TO: IE 484 Students
FROM: Professor Nof
Subject: **Case Study 3**, Fall Semester, 2016

The third case study for this semester (in two parts) has the following objectives:

1. Investigate the integrated effect of the production planning, production control, and material handling systems on the design of production facilities and operations.
2. Propose cost effective, lean alternatives for implementing a production planning and control system, establishing the requirements of such implementation for the production, inventory, and material handling systems of the company.

PACIFIC Inc. is a global food packaging and distribution Center headquartered in Fort Wayne, IN, with locations in other countries, including Costa Rica (CR). The company has asked your team to provide its consulting service for designing and implementing a MRP II/ERP based production planning system in its packaging and distribution Center in Fort Wayne, and Food Bank in CR. However, from a preliminary analysis of the Center operation, your team has already detected several problems that need to be solved prior to considering the design and implementation of the production planning systems.

Thoroughly read and re-read the enclosed document, and study the existing conditions at the packaging and distribution Center, and the Food Bank. Determine the aspects that need to be corrected in the Center operation and its facility layout, and in the Food Bank, and re-arrange the facilities (if and as needed) into configurations facilitating the implementation of a production planning and control system. Utilize CAD software (not graphics software) for designing, communicating and documenting your team design proposals.

Your team must present a progress report with the analysis and recommendation for the production planning situations by Wed. October 5, 2016, and a final report with your entire global solution proposal for the PACIFIC's Center and Food Bank by Wed. October 12, 2016.

Case Study 3: PACIFIC Inc.

Developed by J. A. Ceroni, C. Y. Huang, and S. Y. Nof; Updated by X. W. Chen; A.L. Rodriguez Porras

Given on: Wednesday, September 21, 2016
Due Date Part I: Wednesday, October 5, 2016
Due Date Part II: Wednesday, October 12, 2016

Topics: **Integration of Supply Chain, Production Planning, Production Activity Control, Material Flow, and Material Handling**

Company Background

PACIFIC Inc. is a global food packaging and distribution company with a large Center in Fort Wayne, Indiana. The company has based its development strategy on the repackaging of large bulk foods and distributing them to regional clients. This strategy allows the company reduced investment risks as well as more controlled environments in terms of personnel, vendors, machines, and production planning. The requested study focuses on the operation of the Center. An additional request involves the company's volunteer role in their Costa Rica (CR) operations, concerning the local Food Bank, as discussed below. The products distributed from the Fort Wayne facility presently are mainly for the retail stores and services in Indiana; 80% of the foods are distributed to Indiana clients. Future expansion to package and distribute more foods to stores in neighboring states is under way and is expected to be approved soon. This expansion will help to keep the leadership that the company has achieved in the food distribution market. In the meantime, the company operates similar facilities in other countries. The one in CR was selected for supporting the local Food Bank.

Pacific Fort Wayne Center Facility Background

The packaging and distribution Center is organized by production lines (Figure 1). Three separate lines were devised originally during the design of the current facility. The Center receives five types of foods: Produce, Meat/Seafood, dairy/Deli, Frozen/Ice Cream, and Dry. Some foods require repackaging before they are shipped to clients; others are stored in the Center and shipped to clients according to schedule. The two vacuum chambers seal cheese products in pre-formed film pouches. The cheese products are then inspected, sorted, and re-palletized at assembly stations. The two tray-sealers package fruits inside pre-formed trays. Similarly, the fruits are inspected, sorted, and re-palletized at assembly stations. There are three thermoform fill-seal (also known as roll-stock) machines in the sandwich facility that produces packaging for sandwiches from a top and a bottom roll of semi-rigid film.

The products and their components are specified by the Center (Table 1). All components for the products are supplied by world-class certified suppliers. Most of the supply relies on the just in time (JIT) approach, employing electronic data interchange (EDI over Internet) for expediting the communication between the Center and suppliers. All components are delivered to the Receiving Area (RA) and then transported to the Storage and Preparation Area (SPA). Transporting the materials is performed by the Center's three diesel powered fork-trucks (Figure 2). There are five receiving doors at the RA, each of which is for one type of foods.

