10 Steps to become a Lean Enterprise

Lean Expert Training Course

Step 7

Balanced Workload

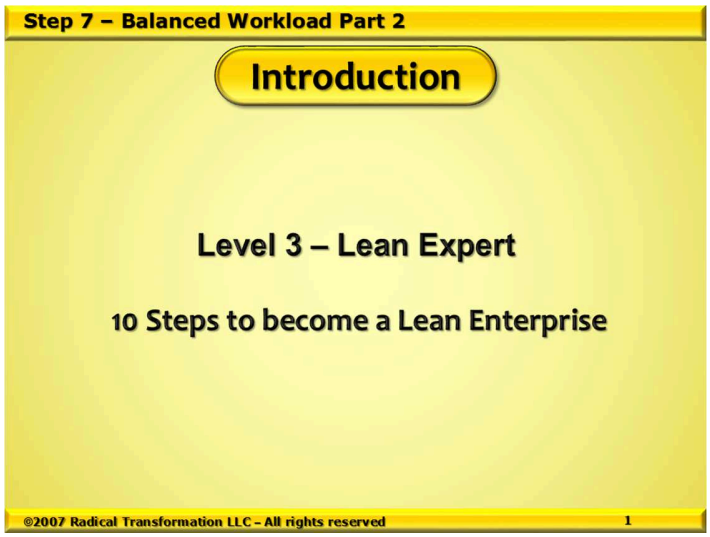
Part 2

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

Table of Contents

Please note that some of the screens in the online course have been omitted from this workbook. This is to protect any proprietary information that may be included in the pictures.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2



Welcome.

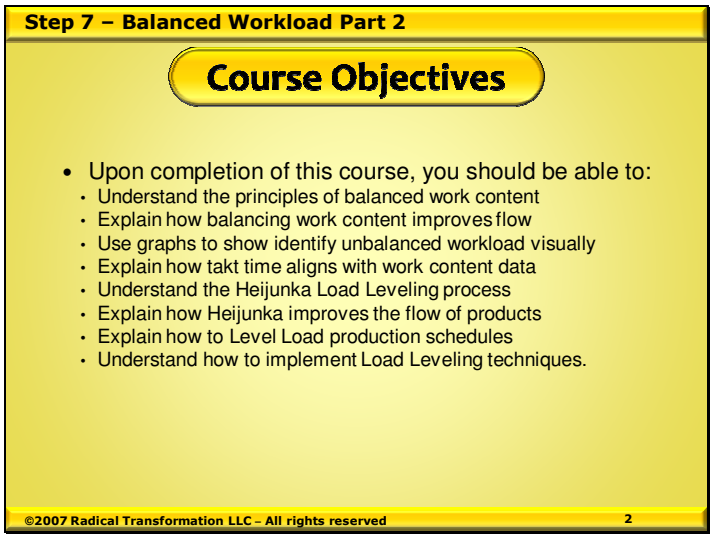
We would like to welcome you back to our next module in this online training course.

This training module is called “Step 7 – Balanced Workload Part 2.”

This module is a continuation of our Lean Expert online course series called “10 steps to become a Lean Enterprise.”

This program has been specifically designed to demonstrate our step by step methodology that will allow any organization to become a Lean Enterprise.

Let’s continue your lean journey!



Course Objectives

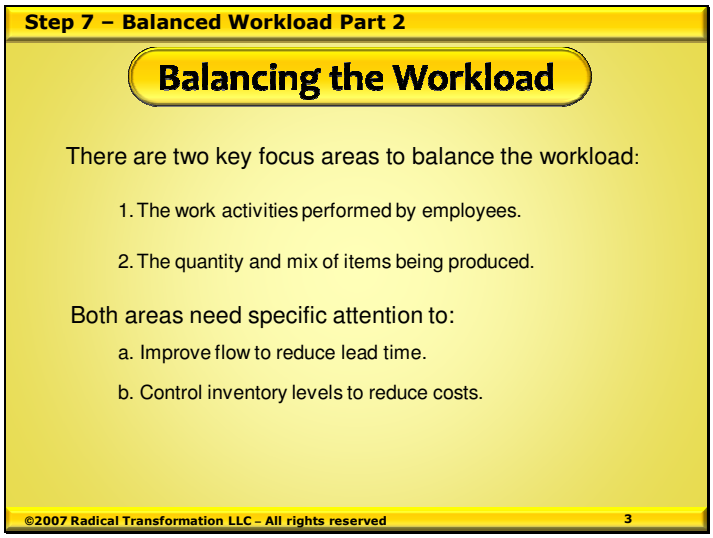
Here are the course objectives for Step 7 – Balanced Workload Part 2.

We specially designed this course to give the information you need to get a full understanding of each step required to become a Lean Enterprise.

Upon completion of this course, you should be able to:

- Understand the principles of balanced work content.
- Explain how balancing work content improves flow.
- Use graphs to identify unbalanced workload.
- Explain how takt time aligns with work content data.
- Understand the heijunka load leveling process.
- Explain how heijunka improves the flow of products.
- Explain how to level load production schedules.
- Understand how to implement load leveling techniques.

Now we are going to work through each course objective.



Balancing the Workload.

So, before we start this training module let's take a moment to recap on the reason why we are looking at this process.

In this screen is the information from the Step 7 - Balanced Workload Part 1 training module.

