ENT CONSTRUCTION

Information Systems Development

Final Year Project 2022

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Introduction

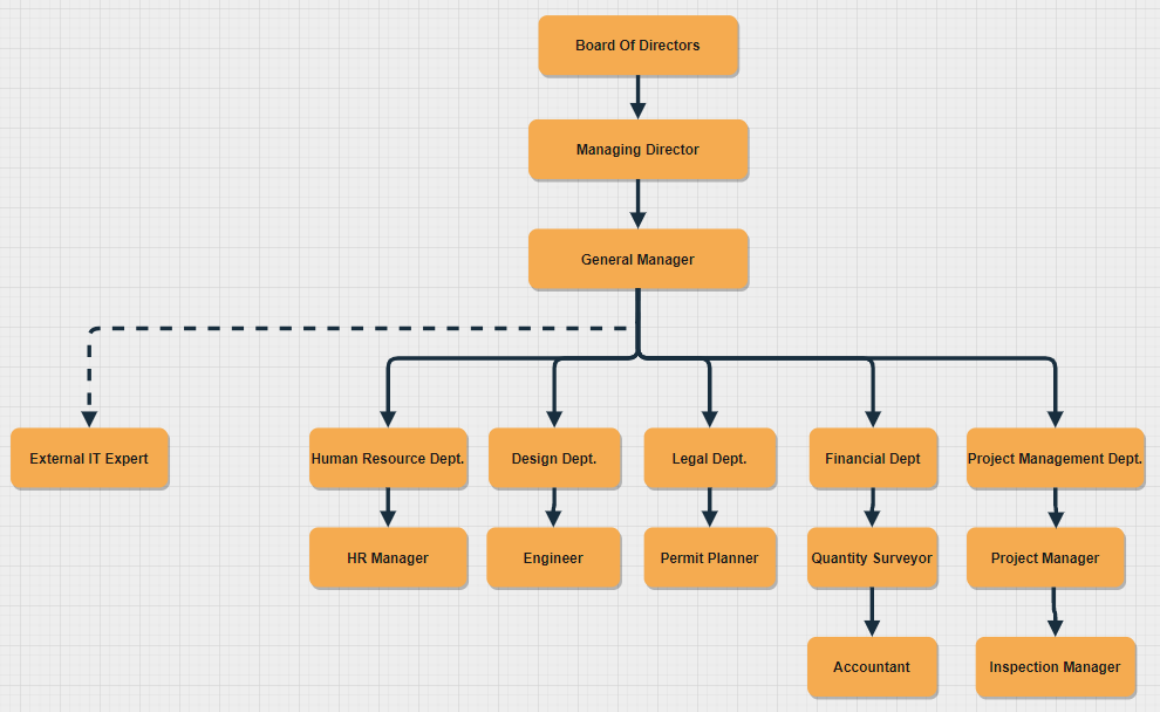
The participants of this study have conducted a significant amount of research into the background of small-scale construction companies. This includes visits to offices and sites, consultations with employees and management from a number of different firms as well as external parties such as suppliers and specialist staff. For this reason, we have based our current background and existing systems description on an amalgamation of different companies. This creates a generic company which combines the attributes of the companies researched and consulted with. The reasoning behind this is to give us a general insight into the operations of these companies. All the companies were of a similar size and conducted similar operations in the same locality. We observed the same protocols, structures, attitudes, habits and general operational behaviour from all researched companies. Crucially, the IT systems, or lack thereof, was a common occurrence throughout all firms examined

In the interest of privacy, we have excluded the names of all companies and persons in this study. Later on in the document, we have referred to the firm as “ENT Construction” for demonstration purposes.

Mission Statement

The objective of this report is to determine the viability of a proposed project management and scheduling software in use in a generic small scale construction firm. The objective of this proposed system is to enable all relevant parties easy collaboration on projects undertaken by the firm. Thorough research has led to the believe that there is both a gap and a need for this proposed system.

Overall Business Description & IT Strategy / Org chart for system



Current System Description

On observation of the current practises in place at a small-scale construction company, it was discovered that there was a lack of meaningful integration of operations with any form of an IT system. The general consensus was to use whatever application on was suited to a project on that particular day. This resulted in different parties of the firm using completely different systems for certain projects to do essentially the same tasks. There was also a noticeable number of staff who preferred to use traditional pen and paper methods of timekeeping and planning. It was discovered that many people at management level within the company had never been properly introduced to certain technologies. They deemed PCs and such as accessory technologies rather than necessities.

The reasoning for this was summed up by an employee of the company who provided consultation as part of this study. They mentioned how they had began working in construction before the influx of technology (particularly in rural Ireland) into everyday life. They had been trained in construction industry practices using traditional methods of timekeeping, recordkeeping, design, planning and communication. This is not to say they don't work with computers every day. In actual fact, they have a highly proficient level of computing. However, their first

instinct when planning a project or task is using the traditional methods first, then translating them to a digital version.

This mindset is echoed throughout the company, especially with more experienced staff members. The resulting IT system in place is somewhat lacking. The hardware is available on site and in offices, with all levels of management having their own PC. However, the software being used is outdated. It was discovered most staff members used older version of Microsoft Office for most tasks. Plans and drawings for projects, initially developed on Adobe's AutoCAD programme, were simply dispersed to relevant parties through email. The same protocol was in place for documentation wrote up on Microsoft Word. This resulted in some parties, both internal and external, having different version of the plans which had been modified. To modify the issue, emails and phone calls were made to seek clarification.

There was also a consultation with the contracts manager of the firm. They explained that most of the pricing and materials work was done using Microsoft Excel to list and price materials. They used Microsoft Project to comply the schedule of events. Excel was also used to a data store for critical information.

Consultation also took place with the externally sourced IT Department, who were hired on a contract basis rather than full time employees of the company. They gave a rundown of the IT infrastructure of the company. All project data created through Microsoft Excel and Project were stored on independent servers. This was intended to allow all relevant parties to access the files at any time. In truth however, aside from a small number of management, all files are generally shared through email.

The IT technician also expressed the need for a new system for better collaboration and they had recommended this to management when asked. However, the high cost of entry for these system packages has made management hesitant to implement such software.

Non-Values

- It is clear to see the biggest non value attribute is the hardware and software infrastructure in place at the firm. The infrastructure has the potential to make daily operations run much more efficiently, however it's full potential has not been exploited.

Current IT Strategy

The IT strategy in the firm is severally lacking. The software in use is outdated and the firm is slow to adapt to new technology. There is a severe lack of innovation in terms of IT. From consultation with the external IT department in use by the firm, it was discovered the firm would unknowingly choose to spend more money and time on a project by not being proactive IT wise than invest in any meaningful IT system outside the absolute necessities. Ironically, in the long run this has estimated to cost the firm as projects often run on a completely different timeline than originally agreed. As well as that a lack of preparedness has led to a substantial amount of expenditure on travel, meetings, equipment hire and sundry expenses that could have been avoided with a proper IT system in place as well as a strategy to support it.

The firm's strategy on hiring outside bodies to perform the duties of an IT department makes sense in theory. It is also commonplace for a construction company of this size. It doesn't make sense hiring staff on a full-time basis when they may only be called upon sparingly. However, this tactic has led to a complete lack of any direction in terms of an IT strategy. IT is only ever implemented on the fly or if absolutely necessary. The hardware (i.e. PCs) used by the firm is only updated when it becomes faulty. Ironically, this has meant that all PCs in head office are relatively up to date, as they need to be updated frequently.

The lack of innovation or investment means the firms IT strategy is extremely basic from an operational point of view. It consists of using the basic products on offer by Microsoft's 365 suite. There's no initiative to invest long term in any IT systems that may improve day to day managerial and logistic operations. The high entry price for software has placed doubt in the minds of the financial department.

Proposed System Description

The proposed system is essentially a method of improving collaboration on projects between all internal and external parties. The end goal of the system is to give all users access to view, add, edit and update tasks, timelines and other critical project information. The proposed system is accessible from a User's PC or mobile device. It is recommended that for configuring and altering data, the system be accessed via PC. For quick information on the go, the system be accessible from a mobile app or through a web browser via the web version. These methods would be in most cases for information retrieval purposes.

The system would be installed locally on all PC devices in a prospective company. The information would then be stored on a centralised cloud database, external to the company. The firms' staff would be able to access each project instantly, needing only a network connection. As well as cloud access, there would be the ability to download a project to store locally. This ensures peace of mind for the client in the event of data loss or disruption. It also avoids issues arising in the event of loss of network connectivity.

It is expected that all staff members would contribute the relevant information for input to the proposed system, For example, the Project Manager would enter a project outline, budget and timeline, the Site Manager would enter an inspection report and HR would enter Staff Listings. This involves simple data entry tasks. Upon completing these tasks, all relevant project members will have access to all critical details of a given project. As opposed to one or two coordinators attempting to gather information from a range of different people and sources, this system allows for all members to contribute the relevant information, quickly and properly.

Vale Added and Returns

- Data entered is clear and accurate. There is very little room for misinterpretation of data. Often, project managers are expected to understand a vast range of data from varying sources. This includes materials, pricing structures, staffing lists, budgeting data and other information. Retrieving this data involves substantial time and effort in consultation with a range of different parties. It also causes time delays and constraints on projects. With the proposed system, the responsibility to enter this information falls on that off the party providing the data. This will insure more accurate data collection.
- Another issue addressed by this system is time efficiency. It was noted in research that management spend a substantial amount of time on setting up meetings and such with multiple parties associated with the project. This results in poor time management. The information gained in these meetings is minimal. It could easily be replaced by a centralised platform capable of hosting all the relevant information. As a consequence of these meetings, employees are being paid travel expenses and such. This adds to costs and means said employees cannot perform more useful task during that time.
- One of the main factors which caused stakeholders to hesitate in implementing new software was the price. Software packages with a similar structure to the proposed system cost over €350 per month. The proposed system would cost a firm €399 in the first year and €499 thereafter. This results in a huge market advantage. It should also be enticing to firms wishing to implement a new system without investing huge sums of money.
- The system also allows for better integration of remote working protocols and software. After the COVID-19 pandemic caused the closure of non-essential workplaces, the firm found itself ill prepared to deal with the switch to remote working. The proposed system allows for better adaptability for staff and projects undertaken remotely.

IT Strategy

The new IT system should be integrated with current operational practises. The proposed system is not replacing another system per say. This means the prospective firm will not have to scrap any existing system in order to implement a new one. It can also be used in conjunction with any traditional methods.

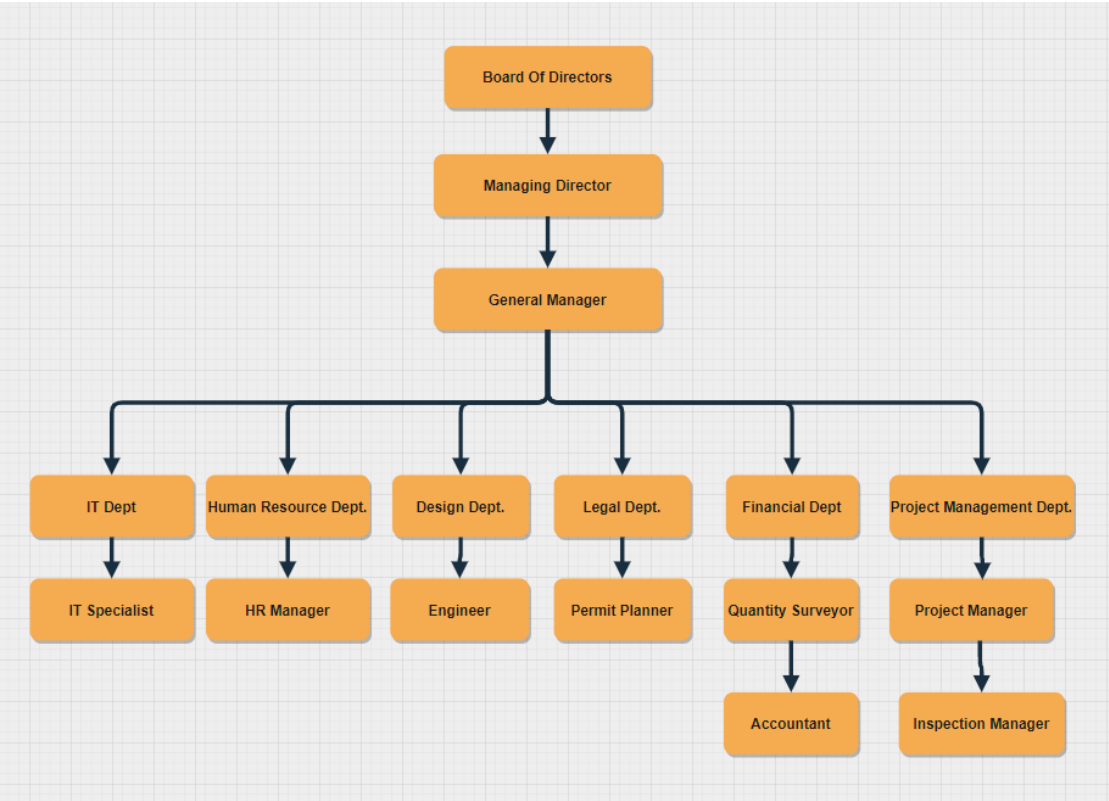
The timeline of the implementation rest on the prospective company. This can be carried out on an incremental level or in a radical style. It is recommended the change take place at an incremental level until all parties are comfortable with using the system. This can be achieved by implementing training from skilled mentors. Initially, this training is expected to take up two days for a small-scale company. Ideally, once training has been completed, staff will begin to implement habits and rituals for new employees to encourage integration the new system. Essentially, the best method of integration is incrementally changing the day-to-day tasks and habits of all staff, until a common practice approach is achieved. To assist in getting to this point, upon implementation, firms will receive access to comprehensive instructional resources. This can be used for new employees as well as external parties working on a project.

In terms of implementation, it is recommended each company carries out a survey of current operations. This should allow the IT staff to adjust the proposed system to suit the needs of those using it. It is recommended this reoccur after 4 years to account for possible changes in operations. This should be carried out prior to any training, ensuring the mentoring can be tailored towards the particular projects the company regularly undertakes.

Hardware and software upgrades should be considered before implementation. The system has a list of minimum requirements which must be met. These requirements should already be in place for a modern-day construction firm. Failure to meet the minimum standards should be remedied as this would leave the company completely incompetent at a technical level.

