Epoka University

Faculty of Economics and Administrative Sciences

Business Informatics

CEN302 -- Software Engineering

Construction Company Management System

Requirements Specification

2CMS Requirements Specification

Version 2.0

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1. Executive Summary

1.1 Project Overview

In today's world technology is becoming part of our everyday life. Technology is being implemented in almost every aspect of our lives and business function. Businesses can save money as they save time by using technology to perform numerous tasks. Considering the huge application of technology in business section, we thought about a management system in a construction company.

In the construction industry, technology helps to manage every level of user or employees. The point is, technological advancements have always driven construction forward. It has made construction sites safer and workers more efficient. According to some research made, construction productivity has remained flat for decades. The traditional method that the administrators, architects, operation managers, workers and even accountants of the companies do their job makes the process slow.

In some companies, like the one we are considering for this project, it was necessary the developing of such a system to manage things within such a company. It will be developed in a way that will facilitate the management job of administrator, accounting tasks of the finance employees, architectural designs tasks of the architects, tasks of operation managers and the schedules of the workers employed in building process of apartments. These will be all organized in a complete set of tools with the aim to facilitate the process of employees inside the organization.

1.2 Purpose and Scope of this Specification

The software aims to make the employees' management process easier in the construction company they work. This will be achieved by a web application that will administer tasks of construction materials records, users' records, design planning, accounting records, operational tasks and workers schedules.

The application makes the process of material management easier for the supervisor, by taking care of the materials on hand as well as ordering new ones and provides a solution for the other users' management, like adding, editing and removing a worker in a specific position within the company. The accounting process will be more flexible with the use of this software from the accountants. Architects employed in this industry will also be given this set of tools to complete their tasks with higher efficiency. Operation manager will find it easier to keep track of progress of constructions. No misunderstanding or any dishonesty will occur in the duration of working hours of workers, as they will be given the chance to check-in and check-out, thus taking the deserved salary, given amount of time they work on the construction.

2. Product/Service Description

2.1 Product Context

2CMS is a useful tool, which serves best to a construction company, as it has all the required functionalities of a management system. This construction company management system aims to give its users the freedom and effectiveness in completing their tasks within the organization.

2CMS is a flexible, user-friendly, easy and efficient instrument in managing each users' tasks in the construction of apartments in the city, making it simple for them to do their job right.

We can mention different features, which makes the system useful,

- Platform accessible in web
- Account for every user level in the company

2.2 User Characteristics

The system is used by 5 working positions: administrative, financial, architectural, operational and simple workers of the apartments the company is constructing to later sell.

1. Supervisor/Administrator:
    - Can log in to his account
    - Can access its own profile
    - Can view other users' personal information
    - Can add a new user: accountant, architect, operation manager, worker
    - Can update profile of an existing user: accountant, architect, operation manager, worker
    - Can delete an existing user: accountant, architect, operation manager, worker
    - Can add/view/edit/delete constructions
    - Can manage actual construction materials by recording quantities available and delivered, maintaining an inventory of materials
    - Can order new materials, by quantity
    - Can view ordering history
    - Can download ordering history
    - Can view accounting reports of each construction
    - Can view design of each construction
    - Can view fulfillment status of each construction
    - Can send messages to other users
    - Can change his credentials
    - Can logout
2. Accountant:
    - Can log in his account
    - Can access its own profile
    - Can view the constructions
    - Can view orders
    - Can record for the net income of constructions
    - Can download net income reports
    - Can view accounting reports of each construction
    - Can send messages to other users
    - Can change his credentials
    - Can logout
3. Architect:
    - Can log in his account
    - Can access its own profile
    - Can view constructions

- Can design constructions by adding images of lightning, hydraulic, interior design planning related to constructions the company is managing to build
- Can view design of each construction
- Can send messages to other users
- Can change his credentials
- Can logout

4. Operation Manager:
    - Can log in his account
    - Can access its own profile
    - Can view the constructions
    - Can see the progress of each construction by a progress bar
    - Can decide on the status of each construction
    - Can view fulfillment status of each construction
    - Can view designing of constructions
    - Can send messages to other users
    - Can change his credentials
    - Can logout
5. Workers:
    - Can log in his account
    - Can access its own profile
    - Can check-in/check-out the time of working
    - Can send messages to other users
    - Can change the credentials
    - Can logout

2.3 Assumptions

- It is assumed that a few activities performed in the background are performed consistently as indicated by the law.
- It is assumed that the profile of the supervisor is created initially by the system administrator and no other user can change information of this profile, except for the system administrator.
- It is assumed that if there is a change on the supervisor, the system manager should be informed in order to modify the profile for the upcoming supervisor.
- It is assumed that the downloaded excel document by the supervisor will be handed to the sales department manually.
- It is assumed that when the supervisor adds a new user in the system, he is verified that he works in the company in one of the positions the system allows.
- It is assumed that the request for the company to deal with a new construction comes manually by the respective department.
- It is assumed that the workers will be given a 4-digit personal code when they are first employed in the company.
- It is assumed that check-in/check-out will be helpful in deciding for salary based on working hours.

- It is assumed that all messages exchanges will be work-related.
- it is assumed that information and activities of other users are confidential.
- It is assumed that users will be trained on how the software will be used.
- It is assumed that employees will be equipped with a computer with internet connection during the working hours in the company.

2.4 Constraints

- The project is constrained by the Internet connection.
- Since it is supposed to be a web application, it is crucial that there is stable Internet connection for the application to function.
- The internet is needed mainly because the data should be read and written from and to the database over the Internet.

2.5 Dependencies

- No new user or construction can be managed if the supervisor is not registered in the system.
- There is a dependency between the supervisor and the accountant because the estimated reports by the accountant are viewed by the supervisor.
- There is dependency between supervisor's job of ordering materials and the accountant, because accountant has to view orders in order to record costs.
- There is dependency between the supervisor and architect, because architect's work is viewed by the supervisor.
- There is dependency between the supervisor and operation manager because status assigned by the OM is needed for the supervisor to decide on existence of the construction in the system or not.

3. Requirements

3.1 Functional Requirements

The following table contains the requirements of the software project.

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_01	The system should support different account types for different users' level.	According to type of user, they are logged in different in the system and will have their own view.	1		
BR_02	The users must log in with their usernames and passwords, inputting before the type of user (accountant, architect, OM worker).	This will provide a secure entering in the system.	1		
BR_03	Credentials validated when trying to log in.	In case of logging in with username and password not found in database, or wrong ones, the system generates an alert message displaying what is wrong.	1		

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_04	Passwords are entered in order to provide security and encryption of the users.	The accounts should have unique and passwords that follow a general rule for the passwords.	1		
BR_05	The supervisor can view the profile of the employees of the company.	He is the only who can view the information about the other users of the system.	1		
BR_06	The supervisor can perform CRUD actions on users of the system.	Supervisor is the only one who creates, reads, updates and deletes accounts of other users.	1		
BR_07	Supervisor can search a certain user.	Supervisor can view a user profile by searching him.	1		
BR_08	Supervisor is alerted if he wants to delete the searched user, in case of doubt.	Supervisor cannot undo the deletion process.	1		
BR_09	The inputted data when adding, editing of the user will be validated.	A user in the company will be given accurate data when being added or edited by the supervisor.	1		
BR_10	Supervisor cannot update/change username and password of other employees' accounts of the system.	Username and password can be edited only by the account's owners.	1		
BR_11	Other users apart from supervisor cannot perform action on the other employees' profiles.	Not supervisor users have only access to their account.	1		
BR_12	The supervisor can perform CRUD actions on the constructions the company is planning to build.	The supervisor is the only one responsible for creating, reading, updating and deleting constructions.	1		
BR_13	The inputted data for the addition or editing of the construction will be validated.	A construction in the company will be given accurate data when being added or edited by the supervisor.	1		

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_14	The supervisor can search a specific construction.	Supervisor can view a construction after searching it.	1		
BR_15	Accountant, architect and operation manager can view the constructions, but can not perform changes on them.	Only the supervisor is responsible for creating, editing, deleting of the constructions from the system. Other users only view the constructions.	1		
BR_16	Supervisor can manage materials required for each construction.	Supervisor is the only one responsible for keeping track of the inventory.	1		
BR_17	Supervisor can order new materials that are needed, allocating them to the respective construction.	Supervisor is the only one responsible for registering what the company has to order regarding new materials.	1		
BR_18	Supervisor and accountant can view ordering history of materials.	Supervisor / accountant are responsible for keeping track of the history of material ordering.	1		
BR_19	Accountant is responsible for generating net income reports regarding certain constructions and can later view them.	The accountant will be able to trace sales, expenses, this way, taking notice of net income of each construction the company is working on.	1		
BR_20	When ordering new materials, accountant will be able to read the cost of them for net income estimations.	After supervisor orders a new material, its cost is directly estimated by accountant, as part of expenses.	1		
BR_21	Supervisor can view / download accounting reports of each construction.	Supervisor can keep an eye of the performance of constructions regarding net income and export them.	1		
BR_22	Adding the necessary images of planning regarding lightning, hydraulic and interior design can only be available for the architect.	The architect can provide the required planning images for the apartments under construction.	1		

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_23	The constructions with respective images done by architect are accessed/downloaded by the supervisor, operation manager and architect himself.	Supervisor, architect and operation manager are the ones responsible among other employees of viewing/downloading the architect work on each construction.	1		
BR_24	Operation Manager is responsible of tracing the progress of each construction, by means of a progress bar.	OM is the only responsible regarding the phases on which each construction is going.	1		
BR_25	Operation Manager can decide on the status of a construction, done or in progress.	According to the progress bar, status of a construction is determined, and OM tasks is to decide on that.	1		
BR_26	The status of each construction is read by the supervisor and the operation manager.	According to the status, supervisor decides on removal of the construction if finished, or no action otherwise. OM can view it too.	1		
BR_27	Workers are responsible to check-in at the time they enter the company to work and to check-out when they finish working.	Workers are required to follow a check-in/check-out procedure.	1		
BR_28	The users can send messages to other users.	The users of the system can communicate with each other as being part of the company.	1		
BR_29	All user positions are able to view their profile when they are logged in to their account.	Supervisor, accountant, architect, operation manager, workers can view their personal information.	1		
BR_30	All users are able to change their username and passwords of their own accounts.	When needed, any user can change their username and password by themselves.	1		
BR_31	When changing usernames and passwords, they are validated before being changed.	It is required that information is valid.	1		
BR_32	After doing their job in the system, each user can log out.	A logout button is provided to let the user exit the program any time.	1		
BR_33	The web app can be in full screen mode.	Users can have their web in full screen mode.	1		

3.2 Non-Functional Requirements

3.2.1 User Interface Requirements

Before user Interface was created, a lot of work was already done for defining the application and desired functionality. The purpose of the UI design draft was to show the design proposed, and to explain how the user interface enables the user to complete the main use cases, without going into details. We tried to make it as visual as possible and all the material was created in such a format that it can be used in the final UI specification.
Our idea is simple: create as many users as possible that are helpful to our Construction Company, which in this case are the following users:

1. Supervisor (owns administrator rights)
2. Accountant
3. Architect
4. Operation Manager
5. Workers

The interface between the software and the user will not be complicated. On the contrary, it will be as simple as possible. The user will be able to access the First Page, which contains the company logo and its name in the header bar. There he must choose his position in the company. This way, the system will be alerted which type of user is logging in. After pressing button “GO”, he can freely login on the account, but in order to do that, he should type in the empty fields the username and password.
Not all users are the same though, since only the Supervisor owns administrator rights and that gives him priority. After logging in on the desired type of account, the user can access different features and is able to perform multiple actions. In case of any failure in credentials while trying to login, the system will generate the respective alert message.

Supervisor Interface

When logged in as a Supervisor (the most important account type in the web app), the user will be sent to the Supervisor/Admin Page, which has a specific design and contains different buttons, that when clicked perform their respective actions. The menu bar contains Profile; Actions-Users / Constructions / Materials, which contain as a sub list: Material management, Order new materials and View ordering history; Inbox; Change Credentials and Log out. Also, a dropdown menu with the name of logged in user on it is provided within the system. It contains profile option, full screen view and log out options is given as a feature for the pages of our app.
For instance, when the user clicks on the “Profile” button he is redirected to the “Profile Page” which contains a small navigation menu, displays all his personal details (name, surname, gender, address, birthdate, email, phone number) and the experiences option. When it is clicked, the user can view two attributed related to his experience, position in the company and years of working in the respective field in the company.
Changing credentials will direct the user to a window with empty fields, where he can input the new username and password for his account and submit the changes. Changes will be saved then, after being validated on the background and displaying alerts of the respective cases.
Inbox page lets you send messages to other system users, allowing internal communication through this management system just by typing name of the user you want to send message to and the message in the text field.
Log out pressing will transfer you to the First Page.
These three courses of action will be the same for all types of other users.
Performing an action means: other users management constructions management or material management, since you already own the administrator rights as a Supervisor.
The supervisor can also View every other user’s page and edit it by after being redirected to the new page. Upon performing some changes/editing, a pop-up message appears, asking the user if he wants to save the settings or not. He is the only responsible for adding a new user/worker in the company and removing an existing one, by being directed to the respective pages, which will contain the appropriate

fields and buttons for submitting any change in the system users. Supervisor can search users too and is directed then to user's profile.
Supervisor is responsible for creating, updating, deleting and searching constructions the company is working on for the given period, by being directed to the respective pages. While retrieving constructions information is something also accountant, architect and OM can do.
Another task of the Supervisor is to View/Manage the "Materials Page", which is one of the most important pages in this web app. This page will contain every single product/material that is purchased and used by each construction. Using Excel-type tables, the user will be able to view every single product, its description, the quantity bought, amount used, that will be like an input box to allow the supervisor to type the used quantity during working process, amount remaining, generated by the system, allowing to notice how much inventory is on hand.
Order new materials/products page will be also in the responsibility of the supervisor, as he must choose from the list of materials, he wants to buy the construction he wants the materials to be allocated, the supplier from which to buy and the quantity the company needs. The inputted data will be transferred to a "purchase history" table, containing also the cost per unit and total cost of bought materials. This history page is retrieved by the supervisor and the accountant to register costs.
While supervisor views constructions he can view accounting reports of that construction if any exists, can views its status assigned by the operation manager and can view changes done by the architect.

Accountant Interface

When logged in as an Accountant, the user will be sent to the Accountant Page. The menu bar of this page like the supervisor's page and all the other pages contains Profile, Inbox, Change Credentials and Log out, as well as the specific action page of an accountant. Accountant accesses ordering history of the materials in order to register costs on specific constructions. Then accountant creates accounting reports regarding the performance of each constructions selling. Generated reports can be displayed and exported to devices for the accountant and supervisor.

Architect Interface

The architect interface contains the 3 pages, which are the same as the other users' interfaces. What the architect is responsible for is to upload images to the apartments under construction. After he is directed on the construction, he can design it by attaching photos, which can be later accessed by the supervisor and operation manager in order to keep track on the necessary features of the constructions.

Operation Manager Interface

The Operation manager interface consists of the some of the features similar to other users and the specific tasks of this type of user. After OM views the constructions information, he is able to track the progress of its process until finish and by that, he assigns a status either Done or in progress. This status is then displayed to supervisor.

Workers UI

When logged in as a worker, the user can check in/out. He will be provided a 4-digit code, which he will enter as soon as he comes at work. This way he is checked in. When he is leaving, entering code again, he is marked checked out. As a worker, the user has the least functions available, since it is the simplest out of all the other users.

3.2.2 Usability

Learnability

- Workers should be able to know how to check in and check out of the system.
- Supervisors and other users should be able to master the system and know how it works in a couple of hours.
- If any error occurs, a message will be displayed in a window, letting the user know what happened.
- The user is responsible for their own tasks in the system.

Accessibility

- Everyone will be provided with his/her credentials such as username and password, when they get employed in one of the positions the system offers.
- The system can be accessed and modified by the supervisor.
- The supervisor can add, modify, delete users, inventory, balance etc.
- The workers can access only the check in page.
- The workers can access the system during their working hours, in the workplace.
- The other users can access only their respective page.
- The supervisor, accountant, architect and OM can access the system anytime.

Efficiency

- The system is designed to be fast and efficient.
- When users do not enter the data correctly, the system checks and informs the users.
- Actions are well-defined, so users can perform them in a very small amount of time.

Memorability

- The intuitive app gives you the freedom to easily remember or get used to it after being not in touch for a while.
- Design of the pages will make it easier for the users to interact.

Errors

- In case of wrong entered data in the system, system will generate alerts and informs the user where to double check.
- In cases of permanent actions as delete from system, user has to confirms if he would like to go on with the process, to eliminate possible errors.

Satisfaction

- The system is very intuitive and does not require the users to remember how it works.

- The design makes the system very easy to use and beautiful to look at.

3.2.3 Performance

3.2.3.1 Capacity

Since we are creating a management software for small to medium construction companies a reasonable average number of simultaneous users would be around 15-20 users on a daily basis (accountants, architects, field supervisors, operation managers, other simple employees).

At most the maximum simultaneous user load would be around 50 users, although, because of the nature of our software and the services it provides, scalability towards supporting larger and larger simultaneous users shall be relatively easy and cheap. Except for a few operations which require more advances calculations and server communication, most of the interactions done with the software shall be completed within 1-2 seconds (at least a good 90% of the interactions available).

3.2.3.2 Availability

- We estimate that program shall be in use at minimum 8 hours/day (the required daily work hours) and at maximum 16 hours/day (considering night shifts or overtime work). However, the program shall be available for access 24/7 in case anyone desires to interact with it for various work-related purposes.
- The program shall be available to anyone with the proper login credentials and a device, be it a PC, smartphone, tablet etc., which has a stable internet access and a popular web browser installed (chrome, Firefox, safari etc.)
- The program shall be accessible only on those geographic areas where an internet connection is available.
- Our program will be focused mostly on work and material management, downtimes shall not cause the interruption of work nor shall they slow it down considerably. Our software works as a helping tool for employees to increase their efficiency and minimize costs, not as a core function of the company, without which work cannot advance. However, downtimes will almost certainly cause inefficiencies in the workforce, lowered coordination between employees and possibly additional opportune costs in correlation with the time of downtime.
- Scheduled maintenance shall be applied between 6 and 7 am, outside working hours, therefore the impact on business operations shall be negligible. Unscheduled maintenance shall not last more than 30 minutes, thus lowering the impact substantially.
- We will strive to achieve the smoothest possible experience when interacting with our software, therefore it would not be reasonable to predict possible failures or permitted failures per hour. In our case the permitted number of failures is 0 and if a bug comes up which causes malfunction, we shall quickly work to fix it.

3.2.3.3 Latency

Since we are dealing with human users with limited time and patience, it would be reasonable to assume that the most time intensive operations shall not require more than 8 seconds to be fulfilled. On average a simple process shall not take more than 2 seconds to complete.

3.2.4 Manageability/Maintainability

3.2.4.1 Monitoring

All users will be able to get access in the software by simply typing their password and their unique username specified when they were registered. The input data must be valid. Otherwise, if the user fails to log in, it is considered as an error, so the system investigates and finds the reason why the login failed. The screen will display a corresponding message based on the problem.
It will display: "Wrong password" if the password the user typed was incorrect.

it will display: "User do not exist" in case the typed username does not match with any of the usernames created in the database.
In case of changing credentials, if the changed password does not match with the confirmed password, the changes are not made, and an alert will be displayed.

3.2.4.2 Maintenance

In case of system crash, the application is going to restart.

The company's management system will be maintained by MySQL database and Apache server. The information is maintained in logs, no loss will occur.

System is designed in modular form; each user type has its own view.

Users of the system will be informed for every change in the application.

3.2.4.3 Operations

Any normal or special operation required by the user:

- Users will visit the web app mostly during working hours, which are officially form 8 AM to 4 PM.
- They access their accounts as soon as they log in to the system.
- Only the supervisor has the rights on other users to perform CRUD functionalities.
- Only the supervisor can perform CRUD functionalities on the constructions.
- Other users can view the constructions.
- Accountant creates accounting reports.
- Architect designs the apartments.
- Operation manager keeps track of the working process
- The workers are requested to log in the system as they enter the company to start their working day and log in again when they close their working time, so as to maintain a check-in/ check - out recording.
- Supervisor has the right to see the job of other users.
- All users access their own profile, can change their credentials and send messages to each other.

3.2.5 System Interface/Integration

3.2.5.1 Network and Hardware Interfaces

The web app will use either Wi-Fi, or mobile data to connect to the internet. The application is stored in a web server, so the connection with the server is a TCP connection.

3.2.5.2 Systems Interfaces

All the users will be able to authenticate using his/her own username and password. This is the only way that a user can be authenticated. Only the supervisor has the rights to create or edit a user. The signing of the consent will be done electronically, complying with all legislative regulations.

System uses HTTP protocol, a web environment protocol and TCP for the client-server communication. Everything is stored on MySQL database, where no changes are allowed.

3.2.6 Security

As we know security is a key issue in every institution or organization nowadays. Personal information of each citizen is protected by law. This way, our software will be secure regarding its users. Also, the supervisor will be careful when creating or updating new users in the system.

3.2.6.1 Protection

To protect the system from malicious or accidental access, modification, disclosure, destruction, or misuse:

- Passwords as sensitive information are encrypted to protect users' privacy.
- The supervisor is responsible for the data of the user he is registering.
- Supervisor is responsible for the confidential information.
- Validation of input data will be done by the system.
- Other users apart from supervisors will only access pages related to his account.
- Users can view their personal profile and not other users'.
- While changing credentials, input information is checked if it is valid.

3.2.6.2 Authorization and Authentication

- User authentication is done by username, password.
- According to user type, after logging in the user will view the respective pages.
- System will use sessions and cookies.
- Inputting wrong credentials will display an alert message notifying he cannot log in.

3.2.7 Data Management

MySQL database will be used to maintain the information of the system.
The database will contain all the necessary tables and the relations between them. It may contain these possible data:

- Users table
- Constructions table
- Material/inventory table
- Reports table
- Orders table
- Status tables etc.

3.2.8 Standards Compliance

The software is an innovative system in the companies of these kind.
However, being new to market, also means that it should follow all the required rules and regulations of the business laws. Everything should work in compliance with the standards of laws regarding business in Republic of Albania, Qendra Kombetare e Biznesit, as well as with rules and ethics of preserving customers rights.

3.2.9 Portability

Since the application is web based, it is portable in any device with internet connection.

3.3 Domain Requirements

The company's management system involves main tasks of main positions inside a construction company, from CRUD functionalities to material/inventory management, accounting mirrors of the company, architectural planning designs and interior communication between users through exchange of messages.

4. User Scenarios

4.1 User Scenarios List

NUMBER	SCENARIO	DESCRIPTION
1	User logs in	All users: supervisor, accountant, architect, operation manager, worker log in their own accounts
2	Profile page	All users: supervisor, accountant, architect, operation manager, worker view their own profile information.
3	Change credentials	All users: supervisor, accountant, architect, operation manager, worker change their username and password.
4	Send messages	All users: supervisor, accountant, architect, operation manager, worker send messages to their colleagues.
5	Full screen view	All users: supervisor, accountant, architect, operation manager, worker access the application in full screen mode.
6	View employees	Supervisor views the users of the system.
7	Add new user	Supervisor creates a new account for a new user.
8	Update user	Supervisor updates account of an existing user.
9	Remove a user from system	Supervisor deletes account of an existing user from system use.
10	Search user	Supervisor searches for an existing user account and views his profile.
11	View construction	Supervisor, accountant, architect, operation manager views the constructions information the company is managing.
12	Add new construction	Supervisor creates a new construction to be accessed in the system.
13	Update construction	Supervisor updates data of an existing construction.
14	Remove construction	Supervisor removes an existing construction profile.
15	Search construction	Supervisor searches for an existing construction and views its data.
16	Materials management	Supervisor manage the materials that each construction uses.
17	Order materials	Supervisor orders new materials for the course of building process.
18	View ordering history	Supervisor, accountant views the materials ordered for each construction.
19	Generate accounting report	Accountant generates reports for each construction for a given period.
20	View accounting report	Supervisor, accountant view each construction reports.
21	Design construction	Architect designs the constructions by attaching the respective images.
22	View construction design	Supervisor, architect, operation manager accesses the designed constructions by the architect.
23	Track progress	Operation manager keeps track of the constructions building process progress.
24	Mark status	Operation manager decides on the fulfillment status of each construction.
25	View status	Supervisor, accountant views completion status for each construction.
26	Check-in	Workers check-in to the system as they start the working day.
27	Check-out	Workers check-out from the system as they finish their working day.
28	User logs out	All users: supervisor, accountant, architect, operation manager, worker log out form their accounts.

