



Equipment Check-Out System (ECS)

INTRODUCTION

In this section you will learn the background information that will prepare you to understand and complete each of the milestones of this case study. This information includes a history of the business, a description of the business's current facilities, and the descriptions of the problems that triggered the project.

CASE BACKGROUND

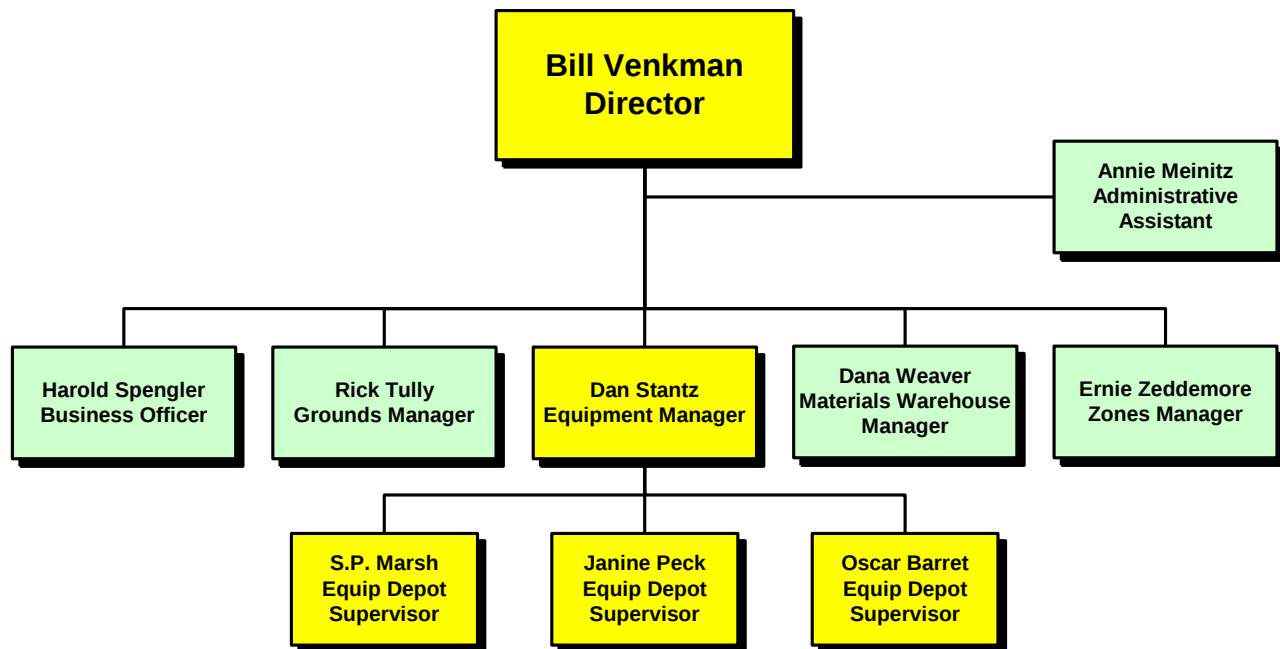
BCIT Manufacturing is a producer of electronic components and testing equipment. The company is located in a plant in the Greater Vancouver Regional District. The corporation has over 1,000 full-time employees.

Approximately 100 employees are employed with the company's maintenance department, which is responsible for the maintenance of building and grounds. Maintenance has assigned a group of employees to provide maintenance for each building of the plant. The employees assigned to each building collectively possess the skills needed to provide proper upkeep. Such employees include carpenters, electricians, painters, welders, plumbers, and the like. The maintenance department also has a group of employees with special skills to assist with special projects that may arise.

ORGANIZATION STRUCTURE

The following individuals report directly to Bill Venkman, Director of Maintenance. Each of the managers has a group of foremen and supervisors that report directly to him or her, although only the supervisors of the Equipment Depot are listed below.

BCIT Manufacturing Maintenance Department



THE PROBLEM

In August Bill Venkman and his management staff completed a one-week retreat aimed at assessing the maintenance operations. Several initiatives resulted from this retreat. It was determined that the most important initiatives were those that primarily dealt with the Equipment Depot operation.

The Equipment Depot's function is to provide the equipment needed by maintenance employees to perform their job duties. Employees are provided with a toolbox containing commonly used, and relatively inexpensive tools such as hammers, screwdrivers, tape measures, and so on. Other tools and pieces of equipment that are needed to complete a job must be checked out through the Equipment Depot. When the job is completed, the employee must return the checked-out equipment. Often pieces of equipment become lost, stolen, or damaged and are therefore never checked back in and made available for others. The dollar amount of lost, stolen, and broken equipment has reached an alarming total. It has been estimated that more than \$50,000 worth of tools are lost or stolen each year. Bill Venkman has decided that something must be done to get the losses under control. Thus, he is giving top priority to the development of a new automated equipment check-out system to keep track of the equipment.



Milestone No.1

SCOPE DEFINITION

SYNOPSIS

The purpose of the preliminary investigation phase is threefold. First, it answers the question, “Is this project worth looking at?” To answer this question, this phase must define the scope of the project and the perceived problems, opportunities, and directives that triggered the project.

In this milestone you will prepare a Request for System Services, which is the trigger for the Preliminary Investigation Phase. Also, you will use fact-finding techniques to extract and analyze information from an interview to determine project scope, level of management commitment, and project feasibility for the Equipment Check-Out System (ECS). With these facts and facts obtained from the Case Background, you will have the necessary information to complete the Problem Statement Matrix and construct the Project Feasibility Assessment Report.

ASSIGNMENT

The Maintenance Department receives computing support from the Information Technology Department. You are to assume that you work as a systems analyst in this department.

You have been asked by Dan Stantz to analyze and design the Equipment Depot system to manage equipment check-in and check-out. In this assignment you first need to assist Dan Stantz in preparing a Request for the IT department. Secondly, by analyzing the interview transcripts, you will determine the feasibility of the project, level of management commitment, and project scope by using fact-finding techniques and the necessary communication skills to compose the Problem Statement Matrix and Project Feasibility Assessment Report.

Mr. Stantz was gracious enough to allow us to record our interview session, and Exhibit 1.1 is a copy of the transcripts. Refer to the Case Background found in the Introduction and to the interview transcript in Exhibit 1.1 for the information necessary to complete the following.

SUBMIT

1. A completed **Request for Systems Services** form using information from the Case Background. Make assumptions where necessary.

DATE OF REQUEST	SERVICE REQUESTED FOR DEPARTMENT(S)
1 Oct 2020	Maintenance Services

SUBMITTED BY (key user contact)	EXECUTIVE SPONSOR (funding authority)
Name Dan Stantz Title Equipment Manager Office Main Equipment Depot Phone 604-555-1236	Name Bill Venkman Title Director Phone 604-555-1237

TYPE OF SERVICE REQUESTED:

- | | |
|--|---|
| ☒ Information Strategy Planning | ☐ Existing Application Enhancement |
| ☒ Business Process Analysis and Redesign | ☐ Existing Application Maintenance (problem fix) |
| ☒ New Application Development | ☐ Not Sure |
| ☐ Other (please specify _____) | |

BRIEF STATEMENT OF PROBLEM

The company is experiencing a loss of over \$50,000 annually in lost or stolen tools and equipment. The current system is incapable of handling the growth in transaction volume.

BRIEF STATEMENT OF EXPECTED SOLUTION

A system is required that will monitor check-in and check-outs of tools and equipment, and track the equipment in terms of person having it in their possession and its location. For safety reasons, the system should prevent issuing equipment to untrained personnel.

ACTION (IT Office Use Only)

- | | |
|--|---|
| ☐ Feasibility assessment approved | Assigned to _____ |
| ☐ Feasibility assessment waived | Approved Budget \$ _____
Start Date _____ Deadline _____ |
| ☐ Request delayed | Backlogged until date: _____ |
| ☐ Request rejected | Reason: _____ |

Authorized Signature_____
Project Executive Sponsor

2. A completed **Problem Statement Matrix** using the interview with Dan Stantz in Exhibit 1.1 and the Case Background for the basis of your information. Make assumptions where necessary. Place yourself in the shoes of Mr. Stantz. Which problems do you believe have the highest visibility, and how should they be ranked? Try to determine the annual benefits. State assumptions and be prepared to justify your answers! Finally, what would be your proposed solution based on the facts you know now?

PROBLEM STATEMENT MATRIX

PROJECT:	Equipment Check-Out	PROJECT MANAGER:	Frank Wegener
CREATED BY:	Sam Smith	LAST UPDATED BY:	Sam Smith
DATE CREATED:	1 Oct 2020	DATE LAST UPDATED:	

Brief Statements of Problem	Urgency	Visibility	Annual Benefits	Priority or Rank	Proposed Solution
1. The dollar amount of lost, stolen, or damaged tools has exceeded \$50,000 per year.	6 months	High	Many '000s	1	New development
2. The Equipment Depot cannot handle the volume of tool requests	6 months	High	Employee productivity increase	1	New development
3. Tools cannot be located	6 months	Medium	Purchase fewer tools	2	New development
4. Employees who have tools in their possession cannot be identified	6 months	Medium	Purchase fewer tools	2	New development
5. A mechanism to generate timely reports does not exist	12 months	Medium		3	New development
6. A mechanism to detect and safety infractions does not exist	6 months	Medium	Lower WorkSafe BC premiums	2	New development

The following is a copy of the transcripts of an interview between Mr. Dan Stantz and you, a systems analyst with the IT department. This initial interview is conducted with a goal of obtaining facts about the problems and opportunities that have triggered the equipment check-out project request, plus other general information that could be used to prepare the Problem Statement Matrix.

Exhibit 1.1

Scene: <i>You have scheduled a meeting to discuss the equipment check-out project with Dan Stantz, Equipment Manager. The meeting is being held at 8:00 AM in Mr. Stantz's office.</i>	
Dan: Good morning!	Dan: That's correct, except the number one priority is the Equipment Depot operation. We would like to focus on tackling that area first.
You: Morning.	You: Good. I wasn't too sure if you wanted this project to address both areas. Well then, why don't you tell me a little about the Equipment Depot . . . just exactly what is an Equipment Depot?
Dan: I am glad we could finally get together. I'm sorry we had trouble finding a time we could both meet and discuss my project. It's been chaotic around here.	Dan: First of all, we have close to 100 maintenance employees. These employees are assigned to certain buildings or plants. Some of the employees are carpenters, electricians, plumbers, and other types of skilled workers. Each new employee is initially provided with a toolbox and a minimal number of tools. Those tools are theirs to keep. At the end of the year, we give them a token amount of money and if they need to replace those tools they can. Otherwise they can keep the money.
You: No problem. Hopefully this meeting won't take too much of your time.	
Dan: I would like to have been able to provide more time to discuss the equipment check-out project. Unfortunately I will have to rush off to a 9:00 meeting with my boss Bill Venkman and his boss, Fred Murray (<i>Vice President of Physical Facilities</i>).	You: That sounds like a sweet deal. Dan: We've found that if you give them ownership, they are more careful and responsible with the equipment. Anyhow, as I said, they are provided with the basic
You: An hour should be more than enough time. The intent of this meeting was for me to simply get an overall understanding of the equipment check-out project.	
Dan: Sounds good. Where should we begin?	
You: Let's start with the minutes from your management retreat. Thanks for sending a copy of that document to me after our phone	

everyday tools such as hammers, pliers, screwdrivers, and the like, depending on their skill. But many jobs they are asked to do require additional tools. That is where the Equipment Depot comes into the picture.

You: The Equipment Depot operates as a store where the employees go to buy additional equipment?

Dan: Not exactly. The employees don't buy the equipment. They check the equipment out from the Equipment Depot and return it when the job is completed.

You: That sounds like a busy operation for the Equipment Depot staff.

Dan: Oh it is! Of course, not every employee needs to go to the depot every day and for every job to get special equipment. Currently, I have three employees working for me in the Equipment Depot. They are able to handle things pretty well, although the beginning and ending of the work day can bring some pretty long lines of employees.

You: Can you tell me the names of your staff? I will likely need to talk to them at some point in time.

Dan: Sure. Janine Peck, Oscar Barrett, and S.P. Marsh each cover one shift. Those three and myself are responsible for the Equipment Depot and its \$1 million inventory.

You: A million! That is a lot of hammers and screwdrivers.

Dan: Remember these aren't hammers and screwdrivers. Small tools are provided in the maintenance toolboxes. These are more expensive pieces of equipment.

For example, air compressors, generators, reciprocating saws, dremmels, etc. – special items that either are needed only on occasions or are too expensive to lose!

You: I see. Tell me about the problems. Are the employees losing too many pieces of equipment?

Dan: We estimate that more than \$50,000 in equipment is lost, stolen, or damaged each year.

You: Wow! So that's why this project is top priority. Do you have any idea what percent is lost, and what percent is stolen or damaged?

Dan: No, we don't. I've seen a couple of pieces of our equipment show up at flea markets, and we've caught a couple employees taking equipment home with them ... but no, we can't say one way or the other for sure.

You: Tell me about your current system.

Dan: The current manual system has been in operation for over 20 years. The current system functioned well in the earlier years. However, as BCIT Manufacturing has grown in the number of buildings and maintenance employees, the system has become inefficient and incapable of handling the growth. I should point out that we no longer subcontract our work out to outside contractors.

You: I was about to ask about that.

Dan: Anyhow, along with that growth is the growth in the volume of equipment check-ins and check-

outs and volume of equipment inventory.

You: So what are you envisioning for the new system?

Dan: Obviously I would like a new system that can handle this growth. I am envisioning a system that will permit my Equipment Depot staff to be able to answer numerous inquiries related to the availability of equipment, the location of a specific piece of equipment, and an up-to-date account of what equipment employees should have in their possession.

You: I see. You want a system that not only monitors check-in and check-out, but you also want the system to literally track the equipment.

Dan: That's right. Heck, if an employee wants to check out an air compressor and we don't have one in stock, I would like my staff to be able to locate one or more of our compressors. Find out which employees have the compressors and when they expect to be done with them. If needed, we can check it out to another employee and instruct that person to go to the job site to pick up the equipment. The last thing I want my people to do is purchase new equipment when they don't have to. That gets expensive.

