



TOCICO 2009 Conference

# TOCICO CONFERENCE 2009

## Productive Change at MTU Detroit Diesel: Using IO Map and Transition Tree

**Presented By:** *Joerg Klisch, Anshum Jain: MTU Detroit Diesel,  
James T. Low: Wayne State University*

**Date:** **June 7, 2009**

# Agenda

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- 1. About MTU Detroit Diesel**
- 2. Initial Situation**
- 3. TOC Journey**
- 4. Success Stories**
- 5. Lessons Learned**
- 6. TOC 2.0**



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# Strong Brands and Companies

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Engines	Onsite Energy and Components		
Brands			
			
Products			
 <p>Diesel Engines</p> <p>Complete Drive and Propulsion Systems</p>	 <p>Gas Engine Systems</p> <p>Diesel Engine Systems</p> <p>Fuel Cells Systems</p>		 <p>Injection systems</p> <p>Propeller shafts</p>



# Products for a Great Variety of Applications

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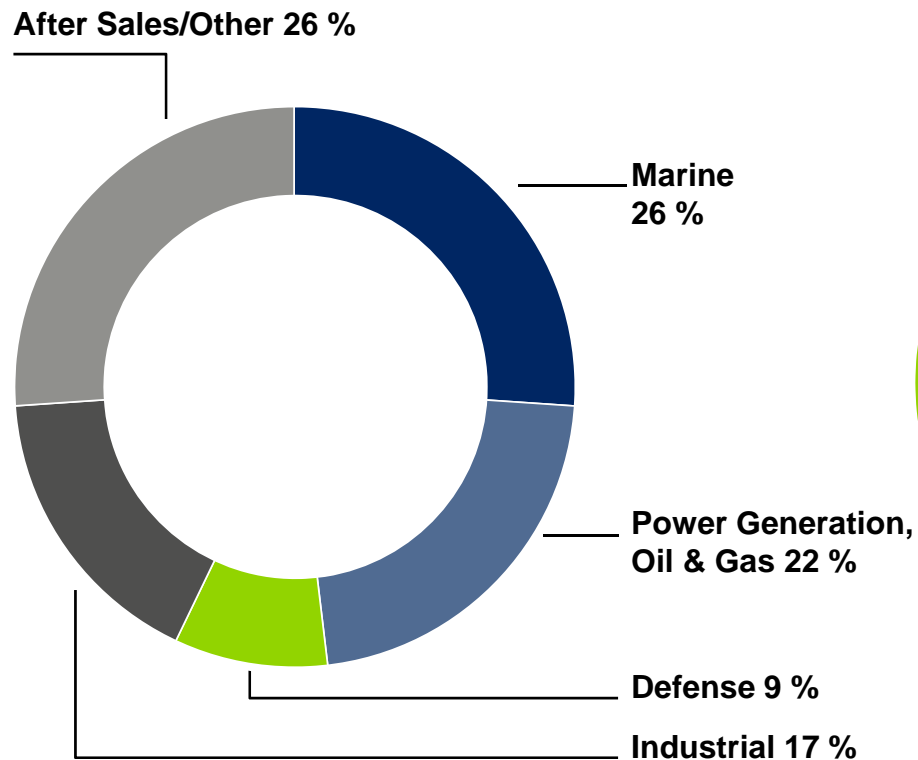
Marine	Industrial	Defense	Oil & Gas	Onsite Energy Systems	Propeller Shafts	Injection Systems
<ul style="list-style-type: none"> <li>• Yachts</li> <li>• Commercial</li> <li>• Naval</li> </ul>	<ul style="list-style-type: none"> <li>• Rail</li> <li>• C&amp;I</li> <li>• Agric.</li> <li>• Mining</li> </ul>	<ul style="list-style-type: none"> <li>• Light and Medium Vehicles</li> <li>• Heavy Vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• Onshore</li> <li>• Offshore</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency Power</li> <li>• Prime Power</li> <li>• Continuous Power</li> </ul>	<ul style="list-style-type: none"> <li>• Passenger Cars</li> <li>• SUVs, Vans, LDV</li> </ul>	<ul style="list-style-type: none"> <li>• Highspeed Engines</li> <li>• Medium Speed Engines</li> </ul>
						



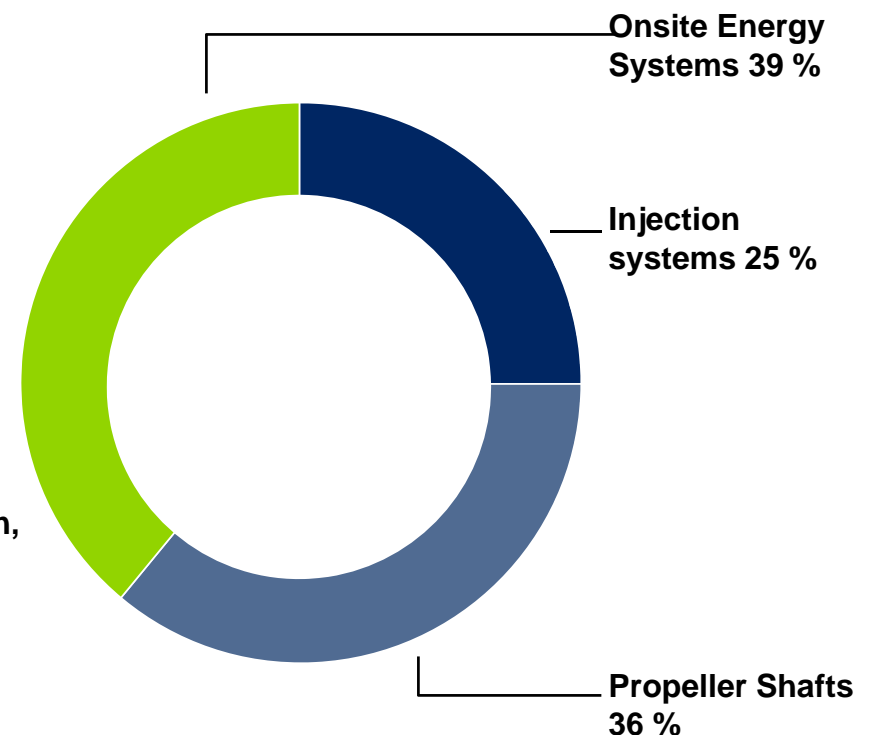
# Business Segments for Profitable Growth

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Segment revenues Engines 2008:  
EUR 2,663 million\*



Segment revenues Onsite Energy Systems &  
Components 2008: EUR 621 million\*



\* Total revenues of EUR 3,133 million includes holding/consolidation amounting to - EUR 151 million



# MTU Detroit Diesel - Products

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# Initial Situation

- Employees working in silos and not able to see the overall picture.
- Hard work not resulting into visible improvements.
- Too much fire fighting and very little continuous improvement.
- Large number of engines coming off the line missing parts.
- Little standardization of tasks.
- Lack of structured problem solving approach.
- Lack of learning to get better.



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# The TOC Journey

- Anshum Jain took the BA7260 TOC Breakthrough Solutions Jonah Course at Wayne State University.
- He gave copies of *The Goal* to every Operations manager at MTU Detroit Diesel.
- Joerg Klisch, Operations Director for MTU Detroit Diesel, saw a way to use TOC to reach the goal of implementing improvements.



# The TOC Journey

- Initial meeting with Joerg Klisch, Anshum Jain, and James Low of Wayne State University (1-18-08)
- Meeting with all Operations area managers (1-25-08)
  - Watch The Goal movie
  - Presentation on TOC production applications, IO Map, Transition Tree



# The TOC Journey

- Meeting with all MTU Detroit Diesel employees in their auditorium (2-1-08)
  - Introduction by Joerg Klisch
  - Watch The Goal movie
  - Presentation on TOC production applications, IO Map, Transition Tree
  - Questions and Answers
  - Identification of the Ambitious Goal by Joerg Klisch
  - Request each person to identify 2 roadblocks (obstacles) to reaching that goal, on 3x5 cards



# What is the Goal?

To successfully build required engines every day from each line.

- Successfully building an engine includes:
- On time
- In perfect quality
- In required quantity
- With the allocated resources



# Roadblocks to reach the Goal

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Feb 01, 2008

All employees watched the movie “The Goal” together.

Everyone was asked to identify two most important roadblock which prevent them from reaching the goal.



# Roadblocks to reach the Goal

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92 roadblocks were identified.

Sandeep Muralidhar  
1) Incorrect and inefficient flow of information.  
2) Support to identify methods.

Road Block  
2. Lack of drawings for S2000/54600 fastener parts. Delays Sourcing.

T-notice's SENT TO Detroit LACKING SUFFICIENT INFORMATION  
FN's Slow Response to request sent REQUIRING CLARIFICATION

KURT EINHAUS  
PART SHORTAGES / NO PART AVAILABLE  
BULK TRIGGERING SYSTEM / KANBAN CARDS

GAKITH  
COUNT TO SUPPORT THE WORK LOAD  
P. MAKI



# Intermediate Objective Map

- Joerg Klisch, all area managers, and James Low met off-site for a full day to develop the Intermediate Objectives and the structure of the IO Map. (2-15-08)
  - Overview of Intermediate Objective (IO) map and Transition Tree
  - Review obstacles suggested by employees. Clarify the wording, resolve duplicates, remove those not applicable. Rank in terms of importance.
  - Used a spreadsheet projected on the wall for this.



# Intermediate Objective Map

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Feb 15, 2008

All area managers met off-site for a whole day to identify intermediate objectives and develop an intermediate objective map to reach the ambitious goal.

## Intermediate Objective (IO)

A circumstance which overcomes a roadblock.

## Intermediate Objective Map (IO Map)

The logical order in which various Intermediate Objectives can be reached.