Table 1 Products and Components

Product	Component
Fruit Package 1 (A1)	Tray (D)
	Flexible Film (E)
	Fruit 1 (A11)
Fruit Package 2 (A2)	Tray (D)
	Flexible Film (E)
	Fruit 2 (A21)
Fruit Package 3 (A3)	Tray (D)
	Flexible Film (E)
	Fruit 2 (A31)
Sandwich 1 (B1)	Semi-rigid Film (F)
	Bread (G)
	Cheese 3 (C31)
	Chicken (B11)
Sandwich 2 (B2)	Semi-rigid Film (F)
	Bread (G)
	Cheese 2 (C21)
	Turkey (B21)
Cheese Package 1 (C1)	Pre-formed Film Pouch (M)
	Cheese 1 (C11)
Cheese Package 2 (C2)	Pre-formed Film Pouch (M)
	Cheese 2(C21)
Cheese Package 3 (C3)	Pre-formed Film Pouch (M)
	Cheese 3 (C31)
Cheese Package 4 (C4)	Pre-formed Film Pouch (M)
	Cheese 4 (C41)

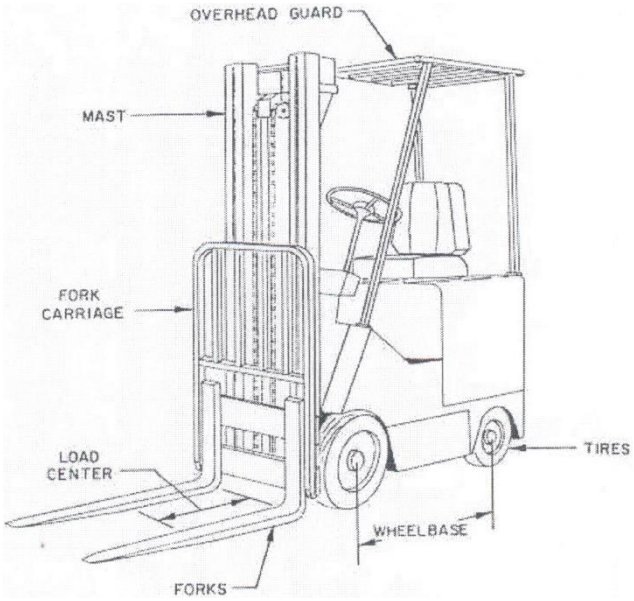


Figure 2 Diesel Fork Truck

Although usually the relationship with the suppliers is friendly, PACIFIC Inc. has not been able to convince them to deliver the components according to the unit loads determined for the Center's repackaging processes. Hence, it is necessary to reorganize the material received according to the process requirements. The unit loads for the components are shown in Table 2.

The components are prepared in the SPA. It usually takes two to three hours at the end of a shift to prepare the components for use in the next shift. Material preparation, including de-palletizing and reorganizing, is labor intensive and requires at least 10 employees and some equipment for cutting and weighing. The personnel are assigned to other tasks the rest of the shift.

Table 2 Component Unit Loads

Component	Sent by Suppliers	Sent to Repackaging
G	Container of 100 foot-long rolls	Plastic container of 200 slices
C11	Sheets of 1mx4mx2.5mm	Plastic container of 300 slices
C21	Sheets of 1mx4mx2.5mm	Plastic container of 300 slices
C31	Sheets of 1mx4mx2.5mm	Plastic container of 300 slices
C41	Sheets of 1mx4mx2.5mm	Plastic container of 300 slices
B11	Sheets of 10cmx10cmx5cm	Plastic container of 200 slices

B21	Sheets of 10cmx10cmx5cm	Plastic container of 200 slices
D	Container of 1,000 units	Plastic container of 500 units
E	Rolls of 15um	Rolls of 15um
F	Rolls of 40um	Send directly to the sandwich facility
M	Container of 2,000 units	Plastic container of 1,000 units
A11	Container of 100 units	Plastic container of 40 units
A21	Container of 200 units	Plastic container of 60 units
A31	Container of 100 units	Plastic container of 30 units

At the beginning of each shift, the components are sorted and distributed in the dispatching section of the SPA and taken to the production lines by helpers and repackaging team members. This distribution operation takes 20 to 30 minutes and is the ideal opportunity to talk to and greet co-workers. Typically, last minute changes in the production schedule necessitate preparing the components at the beginning of each shift. This preparation may cause average additional delays of 20 minutes before starting the actual repackaging process.

Helpers use hand trucks (Figure 3) to take the components to the production lines and divide them among different processes. Hand trucks are available in ample quantity in the Center, and for stability and safety reasons, the maximum amount of plastic containers they can carry had been limited to three. The plastic containers are light boxes of 17”x11”x10”. Their use was standardized throughout the Center for moving components between the various processes. The special team formed by the production engineering department and the recently created ergonomics department has determined that all batches moving among processes should contain exactly 60 units, disregarding the nature of the component. The main argument was that it was a number that is easy to verify by all employees and as a result, better control of the components on the shop floor would be attained. However, this requirement has resulted in high traffic of personnel with hand trucks trying to reach their next process. The Center management seems to be delighted by this frantic activity and it is usually shown to visitors from the regional sales/operations/distribution offices and to visitors from the community from the observation window on the second floor with the comment, “our people are busy working!”