You: Okay, thanks. I think I've got the picture. It is getting close to your

next meeting and I think I have a pretty good understanding of this project. Are there any last things you would like to discuss about the project?

Dan: Yes there is one last thing. Maintenance has taken great pride in its training of employees and its emphasis on safety. I would like the new system to place a check-out restriction on certain equipment. This would not allow employees who do not possess a certain skill class to check out the equipment. It's for their safety. For example, I don't want my carpenters checking out tools that only electricians should operate. Someone could get hurt if they don't know how to operate the equipment.

You: Thank you for your time. I had better let you get ready for your meeting. By the way, is there a deadline that you targeted for this project, and is there a budget?

Dan: I would like to have the new system tomorrow! Seriously, I would like to have something in six months. As for a budget, no we haven't established a budget. I was hoping that you could tell us what it would cost. I would then talk to my boss about getting funding.

You: Good enough. I will be getting back to you soon.



Milestone No.2

PROBLEM ANALYSIS

SYNOPSIS

There's an old saying that suggests, "Don't try to fix it unless you understand it." With those words of wisdom, the next milestone of our project is to study and analyze the existing system. There is always an existing business system, regardless of whether it currently uses a computer. The problem analysis phase provides the project team with a more thorough understanding of the problems, opportunities, and/or directives that triggered the project. Indeed, the analyst frequently uncovers new problems and opportunities. The problem analysis phase may answer the questions: "Are the problems worth solving?" and "Is a new system worth building?"

The purpose of the problem analysis phase is threefold. First and foremost, the project team must gain an appropriate understanding of the business problem domain. Second, we need to determine whether the problems are worth solving. Finally, we need to determine if the system is worth developing. The problem analysis phase provides the systems analyst and project team with a more thorough understanding of the problems that triggered the project. In the process, they frequently uncover new problems and opportunities.

In this milestone you will perform a **Cause-Effect Analysis** on the Equipment Check-Out System and document your findings using the **Problems, Opportunities, Objectives, and Constraints Matrix**.

ASSIGNMENT

Now that we have completed the preliminary investigation of the system and gained approval to proceed, we can attempt to gain a better understanding of the current system. In this assignment we will use our results of Milestone 1, plus the Case Background information and the user interview, in order to perform cause-effect analysis. The results of this activity will provide us a better understanding of the problems, opportunities, and constraints of the current system.

SUBMIT

Submit a completed **Problem Objectives and Constraints Matrix**. Using the interviews and facts presented in Exhibit 1.1 and Exhibit 2.1, provide the causes and effects, objectives, and constraints for each problem. Separate each problem section from the previous one with a horizontal line.

PROBLEM OBJECTIVES AND CONSTRAINTS MATRIX

Project:	Equipment Check-Out	Project Manager:	Frank Wegener
Created by:	Sam Smith	Last Updated by:	Sam Smith
Date Created:	1 Oct 2020	Date Last Updated:	

CAUSE AND EFFECT ANALYSIS		SYSTEM IMPROVEMENT OBJECTIVES	
Problem	Causes and Effects	System Objective	System Constraint
1. Processing a check-in or check-out takes too long.	Cause – Manual records. Effect – Up to 10 minutes per transaction, causing long line-ups and employee resentment.	Decrease transaction time by automating process.	New system must be compatible with existing ERP database.
2. Unable to determine location of equipment.	Cause – Manual records. Effect – Unable to determine equipment availability. Effect – High rate of equipment loss and theft.	Track equipment location by monitoring equipment transactions.	
3. Unable to determine equipment in each employee's possession.	Cause – Manual records. Effect – High rate of equipment loss and theft.	Generate display and/or report of equipment by employee.	
4. Unable to identify employees with high damage and loss claims.	Cause – Manual records. Effect – High rate of equipment loss and theft.	Generate display and/or report of damage/loss claims by employee.	
5. There are no safety restrictions available on check-out.	Cause – Manual records. Effect – Employees have access to all equipment regardless of skill required. Effect – Potential legal action against firm.	Enable cross-referencing between equipment check-out and skill classification.	
6. Summary reports cannot be generated.	Cause – Manual records. Effect – Unable to identify problem areas.	Generate summary and diagnostic reports.	

The following is a transcript of an interview between Dan Stantz's staff and you, a systems analyst from the IT department. Your goal for this initial interview is to obtain facts about the problems and opportunities that have triggered the Equipment Check-Out project request, plus other general information that could help prepare the Problems, Opportunities, Objectives, and Constraints Matrix.

Exhibit 2.1

Scene: <i>The Equipment Depot. You have scheduled to meet with the Equipment Depot staff just after the 3:00 PM shift change when Oscar Barrett finishes work and Janine Peck starts her shift. S.P. Marsh, the third shift employee has agreed to come in for the meeting. You are sitting on stools behind the counter.</i> You: Well it looks like everyone is here. I'm sorry to be delaying Oscar's getting home for the day. I'm especially sorry S.P. had to make a special trip in. S.P.: That's OK. This is about when I wake up anyway. Oscar said he was going to buy me breakfast. You: Well, thank you anyway. If anything, this underscores how important this proposed system is to you and to the company. I assume that Mr. Stantz has clued each of you in on the project that I am working on? S.P.: Yes, Dan told us. (<i>The others nod.</i>) We certainly need the help. You: I hope I can help you. I've been charged with developing a new system, probably computer-based, to help streamline equipment check-out. But clearly I can't do anything until I understand how your current system operates. Mr. Stantz gave me an overview of the operations, but I need to learn more so that I truly understand	what you are trying to do, the problems you face, and opportunities for making some improvements. Oscar: I don't know about the others, but I would be willing to stay here all night if that is what it takes to get things straightened out around here. I'm glad you showed up about a half hour early. Did you notice the long line of employees and how busy we get? You: Yes, I did. I assume those employees were returning equipment they had checked out earlier in the day? Oscar: Yes and no. Some were returning things they had checked out days, even months ago. And then some of them were checking out equipment they are going to need for tomorrow's jobs. Janine: And some were both checking in and checking out. You: According to Mr. Stantz it sounds like you have the same rush of employees at the beginning of the shift. Oscar: Yes. The first and last half hour of each shift we get overwhelmed with employees wanting to check in or check out equipment. That's why we each generally get in early and clock out late – so we can help each other handle the load. It still is discouraging that it takes so long to process a check-in or check-out –
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anywhere from 2 to 5, maybe 10 minutes to process a check-out, and about 2 minutes to process a check-in. We get the feeling that the employees have come to really resent us and are unhappy with the service provided by the Equipment Depot.

S.P.: But you should understand that we do a lot more than just check equipment in and out.

You: I'm sure you do. Perhaps first I should get a better understanding of your overall operations. Could you begin by identifying all the transactions that the Equipment Depot must handle? In other words, what events take place that trigger the need for you people to complete some type of task? I think we have identified the first two – equipment check-in, and a check-out.

S.P.: For one thing, I periodically receive an employee hiring notice from a supervisor.

(S.P. walks over to one of several black notebooks labeled Maintenance Employee Records and opens it up. It contains a simple one-page form labeled BCIT Manufacturing Maintenance Employee Registration.)

The notice looks like this. It has some general information about the employees such as their ID, name, skill classifications, building they are assigned to, supervisor, and other details. We must have one of these records before an employee is authorized to check out equipment. I would estimate there are more than 100 employee registrations that we maintain. The

supervisor usually brings this notice to us and introduces the new employee. This is a simple task. I merely alphabetically insert the form into the notebook.

You: Could I get a photocopy of several of those. You can mark out the names if you want.

S.P.: Let me clear it with Dan first. But I don't see why not.

Oscar: The supervisor may also send us a skill classification update notice, which requires me to update an employee's registration form.

S.P.: And of course, the supervisor will provide us with employee termination notices. In fact, I received one this morning. These are difficult to process. If I'm lucky, I can process one in about 10 minutes. We have to go through and examine the check-in and out records for that employee to decide what equipment the employee has in his or her possession and communicate that to the supervisor. Employees who are quitting usually check in their equipment on their last day. But if they are fired, we rely upon the supervisor to get the equipment and check it in to us. They tend to not be very prompt and reliable in doing that.

Janine: Now S.P., let's not do any finger pointing.

S.P.: Sorry, but it is true.

You: What else do you folks process?

Janine: When employees aren't here turning in equipment, I am frequently busy with ordering new equipment.

You:	What triggers or initiates the need to order new equipment?	who wanted it so he or she can check it out. Right now we keep a log with information, but it doesn't work very well.
Janine:	Usually it is the supervisors. They may have a job that requires a special piece of equipment. If they or the employee tries to check out the needed equipment and we don't carry it, the supervisor submits a new equipment request. Sometimes we initiate a request when an employee reports losing a tool.	
You:	Then that starts a Purchase Order cycle with the Accounts Payable department getting involved?	You: Okay. I'll see what I can do about that.
Janine:	No, thank goodness. That's the way we used to do it, and it took forever to scan through vendor catalogs and find the cheapest price. But about six months ago we signed a contract with equipmentdeals.com to be our exclusive supplier. The three of us are authorized to buy anything they have as long as we don't go over budget.	S.P.: Related to that, when we purchase equipment to replace something an employee lost, we record the cost on the original check-out sheet so we have a record of it.
You:	So this equipmentdeals.com is the cheapest?	Oscar: Then when an employee finds lost equipment, we try to take care of it. Let me emphasize the word "try."
S.P.:	They may not be the lowest cost on every single item, but with the contract that was negotiated we have significant yearly savings. Plus we save a lot of labor for Accounts Payable and us.	Janine: Right. Sometimes we can locate the owner of the equipment, update their checkout records, and notify them that the equipment has been found. More often than not the equipment that is returned cannot be identified. Going through our check-in and check-out forms to match them with the employee is too tedious.
You:	So this new system doesn't have to do anything with purchasing?	You: Can't you match them by serial number or something?
Janine:	I wouldn't say that. Once we place an order it will take a couple days to a couple weeks to come in. The supervisor or employee may call us several times to check the order status. When the order comes in, we need to notify the employee	Oscar: I can on the big pieces that we track by serial number – things like air compressors and compound miter saws. But we have a lot of small things, such as specialized router bits, that don't have a serial number and are too small to attach one to. We call those untracked equipment, because we don't track them individually. That also applies to inexpensive pieces, such as drills, that just aren't worth tracking individually. A drill is a drill.
		You: So how do you match up a found drill with a lost drill?
		Oscar: Sometimes I can make an educated guess though. I can

locate any submitted reports of lost equipment and see if it appeared on the report. But I frequently find that there are multiple employees that reported a similar piece of equipment missing, such as a drill or router.

You: What else do you do?

S.P.: We also follow up on damaged equipment returns. Some can be repaired. I have to see to it that the equipment is sent out for repair and then make sure we get it back. We record the repair cost on the original check-out sheet so we have a record of the employee who caused the damage.

You: So you track repair costs and lost equipment costs by employee?

S.P.: I wish. The supervisors always want to identify the employees who seem to have the most damage and most lost equipment. There's no way we could go through all those records that manually. Maybe you can build that into your system.

You: I'll see what I can do. At some point I will need to learn the details about how each of you processes those transactions. For now let's move on to some other items. I would now like to gain a little better understanding of the records or files you maintain. Can you tell me a little about them? I saw the employee notebooks. Are there others you can tell me about?

Janine: I can't think of anything that wasn't already mentioned.

Oscar: Me neither.

You: Okay then. That list of employees with damages or lost equipment

leads us into the topic of reports. Do you generate any reports?

Oscar: Very few—and that's the problem. I would like to generate all kinds of reports to help us do our job, but it is almost impossible to do so. For example, I would like to have a year-end inventory report.

Janine: Yeah, and a report of all checked-out equipment, by employee.

S.P.: I tell you what we could use, it would be nice to be able provide the employees with a periodic statement detailing what equipment they have checked out and are expected to have in their possession.

Oscar: All that is great, but if we really want to cut into our dollar losses on lost, stolen or damaged equipment, we need that report listing employees having a history of excessive equipment losses or damage.

Janine: The bottom line is that we seem to collect volumes of records, but we don't have any ability to quickly obtain reports or information that we need to do our job.

You: I get the picture. I will certainly see what I can do about that. This was some really helpful information. I look forward to meeting with each of you over the next few weeks to learn even more details about your current checkout operations. But I see we are out of time. So thanks again for permitting me to meet with you.

