Project Charter

1.0 Introduction

1.1 Executive Summary

Limbic Media, a Victoria, British Columbia based company, specializes in audio-responsive lighting systems. They are seeking to improve the security, efficiency and scalability of their inventory-related workflow. The existing system is insecure, time-consuming, and has a number of areas limiting the company's growth. *Limbic Media's Aurora Inventory Upgrade* project seeks to incorporate security measures, including inventory-tracking functionality, and increase efficiency by providing a scalable solution to resolve ongoing inventory management challenges.

To address this, the team will be proposing a solution, which is scalable, easy to maintain, secure, and tracks items effectively. This will be achieved by first gaining an in-depth understanding of Limbic Media's business workflow, then multiple potential solutions will be explored, and finally the team will arrive at the implementation which will best achieve the business needs of this company.

1.2 Context

Limbic Media began as a consulting company by the name of Limbic Consulting. From its beginnings, there was intent to enter into the field of audio responsive lighting systems. As of the launch of their first audio responsive micro-controller, Limbic Media was formed as an extended entity of their consulting company.

Currently, Limbic Media produces, demonstrates, and sells one model of lighting system: the Aurora Revision 1 (R1). They distribute their products across the United States, both in demo kits and in purchased packages. They also collaborate with local companies and organizations in Victoria, BC. Limbic Media is now developing the Aurora Revision 2 (R2), the successor to R1. With the launch of R2, Limbic Media intends to expand further internationally.

Limbic Media stores all of their equipment and products in their head office located in Victoria, BC. Their storage room has no doors, and is accessible to anyone in their office. The entrance to this storage room is surrounded by the desks of staff members, and a paper-based sign-out sheet is used to denote any equipment leaving or being returned to the storage room. Limbic Media allows their employees to work at their own preferred time, and therefore the storage room is accessible at all times of the day.

Any equipment that leaves or returns to the storage room is recorded on the sign-out sheet. For each unit, the name and signature of the person taking the Aurora equipment out is provided, along with the reason for removal, and the date it was removed or returned. There are three major reasons for equipment to leave the storage room:

- A product is sold
  - It is shipped to the client and leaves inventory permanently.
- Demo kits are distributed
  - Demo kits consist of the Aurora R1 micro-controller, required cables and stands, and client preferred lights.
  - Demo kits are tracked using a paper-based map, where the destination is marked with a thumbtack and a pin up note.
  - These kits remain in inventory and their movements must be tracked.
- An employee borrows it
  - Employees borrow equipment from the inventory storage area for quality analysis, testing, repairs, development, for personal use, and for an event set up by Limbic Media.

Limbic Media expects to see sales rise as they prepare for the release of R2 next year, and expect a significant increase in the number of items which they hold in their inventory.

Currently, Limbic Media uses the accounting tool ‘Sage 50’ to keep track of their finances. {The current use of the Sage 50 product does not adequately suit the growing needs and desired style of work relating specifically to inventory management.} Sage 50 comes with an inventory management system, but Limbic Media finds it inadequate to fit their needs and style of work.

1.3 Needs

The inventory system in place functions satisfactorily in the sense that other workflows are not being interrupted. However, it has been stated that employees are becoming frustrated. It is well known that the current system is not scalable for the growth the company. Employees are eager to see a change implemented.

Employees are often forced to look through multiple pages of the sign-out sheet to check if a particular item has been returned. There is no way to determine if a particular item is currently in the inventory, other than manually searching the storage room. Although sign-out sheets are used, Limbic Media employees use Slack to communicate desire for an item, and keep track of their inventory. They have one channel on Slack dedicated to equipment loaning and inventory tracking purposes. This slack channel allows employees to ask about a particular item in the inventory, or to request to loan out an item with specific reasons that are not recorded in the sign-out sheet. The current

workflow is functional, due to their small inventory (~10 micro controllers) and a relatively large amount of accessory equipment. However, the system is becoming more time consuming, and employees are unsatisfied with the lack of organization.

Limbic Media requires a system that is able to manage their inventory items. Inventory must be effectively tracked and scheduled so that information about equipment may be acquired when needed. There should never be an issue with scheduling one piece of equipment simultaneously between two people. Additionally, there should be historical documentation of inventory items such that the company may acquire information regarding where a piece of inventory has been sent, and if there have been any issues with it in the past. Limbic Media needs an improvement of their overtaxed inventory system.

Moreover, there is a requirement for increased security of the storage room. There should be a system in place which tracks exactly what is coming in and out of the room, along with who is removing or returning items.

1.4 Scope

The team will be suggesting changes pertaining exclusively to Limbic Media's inventory management system. The primary functions of this system involve monitoring and recording the movement of inventory coming in and out of the storage room. Inventory leaving the storage room will fall under two main categories: demo kits being sent to potential customers, and employees removing equipment to be used either internally, or for external company purposes (events, displays, etc.). It is part of the project to track and record a substantial amount of information relating to inventory items, including historical data, current location, who is responsible for that item, and why it is out of office. A scheduling system is an aspect of what is looking to be achieved, or in other words a way to record when in the future items will be used, and for what purposes. Another aspect of the project is the security of the storage room, regarding meaningful insight into what happened to misplaced equipment. Finally, within the scope of this project is how efficient and scalable the implementation will be, considering how it will interact with the company, and the legacy that it will have.

However, the software interoperability of the inventory management system with other applications used by Limbic Media will not be assessed. Furthermore, the overall security of the building and other company-owned areas, the transportation protocol of equipment, and identifying the primary users of the new implementation are not in the purview of this project. The reach of the project does not extend to how inventory is moved, only on tracking and recording when it actually does move.

1.5 Stakeholders

Stakeholder	Role and Responsibility
Accountant (Renée)	The accountant keeps track of the company's finances and inventory. Her desk is currently located near the storage room, and as such she sees product as it comes and goes.
Scrum Master (Johanna)	The scrum master takes care of planning the company's objectives and initiatives. To do her job effectively, she needs a thorough understanding of how the inventory system works, and what product has been signed-out at what time.
Support Staff (other employees)	The support staff are all other employees who are not the accountant or scrum master. Their role in the current inventory system consists of: ● Handling the signing-out of demo kits to customers ● Handling product shipping ● Handling product returns ● Handling technical support to customers ● Handling product upgrades ● Handling product orders
Management	When an employee requests to take out equipment on a given date, senior members of the company, or management staff will give approval to requests using the dedicated slack channel.
Analysts	The analysts examine and determine the problems of the current system. They also design and develop an effective inventory management system.

Table 1. Major stakeholders of the current system

1.6 Objectives

The goal is to improve the inventory management system used by Limbic Media in order to allow for expansion, reduce inefficiency and provide greater security. To achieve these goals, the following objectives need to be reached:

- Eliminate the ad-hoc paper-based sign-out sheets attached to clipboards
- Record the purchase history of the inventory
- Replace the current map and pin tracking system with a paper-free and scalable system
- Record historical information for missing and lost inventory
- Make system maintainable by a single employee
- Track inventory which is in and out of office, always having the location recorded

1.7 Glossary

Terms or Abbreviations	Definition
Aurora	An embedded computer system software that controls LED light patterns according to sound from an internal microphone or from a line-in cable. It is a niche product meant to enhance the atmosphere of events.
Aurora R1	Lighting System Revision 1. Released 2016.
Aurora R2	Lighting System Revision 2. Schedule release 2017.
Demos	"Trial" packages sent out to potential clients. They are working models of the products which Limbic Solutions offers. An example would be a set of lights and a controller.
Demo Kits	A full Aurora system with lights, cables and power supply.
Controller	A computer which is used to program the light displays on the Aurora product, uses in-house software and is a necessary component of the system.
Ad-Hoc	For this special purpose.
Inventory	Includes lights, cables, power supplies, whips, and power top ups.
Sage 50 Software	Accounting and inventory software for small businesses.
Slack	A cloud-based team communication tool.

Table 2. List of important terms and acronyms, coupled with their definitions

2.0 Project Approach

2.1 Team Organization/ Roles

Team Member	Roles
Lee Brekstad	*Documentation Specialist*
Spencer Cox	*Head of IT*
Matthew Fung	*President*
Ashley Garnett	*Resource Analyst*
Jinran (Vita) Huang	*Vice President*
Hee Jae (Rachel) Nam	*Director of Marketing*
Kushal Patel	*Testing Expert*
Sarah Warnock	*Design Expert*

Table 3. The members of the team and their roles

2.2 Work Breakdown Structure

High-level tasks to be accomplished throughout this project:

1. In-depth analysis of Limbic Media's requirements
2. Explore multiple potential solutions which satisfy requirements
3. Weigh benefits and faults of potential solutions
4. Collaborate with Limbic Media regarding promising solutions
5. Develop best candidate solution into a mature, final form
6. Create formal report outlining implementation guidelines
7. Present Limbic Media with final report

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Elicitation minutes**	**3 days**	**Thu 9/29/16**	**Mon 10/3/16**
2		Requirements Elicitations (led by Analysts)	3 days	Thu 9/29/16	Sun 10/2/16
3		Elicitation mintutes on website	0 days	Mon 10/3/16	Mon 10/3/16
4		**Project Charter**	**9 days**	**Mon 9/26/16**	**Thu 10/6/16**
5		Project overview; Analyst prepare for 1st client meeting	3 days	Mon 9/26/16	Wed 9/28/16
6		Project Approach and first draft	2 days	Thu 9/29/16	Fri 9/30/16
7		Editing	5 days	Fri 9/30/16	Thu 10/6/16
8		Project Charter due	1 day	Thu 10/6/16	Thu 10/6/16
9		**Project Pitch**	**4 days**	**Mon 10/3/16**	**Thu 10/6/16**
10		PowerPoint	4 days	Mon 10/3/16	Thu 10/6/16
11		Project Pitch	0 days	Thu 10/6/16	Thu 10/6/16
12		**Requirements section in Final Report**	**12 days**	**Thu 10/13/16**	**Fri 10/28/16**
13		Functional and Non-Functional Requirements	8 days	Thu 10/13/16	Sat 10/22/16
14		Use Case Description	8 days	Thu 10/13/16	Sat 10/22/16
15		Use Case Diagaram	8 days	Thu 10/13/16	Sat 10/22/16
16		Domain Model	8 days	Thu 10/13/16	Sat 10/22/16
17		Editing	5 days	Sun 10/23/16	Thu 10/27/16
18		Requirements section in Final Report Due	0 days	Fri 10/28/16	Fri 10/28/16
19		**Second Client Meeting**	**6 days**	**Thu 11/10/16**	**Thu 11/17/16**
20		Prepare for 2nd Client Meeting	4 days	Mon 10/10/16	Thu 10/13/16
21		2nd Client Meeting	0 days	Mon 11/14/16	Mon 11/14/16
22		Feedback from clients	0 days	Thu 11/17/16	Thu 11/17/16
23		**Project Report**	**9 days**	**Mon 11/14/16**	**Thu 11/24/16**
24		**Design solutions in final report**	**6 days**	**Mon 11/14/16**	**Sun 11/20/16**
25		review of elements of the Final Report	6 days	Mon 11/14/16	Sat 11/19/16
26		UI Model	6 days	Mon 11/14/16	Sat 11/19/16
27		Design Model	6 days	Mon 11/14/16	Sat 11/19/16
28		Editing	2 days	Sat 11/19/16	Sun 11/20/16
29		**Remaining sections**	**6 days**	**Thu 11/17/16**	**Thu 11/24/16**
30		Write remaining sections	6 days	Thu 11/17/16	Thu 11/24/16
31		Report Final Report Due	0 days	Thu 11/24/16	Thu 11/24/16
32		**Group Project Presentation**	**6 days**	**Thu 11/24/16**	**Thu 12/1/16**
33		PowerPoint	5 days	Thu 11/24/16	Wed 11/30/16
34		Project Presentation	0 days	Thu 12/1/16	Thu 12/1/16

