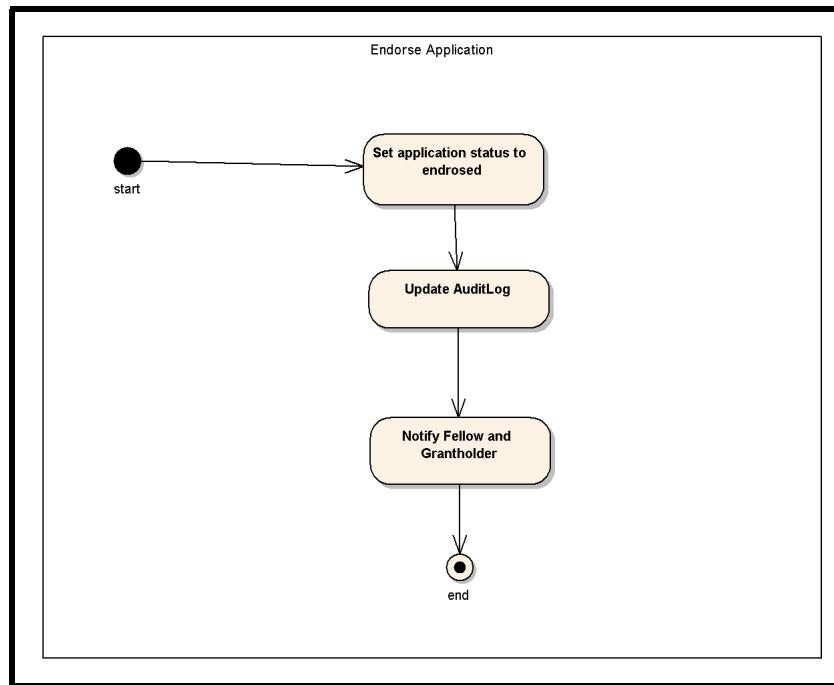


Figure 37: Activity diagram of the Endorse Application use case.

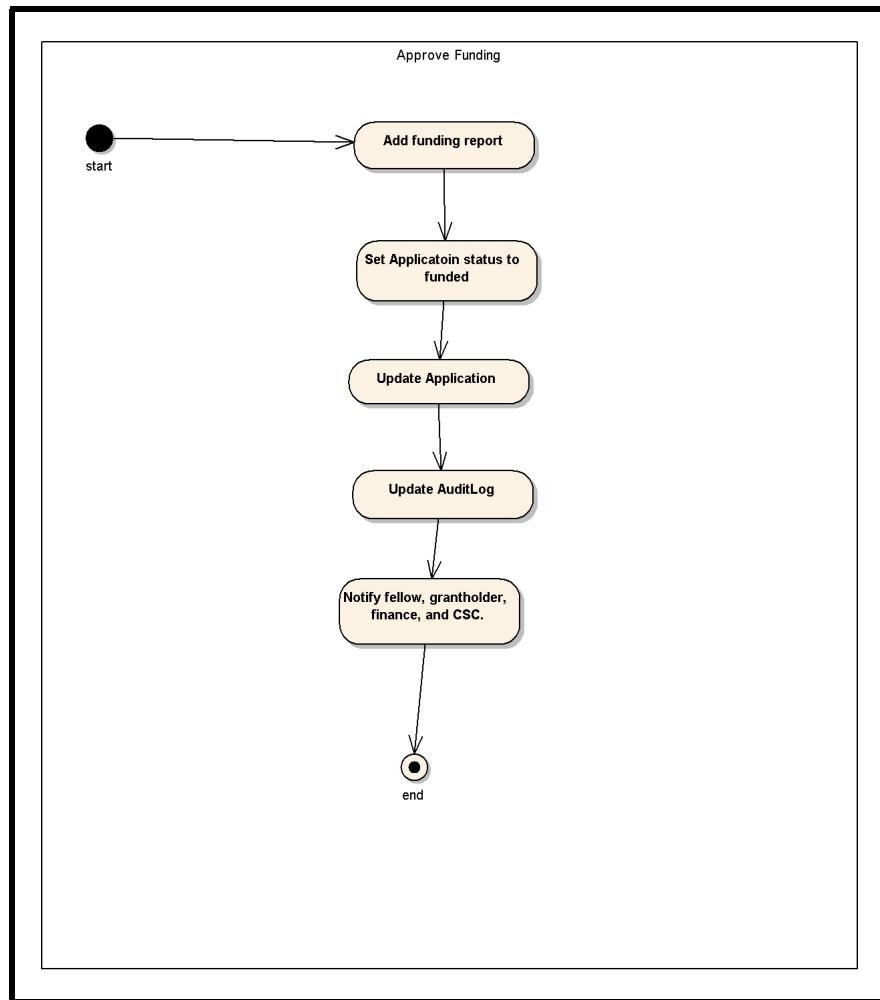


Figure 38: Activity diagram of the Approve Funding use case.

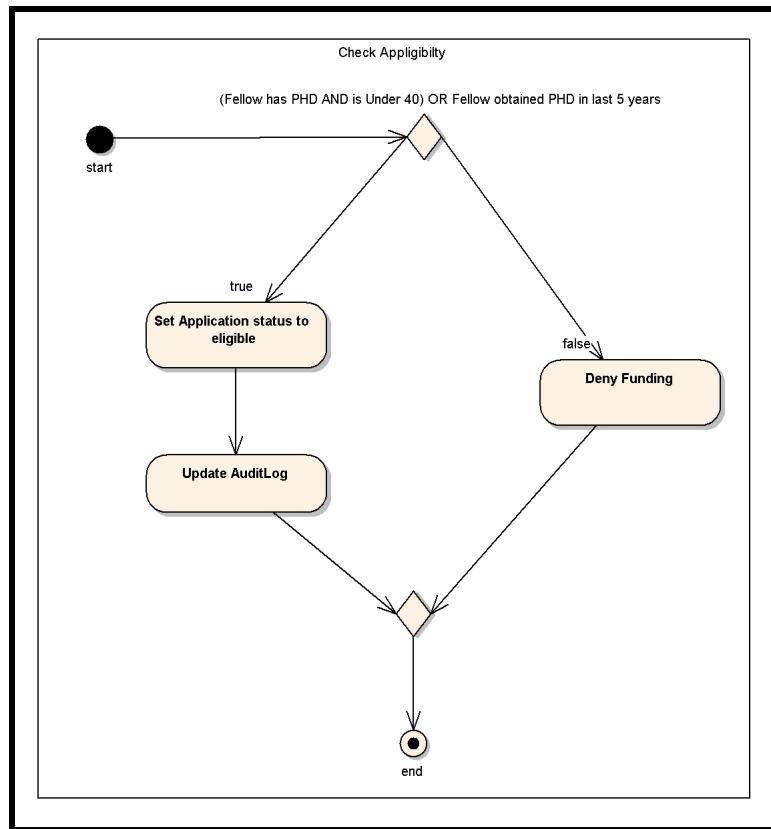


Figure 39: Activity diagram of the Check Applicability use case.

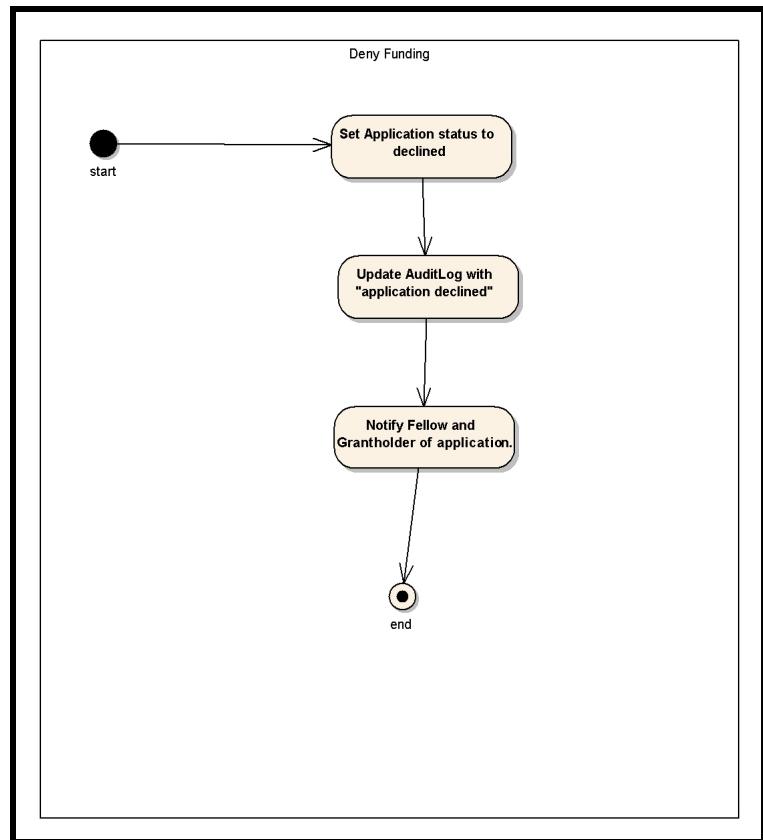


Figure 40: Activity diagram of the Deny Funding use case.

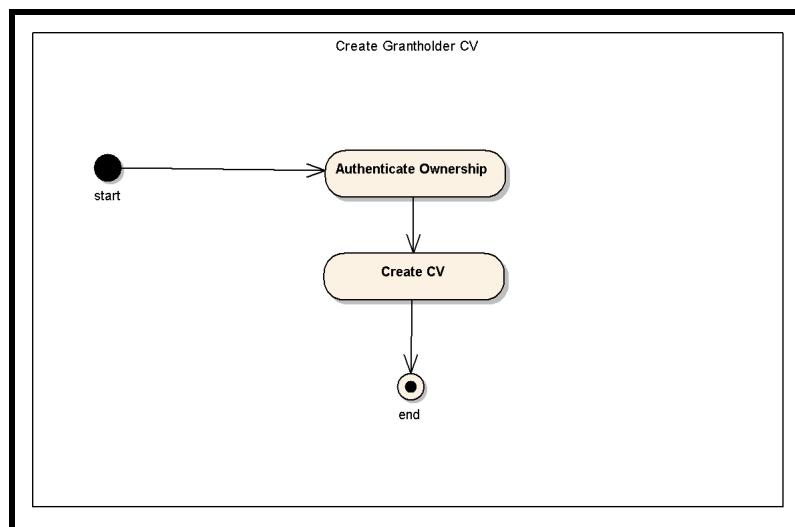


Figure 41: Activity diagram of the Create Granholder CV use case.

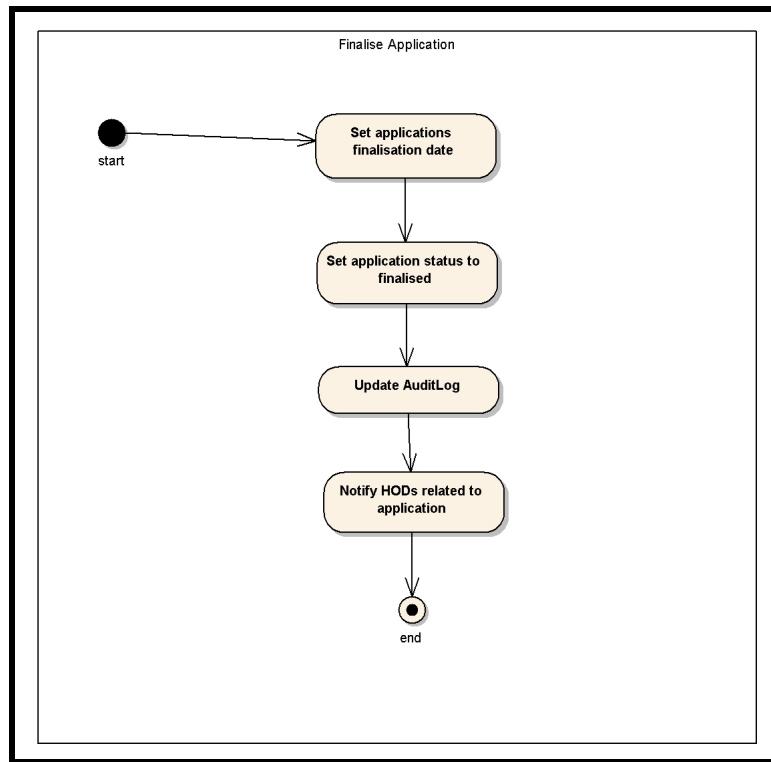


Figure 42: Activity diagram of the Finalise Application use case.

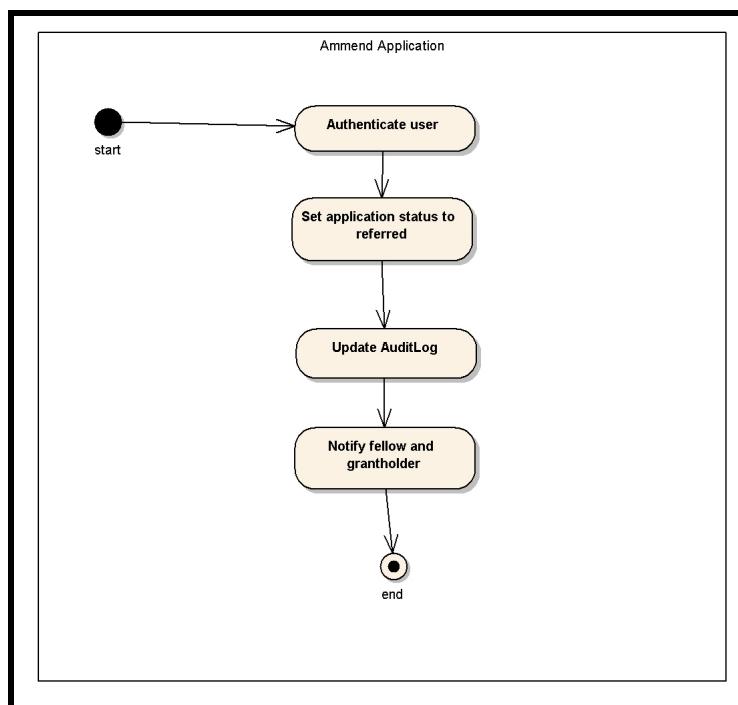


Figure 43: Activity diagram of the Ammend Application use case.

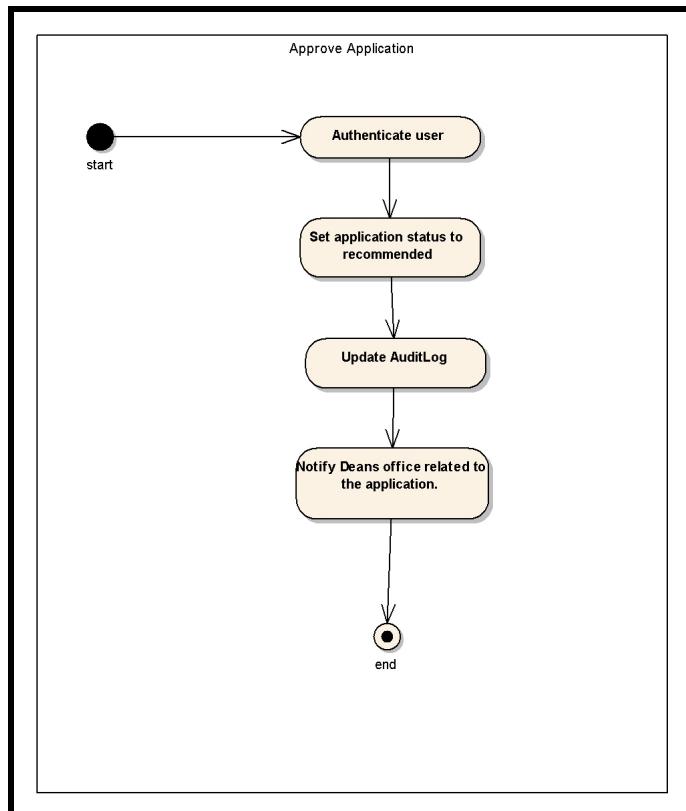


Figure 44: Activity diagram of the Approve Application use case.

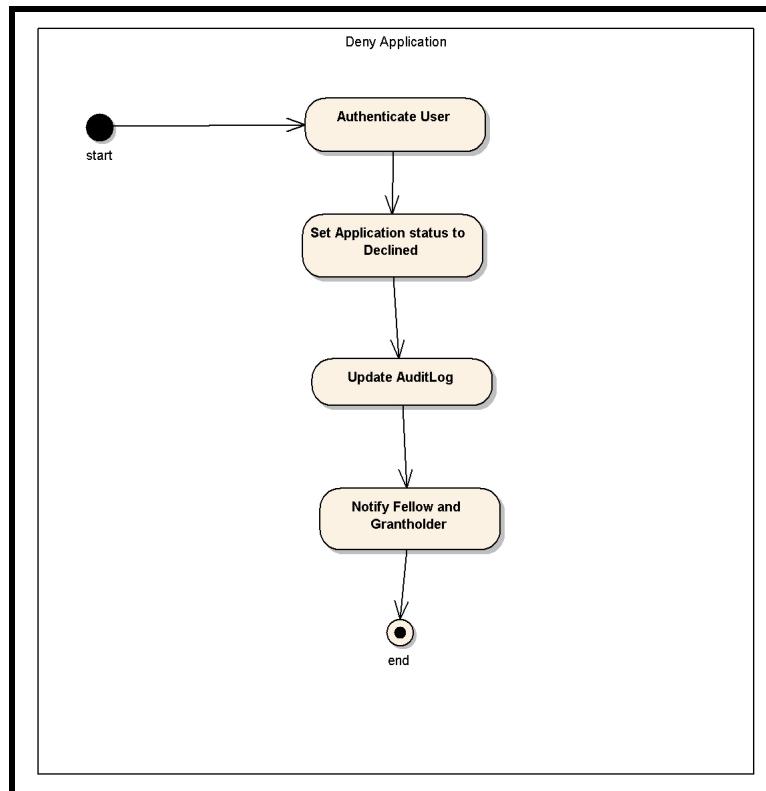


Figure 45: Activity diagram of the Deny Application use case.