COMP 2831 - Term Project

Equipment Check-Out System



MILESTONE 3

Submitted by: Alan Colquhoun A00390667

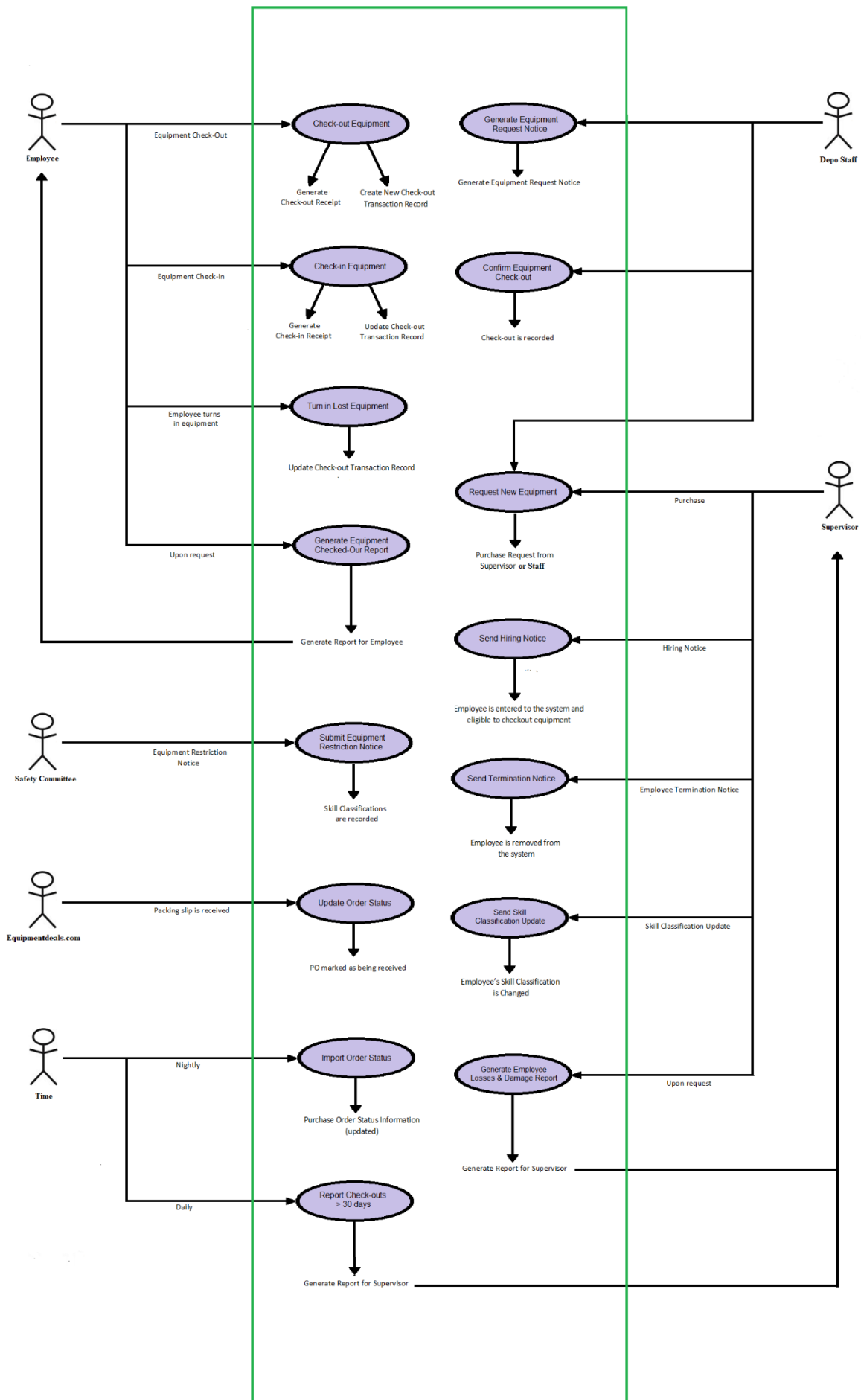
Date: Monday 04 Nov 2019

Instructor: Frank Wegener

Use Case Glossary

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Use-Case Name	Actor	Trigger	Responses
1. Check-out equipment	Employee	Equipment Check-Out	Generate check-out receipt and create new Check-out transaction record.
2. Check-in Equipment	Employee	Equipment Check-In	Generate check-in receipt and update Check-out transaction record
3. Turn in Lost Equipment	Employee	Employee turns in equipment	Update Check-out transaction record if possible
4. Report Check-outs >30 Days	Time	Daily	Generate report for supervisor
5. Generate Equipment Checked-Out Report	Employee	Upon request	Generate report for employee
6. Import Order Status	Time	Nightly	Purchase Order status information is updated
7. Request New Equipment Purchase	Supervisor	Purchase request from supervisor or staff	Purchase Request is recorded
8. Update Order Status	Equipmentdeals.com	Packing slip is received	PO marked as being received
9. Send Hiring Notice	Supervisor	Hiring Notice	Employee is entered to the system and eligible to checkout equipment
10. Send Termination Notice	Supervisor	Employee Termination Notice	Employee is removed from the system
11. Submit Equipment Restriction Notice	Safety Committee	Equipment Restriction Notice	Skill Classifications are recorded
12. Send Skill Classification Update	Supervisor	Skill Classification Update	Employee's skill classification is changed
13. Generate Employee Losses & Damage Report	Supervisor	Upon request	Generate report for Supervisor
14. Generate Equipment Request Notice	Depot Staff	Equipment Check-out	Generate equipment request notice
15. Confirm Equipment Check-out	Depot Staff	Equipment Check-out	Check-out is recorded



Use Narrative

Use-Case Name	CHECK-OUT EQUIPMENT	
Use-Case-Id	EQ-CHKOUT	
Priority	HIGH	
Source	EQ-CHKOUT_Req1.0	
Primary Actor	Employee	
Other Actors	Depo Staff	
Other Interested Stakeholders		
Description	This use case describes the event of an employee checking out equipment.	
Pre-condition	The employee must be active and the depo must be open & staffed.	
Trigger	The use case is initiated when an employee attempts to check out equipment.	
Typical Course of Events	Actor Action	System Response
	Step 1: The employee scans the barcode on his badge Step 3: The employee requests equipment Step 7: The employee gives the receipt to depo staff to check out the equipment. Step 8: The depo staff fetches the required equipment and checks it out. Step 10: The employee receives the equipment and check-out receipt	Step 2: The system verifies that the Employee Id is active Step 4: The system verifies that the employee has the required skill classification. Step 5: The system verifies that the equipment is available. Step 6: If the employee has the required skill classification and the equipment is available, the system generates a check-out receipt. Step 9: The system generates a check-out transaction record.
Alternate Courses		Step 2: The employee is not active. The system displays EMPLOYEE NOT ACTIVE Step 4: The employee lacks the skill qualification. The system displays LACK OF SKILLS REQUIRED Step 5: The equipment is not available The system displays EQUIPMENT NOT AVAILABLE
Conclusion	The use case concludes when an ACCEPTED message is displayed	
Post-condition	The transaction is recorded in the check-out database	
Business Rules	The employee is an active employee The depo is open The employee has the required skill classification The equipment is available	
Implementation Constraints Specifications	Check-out receipt provided to employee	



Milestone No.4

DATA MODELING AND ANALYSIS

SYNOPSIS

The requirements analysis phase answers the question, “What does the user need and want from a new system?” This phase is critical to the success of any new information system! In this milestone we need to identify what information systems requirements need to be defined from the system users’ perspectives and draw graphical, logical models to document the data requirements for a new and improved system.

Data modeling is a technique for organizing and documenting a system’s data. Data modeling is sometimes called database modeling because a data model is usually implemented as a database. Data is viewed as a resource to be shared by as many processes as possible. As a result, data must be organized in a way that is flexible and adaptable to unanticipated business requirements – the purpose of data modeling.

In this milestone you will first discover those entities in the system that are or might be described by data. Then we will define each entity we identify in respect to the business. Then we will construct a Context Data Model that graphically depicts each of the entities and their relationships with each other. Next, we will refine the context data model to include primary and foreign keys. The resulting model is called a Key-Based Data Model. Finally, we refine the key-based data model to include any hierarchies and attributes, and this model is referred to as the Fully Attributed Data Model.

ASSIGNMENT

Now that we have studied the current system and analyzed some of its problems and opportunities, plus gained approval to proceed, we can now start to identify the business data requirements and graphically model them. In this assignment we will use our results of the previous Milestone, samples of forms we have collected, and a copy of a transcript of an interview with Dan Stantz’s staff. The results of this activity will identify the business data requirements for the proposed system.

SOLUTION

1. A complete ENTITY DEFINITION MATRIX. Analyze each of the forms shown in Exhibits 4.2, 4.3, and 4.4 that are referenced by the user interview in Exhibit 4.1. Make assumptions where necessary. A complete **CONTEXT DATA MODEL** based on the Entity Definition Matrix you created.
2. A complete **KEY-BASED DATA MODEL** based on the context data model you created. Insert any associative, transactional, and dependent entities that may be required to solve the many-to-many relationships that may exist. Also consider that the primary key of these new entities may contain foreign keys, depending on whether or not instances can re-occur.
3. A complete **FULLY ATTRIBUTED DATA MODEL** based on the information in Exhibit 4.1 and any other assumptions you have made.

The following is a copy of the transcripts of an interview between you and Oscar Barrett. The goal of this interview was to obtain sample forms used for processing check-ins and check-outs and to be able to ask questions about them in order to discover data entities of the business system.

Exhibit 4.1

<i>Scene: You have arranged to drop by the Equipment Depot to pick up samples of forms used to process check-ins and check-outs. Oscar Barrett was willing to collect them and answer any questions that you might have.</i> Oscar: Hi. I assume you are here to pick up the forms. You: Yes. Is this a good time? Oscar: Sure. Here are the forms. Any questions? You: Let's see ... I see check-outs on this form (see <i>Exhibit 4.2</i>) but no return. Does that mean that equipment is still out? Oscar: No. Each time an employee comes to the Equipment Depot counter to conduct business with us, we pull one of these forms out and record all the check-in and/or check-out activity they wish to perform during that visit. It is not intended to be reused when they come back. I'm not sure why we couldn't use it that way, we just don't. You: I see. So the "Date" refers to that day's record of check-in and check-outs for the employee? Oscar: Well, it is simply the date they are checking in or out the equipment. I know it is a little confusing. Let me give you an example. We would use one of these forms to record all the check-ins and check-outs an employee did in the morning. If	that employee returned in the afternoon to return equipment, we would use a new form. You: Just curious. Why wouldn't you just pull the form when they come back in and update it? Oscar: Time! It takes time to look up the form. We do file these, but sometimes they don't get filed right away. We want to get the employees taken care of as quickly as possible. So it is easier to simply fill out a new one for each visit. You: But if the new system made it easier to find those records and update them? Oscar: Yeah, that might make the whole system work better. You: OK. What is this "Employee ID"? Does the Maintenance Department assign that? Oscar: That is the BCIT Manufacturing Employee Id. All maintenance employees wear an Employee ID badge that has their ID and photo. We started that two years ago. It makes things go more quickly. We don't have to wait for them to pull out their wallets and look up their ID. We can just read it. You: Do you have to record both the "Equip ID" and the "Description"? Oscar: If it is tracked equipment we record the serial number. Those are the
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	equipment we want to specifically track and know who has it.		in numbered storage bins. Bin A48, I think, holds all the router and bit sets, and right on the front of the bin is a card that says Equip ID 1425.
You:	I remember. You have tracked and untracked equipment. Some pieces are too small for an equipment ID and some are too inexpensive to be worth tracking.	You:	Is the tracked equipment also stored in bins?
Oscar:	Exactly. Let's say we have a particular air compressor and its serial number, 123456789, is stamped on the side. That is an expensive item. We want to track it. We want to know that John Doe has checked out that particular air compressor. We want to know where that particular air compressor is at all times.	Oscar:	No. Most of them are too large to fit in bins. They are stored in a particular aisle.
You:	OK. And you call that tracked equipment?	You:	And you keep all this storage information in your head?
Oscar:	Right. That nailer on the second line is tracked.	Oscar:	We know where all the most popular equipment is stored. But for uncommon requests we refer to this storage list. (see Exhibit 4.3) It shows the aisle or bin location of each kind of equipment. This is just part of it. You can have that.
You:	So what is the "Equip ID" on the router and bits?	You:	Does some information system generate this list?
Oscar:	We still give everything a numeric ID. It helps us identify them when we are sorting through all these forms. But if we have 10 router and bits sets, they all have the same ID. 1425 means a router and bit set.	Oscar:	Just a word processor.
You:	But if that number isn't stamped on the equipment as a serial number is, how do you know its number for the form?	You:	What is this "Type" column?
Oscar:	Oh, we just know most of them. You'd be surprised what sticks in your head over time. But those numbers are also printed on each bin.	Oscar:	We categorize the equipment – carpentry, welding, plumbing, machine tools, etc. We have so machine pieces of equipment that those type codes really help us when we're searching for a particular piece.
You:	Bin?	You:	OK. One more time, let me make sure I understand tracked versus untracked. On this check-out form you know that this employee checked out a router and bit set. But you don't know which router and bit set.
Oscar:	Storage bin. All the untracked equipment is organized and stored	Oscar:	Right. We know which nailer but not which router. Here's another example and this might clear things up for you. Let's say that an employee wants checks out a

wrench. A wrench is relatively inexpensive. Also, it is virtually impossible to track. A particular wrench does not have a serial number on it! But since it is relatively inexpensive and virtually impossible to track, we don't even attempt to do so. We simply want to keep track of the fact that the employee checked out a wrench. We don't care which wrench. We only care that we get the wrench back.

You: OK. Two kinds of equipment and slightly different information kept for each. But everything has an Equip ID.

Oscar: Right. For tracked equipment we only have one piece with that Equip ID. With untracked we could have several.

You: Do you need the system to track the **quantity** you have of each kind of equipment?

Oscar: Good question. We haven't until now. If someone calls us up see if we have something in stock we just put him or her on hold and go look. But it would be nice if the computer had a total and could subtract the outstanding loans. Sometimes I've suspected people of sneaking in here and raiding our inventory. And maybe your system could even allow people in another plant to check our inventory online before they trudge over here.

You: We're still working out the system requirements. I'll write that down. Let's finish the check-out form. I assume "**Qty In**" and "**Qty Out**" for large equipment is always one?

Oscar: That's correct . . . in fact sometimes we don't even enter a

quantity, since it can't possibly be more than one.

You: Is "**Damage**" recorded for check-ins or for check-outs or for both?

Oscar: Just for check-ins. If something is damaged enough to not work properly we fix it before it goes out again. Minor damage we just ignore. We don't care what it looks like as long as it works.

You: OK. Now this employee registration (see *Exhibit 4.4*) looks pretty understandable. I see you track **supervisor**.

Oscar: Right. If someone isn't returning something we go to the supervisor.

You: Are supervisors also employees?

Oscar: Yes. All the maintenance supervisors have to work with their hands, too. So they often check-out equipment. They each have supervisors, but that is one of the maintenance managers.

You: And the supervisor of the maintenance managers is Mr. Venkman.

Oscar: Right.

You: And the **classification**?

Oscar: That is the employee's skill classification. Right now we just eyeball that and make sure the equipment being checked out is appropriate for that skill classification.

You: But Mr. Stantz said he wants the new system to track a **skill class** for each type of equipment and restrict check-outs to employees having that class.