4.2 User Scenarios extended

1. User logs in:
    a) User chooses his type, supervisor/accountant/architect/operation manager/worker
    b) He is directed to login page
    c) He must complete username and password fields
    d) User presses login button
    e) In case of right credentials, the user accesses his page
    f) In case of wrong credentials, the user is alerted with message and is obligated to try again from step b)

2. Profile page:
    - From main menu

    a) User logs in as in scenario 1: User logs in
    b) User chooses from the navigation menu the “Profile” option
    c) User is directed to his own profile page
    d) User can either choose “Personal data” or “Experience” options from a menu in the left corner of the page
    e) If user clicks on the “Personal data” tab, their personal information is displayed
    f) If user clicks on the “Experience” tab, information related to his work experience is displayed
    - From dropdown

    a) User logs in as in scenario 1: User logs in
    b) User clicks on the dropdown which contains his name and surname
    c) User clicks on “My profile”
    d) User is directed to his own profile page
    e) User can either choose “Personal data” or “Experience” options from a menu in the left corner of the page
    f) If user clicks on the “Personal data” tab, their personal information is displayed
    g) If user clicks on the “Experience” tab, information related to his work experience is displayed

3. Change credentials:
    a) User logs in as in scenario 1: User logs in
    b) User chooses from the navigation menu the “Change Credentials” option
    c) User is directed to the page with the fields to change credentials
    d) User types his new username and new password
    e) User types again the password in the “Confirm password” field to confirm it
    f) User presses “Save changes” button
    g) In case of invalid data, the system will tell where the mistake with the information is, so the action won’t be completed
    h) In case all fields have valid data, user is alerted with the message: “Credentials changed successfully!”
    i) Next time user logs in, he types the new username and new password

4. Send messages:
    a) User logs in like in scenario 1: User logs in
    b) User chooses from the navigation menu the “Inbox” option
    c) User types the name of the employee he wants to send messages
    d) User types the message

e) User hits “Send” button
f) System validates if the user exists and according to that displays an alert
g) The receiving user gets notified that in his inbox a message has arrived

5. Full screen view:
    a) User logs in like in scenario 1: User logs in
    b) User clicks on the dropdown which contains his name and surname
    c) User clicks on the “full screen” tab
    d) User can now view the application in full screen mode
    e) User presses “esc” to quit full screen mode

6. View employees:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Users” option
    c) User presses “View employees” button from the “Users” list
    d) Supervisor can now view the table with the employees list
    e) Supervisor clicks on “View user”
    f) Supervisor views profile of that user

7. Add new user:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Users” option
    c) Supervisor presses “Add new user” button from the “Users” list
    d) A new page is displayed with respective fields of adding a user on system
    e) Supervisor completes each field
    f) Supervisor presses the “Submit” button
    g) If Information is validated, the new account is created, and information is saved in the database
    h) A confirmation message is displayed: “Employee added successfully” and supervisor is directed to users’ page
    i) A failure in the data inputs will generate an error, thus an alert message, so operation fails to be completed, supervisor is obliged to double check and repeat from step d)

8. Update user:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Users” option
    c) Supervisor presses “Edit user” button from the “Users” list
    d) Supervisor searches user by name
    e) If user exists, procedure can go on
    f) Supervisor is displayed a form with the necessary fields to update that user
    g) Supervisor completes the form
    h) Supervisor hits “Save Changes” button
    i) System checks if user searched exists in the database, if he exists the procedure goes on
    j) In case the entered information is valid, a confirmation message is displayed: “Employee updated successfully” and supervisor is directed to users’ page
    k) In case of invalid information, alert is displayed, and supervisor can repeat from step e)
    l) If searched user does not exist, the respective alert is shown

9. Remove a user from system:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Users” option

c) Supervisor presses “Delete user” button from the “Users” list
d) Supervisor searches by name
e) Supervisor is shown the profile of that user
f) Supervisor presses “Delete user” button
g) System checks if user searched exists in the database, if he exists the procedure goes on
h) An alert is shown if he is sure he wants to delete that specific user
i) If supervisor presses “Yes”, a confirmation message is shown “User removed successfully” and supervisor is directed to users’ page
j) If supervisor presses “No”, supervisor stays where he is
k) If searched user does not exist, the respective alert is shown

10. Search a user:
a) Supervisor logs in like in scenario 1: User logs in
b) Supervisor chooses from the navigation menu the “Actions-Users” option
c) Supervisor presses “Search user” button from the “Users” list
d) Supervisor types in the “Search” field in the main page
e) Supervisor can search by name
f) If any result is found, a table with the search user information is displayed
g) If not, an alert window with “No result found!” message is displayed

11. View constructions:
- Supervisor

a) Supervisor logs in like in scenario 1: User logs in
b) Supervisor chooses from the navigation menu the “Actions-Constructions” option
c) Supervisor presses “View constructions” button from the “Constructions” list
d) Supervisor is redirected to constructions list
e) A table with all the constructions the company is working on at the given period is shown
- Accountant

a) Accountant logs in like in scenario 1: User logs in
b) Accountant chooses from the navigation menu the “Perform action” tab
c) Accountant is redirected to constructions list
d) Accountant clicks on the construction image
e) Accountant can view the constructions with their respective information
- Architect

a) Architect logs in like in scenario 1: User logs in
b) Architect chooses from the navigation menu the “Perform designs” tab
c) Architect is redirected to constructions list
d) Architect clicks on the construction image
e) Architect can view the constructions with their respective information
- Operation manager

a) Operation manager logs in like in scenario 1: User logs in
b) Operation manager chooses from the navigation menu the “Actions” tab
c) Operation manager is redirected to constructions list
d) Operation manager clicks on the construction image
e) Operation manager can view the constructions with their respective information

12. Add a new construction:
a) Supervisor logs in like in scenario 1: User logs in
b) Supervisor chooses from the navigation menu the “Actions-Constructions” option
c) Supervisor presses “Add new construction” button from the “Constructions” list
d) A new page is displayed with respective fields of adding a construction on system

e) Supervisor completes each field and press the submit button
f) If Information is validated, the new construction is created, and information is saved in the database
g) A confirmation message is displayed: “Construction added successfully” and supervisor is directed to constructions’ page
h) A failure in the data inputs will generate an error, thus an alert message, so operation fails to be completed, supervisor is obliged to double check and repeat from step d)

13. Update construction:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions- Constructions” option
    c) Supervisor presses “Edit construction” button from the “Constructions” list
    d) Supervisor searches construction by address
    e) If construction exists, procedure can go on
    f) Supervisor is displayed a form with the necessary fields to update that construction
    g) Supervisor completes the form and hits “Save Changes” button
    h) System checks if construction searched exists in the database, if it exists the procedure goes on
    i) In case the entered information is valid, a confirmation message is displayed: “construction updated successfully” and supervisor is directed to constructions’ page
    j) In case of invalid information, alert is displayed, and supervisor can repeat from step e)
    k) In case the searched construction does not exists, then the appropriate alert displays

14. Remove a construction from system:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Constructions” option
    c) Supervisor presses “Delete construction” button from the “Constructions” list
    d) Supervisor searches by address
    e) If construction exists, procedure can go on
    f) Supervisor is shown the information of that construction
    g) Supervisor presses “Delete construction” button
    h) System checks if construction searched exists in the database, if it exists the procedure goes on
    i) An alert is shown if he is sure he wants to delete that specific construction
    j) If supervisor presses “Yes”, a confirmation message is shown “construction removed successfully” and supervisor is directed to users’ page
    k) If supervisor presses “No”, supervisor stays where he is
    l) In case the searched construction does not exists, then the appropriate alert displays

15. Search a construction:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Constructions” option
    c) Supervisor presses “Search construction” button from the “Construction management” list
    d) Supervisor types in the “Search” field in the main page
    e) Supervisor can search by address
    f) If any result is found, a table with the searched construction information is displayed
    g) If not, an alert window with “No result found!” message is displayed

16. Materials management:
    a) Supervisor logs in like in scenario 1: User logs in
    b) Supervisor chooses from the navigation menu the “Actions-Materials” option

c) Supervisor clicks on “Material Management”
d) Supervisor is directed to Material Management page
e) Supervisor is shown all the constructions for the period
f) Supervisor clicks the construction and a table with the materials bought for that specific construction, the description and the purchase quantity is shown
g) Supervisor enters amount used by the construction activities and clicks “Submit”
h) If entered data is according to validation rules, process will continue
i) The remaining amounts are generated by the system itself
j) This way a stock in/ stock out is calculated
k) If there is invalid input, then an alert will display, and supervisor is required to enter amounts again

17. Order materials:
a) Supervisor logs in like in scenario 1: User logs in
b) Supervisor chooses from the navigation menu the “Actions-Materials” option
c) Supervisor clicks on “Order materials”
d) Supervisor is directed to Order Materials page
e) Supervisor is required to complete the required fields regarding order materials
f) Supervisor completes type of material, supplier, quantity needed and which construction he wants the purchased material to be allocated
g) Supervisor clicks “Submit”
h) The system will check the inputs and will generate an alert if there is incorrect data
i) If the data is inputted correctly, material is ordered
j) The data are transferred to the database

18. View Ordering History:
- Supervisor

a) Supervisor logs in like in scenario 1: User logs in
b) Supervisor chooses from the navigation menu the “Actions-Materials” option
c) Supervisor clicks on “View ordering history"
d) Supervisor is directed to Ordering History page
e) Supervisor is shown a table with all the materials for all the constructions
f) Supervisor clicks on the “Download Excel” and the table in excel format is downloaded to user’s device
g) Supervisor can use the excel document for further use
- Accountant

a) Accountant logs in like in scenario 1: User logs in
b) Accountant presses “Ordering History”
c) Accountant views the materials that the supervisor has ordered
d) Accountant clicks on “Download” button
e) The ordering history is downloaded to user’s device
f) Accountant registers the ordering costs

19. Generate accounting report:
a) Accountant logs in like in scenario 11: View construction
b) Accountant presses “Estimate” button
c) Accountant types in the required fields
d) Accountant presses “Save” button
e) The system validates the inputs
f) If they are correct, the system generates the net income for that specific construction
g) If not, the accountant is required to fill again in the empty fields

20. View accounting report:

- Supervisor

a) Supervisor logs in like in scenario 11: View construction
b) Supervisor presses “View Report” button
c) If any report exists for that construction, supervisor can view it
d) If report does not exist, an alert message is displayed: “No report found!”
e) Supervisor clicks on the “Download Report” and the table in excel format is downloaded to user’s device
f) An excel document is downloaded to user’s device

- Accountant

a) Accountant logs in like in scenario 11: View construction
b) Accountant presses “View Report” button
c) If any report exists for that construction, accountant can view it
d) If report does not exist, an alert message is displayed: “No report found!”
e) Accountant clicks on the “Download Report” and the table in excel format is downloaded to user’s device
f) An excel document is downloaded to user’s device

21. Design construction:

a) Architect logs in like in scenario 11: View construction
b) Architect presses “Design” button
c) Architect enters the respective page
d) Architect attaches by selecting design images to the specific construction: lightning, interior design etc.
e) Architect presses “Save changes” button
f) A confirmation message: "The design is successfully saved” is shown

22. View design:

- Supervisor

a) Supervisor logs in like in scenario 11: View construction
b) Supervisor presses “View Design” button
c) Supervisor views the construction with the respective design, if any performed before
d) Supervisor views construction as it was if no changes performed
e) Supervisor presses “Save image” button
f) The image is exported to user’s device

- Architect

a) Architect logs in like in scenario 11: View construction
b) Architect presses “View Design” button
c) Architect views the construction with the respective design, if any performed before
d) Architect views construction as it was if no changes performed
e) Architect presses “Save image” button
f) The image is exported to user’s device

- Operation manager

a) Operation manager logs in like in scenario 11: View construction
b) Operation manager presses “View Design” button
c) Operation manager views the construction with the respective design, if any performed before
d) Operation manager views construction as it was if no changes performed
e) Operation manager presses “Save image” button
f) The image is exported to user’s device

23. Track progress:

a) Operation manager logs in like in scenario 11: View construction
b) Operation manager presses “Progress” button

c) Operation manager can view the progress bar regarding the working process of the construction

24. Mark status:
    a) Operation manager logs in like in the scenario 23: Track progress
    b) If progress percentage is 100%, operation manager marks the construction as "Done"
    c) If progress percentage is not 100%, operation manager marks the construction status as "In Progress"
    d) Operation manager presses "Save" button
    e) A confirmation message: "Status of construction is saved!" is shown

25. View status:
    - Supervisor

    a) Supervisor logs in like in scenario 11: View construction
    b) Supervisor presses "View Status" button
    c) If any saved status exists for the specific construction, "Status of this construction is Done/In progress" message is shown
    d) If there is no status for that construction exits, "Status not saved" message is shown
    - Operation manager

    a) Operation manager logs in like in scenario 11: View construction
    b) Operation manager presses "View Status" button
    c) If any saved status exists for the specific construction, "Status of this construction is Done/In progress" message is shown
    d) If there is no status for that construction exits, "Status not saved" message is shown

26. Check-in:
    a) Worker logs in like in scenario 1: User logs in
    b) Worker is directed to the main page
    c) Worker types the 4-digit code
    d) Worker is shown a confirmation window that he is checked-in on the system
    e) Worker hits "Ok" button and is directed to login page, meaning he has finished with the system for now

27. Check-out:
    a) Worker logs in like in scenario 1: User logs in
    b) Worker is directed to main page
    c) Worker types the code
    d) Worker is shown a confirmation window that he is checked-out from the system
    e) Worker hits "Ok" button and is out of the system

28. User logs out:
    - From main menu
        a) User logs in like in scenario 1: User logs in
        b) User does some of the tasks in the system like in some scenarios above
        c) User clicks "log out" from main menu
        d) User is out of the system and is directed to first page
    - From dropdown
        a) User logs in like in scenario 1: User logs in
        b) User does some of the tasks in the system like in some scenarios above
        c) User clicks on the dropdown which contains his name and surname
        d) User clicks on log out
        e) User is out of the system and is directed to first page

5. Use Cases

Name	**User logs in**
Summary	User enters username and password to login to his account
Actor	Supervisor / Accountant / Architect / Operation manager / Worker
Description	Each user of the system in order to gain access of the system, is required to log in by typing their correct username and password.
Precondition	Each user must have previously an active account selecting one of the positions he has on the company (Supervisor/accountant/architect/OM/worker) given username and password
Alternatives	There is no alternative option. Users must login with their credentials
Post condition	User is logged in to his own account and this way can access the software system

Use case 1 – Scenario 1 – User logs in

Name	**Profile page**
Summary	User views his own profile
Actor	Supervisor / Accountant / Architect / OM / Worker
Description	Each logged in user accesses his own profile page by either clicking from the navigation menu the “Profile” tab or by the dropdown small menu. He can either view his personal data or information related to his work experience.
Precondition	To access his own profile, the user should be logged in.
Alternatives	Each user can view their own profile. Only the supervisor can access information about other employees, while the others cannot.
Post condition	A page with a small menu that direct either to personal information of the user or work experience is shown.

Use case 2 – Scenario 2 – Profile page

Name	**Change credentials**
Summary	User changes his username and password
Actor	Supervisor / Accountant / Architect / OM / Worker
Description	User logs in and goes to the corresponding page by clicking from the menu “Change credentials”. User types new username, new password and again the password in the confirmation field and clicks “Save changes”
Precondition	User should be logged in to his own account. The username and password should be according to validation rules and passwords in both fields should match.
Alternatives	Users can have their username and password changed only by themselves. Supervisor cannot do this for them, unlike with other personal information.
Post condition	After saving the new username and password, next time user logs in with those.

Use case 3 – Scenario 3 – Change credentials

Name	**Send messages**
Summary	User sends inbox to other employees
Actor	Supervisor / Accountant / Architect / OM / Worker
Description	User logs in and goes to the corresponding page by clicking from the menu “Inbox”. User types the name of the receiver of the message and the message in the respective fields and clicks “Send”.
Precondition	User should be logged in to his own account. The receiver of the message should exist in the system.
Alternatives	If the receiver does not exist, user should check the name of user he has typed in the respective field.
Post condition	The receiver gets notified that in his inbox a message has arrived.

Use case 4 – Scenario 4 – Send messages

Name	**Full screen view**
Summary	User accesses the app in full screen mode
Actor	Supervisor / Accountant / Architect / OM / Worker
Description	User logs in and by clicking in the dropdown menu to full screen option, can interact with the system in full screen mode.
Precondition	User should be logged in to his own account.
Alternatives	User exits the full screen by pressing esc tab.
Post condition	The app is accessed in full mode for its users.

Use case 5 – Scenario 5 – Full screen view

Name	**View employees**
Summary	The supervisor views the list of other employees and their profiles.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Users->View employees”. Supervisor looks up on the table with the users of the system. Clicking on their names, a page with the respective profile is shown.
Precondition	To access employees’ information, supervisor should be logged in. Other users have no access in such users list.
Alternatives	Supervisor can view all the employees, their personal information and their work experience.
Post condition	A table with the users.

Use case 6 – Scenario 6 – View employees

Name	**Add new user**
Summary	The supervisor adds a new user in the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Users->Add new user”. Supervisor fills the required fields and clicks “Submit” button.
Precondition	Supervisor should be logged in. The added user should be part of the company as an employee. The newly created user is unique.
Alternatives	If typed information is valid, a confirmation message is displayed, and user is added. If a failure in validation occurs, supervisor is required to make the necessary changes.
Post condition	A new user(employee) is added on the system

Use case 7 – Scenario 7 – Add new user

Name	**Update user**
Summary	The supervisor updates information of an existing user in the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Users->Update user”. Supervisor searches for the user and completes the necessary fields. Supervisor clicks “Save changes”.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The user should be existing, to be updated.
Alternatives	If user does not exist in the system, an informative message will be displayed. If typed information is valid, a confirmation message is displayed, and user is updated. If a failure in validation occurs, supervisor is required to make the necessary changes.
Post condition	The respective user’s information is updated.

Use case 8 – Scenario 8 – Update user

Name	**Remove user from system**
Summary	The supervisor removes an existing user of the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Users->Delete user”. Supervisor searches for the user clicks “Delete user”. An alert is shown if he is sure he wants to delete that user.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The user should be existing, for the supervisor to delete him.
Alternatives	If the user is inexistent in the system an alert will display. If the supervisor is sure he wants to delete the user, he presses “Yes”, otherwise he presses “No” and stays where he is.
Post condition	The user is removed from the system use.

Use case 9 – Scenario 9 – Remove user from system

Name	**Search a user**
Summary	The supervisor searches a specific user of the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Users->Search user”. Supervisor searches for the user by typing his name on the “Search” field. Supervisor clicks “Search”.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The user should be existing.
Alternatives	Supervisor can search by name. if no such user found, an alert is displayed.
Post condition	A table with the searched user information is shown.

Use case 10 – Scenario 10 – Search user

Name	**View construction**
Summary	Supervisor / Accountant / Architect / OM views the list of constructions the company is working on.
Actor	Supervisor / Accountant / Architect / OM
Description	In the supervisor's version, he logs in and clicks on the "Actions->Constructions->View construction" to view all the current constructions of the company. In the accountant's version he logs in and clicks on the "Perform action" and he can view all the current constructions of the company. In the architect's version, he logs in and clicks on the "Perform designs" and he can view all the current constructions of the company. In the OM's version, he logs in and clicks on the "Actions" and he can view all the current constructions of the company.
Precondition	Users should be logged in. Workers are not allowed to do this. The constructions should exist in the database.
Alternatives	The users can view the whole list of current constructions. Clicking on images, the respective information is shown.
Post condition	A page with list of construction is shown.

Use case 11 – Scenario 11 – View construction

Name	**Add new construction**
Summary	The supervisor adds a new construction in the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the "Actions->Constructions->Add new construction". Supervisor fills the required fields and clicks "Submit" button.
Precondition	Supervisor should be logged in. The order for the added construction should be taken manually by the customer.
Alternatives	If typed information is valid, a confirmation message is displayed, and construction is added. If a failure in validation occurs, supervisor is required to make the necessary changes.
Post condition	A new construction is added on the system

Use case 12 – Scenario 12 – Add a new construction

Name	**Update construction**
Summary	The supervisor updates information of an existing construction in the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Constructions->Update construction”. Supervisor searches for the construction and completes the necessary fields. Supervisor clicks “Save changes”.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The construction should be existing, to be updated.
Alternatives	In case of nonexistence of the construction, the respective alert will inform the user. If typed information is valid, a confirmation message is displayed, and construction is updated. If a failure in validation occurs, supervisor is required to make the necessary changes.
Post condition	The respective construction’s data is updated.

Use case 13 – Scenario 13 – Update construction

Name	**Remove construction from system**
Summary	The supervisor removes an existing construction of the system.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Constructions->Delete construction”. Supervisor searches for the construction and clicks “Delete construction”. An alert is shown if he is sure he wants to delete that construction.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The construction should be existing, for the supervisor to delete it.
Alternatives	If supervisor has searched for a nonexistent construction, an alert will be displayed. If the supervisor is sure he wants to delete the construction, he presses “Yes”, otherwise he presses “No” and stays where he is.
Post condition	The construction is removed from the system use.

Use Case 14 – Scenario 14 – Remove construction form system

Name	Search construction
Summary	The supervisor searches a specific construction the company is building.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Constructions->Search construction”. Supervisor searches for the construction by typing its address on the “Search” field. Supervisor clicks “Search”.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. The construction should be existing.
Alternatives	Supervisor can search by address. if no such construction found, an alert is displayed.
Post condition	A table with the searched construction information is shown.

Use case 15 – Scenario 15 – Search construction

Name	Materials management
Summary	The supervisor manages the materials needed for the activities of the company.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Materials->Manage materials”. Supervisor clicks on a construction, he views the stuffs that construction requires to be built, its description, its purchasing quantity. Supervisor types the used amount of the specific material. System generates the remaining amount and the stock in/out quantity.
Precondition	Supervisor should be logged in. Other users are not allowed to do this. Each construction has its own table of materials. The information of the used amounts is taken manually from the certain staff of the inventory management. Each time a material is purchased in need of the process, it is registered by the supervisor, to be managed later.
Alternatives	Supervisor types only the used amounts, because the other fields are generated by the system.
Post condition	Information about the stock in/out are automatically generated.

Use case 16 – Scenario 16 – Materials management

Name	**Order materials**
Summary	The supervisor orders materials which are required for the course of construction process.
Actor	Supervisor
Description	Supervisor logs in and clicks on the “Actions->Materials->Order materials”. Supervisor completes the required fields to order new materials. Supervisor clicks “Order”
Precondition	Supervisor should be logged in. Other users are not allowed to do this. Supervisor should be told what to order manually by the certain staff of the company.
Alternatives	If supervisor has inputted the information according to validation rules, the order is registered. If not, system announces what is wrong and supervisor is required to make the necessary changes.
Post condition	Orders for needed materials are registered.

Use case 17 – Scenario 17 – Order materials

Name	**View ordering history**
Summary	The supervisor / accountant views the ordered materials.
Actor	Supervisor / Accountant
Description	Supervisor logs in and clicks on the “Actions->Materials->Ordering history”. Accountant logs in and clicks on the “Ordering history”. Supervisor / accountant views a table with all the ordered materials for a certain period. Supervisor / accountant clicks “Download Excel” button. The excel-type table is downloaded in user’s device.
Precondition	Users should be logged in. Other users are not allowed to do this. Materials are previously ordered.
Alternatives	Ordering history of the materials are viewed by supervisor and the accountant to register the costs.
Post condition	A table with the materials that have been ordered is shown.

Use case 18 – Scenario 18 – View Ordering history

Name	**Generate accounting report**
Summary	The accountant estimates net income for each construction.
Actor	Accountant
Description	Accountant logs in and clicks on the “Perform action”. Accountant can view all the current constructions of the company. Accountant presses “Estimate” button. Accountant types in the required fields. Accountant presses “Save” button.
Precondition	Accountant should be logged in. Other users are not allowed to do this. Accountant should be informed about all the costs of the construction and the revenues of its selling.
Alternatives	If accountant has inputted the information according to validation rules, the report is generated and saved. If not, system announces what is wrong and accountant is required to make the necessary changes.
Post condition	A net income report for each construction is generated.

Use case 19 – Scenario 19 – Generate accounting report

Name	**View accounting report**
Summary	The supervisor / accountant views net income report for each construction.
Actor	Supervisor / Accountant
Description	In the supervisor’s version, he logs in and clicks on the “Actions->Constructions->View construction” to view a current construction of the company. Supervisor presses “View report”. In the accountant’s version he logs in and clicks on the “Perform action” and he can view a current construction of the company. Accountant presses “View report” button. Both users can press “Download report” button to export the report to their device.
Precondition	Supervisor / accountant should be logged in. Other users are not allowed to do this. A report on the specific construction should be created by the accountant let the supervisor / accountant view it.
Alternatives	If accountant has generated the report for the construction, supervisor or accountant himself can view it, otherwise an alert message is displayed.
Post condition	The accounting report of the construction is downloaded to user’s device.

Use case 20 – Scenario 20 – View accounting report

Name	**Design construction**
Summary	The architect attaches images to design constructions.
Actor	Architect
Description	Architect logs in, clicks on the “Perform designs” and he can view all the current constructions of the company. Architect presses “Design” button. He attaches by selecting designing images to the specific construction. Architect clicks “Save changes” button.
Precondition	Architect should be logged in. Other users are not allowed to do this. Images of different designs should exist in database to be selected for each construction.
Alternatives	Architect selects images that he thinks are suitable for a particular construction.
Post condition	The construction is designed regarding interior, hydraulic, lightning etc.