The creation of an internal IT department is also advisable. This ensures proper transition to the proposed system. As well as that, the implementation of innovative technologies puts companies in an advantageous position in such markets (Ullah, 2019). The introduction of a new IT department means in future the firm can introduce technology proactively as opposed to reactively. The issue of not having enough work to justify a full-time wage structure for a department can be circumvented by consistently exploring and upgrading IT solutions.

Revised Organisational Chart Post-Implementation



Methodology

The SSADM was the method chosen for this proposed systems analysis. This waterfall methodology allows to focus on the techniques of logical data modelling, data flow modelling and entity event modelling. There was particular emphasis placed on the data flow modelling in the development of this potential system.

The steps of this method in relation to the proposed system are as followed:

1. *Feasibility Study*
   A comprehensive feasibility study was undertaken to value the criteria, potential and viability of the proposed system The nature of the feasibility study was so comprehensive that it aided in the development of the design of the proposed system
2. *Analysis of current business requirements and environment*
   A thorough study of the prospective firm was undertaken. This included studies of the firm's structure, operations, financial performance, staff, projects and resources. This analysis was conducted through research, consultations, site visits and documentation of company information attainable
3. *Business Systems Options*
   This stage involved deciding upon what exactly the proposed system could provide, the level of input required and the type of output given
4. *Definition of requirements*
   This step involved identifying the process and data requirements of the proposed system. This required numerous data flow diagrams and a business process model to be developed. This step resulted in the classification of the requirements of the system.
5. *Technical Systems Options*
   This step allows for the hardware, software, knowledge, resources and personnel needed for the proposed system. It also allows consideration for how the proposed system will affect the prospective firm.
6. *Logical System Design*
   This involves developing how the users would interact with the system as well as how the system would react with data.
7. *Physical Design*
   This step involves how the proposed system would look and interact. It is an important step in the proposed design as it allowed for adjustments on which users could see what data and how it is presented to them.

The validation process of the proposed system will involve testing a prototype of the system with various different projects, vary in size and parties involved. This process will be repeated until all functions and system processes can be verified as functioning correctly.

Feasibility Study

Technical Feasibility

The availability and use of similar technologies in the construction industry shows it is possible to implement such software on a technical level. The system proposed requires similar technical resources that one would expect of a modern-day company. The integration of technology into all areas of business results in most innovative software having the ability to run on common place system architecture.

Hardware Requirements

The requirements for the proposed system will most likely be already in place at an existing firm of similar size to the target market. The system will be accessible from any PC or smart device. With much of day-to-day operational activity being conducted through the use of network connected PCs and smart devices, it is most likely the hardware requirements will be met prior to implementation of a new system. The number of PCs required should be similar to what's already in use by a modern-day construction company.

The minimum specifications of a PC for the proposed system to run is considered 2GB of RAM and at least 20GB of free disk space. The RAM will dictate how much and how quickly synchronisation can occur on the system. The disk space will account for the size of the applications, roughly 2GB based on calculations and similar systems, and storage of project information for offline use.

The slow uptake of certain technologies in the construction sector leaves the possibility of some firms not having the minimum hardware requirements. This would be a glaring weakness in a firm's ability to conduct projects correctly and efficiently. However, implementation of new hardware to match requirements is easily attainable. The implementation process dictates it does not fall on the providers of the proposed system to implement hardware. There are a number of IT solution firms established to provide these resources.

Another hardware requirement of this system is the ability for all relevant parties to access it on the go. This is where smart devices such as smartphones and tablets are preferred. This requirement would already be expected of a contemporary construction company. Failure to possess these requirements is also easily rectified, with most mobile network retailers offering contracts supplying all staff with smartphones.

The final hardware requirement of the proposed system is a reliable connection to the internet. The proposed system will be accessible online and stored on cloud services. This means access to the internet is crucial. However, because there will be no massive bandwidth being used to access the app (no streaming media or large downloads required), a relatively small amount of network usage is required. Due to the fact changes will be made on the system constantly, it is important to have reliable upload speeds as well as download speeds. This could sometimes prove difficult on

certain sites but easily reconcilable with the implementation of routers where required and reliable mobile network access.

Software Requirements

The system is expected to be capable of perform on any desktop or laptop machine with any operating system above and including Windows 7 and Mac OS X Lion. During research, it was discovered the large majority of computing infrastructure comply with these requirements. The vast majority of organisations run Microsoft's Windows operating System (Statista, 2022). Like the hardware specifications, if a firm is unable to meet the minimum software requirements, implementation of software is relatively simple, with Microsoft offering a business plan for enterprises who wish to introduce their software.

The system can be run by downloading the application, which is the preferred method for all apps of this nature. This is to ensure proper integration with a company's existing hardware and software. However, the possibility of a chromium based "lite" version of the system, accessible through a web browser is also advantageous. This requires any browser running on chromium web browser architecture. This requirement is commonplace in all workplaces. Implementation is a simple download. Almost all browsers in 2022 are free.

Finally, for the system to be accessible on the go, there is the potential need for a mobile device application. This would require user's mobile phones or tablets to be running on relatively up to date software. Development of modern-day Android and IOS applications hinges on the devices running a minimum software that's over 5 years old (Android 8.0 and IOS 11). Given the lifespan of most mobile devices is less than this (Valorvortech.com, 2022) means most devices will be guaranteed to be running the correct software.

Potential issues for a firm arising from not having the correct mobile software can be resolved by the purchase of new devices where necessary. This can be done by creating a contract with mobile operators and providers tailored for business needs. Alternatively, these issues can be negated by certain staff members accessing the system through the PC client only.

IT personnel and knowledge requirements

The basis of the system is to give all parties a user-friendly UI and allow simple data entry tasks to be translated to an all-encompassing overview of the company's ongoing operations. The system, once implemented, should be relatively easy to understand quickly, with a gentle learning curve. With the use of basic IT systems now being intrinsically linked to the everyday operations of construction staff, the average employee should have no difficulty using the system.

The implementation and monitoring of the system may require a trained IT technician. During observations of daily operations of a small construction firm, it was discovered the preferred IT solution was to hire an external worker or firm to provide IT assistance whenever it was required. This ensures the construction firm has assistance available whenever necessary, while also ensuring funds aren't wasted employing a fulltime employee for temporary work.

The possible issues arising from lack of knowledge from users of the proposed system has been considered. To rectify this issue, it has been recommended that training be provided to explain how the system works. Ideally, upon initial implementation, this training would involve a skilled instructor to perform an overview of how the system works, its capabilities, how it will change the day-to-day operations of projects and how it will affect certain staff individually. It is estimated that for a small-scale company, this activity would take no more than 2 working days upon initial implementation. It is also recommended that the prospective company employ training every year at a lower rate for new employees as well as possible changes/upgrades to the application.

Based on the above analysis, it is deemed the prospective system is technically feasible for a small-scale construction company to implement. The computing infrastructure and persons is already in place in most scenarios. Improvements to meet the technical requirements of the system are also easily accessible. In truth, a construction firm without the minimum technical requirements for this system will fail in meeting the modern-day standards of a firm.

Financial Feasibility

Cost Benefit Analysis

This method has been conducted from the point of view of a potential purchaser of the projecting software. This firm would most likely have between one and five projects ongoing at any one time. They would have no more than fifteen projects within a calendar year. The financial analysis conducted in the cost benefit framework gives an indication of how much the company could expect to make with the introduction of this software versus the expenditure on implementation and development costs. The following data is estimation based on a small-scale construction company. Along with thorough research, these figures have been estimated with the help of consultation with management of contractors of a similar nature to what we would expect to be the target market of this software. These figures are intended to be scalable to compensate for any larger or smaller scale projects and businesses. The objective of this benefit is to show the feasibility of the proposed system in proportion the to potential profit of a given project.

Benefits	2023	2024	2025	2026	2027	Total
Profit Revenue increase	€0	€10,000	€15,000	€17,000	€20,000	€62,000
Increase of Time Efficiency	€1,000	€2,000	€2,500	€3,000	€3,500	€12,000
Decrease in Equipment expenses	€200	€300	€350	€350	€350	€1,550
Cost savings on redundant liasons	€300	€500	€600	€600	€600	€2,600
Total Value of Benefits	€1,500	€12,800	€18,450	€20,950	€24,450	€78,150
Development Cost						
Annual Subscription to Service	€399	€499	€499	€499	€499	€2,395
Implementation Training	€200	€100	€100	€0	€0	€400
Implementation Costs	€250	€0	€0	€0	€0	€250
Survey of Operations	€150	€0	€0	€0	€150	€300
Total Development Costs	€999	€599	€599	€499	€649	€3,345
Operational Costs						
Hardware Upgrade	€1,100	€100	€100	€100	€600	€2,000
Software Upgrade	€500	€0	€0	€0	€500	€1,000
Maintenance	€100	€100	€100	€100	€100	€500
Total Operational Costs	€1,700	€200	€200	€200	€1,200	€3,500
Total Costs	€2,699	€799	€799	€699	€1,849	€6,845
NET BENEFITS OF IMPEMENTATION	-€1,199	€12,001	€17,651	€20,251	€22,601	€71,305

Benefits

Profit Revenue increase

Due to the implementation timeline and the need for surveying, training and hardware/software upgrades, it is estimated the software may not have a huge affect on the sales revenue in the first year. This period is intended for users to become familiar with the software and develop into the habit of utilising the software.

Within the Year 2, the sales figure is expected to show its largest increase. This is due to the firm's employees becoming familiar with the software. If successfully implemented, the software should cut cost wastage significantly within a year. This will result in a substantial impact on the firms bottom line for numerous projects, if not all.

Year 3s profit revenue increase is expected to show less growth than the previous years as the initial impact of the software passes. However, as the firm becomes more familiar and tinkers with different projects with the aid of the software, there will remain a trend of increasing profit margins. This trend is expected to continue in year 4 at a slower pace again.

Year 5 is expected to be the optimum year of the software in its current iteration. The prospective firm will have gained experience which would enable them to realize the full potential of the system for their business. The increase on profit as a result of the software could be double that of the second year after implementation. In total, over the five-year period, the prospective firm could stand to increase its profit revenue by €62000.

Increase in Time efficiency

This benefit is an intangible cost saving implications based on the use of the proposed system. This is mainly due to the collaboration features of the system, allowing staff members to instantly see the status of critical project information and progress. The access to this information overview instantly will cut out the need for redundant travel expenses of employees and wages for hours misused. These hours may also be used to perform more beneficial tasks for the firm or on a project. The increase on time efficiency is expected to save the company €1000 in the initial year raising to €3500 in Year 5. This could save the company €12000 in the 5-year period.

Cost savings on Redundant Consultations and Meetings

Due to the system's ability to let each party access relevant information instantly, the need for a number of meetings between staff as well as external parties is unnecessary. This is estimated to save the company €2600 in the 5-year period. This is crucial considering the general notion that meetings in modern day practises already lack substance when compared to cost (Rogelberg, 2007).

Decrease in equipment expenses

The system is intended to allow better planning and coordination. The ability to know exactly what is needed on a site at a particular time allows for reduction in monies

spent on rental and transport of equipment. This is due to employees not needing to overestimate the duration of certain tasks. This is expected to save the prospective firm €1550 in a 5-year period.

Costs

Annual Subscription to Service

The pricing structure of the service is likely to be €399 in the first year and €499 thereafter. This translates to €33.50 per month for 1 year and €42 a month after. Giving consumers an incentive (i.e., a discount or free trial) to trial the software for an initial period is proven to substantially increase the uptake of a service (Huijie,2022). The annual price is incredibly competitive when compared to similar software in the construction industry.

Implementation Training

Upon implementation, it is necessary for a firm to undertake training provided by the suppliers of the system. This training should be implemented at a reduced fee upon purchase of the system. In the first year, it is estimated the prospective firm could receive two days of training on how to use the software as well as its features and best practices. This training would be reduced to one day a year for additional staff in years 2 and 3. Following this, it is hoped the firm would have the ability to implement their own training on induction of new staff and external parties.

The cost of training figure is in line with cost of training for required licenses and passes in the construction industry in Ireland (SOLAS,2022).

Implementation Costs

It is recommended any firm acquiring this system be supplied with or hire trained IT technicians to implement the software structure. This is a one-off cost in Year 1 of implementation. This figure is calculated on the assumption that the prospective firm would have one head office where this could be implemented centrally and adding the cost of labour and expenses for a trained IT technician (Payscale.com, 2022).

Survey of Operations

On purchasing the software, it is recommended a survey of operations is carried out to assess the needs of the firm. This will assist in the training and day to day use of the system. It is also recommended this be repeated four years later to account for any changes in the firm’s operations or external environment.

Hardware Upgrade

To be best prepared for the implementation of this software, it is recommended the firm perform hardware upgrades to the IT in place. This involves ensuring minimum systems specifications are met on all computing used by the new system. This figure considers the fact most modern-day construction firms have, in the main, up to date hardware in place. This upgrade process should be repeated four years later on a smaller scale.

Another factor that adds to the cost of the implementation is the need for network connectivity. This could cause difficulty in some sites where network coverage may be required, costing roughly €100 per annum from Vodafone Ireland, who possess the best geographic network coverage at the best value price.

Software Upgrade

This cost is to ensure the firm has the required software up to date on its machines in order to utilise the software. This cost is reoccurring every five years, to account for the frequency of new software releases from major operating system providers (Microsoft, 2021). This practice is recommended for a firm of any nature regardless of system implementations.

Maintenance

The maintenance for a prospective company is estimated to be €100 per annum. This is a liberal estimate as upon implementation. This is to account for the possibility of staff and departments with an improper IT skillset requiring further assistance or running into issues. Despite this being a liberal estimate, it is fundamental to consider these costs when analysing feasibility (Rehman, 2018).

The cost benefit analysis shows the proposed system is financially feasible on implementation to a prospective small scale construction company. The potential return on investment far outweighs the cost incurred by introducing this proposed system over a five-year period.

Operational Feasibility

The goal of the proposed system is to improve efficiency of a firm's time and resources. To determine the viability of the system, it must be considered what problems the prospective firm is facing and how the proposed system can eradicate these issues. During analysis and observation of a small-scale construction company (considered the target market for the system), the following issues were found on an operational level:

- Existing software in place is outdated
- Newer software is too expensive for a small-scale company to use (Project management software Procore™ begins at $375 per month).
- Communication and collaboration internally and externally on projects is inadequate.
- The firm's expenditure on meetings and travel are high and affecting the profit margin on projects.
- Certain departments are left waiting on updates to the status of projects from other parties, resulting in poor time management efficiency.
- Clients are passed on to different departments for clarification.
- Timelines on projects are often inaccurate.
- Lack of remote working initiative despite the effects of COVID-19 pandemic.