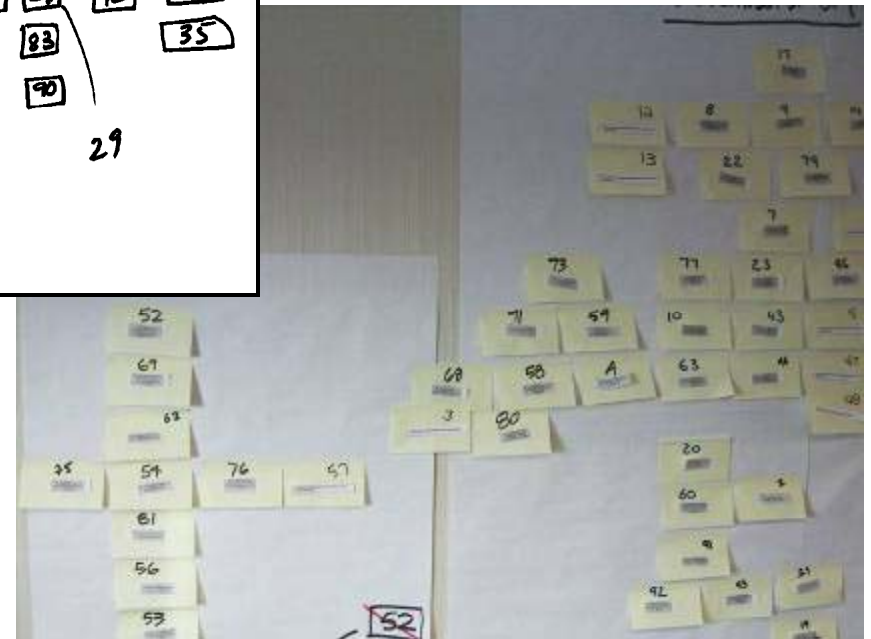
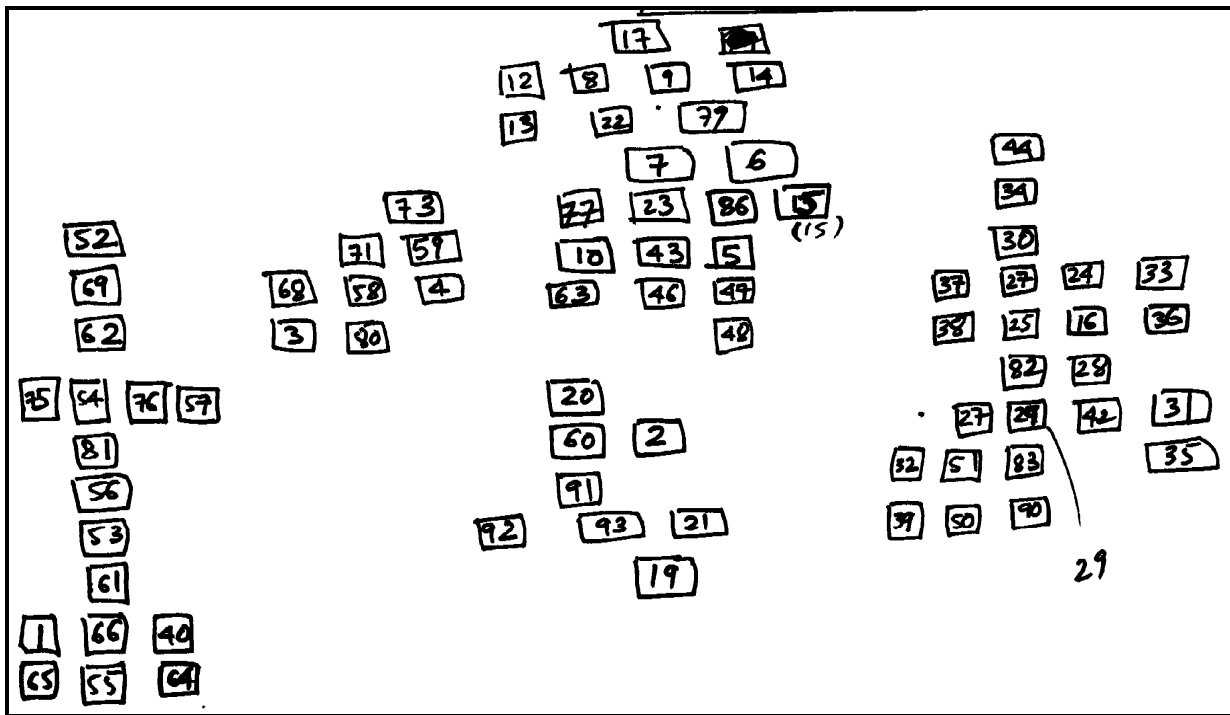


# Intermediate Objective Map

- Arranged IOs on Post-It Notes in rough groupings by subject area on the wall.
- The managers, working as a group, arranged IO statements in priority sequence order (bottom to top)
- Circumstances at a lower level would need to be accomplished first, before the circumstances at the next level up could be done.
- Some groupings of IOs were related to issues in:
  - Production, Procurement, Coordination, Labor relations
- The following slides show some of this arrangement.



# Intermediate Objective Map



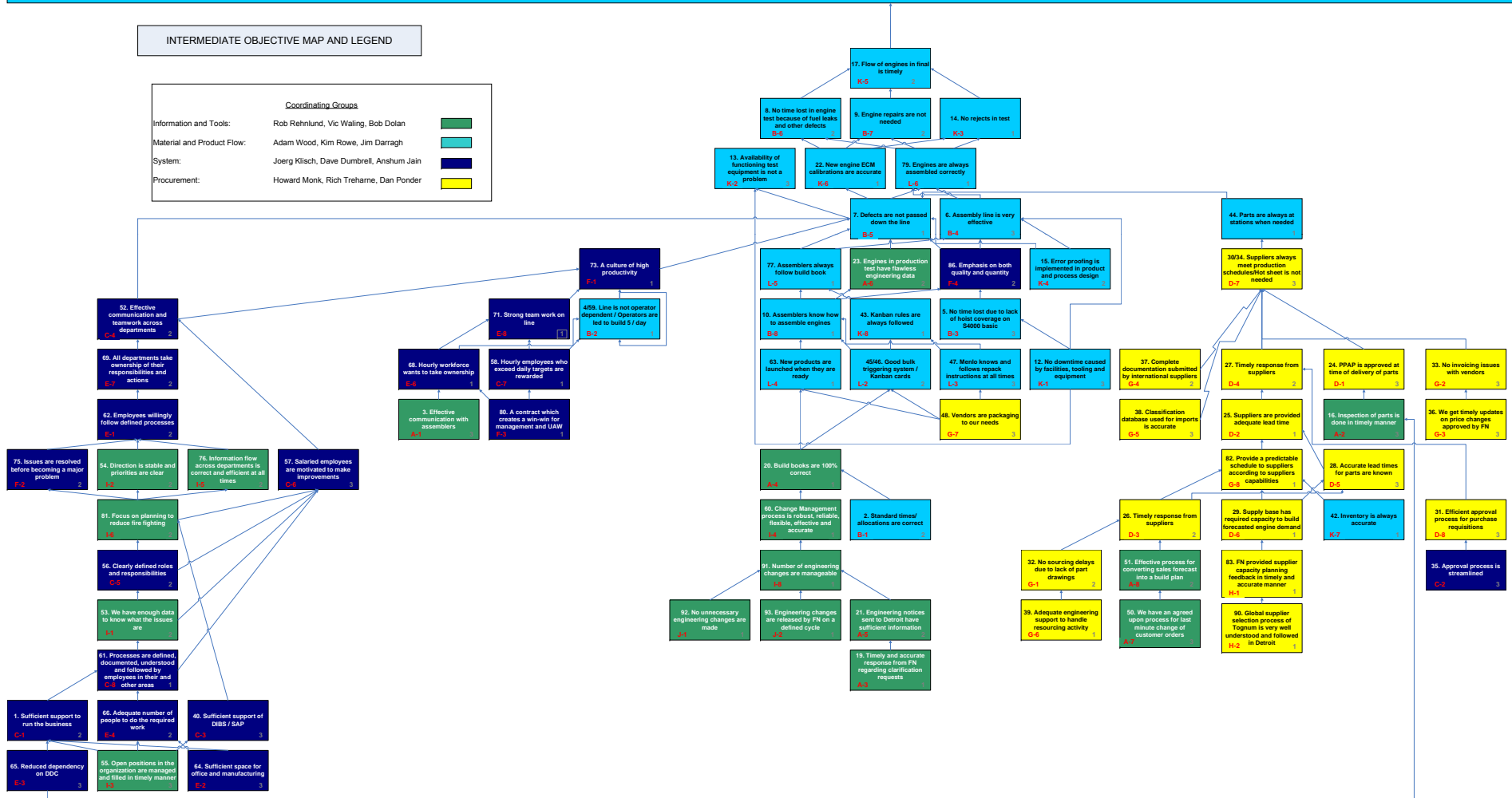
# Intermediate Objective Map

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BUILD REQUIRED NUMBER OF ENGINES ON TIME AND IN PERFECT QUALITY

## INTERMEDIATE OBJECTIVE MAP AND LEGEND

Coordinating Groups		
Information and Tools:	Rob Rehlund, Vic Waling, Bob Dolan	<span style="color: green;">■</span>
Material and Product Flow:	Adam Wood, Kim Rowe, Jim Darragh	<span style="color: cyan;">■</span>
System:	Joerg Kirsch, Dave Dumbrell, Anshum Jain	<span style="color: blue;">■</span>
Procurement:	Howard Monk, Rich Trehan, Dan Ponder	<span style="color: yellow;">■</span>



# Transition Tree

## Transition Tree

Transition Tree helps in finding a way to reach Intermediate Objectives.

March 10, 2008

20 people participated in a training session on how to build a Transition Tree.



# Transition Tree

The Transition Tree turns the IO Map into an action plan with specific steps to be carried out.

20 MTU Detroit Diesel managers met off-site for a half-day session on how to build steps in a Transition Tree. (3-10-08)

The thrust of this meeting was to develop the managers as facilitators, so that there would be a cadre of experienced team leaders in working with Transition Trees.