Use case 21 – Scenario 21 – Design construction

Name	**View design**
Summary	The supervisor / architect / OM views the constructions with respective design.
Actor	Supervisor / Architect / OM
Description	In the supervisor’s version, he logs in and clicks on the “Actions->Constructions->View construction” to view a current construction of the company. Supervisor presses “View design” button. In the architect’s version, he logs in and clicks on the “Perform designs” and he can view a current construction of the company. Architect presses “View design” button. In the OM’s version, he logs in and clicks on the “Actions” and he can view a current construction of the company. OM presses “View design” button. These users can also export the constructions images to their devices by clicking “Save image” button.
Precondition	Supervisor / Architect / OM should be logged in. Other users are not allowed to do this. The construction with its image should exist in the database.
Alternatives	If architect has updated the construction with designing images, that updated version will be shown to supervisor’s / architect’s / OM. Otherwise they will view a construction with no changes made.
Post condition	The designed construction is shown.

Use case 22 – Scenario 22 – View design

Name	**Track progress**
Summary	OM views the progress of building process of the respective constructions.
Actor	OM
Description	Operation manager logs in and clicks on the “Actions”. He can view a current construction of the company. OM presses “Progress” button.
Precondition	OM should be logged in. Other users are not allowed to do this. The construction should exist in the database. A progress bar should correspond to each construction.
Alternatives	Operation manager keeps track of the progress of the process.
Post condition	A progress bar that shows how much of building process is completed, is shown.

Use case 23 – Scenario 23 – Track progress

Name	**Mark status**
Summary	OM marks the status of each construction.
Actor	OM
Description	Operation manager logs in and clicks on the “Actions”. He can view a current construction of the company. OM presses “Progress” button. OM clicks either “Done” or “In progress” and then “Save”.
Precondition	OM should be logged in. Other users are not allowed to do this. The construction should exist in the database. A progress bar should correspond to each construction.
Alternatives	If progress percentage shows 100%, OM marks it as a completed process. Otherwise, OM lets the status to be in progress.
Post condition	The status of fulfillment is saved for each construction.

Use case 24 – Scenario 24 – Mark status

Name	**View status**
Summary	Supervisor / OM views the status of each construction.
Actor	Supervisor / OM
Description	In the supervisor's version, he logs in and clicks on the "Actions->Constructions->View construction" to view a current construction of the company. Supervisor presses "View status". In the OM's version, he logs in and clicks on the "Actions" and he can view a current construction of the company. OM presses "View status".
Precondition	Supervisor / OM should be logged in. Other users are not allowed to do this. The construction should exist in the database.
Alternatives	If OM has previously saved a status for that construction, that status is shown. Otherwise, supervisor / OM cannot view a status, because it has not been saved yet.
Post condition	The status of fulfillment is shown for each construction.

Use case 25 – Scenario 25 – View status

Name	**Check-in**
Summary	Worker checks-in at the moment he starts working for the certain day.
Actor	Worker
Description	Worker logs in. Worker types the 4-digit code provided before.
Precondition	Worker should be logged in. Worker should have a unique 4-digit code, which he was given in the moment he has been part of the company.
Alternatives	Worker is checked-in as soon as he types his code and a confirmation window is displayed. Worker hits "Ok" and is directed to login page.
Post condition	Worker is checked-in on the system for the working day.

Use case 26 – Scenario 26 – Check-in

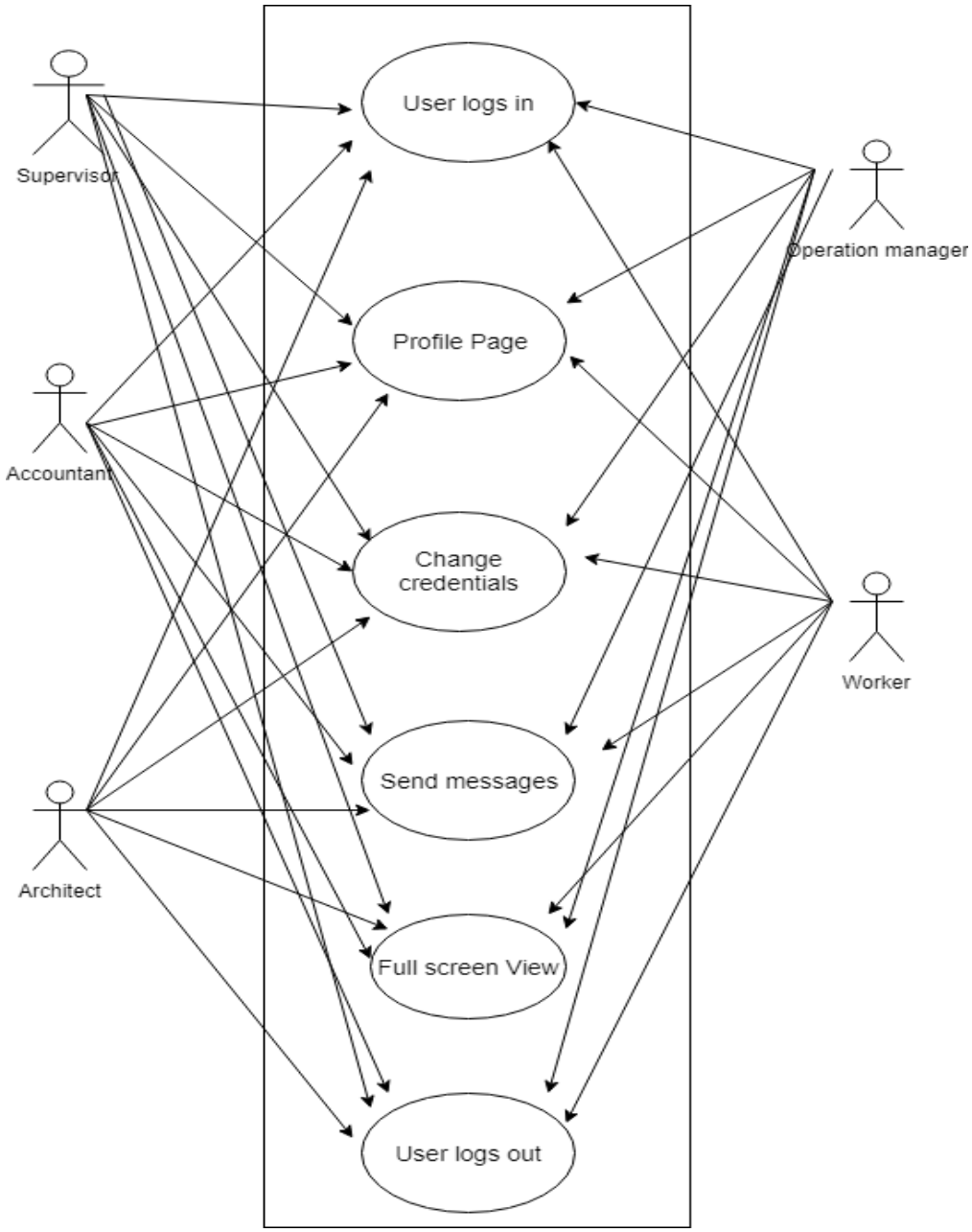
Name	**Check-out**
Summary	Worker checks-out at the moment he has finished his job for the certain day.
Actor	Worker
Description	Worker logs in. Worker types the 4-digit code provided before.
Precondition	Worker should be logged in. Worker should have a unique 4-digit code, which he was given in the moment he has been part of the company. Worker should be checked-in before for the system to recognize that this is the second time in a day that he enters the system, thus, to be checked-out.
Alternatives	Worker is checked-out as soon as he types his code and a confirmation window is displayed. Worker hits “Ok” and is directed to login page.
Post condition	Worker is checked-out on the system for the working day.

Use case 27 – Scenario 27 – Check-out

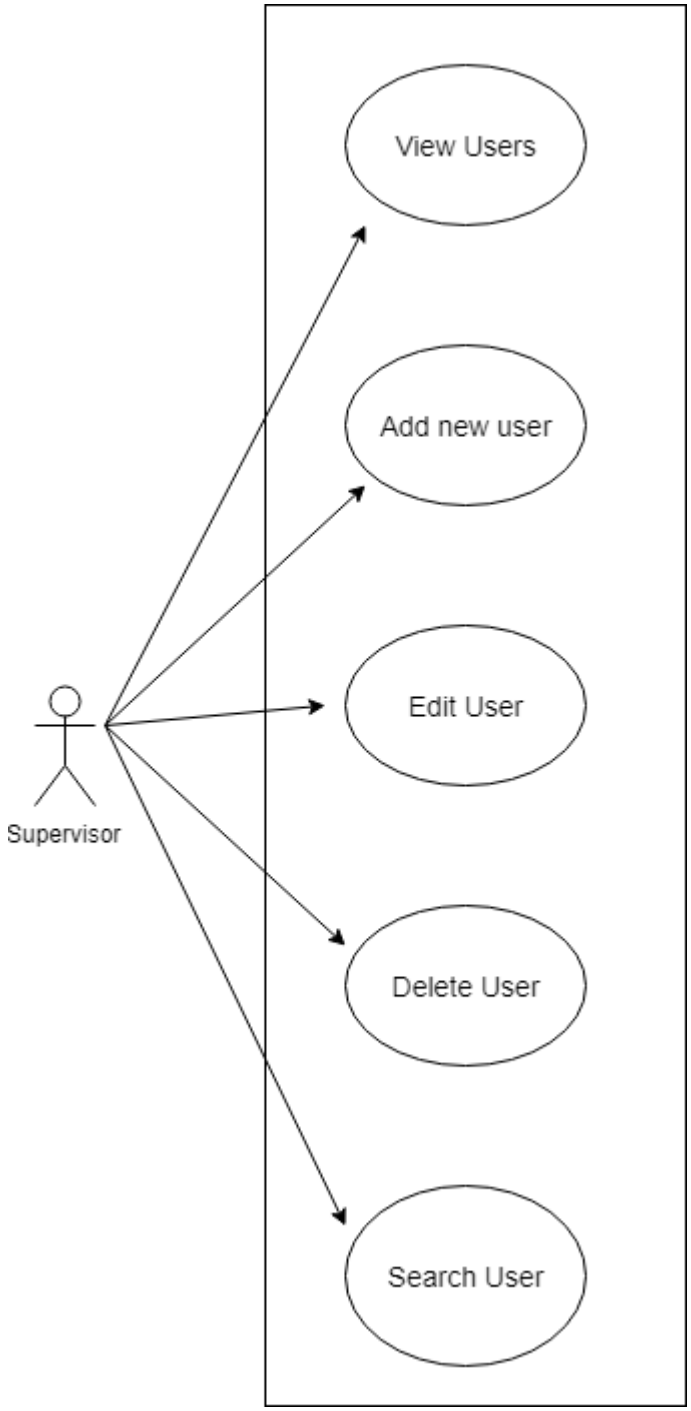
Name	**User logs out**
Summary	User has finished with the activities in the system.
Actor	Supervisor / Accountant / Architect / Operation manager / Worker
Description	The user logs in. User accesses the system features. User clicks “Log out” from navigation menu or from the dropdown small menu.
Precondition	User should be logged in.
Alternatives	User can log out whenever he finds it appropriate.
Post condition	User has finished using his account.

Use case 28 – Scenario 28 – User logs out

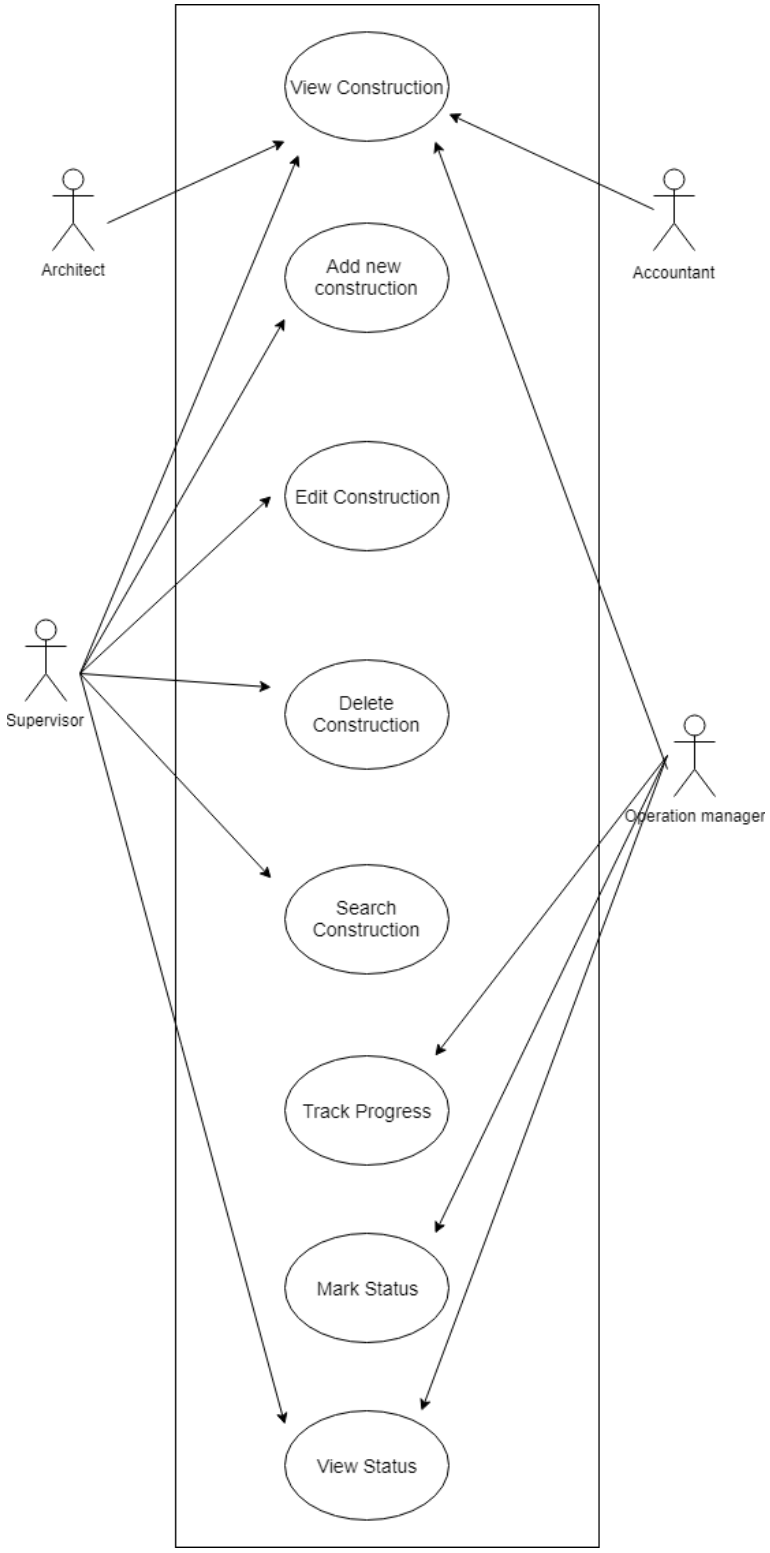
5.1 Use cases Diagrams



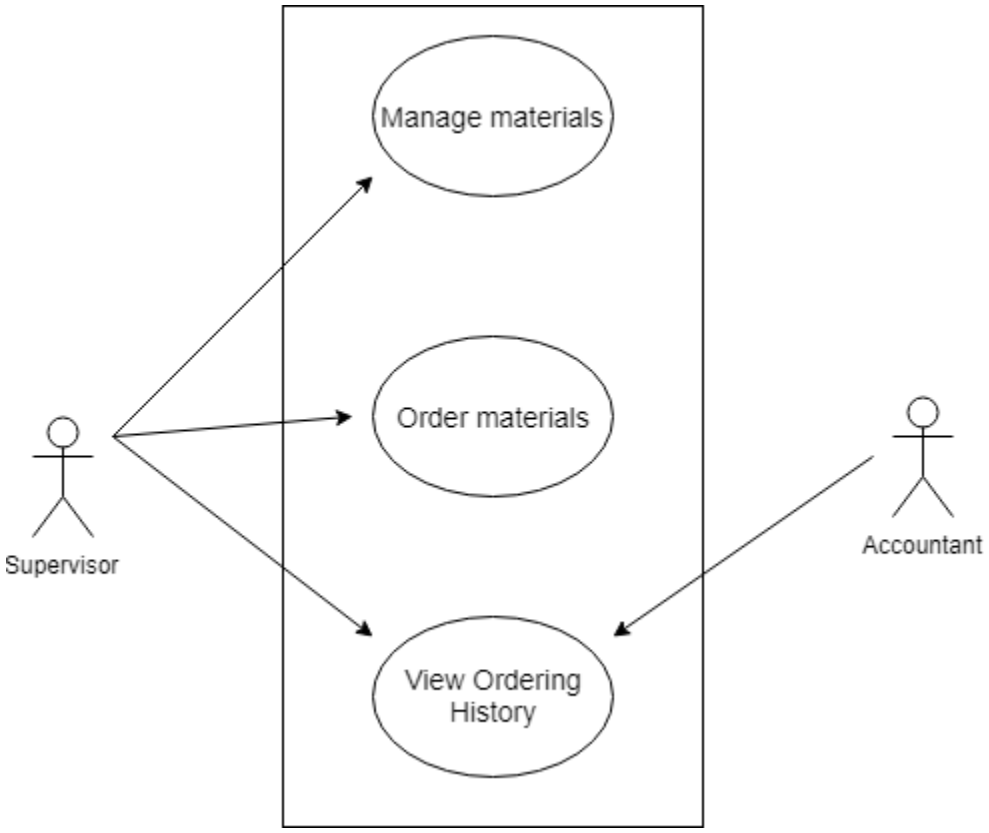
All users Use case diagram – Use cases 1, 2, 3, 4, 5, 28



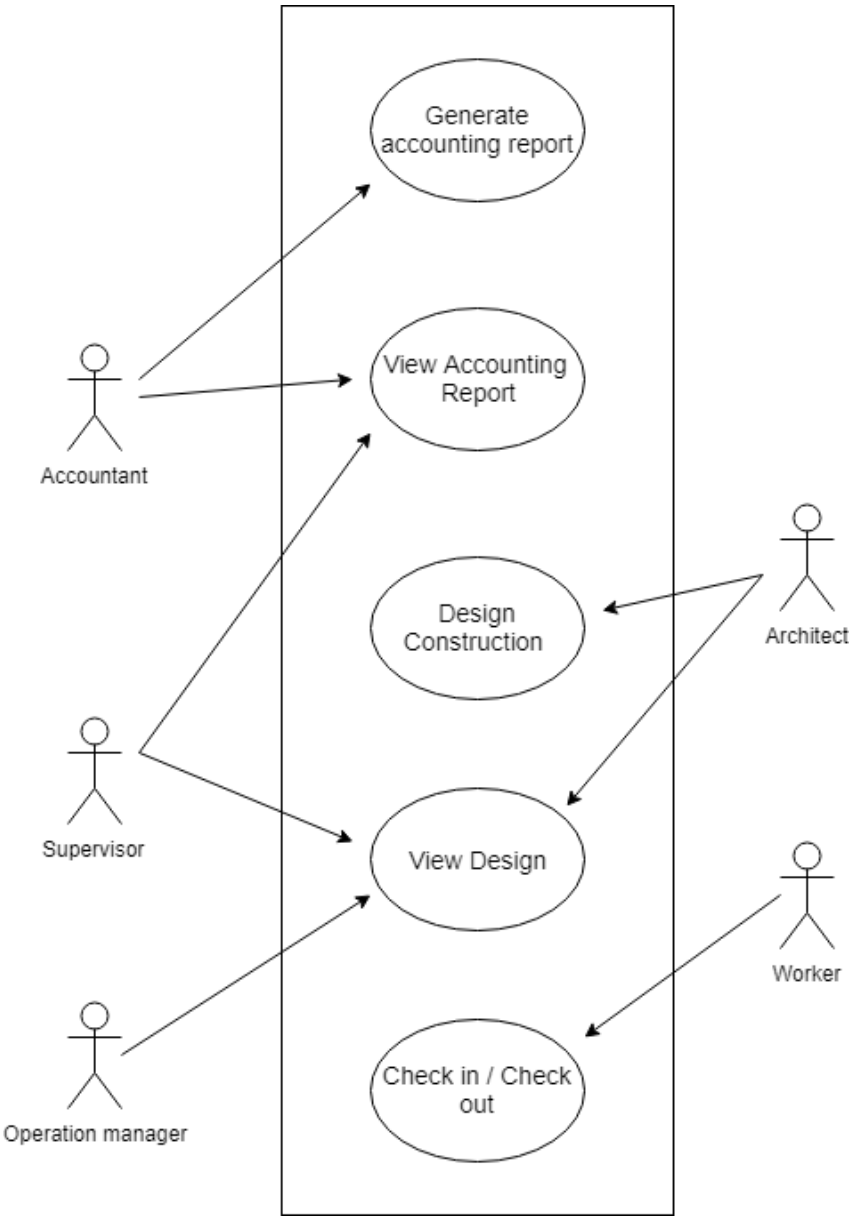
Users Use case diagram – Use cases 6, 7, 8, 9, 10



Constructions Use case diagram – Use cases 11, 12, 13, 14, 15, 23, 24, 25



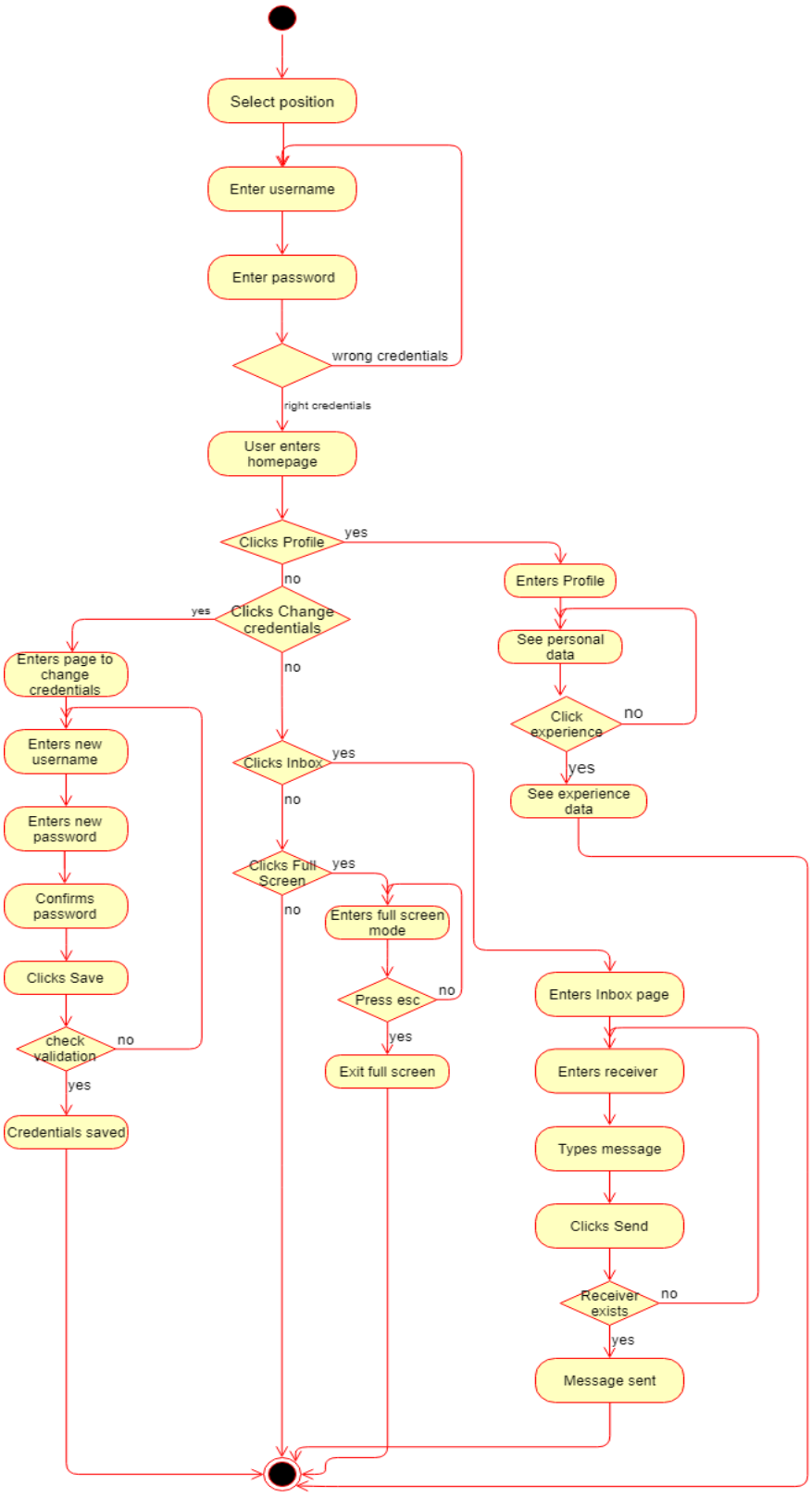
Materials Use case diagram – Use cases 16, 17, 18