There are two key focus areas to balance the workload in any process:

1. The actual work activities performed at each workstation by employees in a work area or cell.

2. The workload scheduling methodology for the quantity and mix of items being produced by a work area or cell.

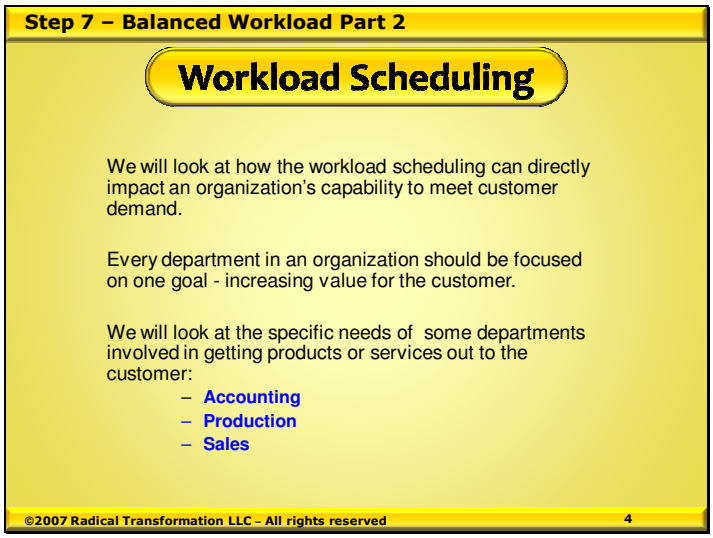
Both areas need specific attention to:

a. Improve flow to reduce lead-time.

b. Control inventory levels to reduce costs.

In Step 7 – Balanced Workload Part 1 we looked at the first focus area, which included the work activities performed by employees.

In Step 7 – Balanced Workload Part 2 we will look at the second key focus area, which is the workload scheduling methodology.



Workload Scheduling.

In this section of the training we will look at how the scheduling of the workload can directly impact an organization's capability to meet customer demand.

Every department in an organization must be focused on the same goal, which is to increase value for the customer.

When this is achieved, the paybacks are huge for any business because customers who perceive value in their supplier's products or services are satisfied customers and they will become loyal customers.

Loyal customers continue to return to re-order those products and services.

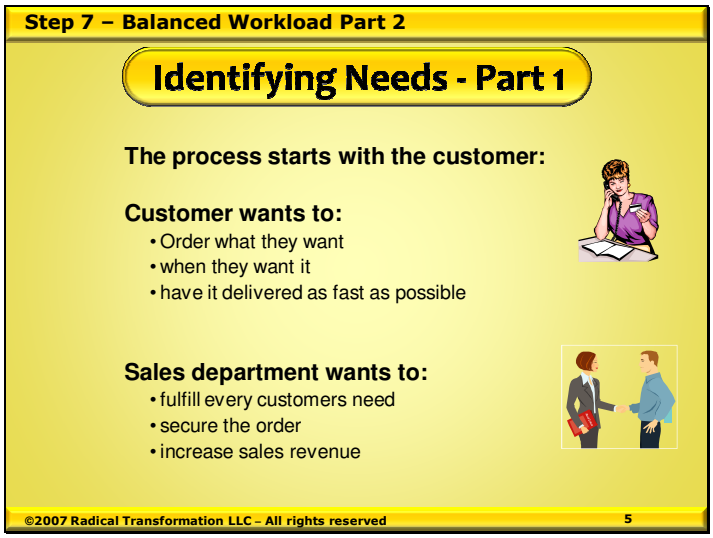
The reward for satisfied customers is profit, so it's important for a business to focus on giving the customer what they want, when they want it.

Let us take a closer look at some of the specific needs of each of the departments involved in getting products or services out to the customer:

We will focus on the needs of three departments:

- Accounting
- Production
- Sales

We will discuss these in the following screens.



Identifying Needs – Part 1

Every business process starts with the customer. Customers have an expectation of getting what they need.

Anything less than this means their needs go unfulfilled and they end up feeling frustrated with their supplier.

A customer wants to be able to place an order, get what they want, when they want it and have it delivered as fast as possible.

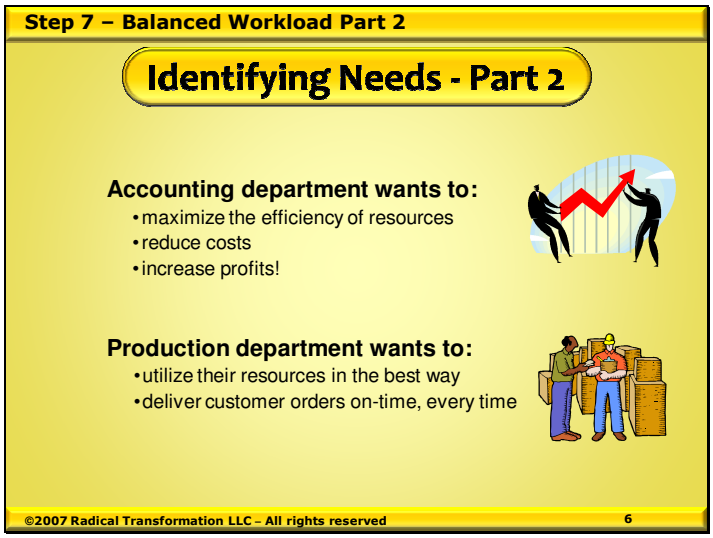
A customer will expect value for money and will accept nothing less.