Fig 1. Data presented in Gantt chart

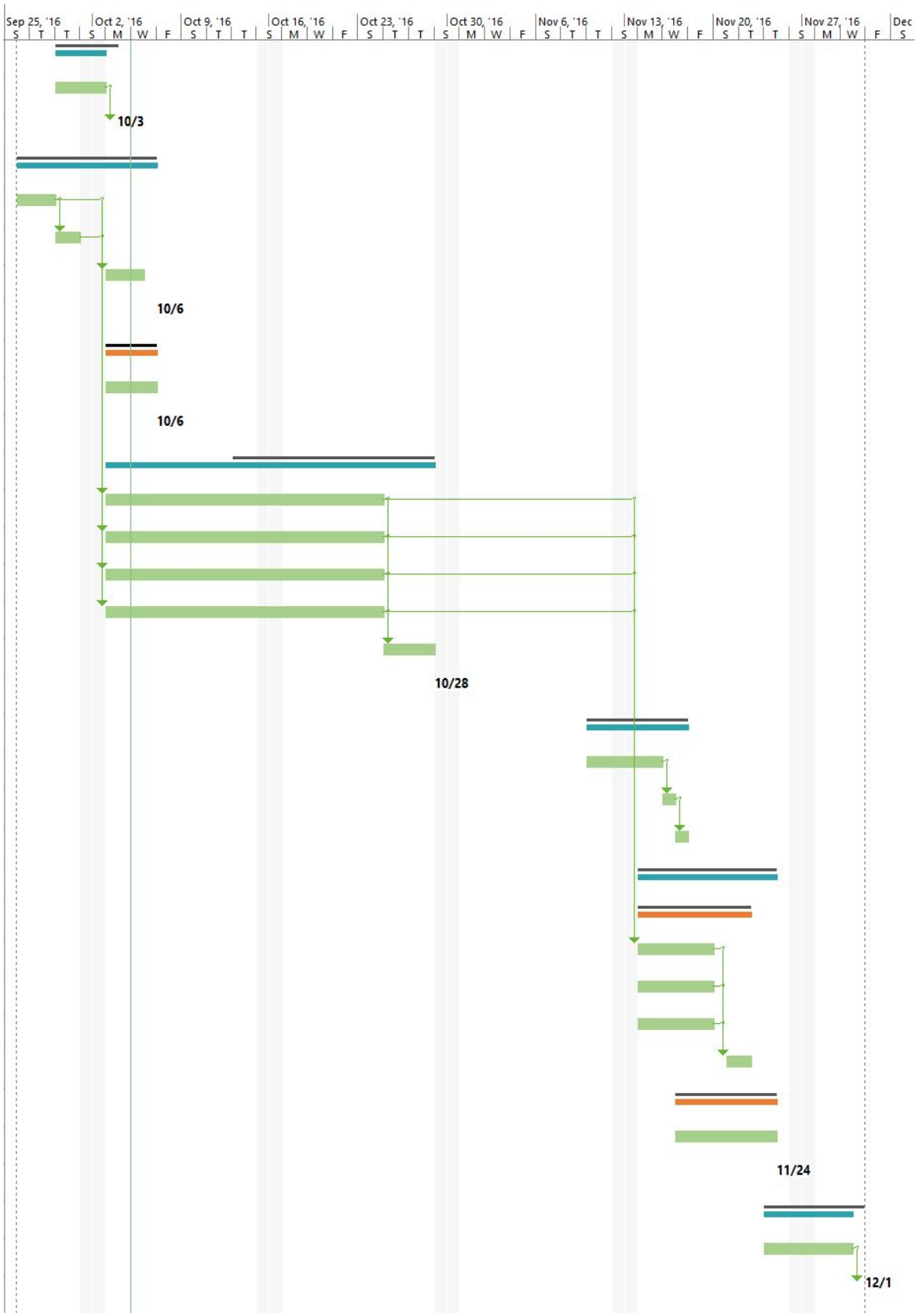


Fig 2. Gantt chart representing Milestones and tasks, including dependencies

2.3 Milestones

Project Milestones	Description	Delivery Date
Project Charter	A formal description of the project in its entirety	Oct. 6, 2016 9:00 am
Project Pitch	Present the Project Charter to the Clients (in class)	Oct. 6, 2016
Requirements Analysis	Develop requirements section for the final report	Oct. 27, 2016 9:00 am
2nd Client Meeting	Presentation of design solutions with feedback from the clients	Nov. 14, 2016
Final Report	Develop solutions based on feedback from 2nd client meeting	Nov. 24, 2016 9:00 am
Project Presentation	Group project presentation with client and analysts together	Nov. 27, 2016 or Dec. 1, 2016

Table 4. Important milestones for the project

2.4 Deliverables

Deliverables	Description	Due Date
Elicitation Minutes	Add 1st client meeting notes to analyst website	Oct. 3, 2016
Project Charter	A formal description of the project in its entirety	Oct. 6, 2016 9:00 am
Project Pitch	Present the Project Charter to the Clients (in class)	Oct. 6, 2016

Requirements Section for Final Report	Complete the requirements section for the final report	Oct. 27, 2016 9:00 am
Final Report	Develop solutions based on feedback from 2nd client meeting	Nov. 24, 2016 9:00 am
All Project Documents	Have all project documents available on the analyst's website	Nov. 24, 2016 9:00 am
Project Presentation	Group project presentation with client and analysts together	Nov. 27, 2016 or Dec. 1, 2016

Table 5. Deliverables for the project, as well as their corresponding dates

2.5 Risks

No.	Risk Description	Probability (L/M/H)*	Impact (L/M/H)*	Plan for Mitigation
1	Stakeholder conflict over proposed changes	M	H	Cross reference the needs of the high stakeholders to ensure everyone involved is willing to buy into the solution
2	Implementation of this project may not fall into their requested	M	M	Amend the scope of our project to focus on fewer of their needs.

	time constraint (ie., implemented by the end of the year)			
3	Solution may be out of the domain of knowledge for the main stakeholder(s)	M	L	Training material will be provided

Table 6. Risk Assessment

*L/M/H refers to low, medium or high-risk probability or impact.

3.0 Approval

This charter formally authorizes this project based on the information outlined in this document. Should any of this information change throughout the duration of the project, it shall be discussed with Limbic Media and documented on the Clear Solutions Inc. website.

Approval Date: _____

Approved By:

_____	_____
Daniel Astraquillo	Jithin James
_____	_____
Duolun (Ally) Jiang	Dylan Leard
_____	_____
Atem Machar	Kristine Pedersen
_____	_____
Jason Sanche	ZhengTang (Raymond) Wang

Lee Brekstad	Spencer Cox
Matthew Fung	Ashley Garnett
Jinran (Vita) Huang	Hee Jae (Rachel) Nam
Kushal Patel	Sarah Warnock

Requirements Analysis

4. System Features

4.1 Internal Equipment Request System

4.1.1 Description and Priority

Inventory items will be used internally by employees for various reasons. An employee can take out a piece of equipment to test the functionality and performance. Testing of a product is especially important before the product is sent to a client, either as a demo package or a sale. Additionally, if there is an event happening in Victoria, which Limbic Media wishes to display their product at, an employee may take the product out for the specified event. The stakeholders in this process are generally employees of Limbic Media, and therefore a medium priority is given to this process.

4.1.2 Functional Requirements

1. The system will update the equipment schedule when an employee requests inventory items.

Forwards Traceability: This requires an ability for the equipment administrator to update the schedule of certain equipment items. They can then notify other users of the system that the piece of equipment will be in use during specified times. However, if the equipment is already scheduled, the employee must be notified, and must request an alternative time to use the equipment. This requirement would be fulfilled if employees did not have issues scheduling equipment.

Backwards Traceability: This requirement is the result of the Limbic Media's expressed need for use of equipment. In both the request for proposal (RFP - see appendix 5) and client interview, it was stated that employees need access to equipment and equipment needs to be sent to clients.

2. The system will require a reason for scheduling a request (ex. testing of equipment, local use of equipment).

Forwards Traceability: This requirement would be fulfilled if, upon an employee creating an inventory schedule request, they are required to input the reason for creating the inventory schedule.

Backwards Traceability: This stems from Limbic Media's need to track what an item is being used for over its lifetime.

4.1.3 Use Case associated with this Feature

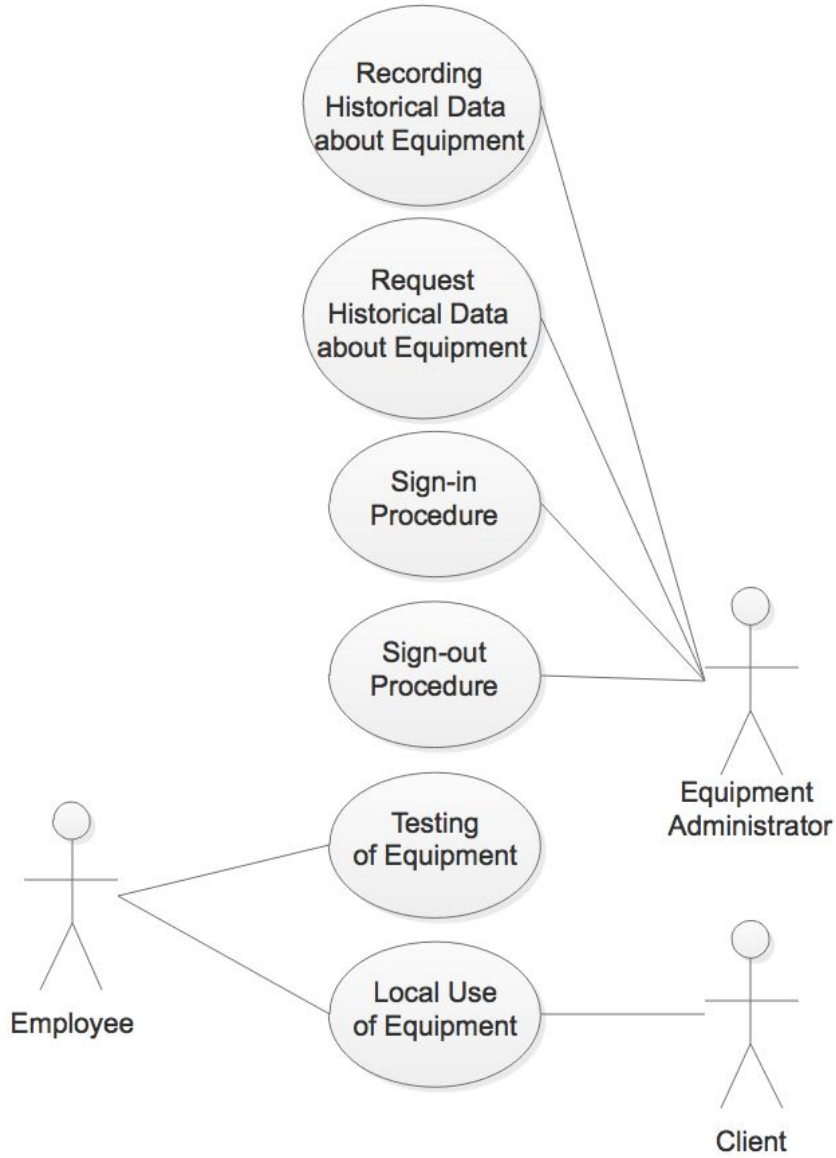


Fig.3 Use case - Testing and local use procedure

Case Number	1
Use Case Name	Employee Usage
Actors	Equipment Administrator, Employee, Client
Preconditions	1) Employee has submitted an equipment request 2) Equipment has been signed out
Normal Flow	1) Employee tests the equipment 2) Employee uses the equipment for themselves or for local clients
Success Condition	Equipment passes the testing and clients successfully receives desired equipment

Alternate Flow	Employee uses the equipment themselves (no client)
Assumptions	1) Employees are registered in the inventory management system 2) Clients are authorized to receive demo kit

4.2 External Equipment Request System

4.2.1 Description and Priority

The external equipment usage of the inventory management system involves the request for demo kits, sales transactions, and shipment of equipment. A client can request a demo kit from an employee to try the product before they make a decision to purchase it. The demo kits and purchased items will be shipped to the clients via a shipping company. The shipping company will provide a tracking number for the order. This allows the employees at Limbic Media and the clients to track the location of the product, and to have an approximate time of arrival for the equipment. This external usage of the equipment is considered to be high priority because of the close interactions between the stakeholders (employees and clients), the reputations of the company and clients.

4.2.2 Functional Requirements

1. The system will record a list of trusted clients who are authorized to receive demo kits.

Forwards Traceability: A customer log within the inventory management system permits the authorization of clients to receive demo kits. Keeping a record of trustworthy clients will meet the requirement of identifying dependable clients, as addressed in the client-analyst meeting.

Backwards Traceability: As stated in the first client-analyst meeting, Limbic Media only wants reputable clients to be able to receive demo kits. This includes referrals from current clients or employees. This will improve the tracking of items, as well as strengthen the client-employee relationship. It will also keep a customer log within the system.