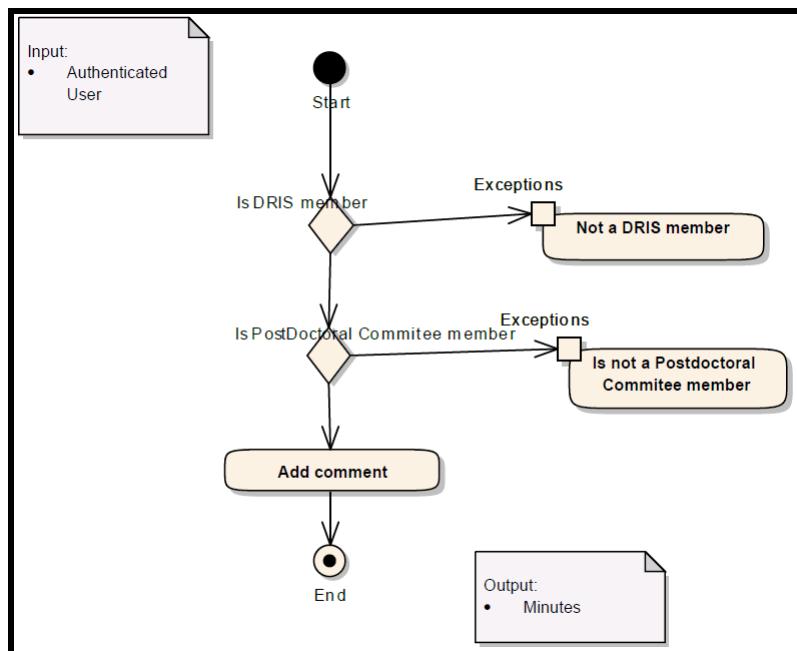


Figure 46: Activity diagram of the Add Minute Comment use case.

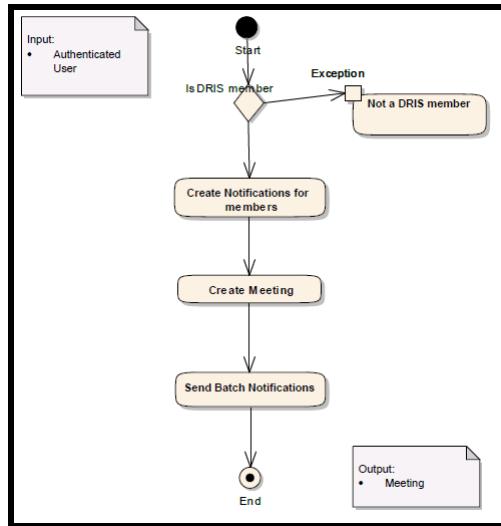


Figure 47: Activity diagram of the Create Meeting use case.

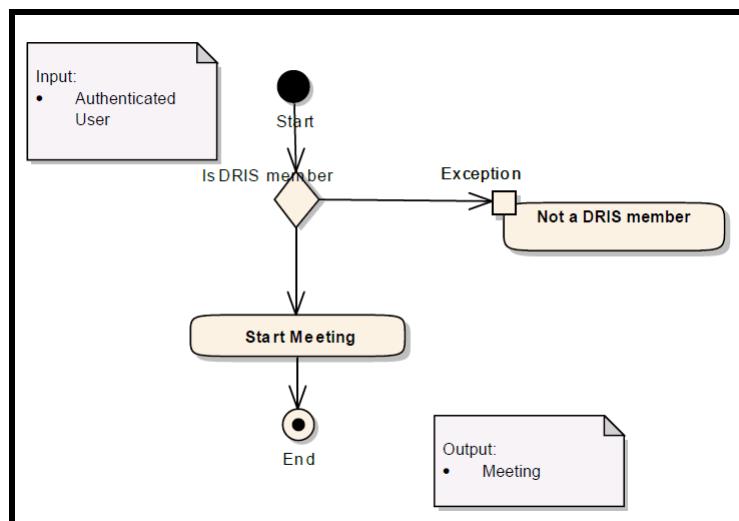


Figure 48: Activity diagram of the End Meeting use case.

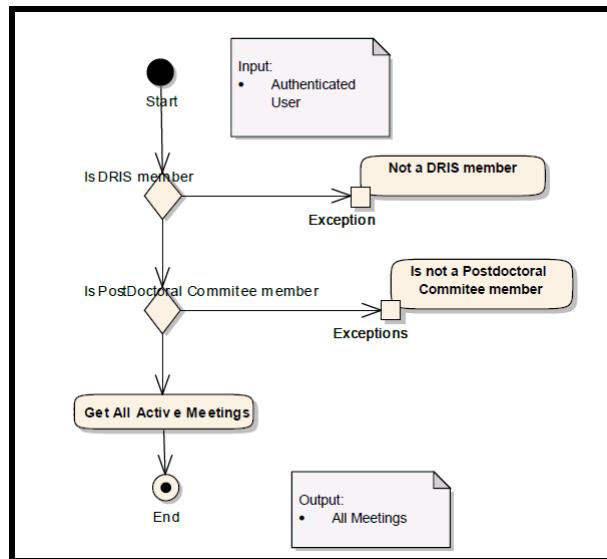


Figure 49: Activity diagram of the Get All Active Meetings use case.

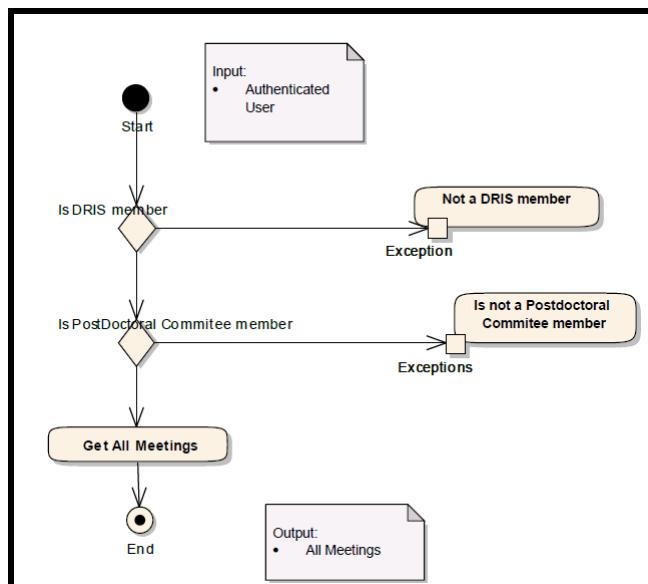


Figure 50: Activity diagram of the Get All Meetings use case.

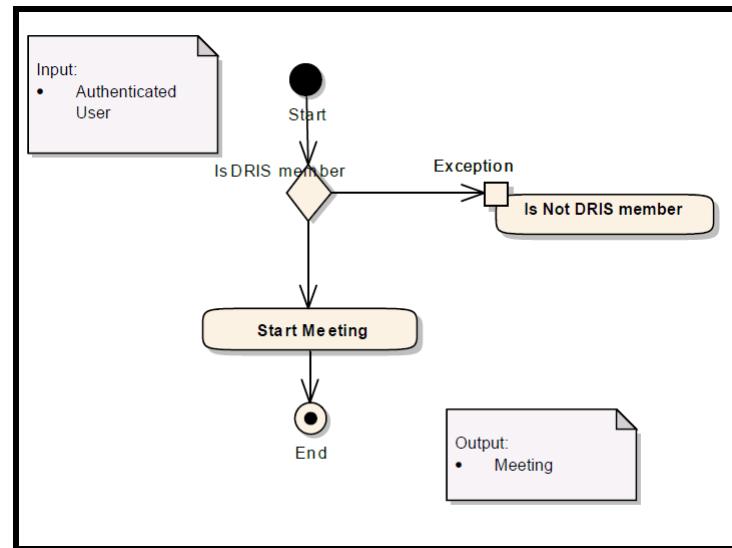


Figure 51: Activity diagram of the Start Meeting use case.

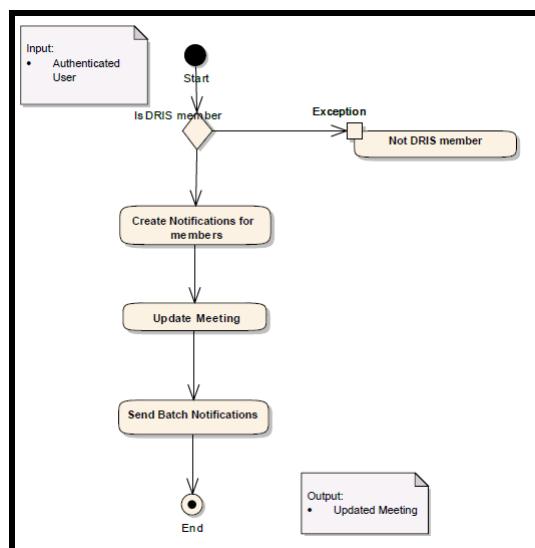


Figure 52: Activity diagram of the Update Meeting use case.

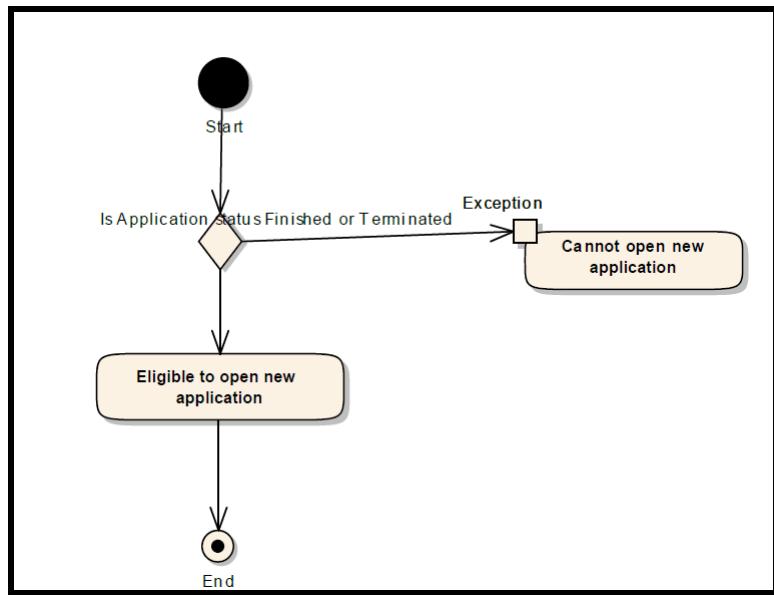


Figure 53: Activity diagram of the Can the fellow open a New Application use case.

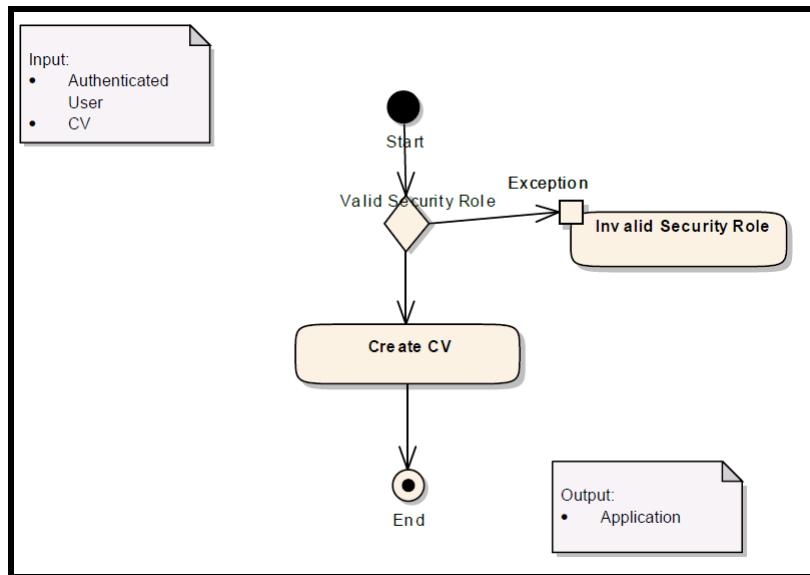


Figure 54: Activity diagram of the Create CV use case.

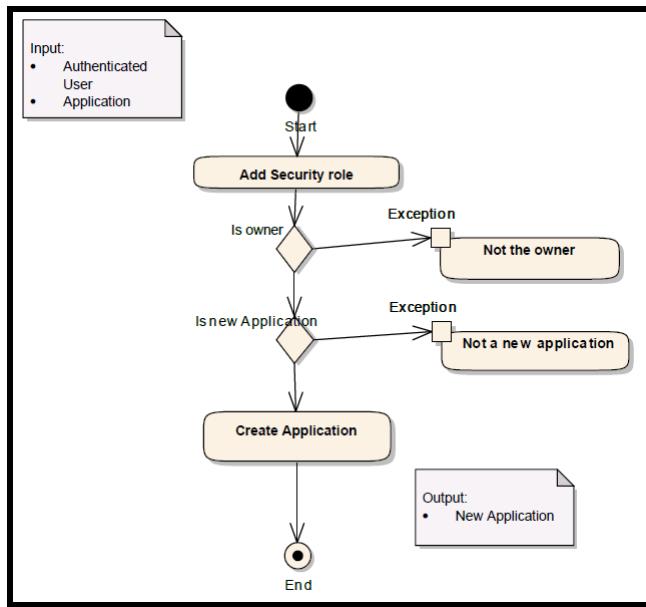


Figure 55: Activity diagram of the Create New Application use case.

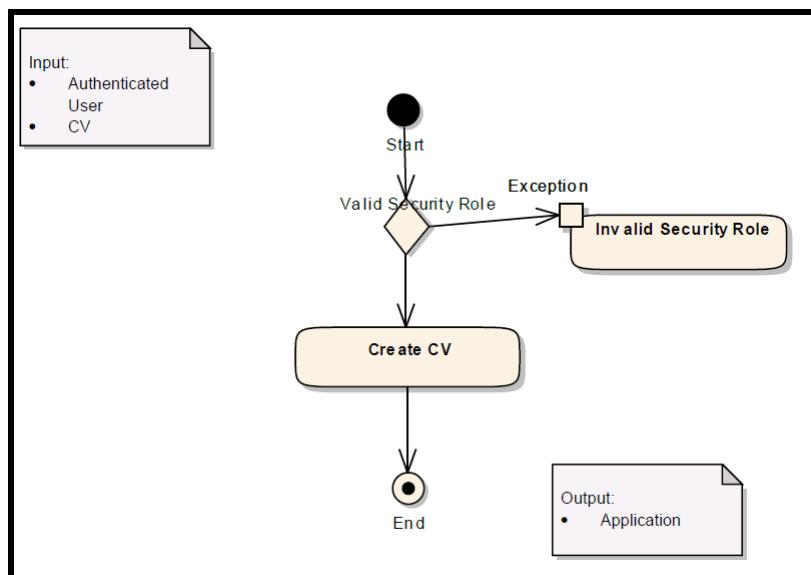


Figure 56: Activity diagram of the Get Open Application use case.

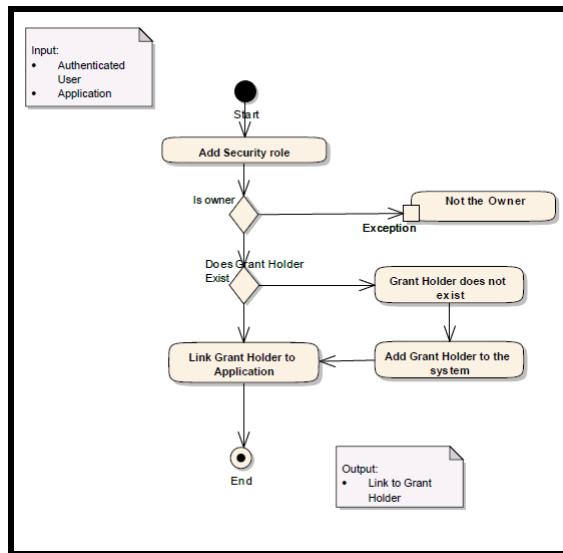


Figure 57: Activity diagram of the Link Grant Holder to Application use case.

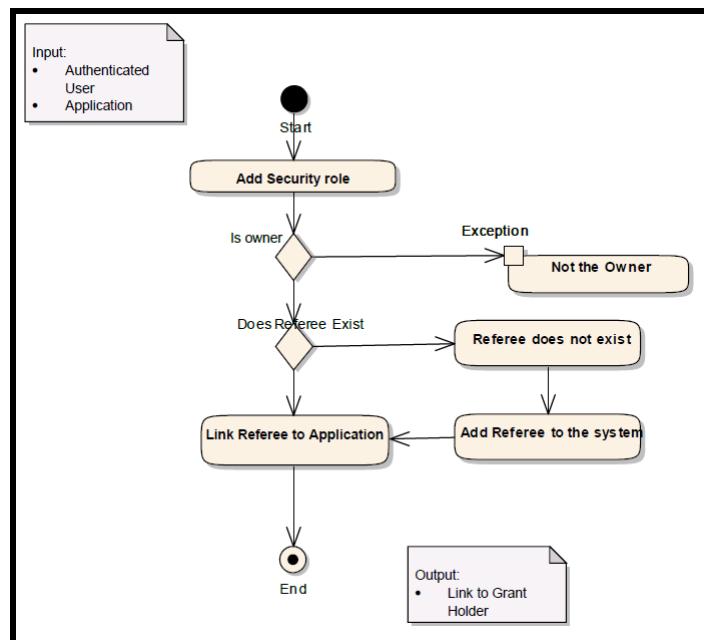


Figure 58: Activity diagram of the Link Referee to Application use case.