Exploring these issues, it is obvious to see there exist the potential for a system to be implemented to address the problems. The lack alternative affordable software represents an opportunity to fill a gap in the market. Firms making a 15% markup on a small number of projects undertaken cannot be expected to spend over €4000 ($4500) on software. The target firm is also spending a significant amount of funds on unnecessary meetings and liaison which could be rendered redundant with proper use of the proposed system. As well as this, the proposed system would vastly improve the collaboration efforts of parties both internal and external on the progress of project tasks and projects.

The stakeholders for the proposed system would be widespread throughout all levels of a company. They would also include external parties with input on certain products. All parties would be expected to input their relevant participative information to allow interested parties to see the status of tasks. This will inevitably change the day-to-day tasks of anyone associated with a project, on any level. This may result in a 5-minute data input task or quick rundown of certain criteria. It could also result in a significant amount of time being invested to adding information to the system each day. Ultimately however, adding bit sized bites of information each day will save employees a huge amount of time and aggravation in the long run. It also ensures conflicts and possible issues that may arise are detected early on in the planning stage.

Management will see a huge benefit in the implementation of this system. To properly analyse the progress of a project, management needs the ability to have

access to a range of data. Ordinarily, this would involve a significant amount of liaison with a number of staff, often people who have been tasked with compiling critical information and progress of a project. However, with the use of this system, management can get an overview of this information very efficiently. Because parties will be adding the relevant information to a centralised system regularly, it cuts out the need for tracking down information from numerous parties. This will aid management in the use of decision making and planning.

Another stakeholder whose role will be dramatically changed by this system is the external parties on a project. If they are participating in a project, they will be encouraged to follow the systems protocol. They will also be given access to relevant project information, allowing more efficient collaboration. This will result in more efficient dealings with the construction firm on projects.

Upon conducting the above analysis, it is deemed the proposed system is operationally feasible for implementation.

Legal Feasibility

The following is a checklist of compliance with European Union's GDPR guidelines GDPR.EU, 2022):

Condition	Achievable?	Method of compliance
• Conduct an information audit to determine what information you process and who has access to it.	Yes	• Conduct required information audit
• Have a legal justification for your data processing activity.	Yes	• Ensure legal grounds for any processing on the system
• Provide clear information about your data processing and legal justification in your privacy policy.	Yes	• Ensure Clarity in privacy policy provided with system
• Take data protection into account at all times, from the moment you begin developing a product to each time you process data	Yes	• During the development and implementation of the system, data protection is treated as a priority
• Encrypt, pseudonymize or anonymise personal data wherever possible.	Yes	• Use encryption and anonymity wherever necessary
• Create an internal security policy for your team members and build awareness about data protection.	Yes	• Create the appropriate policy and add compulsory awareness protocols for relevant parties
• Know when to conduct data protection impact assessment and have a process in place to carry it out.	Yes	• Conduct data protection impact assessments on a regular basis and implement proper procedures
• Have a process in place to notify authorities and your data subjects in the event of a data breach.	Yes	• Implement notification of data breach protocol to relevant parties

• Designate someone responsible for ensuring GDPR compliance across your organisation.	Yes	• Assign GDPR compliance officer duties to staff member
• Sign a data processing agreement between your organisation and third parties that process personal data on your behalf.	Yes	• Should third parties be used to process data, ensure data processing agreement is in place
• If your organisation is outside the EU, appoint a representative within one of the EU member states.	Yes	• System exists inside the EU
• Appoint a Data Protection Officer (if necessary).	Yes	• Assign Data Protection Officer duties to staff member
• It's easy for customers to request and receive all the information about them.	Yes	• Create client and staff portal for information retrieval
• It's easy for your customers to correct or update inaccurate or incomplete information.	Yes	• Create client and staff portal for information update and correction
• It's easy for your customers to request to have their personal data deleted.	Yes	• Create client and staff portal for data deletion requests
• It's easy for your customers to ask you to stop processing their data.	Yes	• Create client and staff portal for seizure of data processing
• It's easy for your customers to receive a copy of their personal data in a format that can be easily transferred to another company.	Yes	• Create client and staff portal for personal data retrieval and transferring

• It's easy for your customers to object to you processing their data.	Yes	• Ensure clients and staff always have an opportunity to object to data processing •
• If you make decisions about people based on automated processes, you have a procedure to protect their rights.	Yes	• Ensure any decisions undertaken using data considers privacy of data

Having completed the relevant task list on GDPR, there is clear confirmation that the proposed system can satisfy the appropriate privacy requirements.

The data governance can be modelled off this checklist. Each relevant person will be given responsibility to both know and implement this data policies in their work and/or in the area they administrate.

Specific Requirements

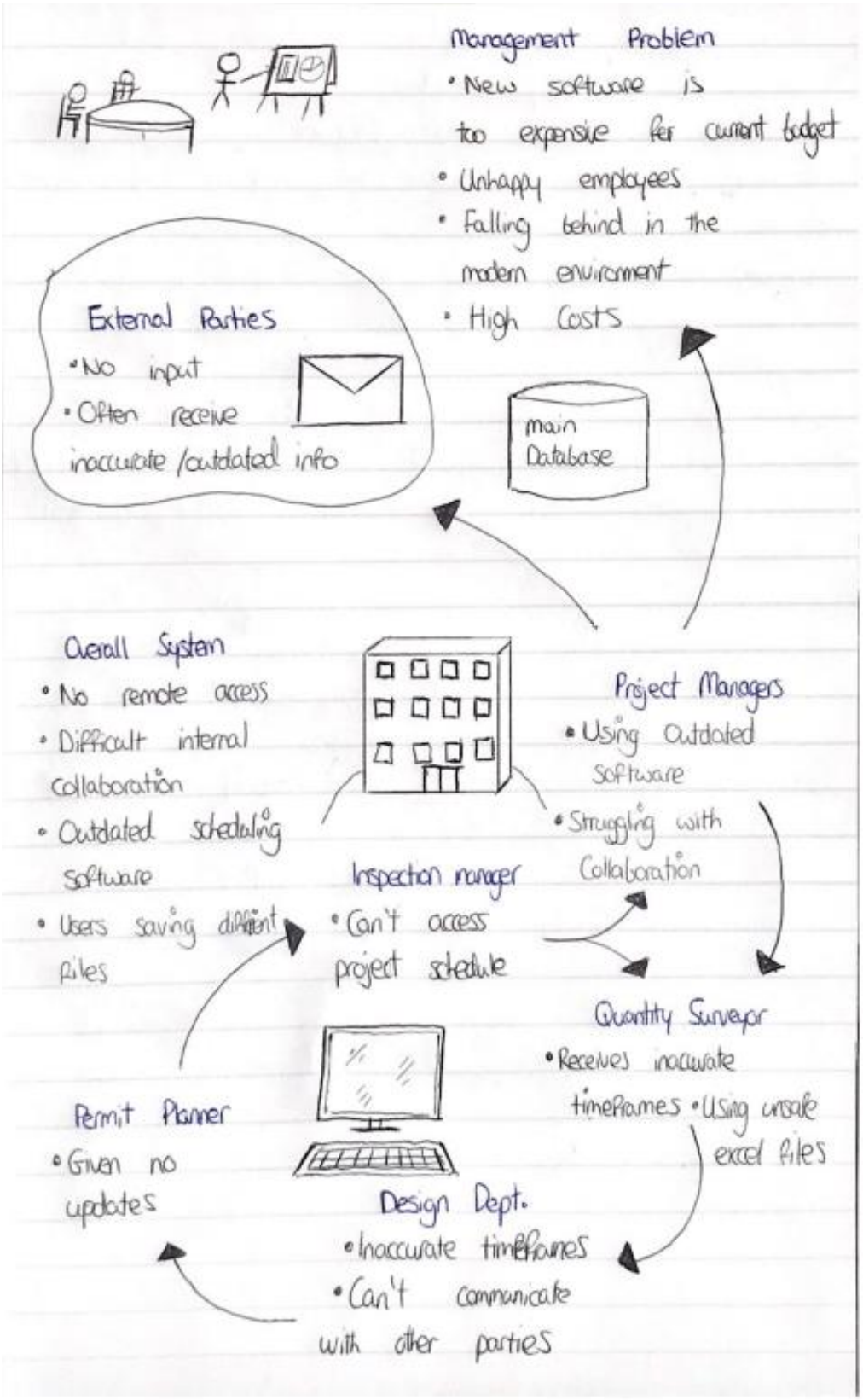
Hardware Requirements (Specific)

- Each member of staff is expected to have access to a PC with minimum 2GB RAM and 20GB free disk space. It is recommended the company have a minimum 0.75 PC for each member of office/ administration staff (i.e. an office with 4 people would be expected to have 3 PCs available). From our studies this hardware infrastructure is already common place in almost all construction companies of this size.
- Each office is expected to have access to reliable network connectivity. The system will work with low network speeds (mb/s), however the stronger and faster the connection the better. Network adapters and network powerlines could be purchased for wired connection to hardware, insuring maximum speed. Again, some form of reliable network connectivity is commonplace in construction offices.
  A prospective firm may want to use mobile WIFI routers for use on remote sites as well as offices.
- Mobile devices such as phones and tablets are recommended for ease of access on the go. The system can be accessible through an application or the devices browser.

Software Requirements (Specific)

- All PCs should be running a minimum of Windows 7 or Mac x Lion operating system. The preferred OS is Windows 10/11. This is also the most common operating system in use worldwide
- The application can be accessed through a web browser such as Chrome, Firefox or Microsoft Edge
- Mobile devices accessing the system should be equipped with Android 8.0 or IOS 11 minimum.

Soft Systems Methodology– Overall Rich Picture



Soft Systems Methodology – Business Issues

CATWOE Analysis

Customers

Project stakeholders/clients are suffering from projects going wrong due to software inputting issues/inaccuracies. A new system will benefit the end product creating higher quality projects for customers.

Actors

All employees within the company will benefit from the system upgrade allowing them to work on and view all projects

Transformation

A new system will operate under a new process of project creation. The project manager will create the project then allowing all stakeholders to add their individual reports.

World View

This system input will be a positive trend in the world view. All external stakeholders will agree with a new better developed system.

Owners

The general manager is the main owner of the problem situation. The owner will positively impact the change as they originally identified the problem and is open to the idea of system development.

Environment

Some environmental constraints exist in GDPR related issues.

Hard – Requirements Catalogue

Requirement ID	Business Area	Process	Description	How it will happen
PMS-1	Project Manager	Project Outline	Project outline report created outlining ID, scope and requirements	Record created in project outline datastore, ID assigned and report created
PMS-2	Project Manager	Client Input	Client full name inputted	Input stored in project outline datastore and added to project outline report
PMS-3	Project Manager	Status	Status of project inputted	Input stored in project outline datastore and added to project outline report
PMS-4	Project Manager	Project Scope Input	Project outline scope inputted	Input stored in project outline datastore and added to project outline report
PMS-5	Project Manager	Timeline	Timeline report created & unique ID created	Record created in timeline reports datastore, ID assigned, and report created
PMS-6	Project Manager	Timeframe input	Timeframe requirements and ID	Input stored in timeline reports datastore, ID assigned and added to timeline report
PMS-7	Project Manager	Timeframe layout	Timeframe layout created through consultation of set layouts	Layouts created from Timeline reports datastore and report created

PMS-8	Project Manager	Dates Input	Dates inputted into report	Dates inputted into reports, moved to inspection process and stored in timeline reports datastore
PMS-9	Inspection Manager	Inspection	Process of creating inspection report	Inspection requirements added to report and saved in datastore
PMS-10	Inspection Manager	Inspection report input	Inspection report given ID and layout form consulted	Inspection report ID created and report layout used from inspection reports datastore
PMS-11	Inspection Manager	Requirements Input	Inspection report requirements inputted into layout form	Inspection report transferred to site manager and stored in inspection reports datastore
PMS-12	Permit Planner	Construction Permits	Process of creating a permit application	Inspection report used to create and store permit application
PMS-13	Permit Planner	Permit Input	Permit assigned ID and details	Permit ID and details inputted into system
PMS-14	Permit Planner	Permit Application Input	Permit report created using layout supplied by permit planner	Permit ID & details inputted into application form and stored in construction permits datastore
PMS-15	Design Dept.	Construction Plans	Process of inputting the construction plan	Construction Plan inputted by design dept. and stored in plan reports datastore

PMS-16	Design Dept.	Input Plan report	Finalised permit used to input plan report	Layout used from plan report datastore and ID and details inputted
PMS-17	Design Dept.	Define approach from CAD printouts	Plan approach inputted from CAD printout	Design dept. input Computer aided designs and approach detailed in report
PMS-18	Design Dept.	Define W.B.S	Work breakdown structure added to report	W.B.S added to plan report and finalised version saved to plan reports datastore
PMS-19	Quantity Surveyor	Bill Of materials	Bill of materials report creation process	BOM report created and saved in BOM datastore by quantity surveyor
PMS-20	Quantity Surveyor	Input BOM report	BOM report created using plan report	BOM report created using layout from BOM datastore and requirements detailed
PMS-21	Quantity Surveyor	Costing Input	QS adds pricing inputs into report	Costings inputted into report and saved in BOM datastore
PMS-22	Sub-Contractor	Materials report created	Materials report created using BOM report	Report given ID and layout from material report datastore
PMS-23	Sub-Contractor	Materials Info input	Materials name and cost added to report	Requirements added by sub-contractor and report finalised and added to materials report datastore

PMS-24	Human resource department	Staff Assignment	Project manager assignment	Assigned project manager details stored
PMS-25	Human resource department	Select Project Manager	Manager assigned	Project manager adds name and ID which is then stored in staff assignment datastore