2. The system will store historical information about demo kits, including previous locations, clients, and transactions.

Forwards Traceability: The inventory scheduling log within the system will keep track and record any loan or sale information regarding demo kits and inventory. This will meet the need of improving the documentation of information relating to equipment.

Backwards Traceability: According to the RFP, Limbic Media needs to keep historical records about demo kits. An inventory scheduling log allows employees to keep records about equipment loans. They will be able to share this information with other employees and clients.

a. The system will provide tracking information for employees and clients to locate equipment.

Forwards Traceability: By using the tracking number provided by shipping companies, employees and clients will be able to monitor the location of demo kits. This will be stored in the inventory scheduling log and will be updated regularly. This will meet the requirement of having a paper-free tracking system that is also scalable.

Backwards Traceability: From the client-analyst meeting, and as stated in the RFP, tracking equipment has been highlighted as an important requirement of the system. This will be fulfilled by utilizing the tracking number provided by shipping companies, allowing employees and clients to track the location of demo kits.

4.2.3 Use Case associated with this Feature

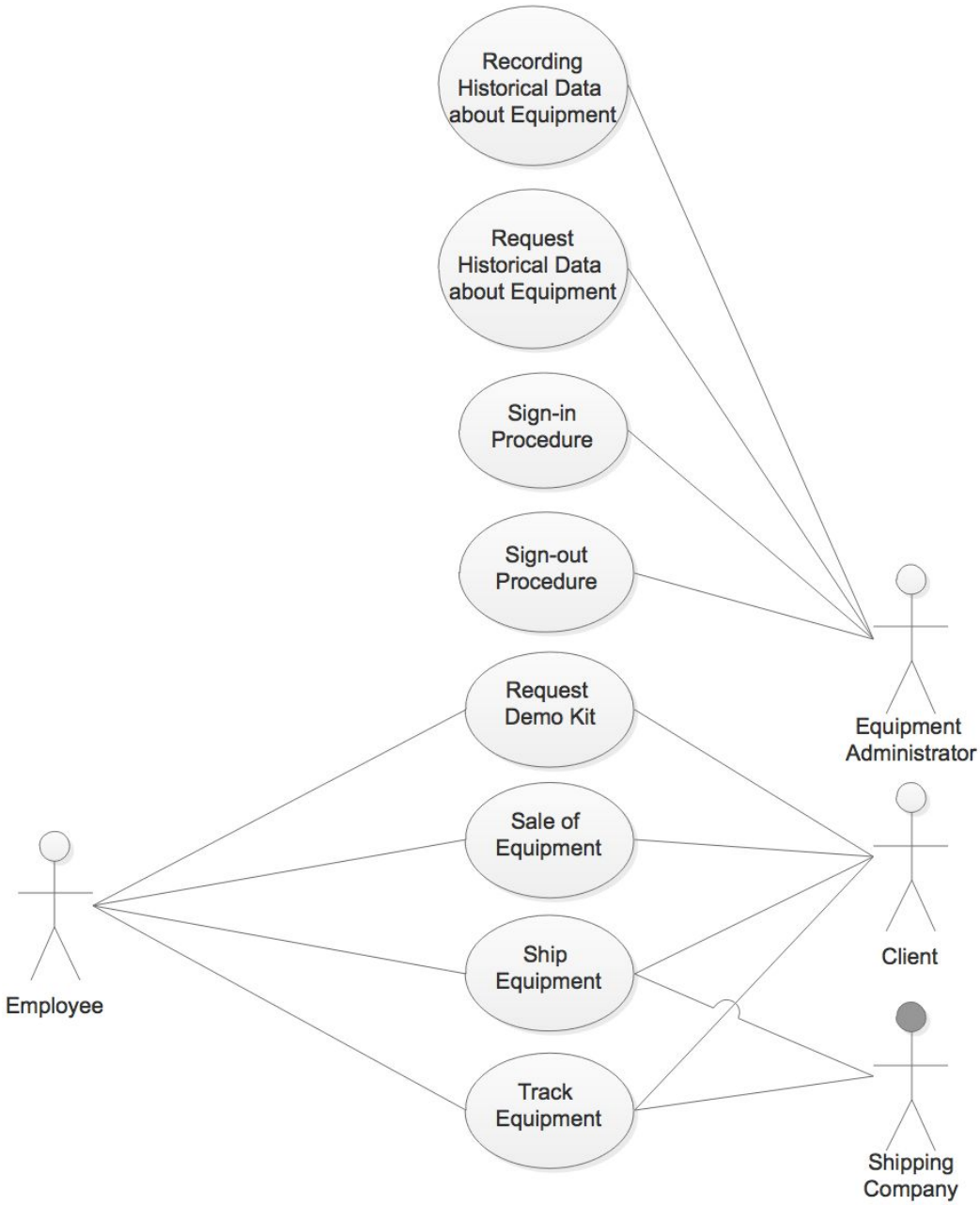


Fig 4. Use case - Sale and demo kit procedure

Case Number	2
Use Case Name	Demo kit and Sales
Actors	Equipment Administrator, Employee, Client, Shipping Company
Preconditions	1) Equipment is in inventory 2) Equipment is not booked for any other purpose 3) Equipment is signed-out
Normal Flow	1) Client requests a demo kit 2) Equipment administrator approves this request

	3) Client provides location information 4) Equipment administrator signs-out equipment 5) Employee/equipment administrator forwards the equipment to the shipping company 6) Shipping company provides a tracking number 7) Employee updates the inventory system with the tracking number 8) Employee provides the tracking number to the client
Success Condition	Client successfully receives desired equipment
Alternate Flow	1) Client wants to purchase equipment 2) Employee collects client details and takes payment 3) Equipment administrator signs-out equipment 4) Employee forwards the equipment to the shipping company 5) Shipping company provides employee with a tracking number 6) Employee updates the inventory system with the tracking number 7) Employee provides the tracking number to the client 8) Clients may choose to keep or return the equipment based on customer satisfaction
Assumptions	1) Product is returnable 2) Employees are registered in the inventory management system 3) Clients are registered into the inventory management system 4) Shipped items have tracking numbers (Sold items and demo kits)

4.3 Sign-out and Return Procedure

4.3.1 Description and Priority

The sign-out and return procedure of the inventory system addresses how employees sign-out equipment, sign-in equipment, take-out equipment, and return equipment. The sign-out and return procedure is considered a high priority due to its necessity in providing equipment to employees and clients.

4.3.2 Functional Requirements

1. The system will allow all employees of Limbic Media to create equipment sign-out requests.

Forwards Traceability: The implementation of an employee log will allow the system to authorize employees. Keeping a record of the employees meets the requirement of securing the system to approved staff members.

Backward Traceability: Currently, the sign-out and return procedure is accessible to all staff. Limbic Media only wants authorized personnel to be able to access the system, as stated in the RFP. The implementation of an employee log will keep track of who works for the company and who is authorized to sign-out and return equipment.

2. The system will allow the location of an inventory item to be updated at any time.

Forward Traceability: By implementing an electronic inventory log, the sign-out process will be improved. The employees will know the status (availability) of the equipment before they take inventory items out. This will address the requirement of improving the logging system of equipment as described in the RFP and the client-analyst meeting.

Backward Traceability: As stated in the client-analyst meeting and RFP, there is a requirement for improving the logging system of the sign-out sheet to make it paper-free. Entering data into an electronic inventory log will improve the scheduling of equipment and make the sign-out process easier to navigate.

3. The system must record information (ex. employee ID, client ID, and item ID) about which employee or client is in possession of any signed-out equipment.

Forwards Traceability: An inventory log will keep track of equipment and will allow employees to know who is in possession of particular equipment. This is achieved by implementing an inventory log where it will keep track of the the employee, items taken out, and other data. This will address the need to keep track of inventory and formally document it in the system.

Backwards Traceability: As described in the RFP, and reinforced in the client-analyst meeting, the need to keep track of who signed-out equipment is vital. Having an electronic form will make information legible and easy to determine if an employee is in possession of equipment.

4. The system will record when equipment is signed-in by an equipment administrator.

Forwards Traceability: This requirement is essential for the system to function. For items to become available again, they will need to be signed in once they are finished being used by an employee or client. A successful implementation of this requirement would manifest by having a screen or interface by which an employee could note when an item is returned to the storage room.

Backwards Traceability: As described in the RFP, there is a need to know when equipment has been returned to the equipment storage room.

4.3.3 Use Cases associated with this Feature

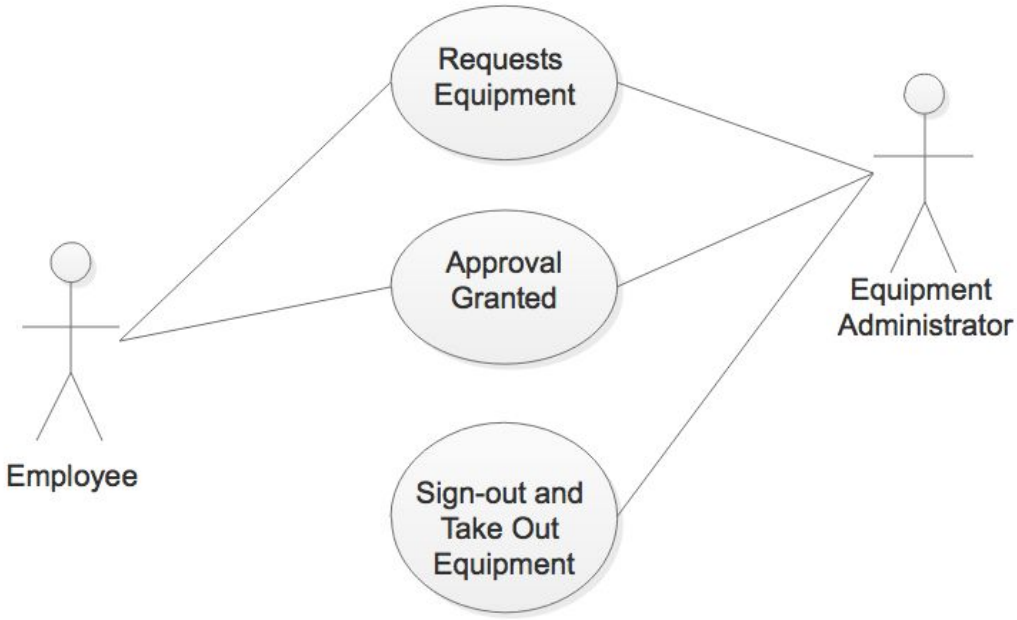


Fig 5. Use case - Sign-out procedure

Fig 6. Use case - Sign-in procedure

Case Number	3
Use Case Name	Equipment Sign-out
Actors	Employee, Equipment Administrator
Preconditions	1) Equipment needs to be in inventory
Normal Flow	1) Employee requests approval to sign-out equipment 2) Equipment Administrator approves the request 3) Equipment Administrator logs into the inventory system using unique credentials and fills the sign-out form 4) Equipment Administrator is able to access the storage room

	and take the requested equipment
Success Condition	Equipment is signed-out successfully and the inventory log is updated
Alternate Flow	N/A
Assumptions	1) Equipment is in working condition 2) Employee is a registered user in the inventory management system

Case Number	4
Use Case Name	Equipment sign-in
Actors	Equipment Administrator
Preconditions	1) Equipment is not damaged and in working condition
Normal Flow	1) Equipment Administrator logs into the inventory system and adds the equipment into the inventory 2) Equipment Administrator places equipment in storage
Success Condition	Equipment is successfully added to the inventory system
Alternate Flow	N/A
Assumptions	1) Equipment Administrator is a registered user of the inventory management system 2) Equipment can be new items or returned demo kits

5. Nonfunctional Requirements

5.1 Performance Requirements

The inventory management solution must provide, at minimum, a method to store and retrieve information about Limbic Media's equipment, employees and clients. The following parameters provide room for growth, and a foundation for future scalability options.

The equipment database will contain enough storage for at least 150 unique items, with each item being able to stock at least 1000 units. These items will have the data fields: item ID, item name, and item status.

The employee database will contain options for at least 150 employees, each with the data fields: employee ID, employee name, employee title, and employee phone number.

The client database will provide for at least 1000 unique clients with the data fields: client ID, client name, client phone number, and client address.