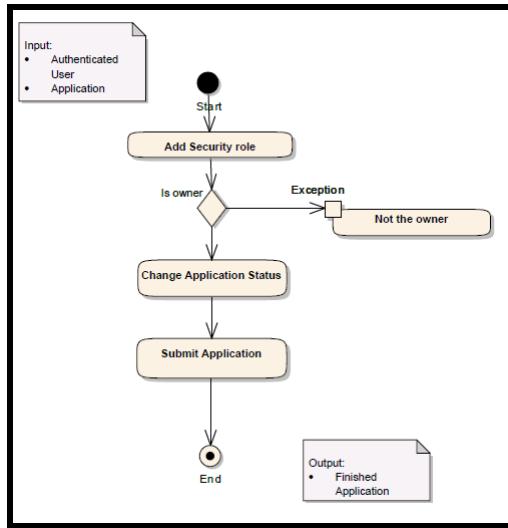


Figure 59: Activity diagram of the Submit Application use case.

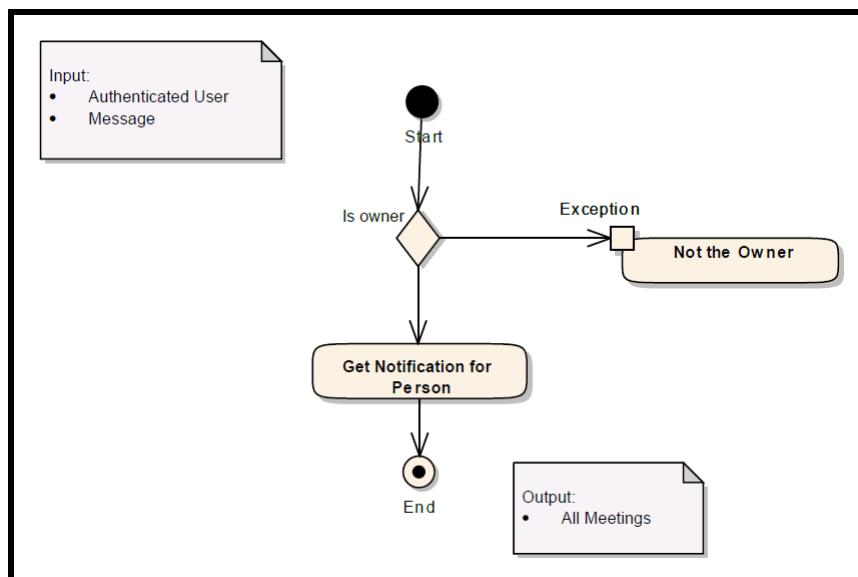


Figure 60: Activity diagram of the Get Notifications for Person use case.

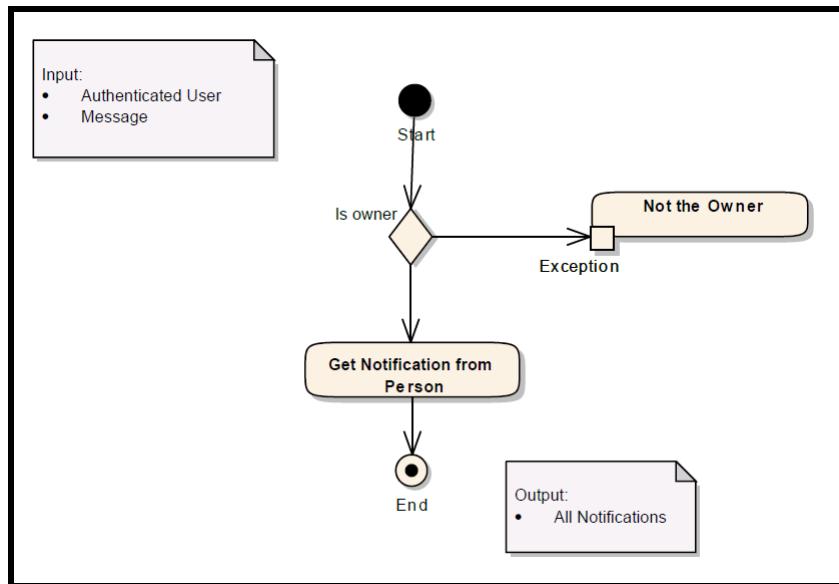


Figure 61: Activity diagram of the Get Notifications from Person use case.

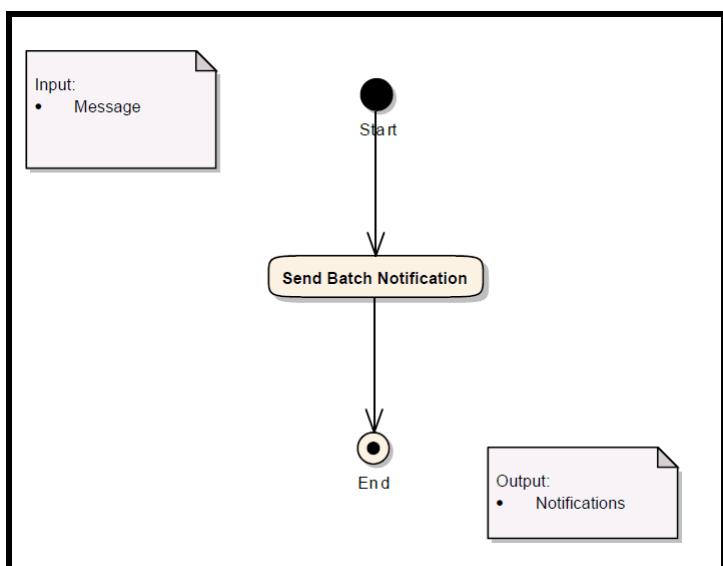


Figure 62: Activity diagram of the Send batch Notifications use case.

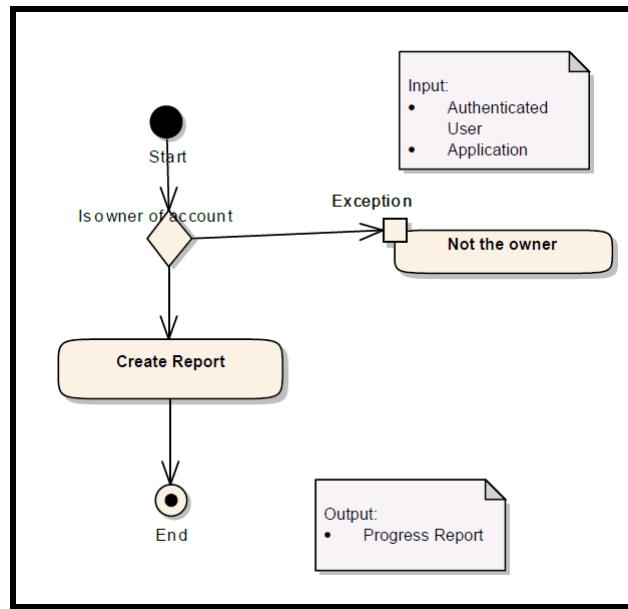


Figure 63: Activity diagram of the Create Progress Report use case.

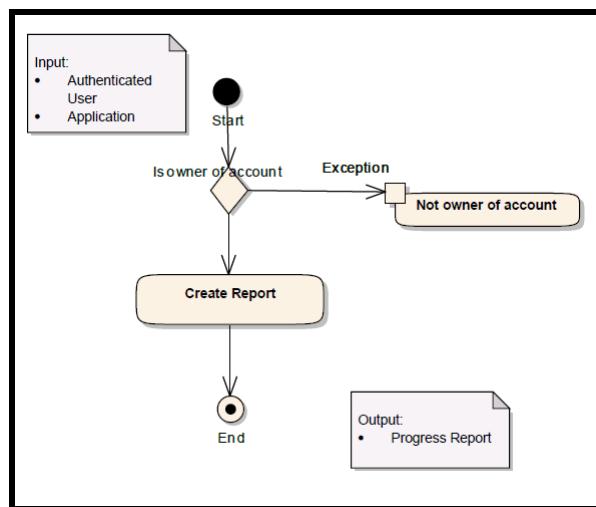


Figure 64: Activity diagram of the Update Progress Report use case.

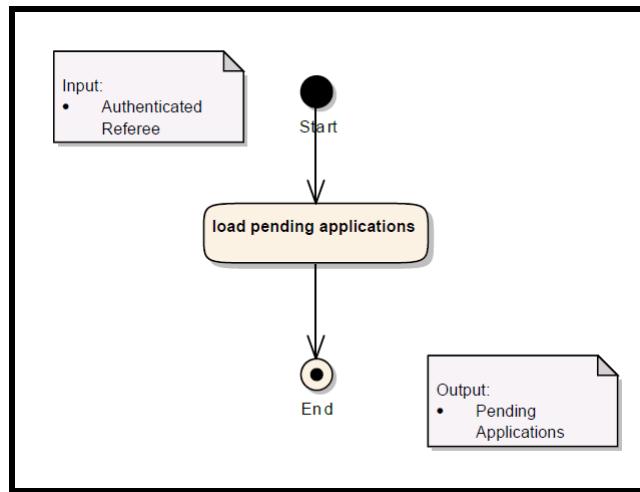


Figure 65: Activity diagram of the Create Referee Report use case.

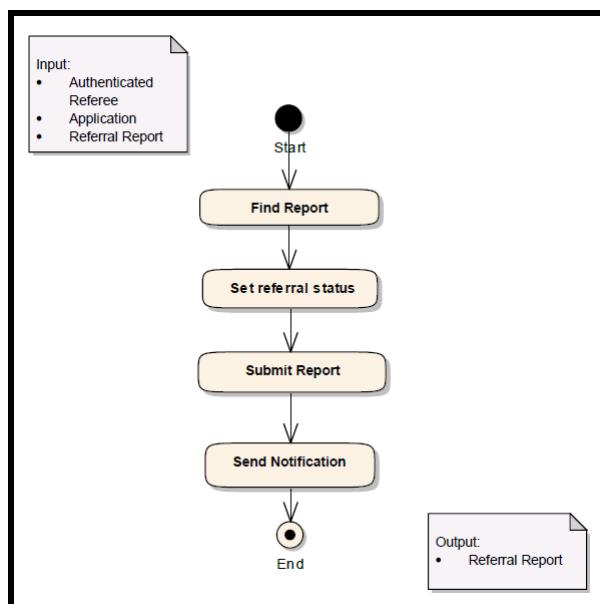


Figure 66: Activity diagram of the Submit Referee Report use case.

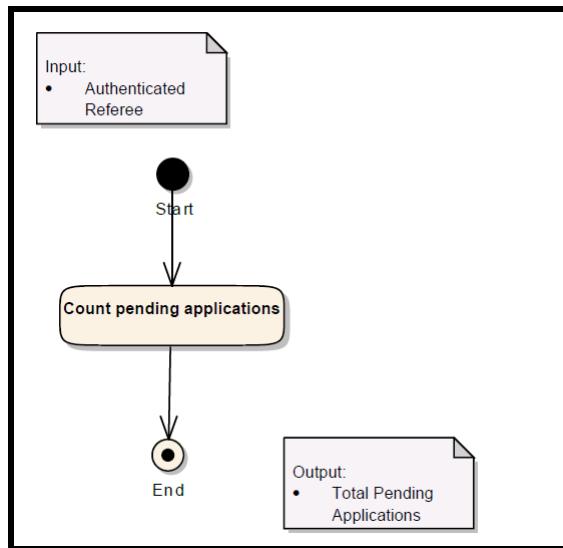


Figure 67: Activity diagram of the Count Pending Reports use case.

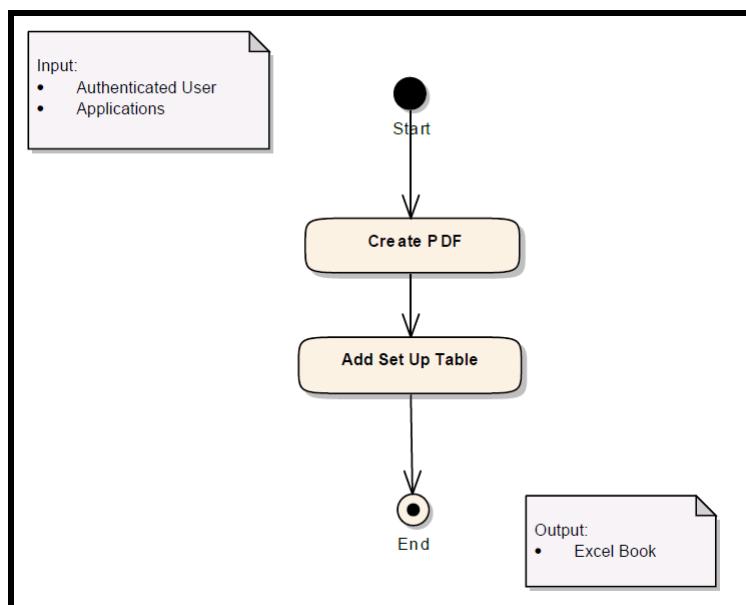


Figure 68: Activity diagram of the Export PDF Report use case.

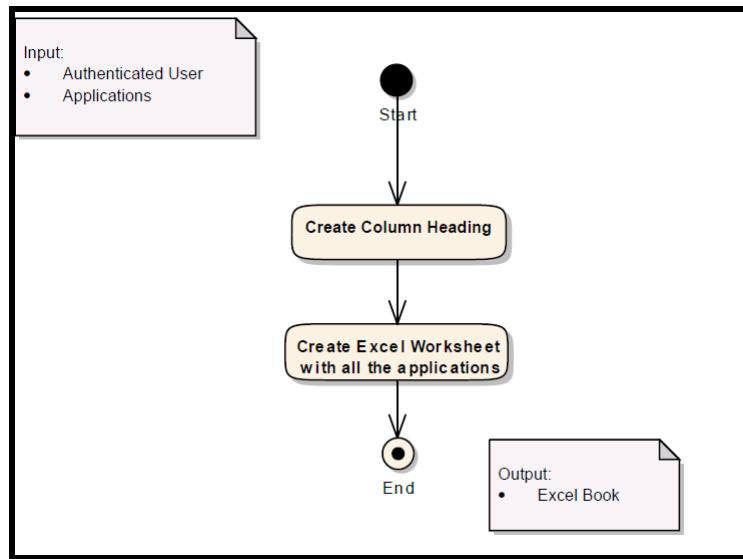


Figure 69: Activity diagram of the Export PDF Report use case.

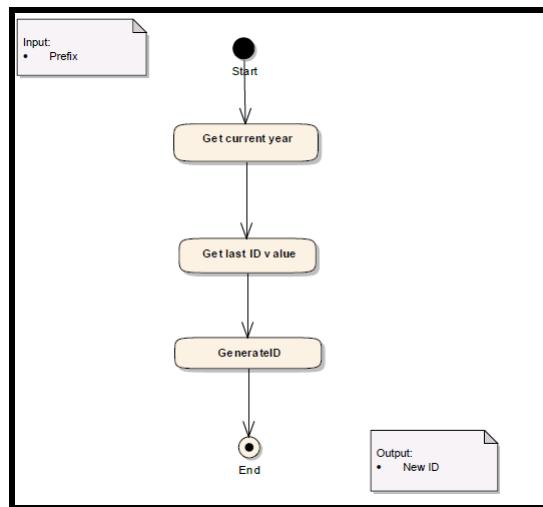


Figure 70: Activity diagram of the Generate System ID use case.

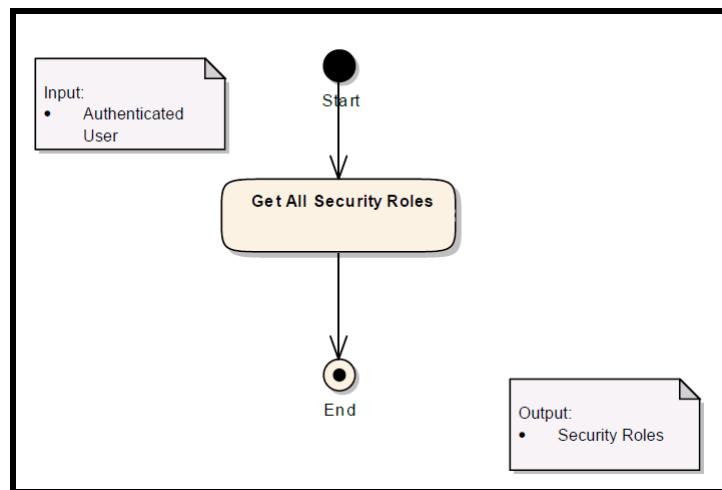


Figure 71: Activity diagram of the Get All Security Roles use case.