Customers are looking for suppliers who can focus on meeting their needs with excellent customer service.

The Sales department wants to be able to fulfill every customers need.

They want to sell products or services to the customer.

Sales people focus on giving the customer what they need, securing the order and increasing the company's sales revenue.



Identifying Needs – Part 2

In this screen, we will take a look at the needs of the Accounting and Production departments.

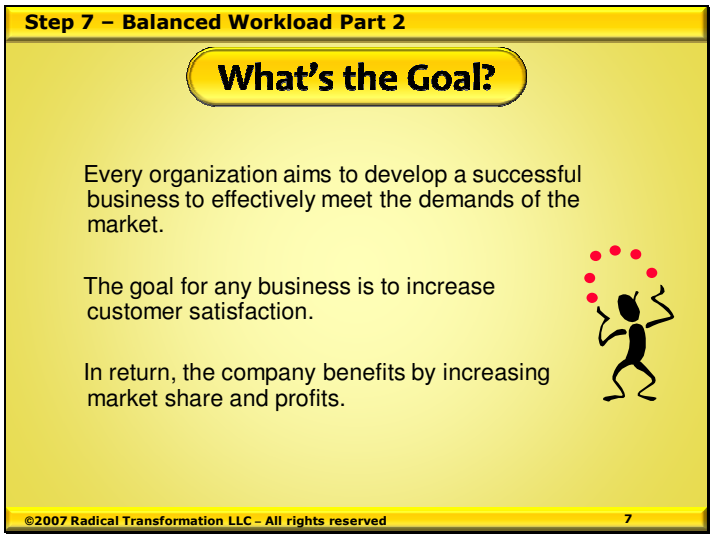
The accounting department wants to maximize the efficiency of their company's resources.

They want to achieve this to support the customer, sales and production departments.

At the same time they are focused on finding ways to reduce costs and increase company profits.

The production department wants to utilize their resources to deliver quality products or services to the customer.

They want to deliver these products and services, on time, every time to meet the customer's schedule.



What's the Goal?

In this screen, we will discuss the purpose and goal of a business.

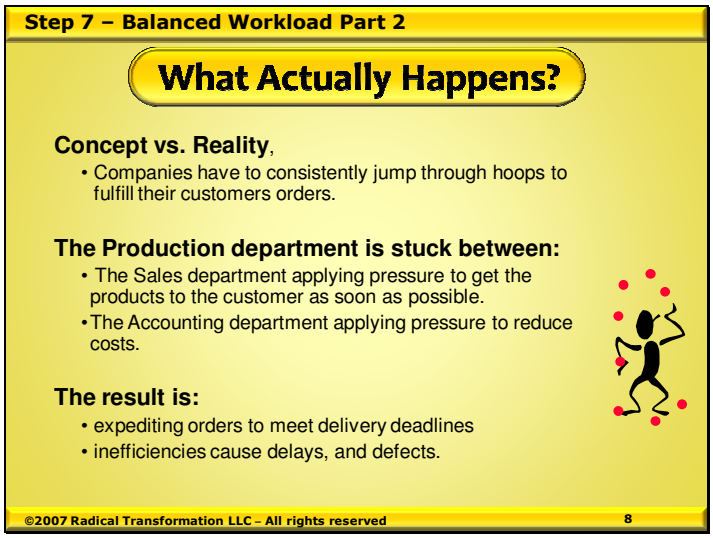
Every organization aims to develop a successful business management system.

Their reason for doing this is to meet the demands of the local, national and international markets.

The purpose for developing a business management system is to help an organization to focus its resources on the effective fulfillment of orders to increase customer satisfaction.

In return for increasing customer satisfaction, a company receives the benefits of successfully and consistently increasing market share and profits.

Therefore, the overall goal of developing a business management system is to focus resources in an effective manner to improve customer satisfaction.



What Actually Happens?

There is a difference between the concept and reality when trying to understand the needs of the departments involved in delivering value the customer.

Invariably, what actually happens is the company has to consistently jump through hoops to fulfill its customer orders.

It goes through a daily process of firefighting to try to do the best it can for its customers in the hope they will not cancel their orders.

Most of the time it will make it, but sometimes it will not.

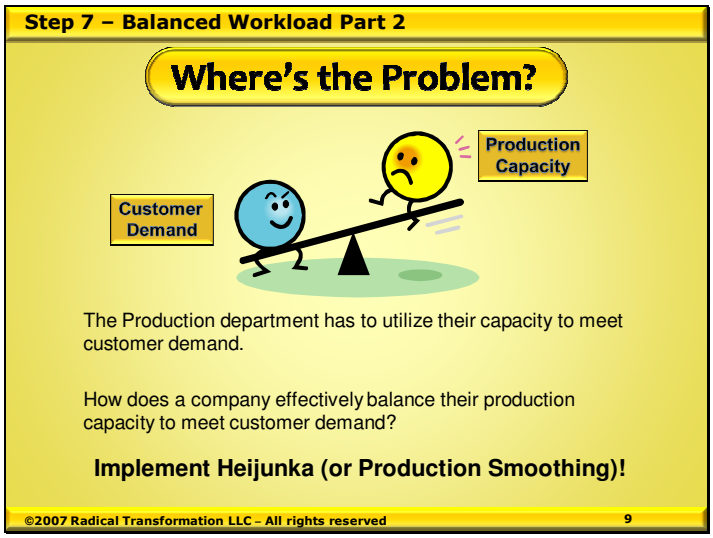
So, what is the problem?