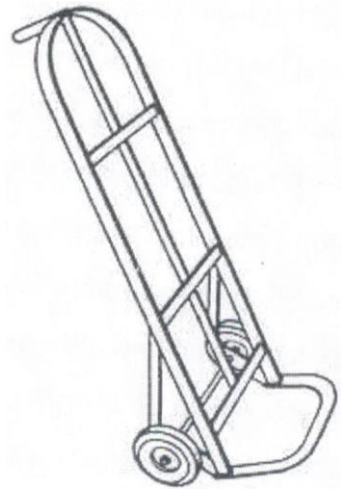


Figure 3 Hand Truck

The repackaging processes in the Center and the products they produce are shown in Table 3. The sandwich facility is isolated from the rest of the facility and receives the bread, chicken, and turkey meat from the SPA, and other required raw materials directly from the outside to their storage. This sandwich facility is relatively modern, and requires a 75 minutes setup whenever it has been stopped during the entire previous shift (for example, every first shift of the day if the Center operates only in two shifts).

Table 3 Manufacturing Processes of Products

Product	Process	Number of Operators	Rate per Shift (Units)
A1	Tray Packaging	5	400
A2	Tray Packaging	3	360
A3	Tray Packaging	4	300
B1	Film Wrapping	6	350
B2	Film Wrapping	6	280
C1	Vacuum Packaging	3	300
C2	Vacuum Packaging	3	300
C3	Vacuum Packaging	3	250
C4	Vacuum Packaging	3	250

After the repackaging process is completed, components are sent to the routing station for routing them to assembly stations. This routing is based on the daily production schedule and serves as a decoupling point between the repackaging and assembly areas, by keeping some inventory of repackaged components.

Once a repackaged component arrives at assembly stations, it is first inspected, then sorted and re-palletized, and finally sent to either the finished product storage, or one of the five shipping doors in the shipping area, each of which is designated for one client. Table 4 shows the assembly process on each station. To monitor the quality of products, 1% of the products sent to assembly stations 1 and 2 will not be inspected, but sent to the test kitchen for further test. In case a product requires rework because of the defects identified by inspectors, it is taken to the rework department. Expired and damaged products are sent to the salvage area.

Table 4 Assembly Stations Activity Description

Station	Activity	Rate per Shift (Units)
1	Inspection	1500
2	Inspection	1500
3	Sorting, Packing and Re-palletizing	2400

To smooth the flow, assembly stations 1 and 2 keep a small inventory buffer of 5 hand trucks for emergencies. These buffer products are kept within the station area and are not allowed to take more than 60 square feet of the station available space.

After assembly, products are sent to corresponding shipping doors or final product storage by the fork truck. During the inspection, a historical defect rate of 3.1% has been observed. Accepted products are packed in boxes (12 units per box) and organized by product on standard pallets with capacity for 6 boxes. Once a pallet is fully loaded, it is sent to one of the five shipping doors

where customer orders are staged and prepared for shipping, or the final product storage department.

CR Food Bank Background

Last January, Costa Rica approved the Action Plan for Food Security, Nutrition and Hunger Eradication 2025 developed by Community of Latin American and Caribbean States. Pacific, as a leading company in the food industry, decided to volunteer and help design the local Food Bank, and your team is asked to also provide the analysis and design for it. The main objective is to minimize losses and food waste in the various stages of the food supply chain.

The Food Bank of Costa Rica is a private and a non–profit company organized in 2012 to collect food and necessities to low-income populations located in social risk areas of the country. Almost 350,000 Costa Ricans (85,557 households) lack the income necessary to buy and consume daily staples. Nowadays, the Food Bank has four locations in San Jose, San Carlos, Guanacaste, and Limon. For this case, we will only focus on the main branch located in San Jose. Deliveries are made through Social and Community Organizations. Most of the Food Bank's work is done by volunteers. Also, enterprises such as Pacific collaborate through corporate social responsibility (CSR) programs, by lending management, technical and manual skills from their employees, which is the case of your team.