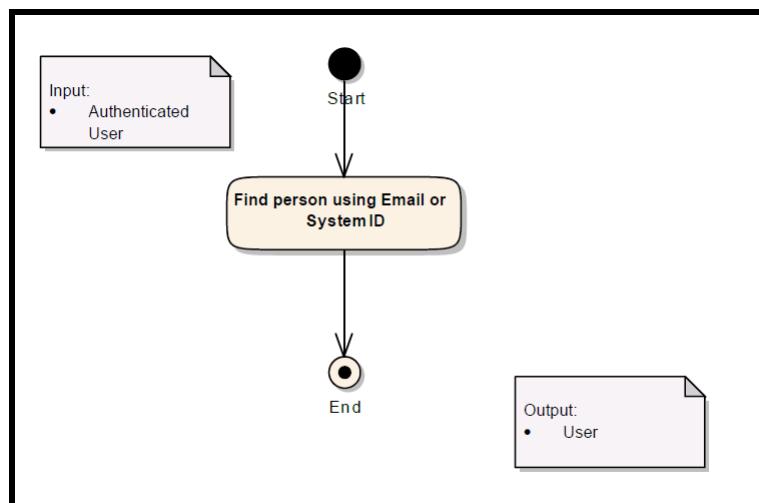


Figure 72: Activity diagram of the Get user by Email use case.

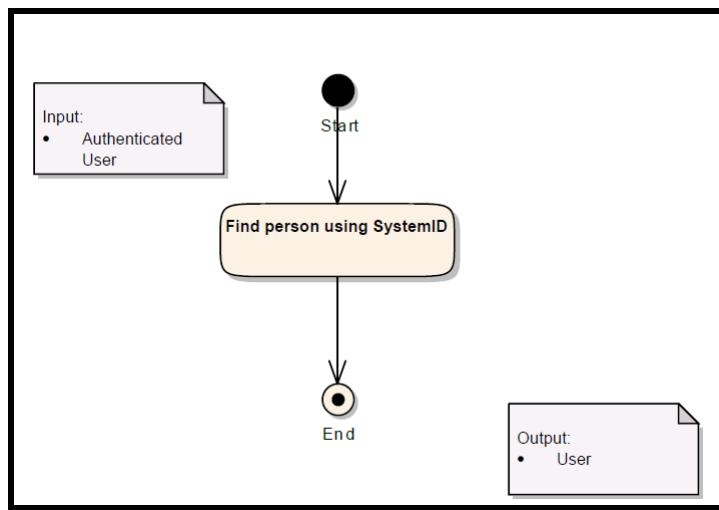


Figure 73: Activity diagram of the Get User by System ID use case.

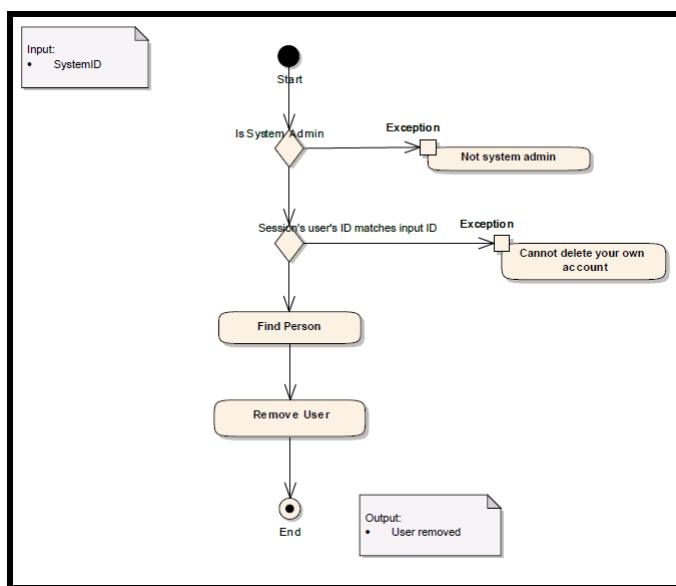


Figure 74: Activity diagram of the Remove User use case.

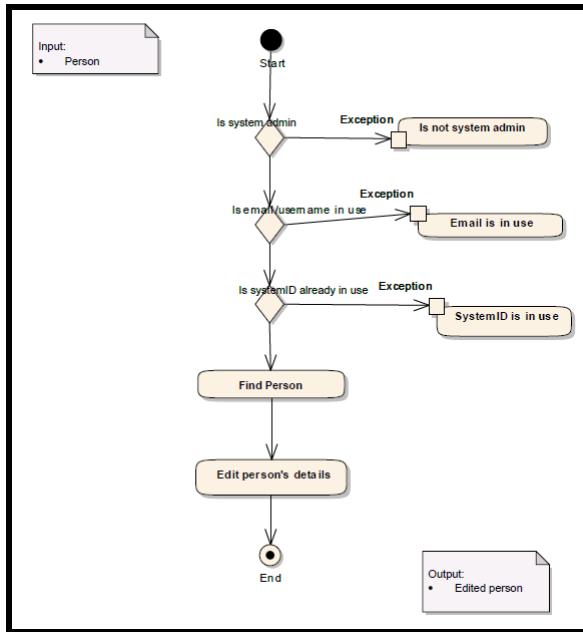


Figure 75: Activity diagram of the Update User use case.

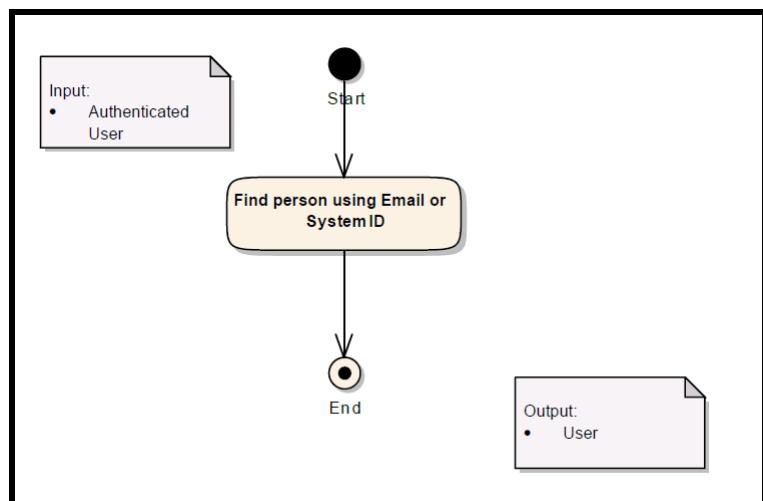


Figure 76: Activity diagram of the View All Users use case.

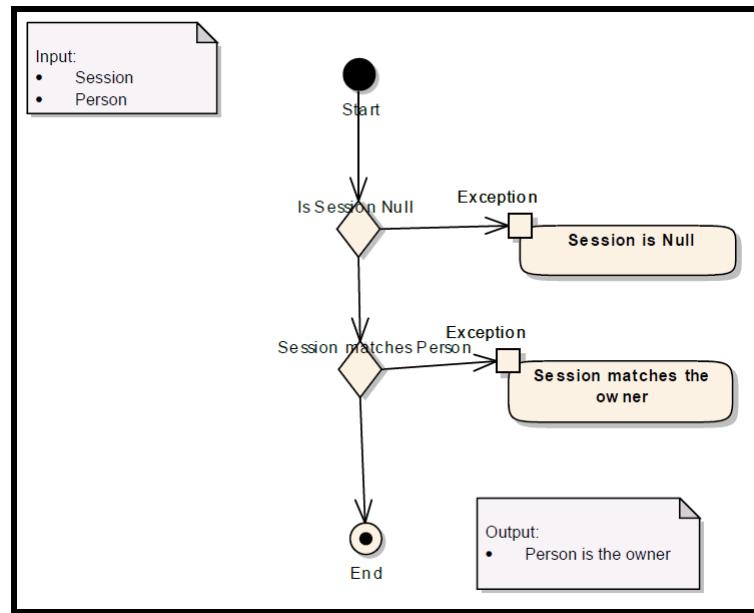


Figure 77: Activity diagram of the Authenticate User as Owner use case.

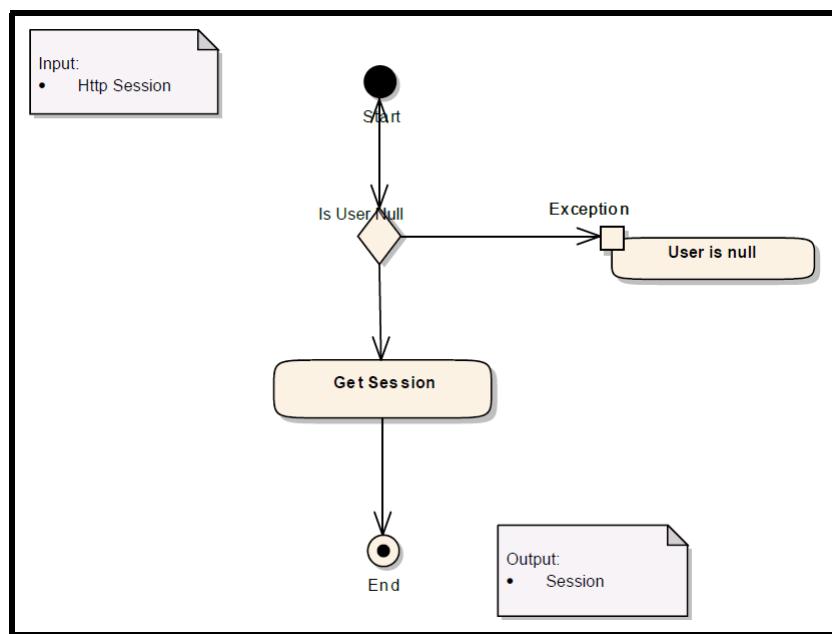


Figure 78: Activity diagram of the Get HttpSession from Session use case.

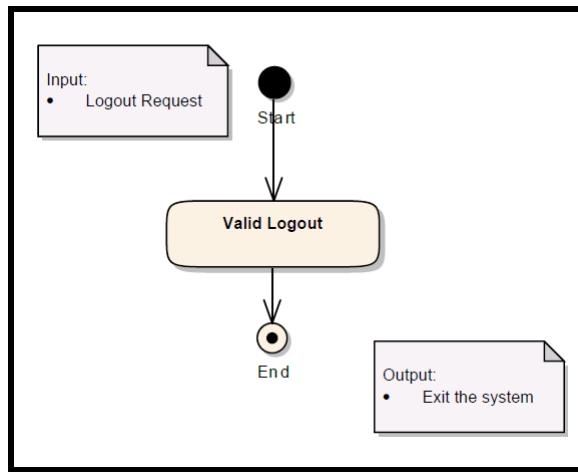
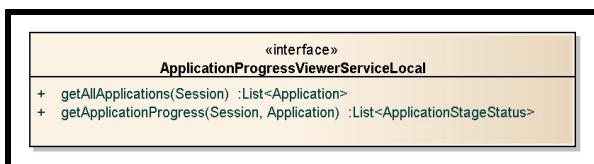
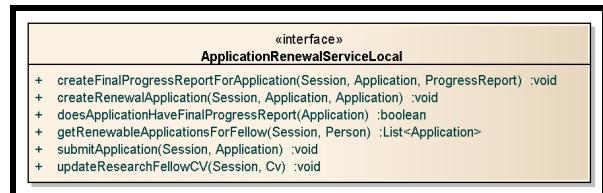


Figure 79: Activity diagram of the Logout use case.

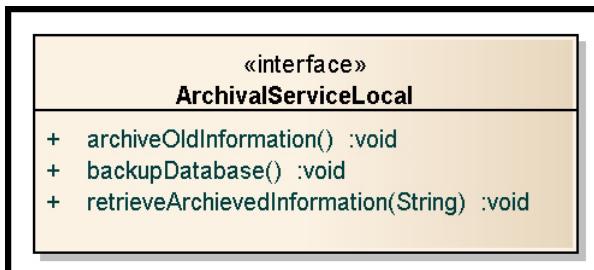
3.7 Interface Diagrams



(a) Interface Diagram for the Application Progress Viewer service.



(b) Interface Diagram for the Application Renewal service.



(c) Interface Diagram for the Archival service.



(d) Interface Diagram for the CV Management service.



(e) Interface Diagram for the Deans Endorsement service.



(f) Interface Diagram for the DRIS Approval service.



(a) Interface Diagram for the Grant Holder Finalisation service.



(b) Interface Diagram for the HOD Recommendation service.



(c) Interface Diagram for the Meeting Management service.



(d) Interface Diagram for the New Application service.



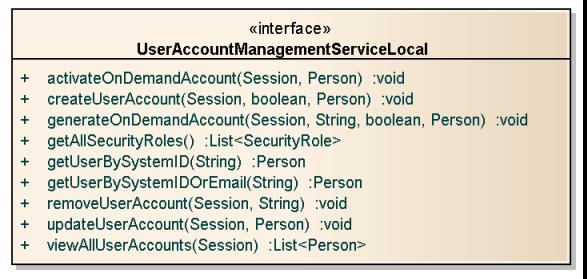
(e) Interface Diagram for the Notification service.



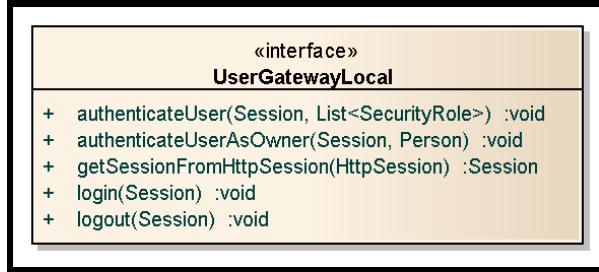
(f) Interface Diagram for the Progress Report Management service.



(a) Interface Diagram for the Referee Report service.



(b) Interface Diagram for the User Account Management service.



(c) Interface Diagram for the User Gateway service.

3.8 Data Flow Diagrams

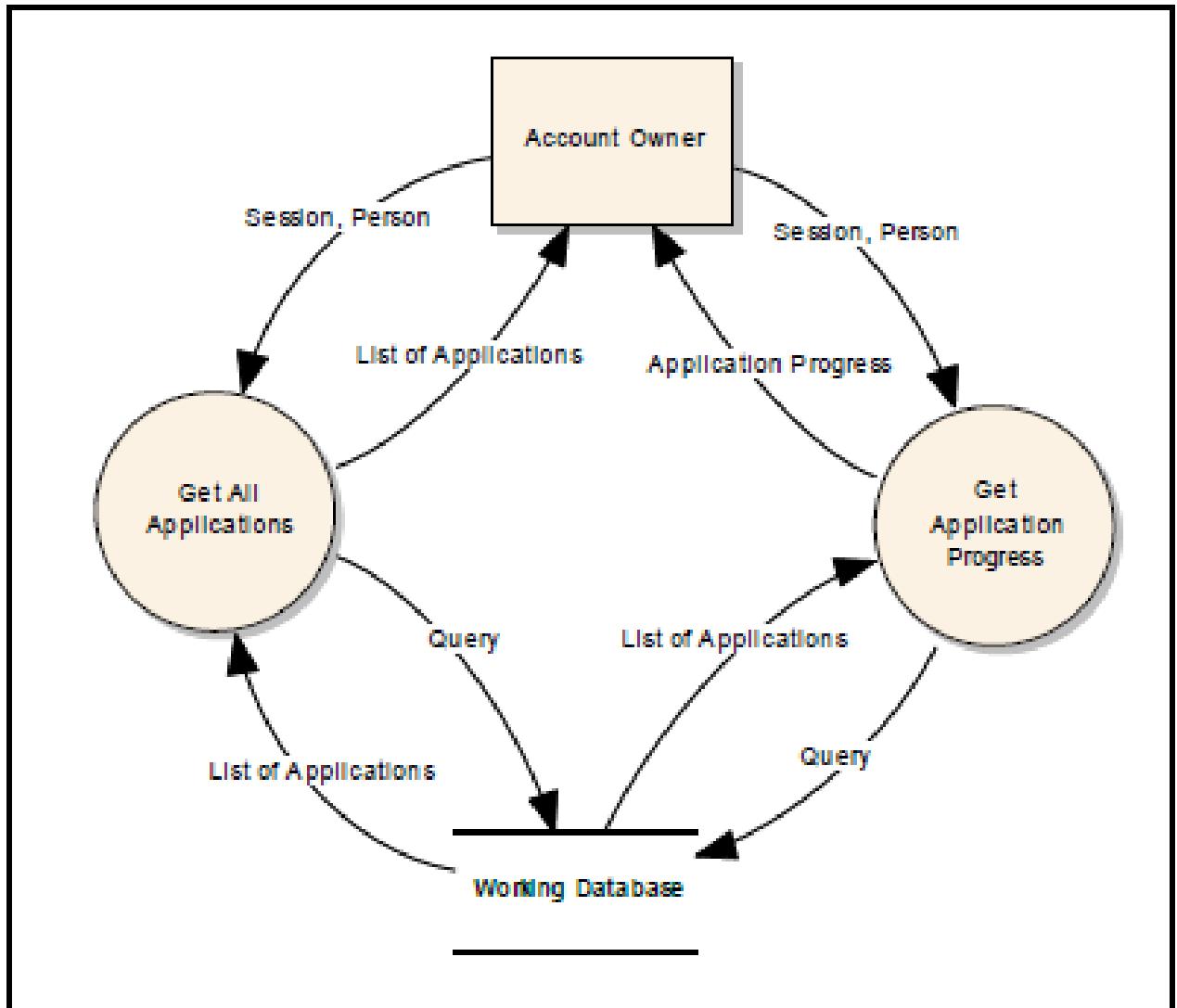


Figure 83: Data Flow for Application progress viewer.