These team leaders were preparing to each lead a team at a following off-site workshop that would involve all MTU Detroit Diesel employees.



# Transition Tree

- The managers worked as a overall group on 3 specific Transition Tree modules, facilitated by James Low.
- The managers then divided into four teams.
- Each team worked independently to construct a specific Transition Tree module.
- Each team presented to the overall group, which helped them to refine their work.
- The following slides show some of the examples from these teams.



# 2 Day Workshop – April 11-12, 2008

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- 126 people from operations and other functional areas participated.
- 19 teams with 4-6 people per team worked on a total of 79 intermediate Objectives.
- The Transition Tree was developed for MTU to reach its ambitious goal.



# 2 Day Workshop – April 11-12, 2008

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- Everyone was given 3 Green stickers and 3 Yellow stickers.
- Green stickers were “participant” stickers and all 3 were to be used.
- Yellow stickers were “leader” stickers and were optional.
- Everyone was free to use the stickers on the parts of the transition plan they wanted to participate in or lead.

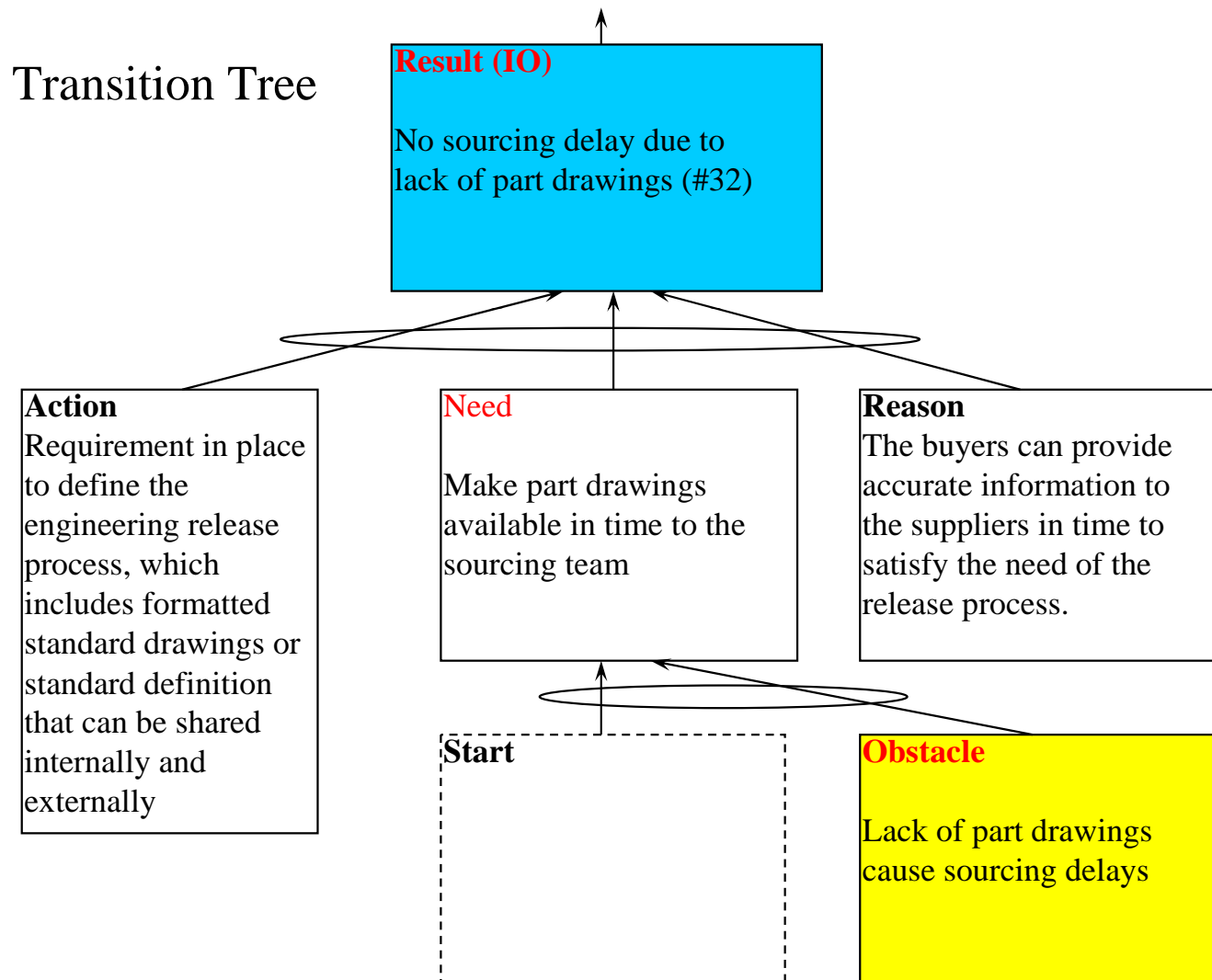


# 2 Day Workshop – April 11-12, 2008

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# Transition Tree - Example



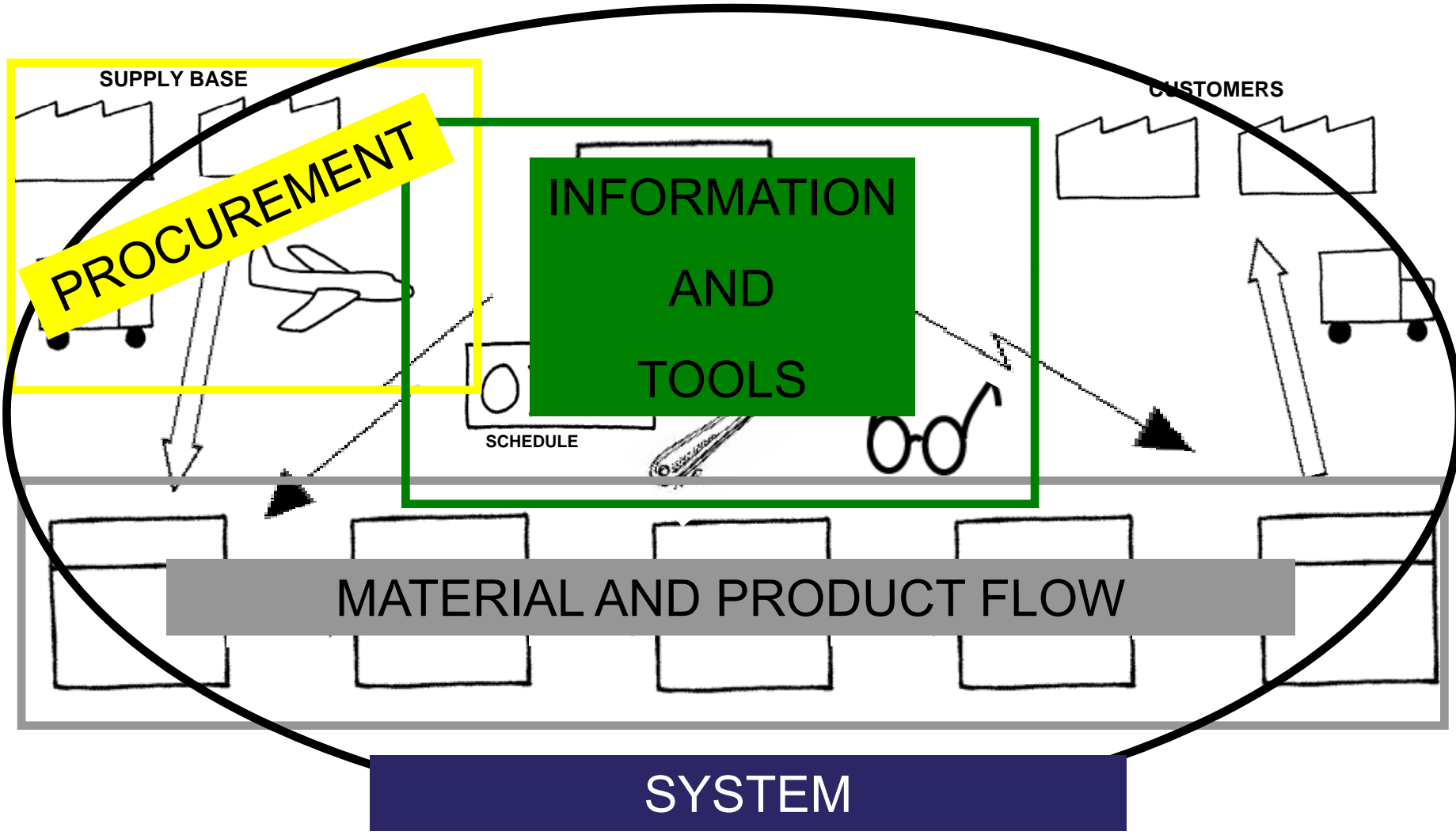
# After the 2-Day Workshop

- **It became evident that there was a need to coordinate the efforts of the 79 teams:**
  - To get them started
  - To keep them moving
  - To keep them motivated
  - To avoid duplication of effort or working at cross-purposes
  - To report on their progress for their task
  - To find ways to reward them for their efforts
- **Hired a coordinator for improvement efforts**
- **We developed 4 coordinating groups centered on functional areas.**



# Support Structure

## Value Stream Approach



# Coordinating Groups

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## PROCUREMENT

- Howard Monk
- Rich Treharne
- Dan Ponder

## MATERIAL AND PRODUCT FLOW

- Dave Dumbrell
- Kim Rowe
- Jim Darragh

## INFORMATION AND TOOLS

- Rob Rehnlund
- Vic Waling
- Bob Dolan

## SYSTEM

- Joerg Klisch
- Adam Wood
- Anshum Jain



# Coordinating Groups

## Tasks of coordinating groups:

- Meet with all the teams in their group once every quarter.
- Guide and support teams to reach their intermediate objectives.
- Avoid duplication of efforts.
- Meet with other coordinating groups once every quarter.
- Make sure actions of every team align with company's long term strategy.