The system's minimum requirements include the ability to track 25 demo kits simultaneously. It must allow for the employees to securely sign-out demo kits for shipping to qualified clients. Each transaction record must include: record ID, product serial number, date and time of sign-out, reason for sign-out, expected date and time returned, and audit trail information of who signed-out and returned the item. This tracking should also allow for monitoring of the location of the demo kits on a map, information regarding which client the product is assigned to, and the tracking number provided by the shipping company.

Sales records will be linked to the inventory tracking system, including the date and time of sale, client name, employee name, and which items were included in the transaction.

5.2 Security Requirements

To protect Limbic Media's inventory and management system, the new system needs to contain the security requirements listed below:

1. Security should be manageable
    a. The security settings of the system should be configurable.
    b. System access should be auditable.
    c. The inventory storage room must be locked and can only be accessed by registered users.

2. Confidentiality, accuracy, and integrity of the system's data should be maintained
    a. The information must be kept private from third parties.

3. Passwords must meet minimum criteria
    a. It should contain at least 8 characters.
    b. It should contain at least 1 uppercase character.
    c. It should contain at least 1 number.

6. Diagrams

6.1 Use Case model

The use case model describes the functionality of the proposed system. This model represents the interaction between the actors (users of the system) and the system. The four actors in this use case model includes employee, equipment administrator, client, and the shipping company. These actors have distinct roles in the system. This is related to the use case design of the system features in section four.

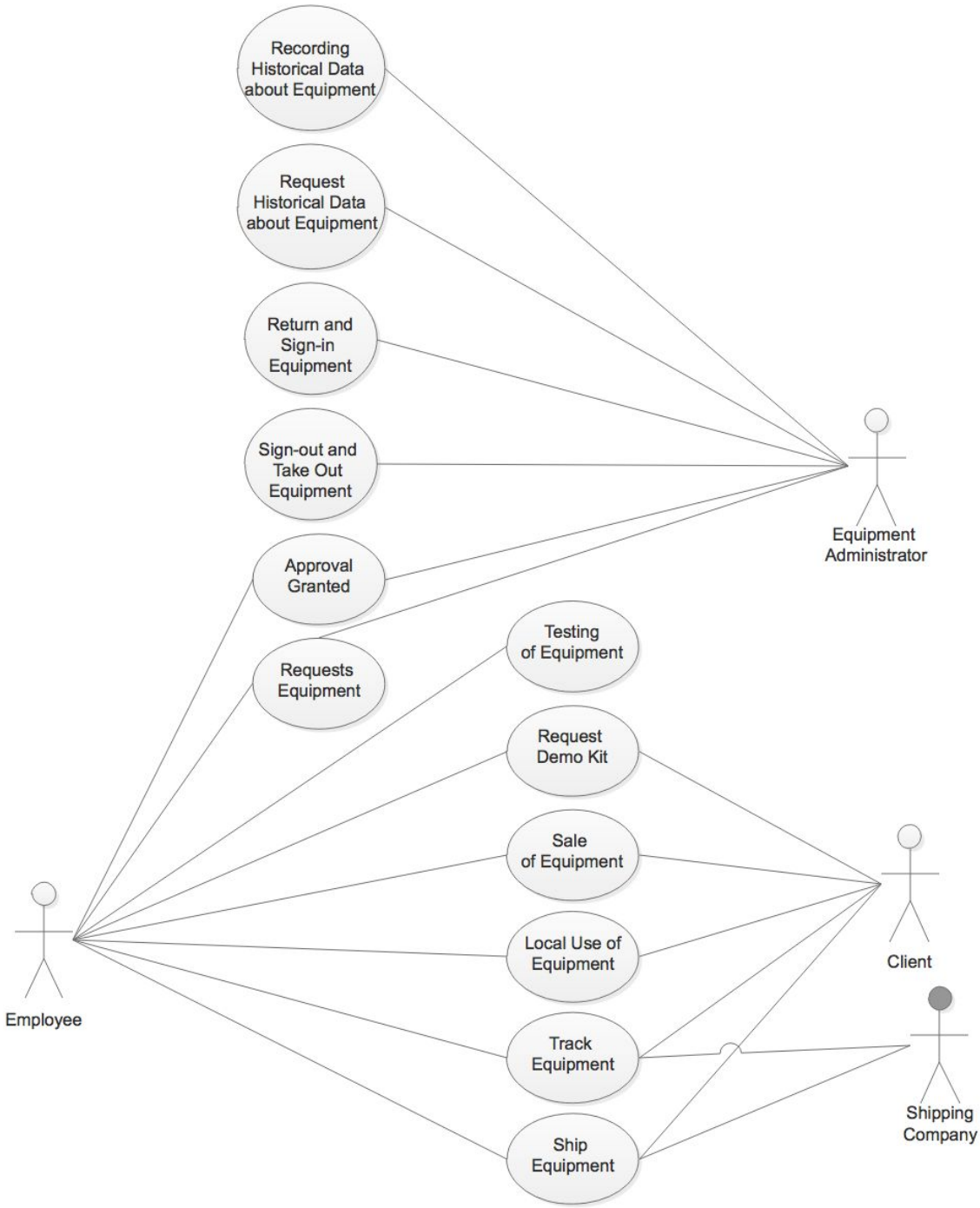


Fig 7. Use case model

6.2 DFD Level-0:

A high level overview of the data flow between the actors and the inventory management system. Employees and equipment administrators both have a large amount of information going into and coming out of the system, whereas clients and shipping companies have smaller roles.

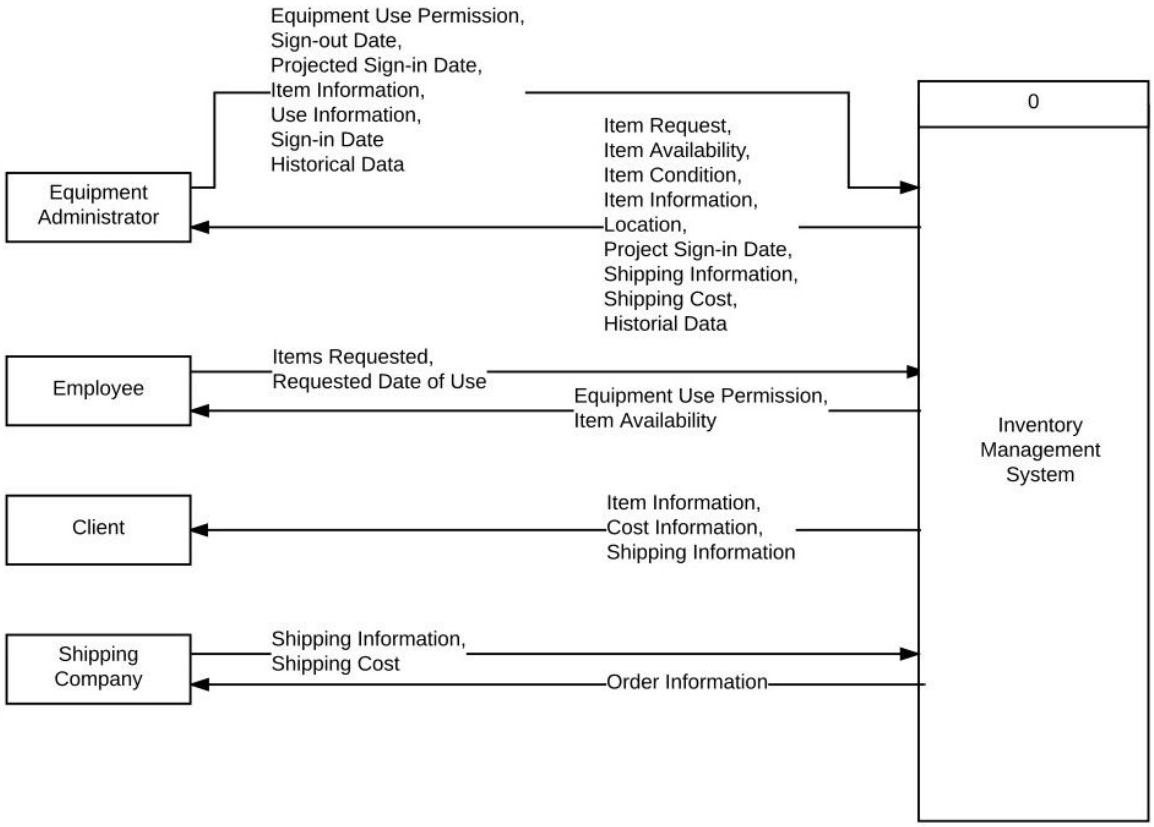


Fig 8. DFD Level-0

6.3 DFD Level-1

This diagram describes the dataflow of the proposed system in an in depth manner. It shows all interactions between the actors and the system as well as all interactions among the different entities within the system. We assume the client communicates with an employee to enter information, therefore, the client does not directly input data into the system.

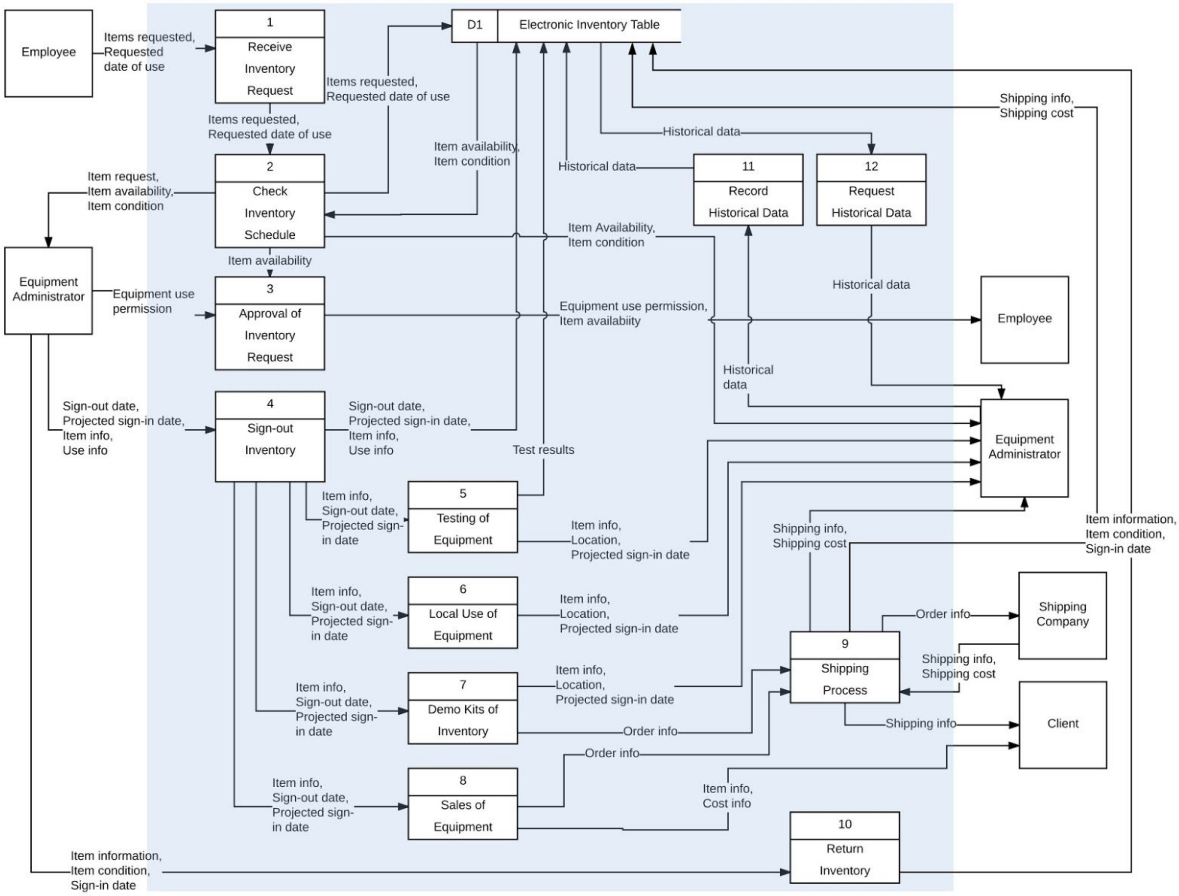


Fig 9. DFD Level-1

6.4 Entity Relationship Diagram

Using information engineering style relationship notation (crow's foot notation), this ERD shows relationships between the entities and the artifacts. The glossary gives a description of each entity and artifact in this diagram.