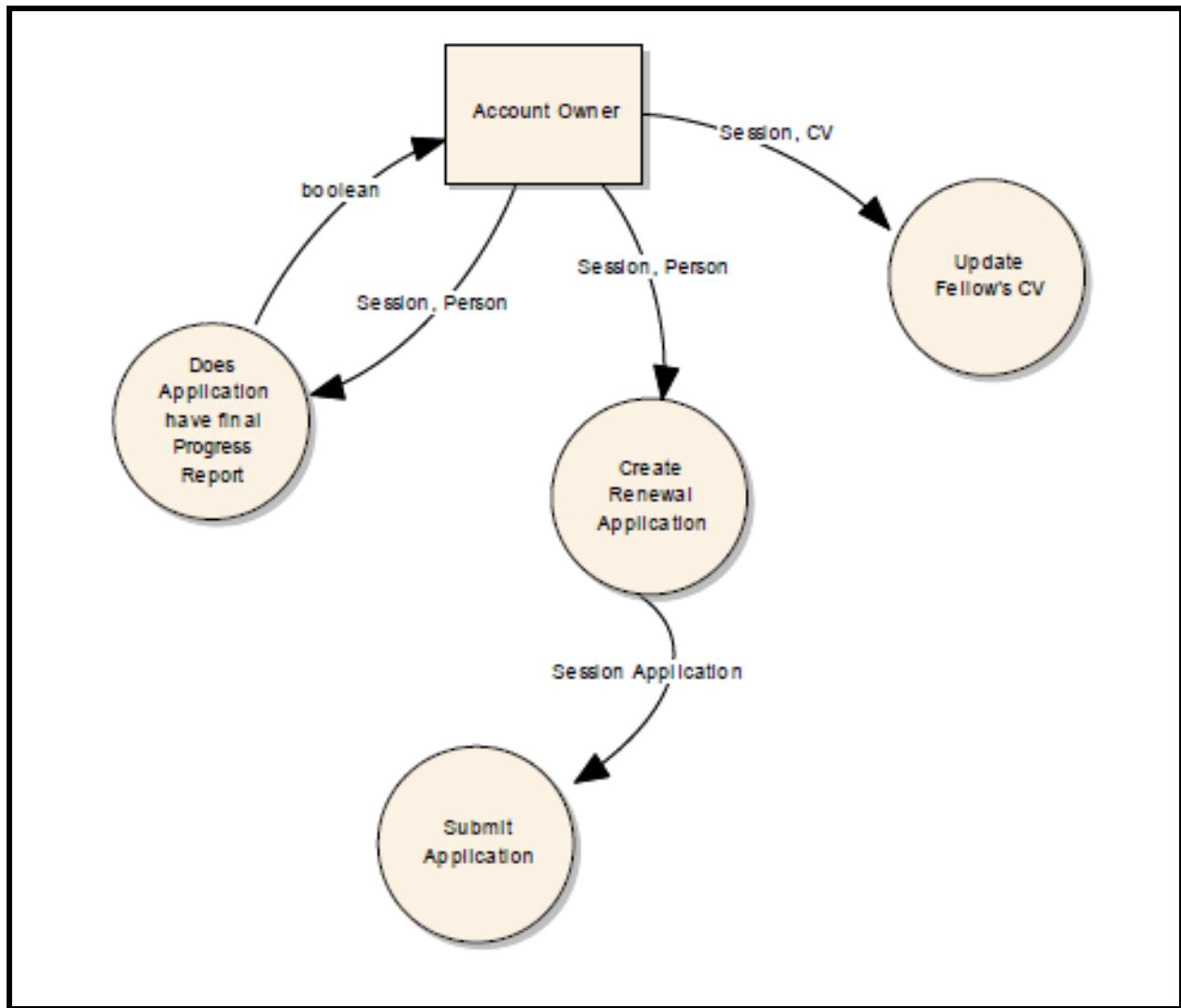


Figure 84: Data Flow for Application Renewal.

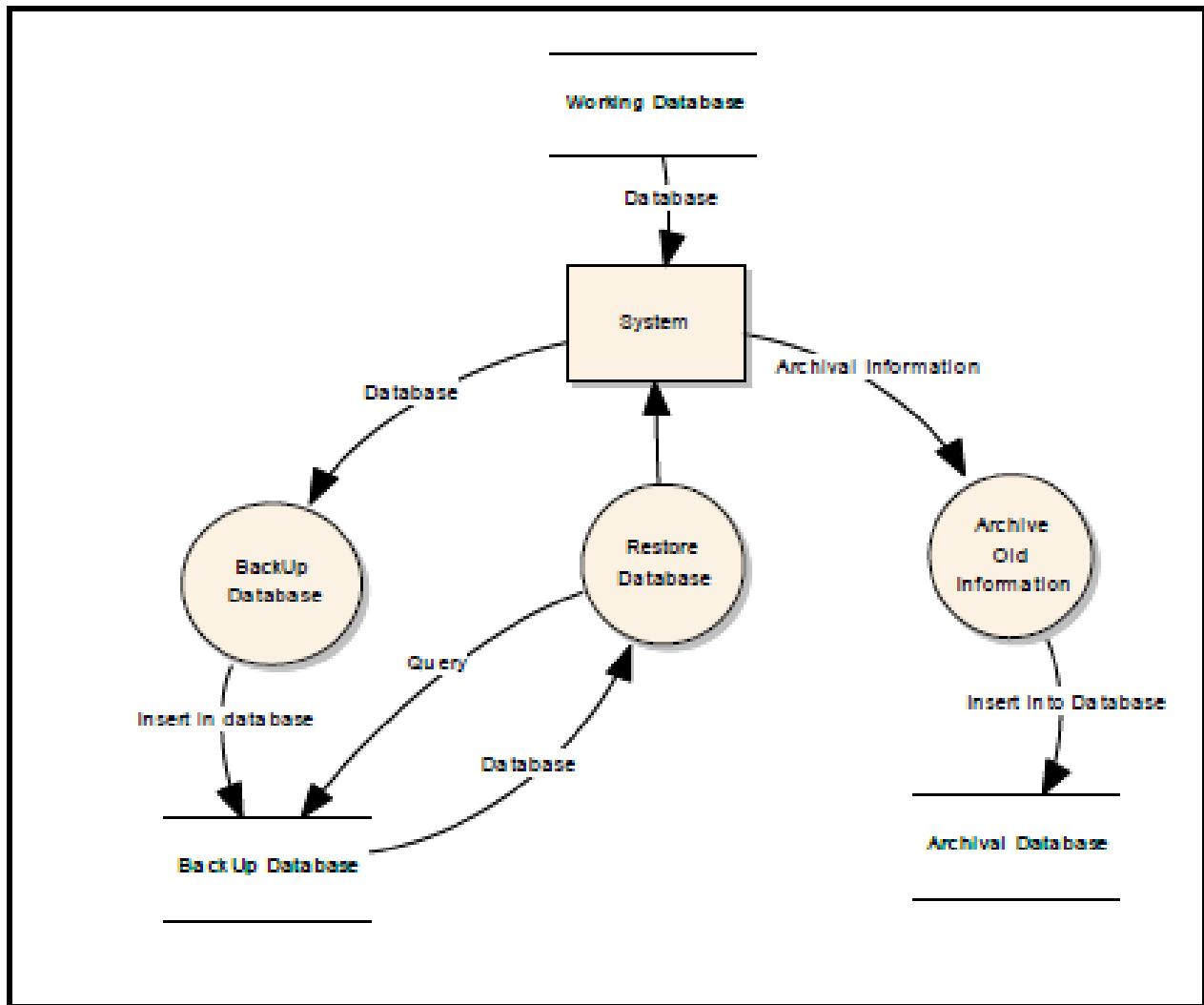


Figure 85: Data Flow for Archival Service.

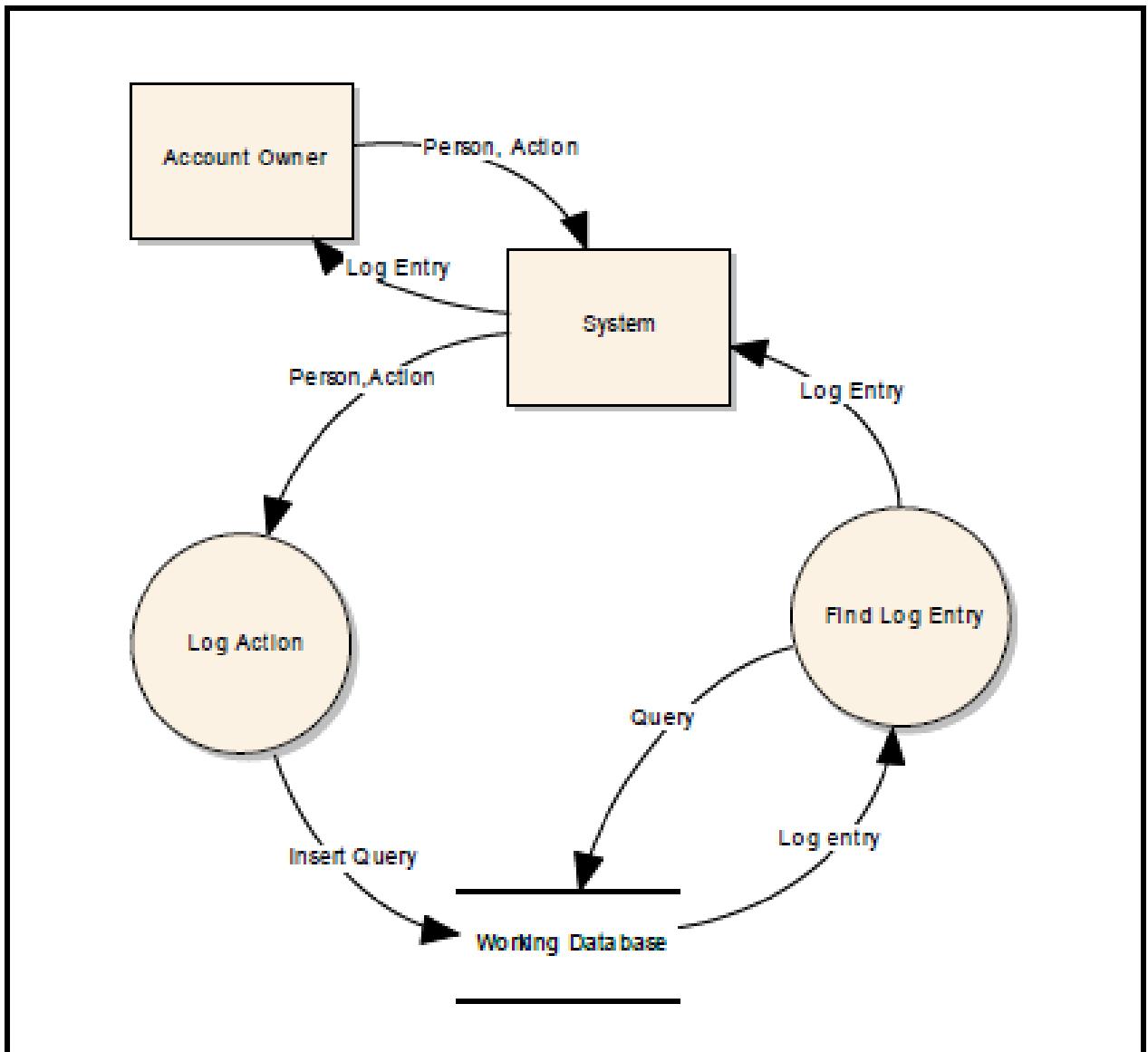


Figure 86: Data Flow for Audit Trail.

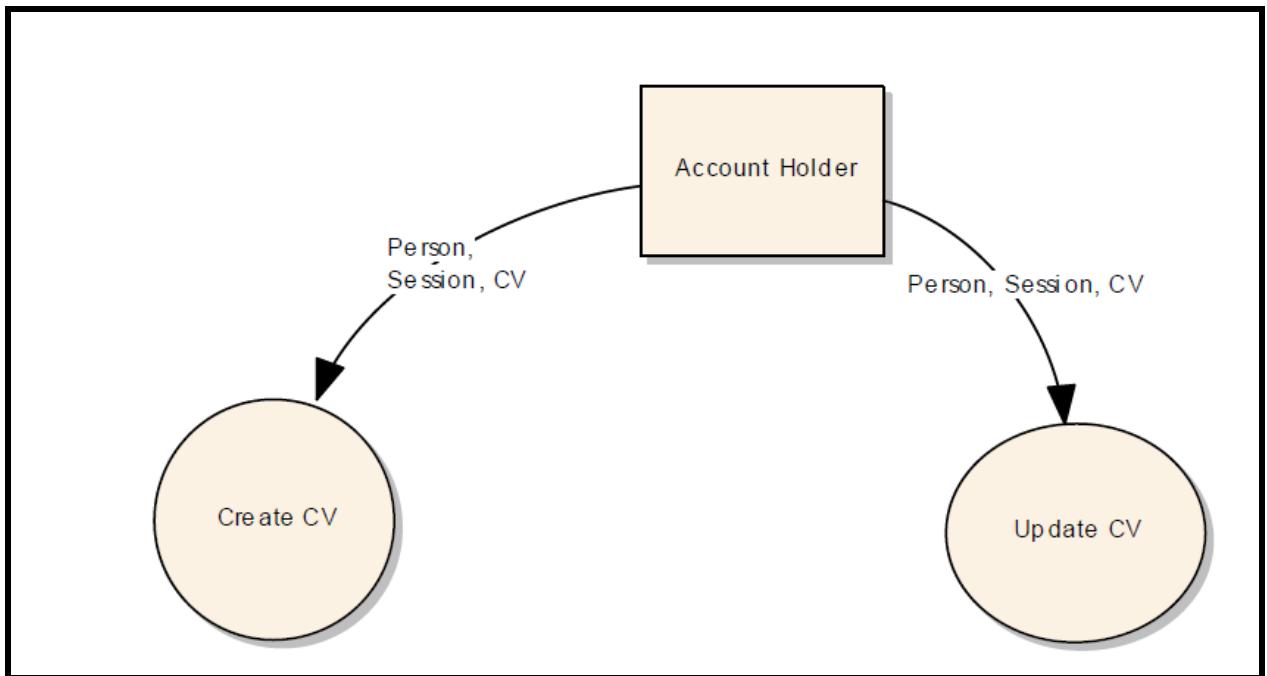


Figure 87: Data Flow CV Management.

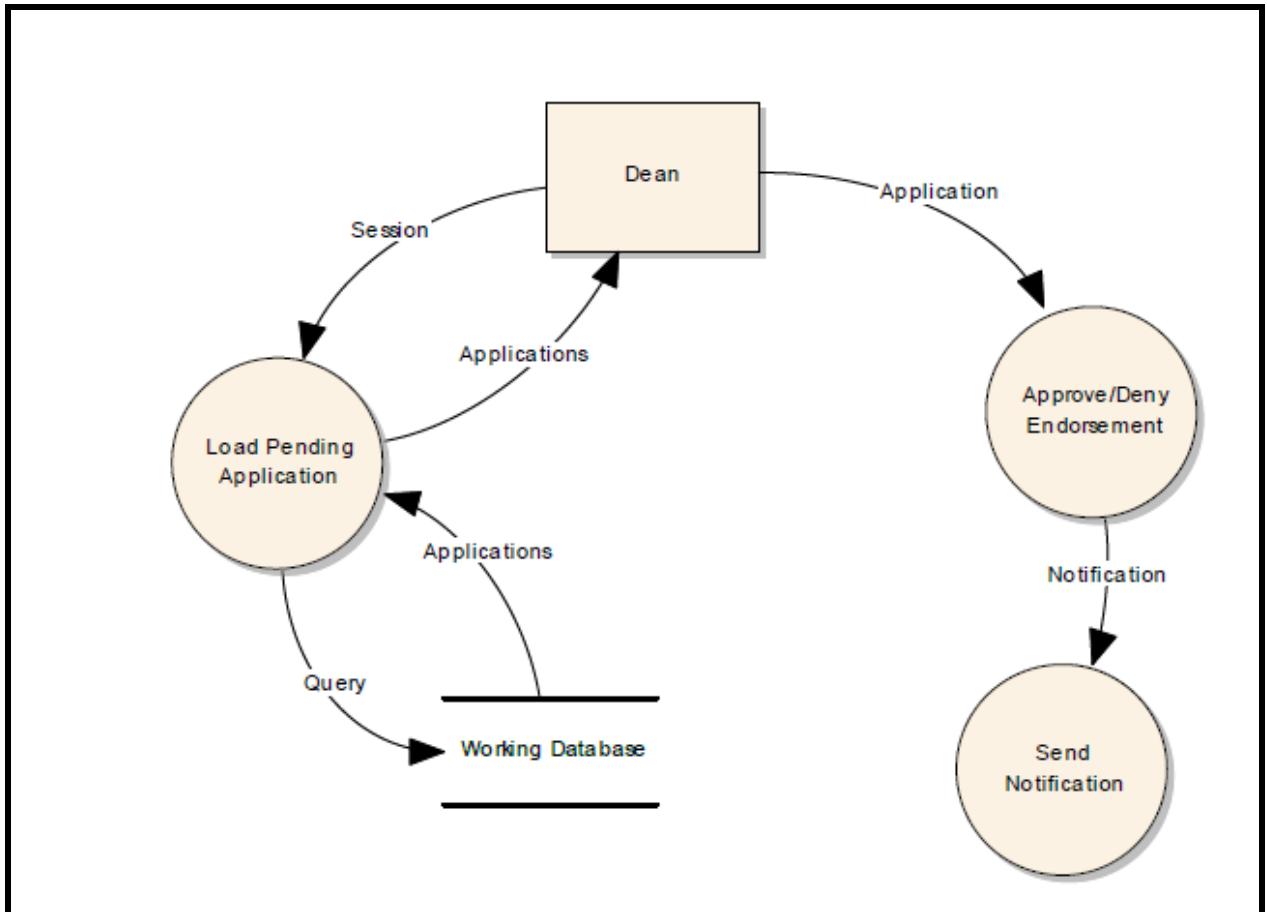


Figure 88: Data Flow for Dean's Endorsement.