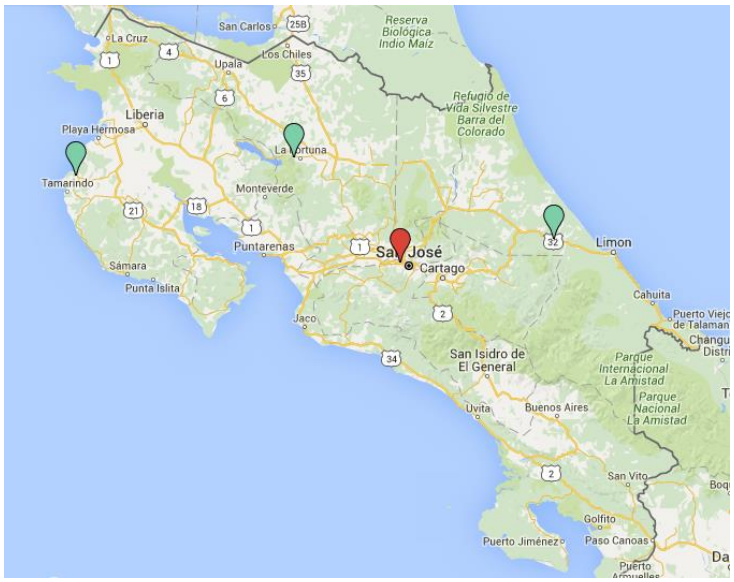


Figure 4. Location of the four Food Bank sites. In red -- the San Jose site

The Food Bank reaches only 7% of the food demanded in Costa Rica, and their goal is to reach 100% of those in need. In the beginning of the year, the Food Bank tried to start serving additional social organizations. There is a debate inside the company whether it could serve more organizations, using their current capacity. Some administrators believe that accepting too many new client organizations was the reason for the loss reported last year.

The executive director and the director of operations of the Food Bank are looking for your advice and active consultation. You would take tactical and strategic decisions, reviewing the policies in each of the four main functions of the company. Also, you are going to develop a method for deciding which new donating supplier to accept and which to reject.

Since its launch, the Food Bank has managed to distribute more than 5500 tons of products that become more than 25 million food rations. Thus, they became the most important project in the fight against hunger in Costa Rica.

In this type of organization, there is always a problem with the uncertainty in demand and supply. We could say that the biggest problems in food banks are the difficulties in satisfying demand, knowing that it is highly heterogeneous and always growing, and also taking into account that the supply follows its own rules.

You must be aware of the fact that the problem of hunger is not a matter of production capacity, instead, it is a problem of distribution capacity: that is why Food Banks are created. This type of organization is basically a group of warehouses that collect, store and distribute surplus food to programs that provide meals to hungry people. Do not forget that there is always a problem in food banks with the uncertainty in demand and supply. Your team has to propose and perform the analysis of different warehousing methods, inventory techniques, methods for reducing product loss and maximization of space utilization (because expansion is not an option) that could be applied for the requirements of the Food Bank. All these techniques and methods would help you justify your design decisions.

Products

Every week from Monday to Friday the Food Bank collects a lot of different products from the collaborating companies. Inside the warehouse, all the products are classified into four families:

1. Basic Grains (especially rice)
2. Cereals, crackers, and snacks
3. Canned
4. Other products
5. Store (consumer staples)

The rice and sugar are two products that arrive in large amounts, both within the family of basic grains. Also, cereals, crackers, and snacks arrive in larger amounts than other products. Consider that rice, sugar, cereal and crackers, in this order, are the largest amounts of food donations received in the Food Bank.

Most of the food items collected (95%) are nonperishable food and the rest could be fruits, vegetables, cold cuts or milk. All the perishable food items do not stay more than 24 hours in the warehouse and are managed in a special way, so organizations order differently and the food bank considers this activity as an extra load during the week.

In the case of perishable food like cold cuts, yogurt and milk are located inside a cold storage room with a maximum capacity of 5 tons. Every Friday the food bank receives from 1 to 3 tons of cold cuts that stay in the warehouse less than 24 hours.

The recovered fruit per week is from 8 to 10 tons and 50% is bananas (reject because of color but in good condition for human consumption). The fruit items do not go inside the cold room and stay in the warehouse less than 12 hours.

They recollect a range of 80 – 100 tons of product every week. This includes consumer staples as cleaning and personal care products. But the consumer staples represent only 15% of the 80 – 100 tons recollected, and for this case study, do not have to be considered.

The food products managed by this organization can be classified as shown in Table 5:

Table 5. Type of Products Donated to the Food Bank

Name	Description	Percentage
Supermarket Losses	Products in perfect condition but because some proprietary protocol issues cannot be sold, (defects in packaging, post-season products, or banding).	60%
Factory Products	Products ready to go inside the market, but their sale is not permitted because of expiration date. For example, some products that enter with an expiration time less than 6 months cannot be sold (Walmart's Policy).	40%

Market

The Food Bank of Costa Rica provides all the food collected to the neediest, from children to elderly people. Today 200 social organizations, with 315 programs, are clients of this Food Bank. This means nearly 37 000 people in need are fed every day in Costa Rica. Not all the people receive three daily meals, and all of this food is equivalent to 33 million donated meals.