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-1		
Requirement Name:		Project Outline		
Business Area/Domain:		Project Management Dept.		
Source:		Project Manager		
Owner:		ENT CONSTRUCTION		
Priority:		HIGH		
Type of Requirement:		Functional		
Requirement Description:		Project outline report created outlining ID, scope and requirements		
Associated Non-Functional Requirements:		Availability, Archiving		
Acceptance Criteria:		Unique ID given to project outline report		
Related Documents:		Timeline report, plan report		
Related Requirements:		PMS-2, PMS-3, PMS-4, PMS-5		
Resolution:		Report created with record for ID, scope, client name etc.		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-5		
Requirement Name:		Timeline		
Business Area/Domain:		Project Management dept.		
Source:		Project Manager		
Owner:		ENT CONSTRUCTION		
Priority:		HIGH		
Type of Requirement:		Functional		
Requirement Description:		Timeline report created and stored in timeline reports datastore		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Timeline report created and given unique ID		
Related Documents:		Project Outline report, Inspection report		
Related Requirements:		PMS-1, PMS-6, PMS-7, PMS-8, PMS-9		
Resolution:		Report created that adds records with ID, timeframe, dates etc.		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-9		
Requirement Name:		Inspection		
Business Area/Domain:		Project Management dept		
Source:		Inspection Manager		
Owner:		ENT CONSTRUCTION		
Priority:		HIGH		
Type of Requirement:		Functional		
Requirement Description:		Inspection requirements added to report and saved in datastore		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Inspection report created and unique ID added		
Related Documents:		Project Outline report, timeline report, permit report		
Related Requirements:		PMS-10, PMS-11, PMS-1, PMS-12		
Resolution:		Report created that stores records site inspection requirements		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-12		
Requirement Name:		Construction Permits		
Business Area/Domain:		Permit Dept.		
Source:		Permit Planner		
Owner:		ENT CONSTRUCTION		
Priority:		High		
Type of Requirement:		Functional		
Requirement Description:		Inspection report used to create and store permit application		
Associated Non-Functional Requirements:		Backup & recovery, Archiving		
Acceptance Criteria:		Permit application created with ID added		
Related Documents:		Project outline report, inspection report		
Related Requirements:		PMS-1, PMS-13, PMS-13, PMS-9		
Resolution:		Report created detailing records showing application information		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-15		
Requirement Name:		Construction Plans		
Business Area/Domain:		Design Dept.		
Source:		Design Dept.		
Owner:		ENT CONSTRUCTION		
Priority:		High		
Type of Requirement:		Functional		
Requirement Description:		Construction plans inputted and report created		
Associated Non-Functional Requirements:		Backup and recovery, Archiving		
Acceptance Criteria:		Plans report created and assigned unique ID		
Related Documents:		Project outline report, inspection report, BOM report		
Related Requirements:		PMS-1, PMS-9, PMS-12, PMS-16, PMS-17, PMS-18		
Resolution:		Report created with records detailing construction plan information		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-19		
Requirement Name:		Bill Of Materials		
Business Area/Domain:		Costing Dept		
Source:		Quantity Surveyor		
Owner:		ENT CONSTRUCTION		
Priority:		High		
Type of Requirement:		Functional		
Requirement Description:		Bill of materials report created in system and save in datastore		
Associated Non-Functional Requirements:		Usability		
Acceptance Criteria:		BOM created and unique ID given		
Related Documents:		Project outline report, inspection report, construction plan report		
Related Requirements:		PMS-1, PMS-12, PMS-9, PMS-20, PMS-21		
Resolution:		New report page created with records containing bill of materials info		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-22		
Requirement Name:		Materials Reports		
Business Area/Domain:		Costing Dept		
Source:		Sub-contractor		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Material report created and layout inserted		
Associated Non-Functional Requirements:		Backup and recovery		
Acceptance Criteria:		Report created, unique ID given, and sub-contractor adds costing input		
Related Documents:		Project outline report, Bill of materials report		
Related Requirements:		PMS-1, PMS-19, PMS-23		
Resolution:		New report page created and sub- contractor costs inputted		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-24		
Requirement Name:		Staff Assignment		
Business Area/Domain:		Human resource dept		
Source:		Human resource manager		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		General		
Requirement Description:		Project manager details assigned to the project and saved in datastore		
Associated Non-Functional Requirements:		Availability		
Acceptance Criteria:		Project manager name assigned		
Related Documents:		Project outline report, timeline report		
Related Requirements:		PMS-1, PMS-5		
Resolution:		Report created with records for all project manager details		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-4		
Requirement Name:		Project scope input		
Business Area/Domain:		Project management dept		
Source:		Project manager		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Project outline scope inputted and stored in system		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Minimum 25 character project scope input		
Related Documents:		Project outline report, Timeline report		
Related Requirements:		PMS-1, PMS-2, PMS-3		
Resolution:		Record created and stored that satisfies full scope entry requirements		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-7		
Requirement Name:		Timeframe Layout		
Business Area/Domain:		Project management dept		
Source:		Project manager		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Project timeframe created through consultation of set layouts and		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Layout added to system		
Related Documents:		Project outline report, Timeline report		
Related Requirements:		PMS-1, PMS-5, PMS-6		
Resolution:		Record created and stored detailing project timeframe layout		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-8		
Requirement Name:		Project dates input		
Business Area/Domain:		Project management dept		
Source:		Project Manager		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Dates inputted into report		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Start and end date added to report for project		
Related Documents:		Project outline report, timeline report		
Related Requirements:		PMS-1, PMS-2, PMS-5, PMS-7		
Resolution:		Record created in report that details start and end dates		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-14		
Requirement Name:		Permit Application Input		
Business Area/Domain:		Permit dept		
Source:		Permit planner		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Permit report created using layout supplied by permit planner		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		Permit application added to system by permit planner		
Related Documents:		Project outline report, construction plan report		
Related Requirements:		PMS-1, PMS-13, PMS-15		
Resolution:		Permit application report created and stored in datastore		

ENT Construction		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-17		
Requirement Name:		Design approach from computer aided design printouts		
Business Area/Domain:		Design dept		
Source:		Design dept		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		Plan approach inputted through consultation of C.A.D printout		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		C.A.D printout is accessible and approach input is open		
Related Documents:		Project outline report, timeline report, construction plan report		
Related Requirements:		PMS-1, PMS-5, PMS-15		
Resolution:		Record added to report that outlines approach plan to project		

ENT CONSTRUCTION		Requirements Catalogue		
		Project ID & Name	Project Management Software	
	Date:	**Version:**	**Status:**	
	15/03/2022	V1.0	Completed	
Requirement ID:		PMS-21		
Requirement Name:		Costing input		
Business Area/Domain:		Design dept		
Source:		Quantity surveyor		
Owner:		ENT CONSTRUCTION		
Priority:		Medium		
Type of Requirement:		Functional		
Requirement Description:		QS adds pricing inputs into report		
Associated Non-Functional Requirements:		Archiving		
Acceptance Criteria:		QS adds total costing input		
Related Documents:		Project outline report, construction plan report, materials report		
Related Requirements:		PMS-1, PMS-20, PMS-22		
Resolution:		Records are created in the report detailing individual costing inputs		