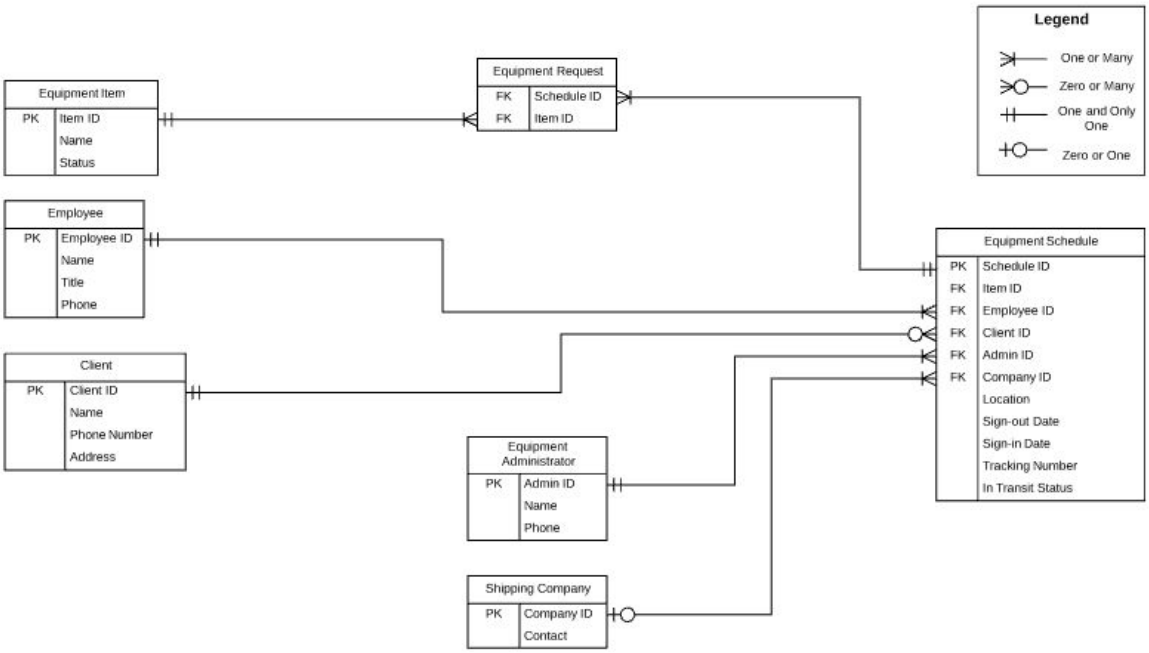


Fig 10. Entity Relationship Diagram

7. Solution

After demonstrating a storyboard prototype of our system to the client group, various options were weighed in terms of their ability to fulfill Limbic Media's business needs. The team has arrived at a decision which will contain all of the features and functionalities needed to effectively manage Limbic Media's inventory. Our recommendation is to purchase Sage 50 Premium software, along with implementing barcode scanning of inventory, and a lockable door between the main office and the storage room.

Using Sage 50 Premium is a very streamlined and easy process. There are many tutorials available, as well as a dedicated support team to help make the software understandable. Additionally, the accounting team already uses another version of Sage 50, so using the extra functionalities of Sage 50 Premium should not pose too many difficulties. Regarding the scanning function, a few items will have to be purchased. First, a printer capable of printing scannable barcodes, and a scanner that can read the barcodes, must be purchased by Limbic Media. Then, for each inventory item, they must place a barcode on the equipment, and input that item's information into the system. Next, once every item and its barcode are stored in the system, simply scanning the attached barcode on an item will pull up that item in the system, and allow the user to perform actions on that item. Finally, to satisfy the security requirements of the storage room, a door will be added to the entrance of

the storage room. This door has a lock, which the equipment administrator has the ability to open.

Our recommended solution is made based on the following constraints, derived from the RFP, and are best addressed by Sage 50 Premium:

1. Must be implemented by the end of 2016

Limbic Media already uses Sage 50's basic package for their accounting team. It would be very easy to upgrade their software. Regarding scanning functionality, the initial implementation would require time, although it could be done in one or two days by one employee.

2. Resources

The resource requirements would be a printer, a scanner, purchasing the software for Sage 50 Premium, and a lockable door. This is relatively inexpensive, and will satisfy Limbic Media's need to minimize costs.

3. Usability

This is where the is solution is far superior to other options. Since employees are already familiar with Sage 50 software, upgrading to Sage 50 Premium will not be difficult.

4. Scalability

Since the software is developed by a third party company, whose list of clients include much larger companies, there will be no problem with the solution scaling to accommodate the company and inventory growth.

8. User Interfaces

The software interface is the primary method of interaction between the users and the system. The Sage 50 Premium software meets Limbic Media's need to eliminate the current paper-based documentation.

To unlock the system, users are required to login with a unique username and password, and new users can be added to the system by users with administration access. This will address Limbic Media's need for greater security of the inventory management system.

Users will be forwarded to the directory home screen, where they will be able to choose the function they need. According to their permission levels, users will see the appropriate functions associated with their position. For example, if the user does not have authority to access an action, that function will not show up on the screen.

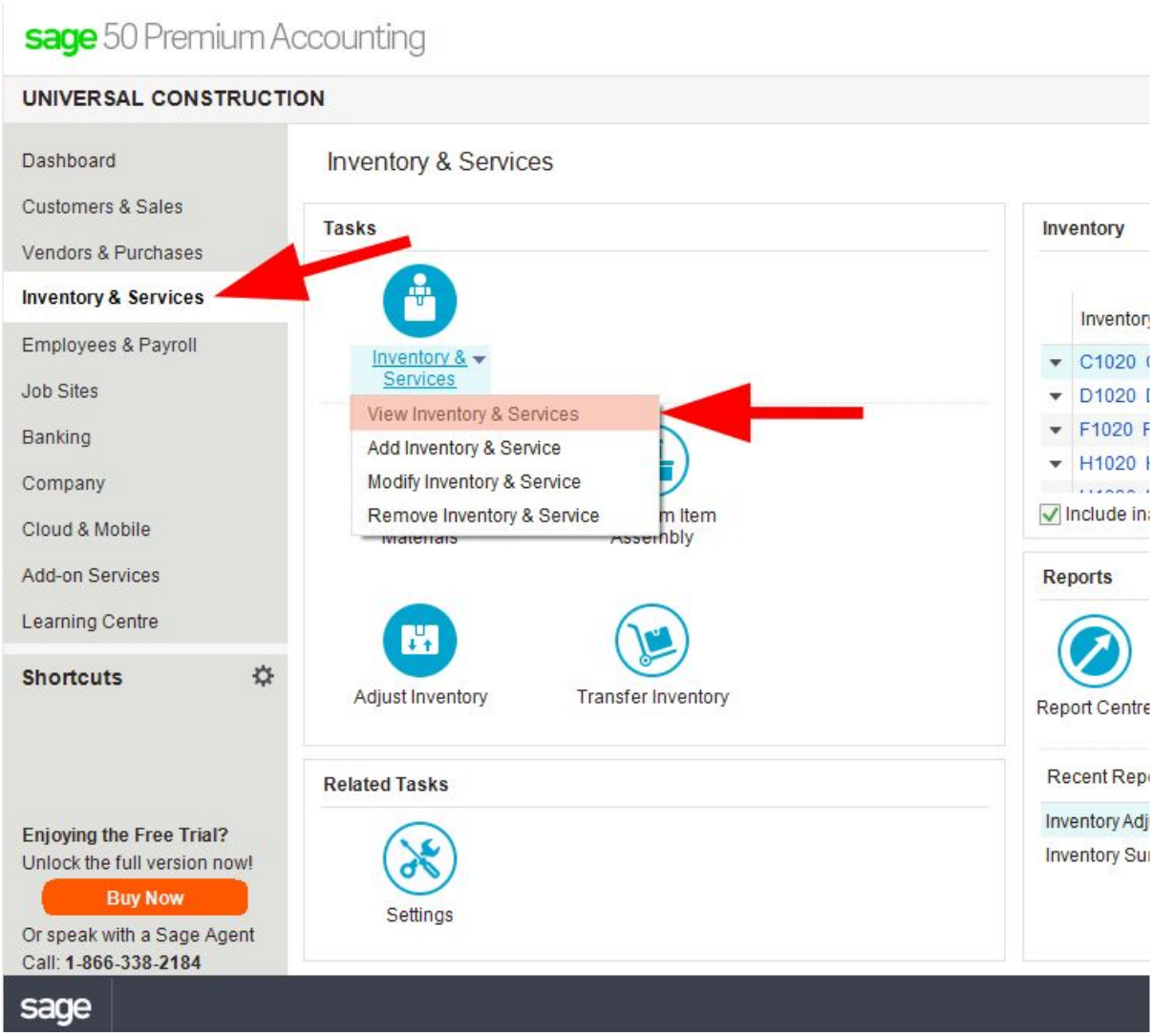


Fig 11. Home screen directory

Once the user logs in, there are three standard features that can be accessed from any page in the system:

- A home button that directly takes users to the home screen.
- A help function that provides detailed tutorials, an open learning center, and a direct contact with the support staff at Sage.
- An exit function that logs out the current user while locking the system.

These buttons are consistent on all screens throughout the system.

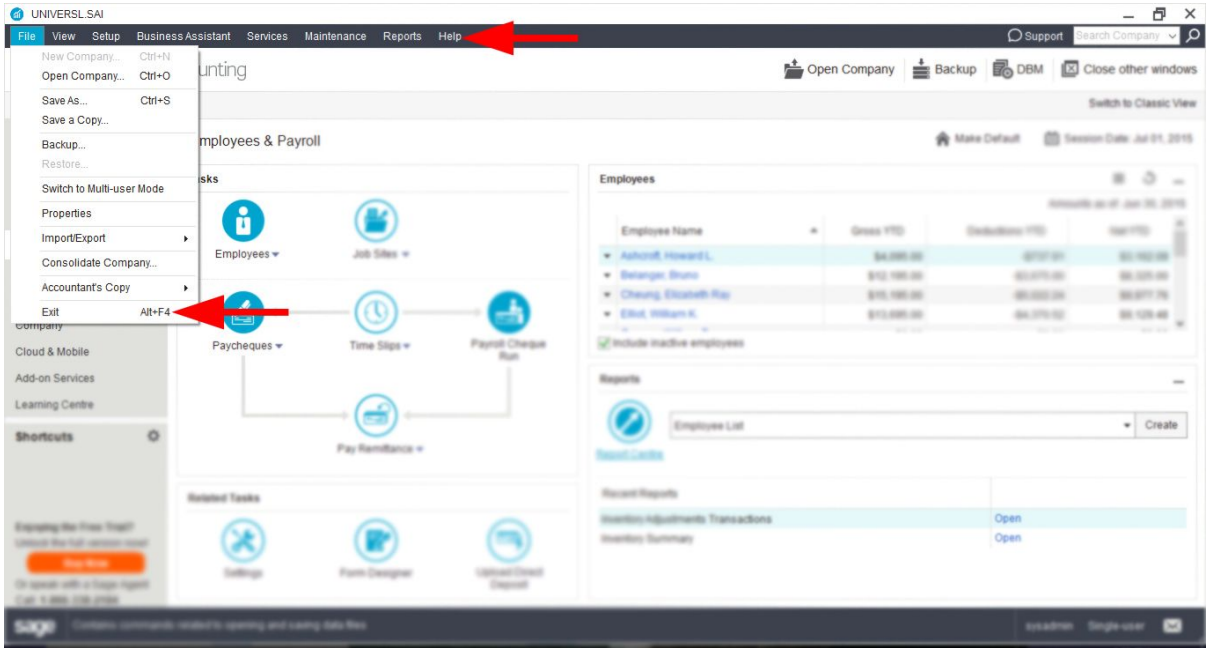


Fig 12. Sage 50 Premium logout and help functions

A pop-up error message will be displayed if the user attempts to incorrectly complete the screen. The system will not allow the user to continue as long as the information is incorrect.

Depending on the number of items requested, there are two different screen options to take out the equipment. When there are multiple pieces of equipment in a request (ex. cable, lighting system and power supply), the user will use the Item Assembly screen. As demonstrated by the red arrow in Fig. 13, pressing the search button allows a user to group items in a package. To take-out individual items, an employee will use the inventory screen - containing a list of all inventory items - to adjust the quantity. To return items and demo kits, we adjust the quantity of the equipment.