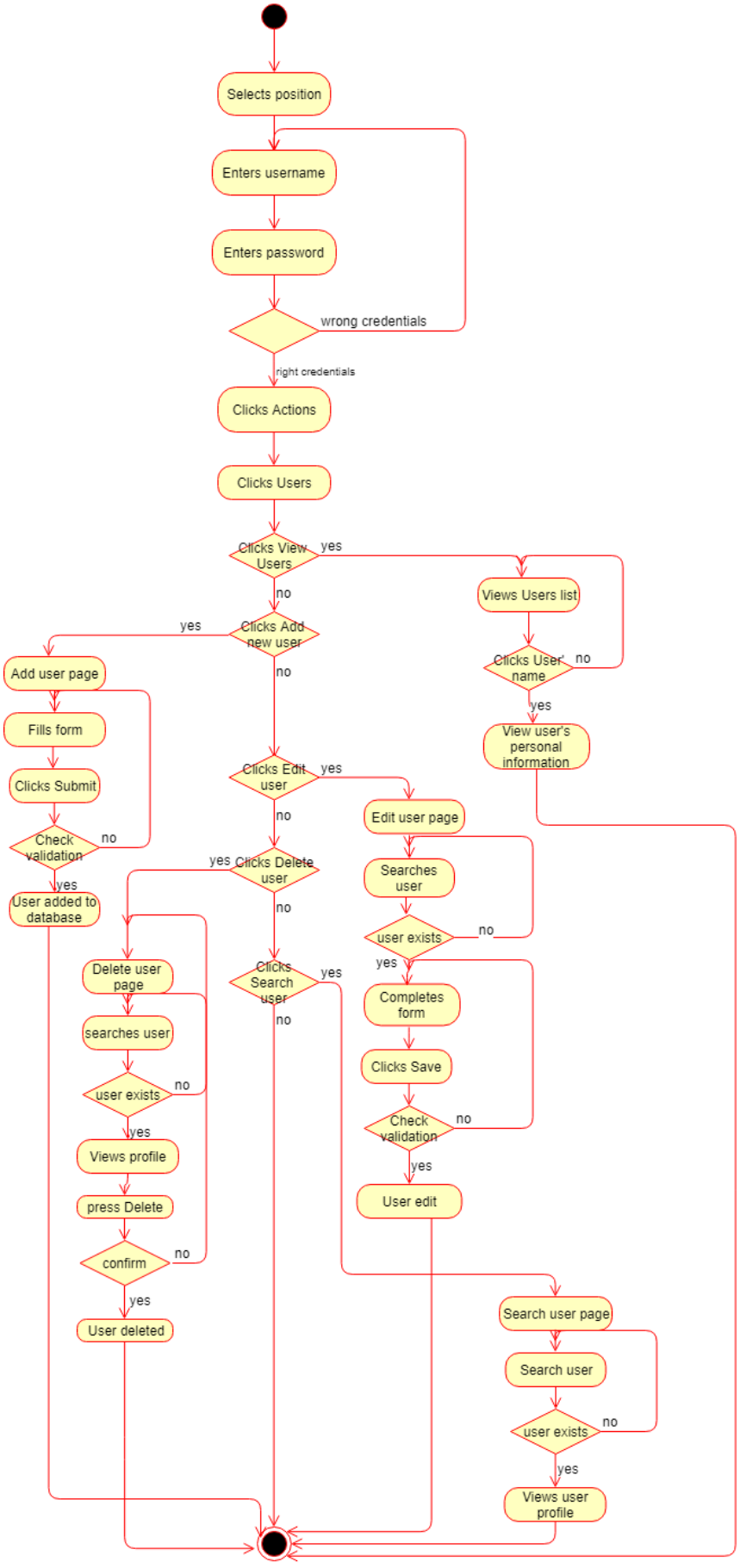
Other tasks Use case diagram – Use cases 19, 20, 21, 22, 26, 27