# TOC Visual Corner

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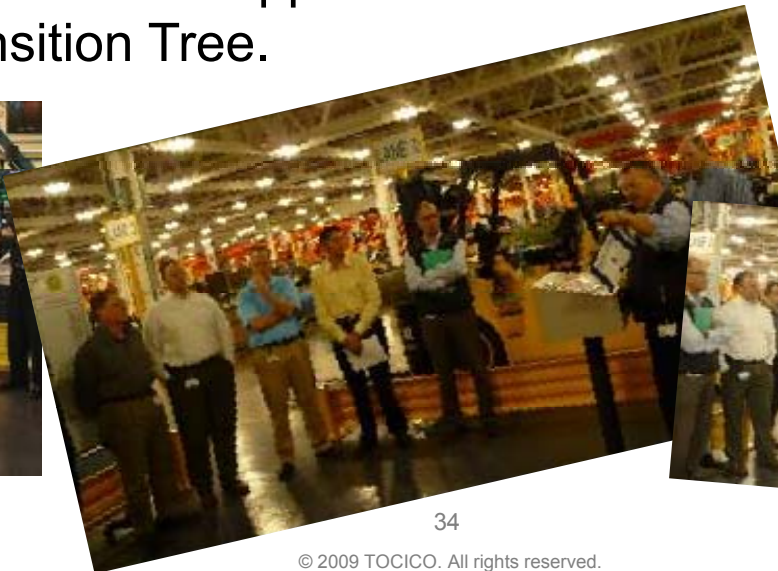
- Centralized visual corner to provide all the information related to TOC.
- All the Transition Tree plans are displayed in TOC corner.
- Teams can check what others teams are working on.
- Team leaders are responsible for keeping their section up to date.
- Provides a visual mechanism on the progress made by each team.



# TOC Update – Every Other Friday @3:00pm

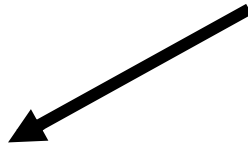
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- 3-4 Transition Tree teams provide an update or show the final solution.
- All employees of operations are invited to attend.
- Focus on seeing the solution in action rather than formal presentation.
- The teams are presented an appreciation reward once they complete their Transition Tree.



# TOC Journey

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# Agenda

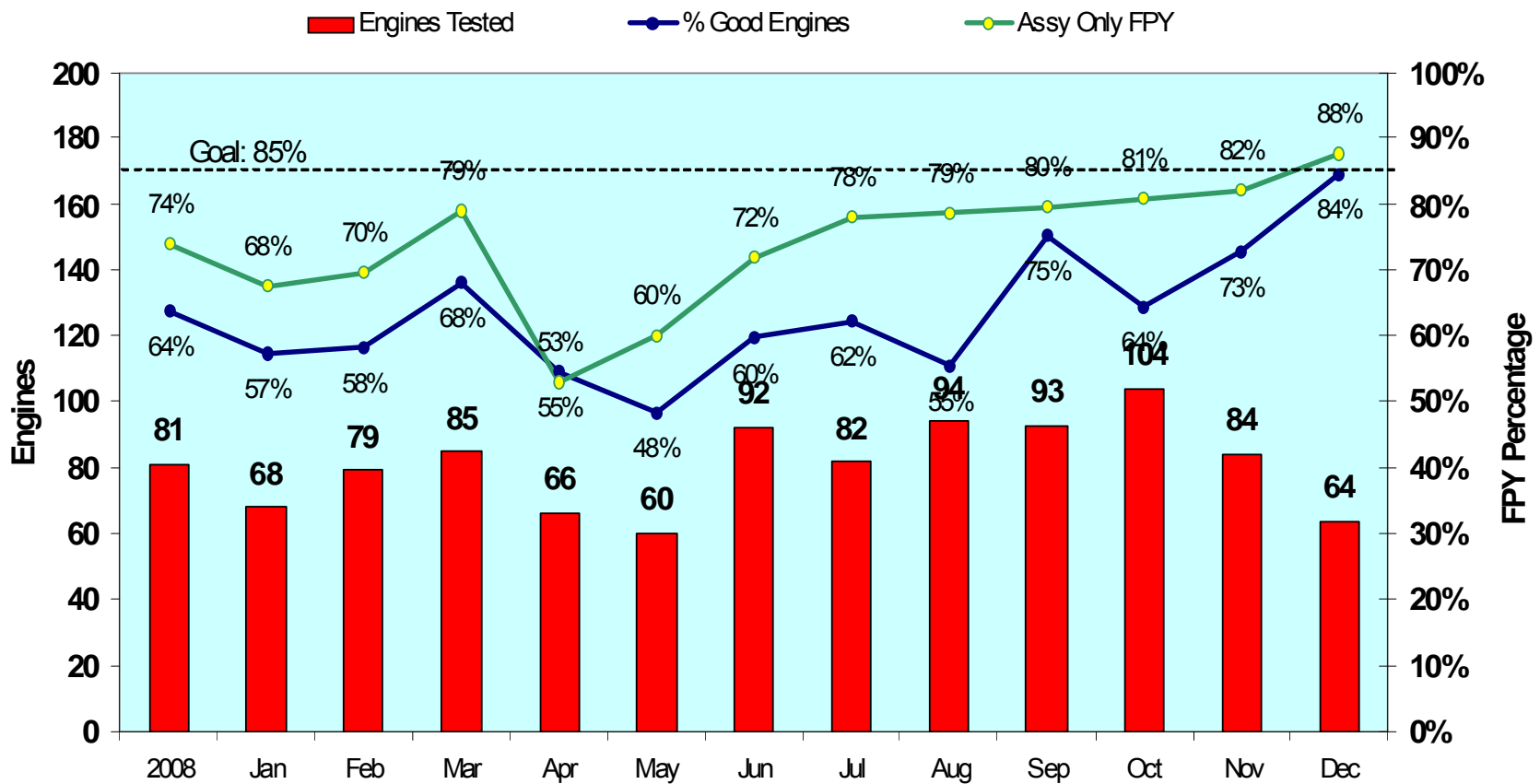
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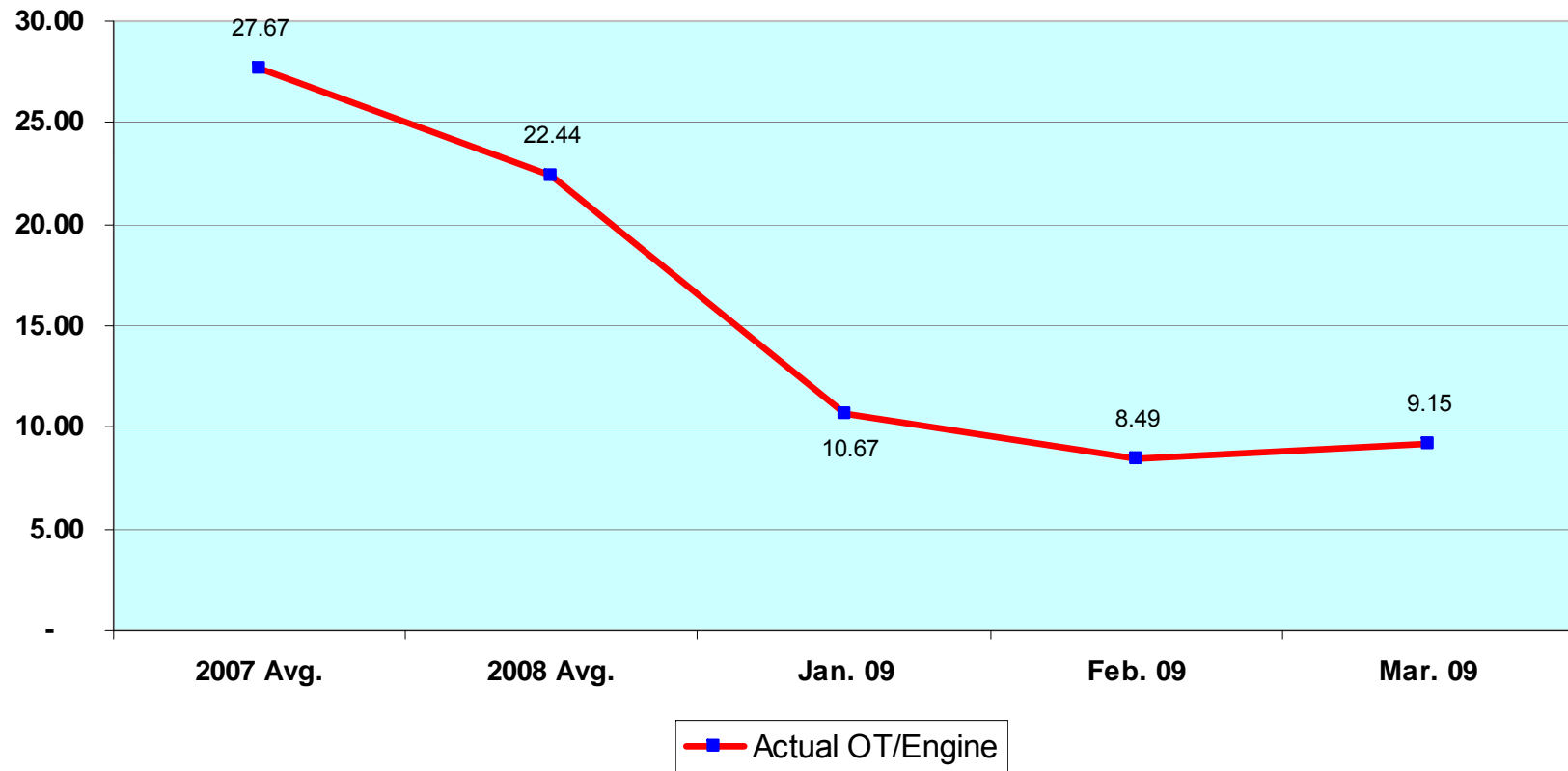
# Improvement in First Pass Yield