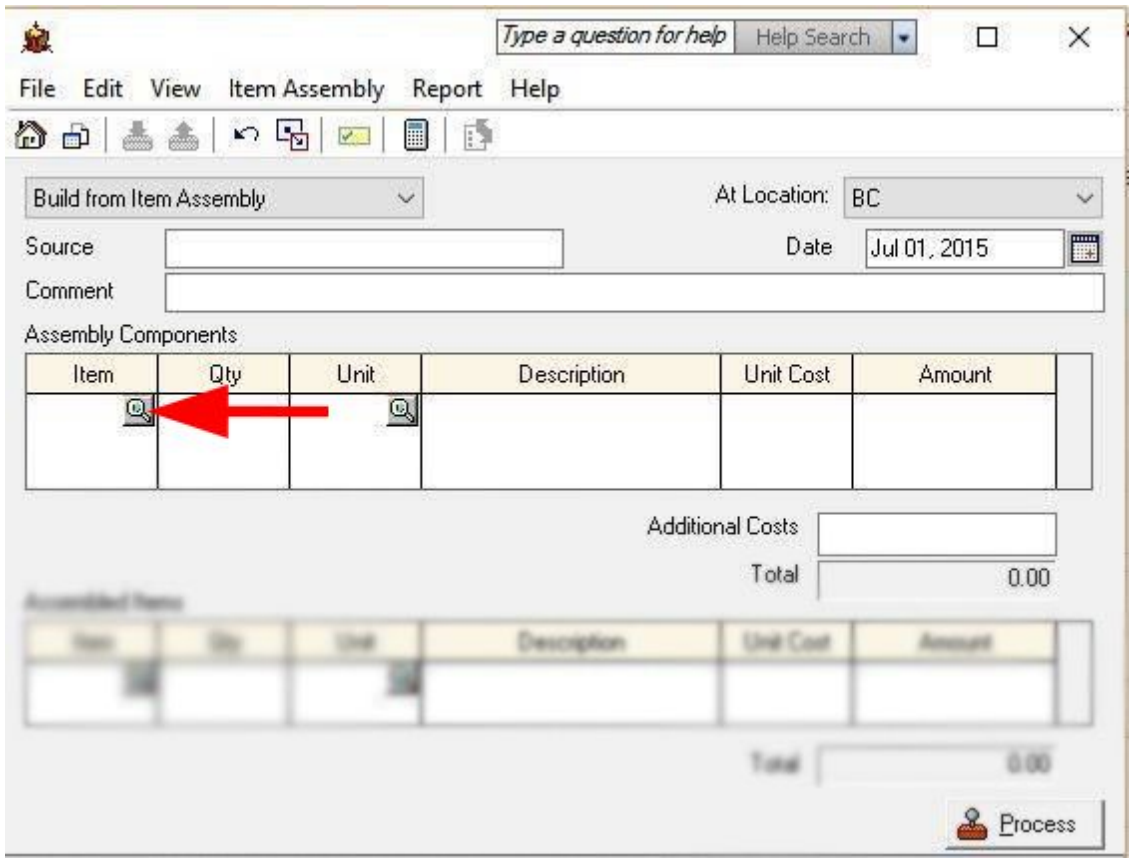


Fig 13. Multiple items sign-out/Assembly screen.

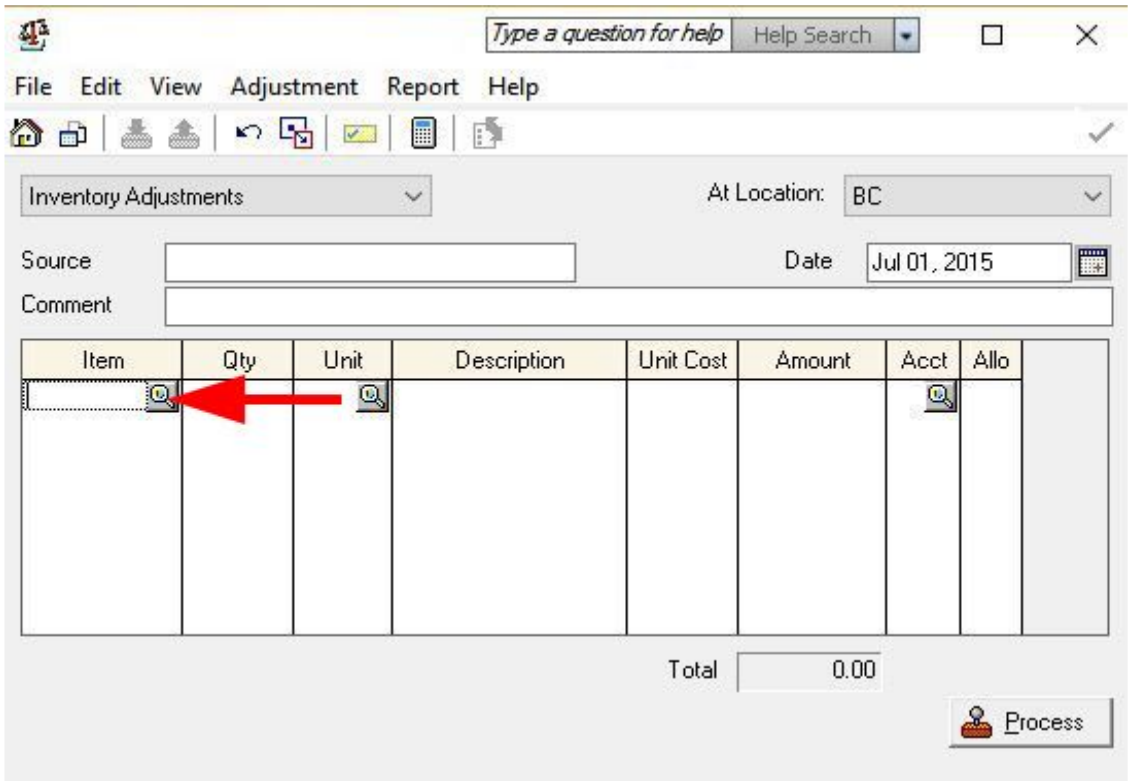


Fig 14. Individual Item sign-out/ return screen.

Job sites allows for items to be relocated for a specific period of time, this is how our system would accommodate scheduling. “Job site” in this case would refer to locations (such as Houston, Texas), employees (such as John Doe), and jobs (such as Amazingly Awesome Trade Show). Furthermore, this keeps the historical information about the inventory item, and keeps track of which inventory items are in and out of office. The status of the job site refers to the completion of an order. This would replace the paper map and pin tracking system while having the location recorded.

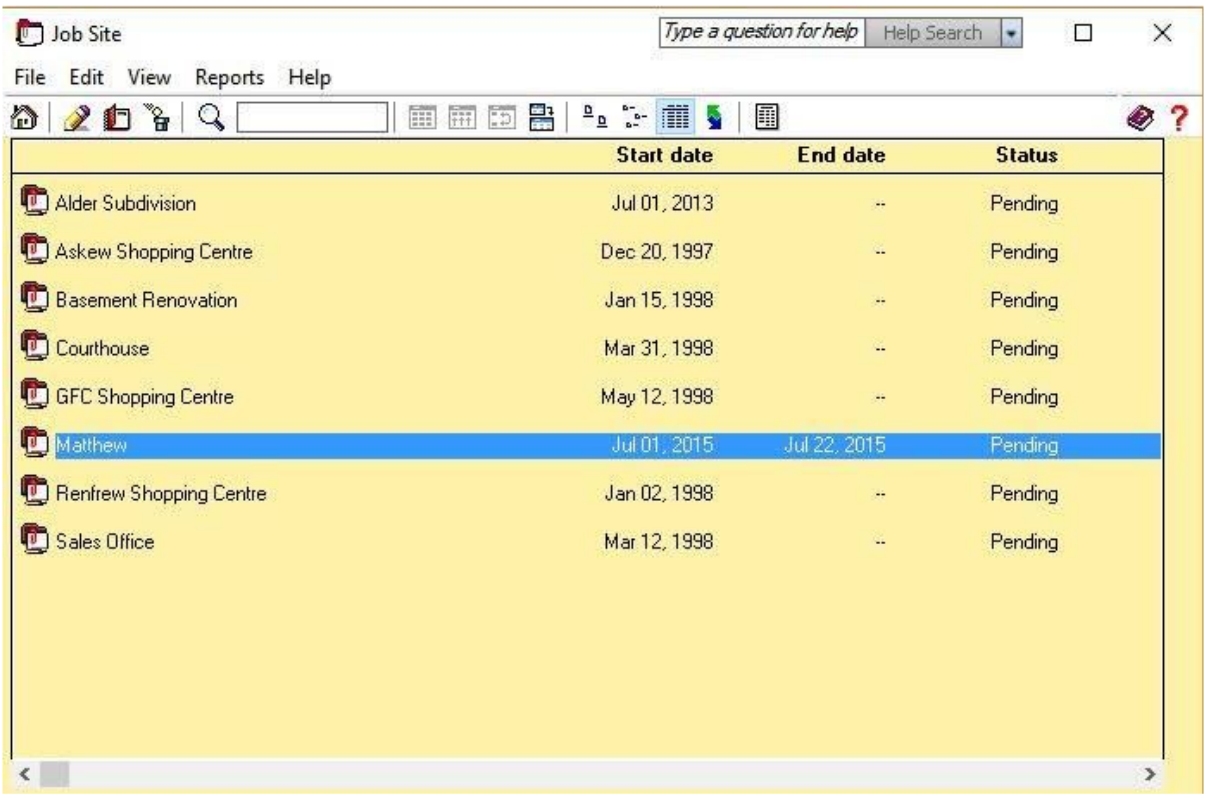
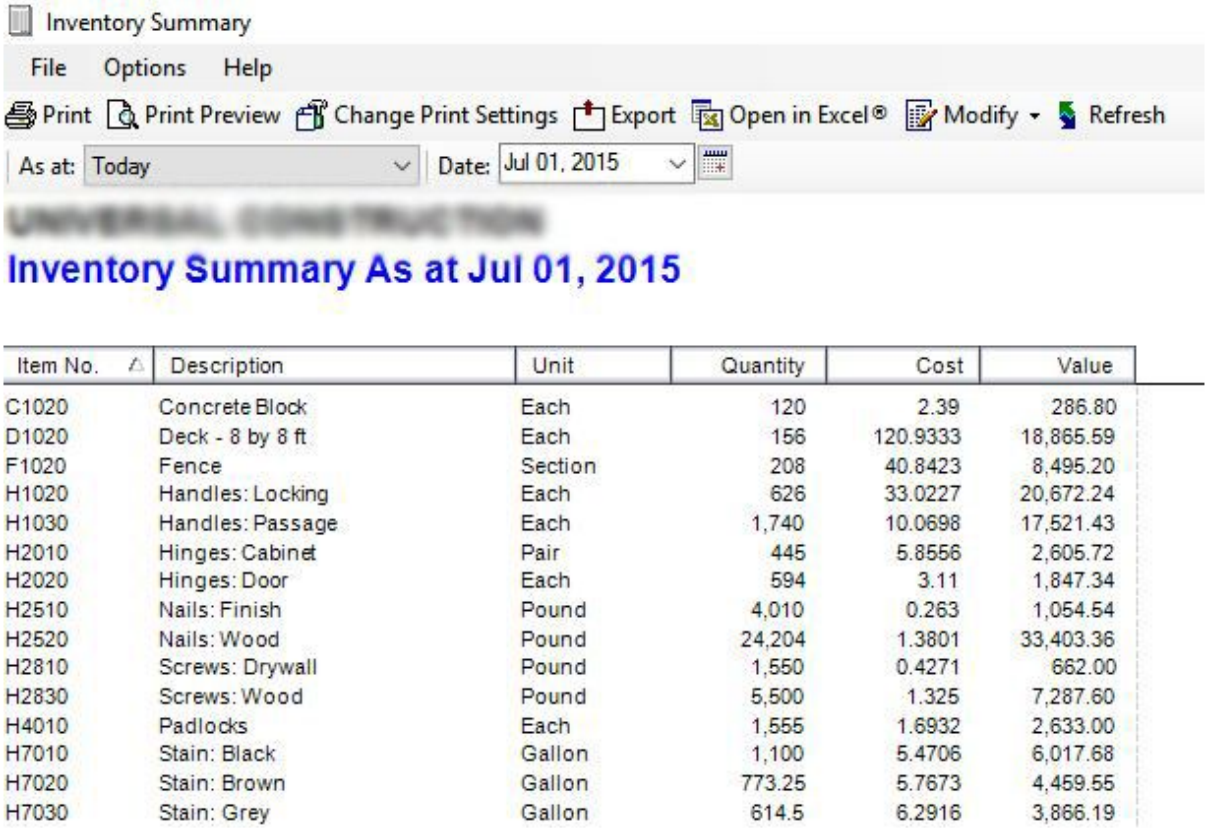


Fig 15. Job site screen - This screen gives the location of where each order is being sent

The Inventory Summary report shows the list of items currently in the system inventory. This list is accessible to all users of the system and updates itself when any inventory item’s quantity is changed. This report allows users to view all items in the inventory before requesting a sign-out. This meets the objective of tracking whether an inventory item is in or out of office.