Oscar: Sounds good. But remember that many pieces of equipment could

be safely used by employees with any of several skill classifications.

You: That would be a really important point. OK, one last thing. We don't have a form for the purchases, do we?

Oscar: No. Thankfully, that is all paperless. The only problem with is that the Item IDs used by equipmentdeals.com are not the same as our Equip IDs. That makes tracking orders a pain.

You: I have some good news on that. Equipmentdeals.com has a way to build us a custom web store with our equipment IDs. Plus they can

put our order status info into XML that we can use to update our own internal database.

Oscar: I didn't understand all that. But if you're saying this solves my order tracking problem, I'm all for it.

You: I think it will solve your problem. You'll be able to view outstanding orders right within our system.

Oscar: Great!

You: Well, believe it or not, that's all my questions for now. Thanks for your time.

Oscar: Anytime. I'm excited about this new system.

GB Manufacturing Check-Out/In

Date	02/13/04
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Name	Todd Ferguson
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[illegible]

Exhibit 4.3

Storage List				
Equip ID	Type	Description	Aisle	Bin
1201	Machine	Bridgeport Milling Machine with Digital Readouts	6	
1202	Machine	Bridgeport Milling Machine w/ 2 axis Prototrak Control	6	
1203	Machine	Trak Milling Machine w/ 3 axis AGE Control	6	
1204	Machine	Vertical Band Saw	8	
1205	Machine	Horizontal Band Saw	8	
1206	Machine	Small toolroom Lathe	15	
1207	Machine	EDM machine for Tap Removal	14	
1208	Machine	Drill Press	15	
1209	Machine	Surface Grinder		B19
1210	Machine	Glass Saw		B20
1211	Machine	Lincoln "TIG" Welder	14	
1212	Machine	Lincoln "MIG" Welder	14	
1213	Machine	Small Sheet Metal Punch		B14
1214	Machine	Hydraulic Greenlee punch set		B17
1215	Machine	Small Sheet Metal Shears		B16

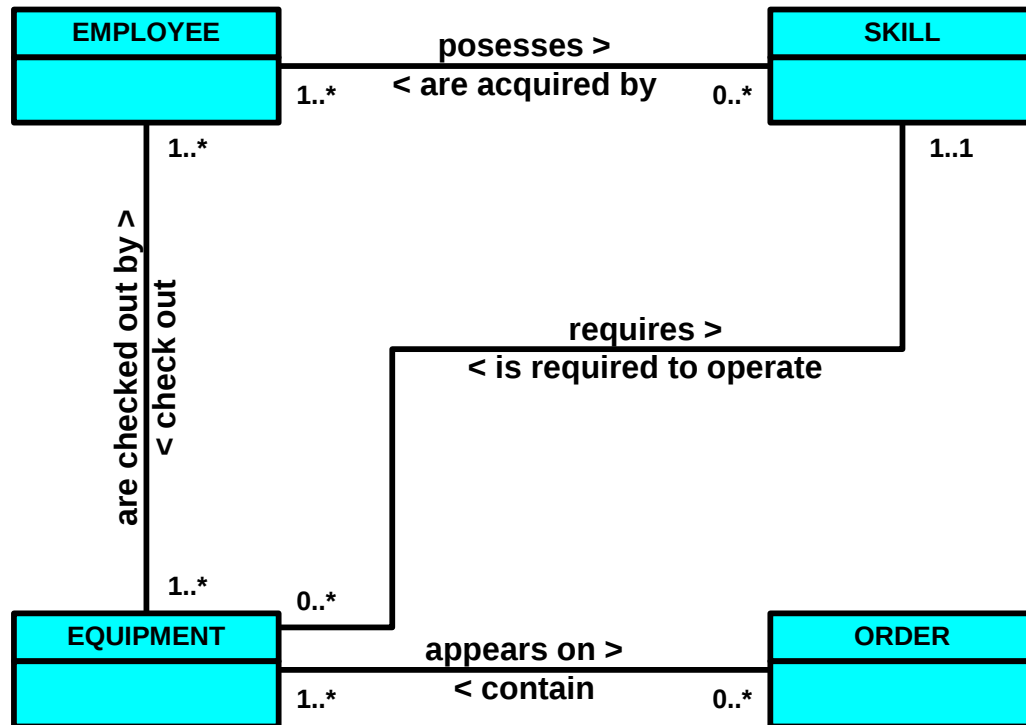
Exhibit 4.4



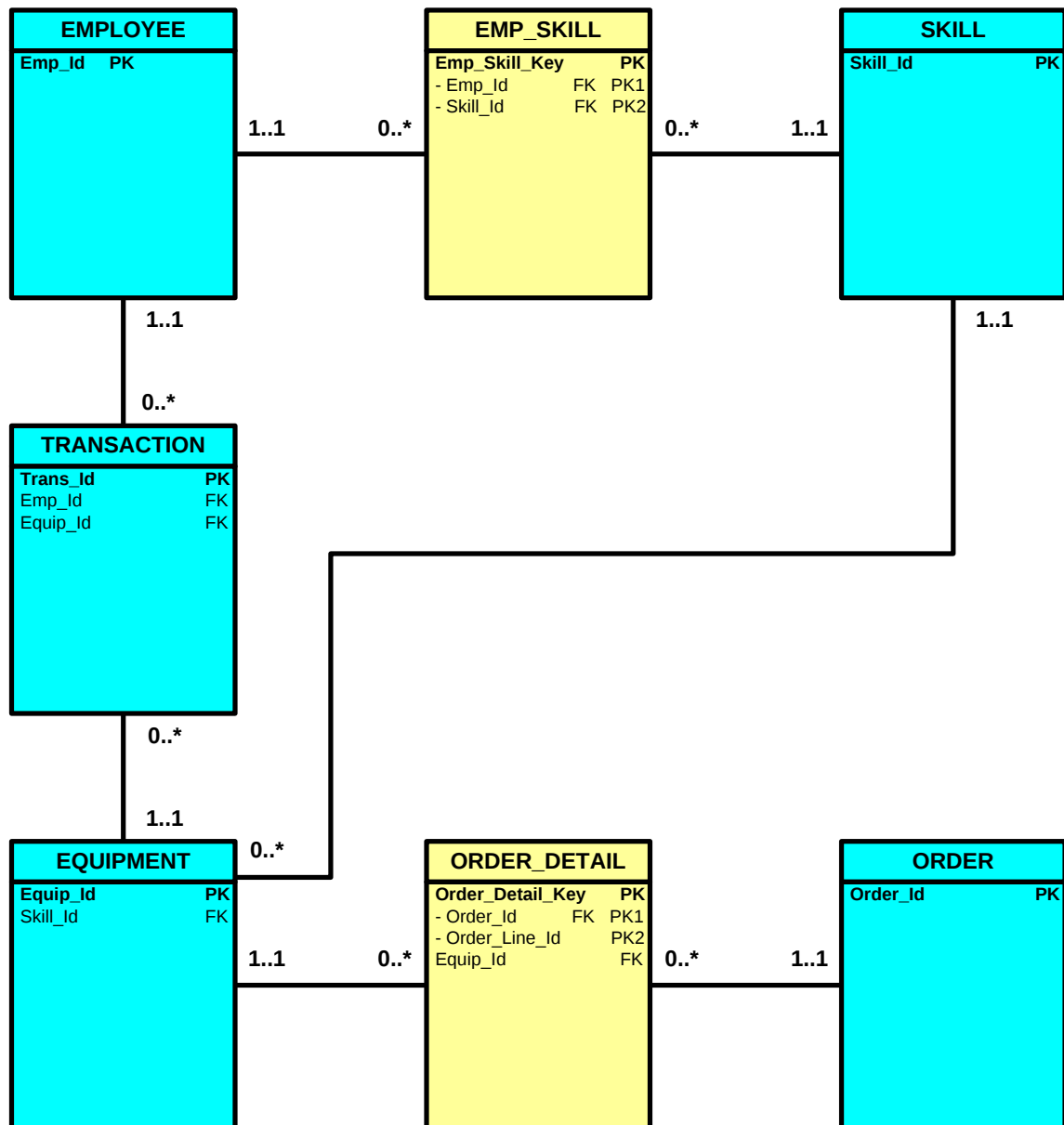
GB Manufacturing Employee Registration

Employee ID	24350	Classification	Carpenter
Name	Todd Ferguson		
Office Phone	555-1066		
Building	Plant 9		
Supervisor	Lucinda Font		