6. Diagrams

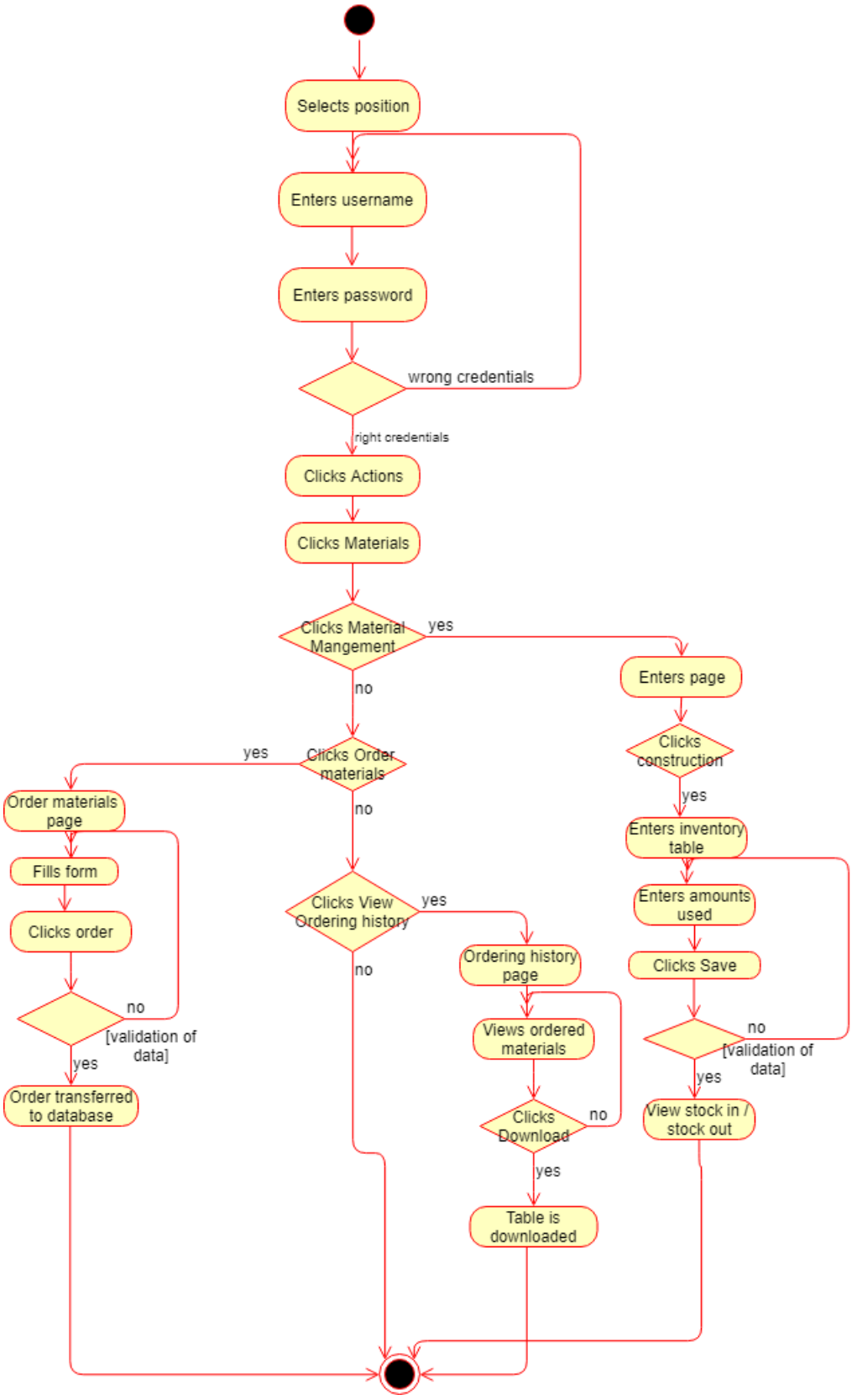
6.1 Activity Diagrams



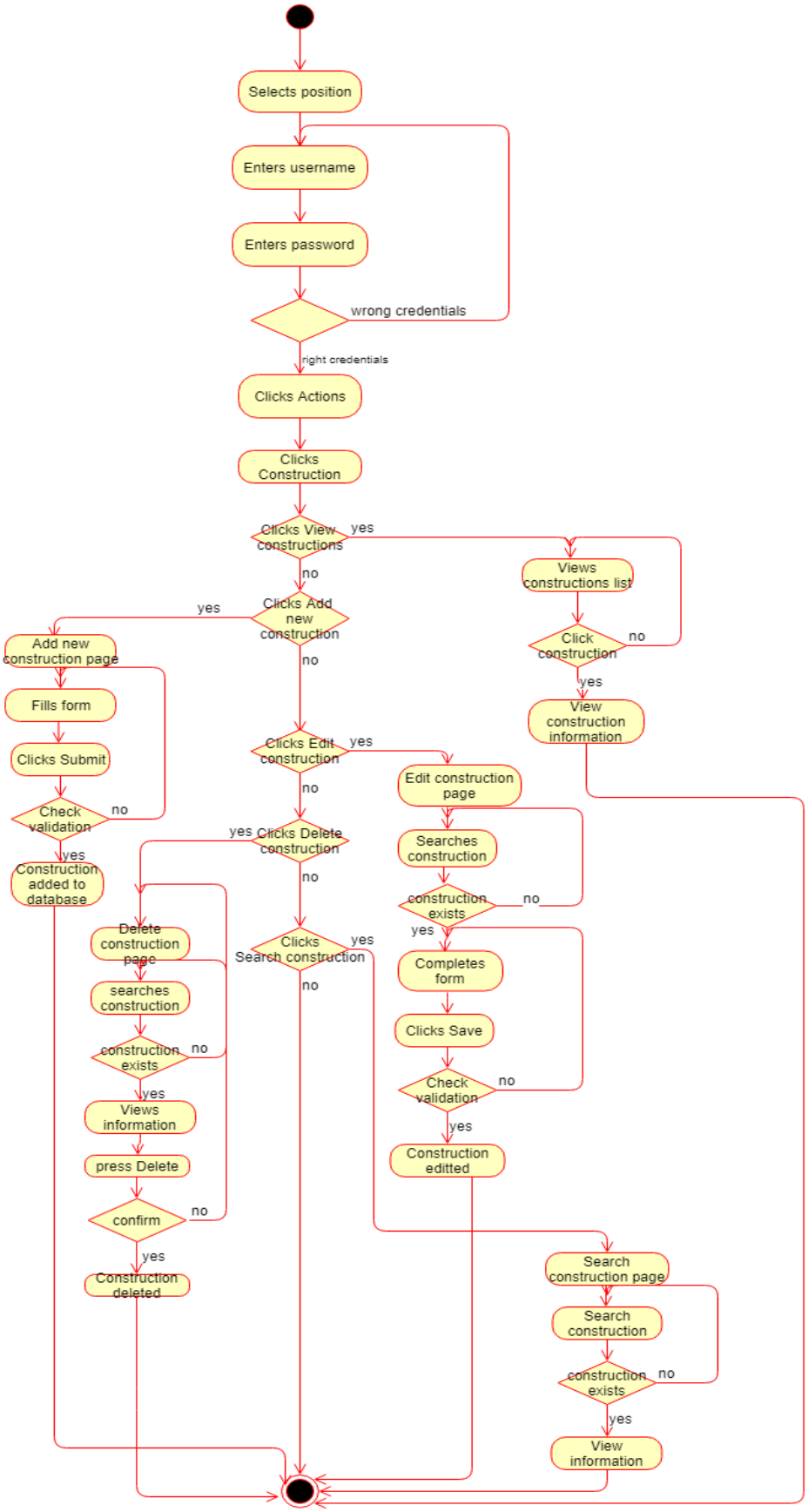
All users Activity Diagram



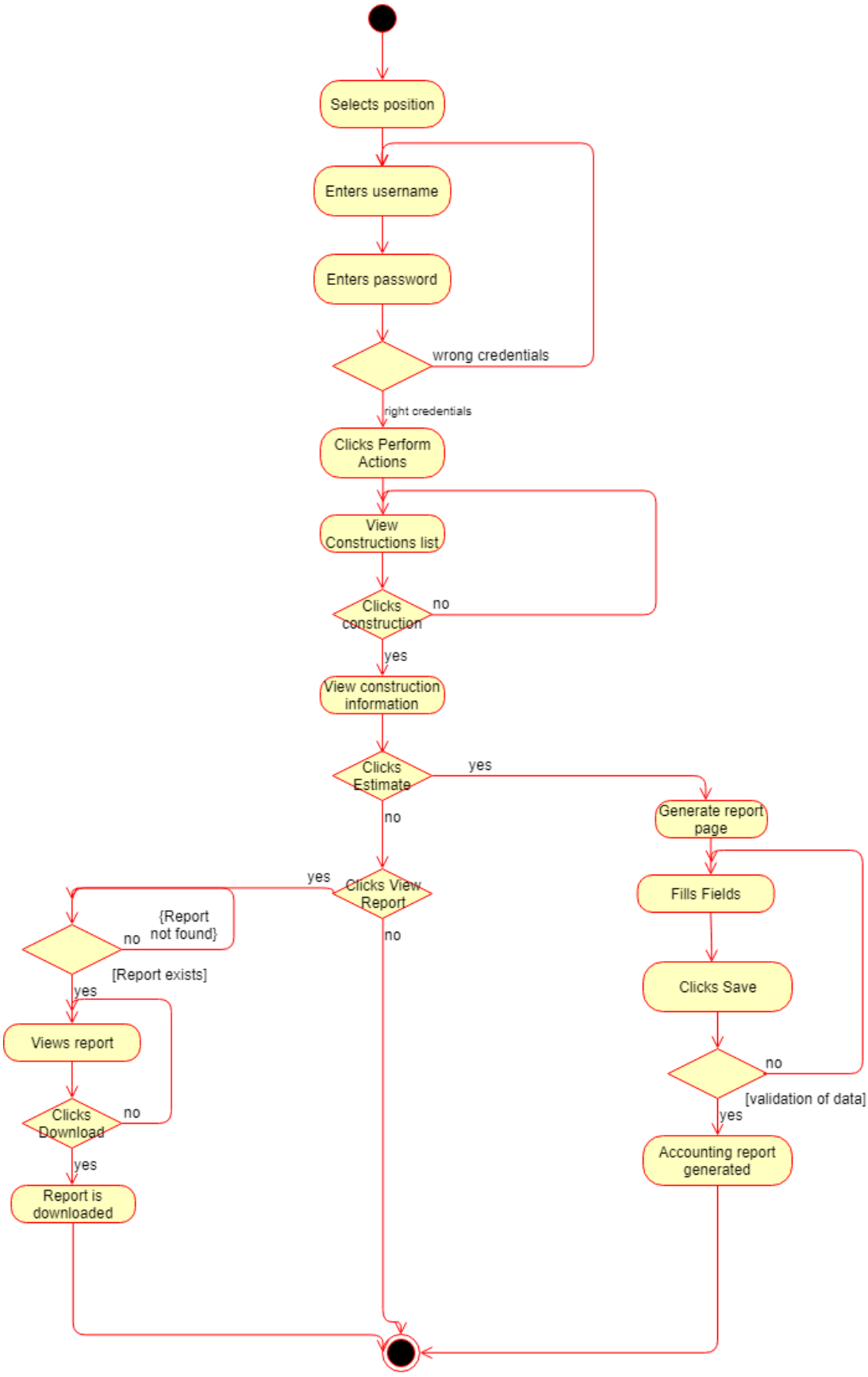
Supervisor Activity Diagram 1



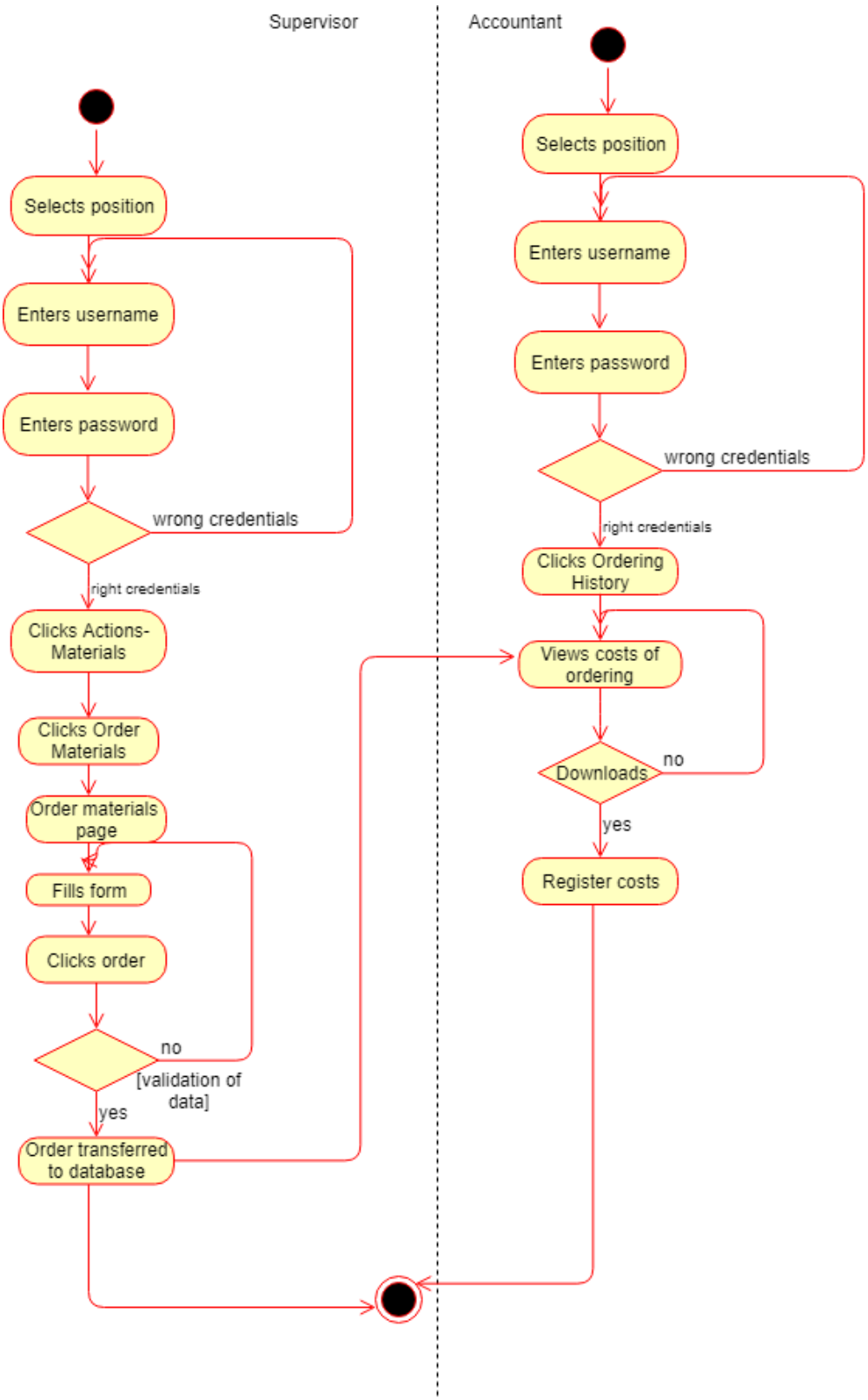
Supervisor Activity Diagram 2



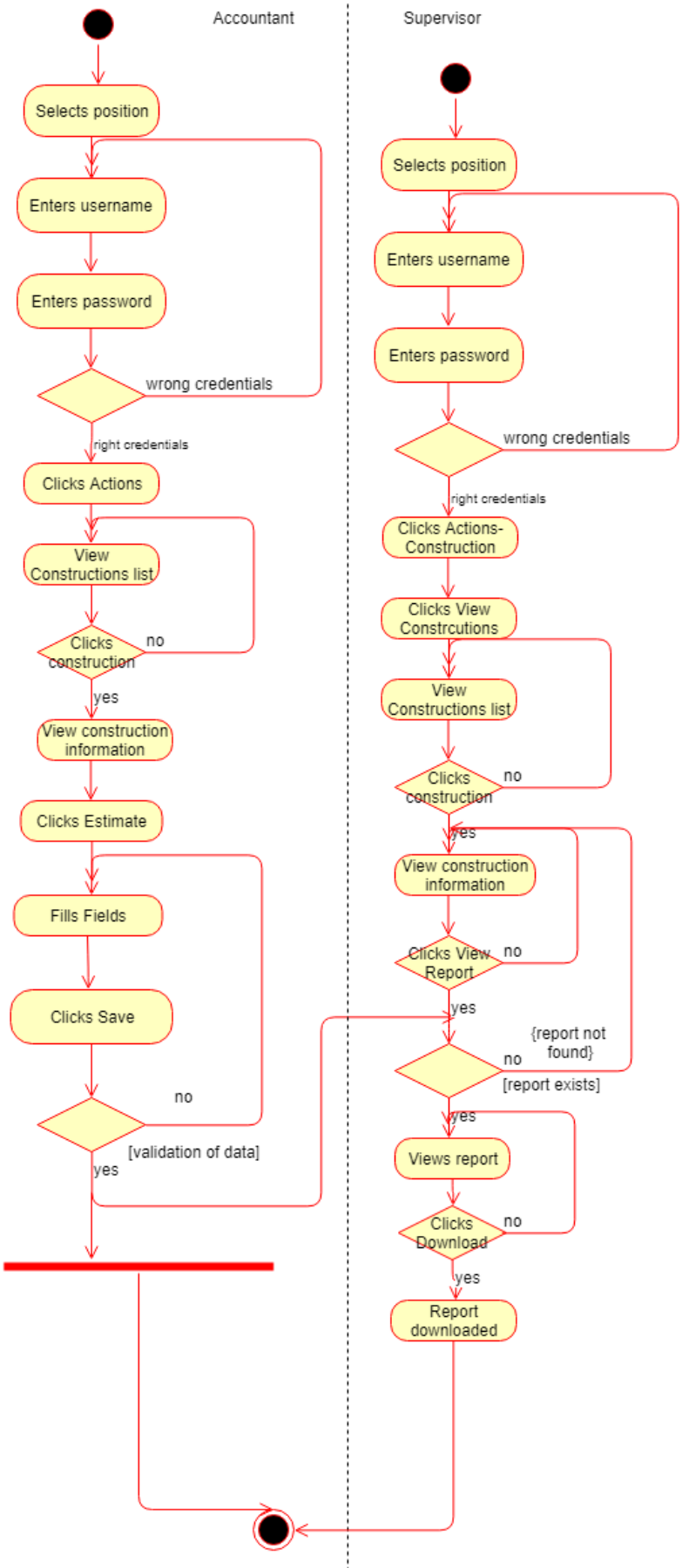
Supervisor Activity Diagram 3



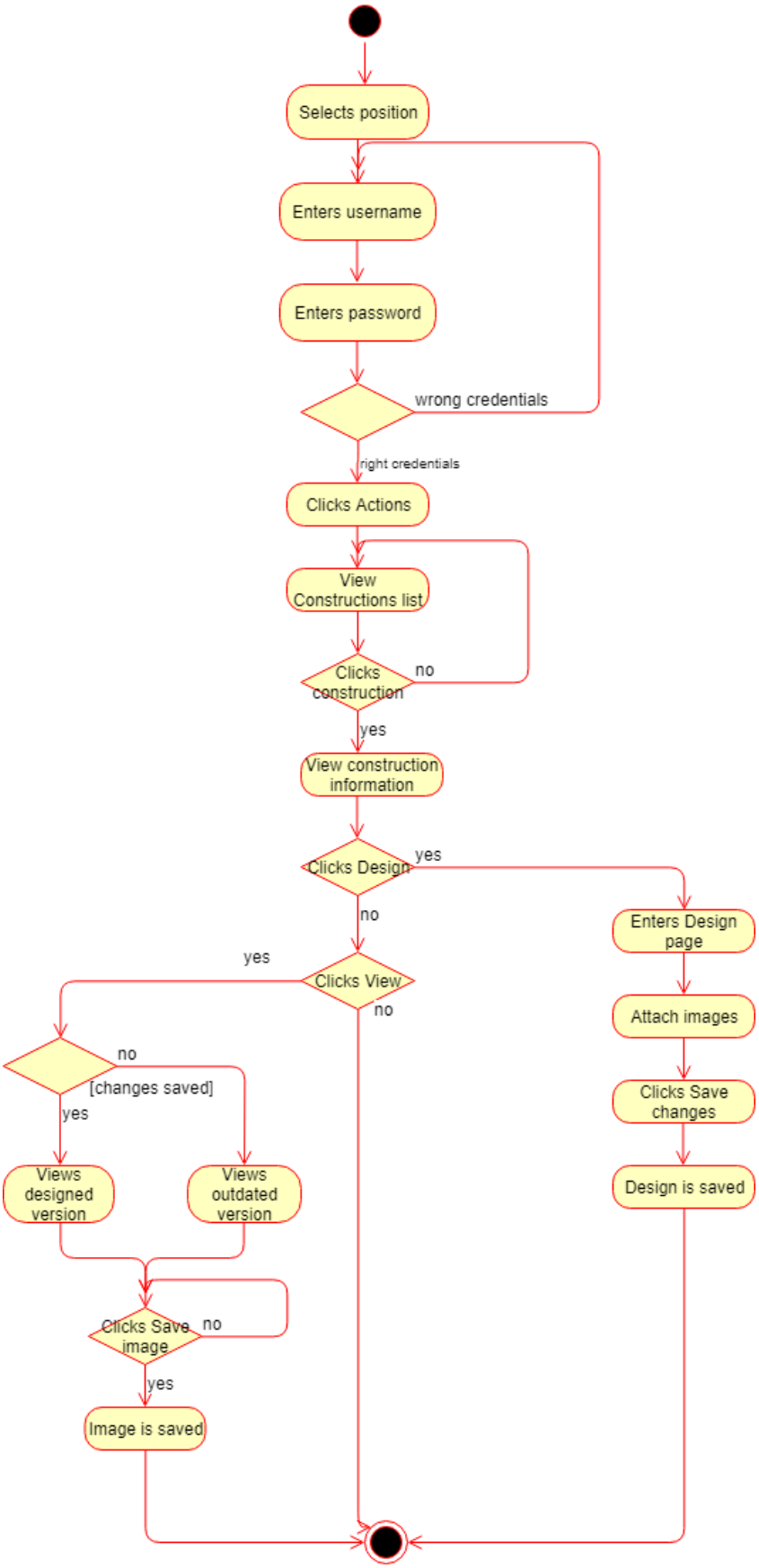
Accountant Activity Diagram



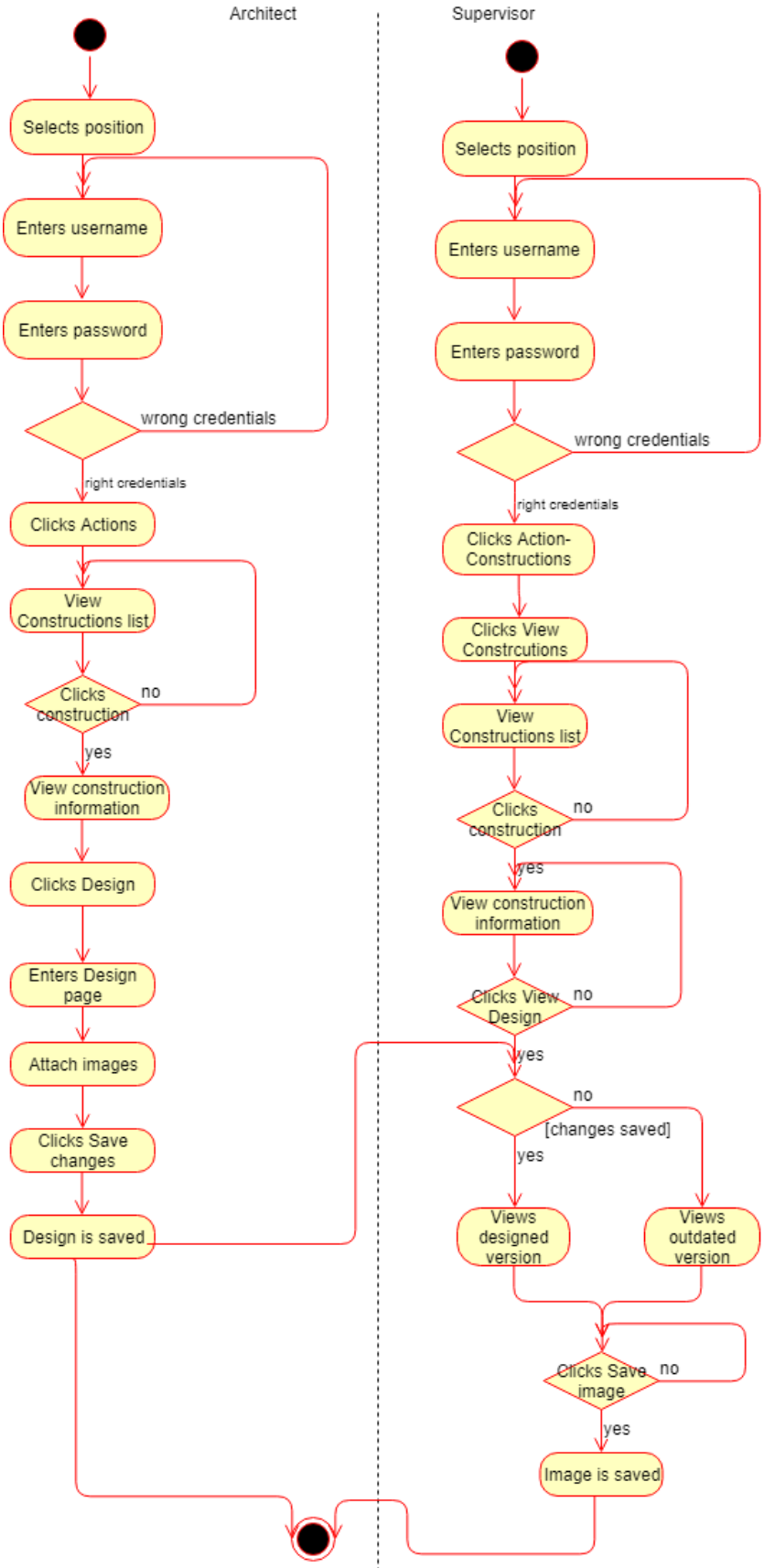
Ordering History Activity Diagram



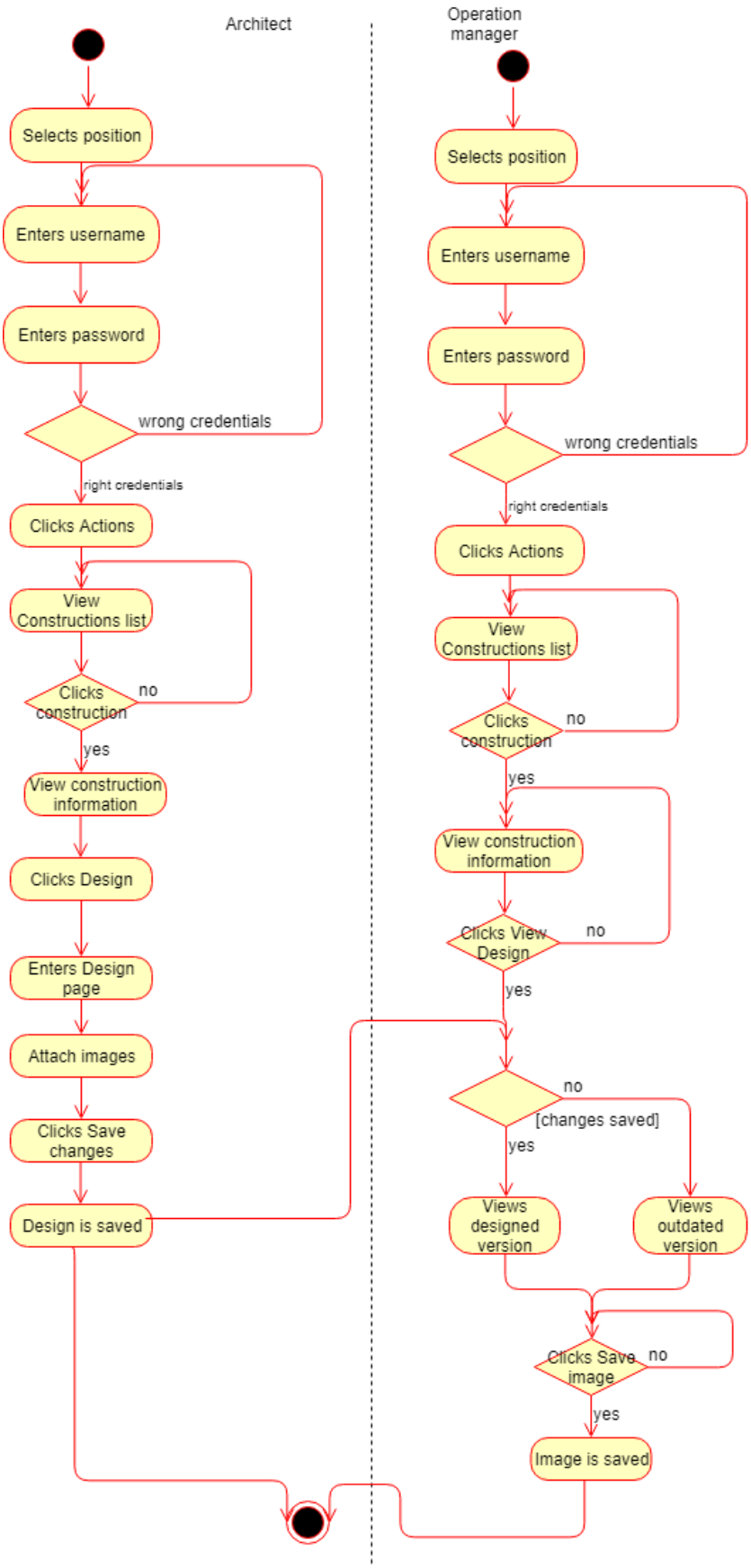
Accounting Report Activity Diagram



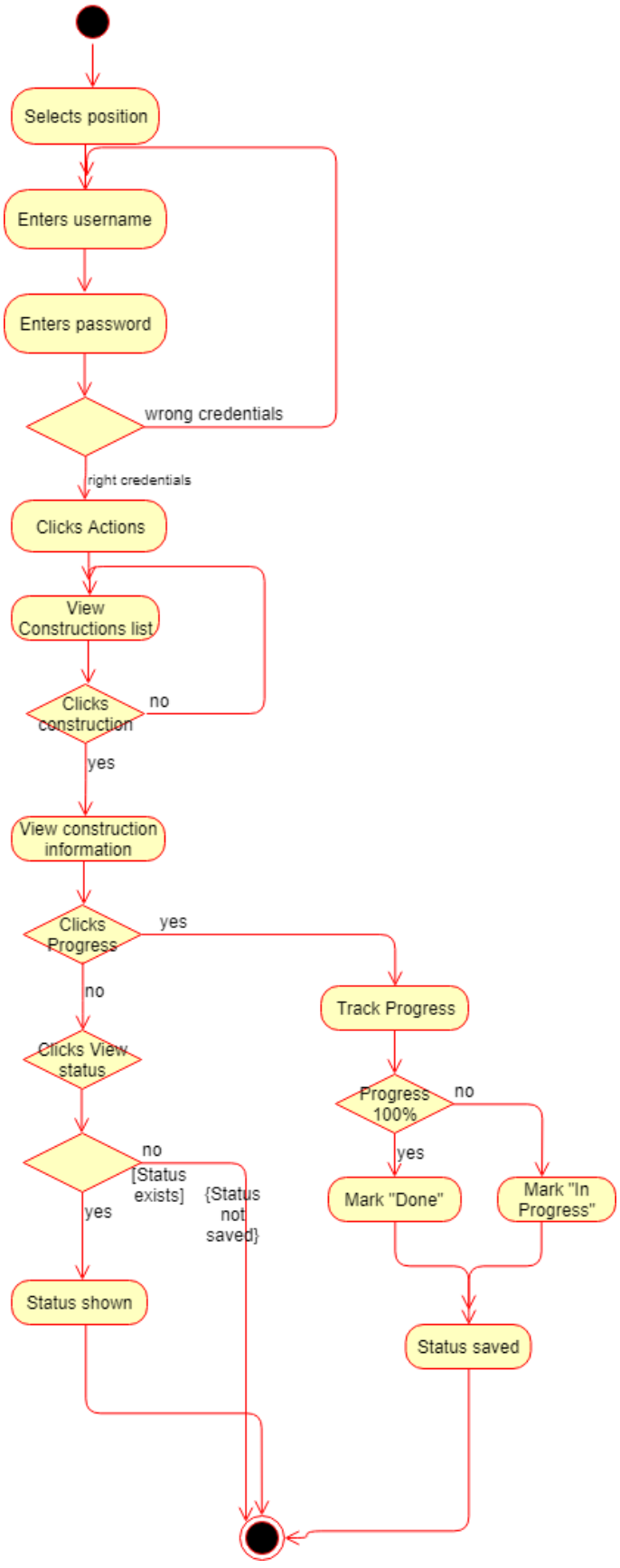
Architect Activity Diagram



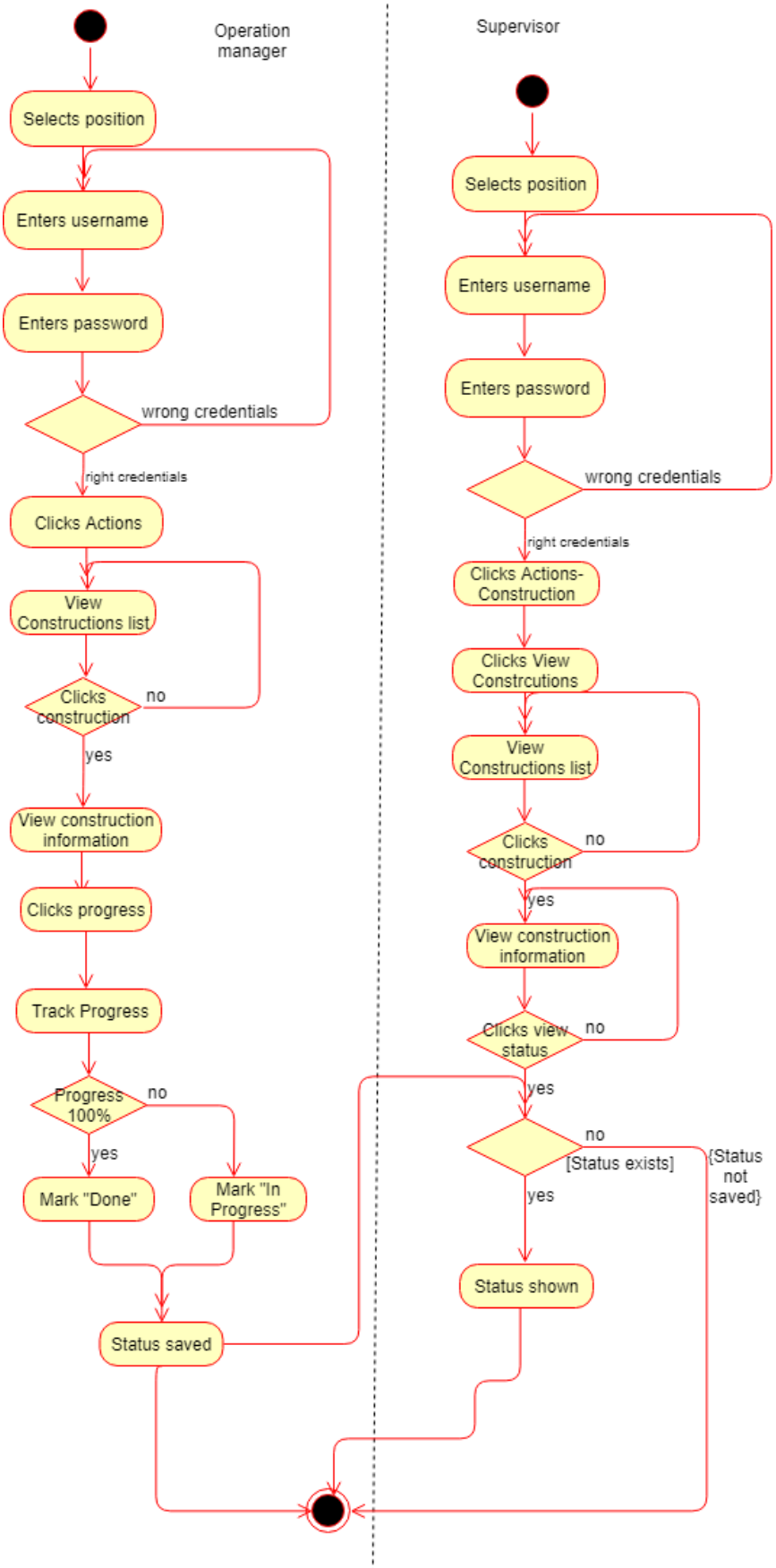
Architect – Supervisor Activity Diagram



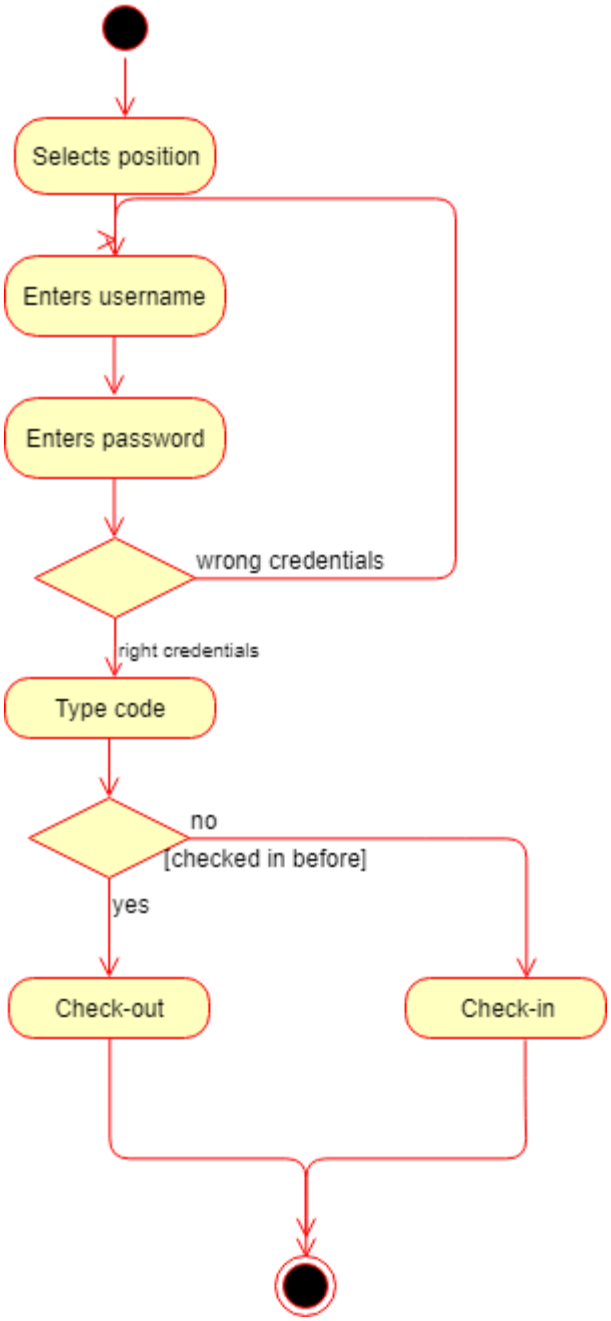
Architect – Operation manager Activity diagram