Inventory Summary

File Options Help

Print Print Preview Change Print Settings Export Open in Excel® Modify Refresh

As at: Today Date: Jul 01, 2015

[redacted]

Inventory Summary As at Jul 01, 2015

Item No.	Description	Unit	Quantity	Cost	Value
C1020	Concrete Block	Each	120	2.39	286.80
D1020	Deck - 8 by 8 ft	Each	156	120.9333	18,865.59
F1020	Fence	Section	208	40.8423	8,495.20
H1020	Handles: Locking	Each	626	33.0227	20,672.24
H1030	Handles: Passage	Each	1,740	10.0698	17,521.43
H2010	Hinges: Cabinet	Pair	445	5.8556	2,605.72
H2020	Hinges: Door	Each	594	3.11	1,847.34
H2510	Nails: Finish	Pound	4,010	0.263	1,054.54
H2520	Nails: Wood	Pound	24,204	1.3801	33,403.36
H2810	Screws: Drywall	Pound	1,550	0.4271	662.00
H2830	Screws: Wood	Pound	5,500	1.325	7,287.60
H4010	Padlocks	Each	1,555	1.6932	2,633.00
H7010	Stain: Black	Gallon	1,100	5.4706	6,017.68
H7020	Stain: Brown	Gallon	773.25	5.7673	4,459.55
H7030	Stain: Grey	Gallon	614.5	6.2916	3,866.19

Fig 16. Inventory Summary

The scan functionality will utilize an electronic device to read the barcodes and automatically fill in the necessary information when signing out the item. Authorized users will also be able to create and print new barcodes for new inventory items using a stand-alone barcode printer attached to the system.

The sale invoice screen provides the functionality of keeping track of inventory via the ‘ship from’ and ‘job site’ boxes, which will replace the current paper map. It will also increase security by making it easier to monitor all equipment. Sales will be saved in Sage 50 Premium to keep in Limbic Media’s records. The shipping company will provide a tracking number to Limbic Media. Using the tracking number, the employees and customers will be able to check the location of the equipment on the shipping company’s website.

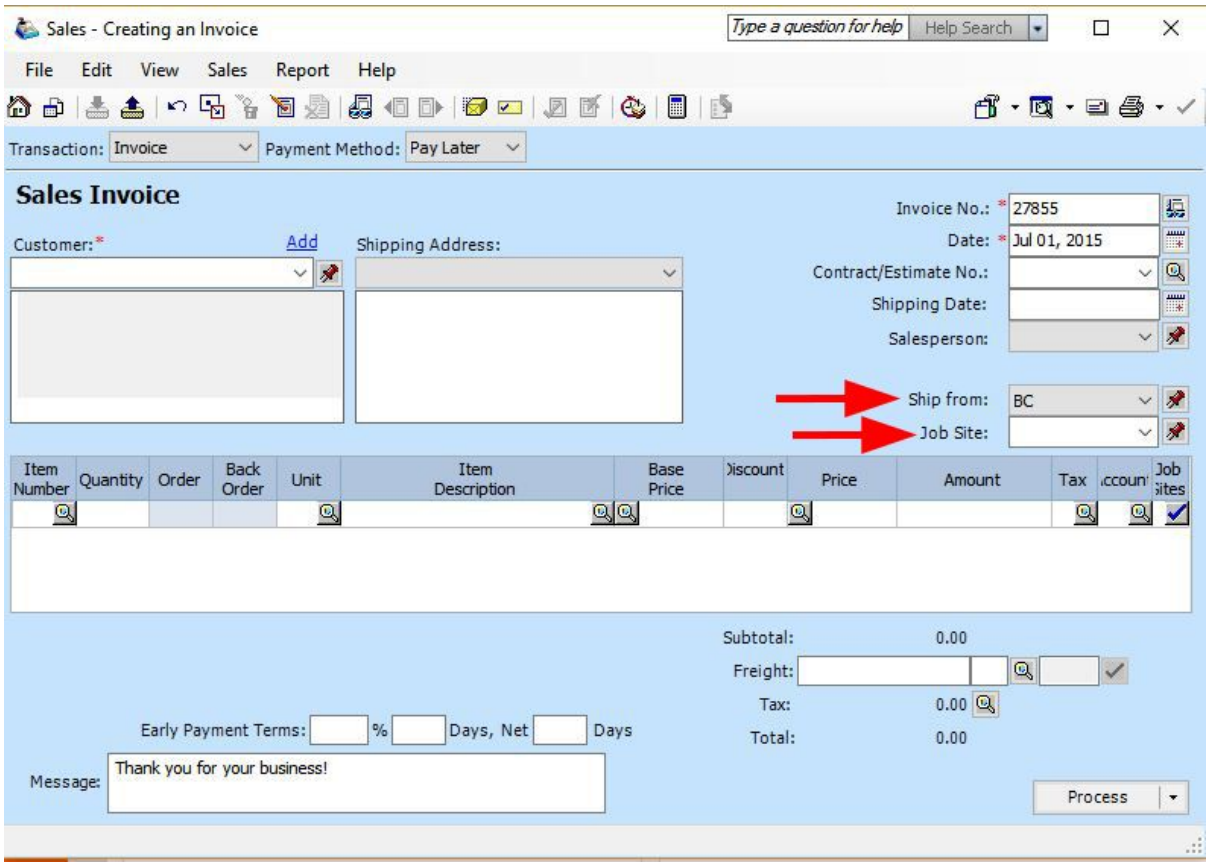


Fig 17. Sales - This screen allows users to input the customer information, shipping information and payment terms for the sale of equipment.

9. Use Case Scenarios:

1. Signing-out equipment
    a. Employee requests inventory for certain dates using system
    b. Equipment administrator receives inventory request on their system
    c. Equipment administrator approves request
    d. When the sign-out date arrives, equipment administrator removes item from storage room, scans the item out, and gives it to the employee who requested the equipment

2. Signing-in equipment
    a. Employee brings equipment to equipment administrator
    b. Equipment administrator scans in the item
    c. Equipment administrator returns item to the proper place in the storage room

3. Local use of equipment
    a. Sign-out process occurs

b. Employee uses the equipment in the manner specified when they made the equipment request
c. Employee returns the item to equipment administrator
d. Sign-in process occurs

4. Testing of equipment
    a. Sign-out process occurs
    b. Employee tests equipment
    c. Sign-in process occurs

5. Demo kit sent out and received
    a. Equipment administrator signs-out items in demo kit on specified date
    b. Equipment administrator delivers items to shipping company, as well as giving relevant shipping information
    c. Equipment administrator notifies client of information from shipping company
    d. Client receives, uses, and returns demo kit to Limbic Media's office
    e. Equipment administrator signs-in items and returns them to appropriate location in storage room

6. Sale of item(s)
    a. Employee makes sale of item(s)
    b. Employee makes equipment request, specifying it is a sale
    c. Equipment administrator approves request
    d. Equipment administrator scans item(s) out and delivers item(s) to shipping company, specifying where they are to be delivered
    e. Shipping company gives equipment administrator tracking information
    f. Equipment administrator gives client tracking information on order

10. Workflow Diagram:

The cross-functional workflow diagram demonstrates how the actors (client, employee, equipment administrator and shipping company) interact with each other and the inventory system.

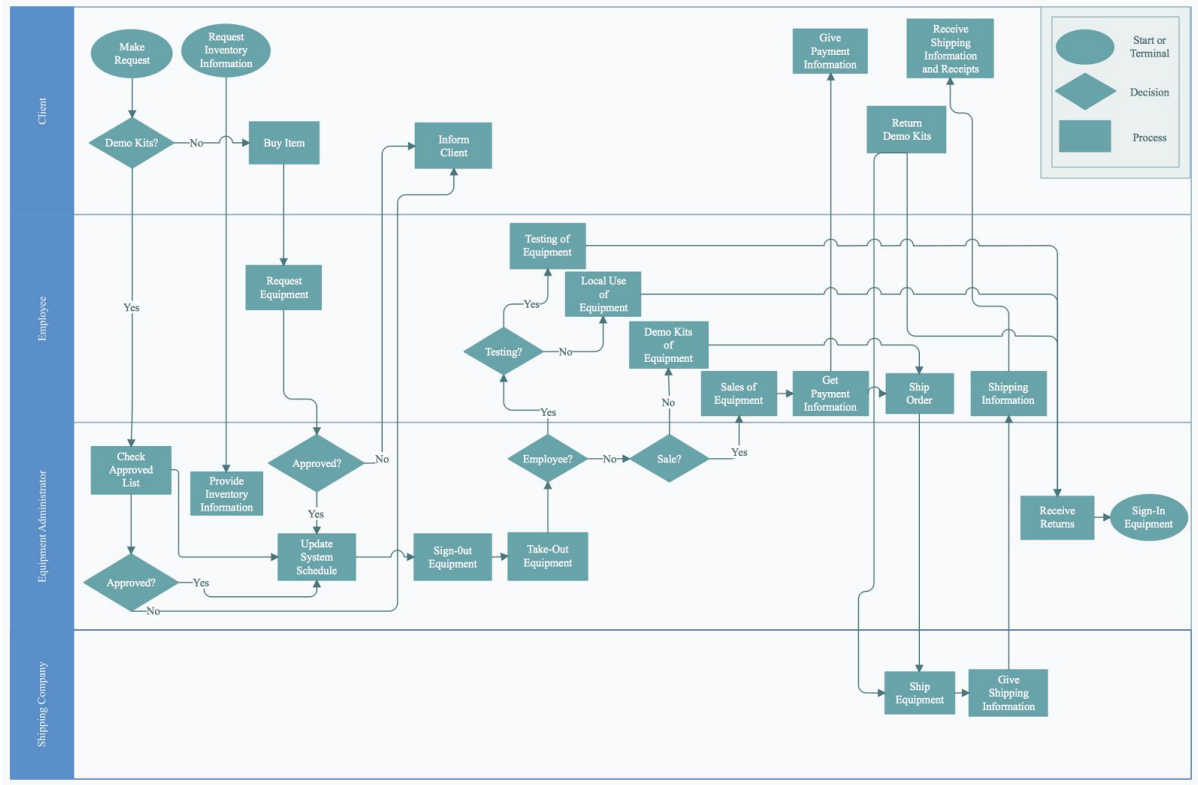


Fig 18. Cross-functional workflow diagram of the inventory management system

11. Conclusions & Recommendations

Our group found that communication, patience, positive attitude, and time management were essential skills in successfully completing this project. There needs to be constant communication to organize meetings, assign work and to make sure that all the group members are on the same page. Patience and a positive attitude ensured teamwork and an enjoyable working environment. There are multiple documents to hand-in constantly, which means time management is very important. Everyone in our group had relatively busy schedules, therefore, it was necessary to plan ahead to make sure all our work was completed on time and of high quality.

To accomplish this project we took advantage of Google docs and the functions of Facebook. We chose roles that suited our skill sets in order to provide quality work. We also had a couple of team building exercises, which helped us bond as a team and become friends.

We would recommend to future students to constantly communicate with your group and to be very organized. We would also suggest that before you hand in a document to talk to the teaching assistant to make sure you correctly understand

what is required in the document. It is also helpful to attend all of the lectures because a lot of the group work is done in class.

As a result of this project, our teamwork skills have improved and we have learned what it may be like working on a project in a real-life situation. This project has been a good experience and we enjoyed working as a team.