Table 6. Type and Number of Client Programs

Program description	No. of programs
Dining room for Children	93
Centers for Elderly	18
Rehabilitation centers for people with addiction problems	23
Organizations for Indigenous communities	4
Center for abandoned elderly and people with disabilities	1
Shelter for homeless	4
Refuge for women	2
Organization that feed homeless	6
Centers for disabled	8
School for vulnerable youth and women	1
General eaters	2
Organizations for girls mothers (from 9 to 17 years old)	3
Organizations for old, alcoholic and homeless people	1
Various other Programs	149

If there is not enough inventory, the social organizations are the ones affected. Also, every year during the months of August, September, and October the Food Bank experiences a high peak of inventory.

Revenue

All the food items and their shipment to the Food Bank are donated by the supplier companies. As a non-profit organization, the revenue is called "administrative load", necessary to afford the operation and logistics of the Food Bank itself. The Food Bank does not "sell" the food, the administrative load is used to cover fees for handling each food product. Each product price, for social organizations, represents an average of 6% of the actual product cost in supermarkets.

Client organizations deposit the money in the bank and the Food Bank gives them a receipt. At the end, the revenue is only used for paying the warehouse rent, insurance, salaries and trucks' fuel. Sometimes orders will not pay the administrative load, which means zero revenue to the Food Bank.

How does a Food Bank in Costa Rica work?

The Food Bank works 240 days/year and the companies that collaborate with the food bank:

- Donate food and other products.
- Provide infrastructure, equipment, services and strategic capabilities for an operation of the Food Bank.
- Volunteer work, CSR programs of the companies, and rehabilitation programs.

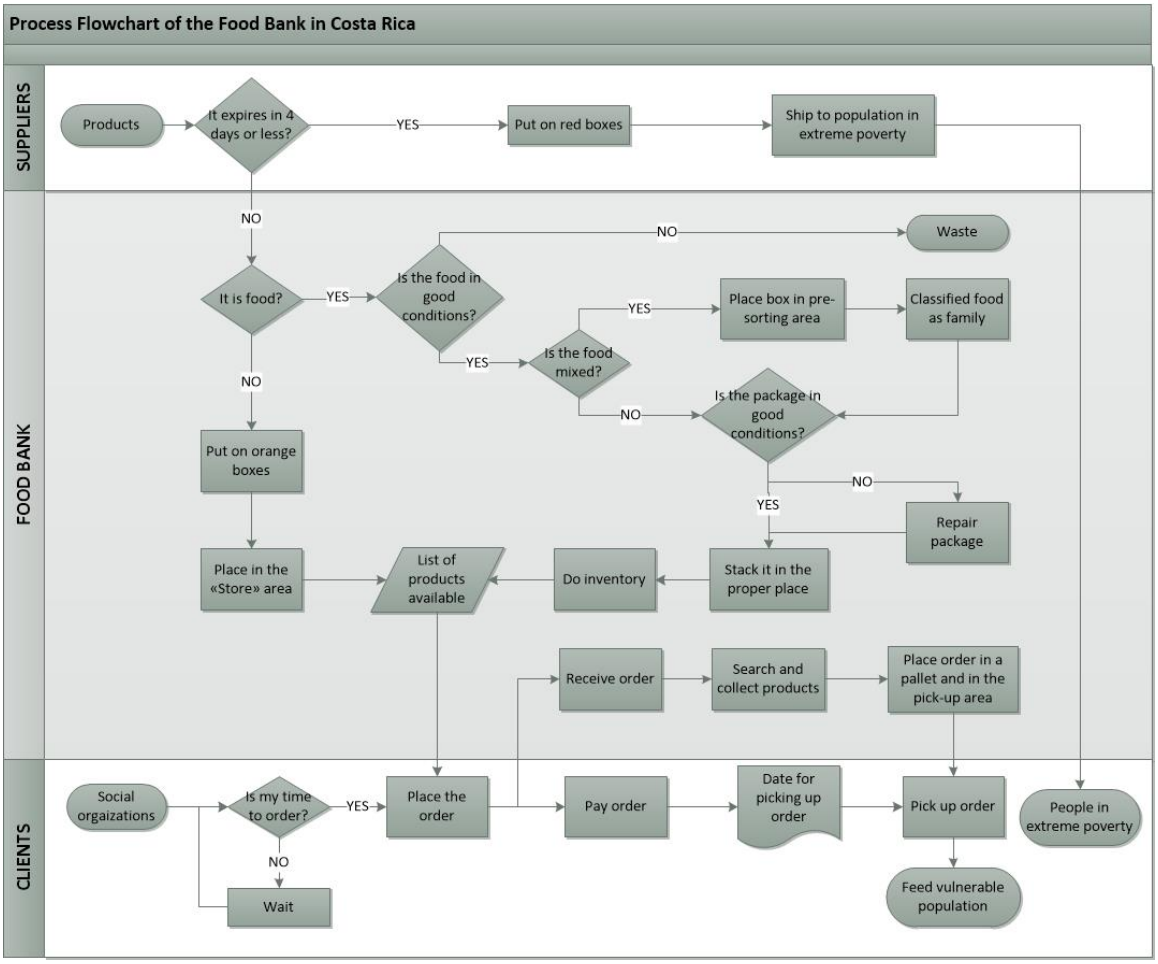


Figure 5 General Flow of Food Bank Operations

Food Bank Limitations

1. The warehouse has a unique platform for loading / unloading their trucks and the organization's trucks. (One platform for 315 programs)
2. The company has limited technological equipment and technology resources.
3. There are no distribution activities, only collecting and dispatching.