Operation manager Activity Diagram

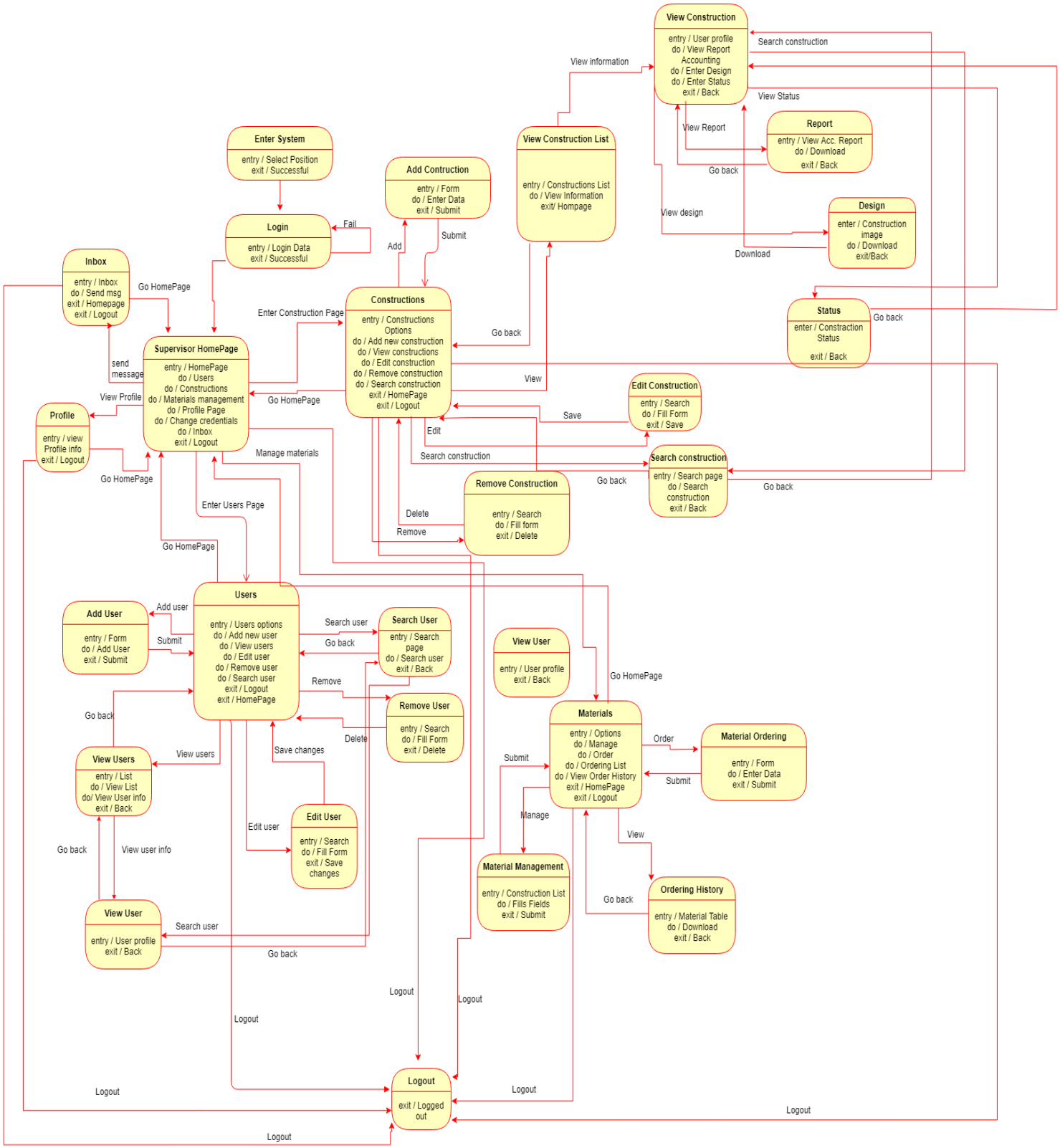


Progress Status Activity Diagram

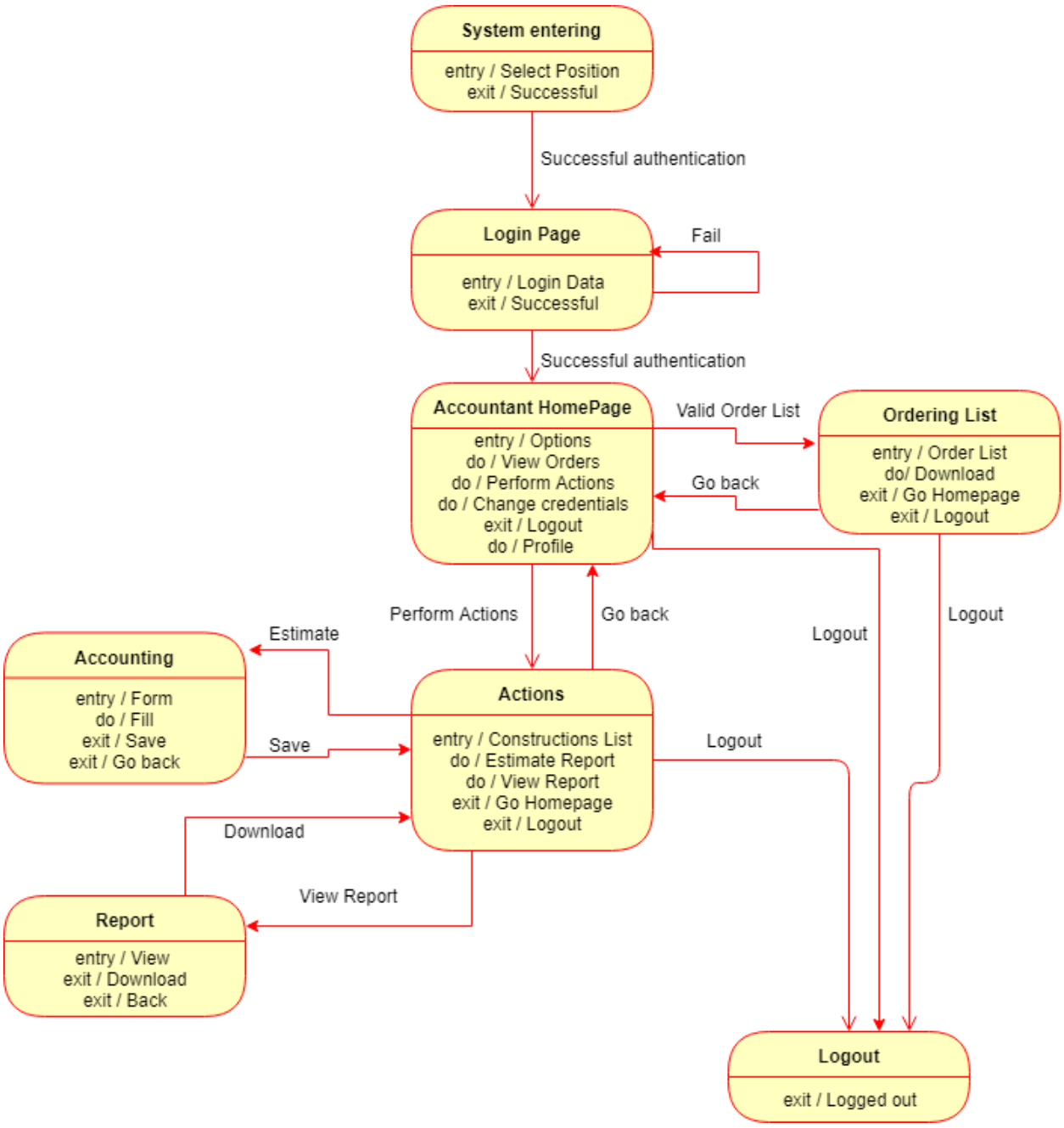


Workers Activity Diagram

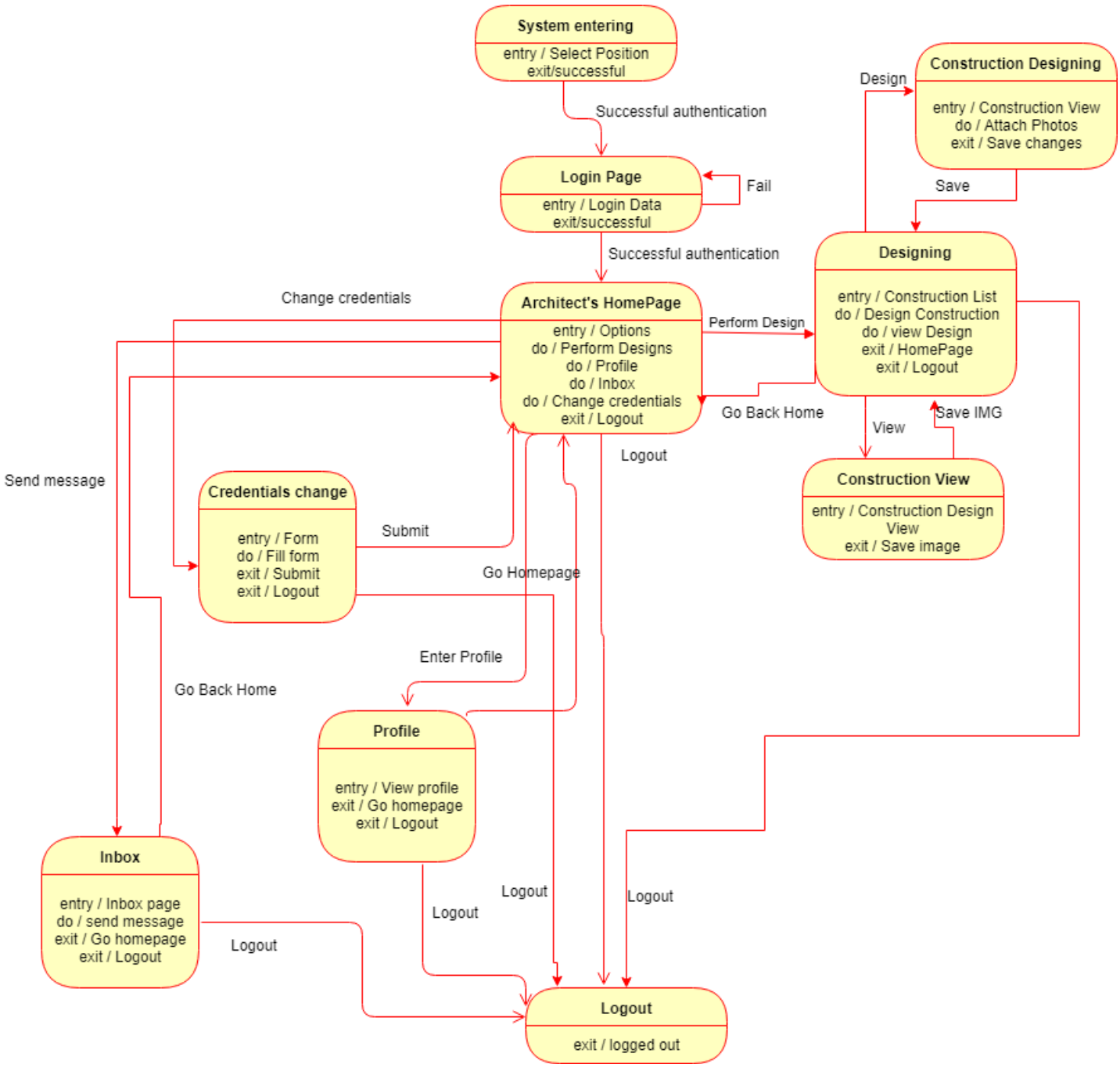
6.2 State Diagrams



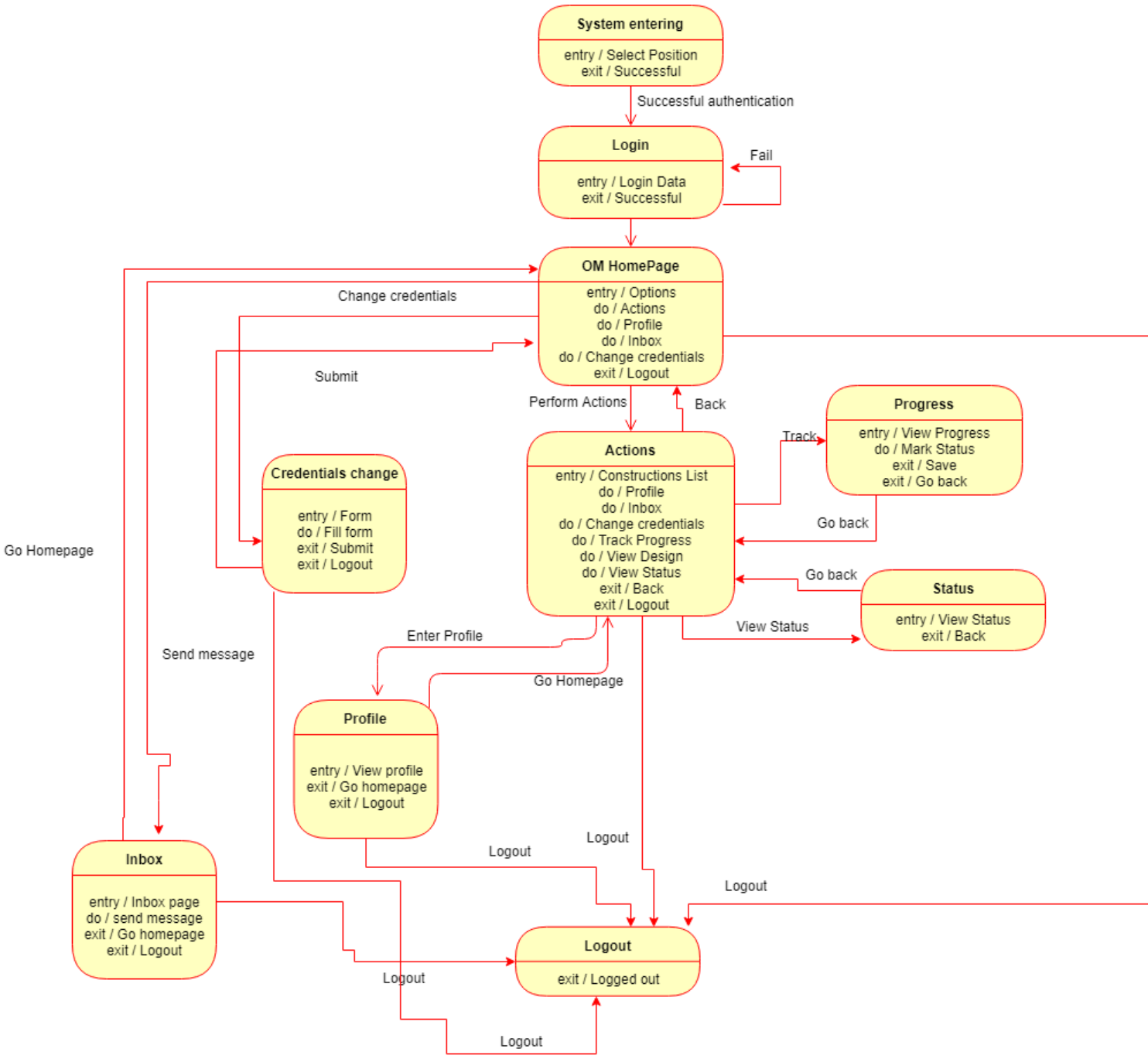
Supervisor State Diagram



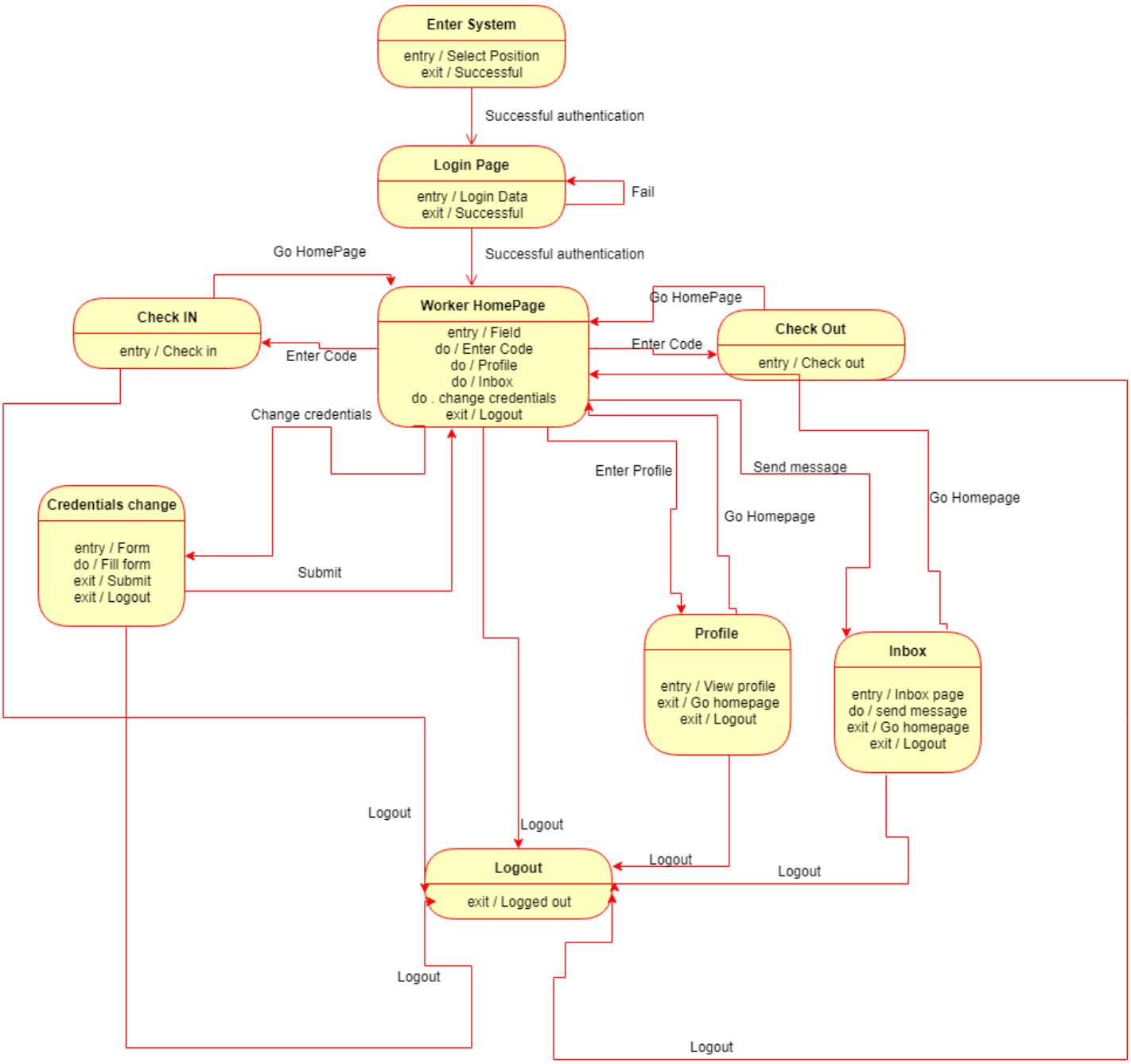
Accountant State Diagram



Architect State Diagram



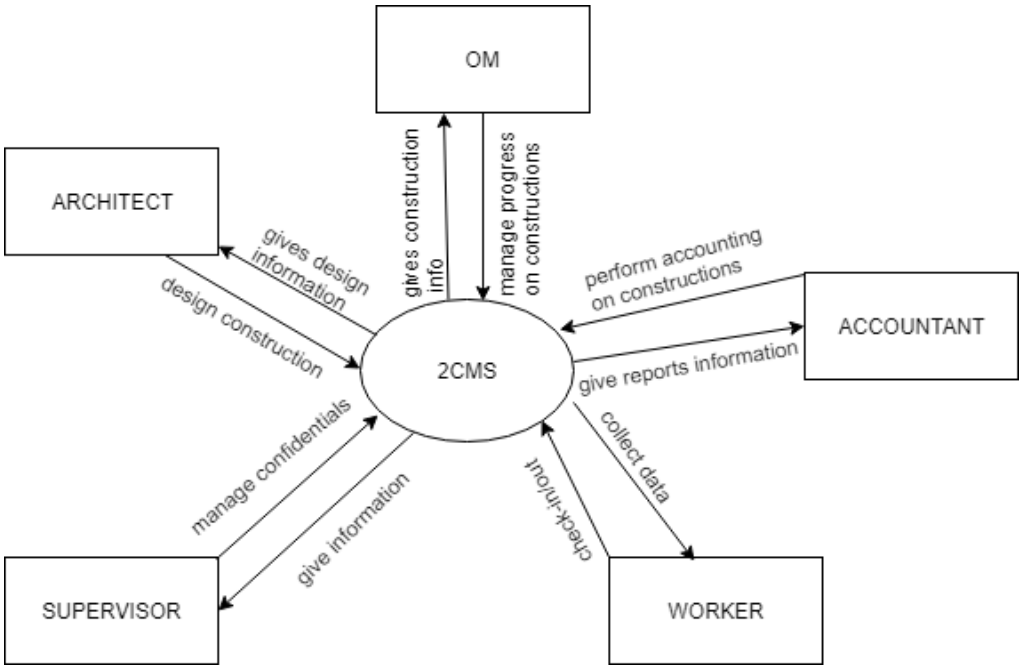
Operation manager State Diagram



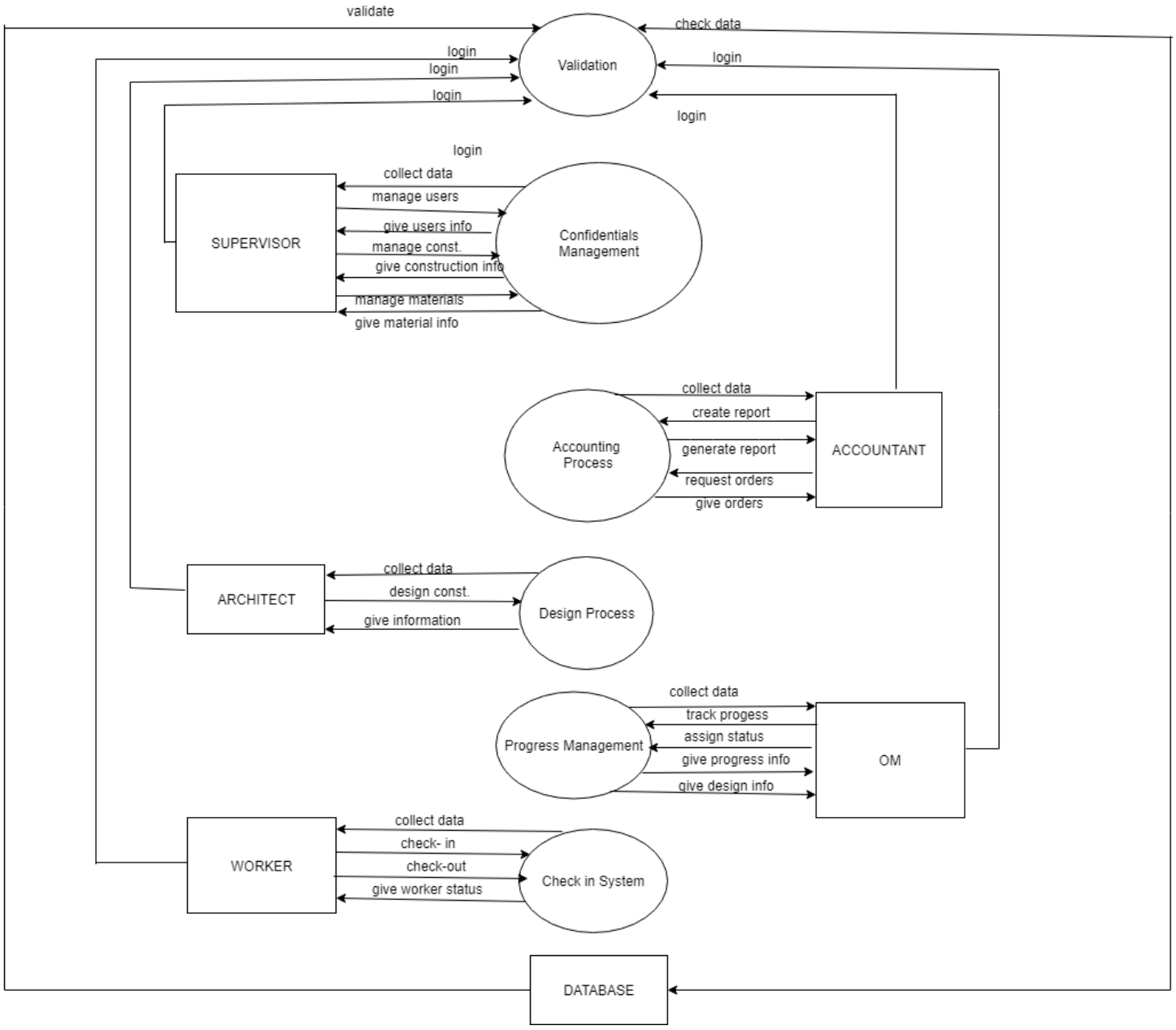
Workers State Diagrams

6.3 Data Flow Diagrams

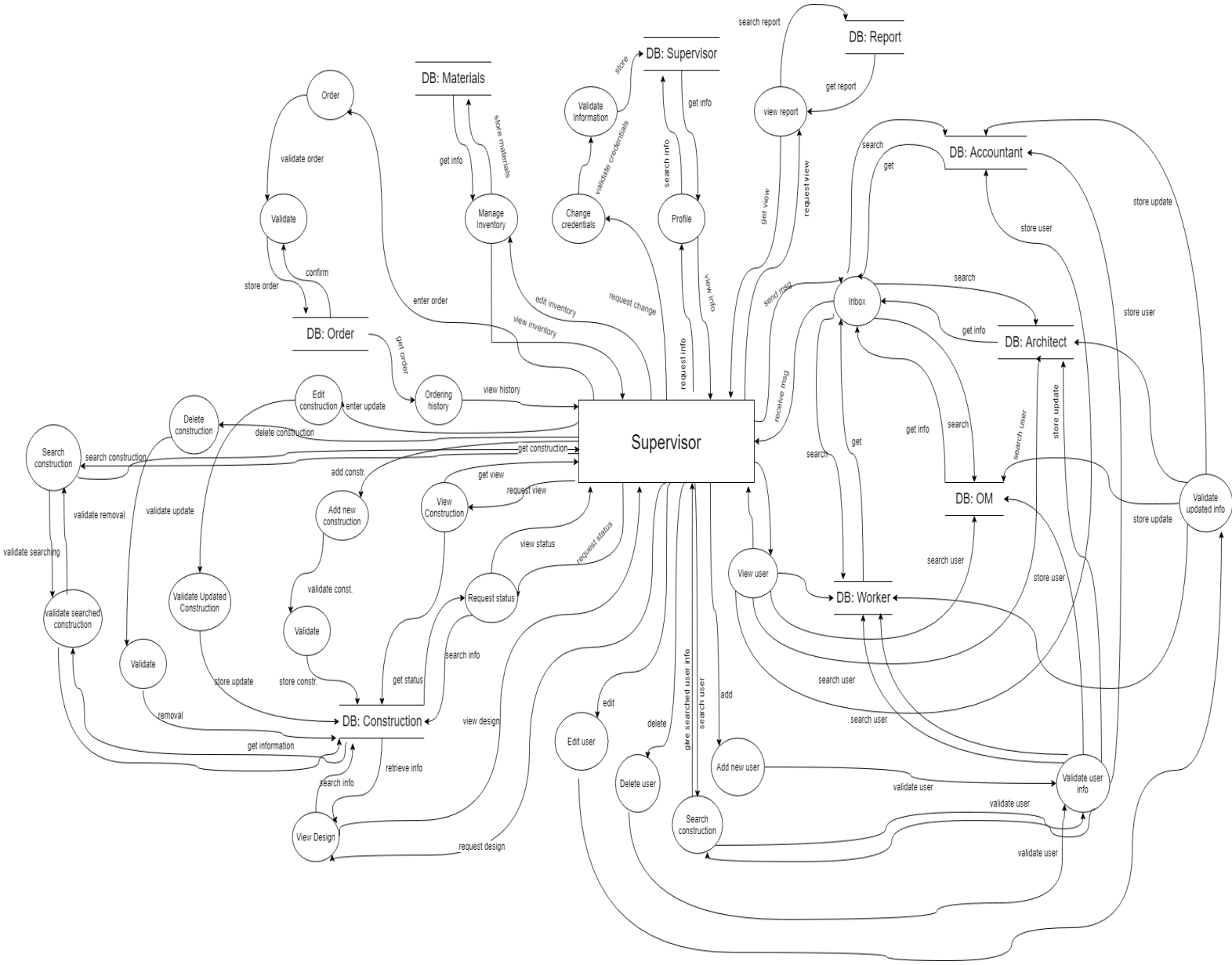
6.3.1 DFD level 0



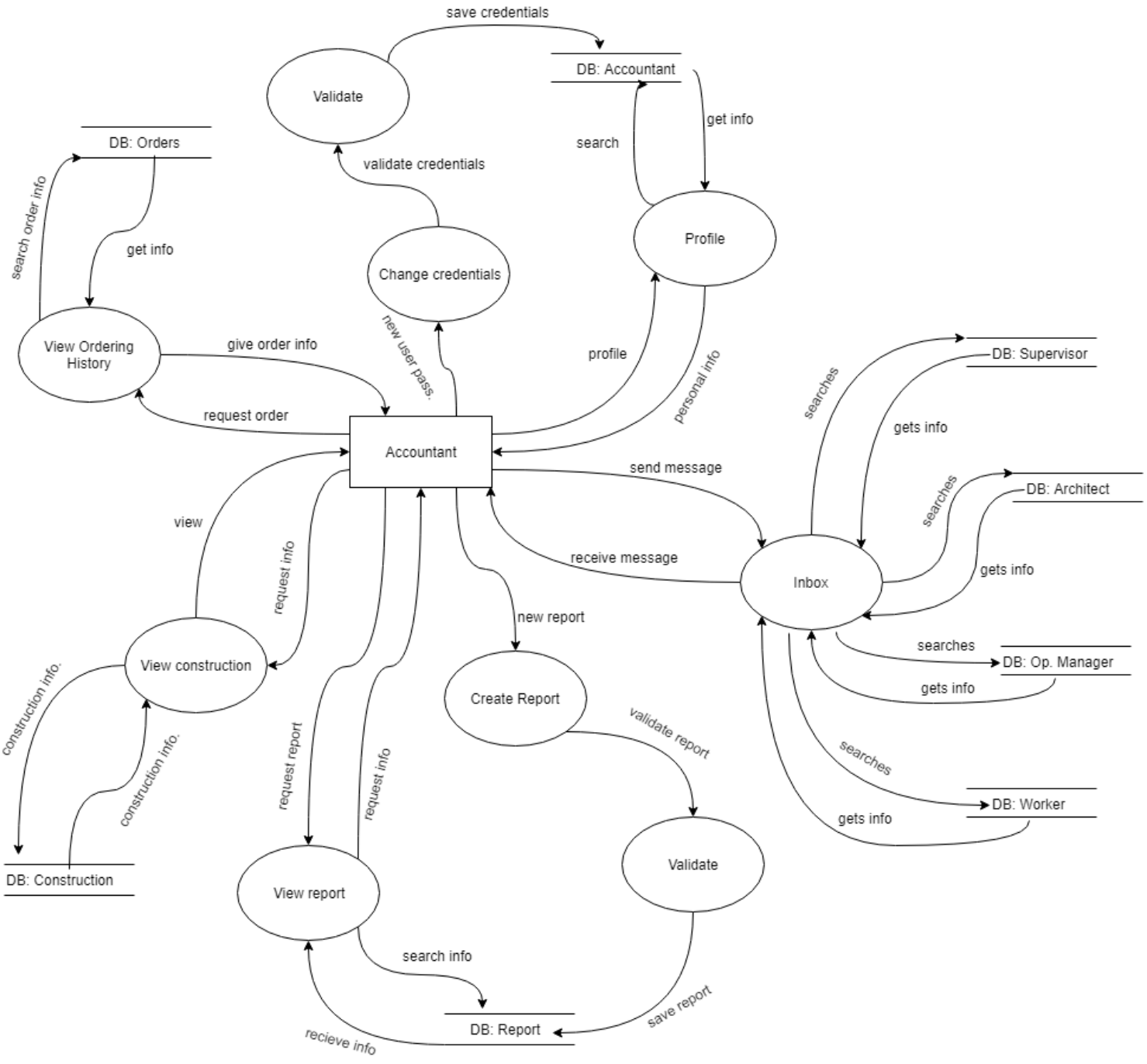
6.3.2 DFD level 1



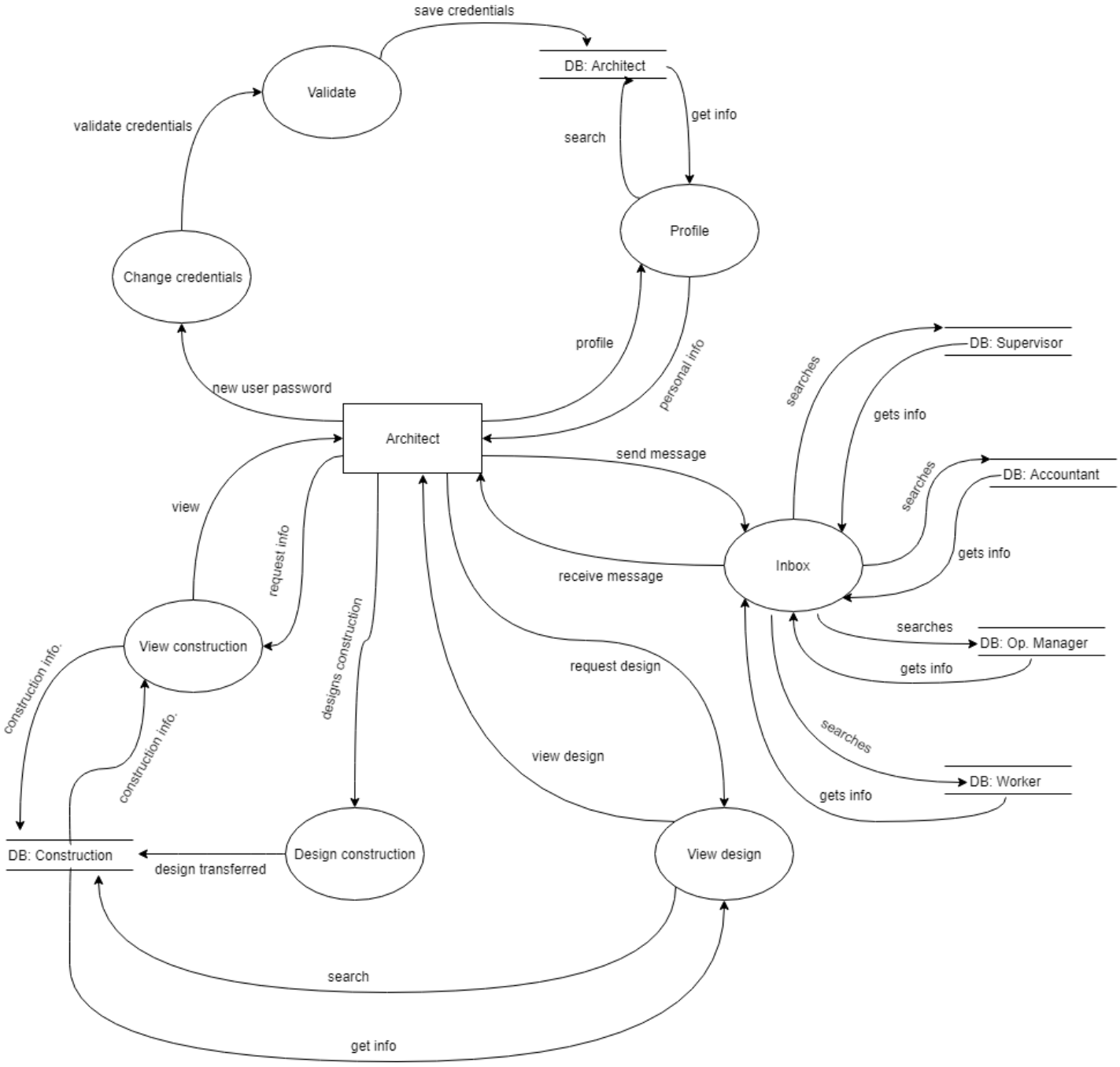
6.3.3 DFD level 2



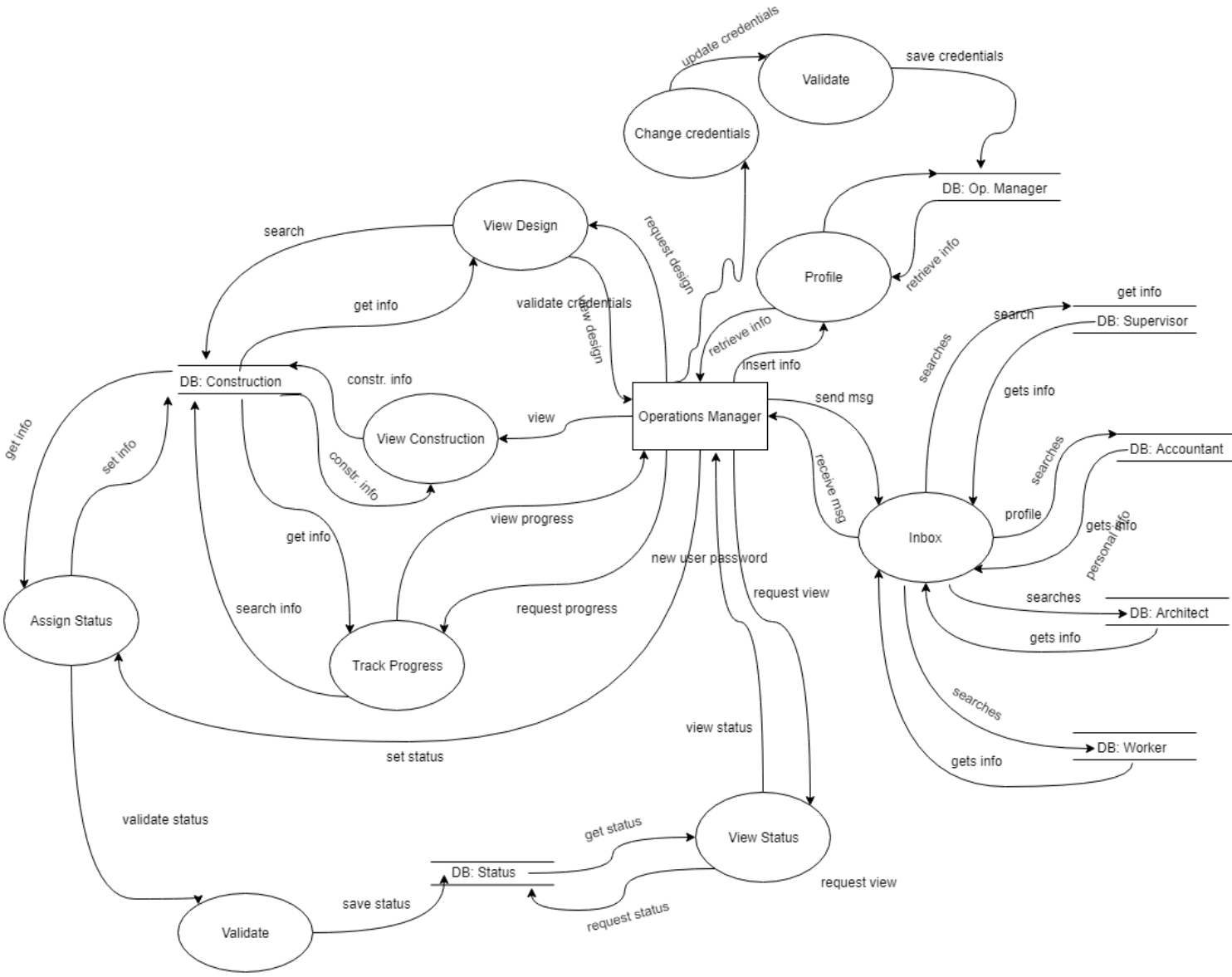
Supervisor DFD Level 2



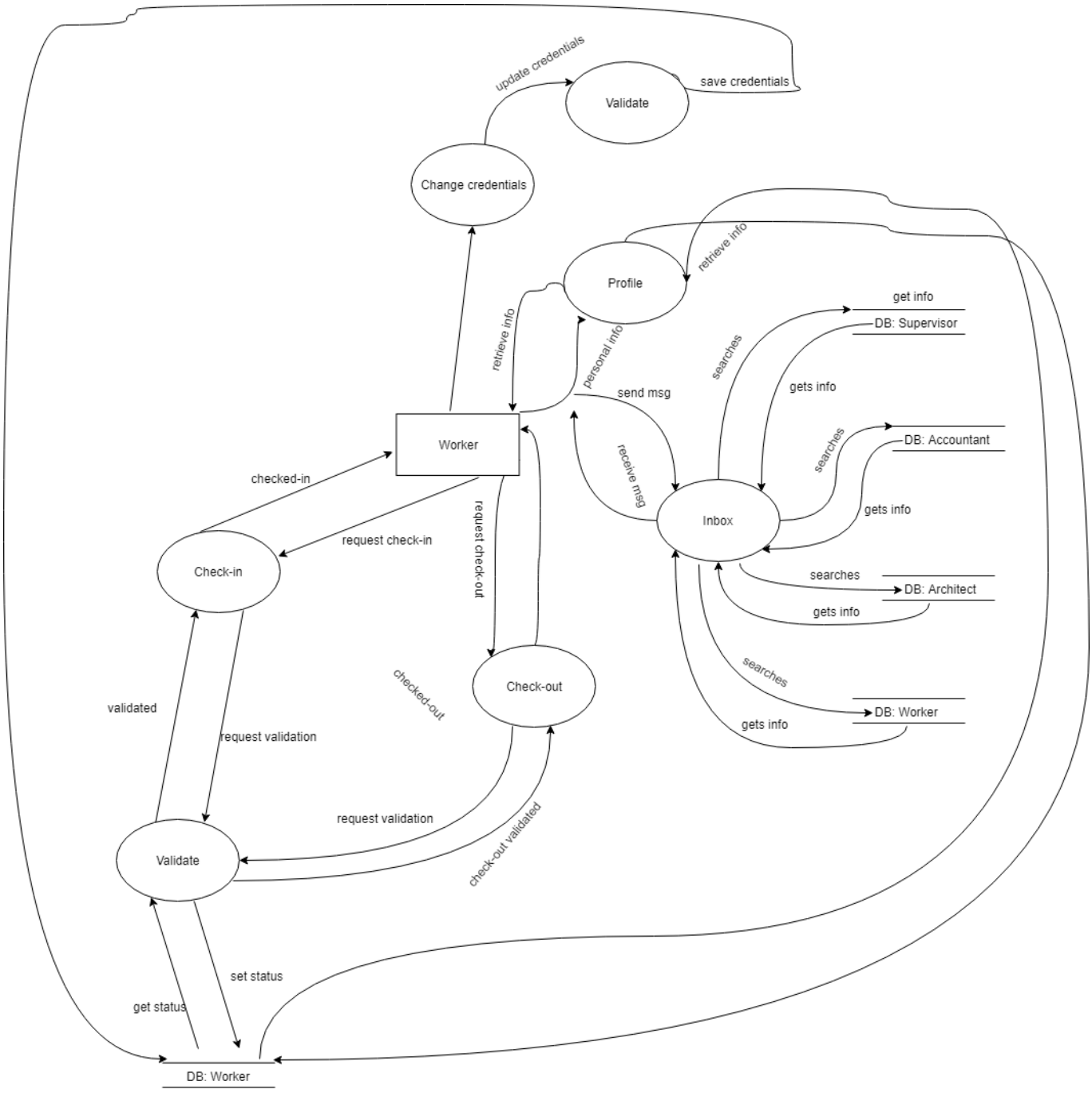