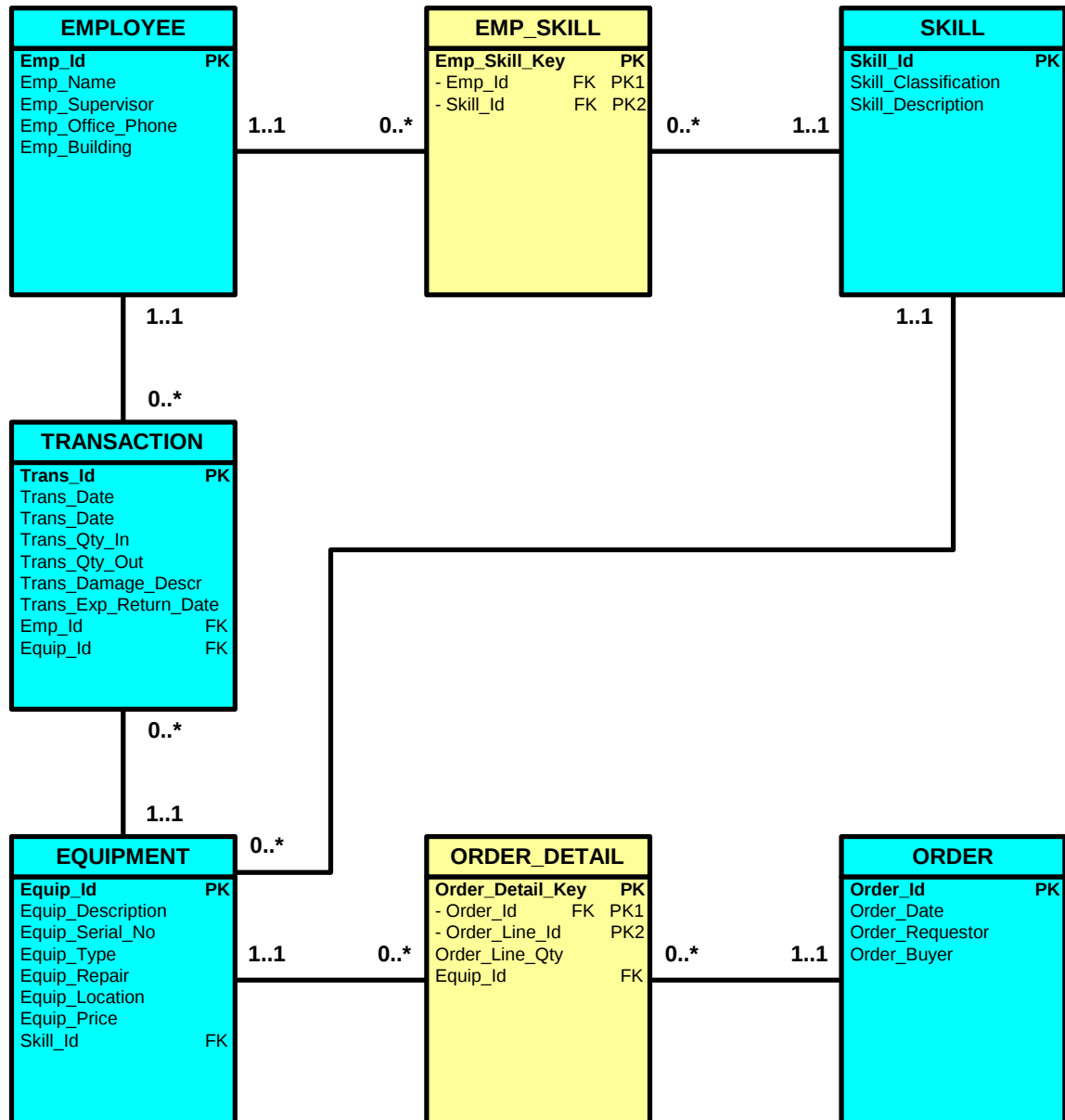
Solution for Context ERD



Solution for Key-based ERD



Solution for Fully-Attributed ERD



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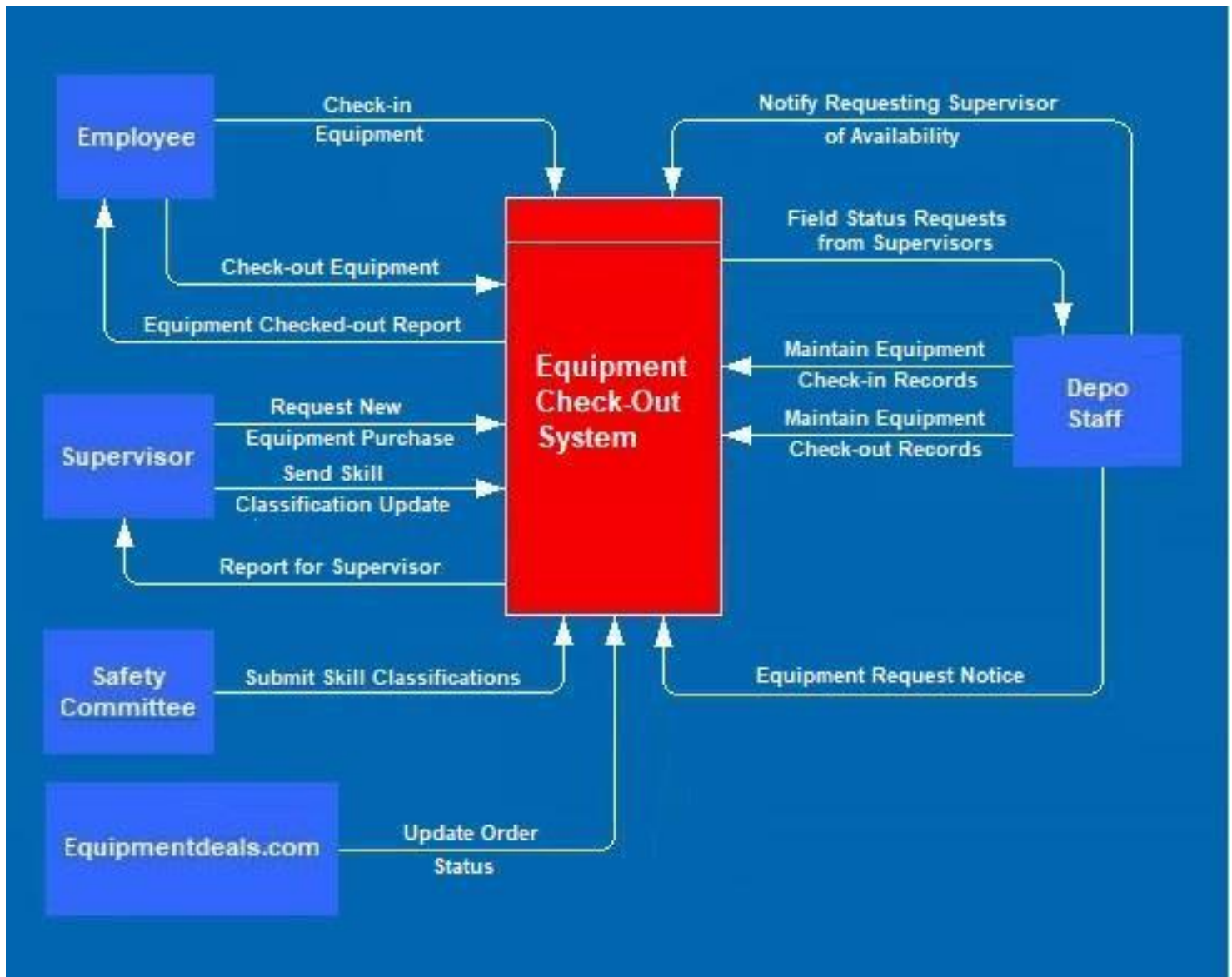
MILESTONE 6

Submitted by: Alan Colquhoun A00390667

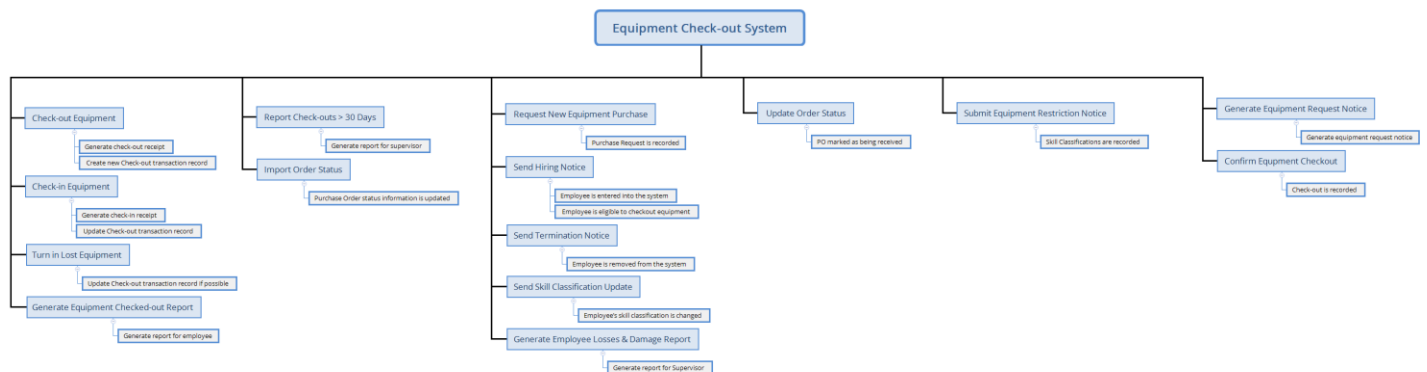
Date: Monday 11 Nov 2019

Instructor: Frank Wegener

Context Diagram

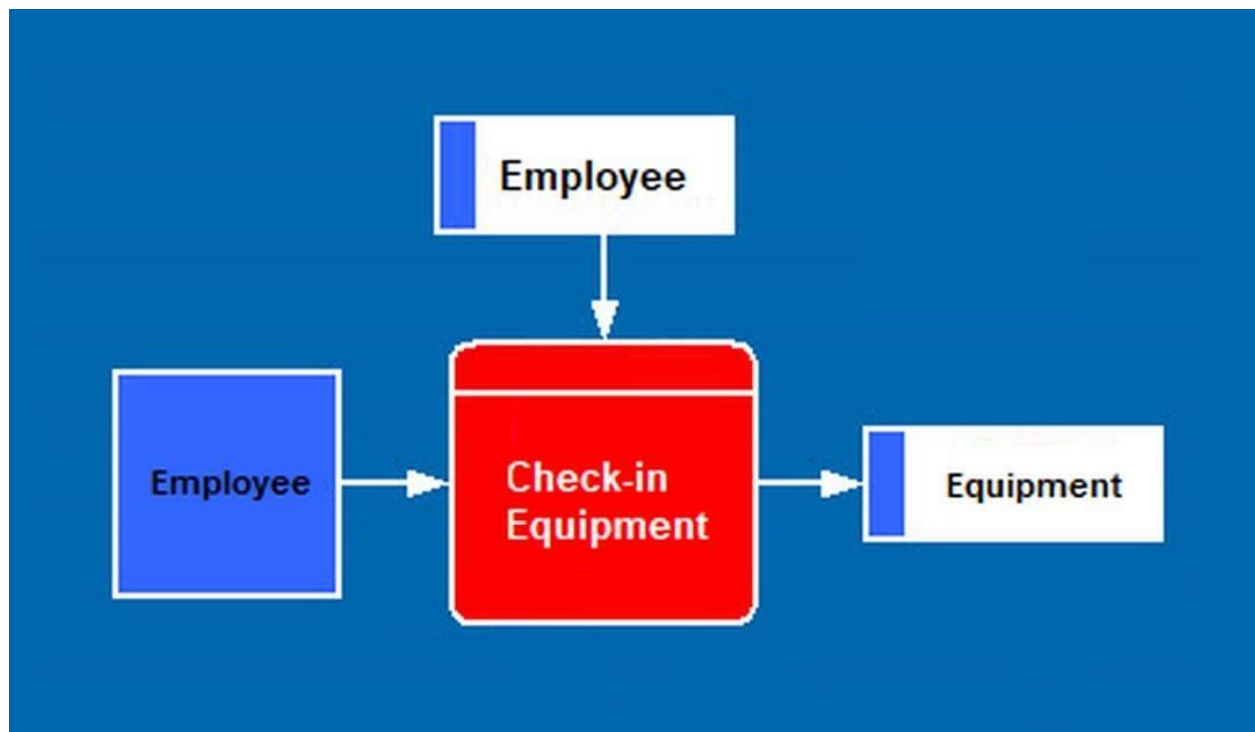
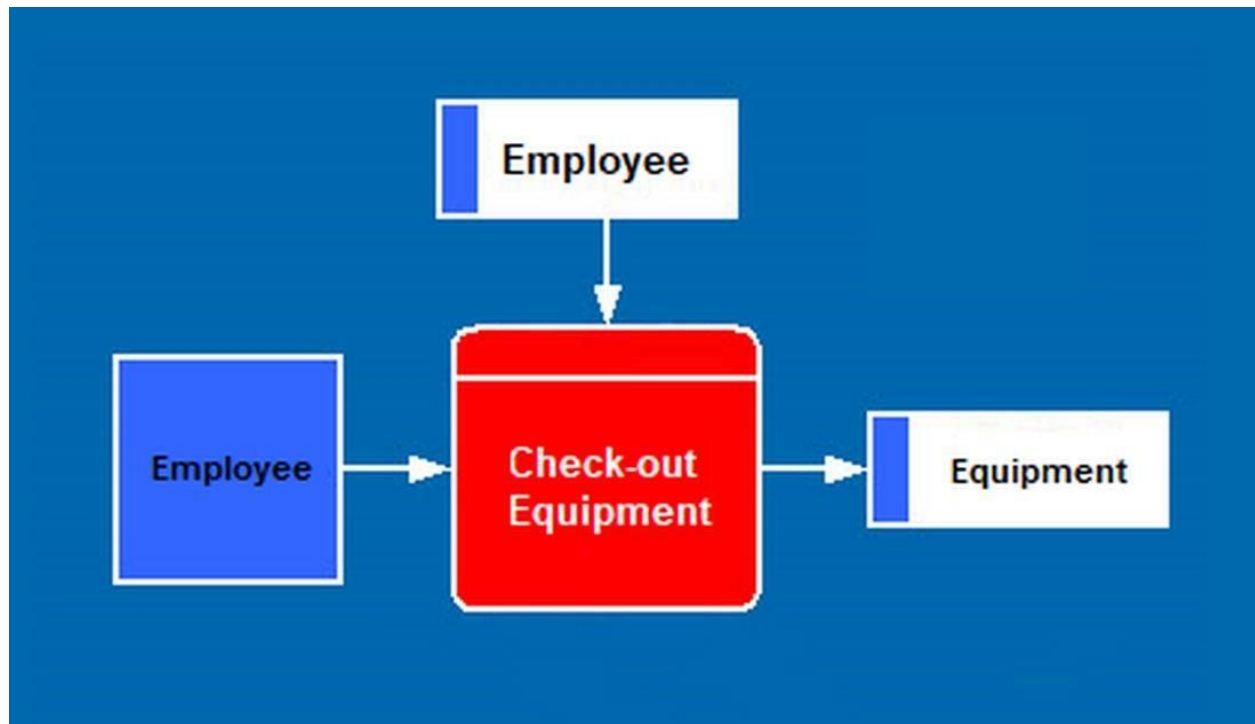


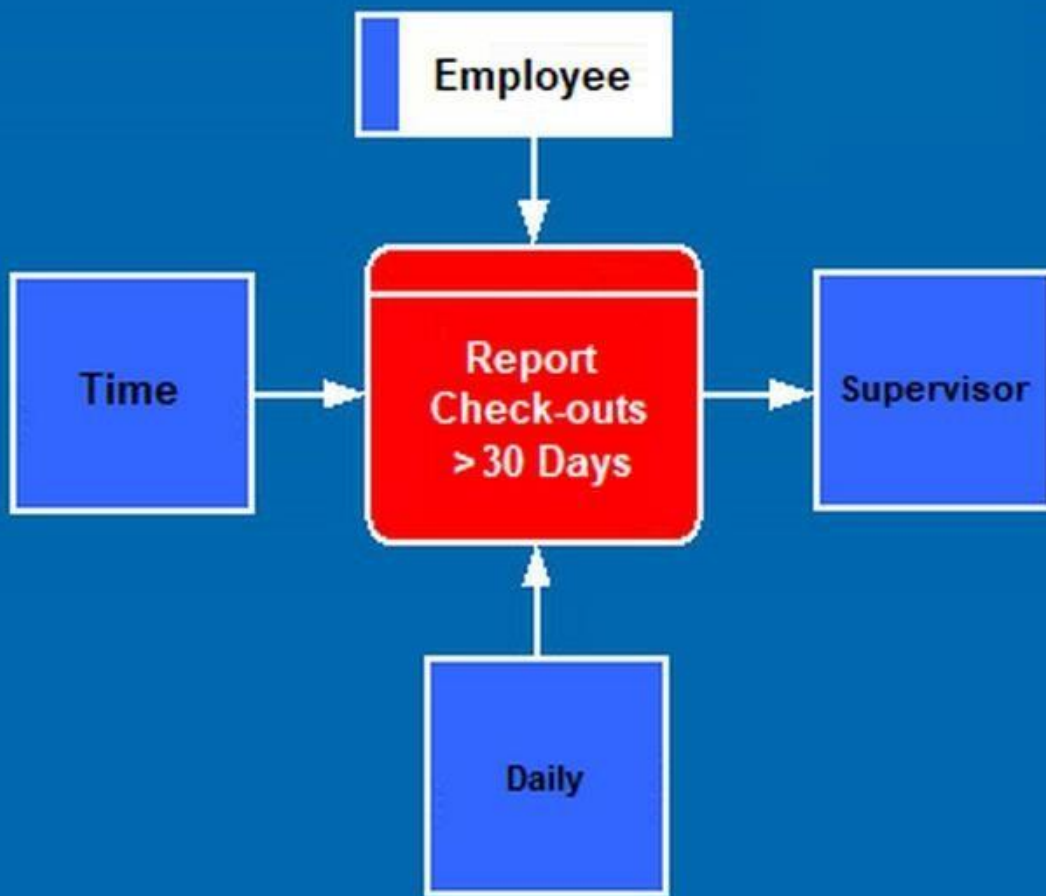
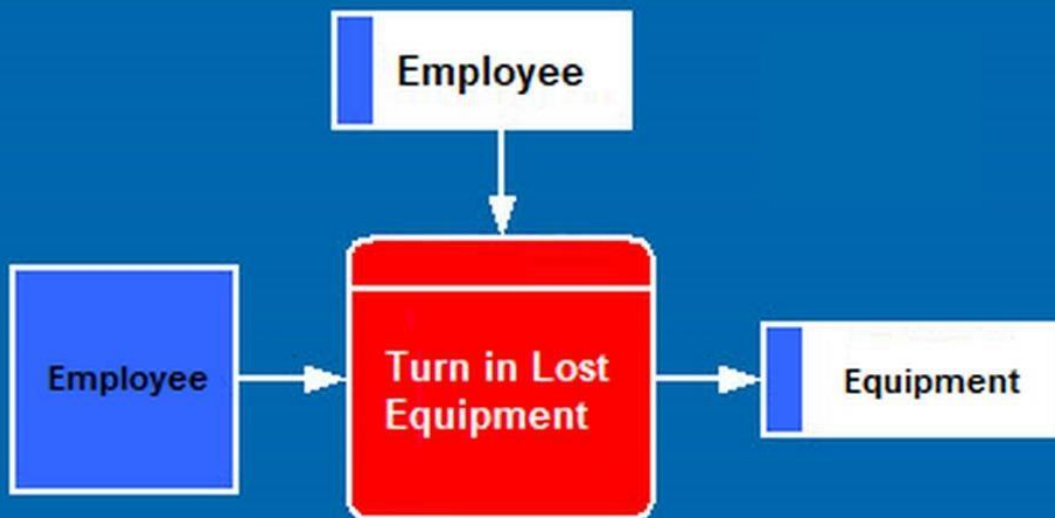
Event Decomposition Diagram