The main problem is that the Production department is stuck between:

- The Sales department applying pressure to get the products delivered to the customer as soon as possible.
- The Accounting department applying pressure to reduce operating costs.

Therefore, the Production department ends up having to prioritize workload based on resource availability and ends up expediting orders to meet delivery deadlines.

This creates process inefficiencies, which are the main causes of delays and defects.



Where's the Problem?

The Production department has to go through a daily balancing act, trying to utilize their resources and available production capacity in an effective manner to meet customer demand.

If a company made one product and customers ordered the same number of products on a regular basis it would be an easier task.

However, most companies do not have the pleasure of this ideal situation.

They are manufacturing of a variety of products or services with constant fluctuations in customer demand.

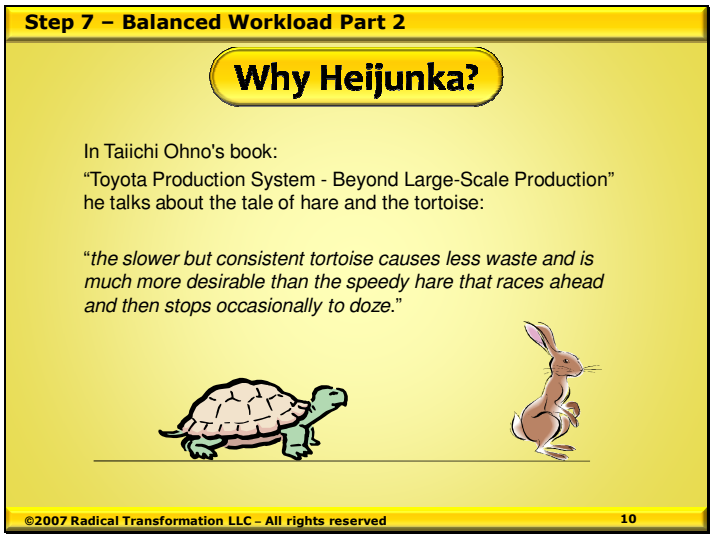
This leads us to ask an important question:

How does a business effectively balance their available production capacity to meet customer demand?

The best method to deal with this issue is to implement a technique called "Heijunka or production smoothing".

Heijunka is a Japanese term for levelling or smoothing the production schedule by averaging the volume and model mix of products.

We will discuss Heijunka in more detail in the following screens.



Why Heijunka?

In this screen, is an excerpt from Taiichi Ohno's book. The book is called:

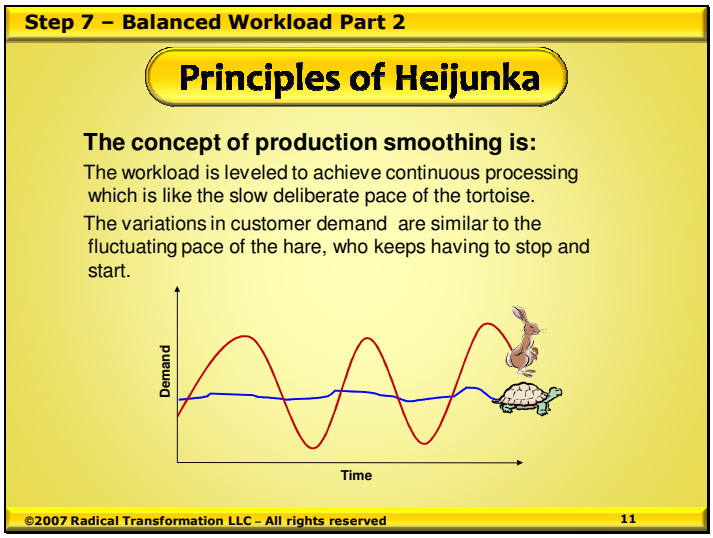
"Toyota Production System - Beyond Large-Scale Production".

In his book he talks about the tale of the hare and the tortoise. This is what he wrote:

"*The slower but consistent tortoise causes less waste and is much more desirable than the speedy hare that races ahead and then stops occasionally to doze*."

Mr Ohno cleverly adapted Aesop's fable about the hare and the tortoise to demonstrate the difference between:

the manufacturing processes (represented by the tortoise) and the excessive variation of customer demand (represented by the hare).



Principles of Heijinka (Production Smoothing)

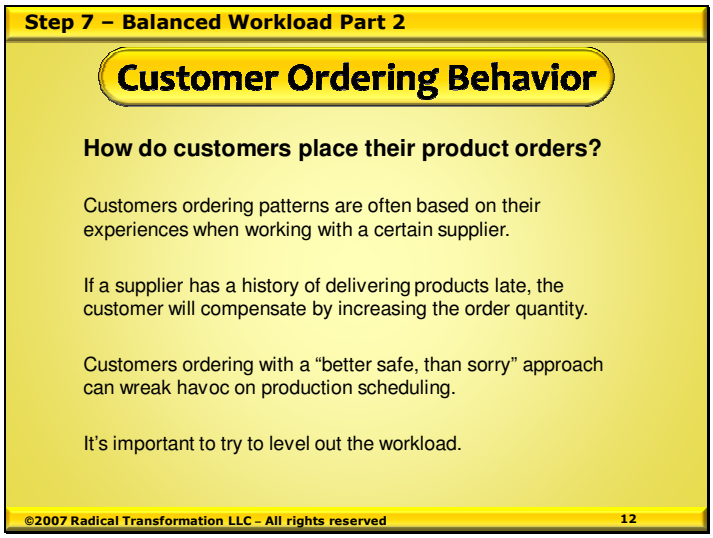
In the previous screen, we saw how Taiichi Ohno used the tale of the hare and tortoise to illustrate the concept of production smoothing.