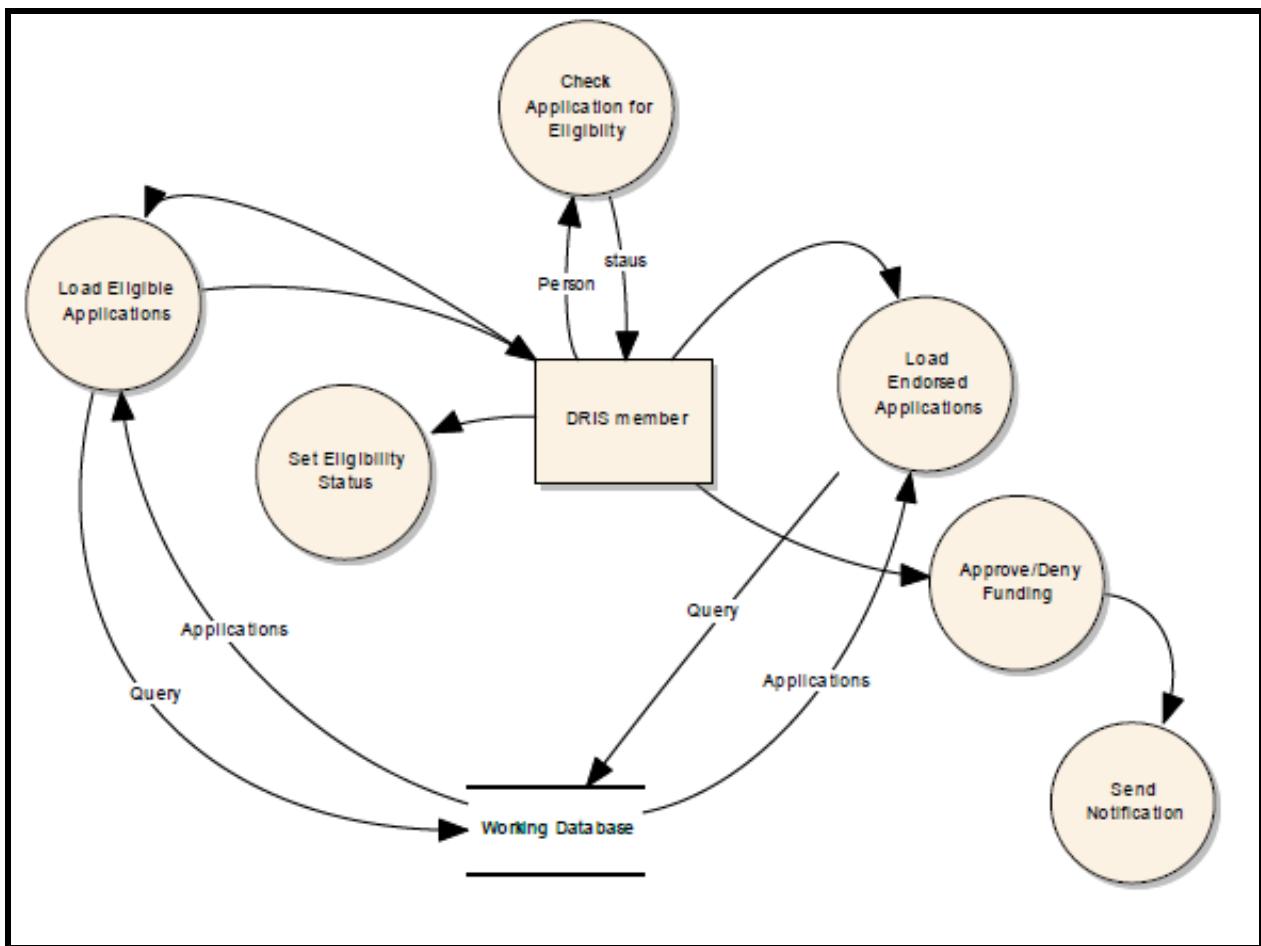


Figure 89: Data Flow for DRIS Approval.

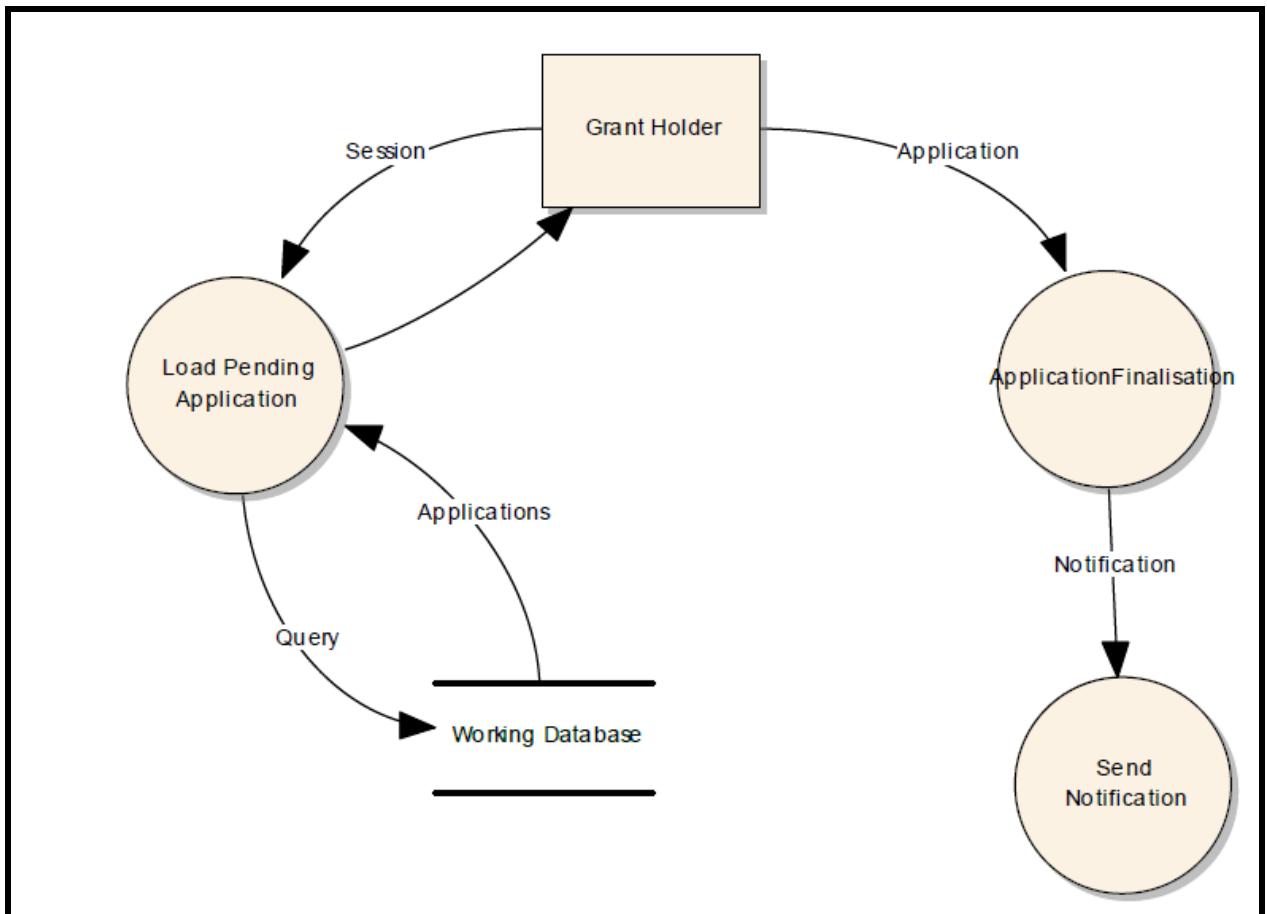


Figure 90: Data Flow for Grant Holder Finalisation.

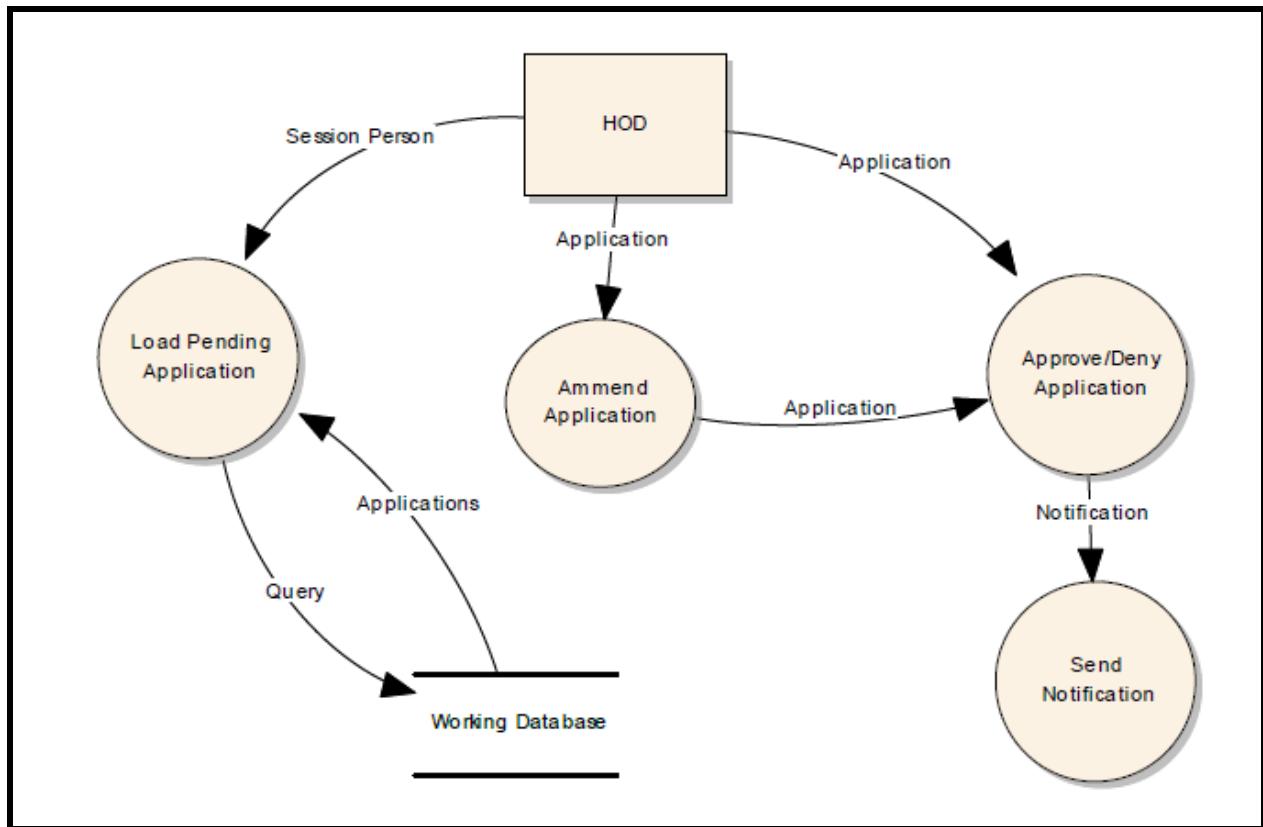


Figure 91: Data Flow for HOD Recommendation.

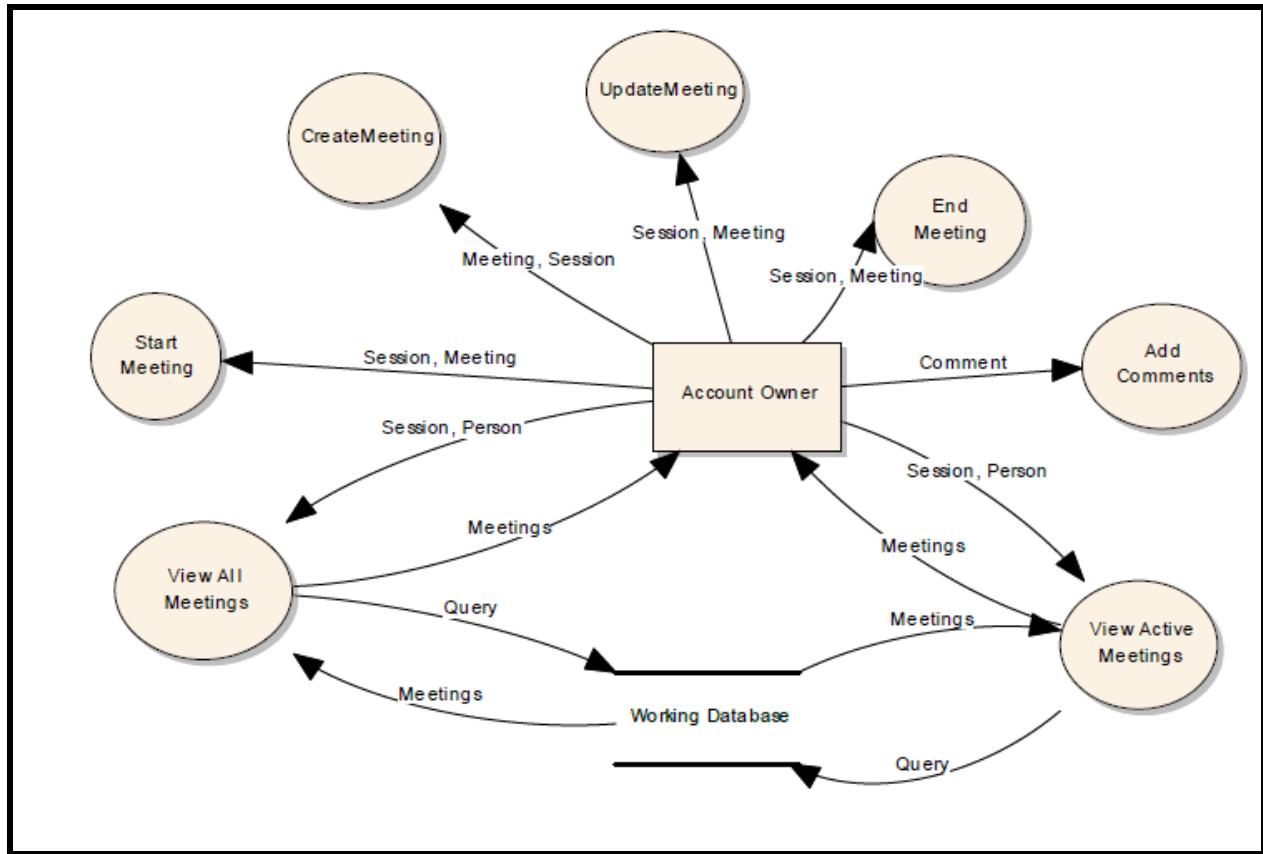


Figure 92: Data Flow for Meeting Management.

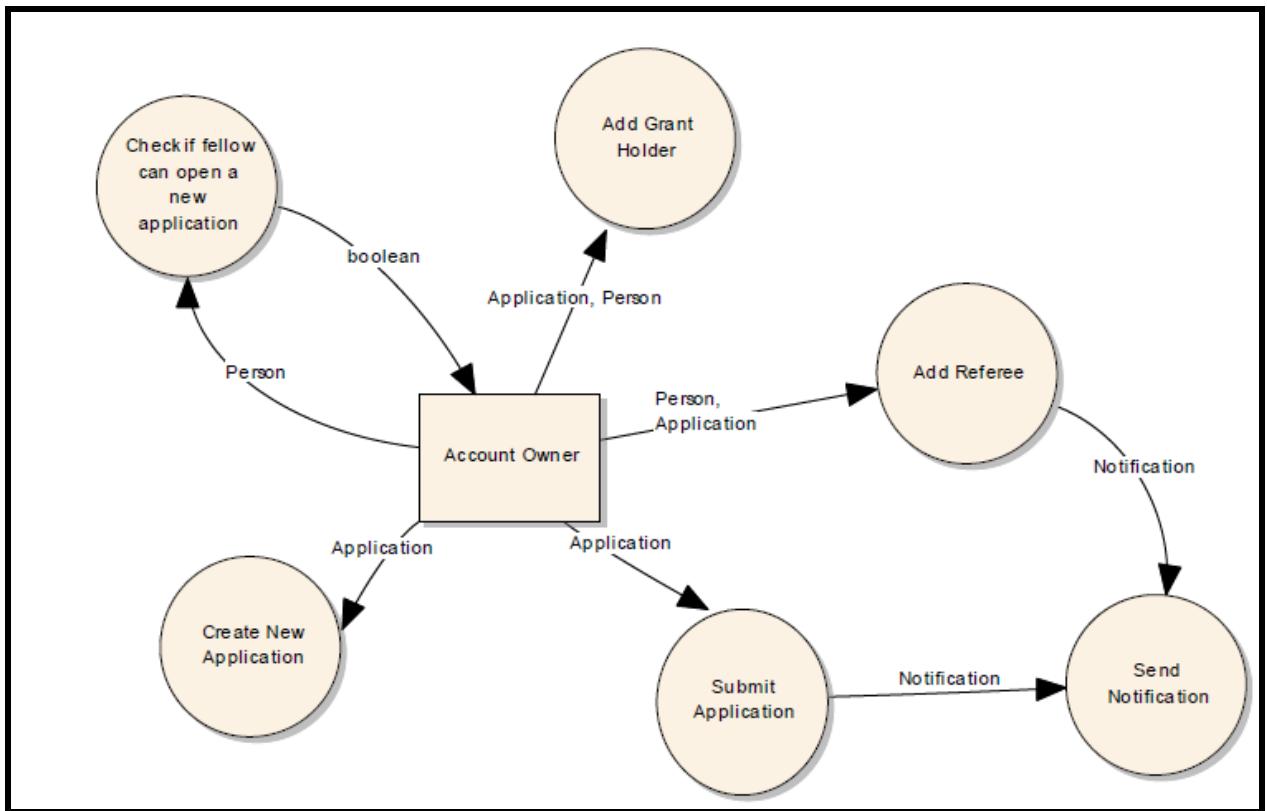


Figure 93: Data Flow for New Application .