S4000 Engines Tested  
& FPY 2008

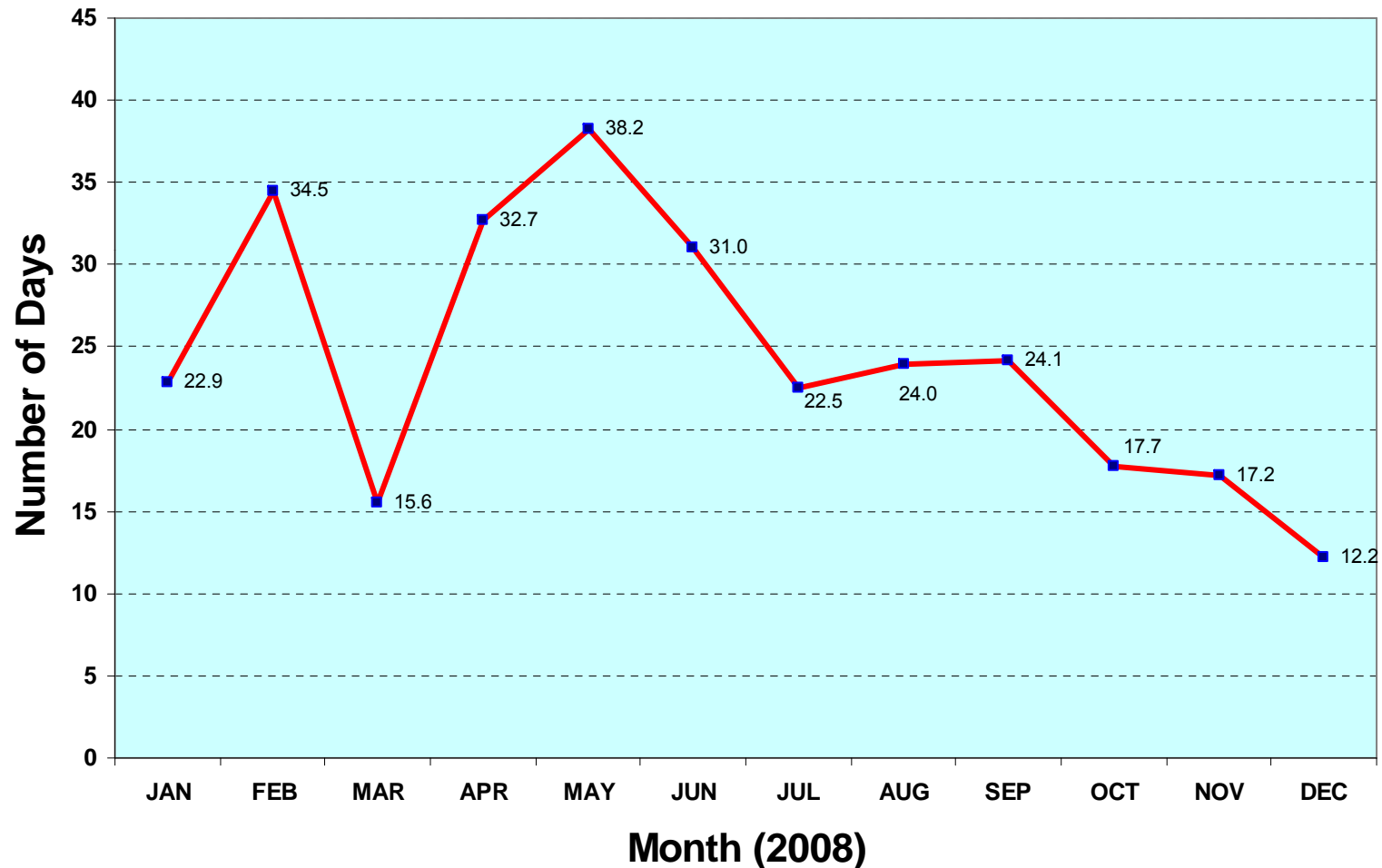


# Reduction in operating cost

Direct Summary: OT/Engine



# Reduction in order to delivery lead time - S4000 Engines



# More Success Stories

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- Launch of a Learning Club
- Reconfiguration of limited office space to provide sufficient number of conference rooms
- Elimination of 5 day hot sheet for critical parts and launch of 5 week reach report.



Strategy and Tactics Tree



What is Lean?



ZAPP Vs. SAPP



# What else have we accomplished?

- Employees see the overall picture and how their work affects the GOAL.
- Employee know their priorities.
- Employees feel more valued as they are the ones who identified roadblocks, came up with solutions, and chose the transition tree they want to work on.
- For the first time in 7 years all engines S2000/4000 were finished and ready to ship prior to Christmas and we had build more engines than ever before.



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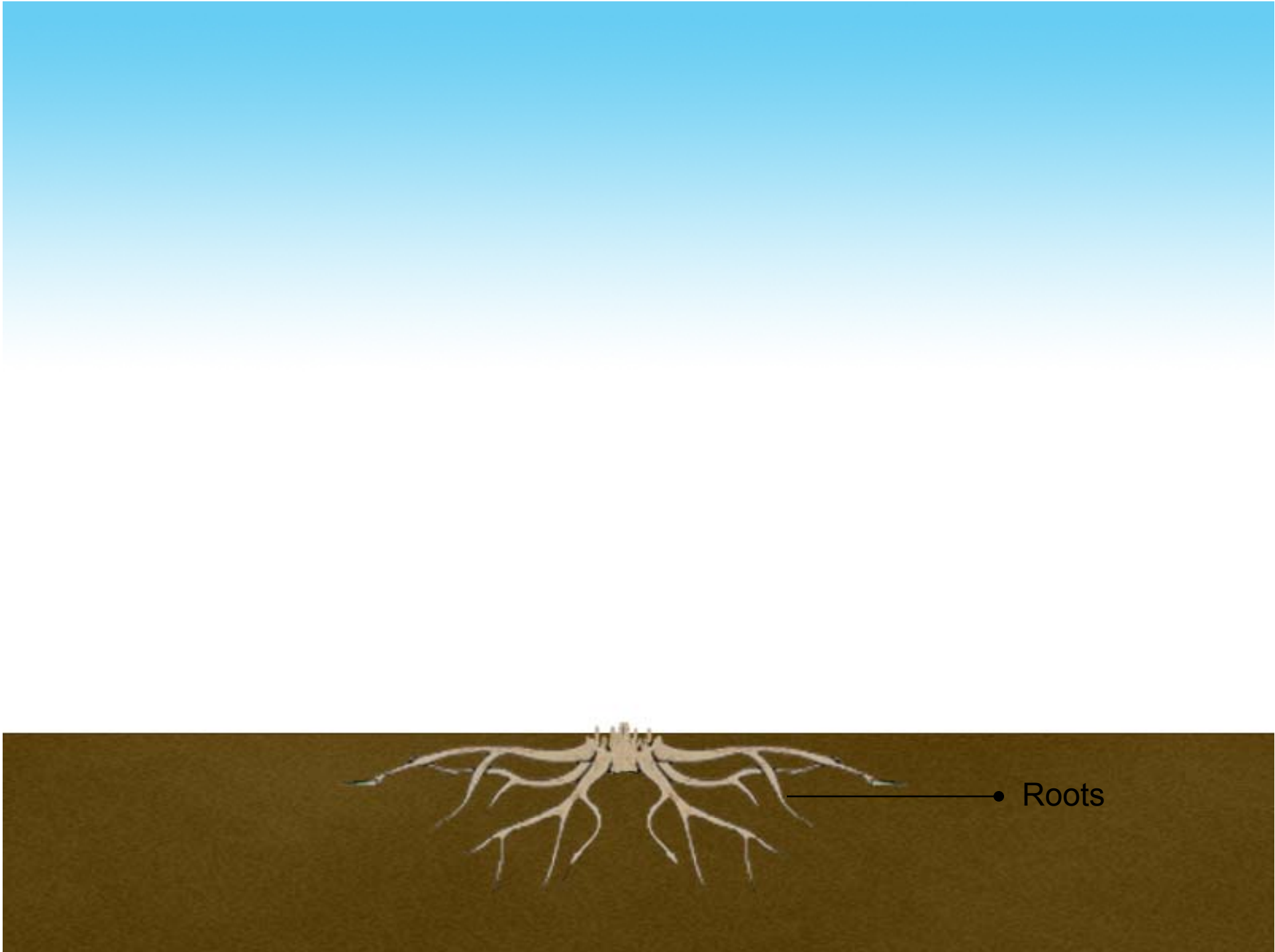
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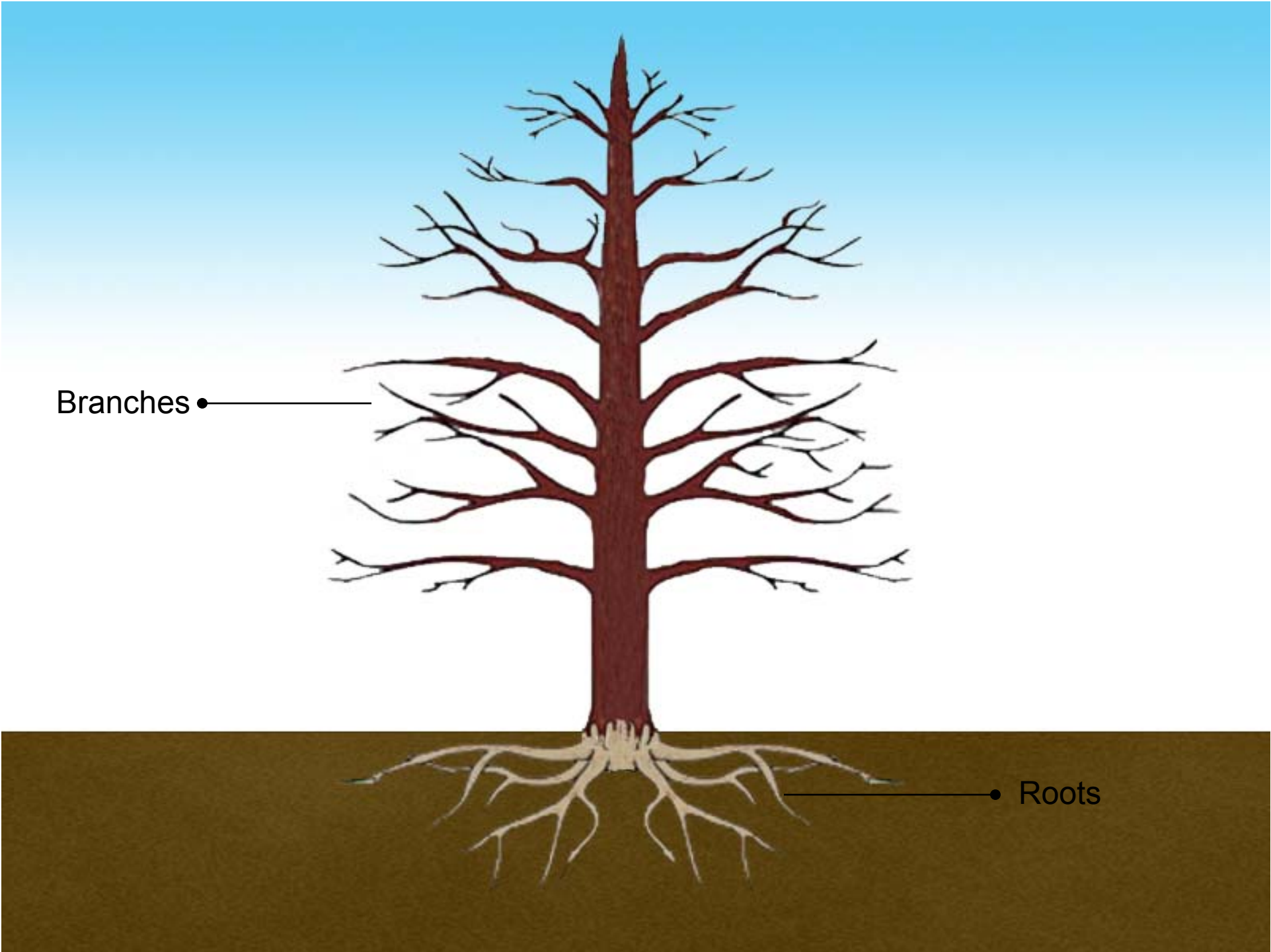
# Lessons Learned