In this screen, you can see a graph of demand vs. time.

In this graph, the hare and tortoise are demonstrating the difference between a leveled production (represented by the tortoise) vs. a fluctuating customer demand (represented by the hare).

The workload is load leveled using the principles of Heijunka to achieve continuous processing which is like the slow deliberate pace of the tortoise.

The variations in customer demand are similar to the fluctuating pace of the hare, which has to stop and start.



Customer Ordering Behavior.

In this screen, we are going to discuss customer behavior when they are placing orders.

Why do they decide to place an order?

What is their reasoning for placing the order?

The obvious answer is "they need to replenish their inventory of parts or materials.

However, the customer's decisions are not always because of the simple need to replenish inventory.

After doing some research, an organization can begin to understand why, when and how their customers decide to place their orders.

It is often found that customers do not order what they need to replenish their inventory levels.

They order based on their experiences when working with a supplier.

If a supplier has a history of delivering products late, the customer will tend to increase their order quantities to compensate for missed delivery dates and potential outages.

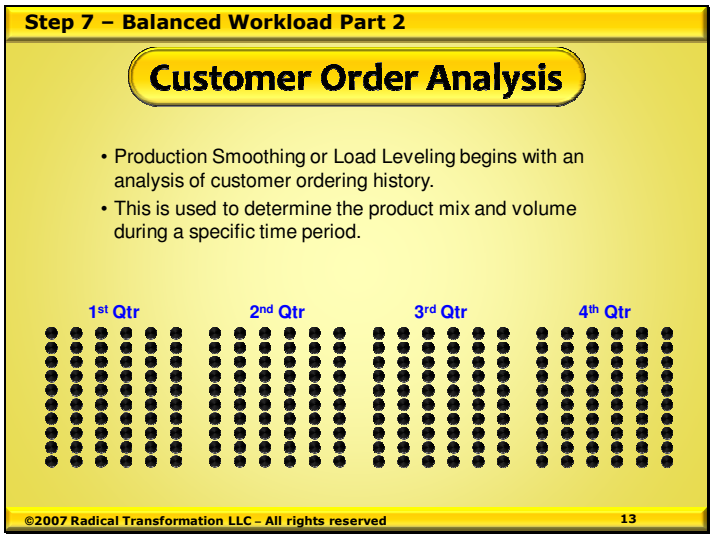
Customers ordering with a "better safe, than sorry" approach can wreak havoc on the production workload scheduling.

This creates fluctuation or spikes in demand leading to feast or famine situation when trying to align resource availability and capacity to meet variations in demand.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

It is important to try to level the workload. This is known as “production smoothing or load leveling”.

It requires collaboration between customers and suppliers to create a win-win scenario for all parties in the value stream.



Customer Order Analysis.

In the previous screen, we discussed customer behavior when they are placing orders.

In this screen, we are going to discuss the analysis of customer orders.

“Production Smoothing or Load Leveling” as it is sometimes called begins with an analysis of customer ordering history.

The reason for this analysis is to determine the product mix and volume during a specific time period (e.g. week, month, quarter, etc).

Before implementing lean principles, a business is probably using a traditional batch and queue production system.

The company will forecast customer orders and make enough products to fulfill their needs over a period of time.

In the lower part of this screen, you can see a graphic. It represents the number of units produced per quarter. In each quarter (or 12 weeks), it shows that 60 units were produced during this period.

A traditional business would make these 60 units in one or maybe two setups.

A customer would call off the parts they ordered and the rest would sit in finished goods inventory until the next customer order.

The concept is simple! However, the supplier business gets it wrong more than they get it right.

Why is this?

It is because:

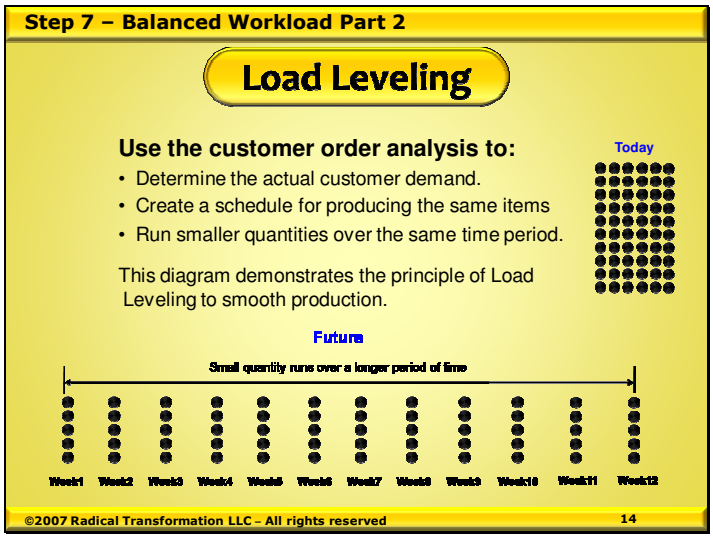
a) they don't make enough parts to meet demand,

b) the customer orders more or fewer than expected,

c) the customer orders something different than what the supplier has in finished goods inventory or

d) the business does not have the resources available to make the parts when the customer wants them.