4. Uncertainty in the supply: the Food Bank does not know how much product will arrive, and when.
5. Capacity is one of their problems; they do not have the necessary funds for more space or technology, so they have to be more efficient in creative ways.

Case Problems

Fort Wayne Pacific Center Problems

Presently, despite the success in sales and good reputation of the PACIFIC Company, you can notice that the operation of the packaging and distribution is plagued with problems. The Center operation is suffering from the effects of poor production planning, inefficient control of processes, and a questionable approach to material handling within the facility. These problems are not perceived clearly by the Center management. Only effects such as delayed customer orders, high levels of inventory of raw materials, high level of work-in-process, and slow material circulation among the processes are noted. The Center management has agreed that more investment is needed and can be justified. However, it is not clear which problem should be solved first, and whether by solving one specific problem, the other symptoms of the Center needing attention will be affected. Therefore, an integrated approach to perform a diagnostic study of the Center is required. This integrated approach should be followed also for generating a cost-effective solution to the problems that the company is having in the Center.

At the same time, the Center management wants to implement the MRP II or ERP philosophy for the planning and control of the operation's materials. By incorporating MRP II/ERP for the Center inventory management, PACIFIC's management expects that inventory service levels will improve considerably, and the space required for storing material in the facility will be minimized. The released space could be allocated for any future expansion of the food packaging and distribution operation. The basic idea, according to the Center's operation, is to convert space from storage areas to production. Changes to customer orders are also a frequent event that causes serious headaches to the production planning team. The Center manager lets everybody know that this facility should work under a Just-in-Time and Lean Production approach with both customers and suppliers.

There is also the problem with moving materials in the facility. The operation of the fork trucks generates a considerable amount of pollution during their last five years of service in the Center; it has been necessary to increase the capacity of the costly air cleaning system and/or consider other material handling equipment. After a recent inspection by the county's industrial health department representatives, they threatened the Center manager with heavy fines if the quality of the air in the Center does not improve and adhere to normal standards before the next inspection. Additionally, the hand trucks that have proven to be highly handy and flexible, have failed to provide efficient material flow between the processes, cause distraction of workers and restrictions on the amount of materials to be moved.

In the past, before the limitation to move not more than three plastic containers, workers' back injuries were a common event. Consequently, the Center manager wishes to incorporate a more efficient technology for material handling in the Center. However, the Center management is rather cautious in making any investment decision without competent advice.

Your team has been asked to provide the analysis of the current situation, along with a recommended proposal for the most cost effective and attractive solution to the Center problems. The Center manager proposes to analyze the Center operation over the next five months, for which there is forecast of the demand for each product as shown in Table 7. The Center has maintained a good relationship with one of its five customers and signed a long-term contract with the customer. Table 8 shows the amount of products needed to be supplied to this customer in the next five months according to the contract. The Center manager wants to keep the actual two shifts per days during five days per week, as the operating time for the Center.

Table 7 Forecast of Demand

Product	Month				
	1	2	3	4	5
A1	2000	2000	2000	2000	2000
A2	1000	1000	1000	1000	1000
A3	2000	800	800	2000	2000
B1	2000	2000	2000	2000	2000
B2	1500	1500	1500	1500	1500
C1	800	800	800	800	800
C2	600	600	600	600	600
C3	1000	1000	1000	1000	1000
C4	800	800	800	800	800

Table 8 Monthly Demand in the Contract

Product	Month				
	1	2	3	4	5
A1	1000	820	900	500	1000
A2	2000	2000	1000	1200	1200
A3	1000	1200	1200	820	900
B1	600	900	500	1000	400
B2	240	900	500	1000	400
C1	800	800	800	1000	1000
C2	600	800	800	800	1000
C3	600	900	600	800	800
C4	1000	600	900	600	800

The manufactured products yield and on-hand inventory for the components are shown in Tables 9 and 10, respectively.