- We tried to work on every roadblock all at once.
- We did not evaluate the strategic importance of each roadblock.
- We let people sign up for objectives they had little knowledge about.
- We did not have a good way to track the progress made as a whole.



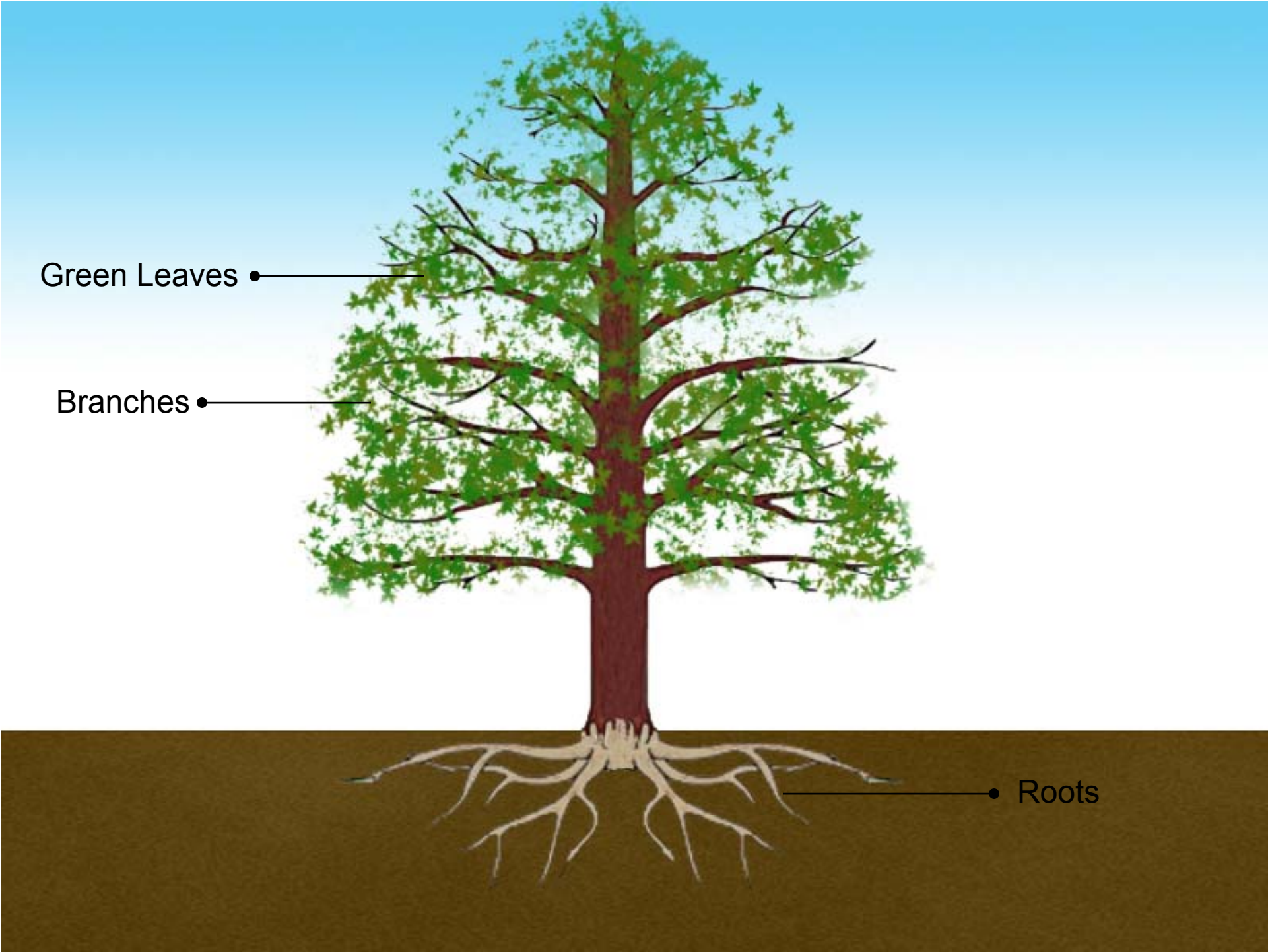


• Roots



Branches

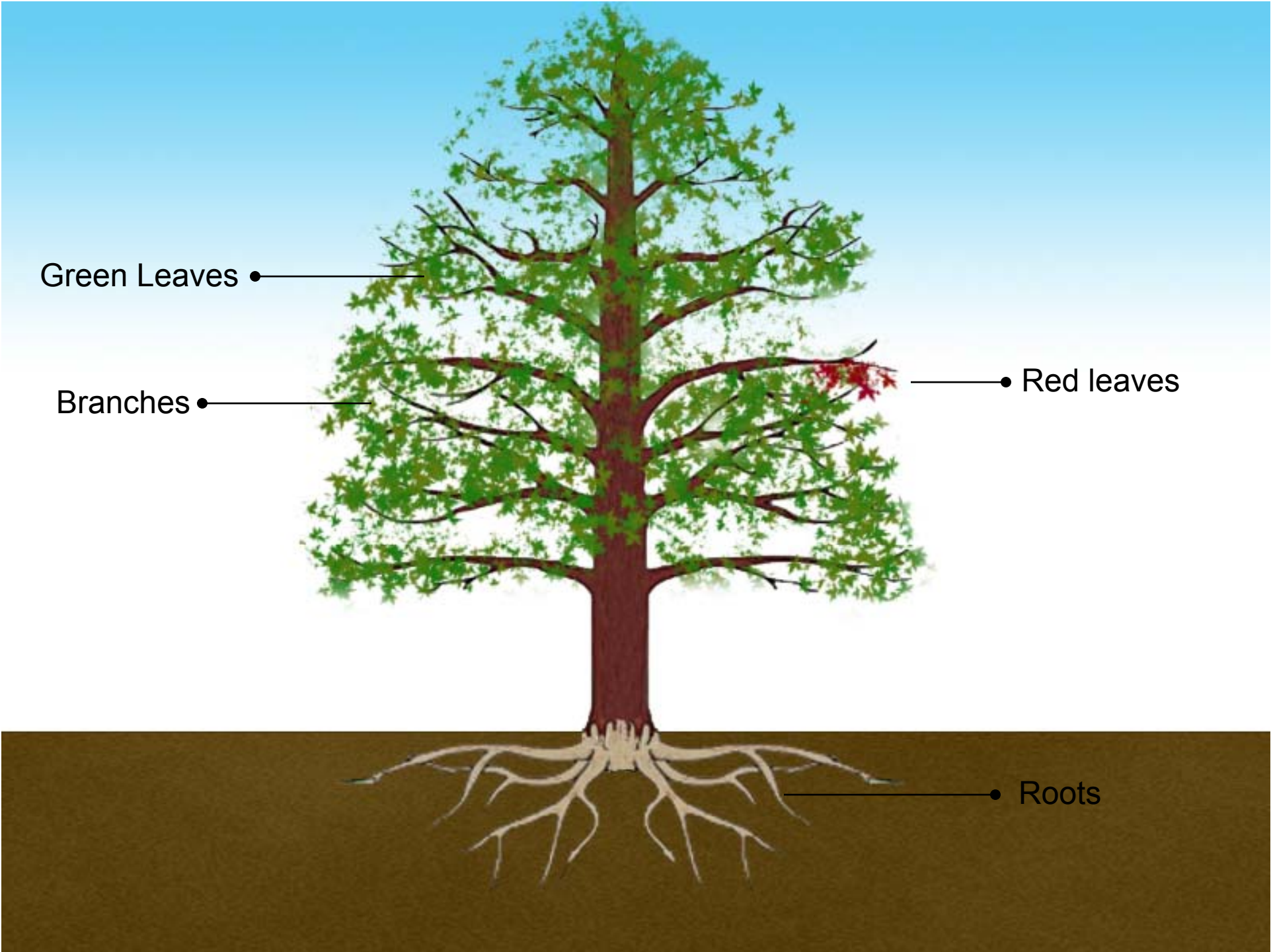
Roots



Green Leaves

Branches

Roots

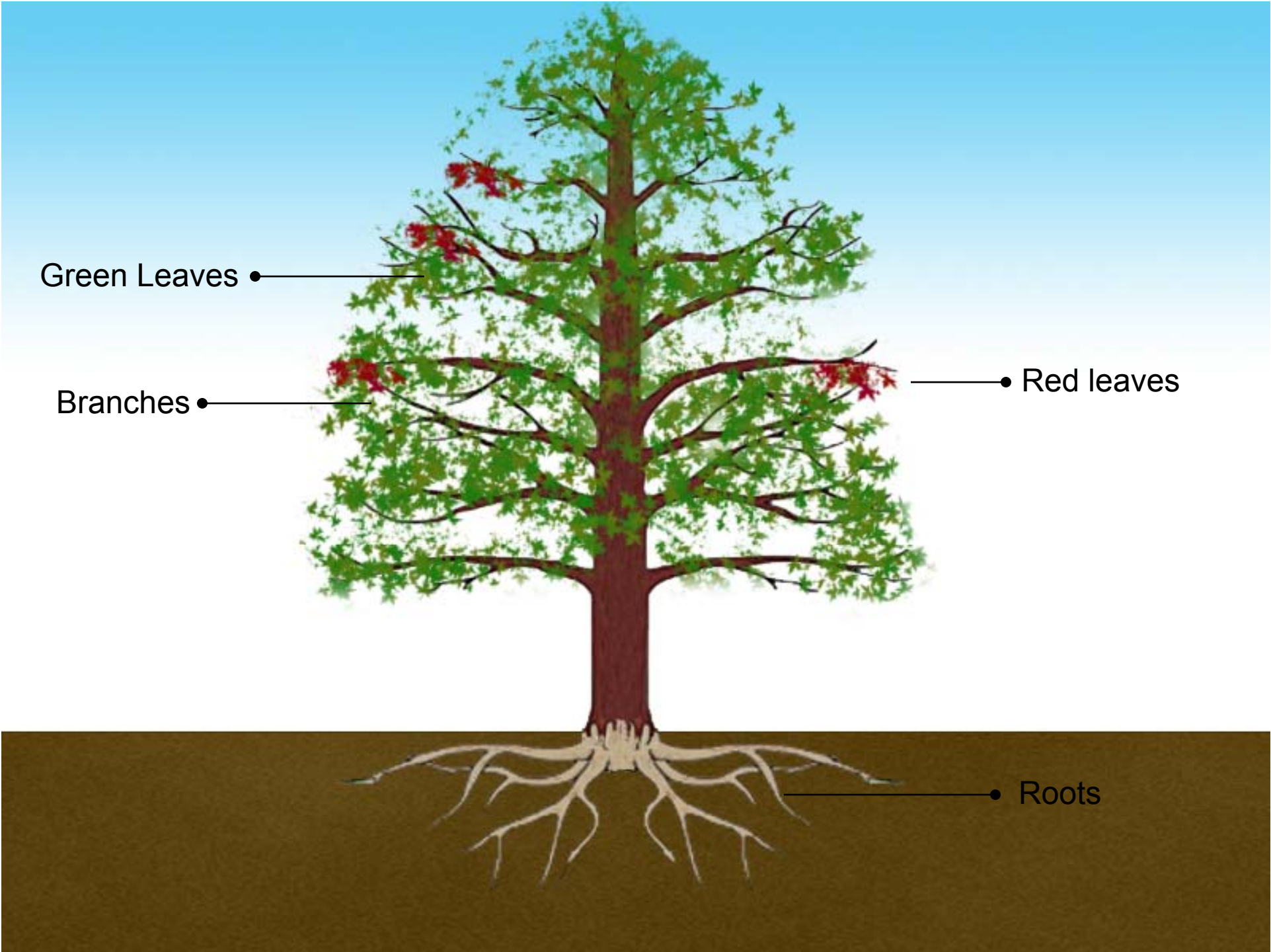


Green Leaves

Branches

Red leaves

Roots