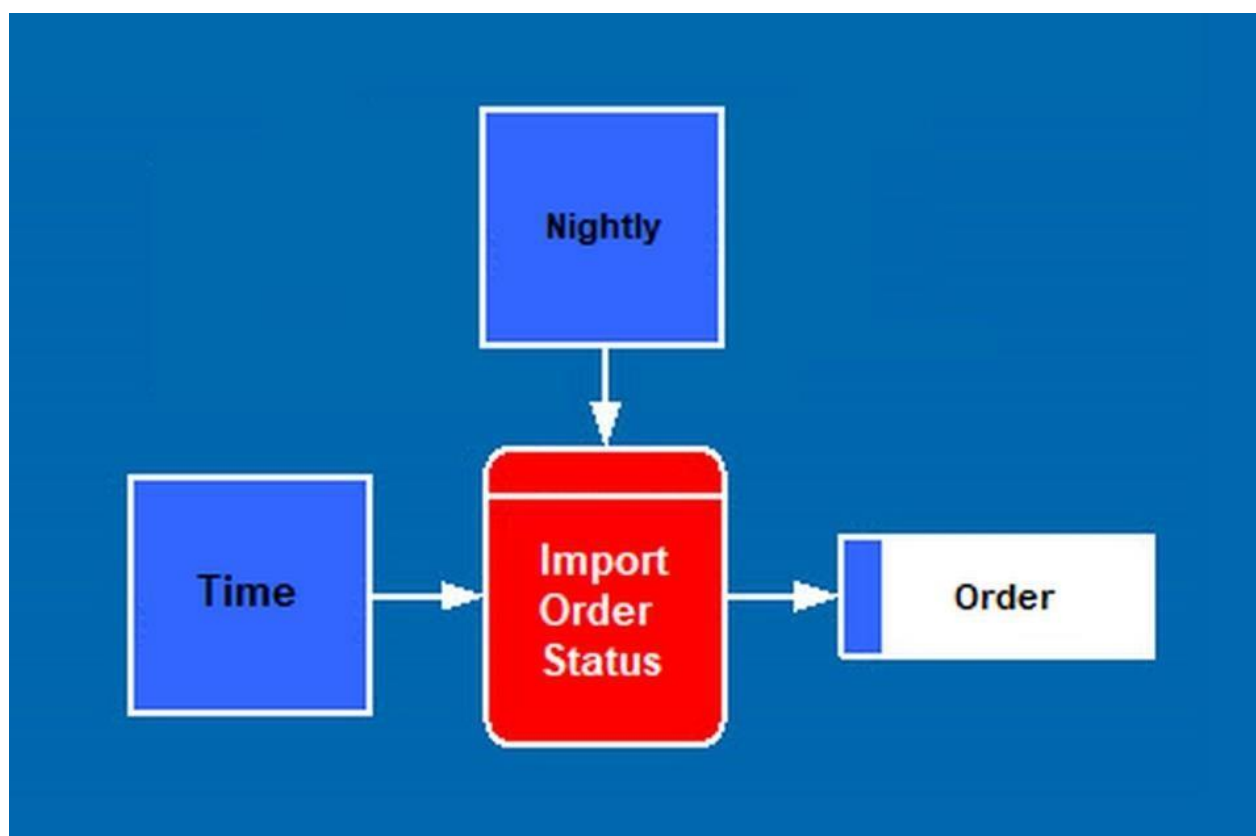
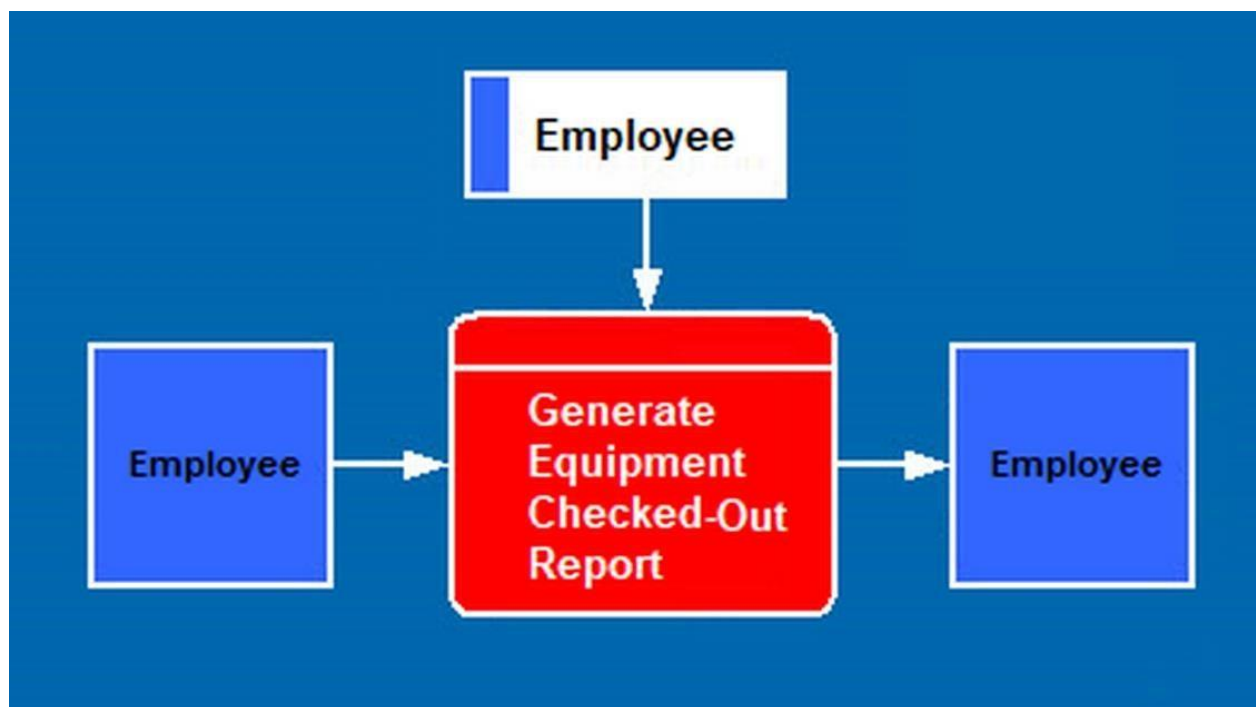


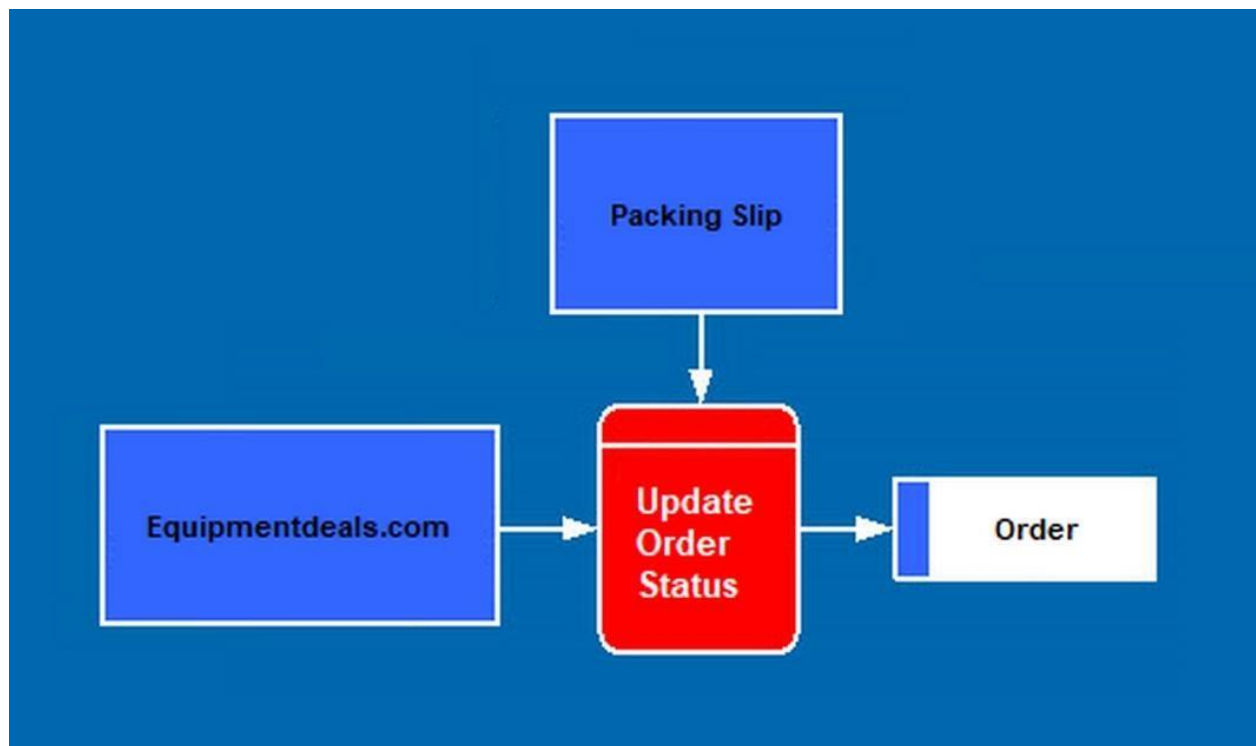
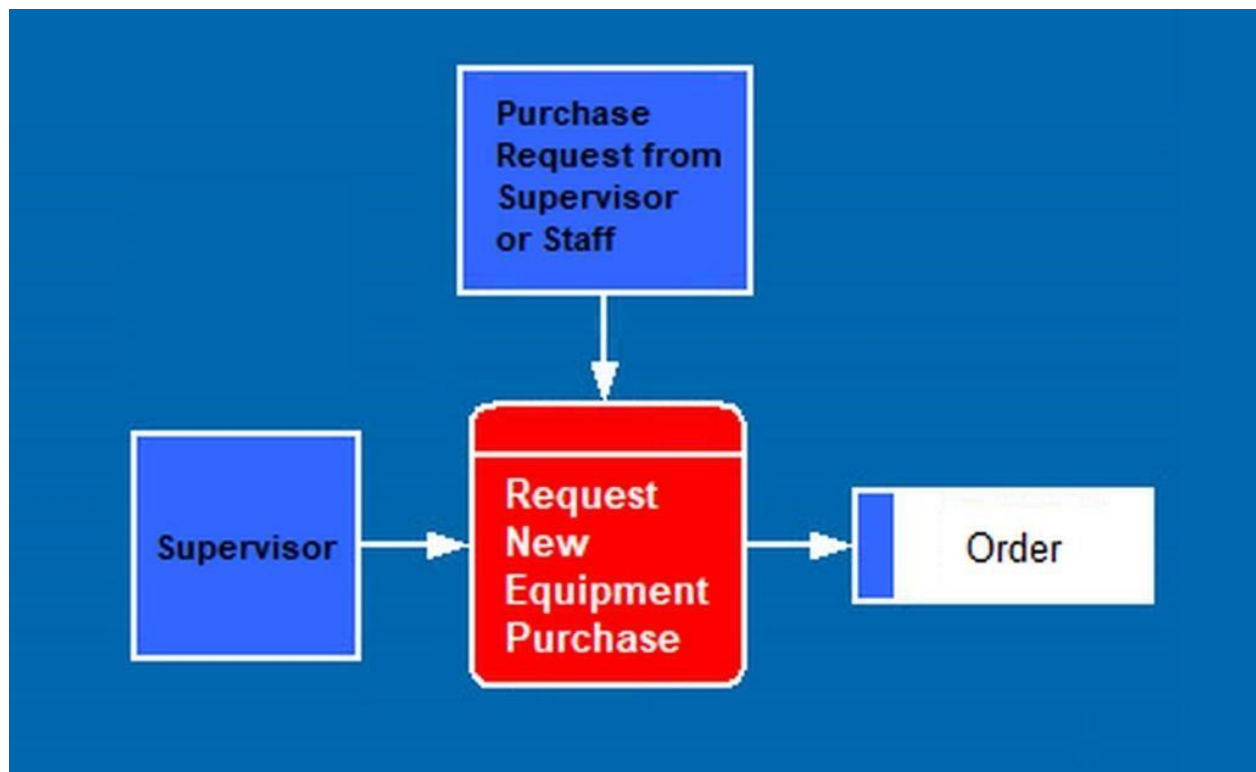
(See the EDD.bmp file for an enlarged view.)