Accountant DFD Level 2



Architect DFD Level 2

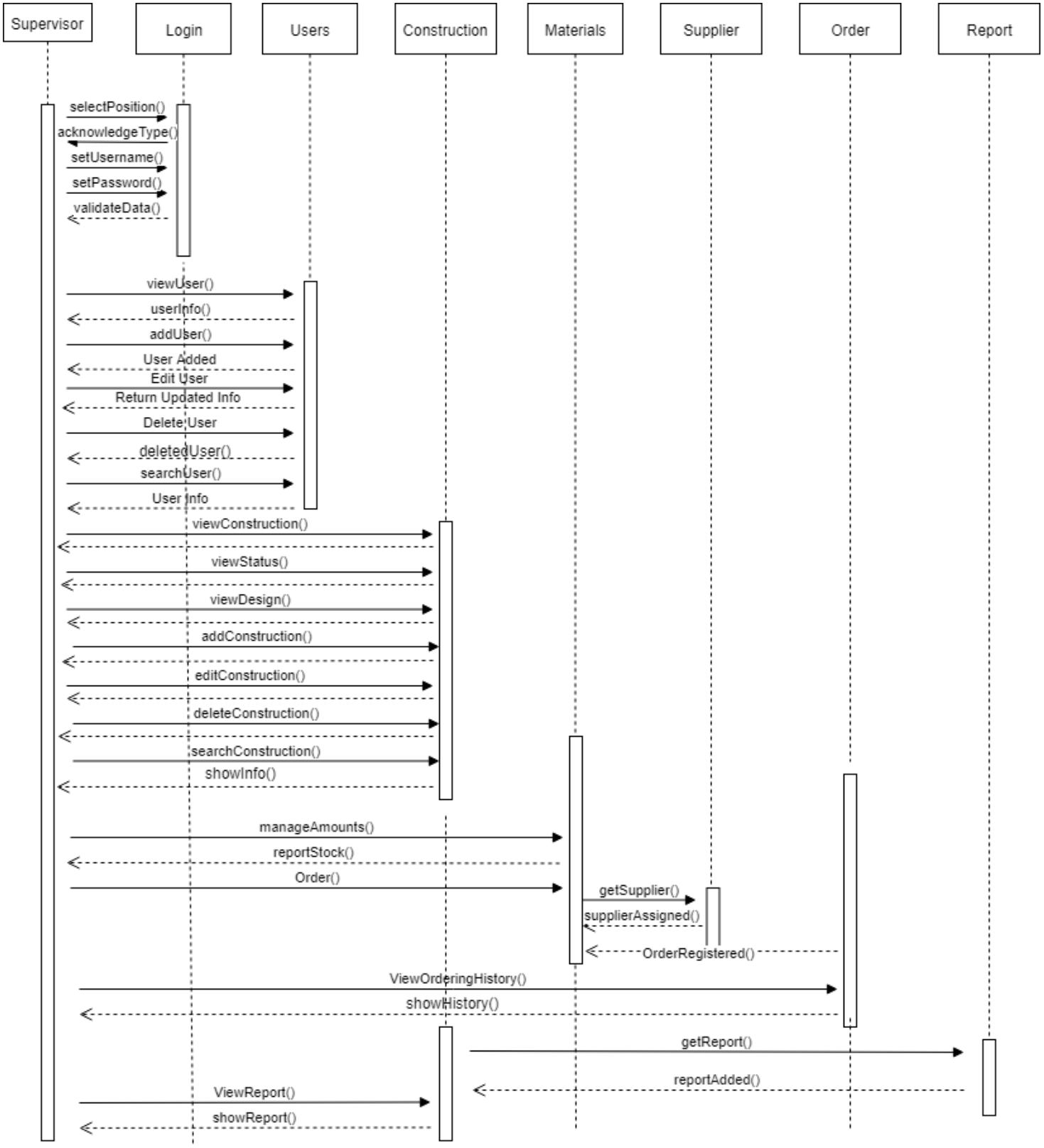


Operation manager DFD Level 2

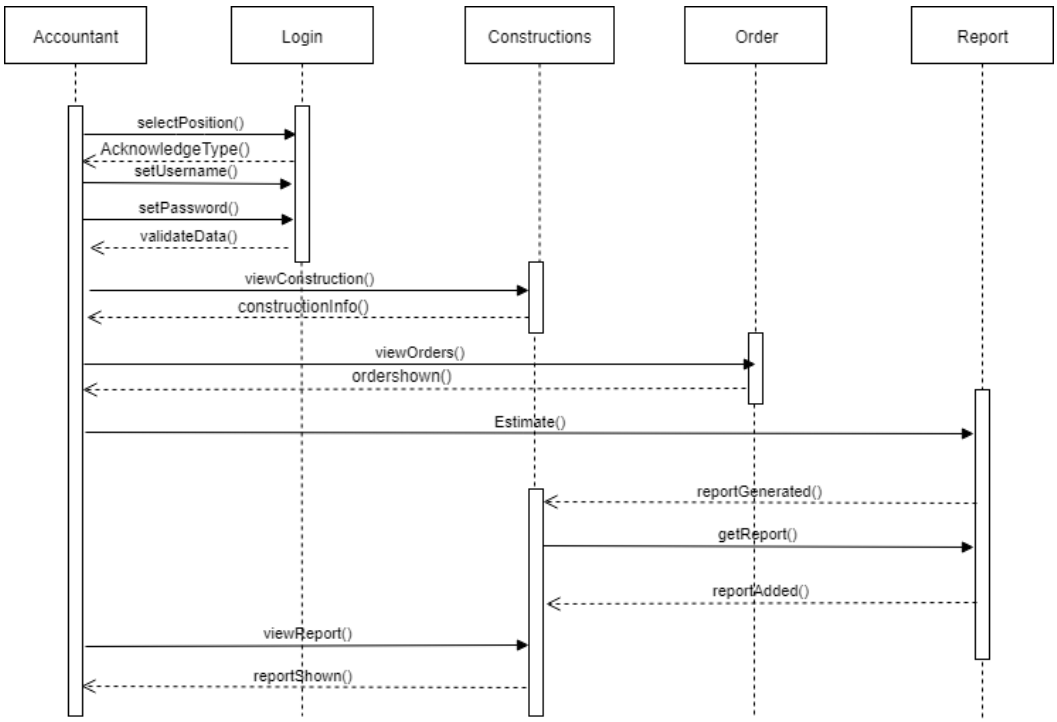


Worker DFD Level 2

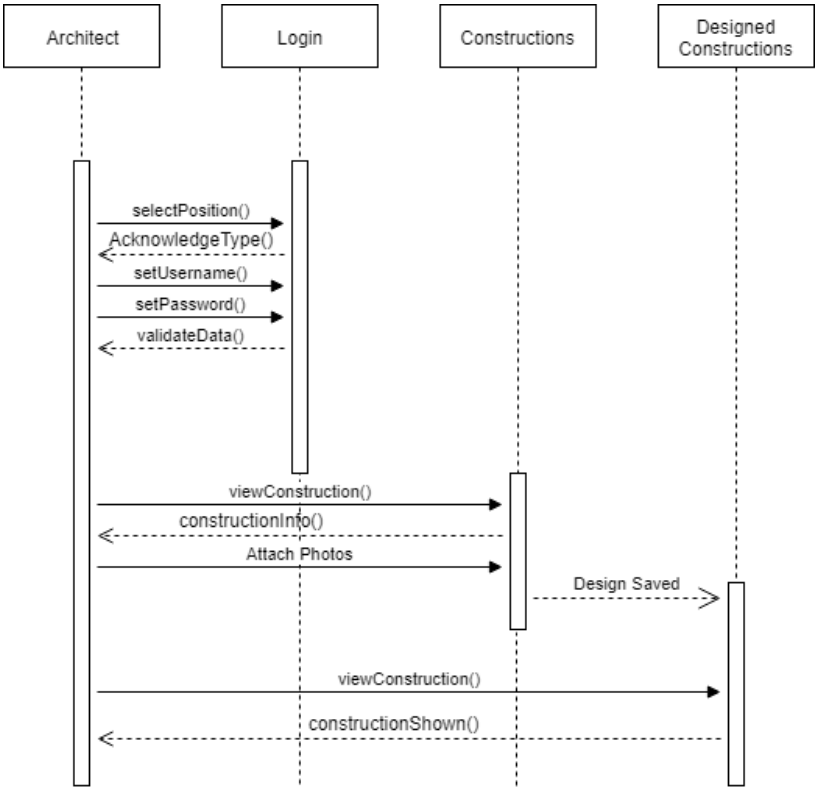
6.4 Sequence Diagrams



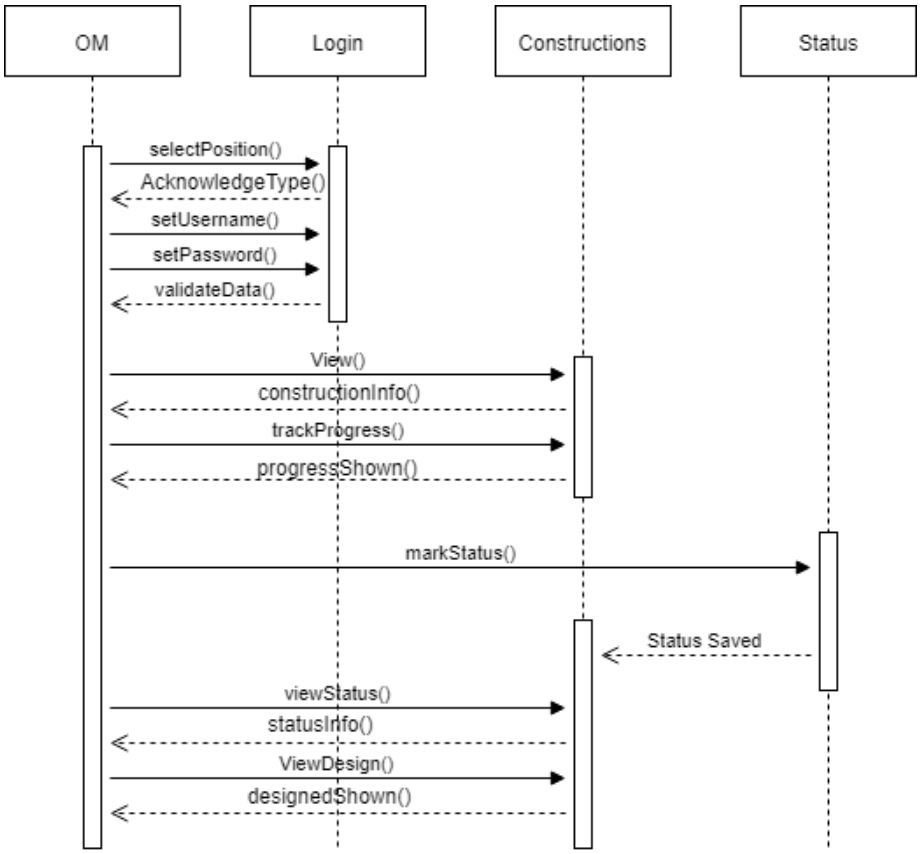
Supervisor Sequence Diagram



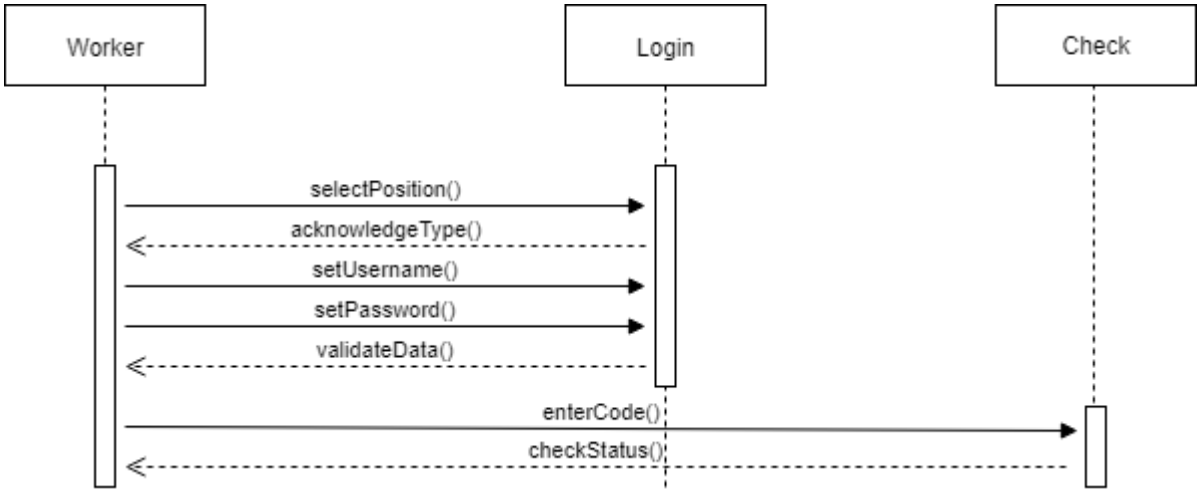
Accountant Sequence Diagram



Architect Sequence Diagram

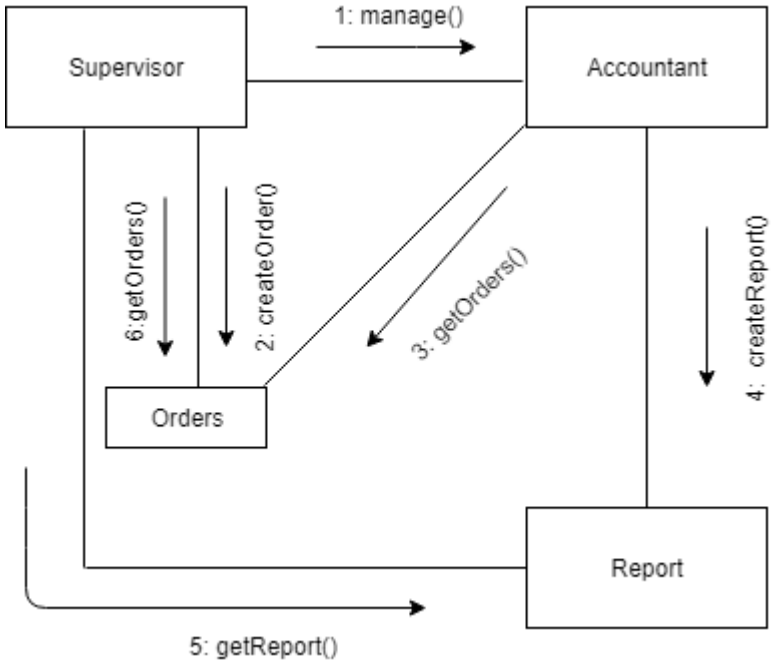


Operation manager Sequence Diagram

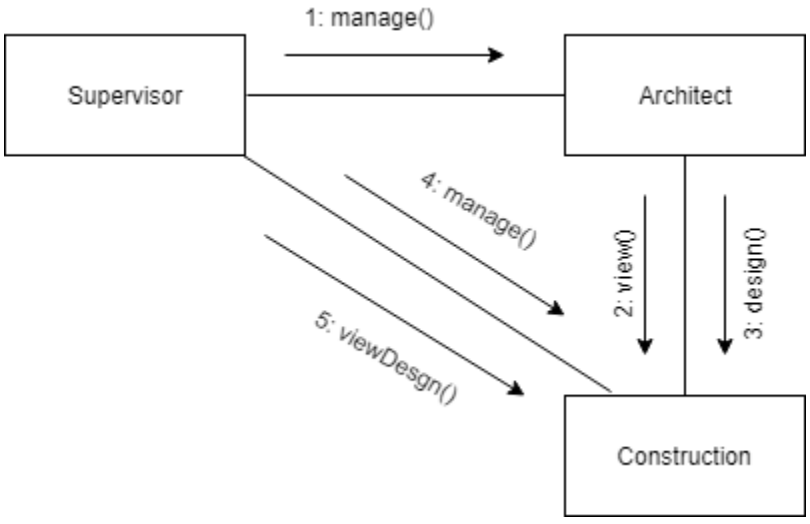


Workers Sequence Diagram

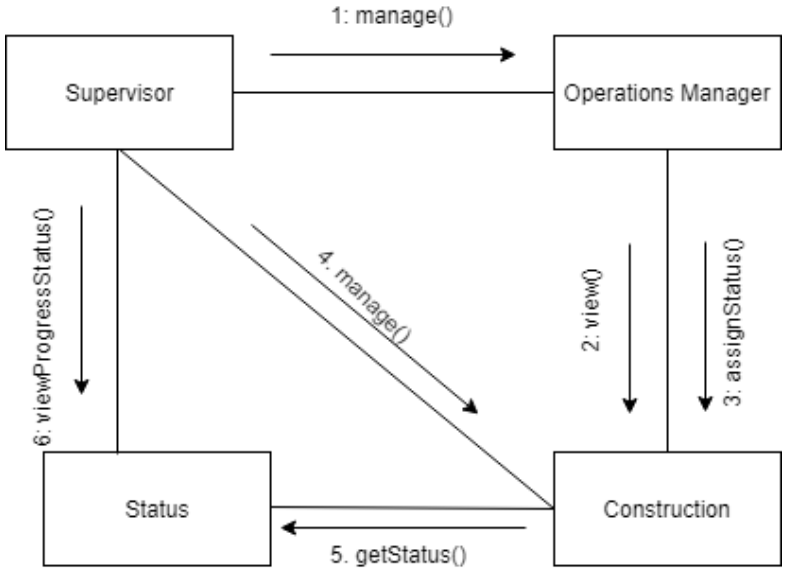
6.5 Collaboration Diagrams



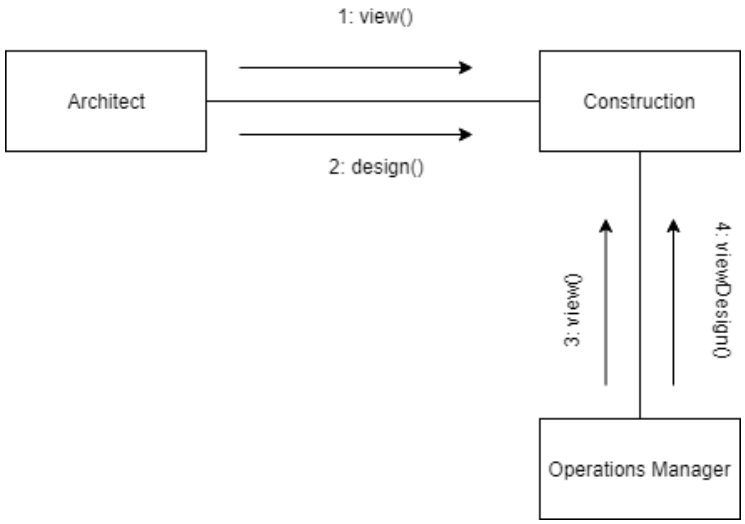
Supervisor – Accountant Collaboration Diagram



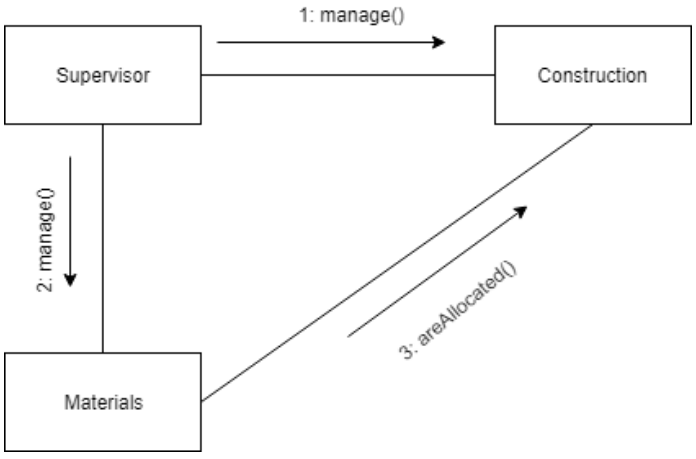
Supervisor – Architect Collaboration Diagram