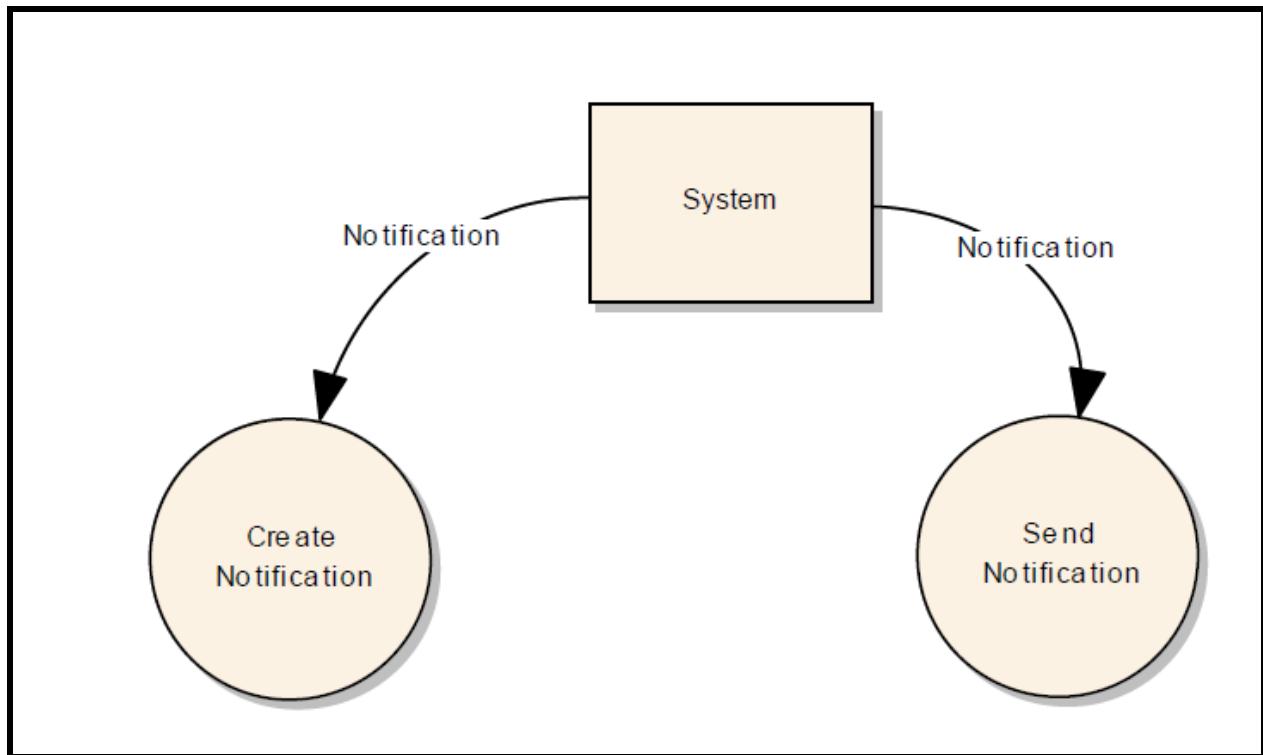


Figure 94: Data Flow for Notification Service.

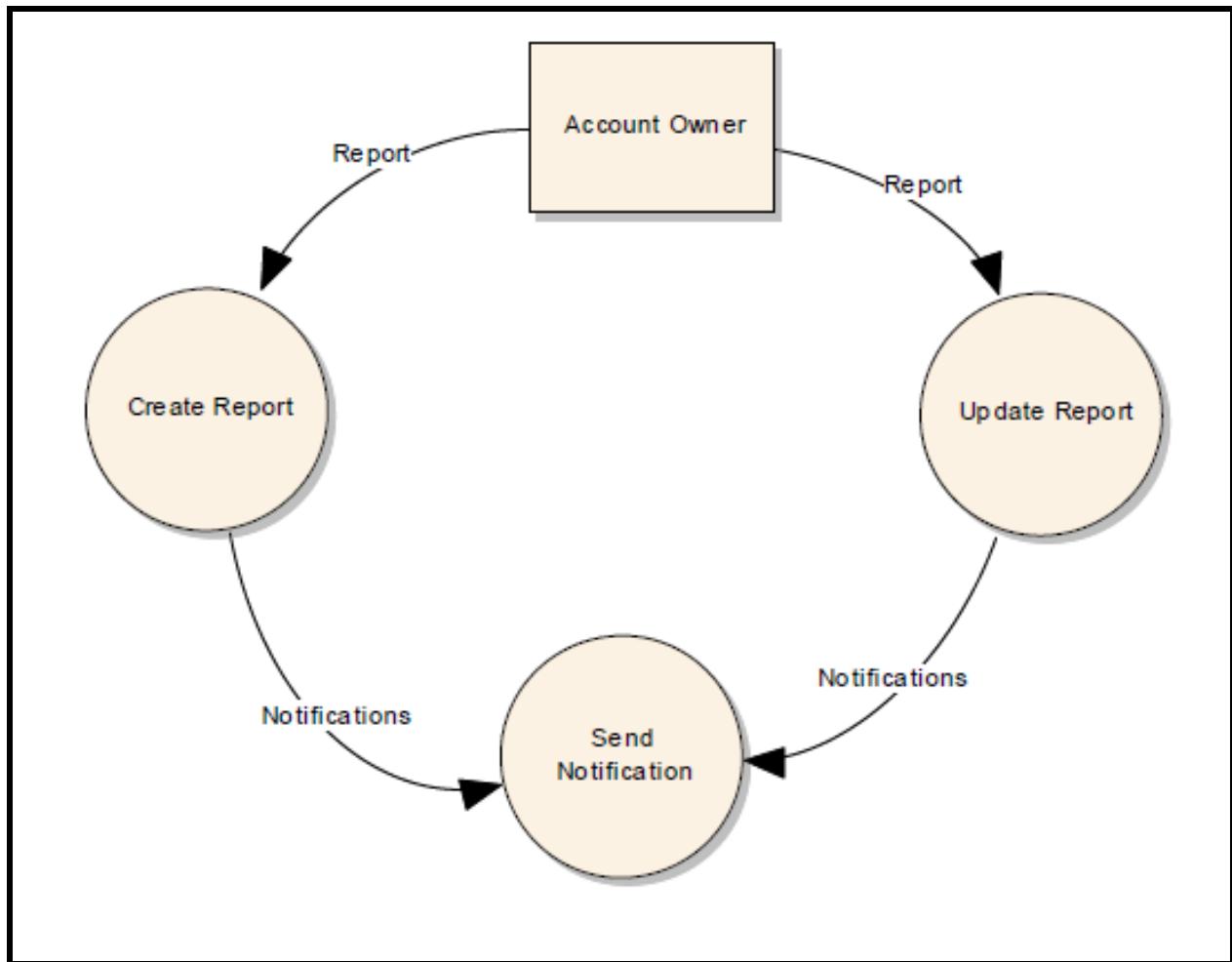


Figure 95: Data Flow for Progress Reports.

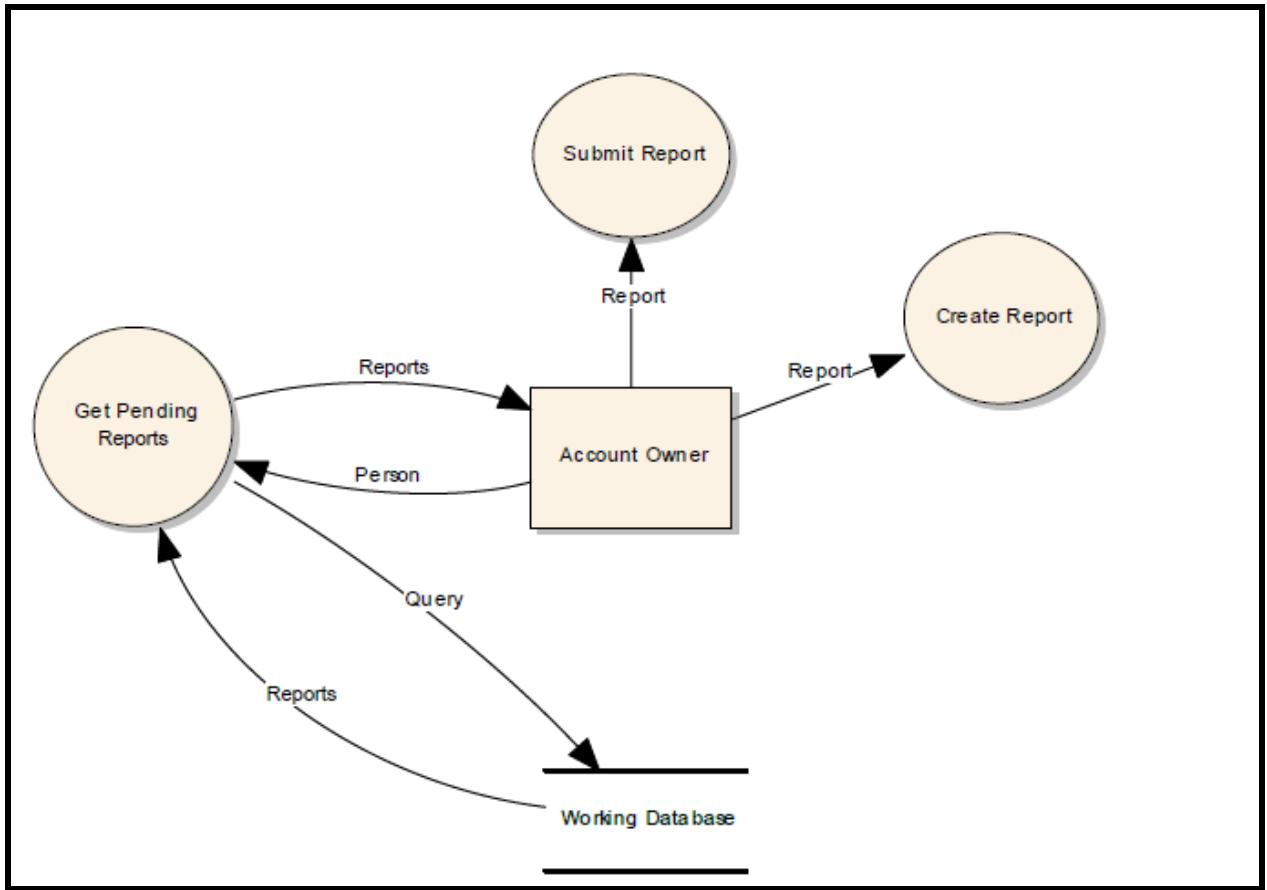


Figure 96: Data Flow for Referee Report.

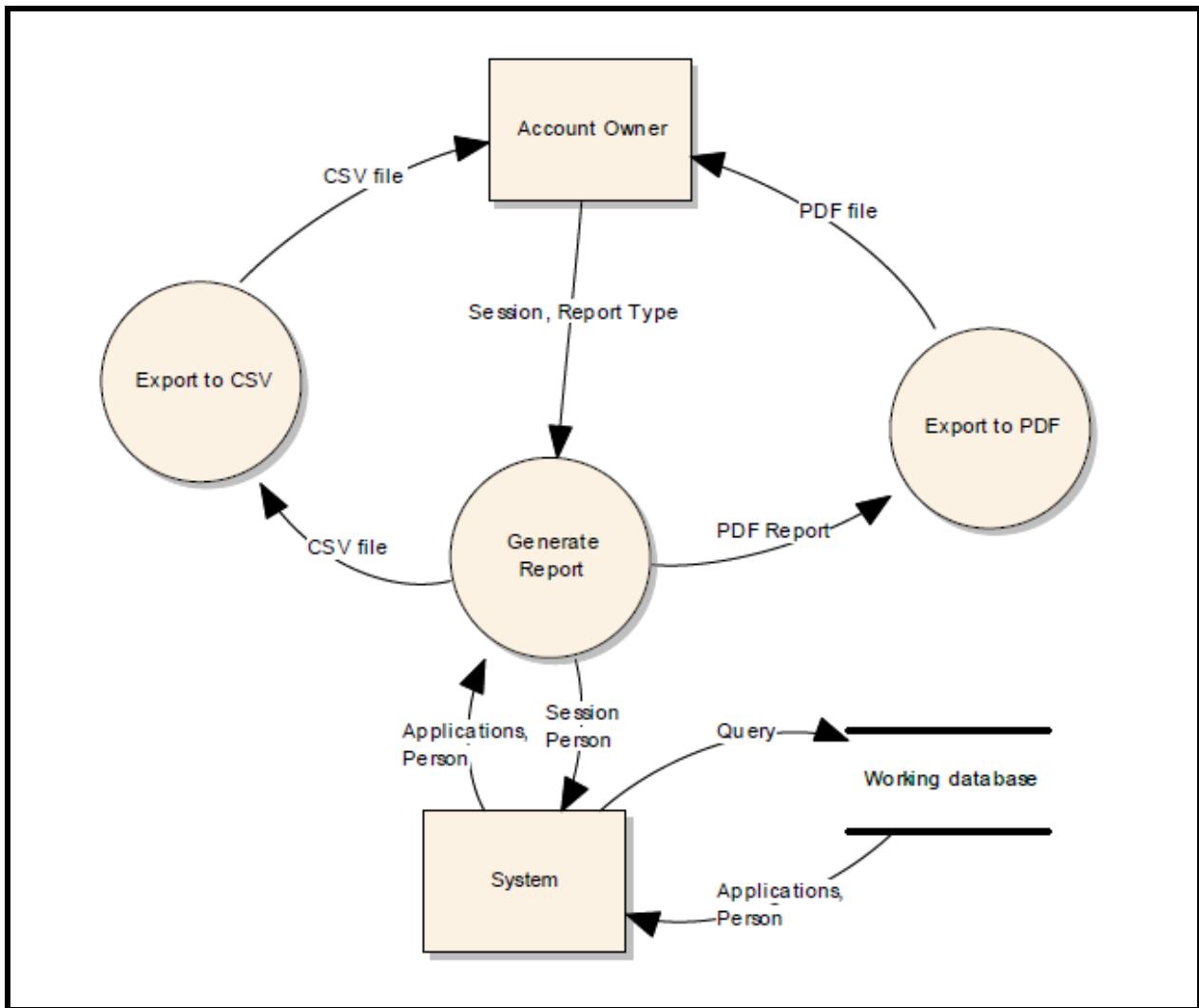


Figure 97: Data Flow for Reporting Service.

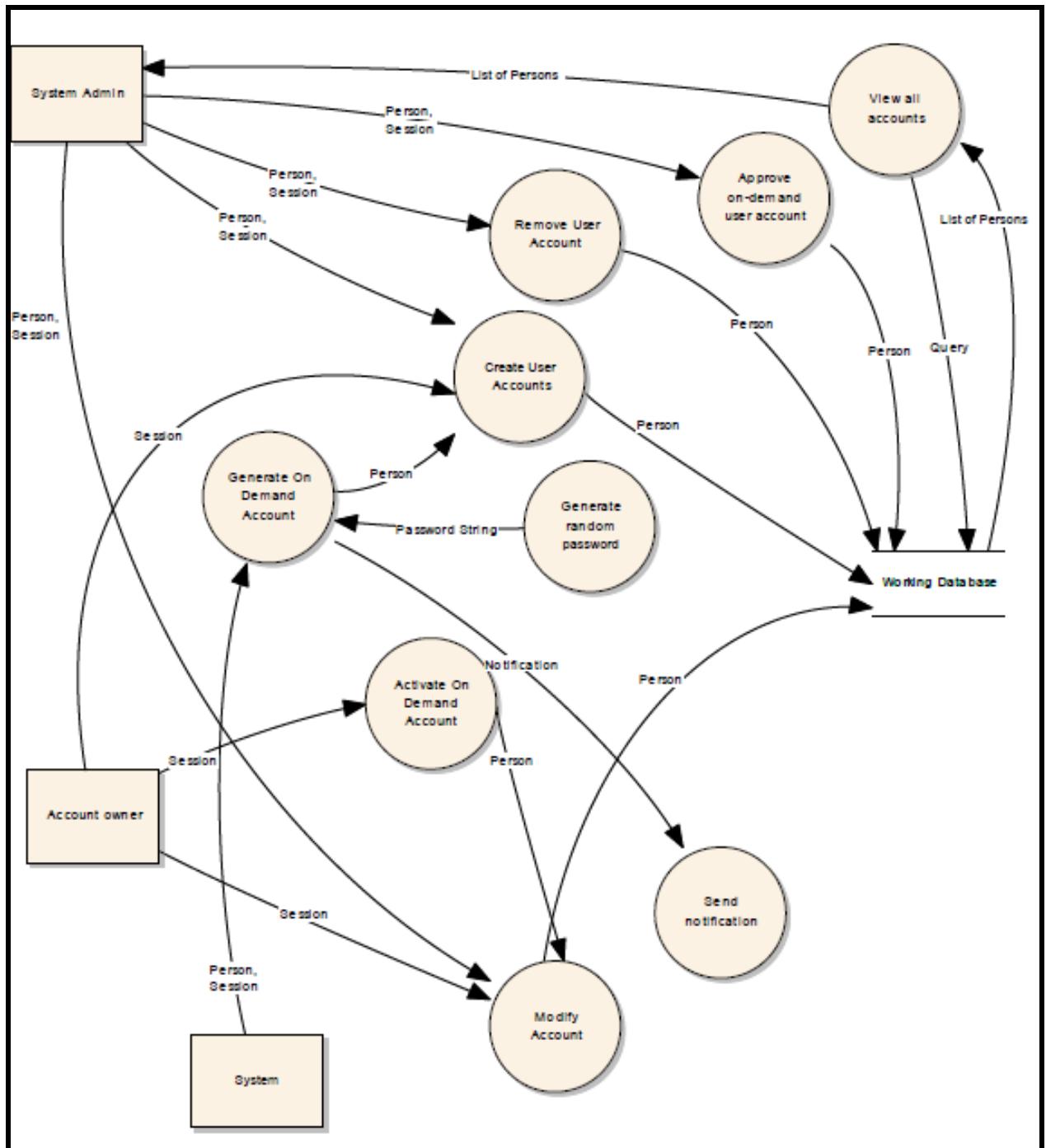


Figure 98: Data Flow for User Account Management.