Data-Flow Diagrams

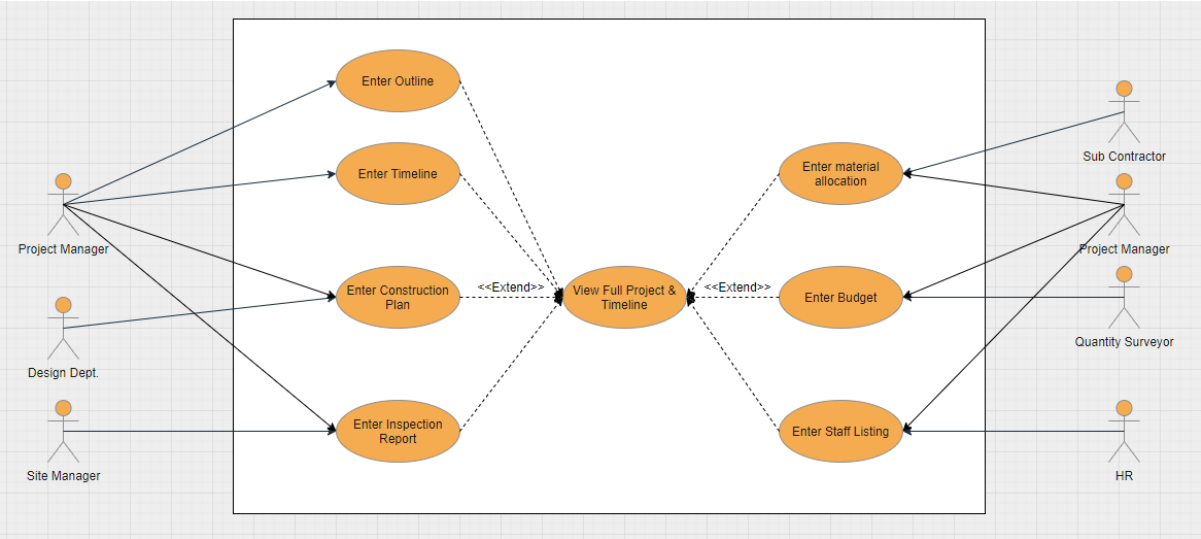


Figure 1- Use Case Diagram

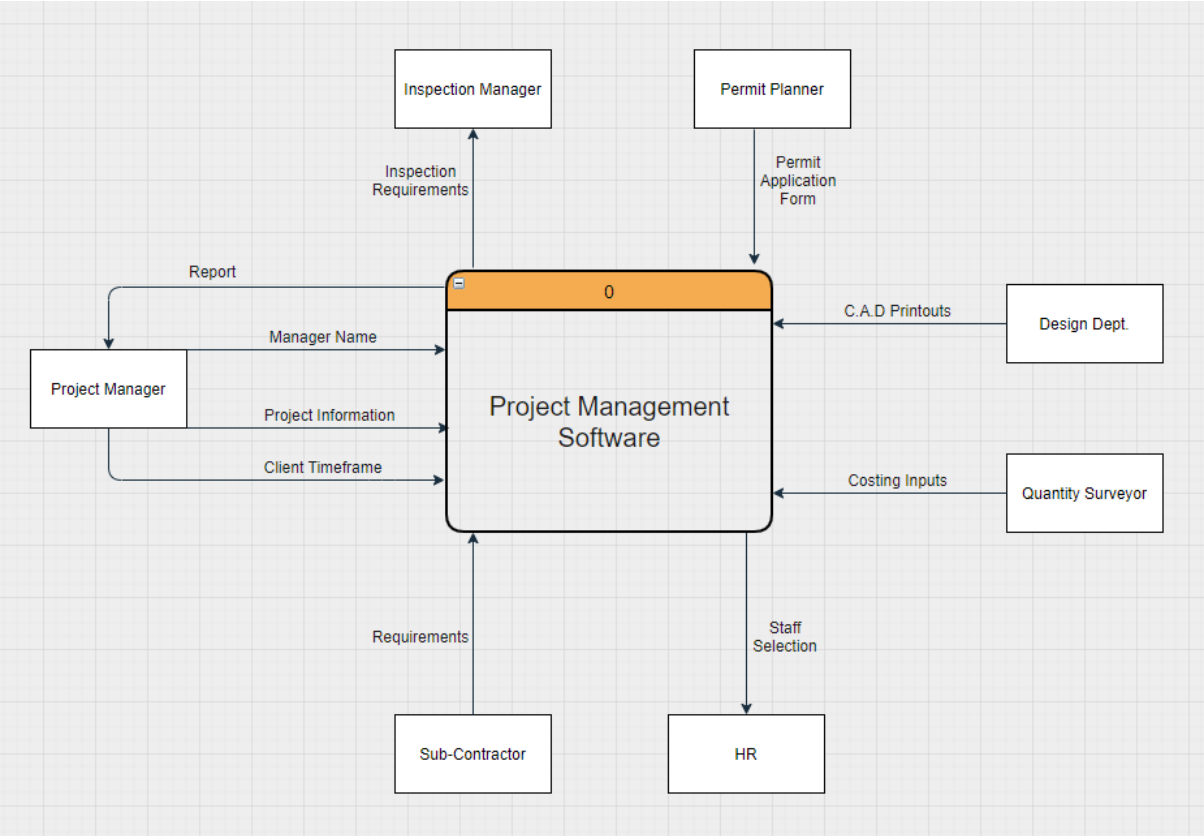


Figure 2- Context Diagram

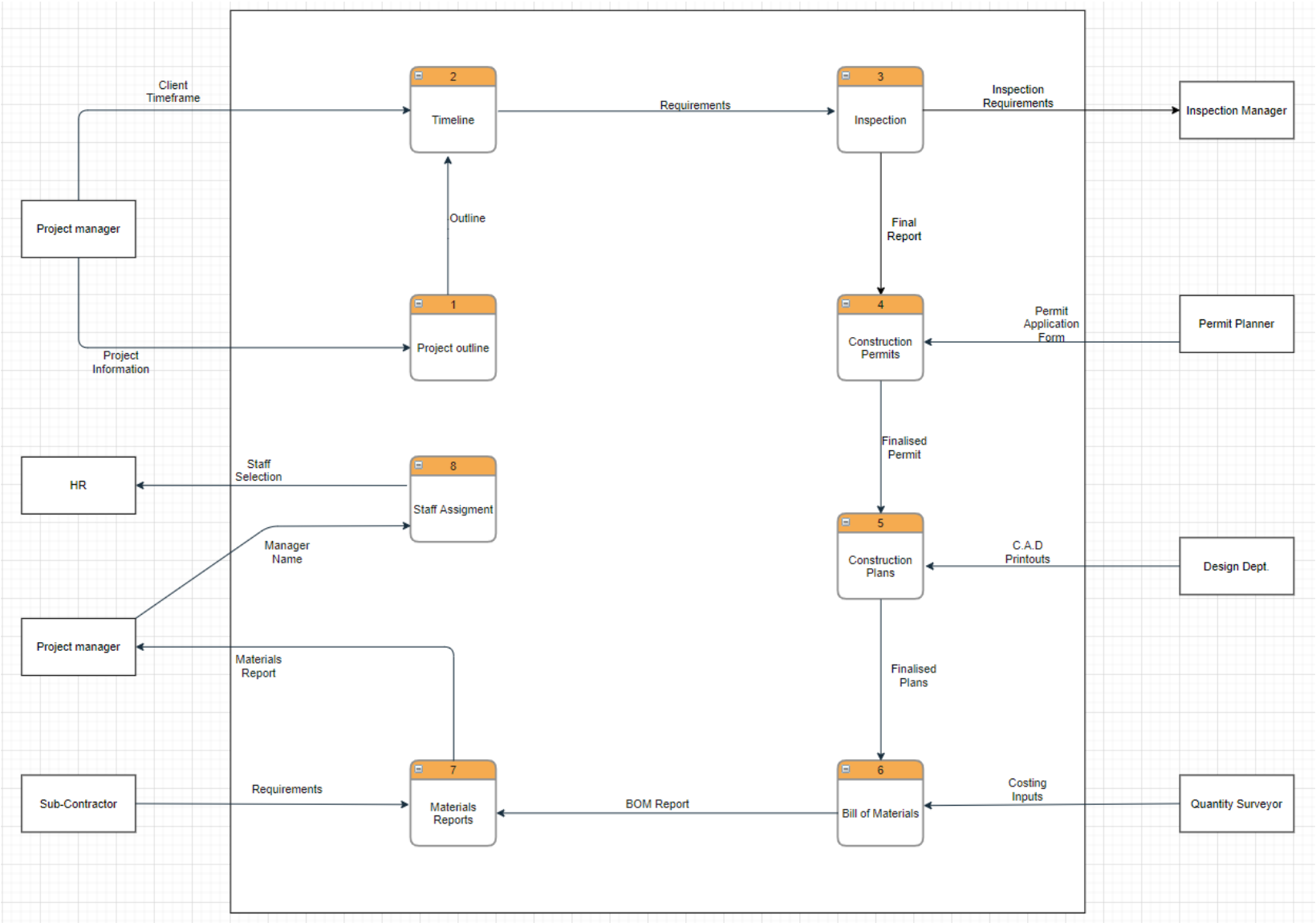


Figure 3- Data Flow Diagram 1

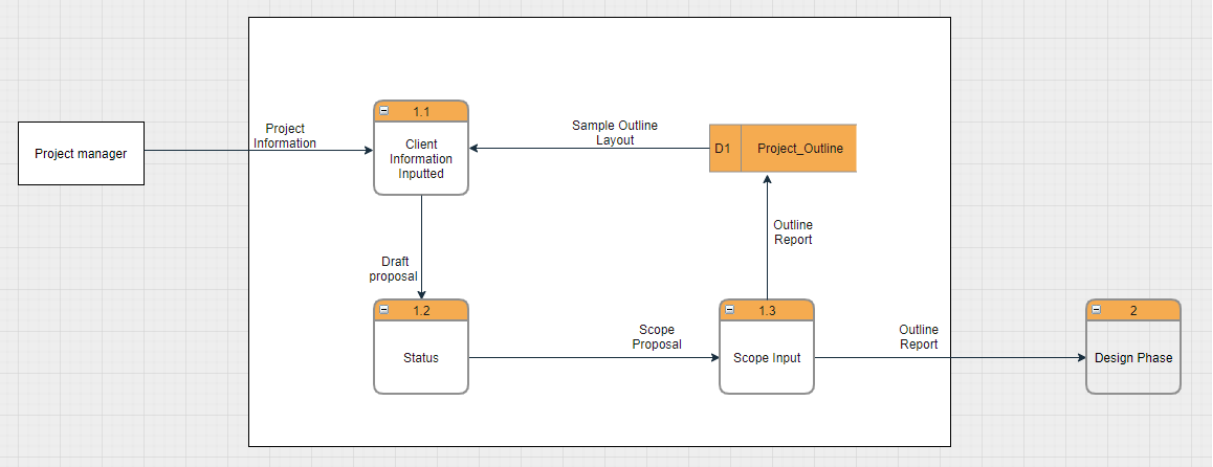


Figure 4- DFD2 Outline

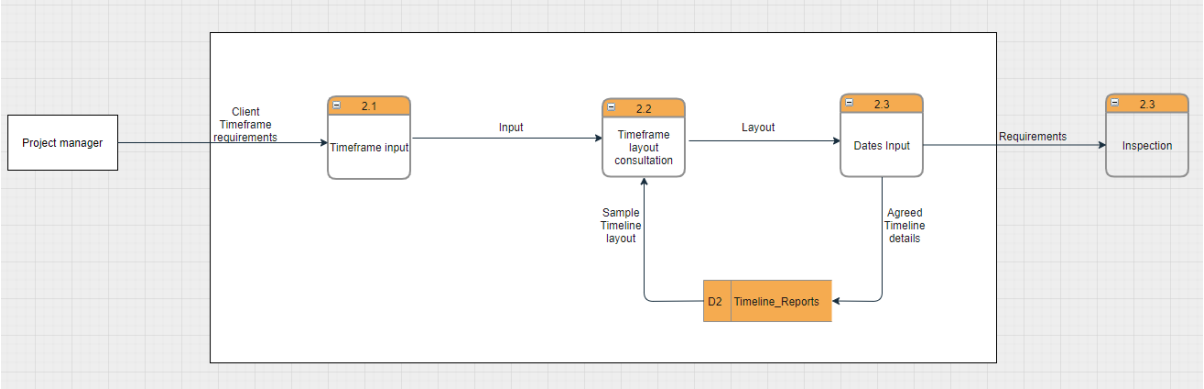


Figure 5 - DFD2 Timeline

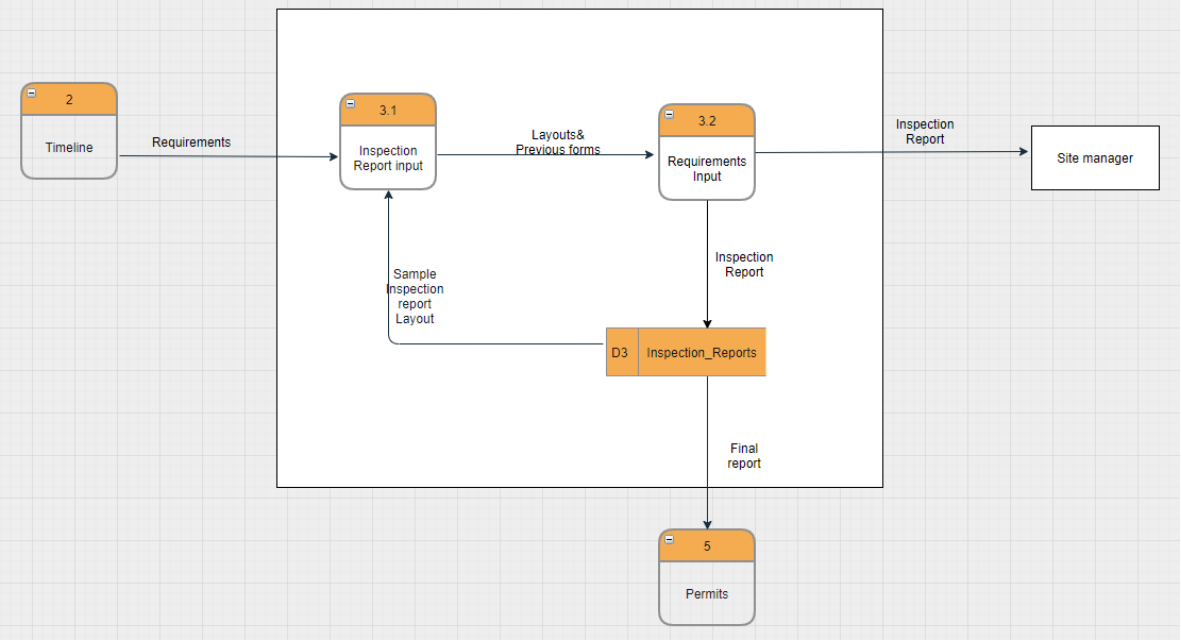


Figure 6- DFD2 Inspection

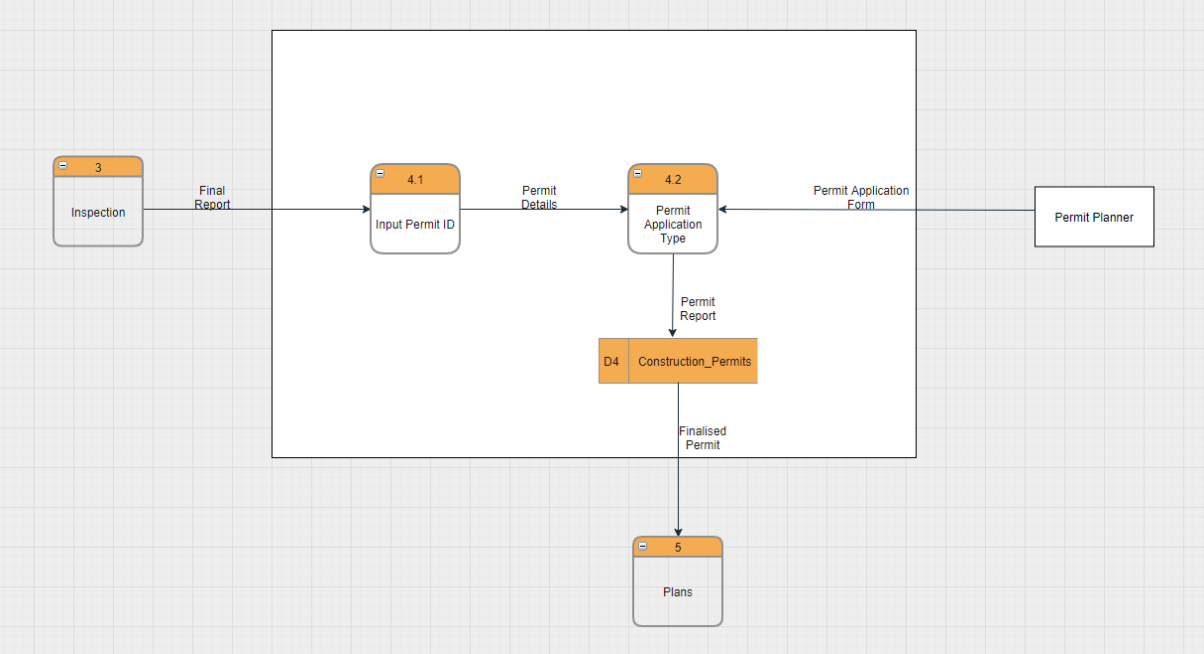


Figure 7 - DFD2 Permits

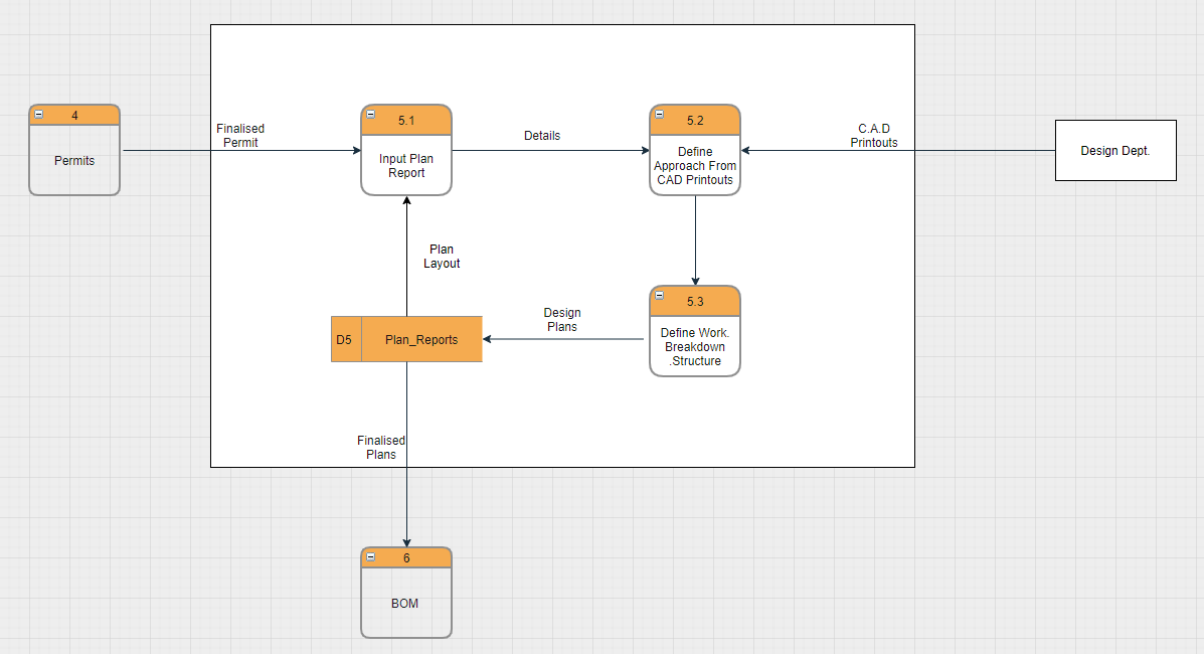