12. Each member's contribution to the project

- **Lee Brekstad**
    - Provided snacks, established initial team building exercise
    - Diagrams, document revisions, research regarding real-world solutions
    - Sage 50 expertise
    - Presentation
    - Client meetings
- **Spencer Cox**
    - Organizational lead (creating to-do lists)
    - Document revisions
    - Team motivator
    - Requirements
    - Analyst in two client-analyst meetings
- **Matthew Fung**
    - The glue of the team - coordinating and communicating with all team members
    - Diagrams, document revisions
    - Client Meetings
- **Ashley Garnett**
    - Requirements
    - Diagrams
    - Document revisions
    - Client meetings
- **Vita Huang**
    - Prototype revision
    - UI prototype revisions, document revision
    - Presentation
    - Client meetings
- **Rachel Nam**
    - Document revisions
    - Diagram revisions
    - Presentation
    - Client meetings
- **Kushal Patel**
    - Website maintainer

    - Document revisions
    - UI prototype revisions
    - Presentation
    - Analyst in two client-analyst meetings
- **Sarah Warnock**
    - Document revisions
    - Storyboard
    - Diagram revisions
    - Presentation
    - Client meetings

13. Appendices

13.1 Appendix 1: Glossary of Terms from Domain Model

Terms	Definition
Client	A person or group who orders, pays and receives inventory items
Employee	An individual who works under a contract of employment at Limbic Media
Equipment Administrator	Must ensure that equipments are available, dependable and safe at all times
Equipment Item	Includes lights, cables, power supplies, whips, and power top ups
Equipment Request	The process by which an employee or a client requests the use of inventory items
Shipping Company	A company that provides shipping services; transports inventory items from Limbic Media to clients

Other terms used:

ERD	Entity Relationship Diagram. Graphic display of entities and their relationship
Demo Kits	A full Aurora system with lights, cables, and power supply.

DFD	Data Flow Diagram. Graphically displays the flow or movement of information in a system
Inventory	Includes lights, cables, power supplies, whips, and power top ups.
RFP	Request for Proposal. Proposal made by clients for vendors to implement a solution.
Sage 50	Accounting and inventory software for small business
Sage 50 Premium	An upgraded version of Sage 50, supporting more users and more functionalities

13.2 Appendix 2: Elicitation notes

1. Q: How large is limbic hoping to become and how large is it currently? (US, Canada, Etc, how many employees)
   A: Currently 14 employees, looking to double in size by this time next year

2. Q: Why is the current system inadequate?
   A: Frustrating to use, unorganized, “ad-hoc”. Generally works for right now, however when the company grows, it will become obsolete and outdated

3. Q: Who are the main stakeholders and what are their roles?
   A: The two main users of the current system are the accountant, renne,and the scrum master, Johanna. Everybody in the company is involved in the sign out of inventory, which is done as needed, however the majority of the work is done by those two.
4. Q: What would make this project a success in your eyes?
   A: Fast to implement/use, lasts at LEAST 1 year, during which time they may do a large overhaul of the company’s workflows.

5. Q: Why do you think this non-technological system has prevailed so far?
   A: “It’s better than nothing”
6. Q: What is the current workflow?
   A: There are two major workflows relating to this problem:
   - Taking out inventory:
     - Ask the team on Slack whether on a specific date, inventory can be taken out
     - When the date comes, take out the items
     - Sign out the inventory items on the paper in the storage room
     - Return the items

        - Mark items as returned
    - Sending out demo packages:
        - Get request for demo package to be sent
        - Send to the address
        - In google spreadsheet, make note of package being sent, and where
        - Mark on pin-up map where the demo package is being sent to

7. Q: Are there any cost or scope constraints?
   A: Minimal company resources spent implementing and maintaining
8. Q: How many resources are you willing to dedicate to the implementation and maintenance of our solution?
   A: 1-2 employees may be responsible for being “gatekeepers” of inventory, although minimal upkeep is emphasized

9. Q: Is there any information that you feel has been left out?
   A: Slack is a communication platform used internally to check if given inventory items can be taken out at certain times

10. Q: Do you see any current impact on your customers due to the current system?
    A: No problems yet, although a newer workflow is needed

11. What is the current computer system? Would a solution need to work using the current system or is there a possibility of technological change?
12. Q: Do you see the staff as “adaptable to change” or more “set in their ways”? (This will influence how dramatic a change might be implemented in the projected timeline and how successful it might be.)
    A: Staff are very eager to see a new solution, and willing to change the current one

13.3 Appendix 3: Spencer’s (brief) notes

- There are two very separate workflows which are a part of this problem:
    - Signing out of inventory
    - Tracking demo packages sent out from the office
- Inventory needs historical documentation (where it’s been, if it’s used, if it’s been broken before)
- Inventory can have multiple states (in testing, demo, in transit, sold, etc.)
- There are ~70 different types of inventory items, of which 10-20 types represent most of the movement of inventory
- Slack used as a channel for communication
- Renne (accountant) will probably be the gatekeeper for the new system, although Johanna (scrum master) may also be in charge
- Office is on douglas, near memorial center arena. Can visit office to see current setup

13.4 Appendix 4: Kushal’s (brief) notes

Solution preferences:

- want a solution with less overhead
- Should store customer records
- Should be easy to use and understand
- Should last them at least a year
- Should be scalable, client wishes to integrate it with an accounting software (eg. SAGE50; their current tool used by accounting department)
- A technical solution is idle for this company, as they prefer and would learn it quite simply
- Budget limited to pay for an app or a tool

Limbic looks to make more sales, get busier with the launch of Aurora R2
Slack also used to keep records of equipment sign out
Clients emphasized on implementing a software solution, in particular that integrates an inventory system with an accounts management system

Appendix: Revision History

Section	**Changes**
1.4 Stakeholders	- Added Analysts as a major stakeholder
4.0 Requirements	- Wording - Forwards Traceability - Backwards Traceability - Use Cases - Use Case descriptions

6.0 Analysis Models	- Use case model & description
	  - Added some process and naming scheme
	- Data flow diagrams (both level 0 and 1)
	  - Added more data in dataflow
	  - Added missing actors
	  - Added more processes
	- Entity relationship diagram
	  - Added missing entities
	  - Fixed entity relationships

13.5 Appendix 5: Limbic Media Aurora Inventory Upgrade

LIMBIC AURORA INVENTORY UPGRADE

Request for Proposal

SEPTEMBER 25, 2016

G6 SOLUTIONS

Contents

1.0 Problem Description

Limbic Media designs and builds technology art solutions for businesses, events and public display. This RFP is a request for a proposed solution to Limbic Media's currently overtaxed inventory system for the Aurora product, a sound responsive lighting system. Aurora R1 is currently in production and R2 is due to be released in spring 2017. Currently Limbic is aggressively marketing Aurora to large corporate users, municipalities, event management companies and lighting supply companies who may sell or rent to their own customers. There is also a demo program in place where complete Aurora systems are supplied on loan to interested customers, as well as an upgrade program where an R1 can be purchased and traded in for an R2 system when it is released. It is expected that significant increase interest in Aurora over the next year will make a scalable inventory system necessary.

Currently the Aurora assets are stored in a back room and tracked by sign-out sheets and, for sales and demos, by Google Sheets spreadsheets and a physical map with pins. The system was created ad-hoc and primarily maintained by a few people who have very little time to upgrade it. All employees currently have access and are expected to sign out items if taken. There are unique inventory IDs only for the controllers (the primary asset of Aurora), and R1 power supplies (R2 will have an internal power supply). Accessories such as lights, cables, whips and power top ups are identified by type and sorted into bins. Demo systems are self-contained units that include all necessary cables and lights and also have their own unique IDs. Tracking all of these assets with the current pen and paper, map and google sheets inventory system is becoming increasingly cumbersome and could lead to expensive losses in sales and time wasted managing a disorganized system.

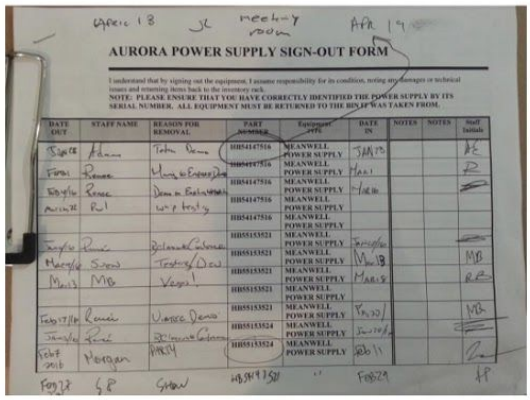
2.0 Project Objectives

Improve the inventory management system in preparation for R2 release and product growth.

3.0 Current System(s)

1. **Sign out**

The current system to keep track of assets within the company are ad hoc paper-based sign out sheets. There are currently numerous sheets attached to clipboards located beside their designated supply. When signing out a supply, employees are required to sign in, date of removal, reason of removal, number of units, equipment type, and a signature. The paper sign-out sheets are difficult to understand which decreases the reliability of the sign out information.



AURORA POWER SUPPLY SIGN-OUT FORM

An example of an Aurora Power Supply Sign out form

2. Tracking

Limbic also utilizes a paper-based system to follow where demo kits are sent around the USA. They use a paper map, pin points and string to keep track of locations. As a growing company, it will start to become difficult to monitor all locations.

Mapping system that tracks where demo kits are sent

1. Security

The inventory room currently is accessible to any staff to sign out equipment. Users need to walk through the management's office space to access it (there is no door on the room).

2. Records

Two Google Sheets spreadsheets keep records of demo kits, controller inventory, sales and rental information.

3. Organization

Bins in the inventory room separate types of accessories and whether they have been tested or not.

3.1 Pending Changes to the Current System

Limbic may need to move forward during the project timeline to implement some of their own changes to mitigate losses:

1. Securing the room with a door or lockable gate.
2. Designating gatekeeper staff who sign out assets for other staff.
3. Accounting for and separating engineering inventory for internal use.

4.0 Intended Users of the System

The primary users of the system are **Limbic Media employees**:

1. All staff members can interact with the assets and sign out via clipboards in the following ways:
    - Borrowing and signing out equipment
    - Returning and signing in equipment
2. The management and admin staff interact with the assets and Google Sheets spreadsheet in the following ways:
    - Recording controller build, testing, shipping and return details
    - Inventory of controller location and status
    - Inventory of lighting and power supply units (poorly maintained in current system)
    - Recording customer details
    - Sales Order tracking
    - Non-sales order tracking (rental, demo, upgrade, promotion)
    - Demo Kit tracking

5.0 Known Interactions Within or Outside the Client Organization

1. **Suppliers**

    Interactions with suppliers via Limbic staff include:

    - Deliveries
    - Returns
    - Pricing and quote generation

2. **Customers**

    All of the customer, rental and demo tracking is currently done through the existing Google Sheets. Interactions via Limbic staff include:

- Orders (sales, rentals, demos)
- Delivery status
- Returns
- Technical support, issue tracking
- Upgrades
- Feedback

3. Community

Limbic is engaged with a local community of artists, municipalities, and businesses, as well as being part of the Accelerate Tectoria Mentor Program. Aurora systems can be checked out via Limbic staff for various events and shows when approved by Limbic Management.

6.0 Known Constraints to the Solution

1. Time/schedule

A solution must be implemented by end of 2016. Limbic will provide implementation and feedback to the analysis, design and prototype input in iterative cycles as necessary. Limbic follows an Agile approach on 2 week sprints and have 3 people involved on this task plus continuous input from the executive team.

2. Resources

An iPad can be dedicated for inventory purposes.

3. Usability

The design of should not be too complicated to use and should not require too much training and education.

4. Scalability

It is essential that any solution allows for scalability as the company continues to grow.

7.0 Project Schedule

Date	Project task
September 25th 2016	Request for proposal (RFP)
September 29th 2016	1st meeting with analysts
October 6th 2016	Project pitch from analysts
October 27th 2016	Requirements section for Final Report
November 14th 2016	2nd meeting with analysts
November 24th 2016	Project presentation and Final Report

8.0 Project Team

Team Member	Role
Jason	*Communication Director*
Jithin	*Project Lead*
Raymond, Atem	*Web Developers*
Ally	*Project Analyst*
Daniel	*Scrum Master*
Kristine	*Presentation Master*
Dylan	*Team Manager*

Email: G6Solutions375@gmail.com

9.0 Glossary of Terms

Aurora: An embedded computer system software that controls LED light patterns according to sound from an internal microphone or from a line-in cable. It is a niche product meant to enhance the atmosphere of events.

Gatekeepers: Staff dedicated to checkout inventory when requested.

Demo kits: A full Aurora system with lights, cables and power supply.

R1: Revision 1. Released 2016

R2: Revision 2. Scheduled to be released on April 2017

Accelerate Tectoria Mentor Program: The Program matches early stage technology CEOs and founders, identified by Accelerate Tectoria, with mentors of strong professional reputation, qualification and experience in the tech industry.

14. References:

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