Table 9 Manufactured Products Yield from Shop Floor Unit Loads

Product	Yield (units)	Yield From
A1	60	D
	300	E
	15	A11
A2	60	D
	120	E
	5	A21
A3	60	D
	240	E
	20	A31
B1	300	F
	30	G
	60	C31
	60	B11
B2	180	F
	20	G
	30	C21
	30	B21
C1	60	M
	4	C11
C2	60	M
	3	C21
C3	60	M
	2	C31
C4	60	M
	4	C41

Table 10 On Hand Inventory of Components

Component	On Hand Inventory (in Vendor Unit Load)
G	10
C11	5
C21	9
C31	10
C41	20
B11	5
B21	5
D	15
E	60
F	100
M	20
A11	30
A21	10
A31	10

The contract signed by your team representative and the Center manager establishes that the results of the analysis and recommended solutions should be presented in two parts:

1. A progress report to be submitted by Wednesday, October 5, 2016, covering the analysis for the *production planning and production activity control situation* in the Center based on the five months' contract and forecast demand. It should also include all the detailed aspects required for the implementation of ERP-MRP DCSS™ scenario in MERP, and its influence over the other systems in the Center.

   Hints:

   (1) Create a BOM for each product.

   (2) Calculate lead time for each part and subassembly.

   (3) Run MRP process.

   (4) Briefly discuss how ERP extends the power of activity control (You can also comment on JIT and Lean Process, but use the MRP calculation procedures).

   (5) Run the ERP-MRP scenario in MERP, explore the policies of different departments and understand the logic behind them.

Food Bank problems to be answered in Part 1:

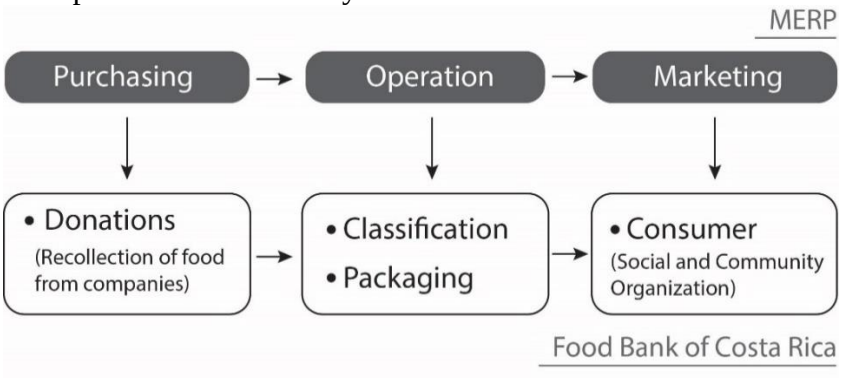
(1) Which inventory policy would you recommend to maximize the amount of revenue by improving purchasing efficiency? Show your calculations. Do you think that this policy would determine the right order quantity to use? Also, you need to deal with two new suppliers that want to help the food bank; you have to decide with which one to work and explain the reason to the executive director. (Relevant information is provided in Appendix 1.)

(2) Which methods do you recommend for efficient warehousing of products, which could help the Food Bank in their normal operations? What do you recommend as the best method to manage products entering the warehouse and also which dispatch policy to use? (FIFO, LIFO, Save Setups, Schedule, EDD)? Justify you recommendations.

(3) You know that expansion of the facilities is not an option for the company right know. How can you maximize warehouse space utilization? Since the main goal is that food reaches the most in need, how can your team reduce product loss inside the warehouse?

(4) Search about "Reverse Logistics": Is this method applicable to the Food Bank? Explain.

(5) Which MERP scenario could best simulate the general operations of the Food Bank in Costa Rica? Explain and rationalize your answer. *Hint:*



2. A final report to be submitted by Wednesday, October 12, 2016, covering the analysis and recommendations for the material handling situation in the Center. The final report should consider the relevant information from the progress report that relates directly to the inventory management and material flow. A detailed presentation of the integrated approach taken for analyzing the problems in the Center must be included in this report. An important part of this report is the specification and rationalization of the material handling system design.

(1) Determine the unit loads, and material handling equipment to use for part transfer (a) between production and assembly; and (b) within assembly.

(2) Select one of the material handling systems needed and specify its engineering parameters (which are required for specification to the equipment vendors).

(3) Analyze the advantages and disadvantages of the equipment you select in (2).

(4) Run the ERP-MRP DCSS™ scenario in MERP, and answer the following questions:

(4.1) How may *order due date* and *lead-time* considerations influence your MRP calculations for PACIFIC Inc.?

(4.2) In the MRP module in MERP, explain the meaning of each of the raw material release policies *in one sentence*:

a) Immediate release
b) MRP
c) Manual release
d) DBR (Drum-Buffer-Rope)
e) DBR without capacity constraint

Which of the above policies is being used by PACIFIC Inc.? Justify your answer.

(4.3) In the purchasing department of MERP, *briefly* explain the difference between the purchase to stock, and MRP policies.