Figure 8- DFD2 Construction Plan

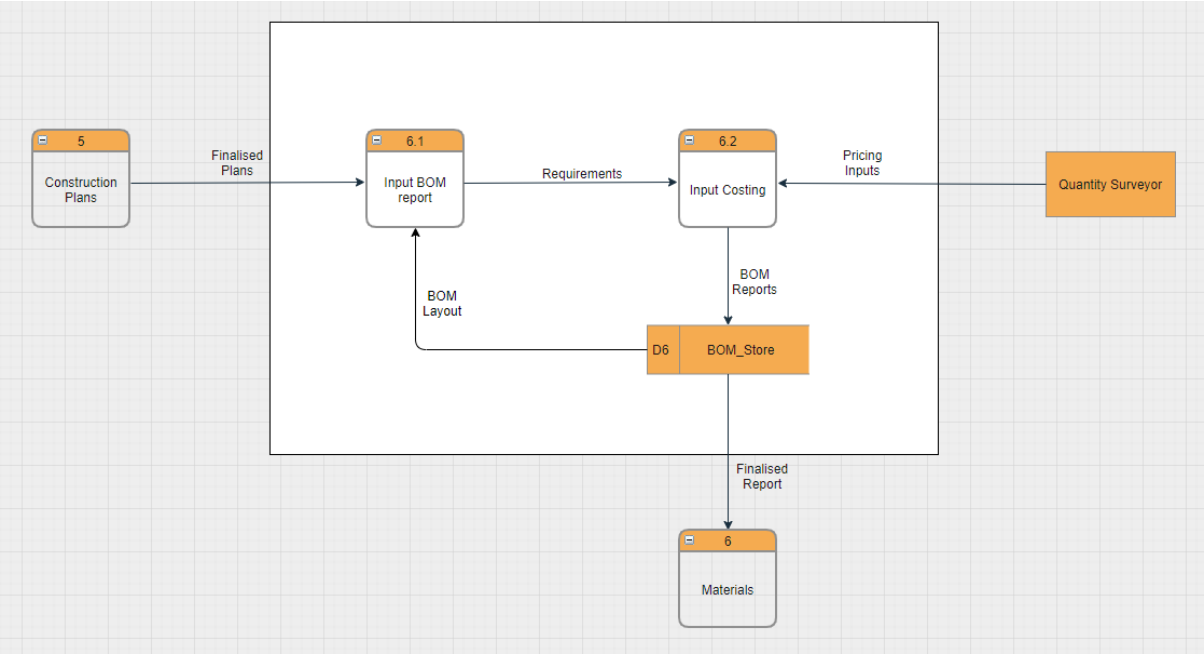


Figure 9- DFD2 BOM

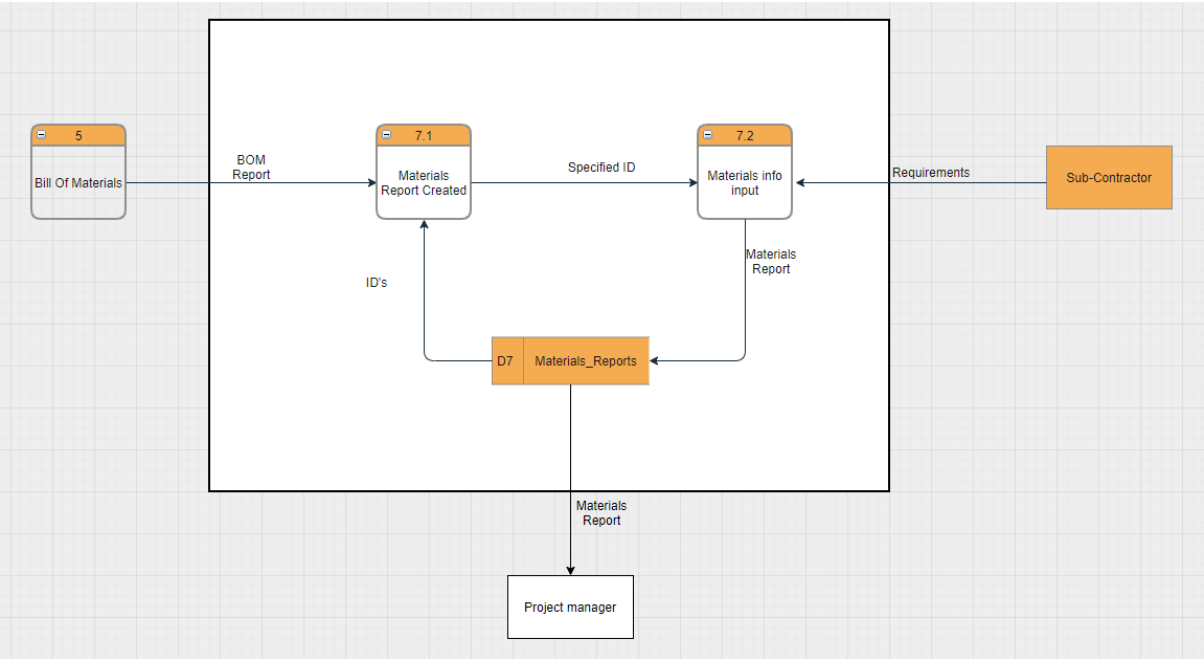


Figure 10- DFD2 Materials

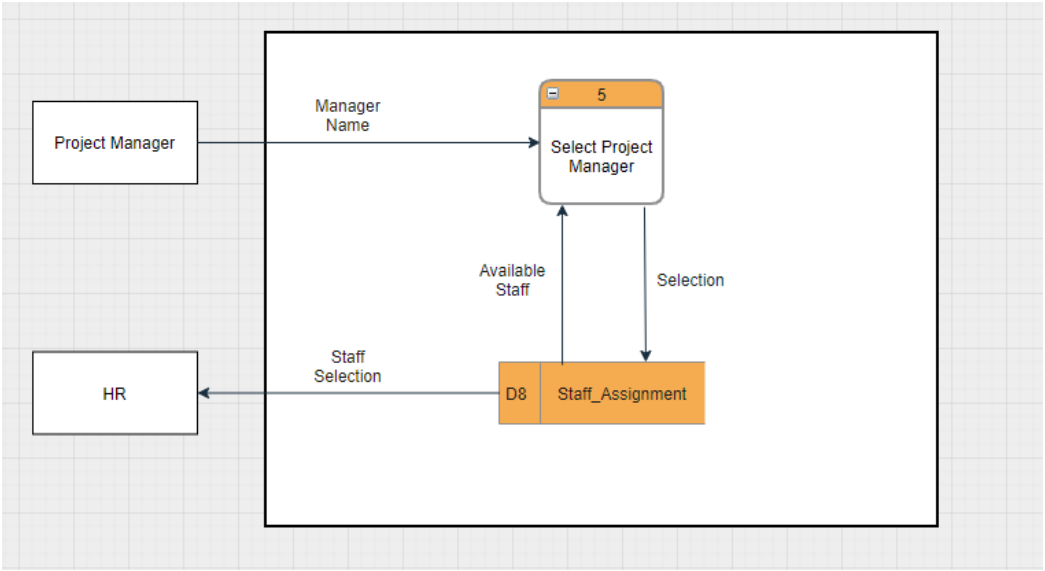


Figure 11- DFD2 Staff Assignment

Entity Relationship Diagram

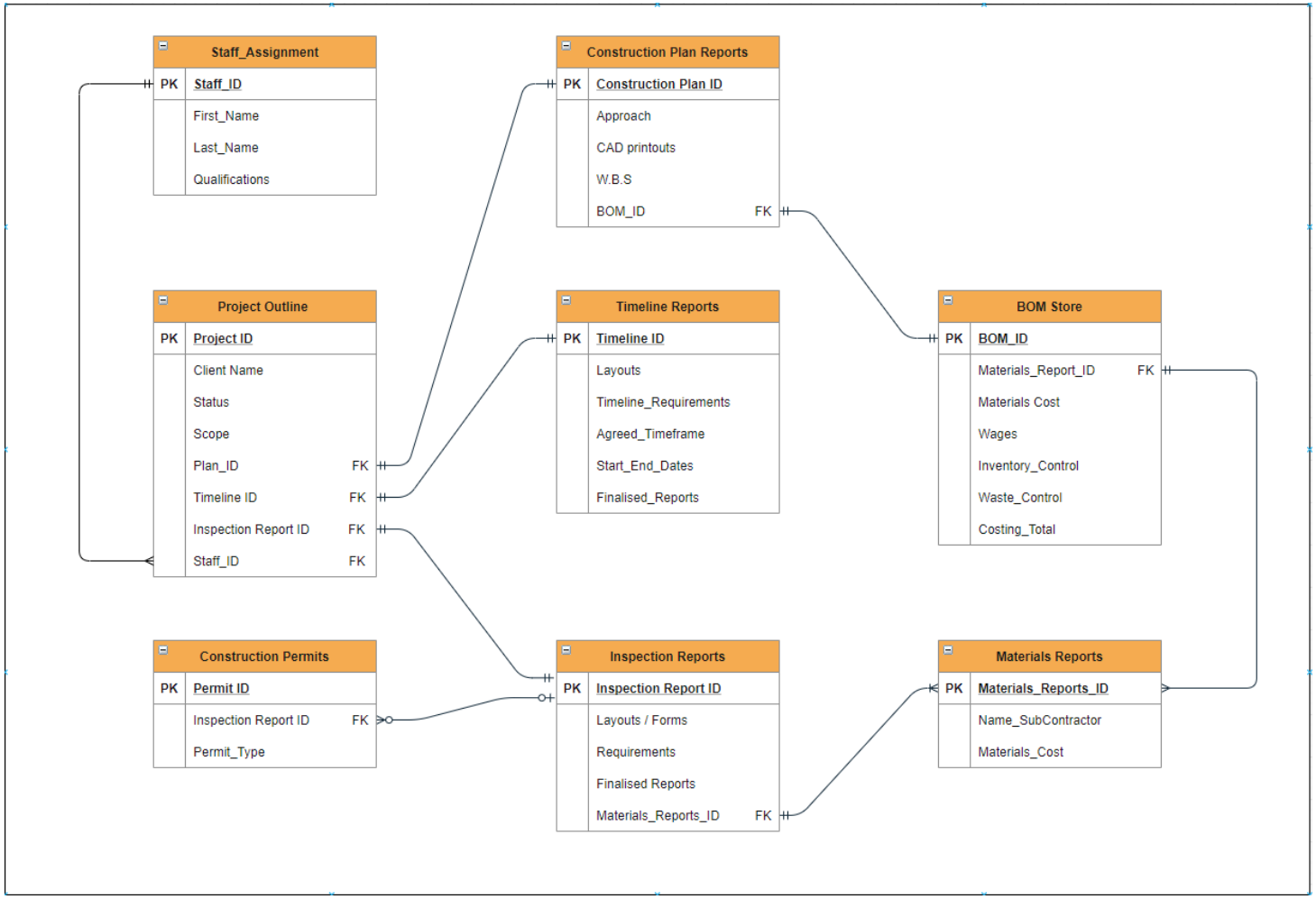


Figure 12- Entity Relationship Diagram

Business Process Modelling Diagrams

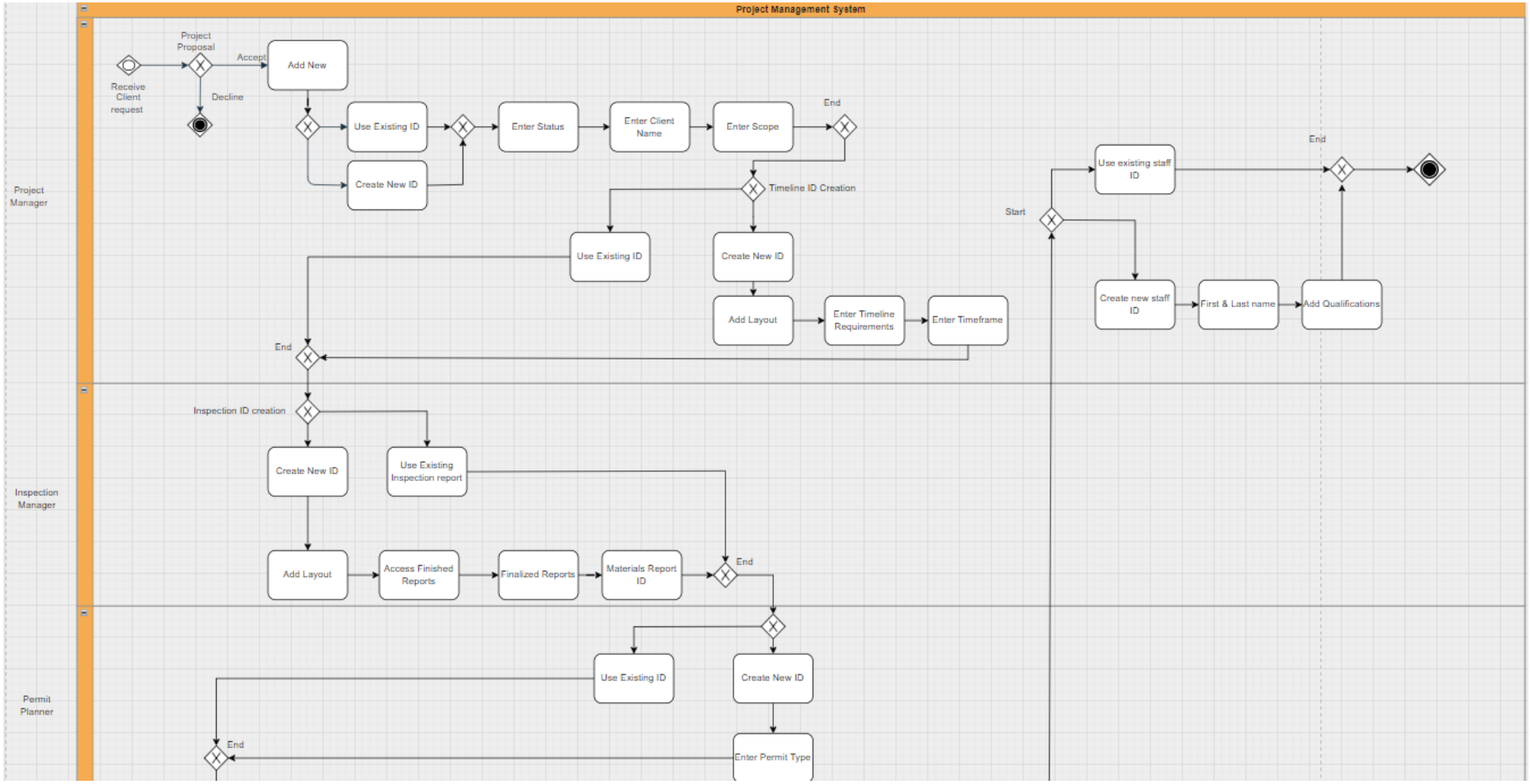


Figure 13- BPM 1(Continued Below)

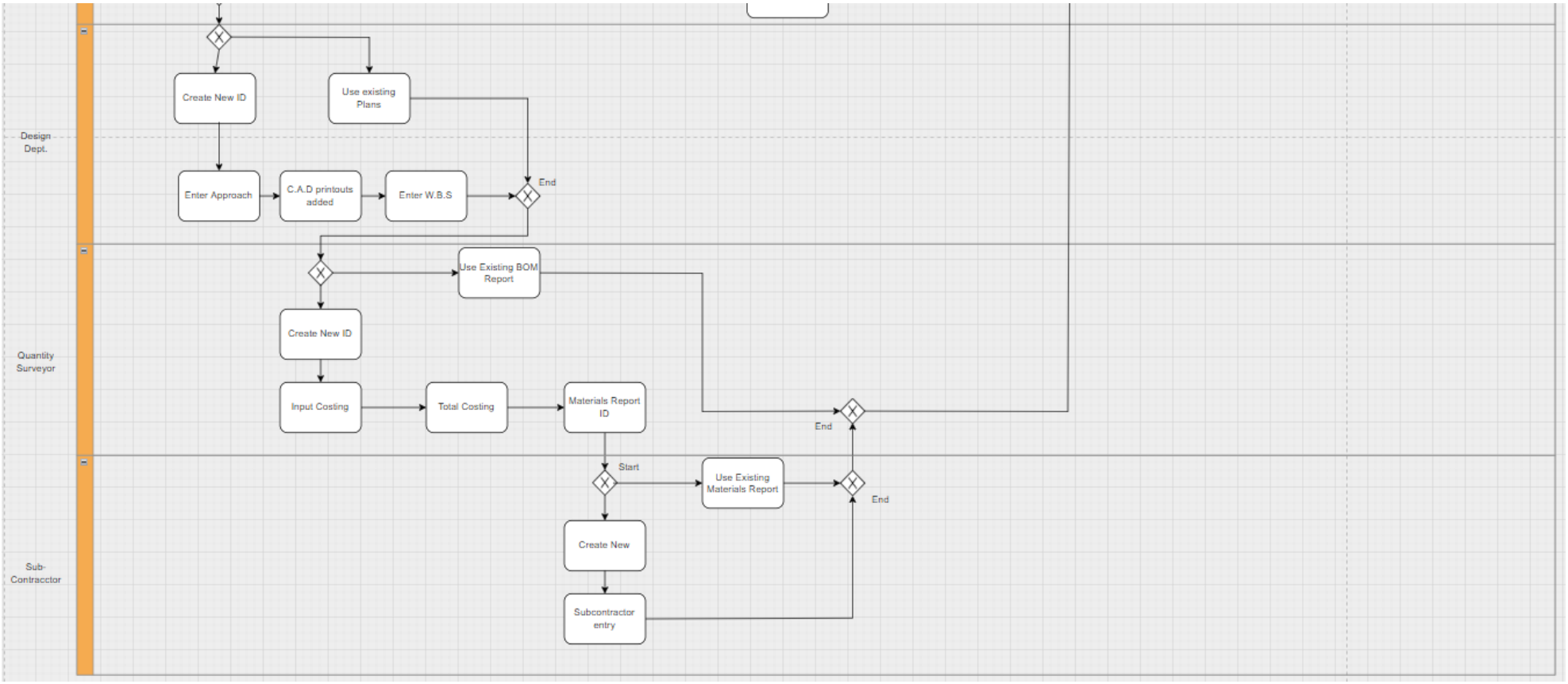


Figure 14- BPM 1 (Continued)