Supervisor – Operation manager Collaboration Diagram

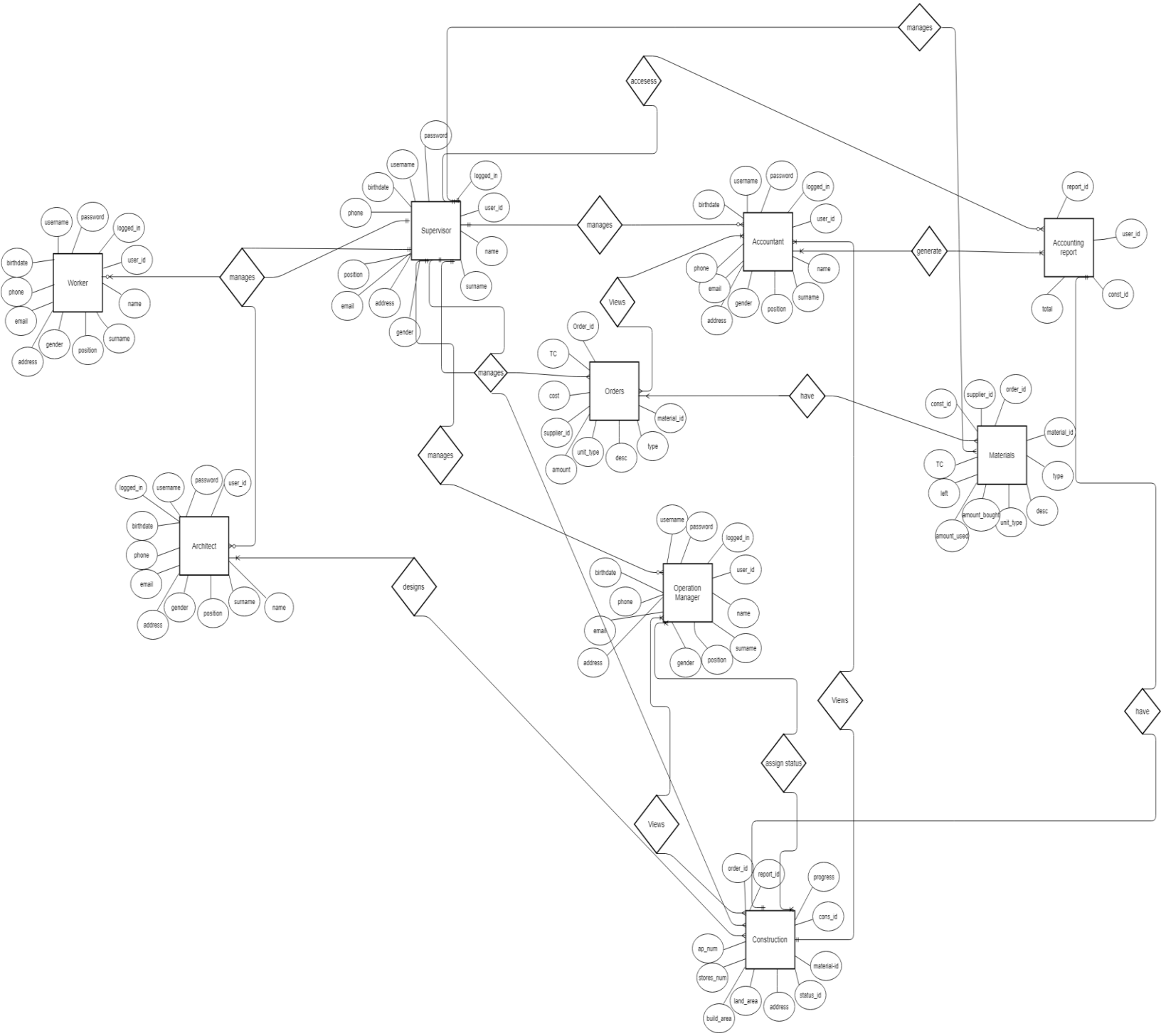


Architect – Operation manager Collaboration Diagram

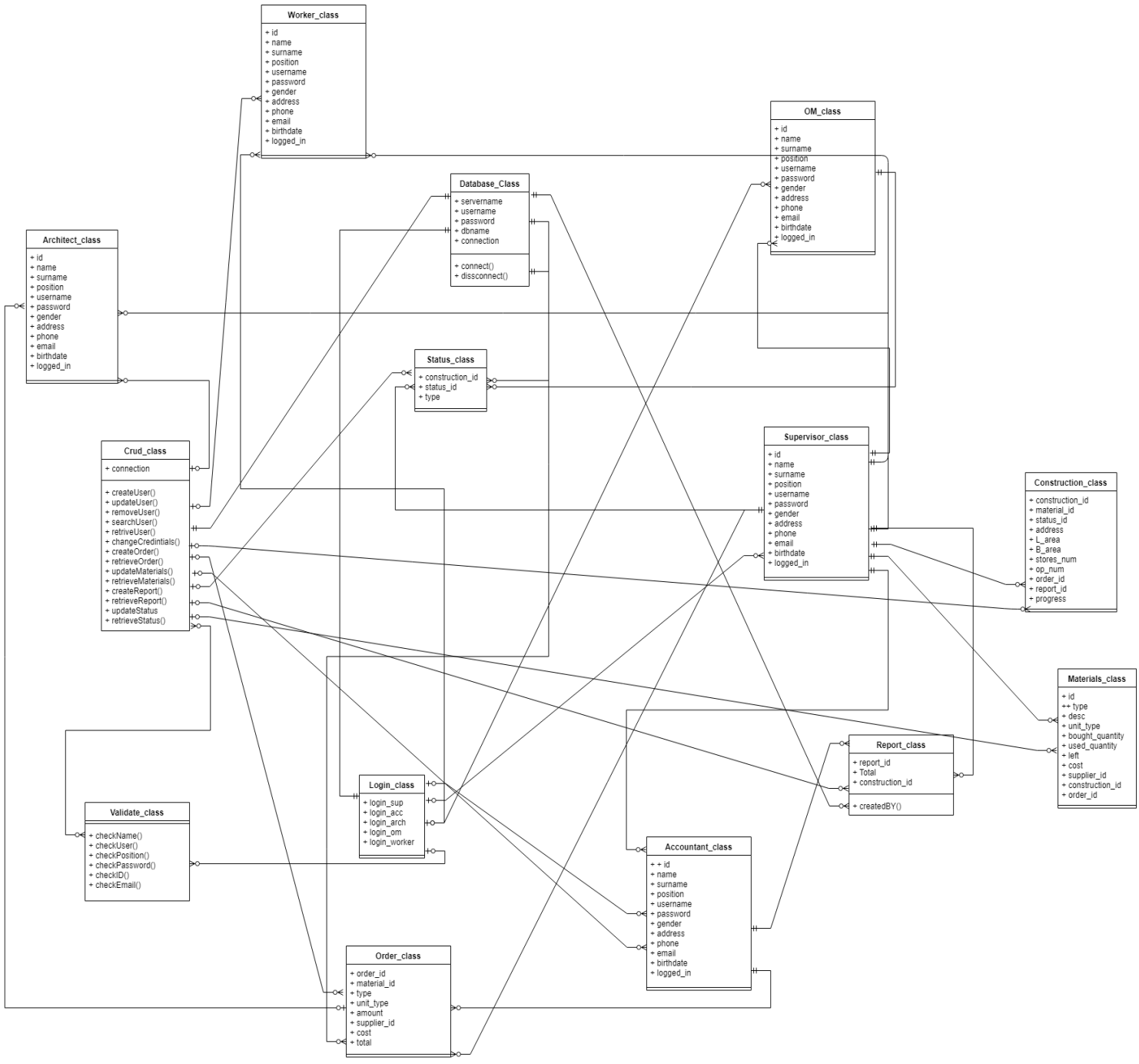


Supervisor – Materials Collaboration Diagram

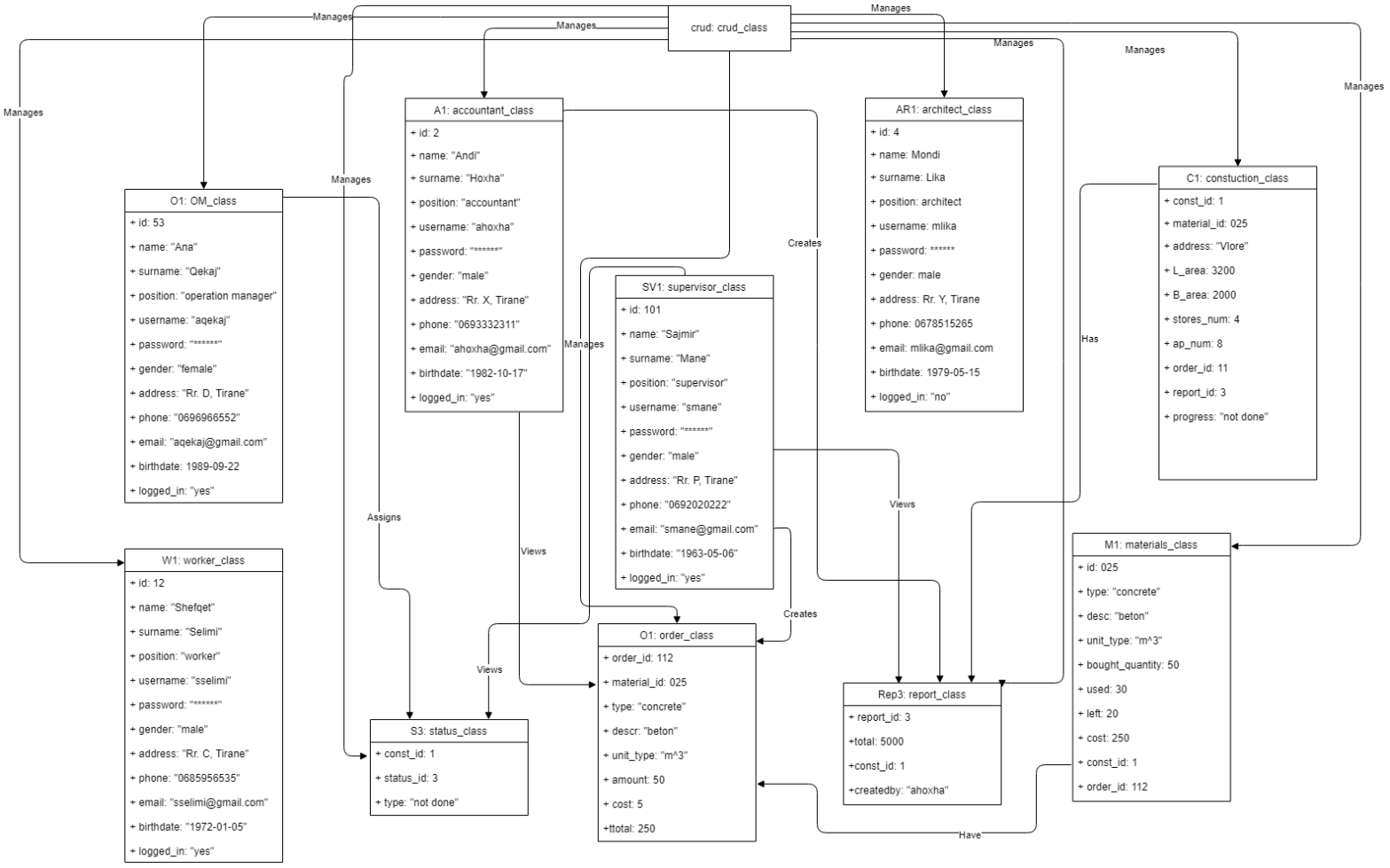
6.6 Entity Relation Diagram



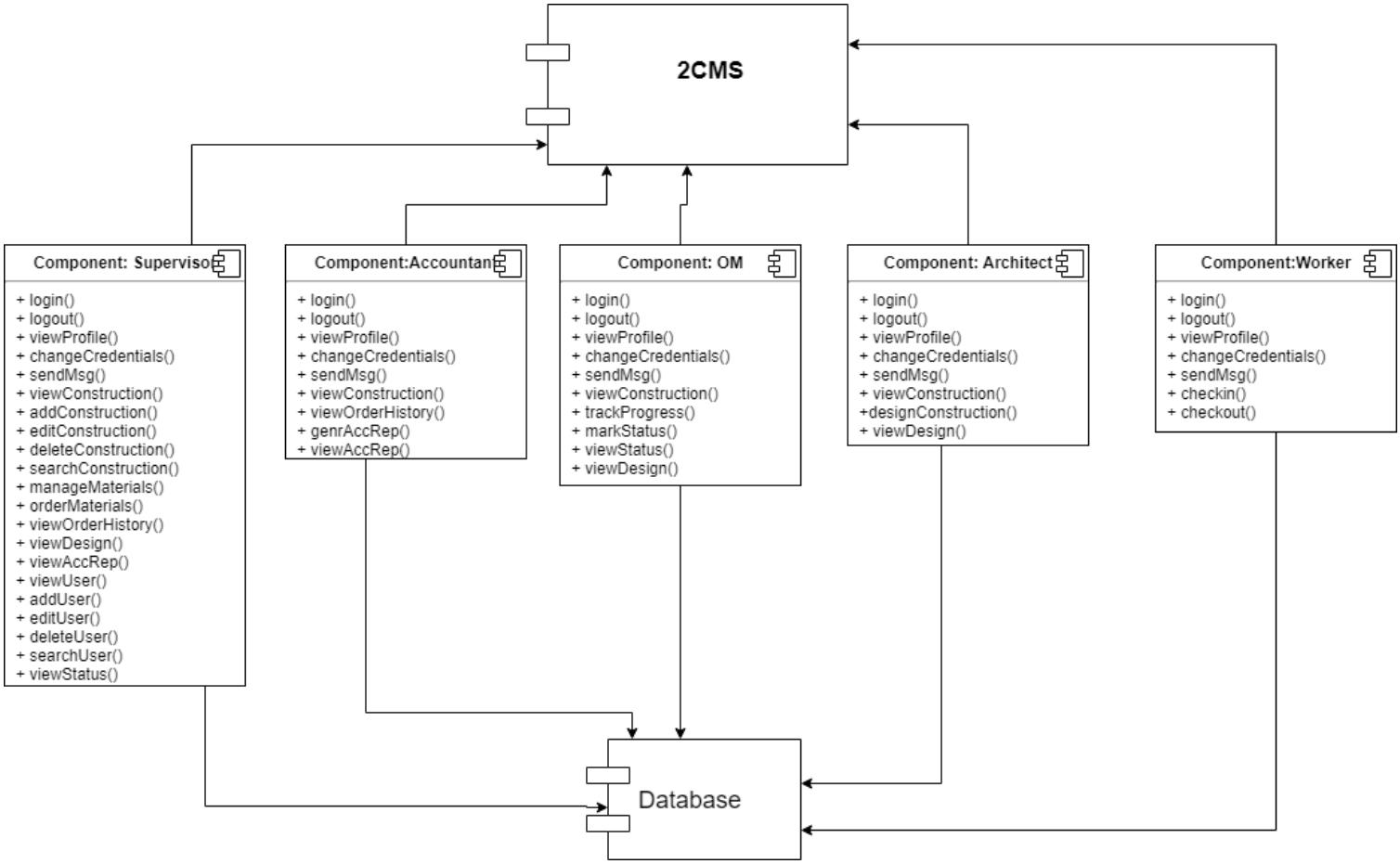
6.7 Class Diagram



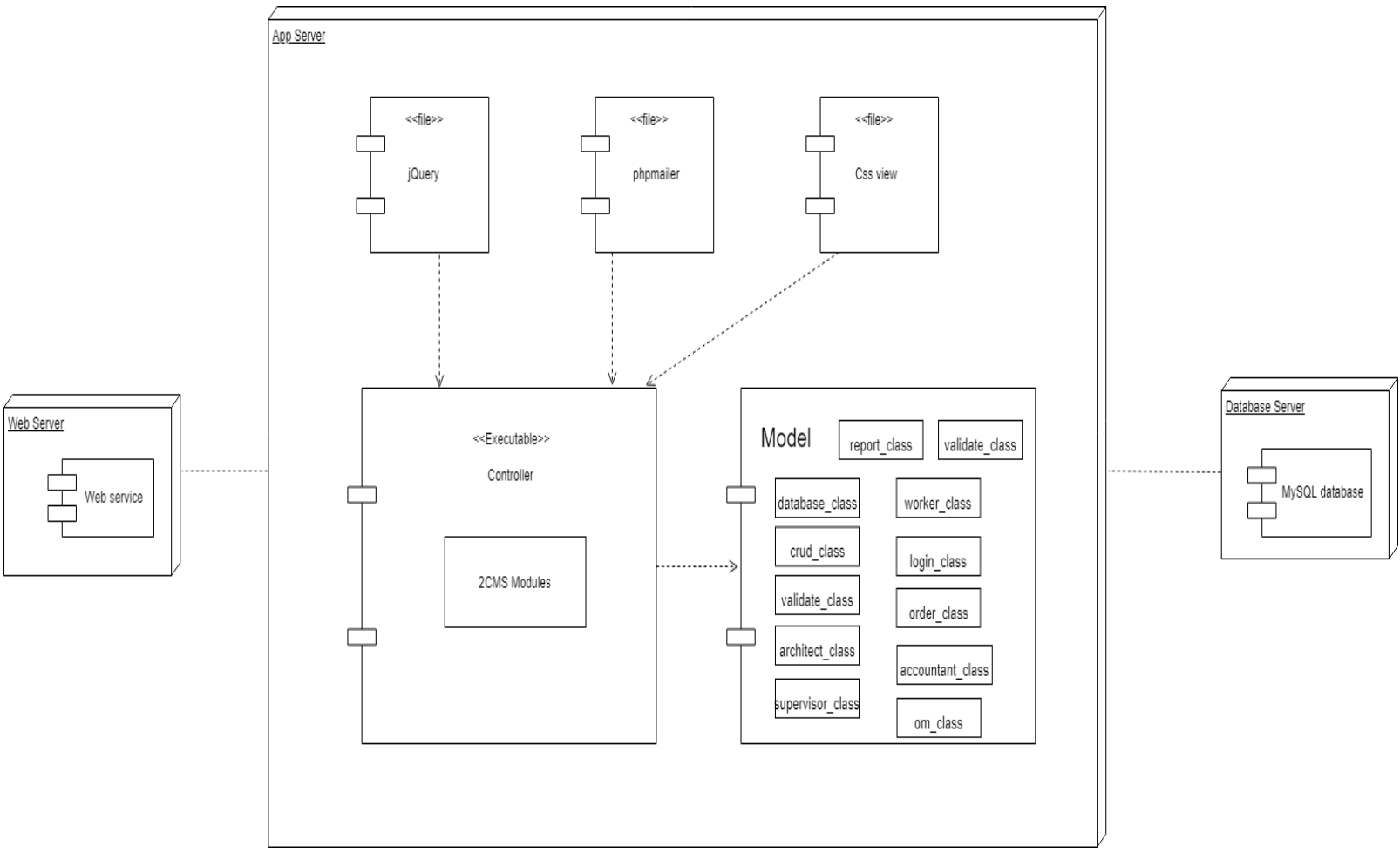
6.8 Object Diagram



6.9 Component Diagram



6.10 Deployment Diagram



APPENDIX

Appendix A. Definitions, Acronyms, and Abbreviations

- 2CMS – Construction Company Management System
- OM – Operation Manager
- CRUD – Create, Read, Update, Delete

Appendix B. References

How technology is reshaping the construction industry? Retrieved from:

https://www.constructconnect.com/blog/construction-technology/technology-reshaping-construction-industry/