(5) For the Food Bank problems:

(5.1) Using the data you developed in your answer to (1) (in Food Bank Problems Part 1) and conditions as needed by the MERP scenario you recommended, calculate the average inventory, the reorder point, and establish a safety stock if it is needed.

(5.2) Run the MERP simulation and set your best action and policies for the Food Bank that would lead to the best performance in terms of purchasing efficiency. Provide a screenshot of your best run in terms of profit and reputation. Try to achieve reputation that does not drops below 70%, and to have positive cash at the end of the run. After understanding how it works and what is a Food Bank, What do the profit and reputation measures mean for this type of company?

(5.3) During the MERP Simulations, which assumptions and analogies did you apply to account for the Food Bank? Does MERP enable you to simulate the Food Bank precisely? Explain your answers.

(6) Compare and contrast (in a table) your recommendations for the Pacific Fort Wayne Center, and for the CR Food Bank, and explain the rational for your observations.

Note: Structure the report for each part as a separate report, following the report guidelines.

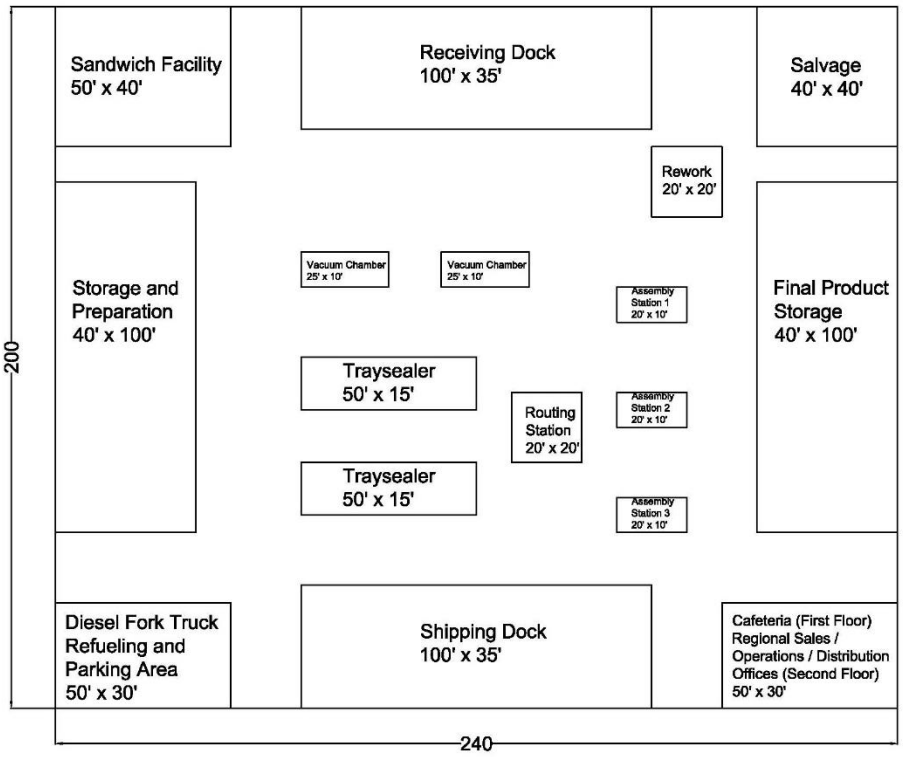


Figure 1

Appendix 1. Purchasing (donated supply) data

For this case, we focus on three types of orders: small (S), medium (M) and large orders (L). Small orders are for small programs (less than 50 people) with small products variety; medium orders are for small programs with a high variety of products; and large orders for large programs (more than 300 people) with a high variety of products. You also need to deal with two new suppliers that want to help the food bank. Decide with which one to agree to work and explain the reason and the decision method to the executive director.

In this company the loan interest rate is 12%/year and it works 240 days/year, 5 days per week, 8 hours per day. Consider that there are four products that people in need order more frequently: crackers, cereal, sugar, and rice -- products that are part of the base diet of Costa Rica. The cost of each product is associated with the transport cost and administrative cost, the food bank manages donations but they still have to cover certain expenses.

A1. Food Bank estimate of orders demand (d) [Consider Std. Deviation!]

Type of Order	Average monthly orders last year (d)
S	64
M	76
L	88

A2. New supplier's information [all costs in US$]

	New Suppliers			
	Supermarket A		Supermarket B	
Products	**Shipping Cost**	**Cost per Unit**	**Shipping Cost**	**Cost per Unit**
Crackers	100	100	200	110
Cereal	100	200	220	220
Sugar	100	300	200	330
Rice	100	10	200	12

Supplier	Average delivery days	Delivery Std. Deviation
AAA	20	10
BBB	2	1

A3. Composition of the standard orders

Type of Order	Orders requirement	
S	Crackers	Rice
M	Cereal	Rice
L	Sugar	Rice