Data Dictionary

Table name	Field name	Data type	Field size	Description	Example
Project_Outline_table	Project_ID	Varchar	10	Primary key of project outline table	PO2
Project_Outline_table	Status	String	15	Project status	Active or finished
Project_Outline_table	Client_Name	String	50	Name of client requesting construction project	John Hansen
Project_Outline_table	Scope	String	200	Scope project insert	Housing restoration project
Project_Outline_table	Timeline_ID	Varchar	10	Foreign key to timeline_ Reports table	TID1
Project_Outline_table	Inspection_ Report_ID	Varchar	10	Foreign key to inspection_ Reports table	INR1
Project_Outline_Table	Staff_ID	Varchar	10	Foreign key to staff assignment table	S05
Project_Outline_ Table	Plan_ID	Varchar	10	Foreign key to plan_reports table	Plan_04
Timeline_Reports	Timeline_ID	Varchar	10	Primary key of timeline reports table	TID2
Timeline_Reports	Layouts	Varchar	255	Layout to timeline reports	Sample restoration layout form

Timeline_Reports	**Timeline_ Requirements**	**String**	**255**	**Timeline requirements specifying materials, plans etc**	**Requirements set out by project manager**
Timeline_Reports	**Agreed_ Timeframe**	**String**	**15**	**Specified timeframe in weeks & days**	**21 weeks**
Timeline_Reports	**Start_End_ Dates**	**Date**	**15**	**Date period for project**	**10-02-22: 21-04-22**
Timeline_Reports	**Finalised_ Reports**	**Varchar**	**255**	**Layout or old finalised reports**	**Finalised report**
BOM_Store	**BOM_ID**	**Varchar**	**10**	**Primary key for Bill of materials store**	**BOM2**
BOM_Store	**Materials_ Report_ID**	**Varchar**	**10**	**Foreign Key for the materials report table**	**MR2**
BOM_Store	**Materials_ Cost**	**Decimal**	**20**	**Cost of materials input**	**€10000**
BOM_Store	**Wages**	**Decimal**	**20**	**Wages cost input**	**€40000**
BOM_Store	**Inventory_ Control**	**Decimal**	**20**	**Inventory controlling costing input**	**€4400**
BOM_Store	**Waste_ Control**	**Decimal**	**20**	**Waste control costing input**	**€900**
BOM_Store	**Costing_Total**	**Decimal**	**20**	**Total aggregate costing input**	**€50000**
Materials_Reports	**Materials_ Report_ID**	**Varchar**	**10**	**Primary key of materials reports table**	**MR2**

Materials_Reports	**Name_ Subcontractor**	**String**	**50**	**Name of sub-contractor insert**	**Alex Payne Suppliers**
Materials_Reports	**Materials Cost**	**Decimal**	**20**	**Cost of materials input**	**€2000**
Construction_Permits	**Permit_ID**	**Varchar**	**10**	**Primary key of construction permits table**	**PR1**
Construction_Permits	**Inspection_ Report_ID**	**Varchar**	**10**	**Foreign key to inspection reports table**	**INR4**
Construction_Permits	**Permit_Type**	**String**	**25**	**Type of construction permit**	**Residential**
Plan_Reports	**Plan_ID**	**Varchar**	**10**	**Primary key of construction plan reports table**	**Plan_02**
Plan_Reports	**Approach**	**String**	**255**	**Documented approach for plan report**	**Housing extension project**
Plan_Reports	**CAD_ Printouts**	**Image**	**10**	**Computer aided design printouts in PDF**	**Document.pdf**
Plan_Reports	**W.B. S**	**String**	**255**	**Work breakdown structure for construction plan**	**Section**
Plan_Reports	**BOM_ID**	**Varchar**	**10**	**Foreign key to BOM store table**	**BOM6**
Inspection_Reports	**Inspection_ Report_ID**	**Varchar**	**10**	**Primary key of inspection reports table**	**INR3**

Inspection_Reports	**Layout**	**Varchar**	**255**	**Sample layouts for inspection reports**	**Inspection layout form**
Inspection_Reports	**Inspection_ Reports**	**String**	**255**	**Requirement for inspection reports**	**Requirements**
Inspection_Reports	**Finalised_ Reports**	**Image**	**50**	**Finished inspection reports**	**Document.jpg**
Inspection_Reports	**Permit_ID**	**Varchar**	**10**	**Foreign key to construction permits table**	**PR4**
Inspection_Reports	**Materials_ Report_ID**	**Varchar**	**10**	**Foreign key to materials reports table**	**MR6**
Staff_Assignment	**Staff_ID**	**Varchar**	**10**	**Primary key to staff assignment table**	**S05**
Staff_Assignment	**First_Name**	**String**	**20**	**First name of staff**	**Robert**
Staff_Assignment	**Last_Name**	**String**	**20**	**Last name of staff**	**Moore**
Staff_Assignment	**Qualification**	**String**	**25**	**Qualification of staff inserted**	**Management**

Implementation Schedule

The implementation of the software for a prospective firm can be undertaken on a incremental or radical basis, at the discretion of the firm. As outlined in the prospective system IT strategy, it is suggested that the firm ensure a level of comfortability in using the system before a full-scale shift to the new system.

As a result of this, the timeline for implementation can vary greatly. It can be implemented within a week after installation of software and appropriate training. However, the firm may need significant time to make widespread use of the app commonplace. It may also take longer to encourage external parties to participate in logging relevant information in the system.

As mentioned in the financial feasibility report, it is likely that in the first year of implementation, the firm may not see a massive increase in profit, if any. This must be noted in the implementation timeline. However, this is also dependent on the level of technological infrastructure already in place at the firm.

GDPR/ Data Governance

As discovered in the legal feasibility report, the proposed system is capable of satisfying all European Union GDPR criteria. Implementation of the appropriate protocols for data protection must be followed in order to maintain the proposed systems proper legal standing. In order to achieve resolute data governing, it is suggested the appropriate protocols and framework be incorporated into the systems privacy policy and terms and conditions. Both these documentations should be available to all clients prior to implementation of the proposed system.

Translation Section

All parts relating to the prototype development

SSM

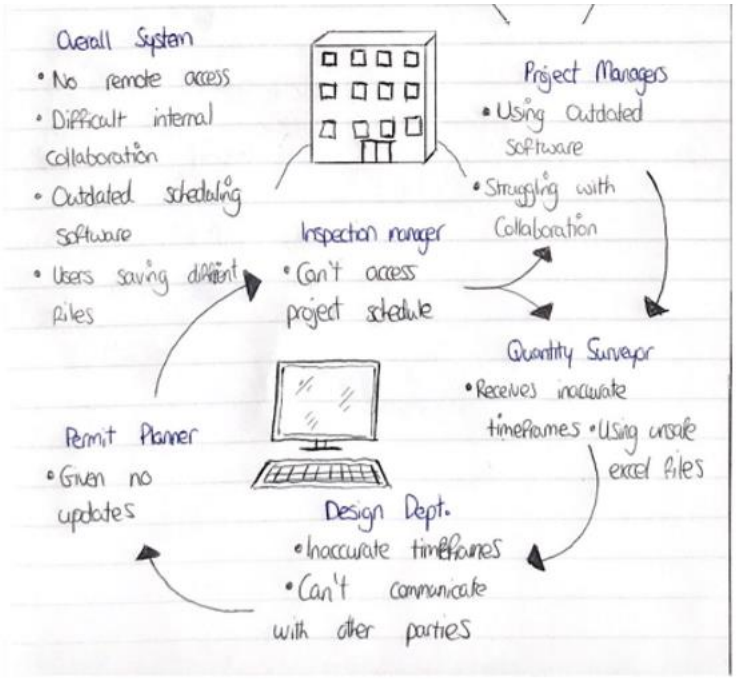
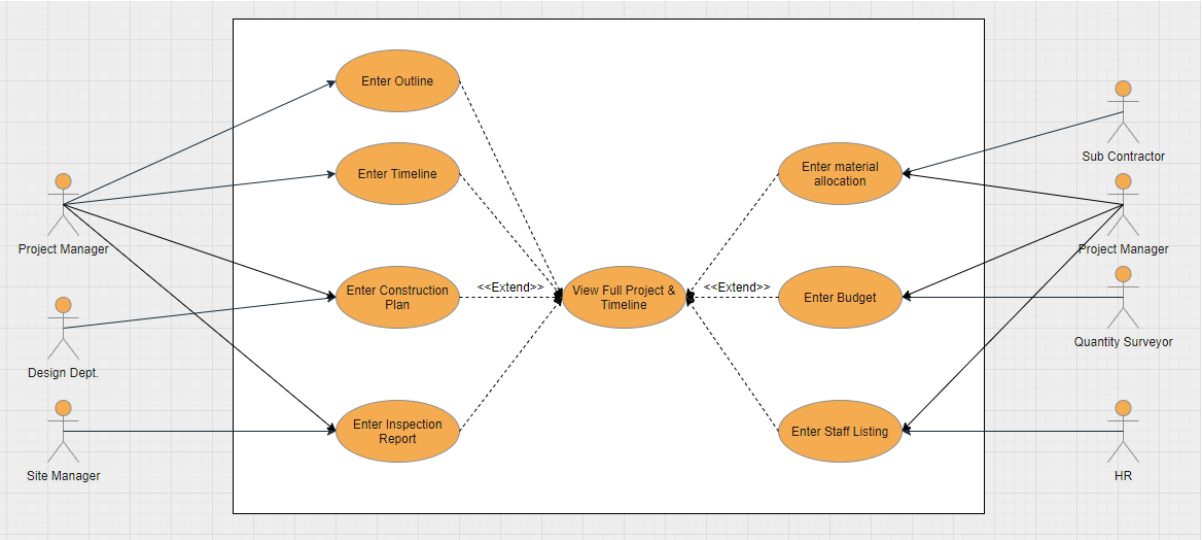


Figure 15- Rich Picture/Problem Situation

The initial system problem outlined an issue with collaboration among users. Project information is shared on multiple systems causing inaccuracies. Our system allows a central source of control and information for all users.

Use Case Diagram



Our use case diagram outlines how every user will interact with the system. The project manager acts a central control source being able to edit all parts while individual users will only be able to edit the section relevant to them e.g HR can only edit the staff listing for a project.

Context Diagram

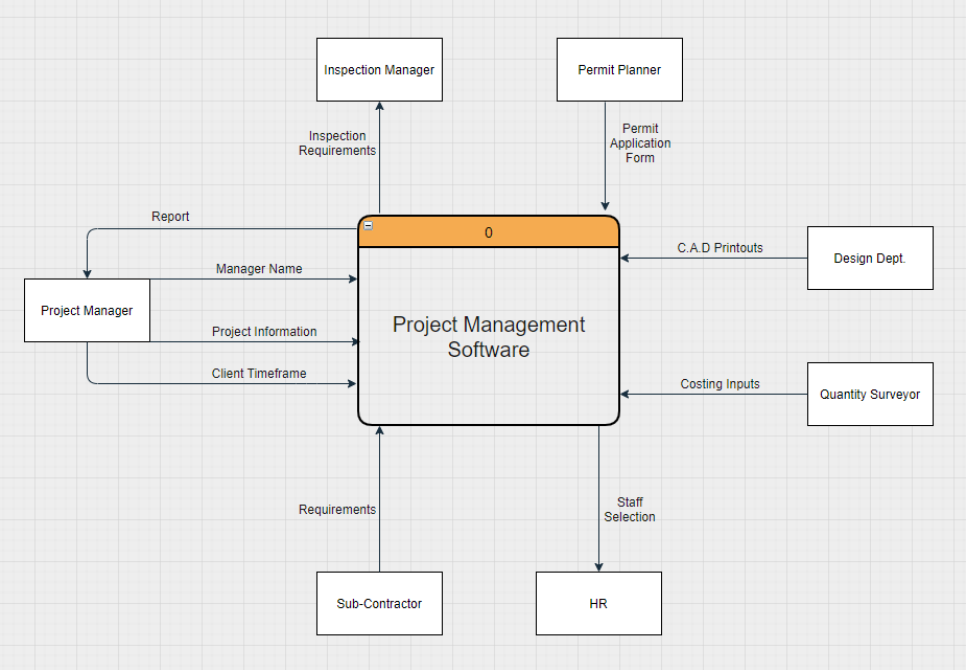


Figure 16- Context Diagram

Using the context diagram, we outlined all the users of the diagram. The context diagram outlined all the information inputs & outputs to new system.