The truth is, it could be all of these.



Load Leveling.

In this screen, we will use the customer order analysis from the previous screen to level load the production schedule.

Using the data analysis of customer orders an organization must do the following:

1. Determine the quantity and types of products ordered by the customer.
2. Determine the needs of the customer.
3. How many do they actually use per week?
4. If they order 60 per quarter, would 5 per week meet their demand requirements?
5. Create a schedule for producing the same number of items over the same time period.
6. Produce them in smaller repeatable quantities over the same period as the customers placed their original orders.
7. How are you going to produce 5 per week on a consistent basis and deliver them on-time, every time?

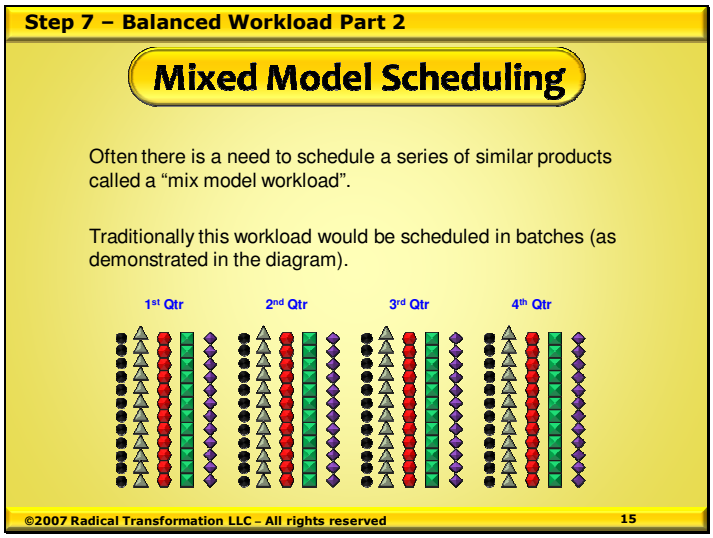
The diagram in this screen demonstrates the principle of load leveling to smooth out production and reduce fluctuations.

Next we have to take the customer requirements of 60 parts per quarter and calculate the demand on a weekly basis.

The calculation is:

60 ÷ 12 weeks = 5 parts per week.

The smaller lot of 5 parts requires less production hours than 60 parts and releases the machine to setup and work on other customer orders.



Mixed Model Scheduling.

In the previous screens, we discussed single product scheduling. In this screen we will start to discuss mixed model scheduling.

What is mixed model scheduling?

Most businesses do not produce one unique product; they produce several different items for many customers.

This means they need to schedule a series of similar products called a "mix model workload" through a work area or cell.

Traditionally, like the single model products, these items would be scheduled in batch quantities.

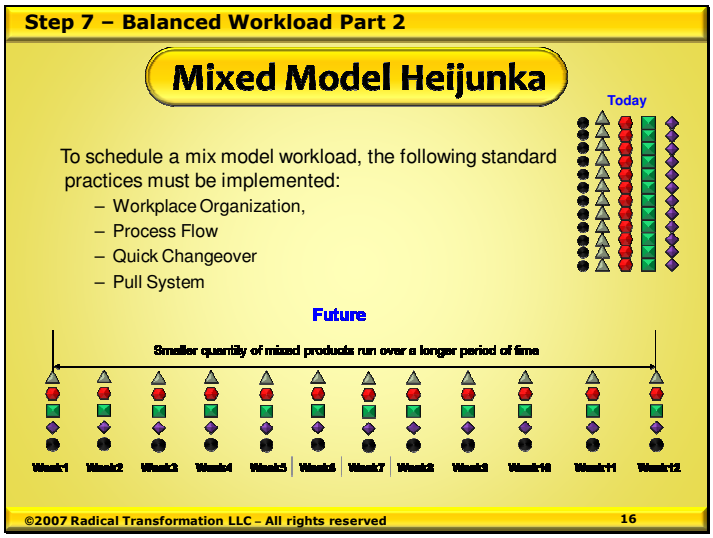
This would happen because of long changeover times or constraints causing product flow issues.

In the diagram in this screen, you can see how a company would schedule their mixed model items.

To demonstrate the process we have used circles, triangles, hexagons, squares and diamond shapes.

During the first quarter (or 12 weeks)t they would make batches of all the circles, then triangles, then hexagons, then squares and finally the diamond shaped products.

They would repeat this same schedule every quarter.



Mixed Model Heijunka.

In the previous screen, we discussed the traditional methods for scheduling a mixed model workload.

In this screen, we will discuss the use of Heijunka or production smoothing to level a mix model production schedule.