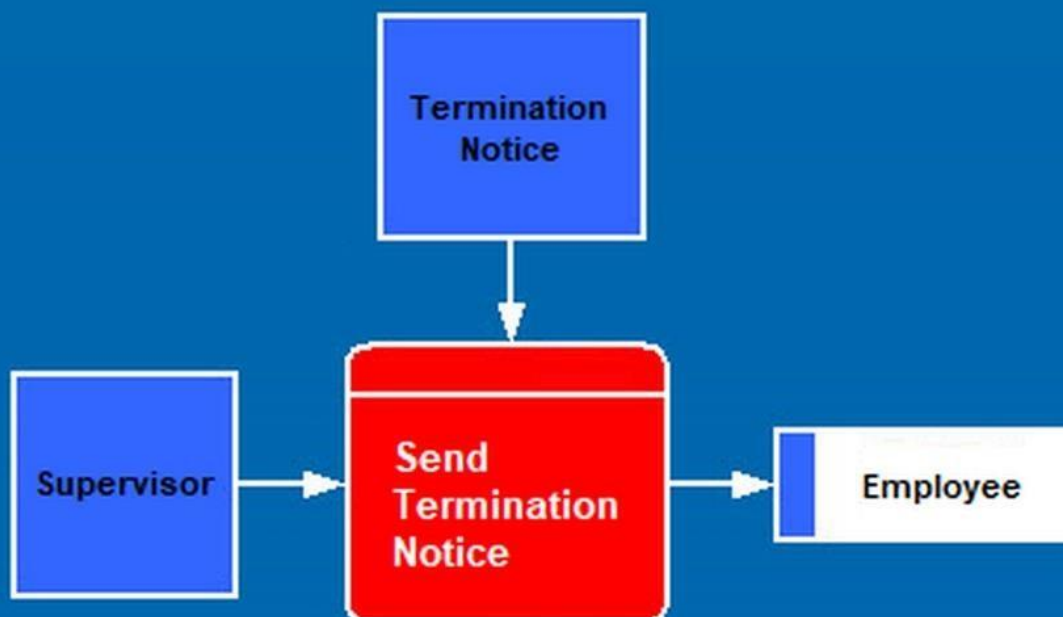
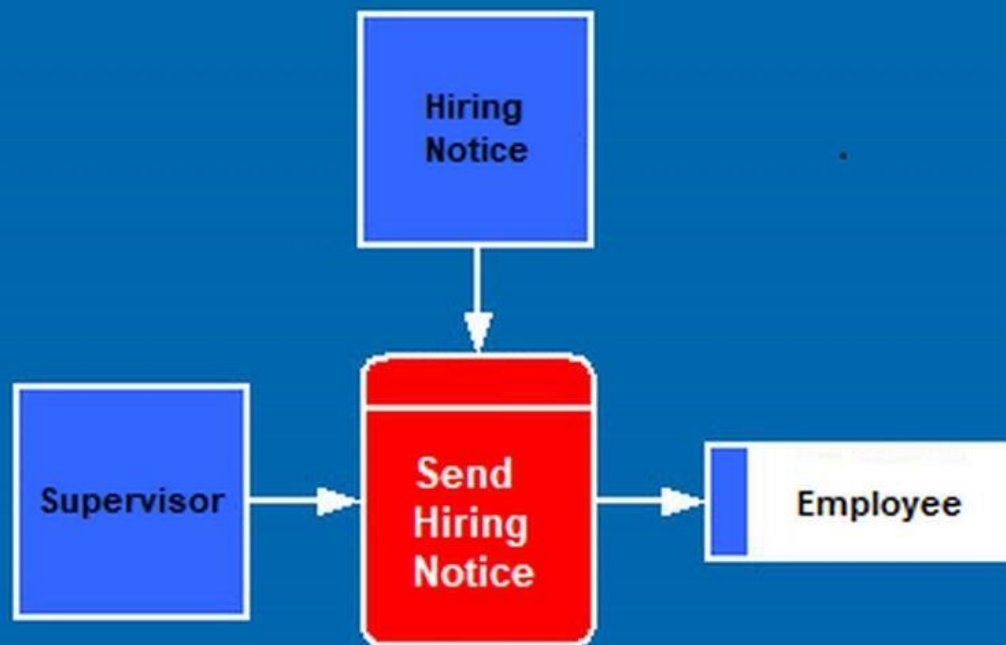
Event Diagrams

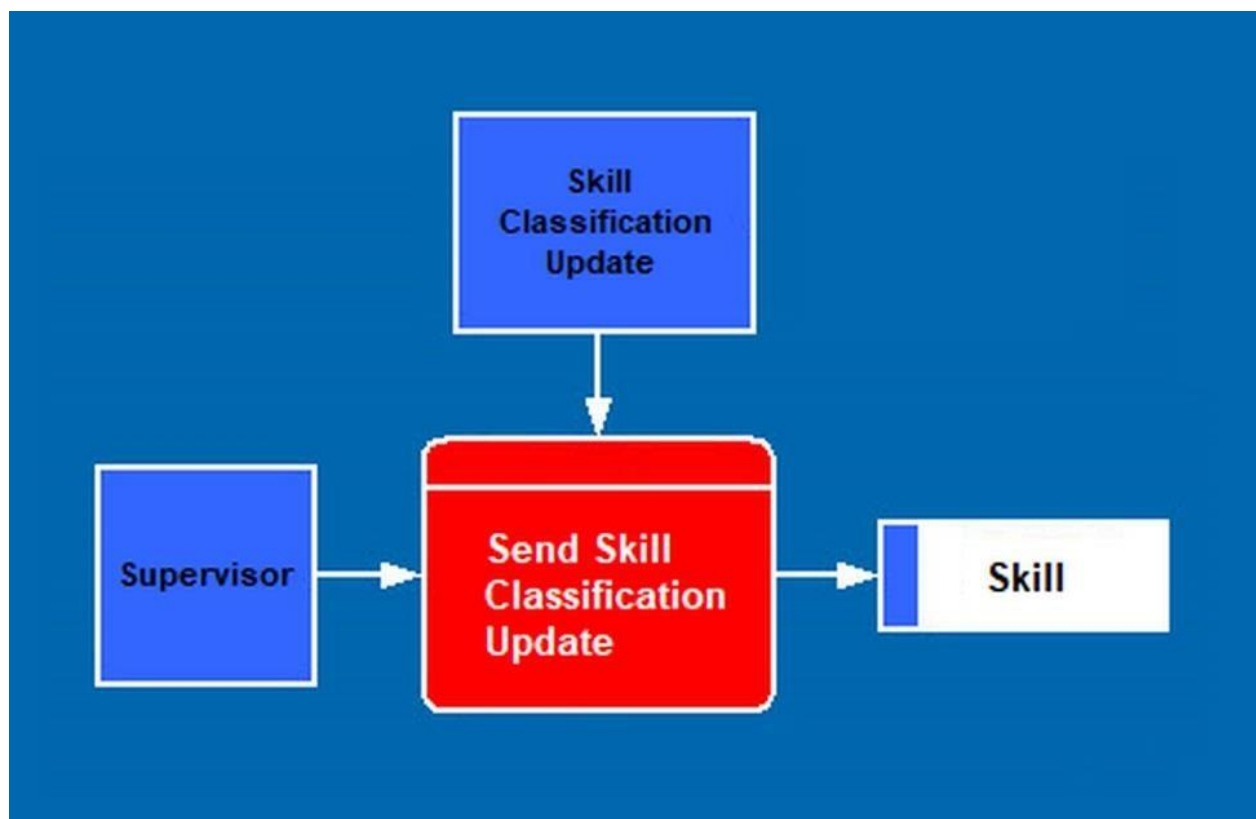
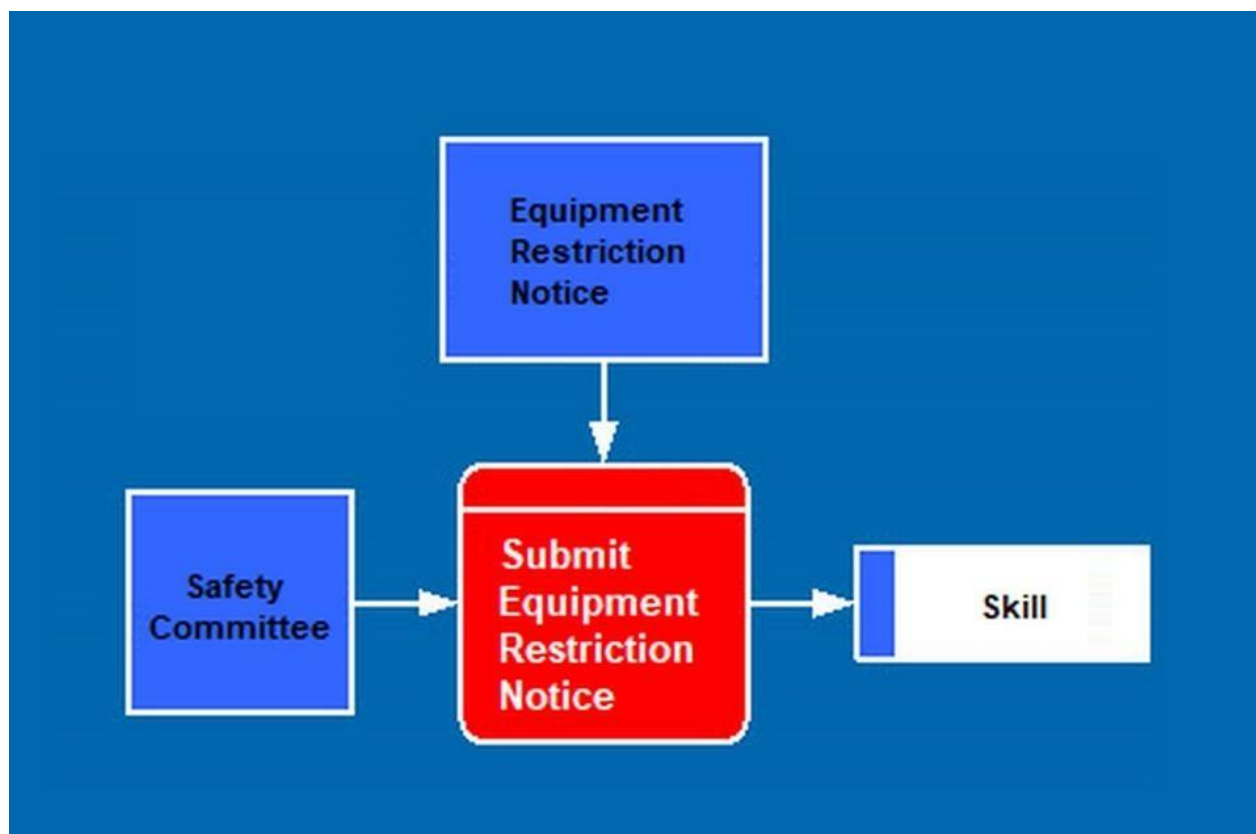


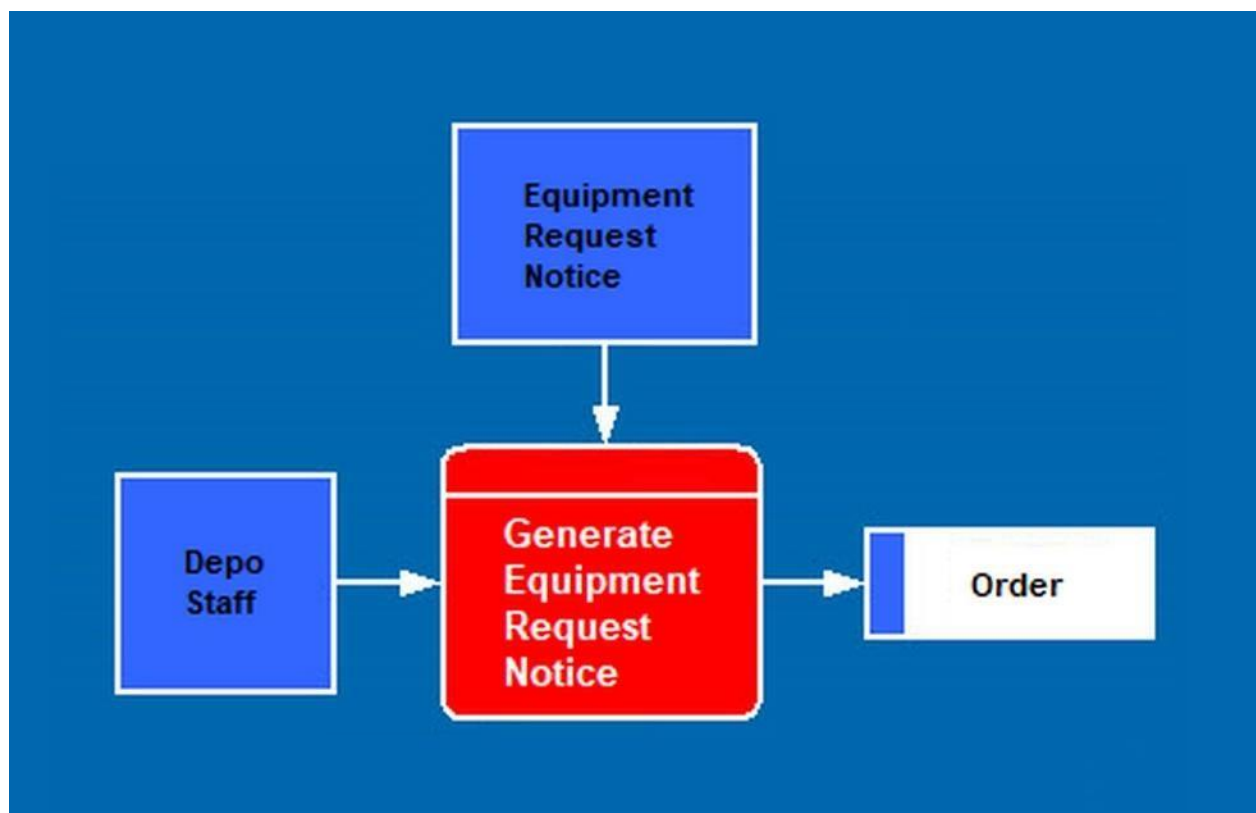
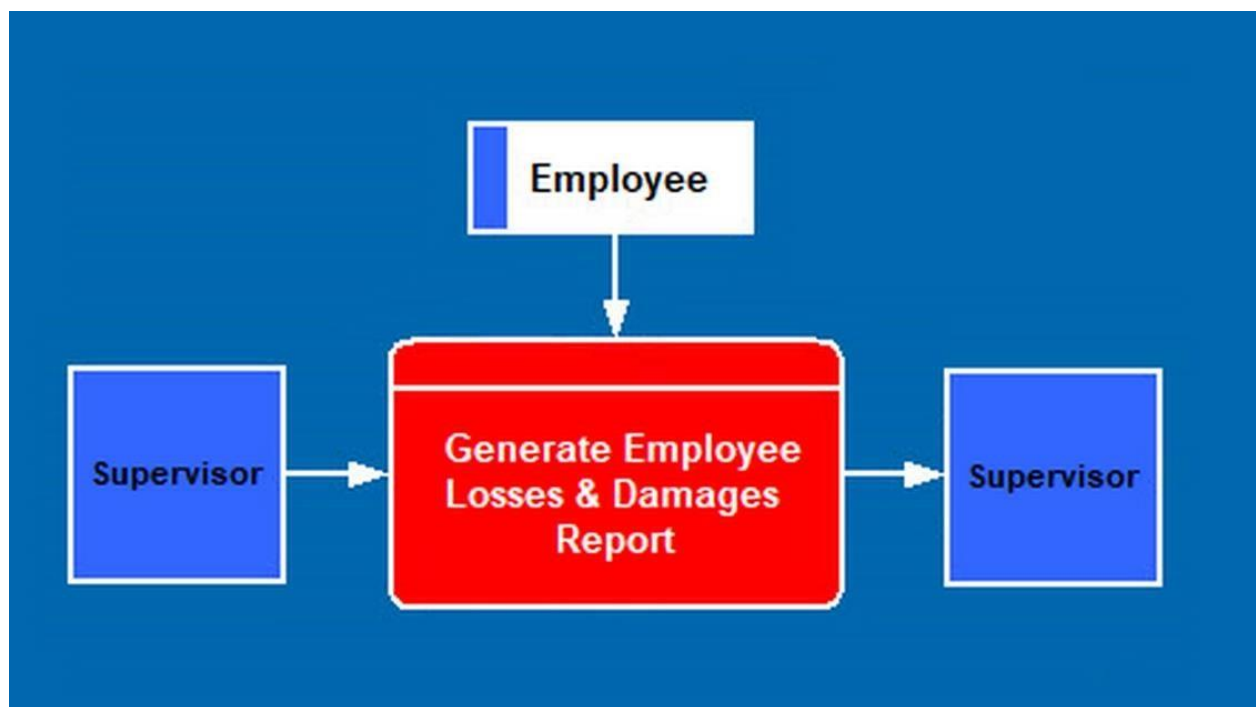