Main DFD

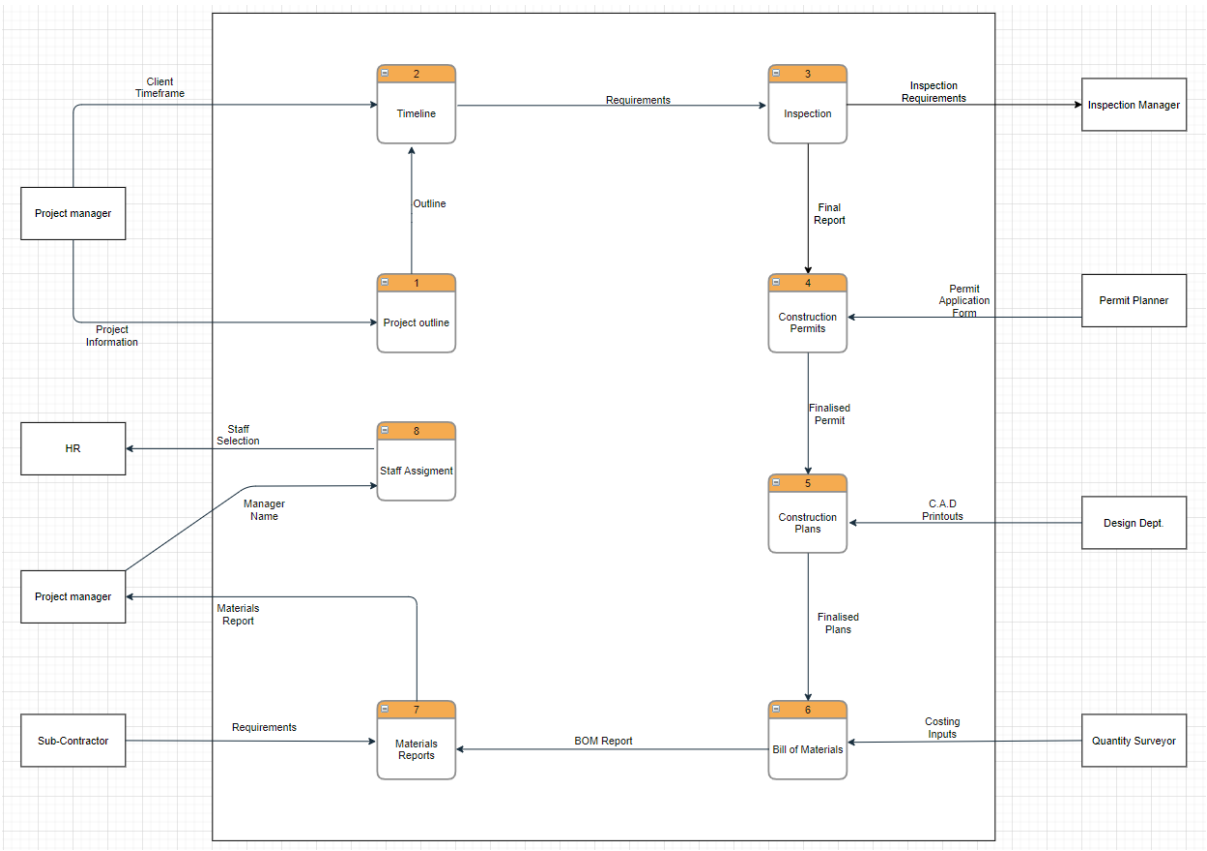


Figure 17- DFD1

The data flow diagram above showcases all the information inputs and outputs of the system and focuses specifically on the information flow from all processes both internally and externally.

ERD

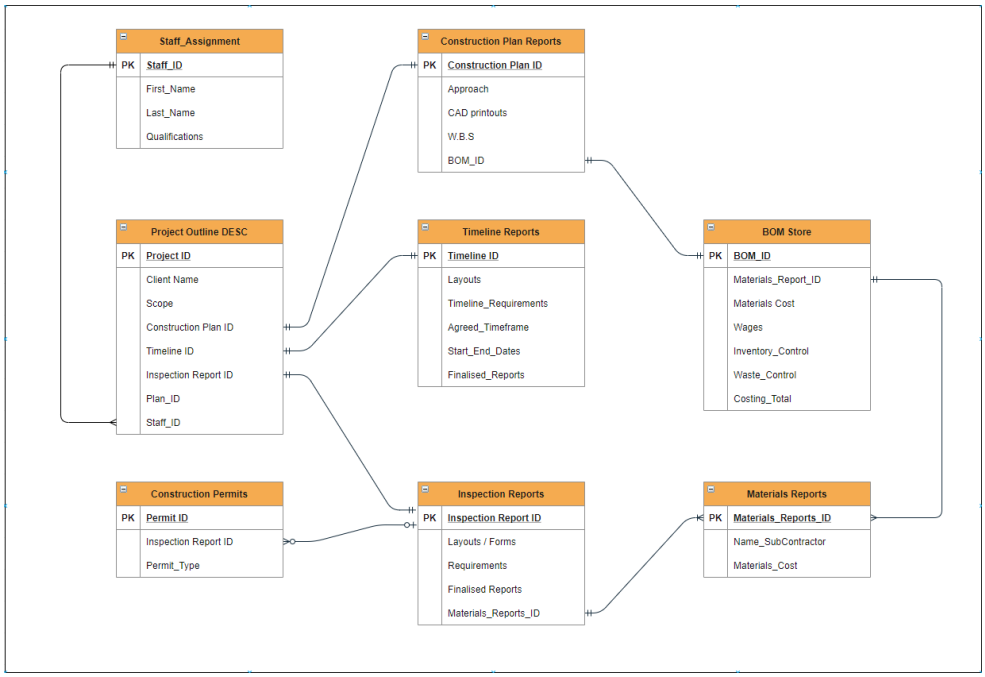
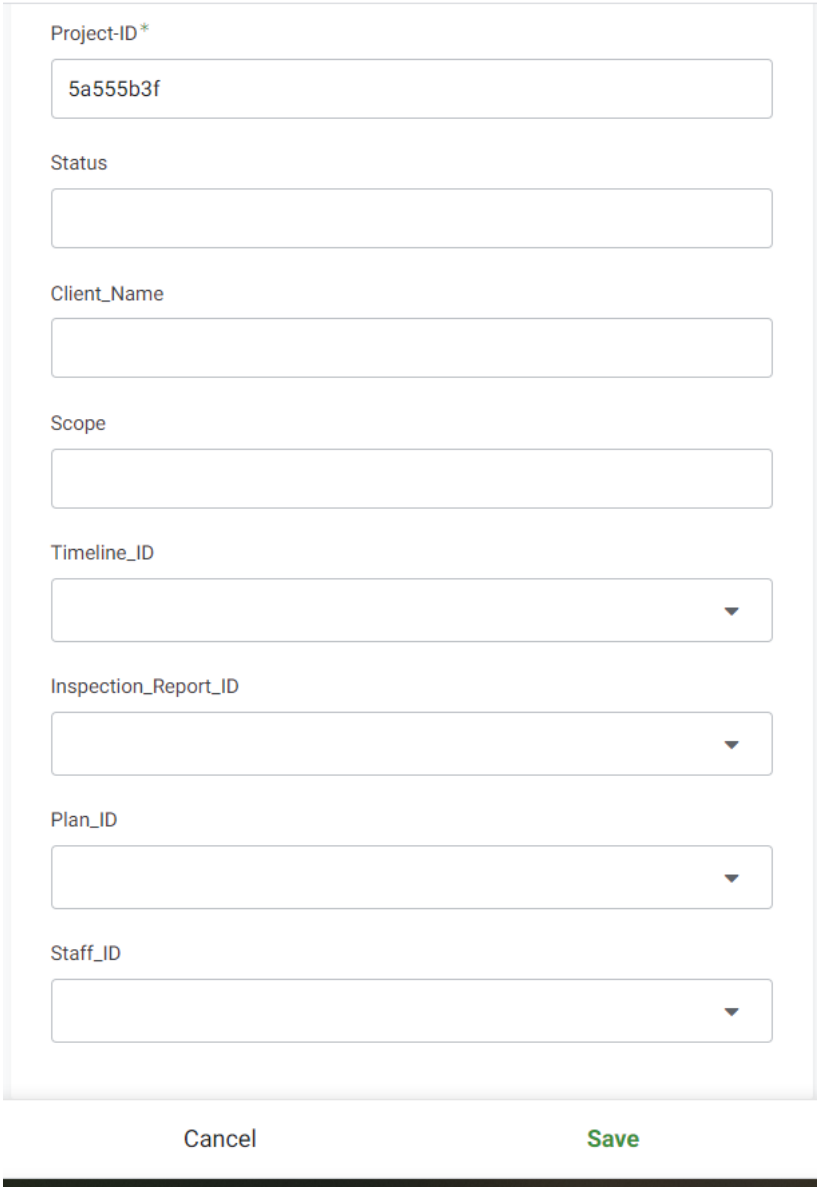


Figure 18- ERD

The entity relationship diagram outlines the relationships between the outlined datastores. All datastores are access through the application and through the server.

Sample Data Entry Screen



This sample data entry screen showcases how the project_outline_table information is entered. This data entry screen is the main source of control for the entire project creation process.

SQL Code used to store datastores in Microsoft azure

This SQL code outlines how our datastores are created and stored. This data is created using the data entry screen above and stored in the Microsoft azure SQL database.

```
/* CREATE TABLE */
CREATE TABLE table_name(
ProjectID VARCHAR(100),
Status VARCHAR(100),
Client_Name VARCHAR(100),
Scope VARCHAR(100),
Timeline_ID VARCHAR(100),
Inspection_Report_ID VARCHAR(100),
Plan_ID VARCHAR(100),
Staff_ID VARCHAR(100)
);

/* INSERT QUERY NO: 1 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO2', 'Active', ' John Hansen', 'Housing restoration Project', 'TID1', 'INR', 'Plan_02',
'S05'
);

/* INSERT QUERY NO: 2 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO3', 'Active', 'Mary Hannon', 'Housing extension project', 'TID2', 'INR2', 'Plan_03',
'S04'
);

/* INSERT QUERY NO: 3 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO4', 'Active', 'David Shaw', 'Housing restoration Project', 'TID4', 'INR4', 'Plan_04',
'S05'
);

/* INSERT QUERY NO: 4 */
```

```
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO5', 'Finished', 'Dylan Mann', 'Shed Remodelling ', 'TID5', 'INR5', 'Plan_05', 'S25'
);

/* INSERT QUERY NO: 5 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO6', 'Finished', 'James Browne', 'Housing extension project', 'TID6', 'INR6',
'Plan_06', 'S15'
);

/* INSERT QUERY NO: 6 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO7', 'Active', 'Philip Maxwell', 'Housing restoration Project', 'TID7', 'INR7', 'Plan_07',
'S05'
);

/* INSERT QUERY NO: 7 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO8', 'Active', 'Ronan Arthur ', 'Housing restoration Project', 'TID8', 'INR8', 'Plan_08',
'S1'
);

/* INSERT QUERY NO: 8 */
INSERT INTO table_name(ProjectID, Status, Client_Name, Scope, Timeline_ID,
Inspection_Report_ID, Plan_ID, Staff_ID)
VALUES
(
'PO9', 'Active', 'James healy', 'Shed Remodelling ', 'TID9', 'INR9', 'Plan_09', 'S25'
);
```

Project Schedule – JIRA Application

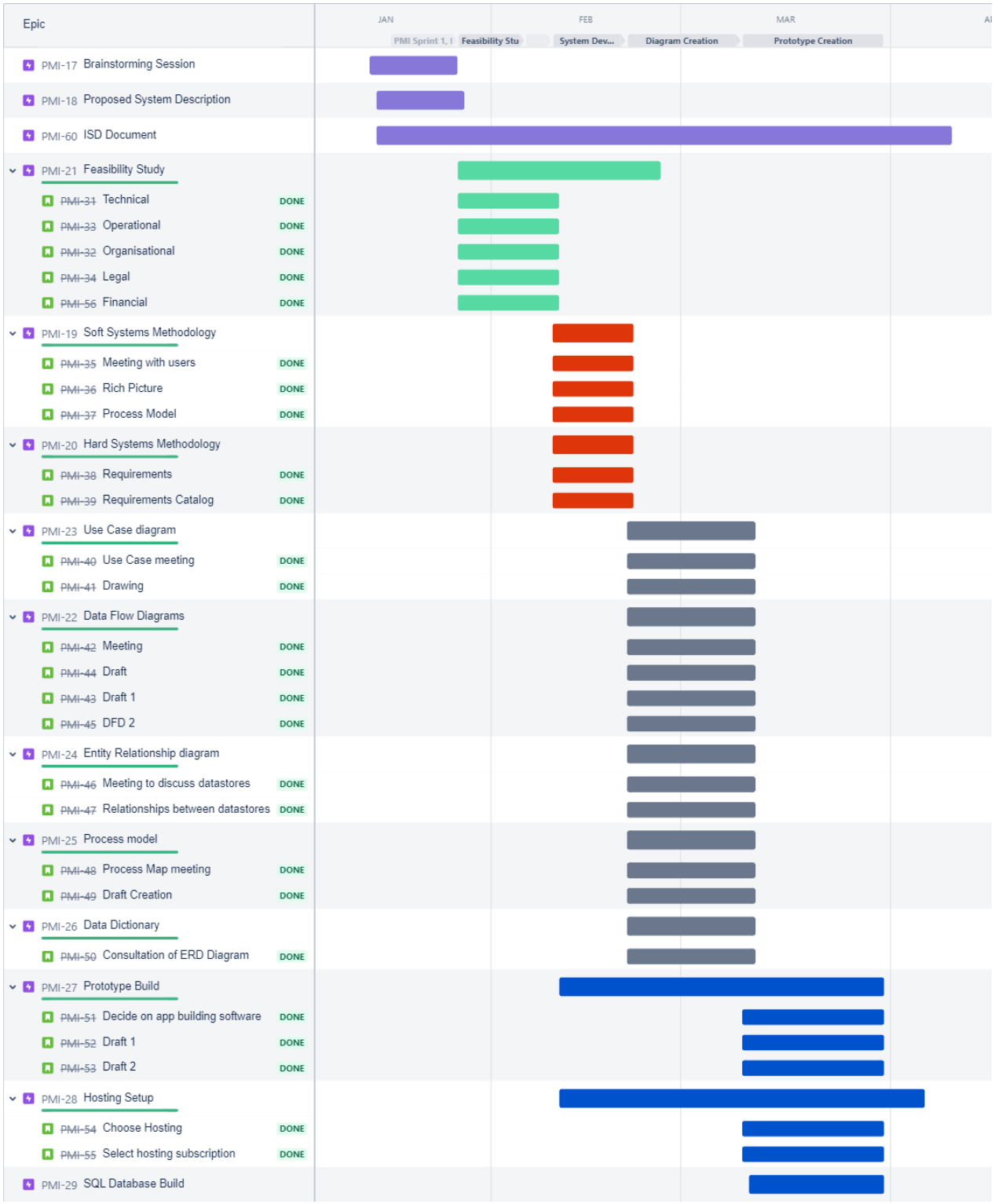


Figure 19- Project Schedule

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