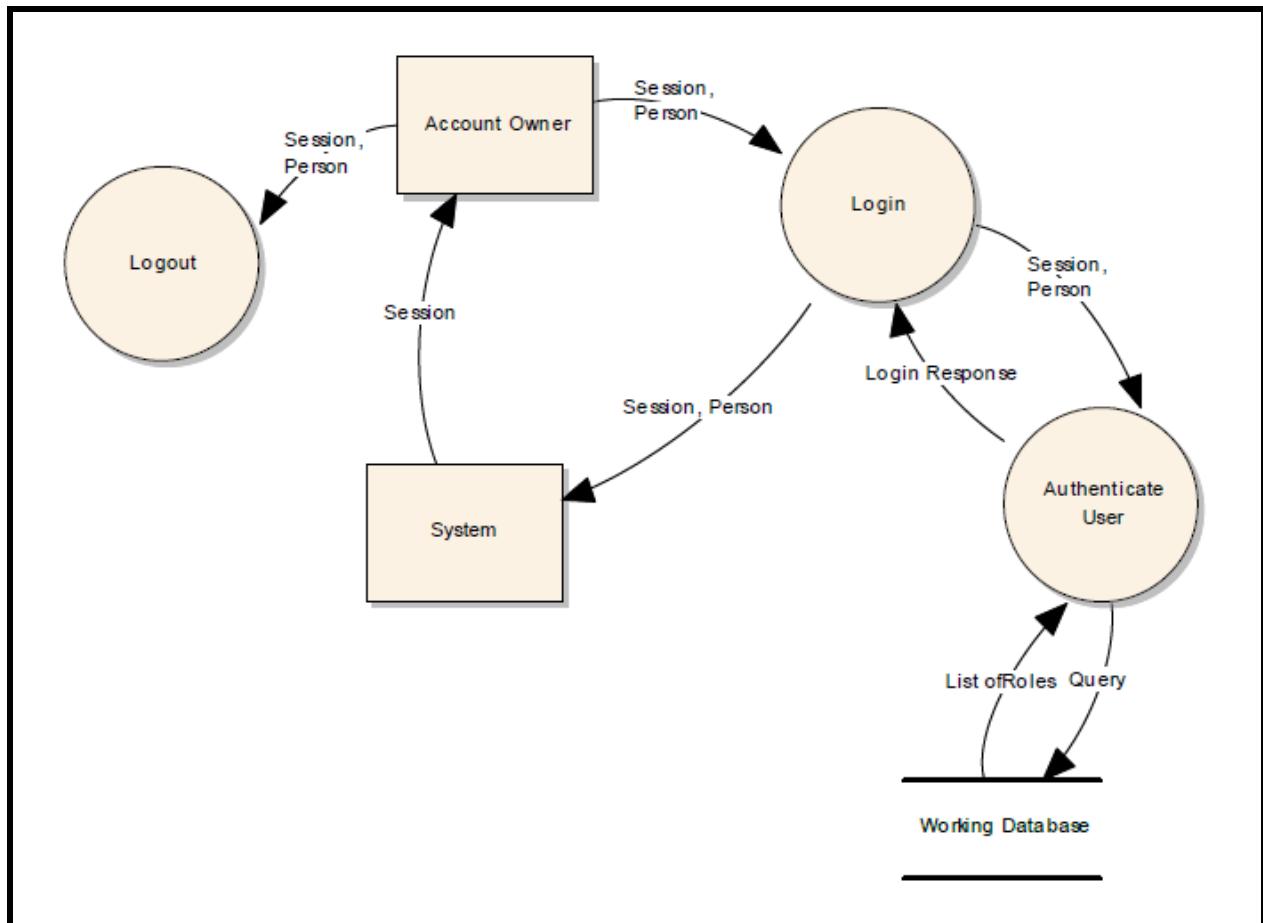


Figure 99: Data Flow for User Gateway.

3.9 Domain Objects

3.9.1 Overview

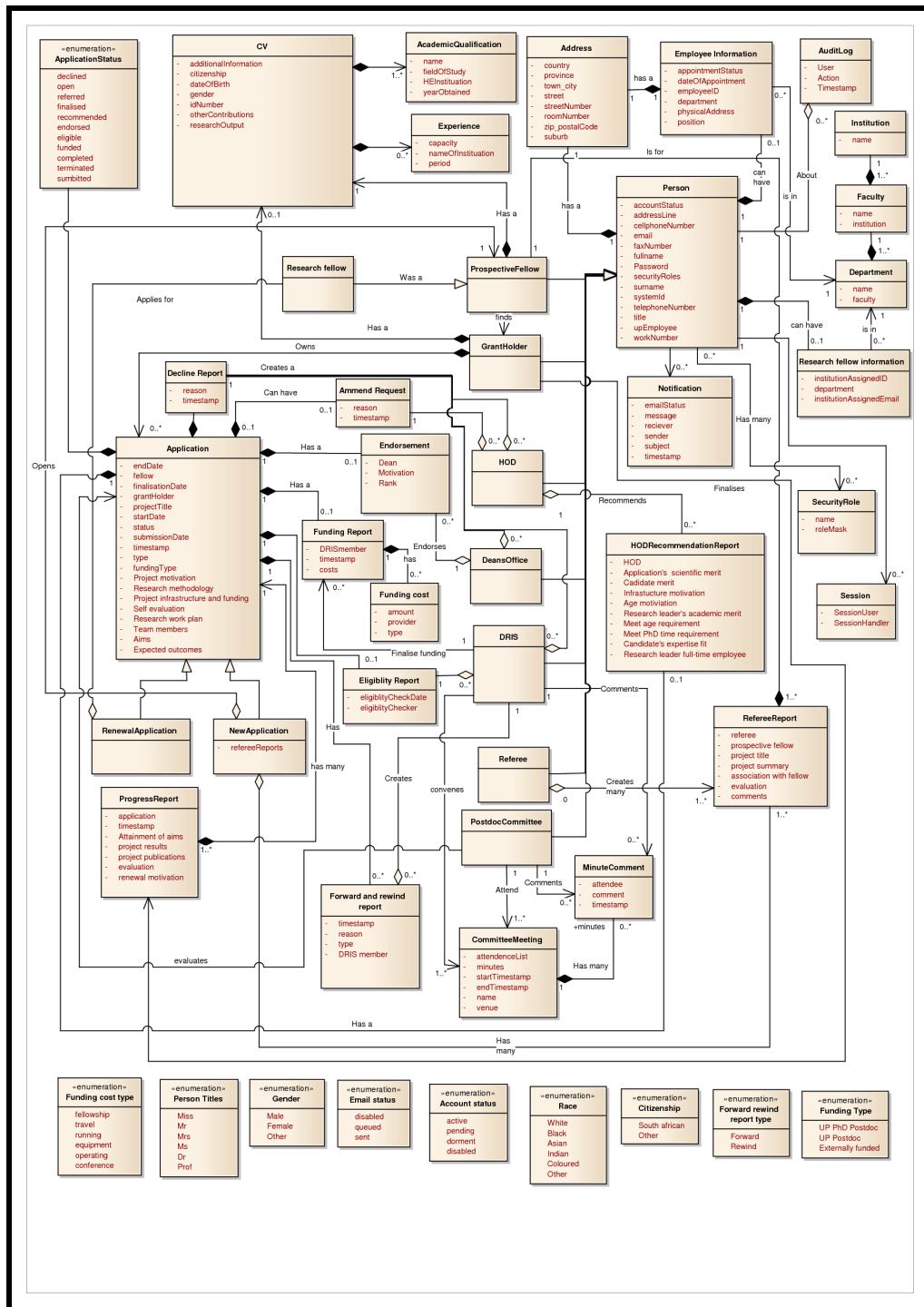


Figure 100: Overview of the data structures and relationships for the core domain objects of the system.

3.9.2 Person

This object represents the stakeholders that will make use of the system. All stakeholders will have accounts which they will use to log on to the system, using a unique user id and a predefined or user specified password. The unique user id can either be a Peoplesoft Emplid number or a email address. The person has an associated **Location** and **SecurityRole(s)**

3.9.3 Department

This object represents the department under which a **Person** falls in the **Faculty**. This is used to if they are a **employee** or **Research fellow** at the University of Pretoria. This object will no longer be needed if the system is integrated with peoplesoft as it would cause redundancy.

3.9.4 Faculty

This object represents the faculty that may exist under an institution. It is used to map the location of a **Person**.

3.9.5 Institution

This object represents the institutions that may exist in the system. It is used to map the location of a **Person**. This allows for generic support if the software solution had to be expanded to other universities.

3.9.6 EmployeeInformation

This object represents the information regarding the employment of a **Person** at the University. It also contains the **Department** under which the **Person** falls. Also it contains the physical **Address** of the employee's office. This is made generic for software expansion support.

3.9.7 ResearchFellowInformation

This object represents the CSC's or institution equivalents assigned emplid and the institution's assigned email address for an appointed **ResearchFellow**. This allows for possible future integration and better user support. Also it stores the **Department** in the institution to which the fellow was assigned to by the **DRIS**.

3.9.8 Address

This object represents a physical address. Thus it is used to expand and provide location details for a particular physical object or person.

3.9.9 SecurityRole

This object represents a particular security role of a **Person**. A **Person** may have many different security roles. The security role can be used as a subtype discriminator for relational database architectures.

3.9.10 DRIS

This object represents members of Department of Research and Innovation Support who administers the process.

3.9.11 FundingReport

This object represents an **Application**'s funding costs as decide per the **DRIS**. It comprises of multiple **FundingCosts** that provides the various funding inputs from various parties for the particular fund-able costs namely fellowship, travel, running, equipment, operating and conference.

3.9.12 FundingCost

This object represents a particular funding input cost for a **Application** from a particular funder.

3.9.13 DeclineReport

This object represents the report associated with an **Application** that has been declined by some authority. It contains the creation timestamp, **Person** responsible and the reason. Only one such report can exist per **Application**.

3.9.14 AmmendRequest

This object represents a Amend request for a **Application** that is sent by some **HOD**. It contains the creation timestamp, **HOD** responsible and the reason. This is used to allow fellow to understand what is wrong with their **Application** so that they can correct it. There can be multiple such requests associated with an **Application**.

3.9.15 EligibilityReport

This object represents a report associated with an **Application** that has been checked for eligibility. It contains the check timestamp and **DRIS** member responsible. It is primary used for auditing. Only one such report can exist per **Application**.

3.9.16 ForwardAndRewindReport

This object represents a report associated with an **Application** that has been either forwarded or re-winded through a particular set of application stages. This is used to track such actions and the reasons for them. There can be multiple such reports associated with an **Application**.

3.9.17 ProspectiveFellow

This inherited object represents a prospective fellow who is a holder of a PhD obtained in the last five years (or nearing completion of a PhD) or is 40 years or younger and has a PhD. The prospective fellow can open a **NewApplication**.

3.9.18 ResearchFellow

This inherited object represents a research fellow who is currently a researcher at the University of Pretoria. This object was initially a **ProspectiveFellow**. The research fellow can apply for a **RenewalApplication** if their application falls in their renewal time frame.

3.9.19 GrantHolder

This inherited object represents a grant holder who can be a rated researcher by the NRF or not. The system should not require the CV's of A and B rated researchers to be added to the system. The reason for this is that the CV's of such researchers can be easily obtained from the NRF and tend to be very long. A grant holder is the supervisor for one or many **ProspectiveFellow(s)** or **ResearchFellow(s)** and owns the **Application** of the **ProspectiveFellow(s)** or **ResearchFellow(s)**.

3.9.20 HOD

This inherited object represents a HOD of a particular department. The HOD creates the recommendation reports for **Application(s)** they consider to meet their requirements.

3.9.21 HODRecommendationReport

This inherited object represents a recommendation report highlighting the reasons to why the **Application** of a **ProspectiveFellow** or **ResearchFellow** is needed by the department.

3.9.22 Deans Office

The Dean's office object represents the relevant faculty's Dean and Deputy Dean. The Dean's Office creates the **Endorsement** for any the **Application** that is approved by them.

3.9.23 Endorsement

This object represents the endorsement of an **Application** of a **ProspectiveFellow** or **ResearchFellow** and contains the rank in comparison to other pending **Application(s)** with a **Endorsement**.

3.9.24 Referee

This inherited object represents the referees of any **ProspectiveFellow** and is responsible for creating **RefereeReport** regarding the **ProspectiveFellow**.

3.9.25 RefereeReport

This object represents the referral report from an identified referee of a **ProspectiveFellow**.

3.9.26 PostDocCommittee

This inherited object represents the individual members of the post-doctoral committee who approves all available **Applications** during committee meetings and records the **Minutes** of the meeting.

3.9.27 CommitteeMeeting

This object represents a meeting of the **PostDocCommittee** convened by the **DRIS** that will be review the **Applications** and will evaluate each. This object contains the attendance list, date and time convened and the **MinuteComments** of the meeting.

3.9.28 MinuteComment

This object represents a comment made by a **PostDocCommittee** member during a **CommitteeMeeting**.

3.9.29 Application

This object represents an applications and will contain the information of **ProspectiveFellow** or **ResearchFellow** and **GrantHolder** who owns it. The object holds the status of the application and any project information. As well as the **HODRecommendationReport** of a **HOD** and **Endorsement** from a **DeansOffice**. It further holds the **EligibilityReport** and **FundingReport** from the **DRIS**. If the application is declined the **DeclineReport** is associated with the application. The application object can also hold multiple **AmmendRequests** if any such requests are created. All the **ProgressReports** created by the **ResearchFellow** are also contained in the application. Lastly if the application forwarded or re-winded then the associated **Forward rewind reports** are also contained by the application

3.9.30 NewApplication

This inherited object represents new application for a **ProspectiveFellow** who is currently not a fellow in the system. Also it holds any **RefereeReport**(s) that has been created for the application.

3.9.31 RenewalApplication

This inherited object represents renewal application for a **ProspectiveFellow** who is a fellow in the system. Also it holds the **ProgressReport** that has been created for the application.

3.9.32 ProgressReport

This object represents the periodical report on the research that the **ResearchFellow** has done for the particular period in the duration of their fellowship. These reports are completed on an annual bases.

3.9.33 CV

This object represents a CV and contains all the information such as personal details, **AcademicQualification**(s), **Experience** regarding a **GrantHolder** or **ProspectiveFellow** in the system.

3.9.34 AcademicQualification

This object represents a academic qualification and the information regarding it such as the qualification name, field, where it was obtained and when it was obtained.

3.9.35 Experience

This object represents a work experience and the information regarding it such as the capacity of the work, where this work was done and when it was done.

3.9.36 Notification

This object represents a email or internal message sent by a user to a user via the system. The system itself may also seen as a user with regards to the sender of such notification. It consists of the actual message, subject, timestamp and email status.

3.9.37 AuditLog

This object represents a audit log that stores all the actions of all users within the system. Each entry records the action, who committed the action as well as at what time the action was committed.

3.9.38 Session

This object represents the details of a currently active session on the system. It contains the user (**Person**) and the link to the system's session management system's record. This object will be used throughout the system for auditing and authentication.

4 Glossary:

- **Activity diagram** - A UML diagram that depicts the flow of actions or activities in the process.
- **API** - Application Programming Interface
- **Audit log** - A log that keeps track of user actions.
- **Application** - Both renewal applications or new fellowship applications are seen as applications by this project.
- **CV** - Curriculum Vita
- **Domain objects** - Are the objects that are present in the system being modelled.
- **HTML** - Hyper Text Mark-up Language
- **Java EE** - Java Enterprise Edition
- **NRF** - National Research Foundation
- **PhD** - A doctoral degree in a particular field of study.
- **PDF** - Portable Document Format file
- **PeopleSoft** - A management system designed by oracle.
- **Spreadsheet** - A special type of digital document that is used to represent data in rows and columns
- **Use case diagram** - A UML diagram that gives a visual depiction of a service or group of services.
- **UML** - Unified modelling language. A commonly used model standard to provide technology neutral models of different aspects of software.
- **UP** - University of Pretoria