To schedule a mix model workload successfully through any work area or cell, the following steps must have been implemented and be acceptable standard practices:

- Workplace Organization (Step 3).
- Continuous Flow (Step 4 and Step 6).
- Quick Changeover (Step 5)
- Pull System (Step 6)

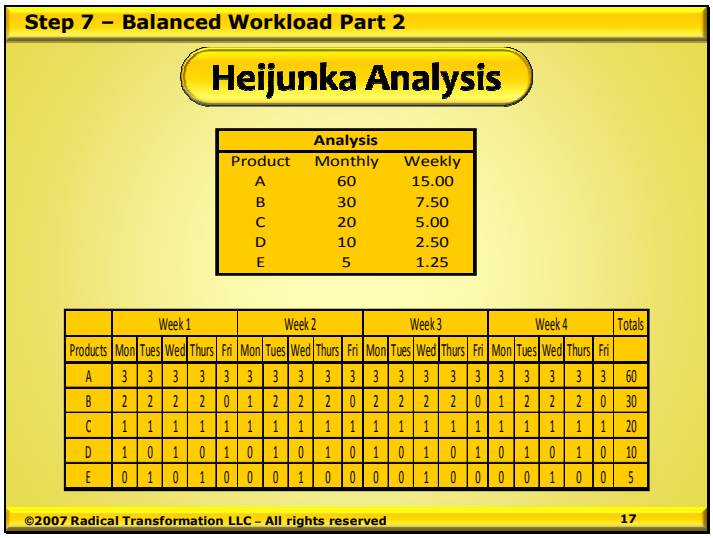
These four practices are included in the 10 Steps to become a Lean Enterprise training model.

If any of these four steps are missing, an organization is going to have trouble implementing Heijunka as a standard practice.

The diagram in this screen demonstrates how sixty parts, consisting of five different product designs would be scheduled during a quarter (or over 12 weeks).

An organization must develop a high level of flexibility to be able to changeover its manufacturing processes from one design to the next.

Everything must be organized and synchronized to perform the necessary tasks in a seamless manner.



Heijunka Analysis.

In the previous screens, we discussed how to implement Heijunka.

In this screen we will discuss the tracking and monitoring of the Heijunka process.

It is sensible to develop a standard practice of tracking and monitoring the Heijunka scheduling system.

The purpose for doing this is to analyze the demand over several weeks or months and to calculate an average usage for each product.

Why is this necessary?

How will it help a business?

It is necessary to manage the production scheduling system to ensure the processes are meeting demand.

If there are any spikes or dips in demand it is important to determine if they have affected takt time.

It will help to determined the weekly requirements for each product and ensure they are being produced to meet demand or takt time.

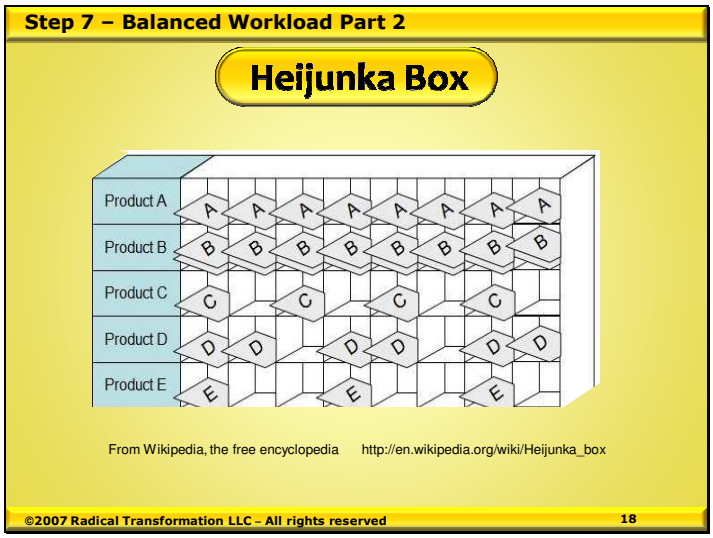
In this screen, there is an example to show how the Heijunka principle would be applied.

It is demonstrating how the data is used to determine demand and how the products are scheduled to meet it.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

The data is entered into a spreadsheet to create a 4 week production schedule.

It demonstrates how five products would be manufactured during the 4 week period to meet customer demand.



The Heijunka Box.

In this screen, there is an example of a Heijunka box. It is a tool that allows easy and visual control of a smoothed production schedule.

The Heijunka box would be used to represent the heijunka analysis spreadsheet.

A typical Heijunka box has horizontal rows for each product. It has vertical columns that represent the time intervals of production.

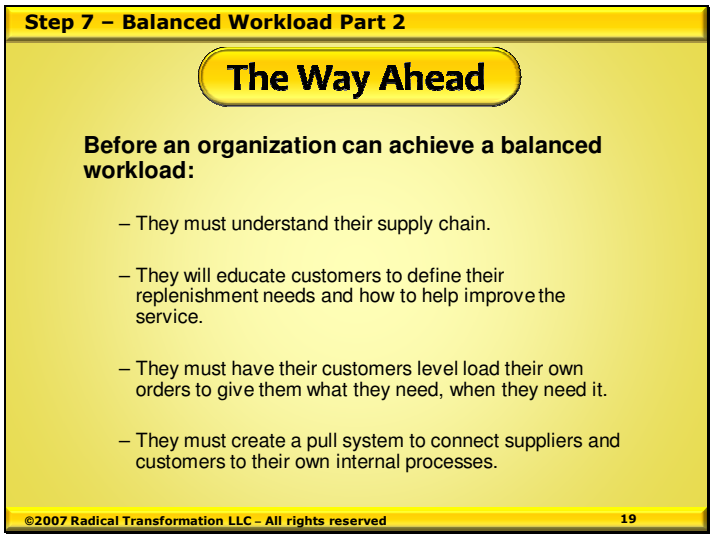
There are eight columns in this example, which represents an 8 hour workday.

Production kanban cards are placed in the pigeon-holes in proportion to the number of items to be built of a given product type during a time interval.