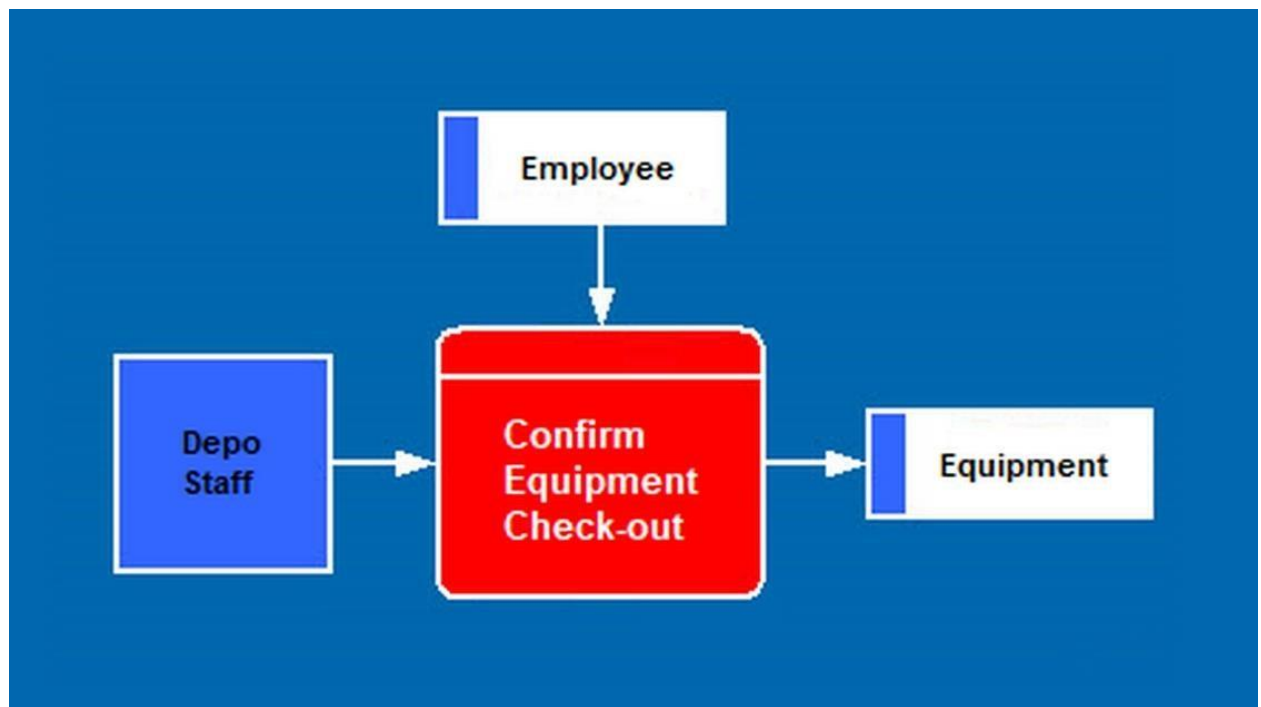




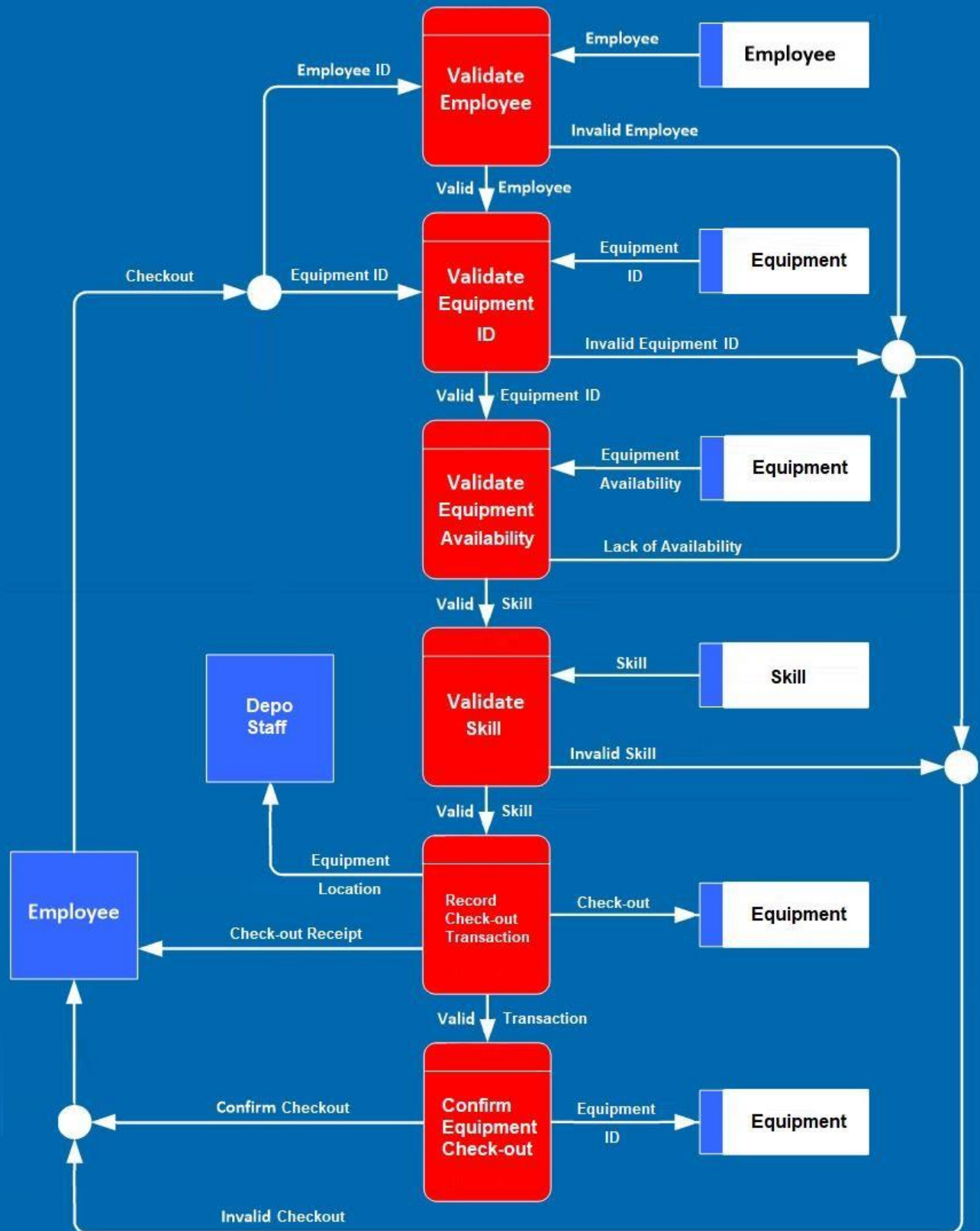








Primitive Diagram



COMP 2831 - Term Project

Equipment Check-Out System



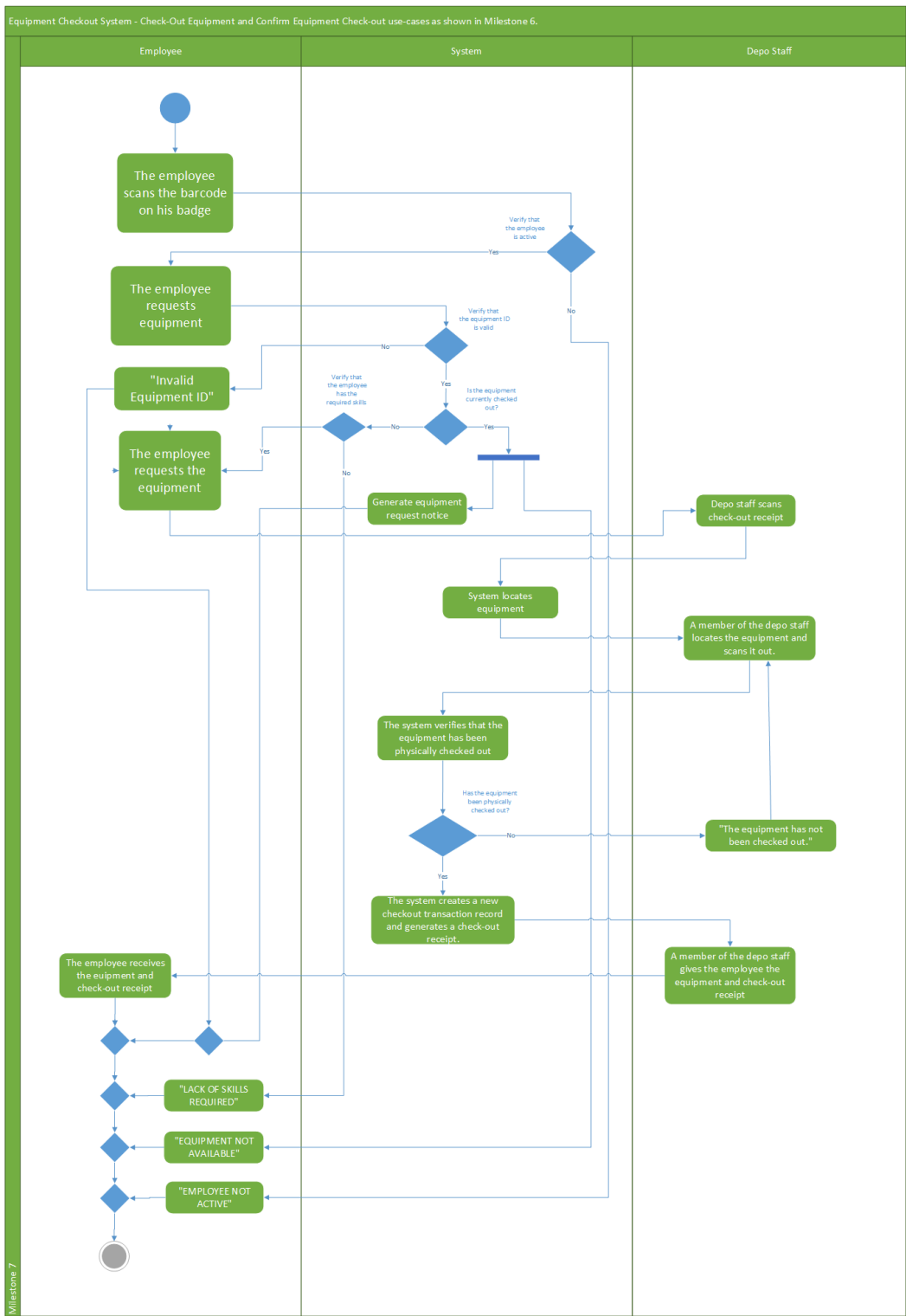
MILESTONE 7

Submitted by: Alan Colquhoun A00390667

Date: Monday 12 Nov 2019

Instructor: Frank Wegener

Partitioned Activity Diagram



(See the attached files for a larger image.)



Milestone No.11

USER INTERFACE DESIGN

SYNOPSIS

Management and users make important decisions based on system outputs. Outputs, the most visible component of a working information system, are the justification for the system. These outputs are produced from data that is either retrieved from databases or, more often, input by users.

Good input and output design can make the difference in whether or not an information system is used effectively. User interface design provides a roadmap or dialog that integrates the inputs and outputs.

In this milestone you will design user interfaces and report outputs for the Equipment Check-Out System.

ASSIGNMENT

The goal of this project is to design user interfaces to input employee and equipment data, as well as output reports that allow the user to be aware of equipment status.

ACTIVITIES

Design the user interfaces and outputs specified below. Develop prototype storyboards and reports.

1. GUI **Employee Login and Equipment Request**
2. GUI **Depot Equipment Request and Release Confirmation**
3. Report **Overdue Equipment Exception Report**
4. Report **Employee Equipment List**

COMP 2831 - Term Project

Equipment Check-Out System



MILESTONE 12

Submitted by: Alan Colquhoun A00390667

Date: Monday 02 Dec 2019

Instructor: Frank Wegener