In this illustration, each time period builds one A and two B's along with a mix of C's, D's and E's.

What is clear from the box, and the simple repeating kanban patterns in each row, is that the production is smoothed for each of these products.

This ensures that production capacity is kept under a constant pressure thereby eliminating many issues.



The Way Ahead.

Going through the process of balancing the workload will have a direct impact on many of the day to day procedures in the work area:

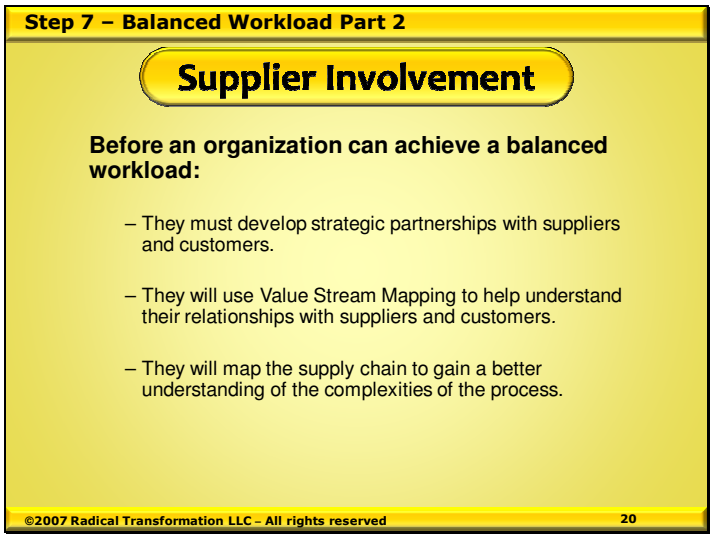
- It will encourage the Standard Work in Process (SWIP) to be defined and this will help to control the inventory levels to meet customer demand (or takt time).
- It will allow quality issues to be easily identified during the production process.
- It will highlight production issues that reduce the flow.
- It will create a consistent work pace for all employees.
- It will give a visual feedback about the status of a process in real-time.

Before any organization can complete and achieve Step 7 - Balanced Workload:

- They must have a complete understanding of the overall supply chain process from their suppliers through to their customers.
- They will need to educate their customers about their specific replenishment requirements and how they can help to improve the process to serve them better.
- They must understand how to level load their own orders to allow the manufacturer to give them what they need, when they need it.
- They must create a pull system that is capable of connecting suppliers and customers to their own internal receiving, production and delivery processes.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

An organization cannot become a Lean Enterprise without integrating Step 7 – Balanced Workload into their day to day practices.



Supplier Involvement.

Before an organization can achieve a balanced workload:

They must develop strategic partnerships with their suppliers to ensure they can deliver what is needed, when it is needed, on time, every time.

See Step 10 – Lean Supply Chain for more details.

You will need to use Value Stream Mapping to help understand the relationships between suppliers, customers and their internal processes.

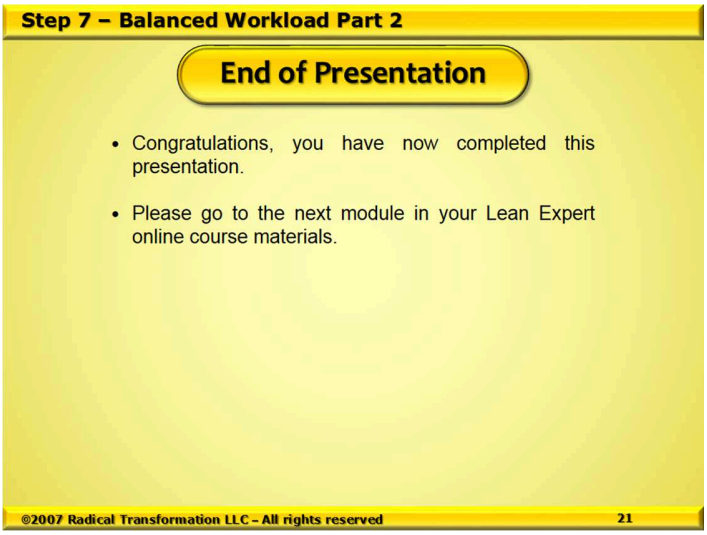
See Step 2 – Value Stream Mapping Part 1 for more details.

Without mapping they will not fully understand the complexities of their internal processes or be able to define what must change to achieve their improvement goals.

See Step 2 – Value Stream Mapping Part 2 for more details.

Any organization is only as effective in servicing their customers, equally as well as their suppliers are capable of delivering parts and materials on-time, every time.

If a supplier fails, an organization fails to meet their customer demand too.



End of Presentation.

Congratulations, you have now completed this presentation.

Please go to the next training module in your Lean Expert online course materials.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

Reference Materials

1. **Creating Level Pull: A Lean Production-System Improvement Guide for Production-Control, Operations, and Engineering Professionals.**
   By: Art Smalley. Published by Lean Enterprise Institute Inc. 2004.
2. **Creating Continuous Flow: An Action Guide for Managers, Engineers and Production Associates.**
   By Mike Rother and Rick Harris. Published by Lean Enterprise Institute Inc. 2001.
3. **Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements.**
   By Don Tapping, Tom Luyster and Tom Shuker. Published by Productivity Inc. 2002.

Lean Expert Course Workbook - Step 7 Balanced Workload Part 2

Documents List

There are no required documents for this training module.