Green Leaves

Branches

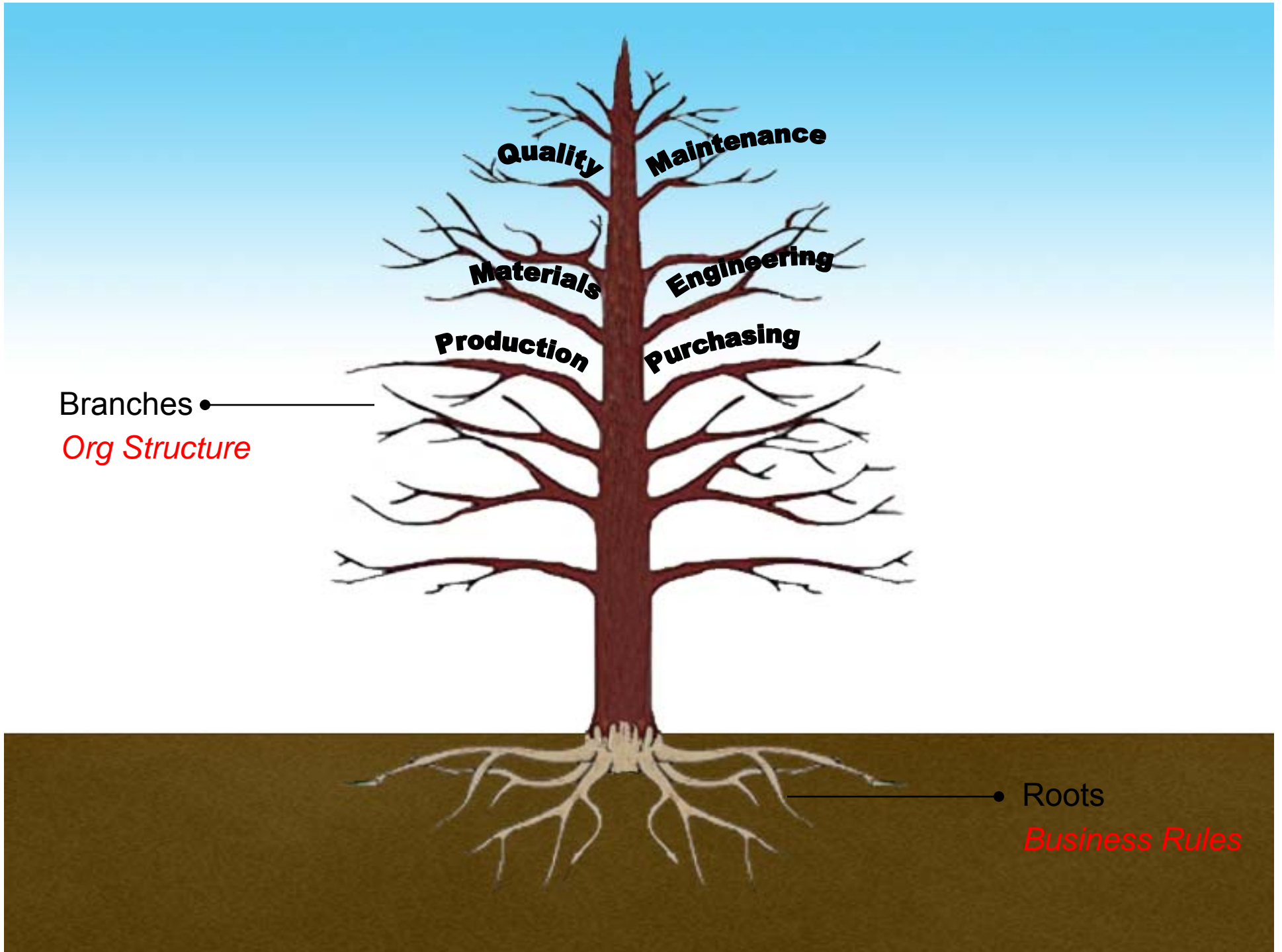
Red leaves

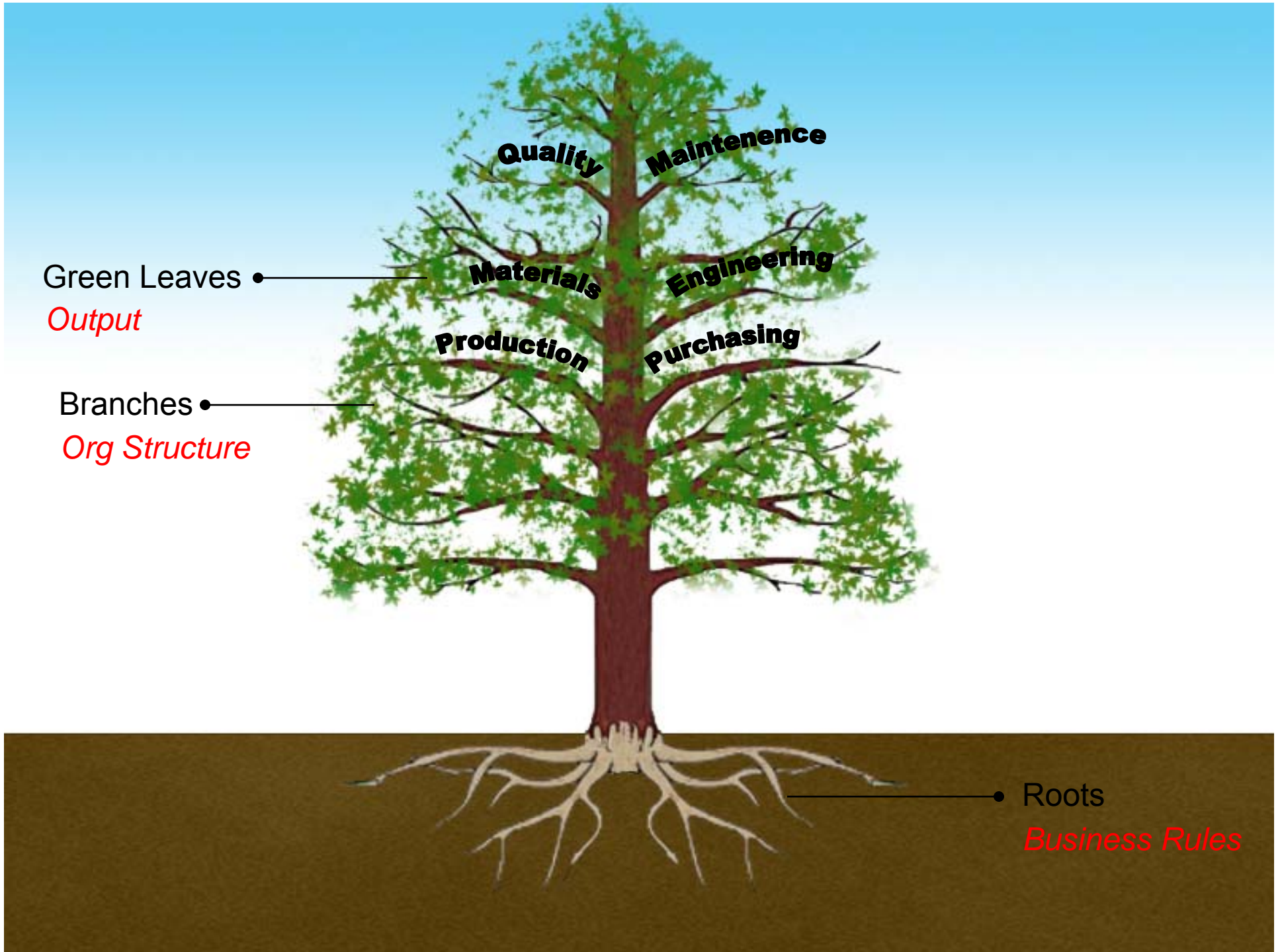
Roots

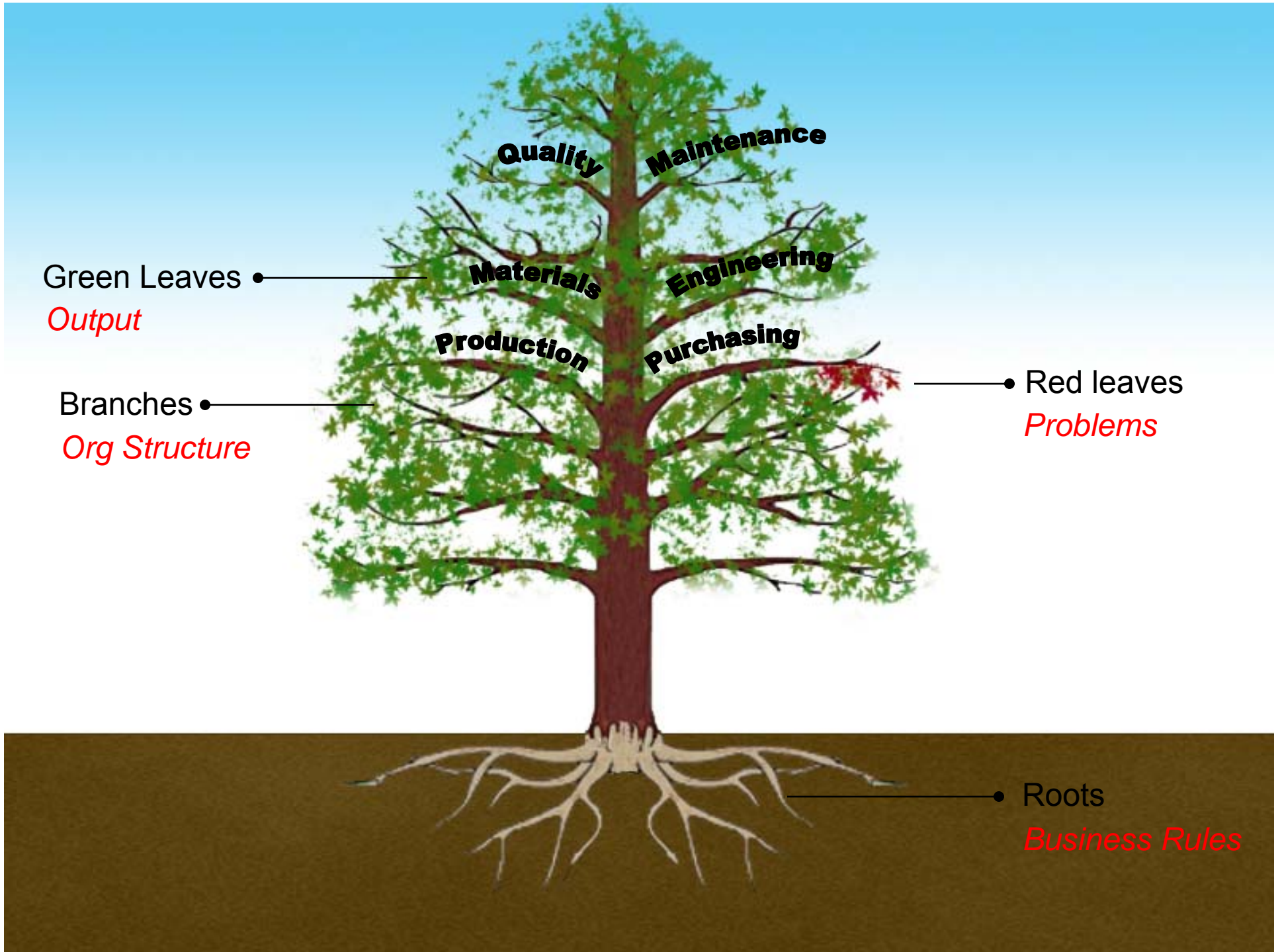


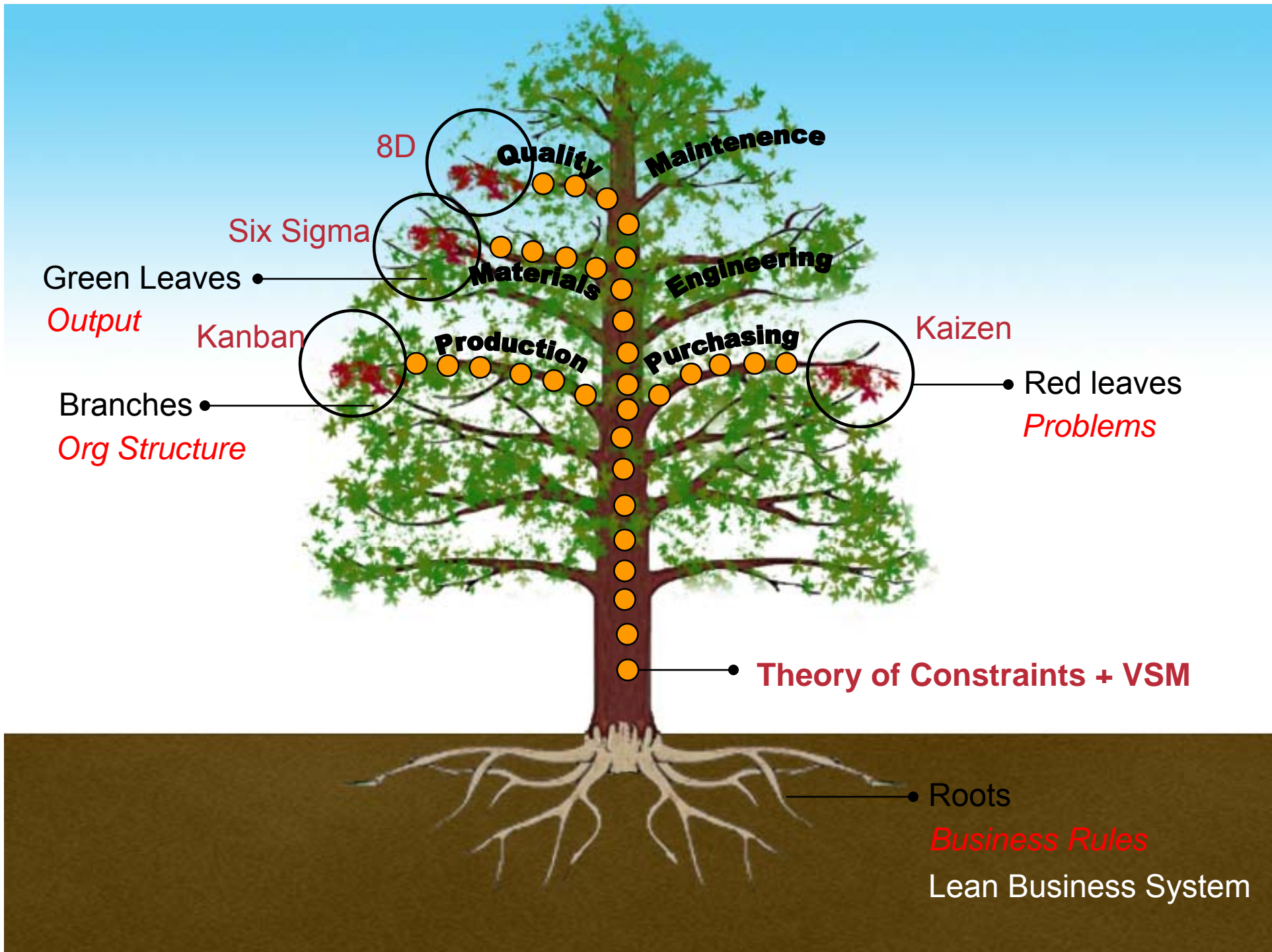
• Roots

*Business Rules*









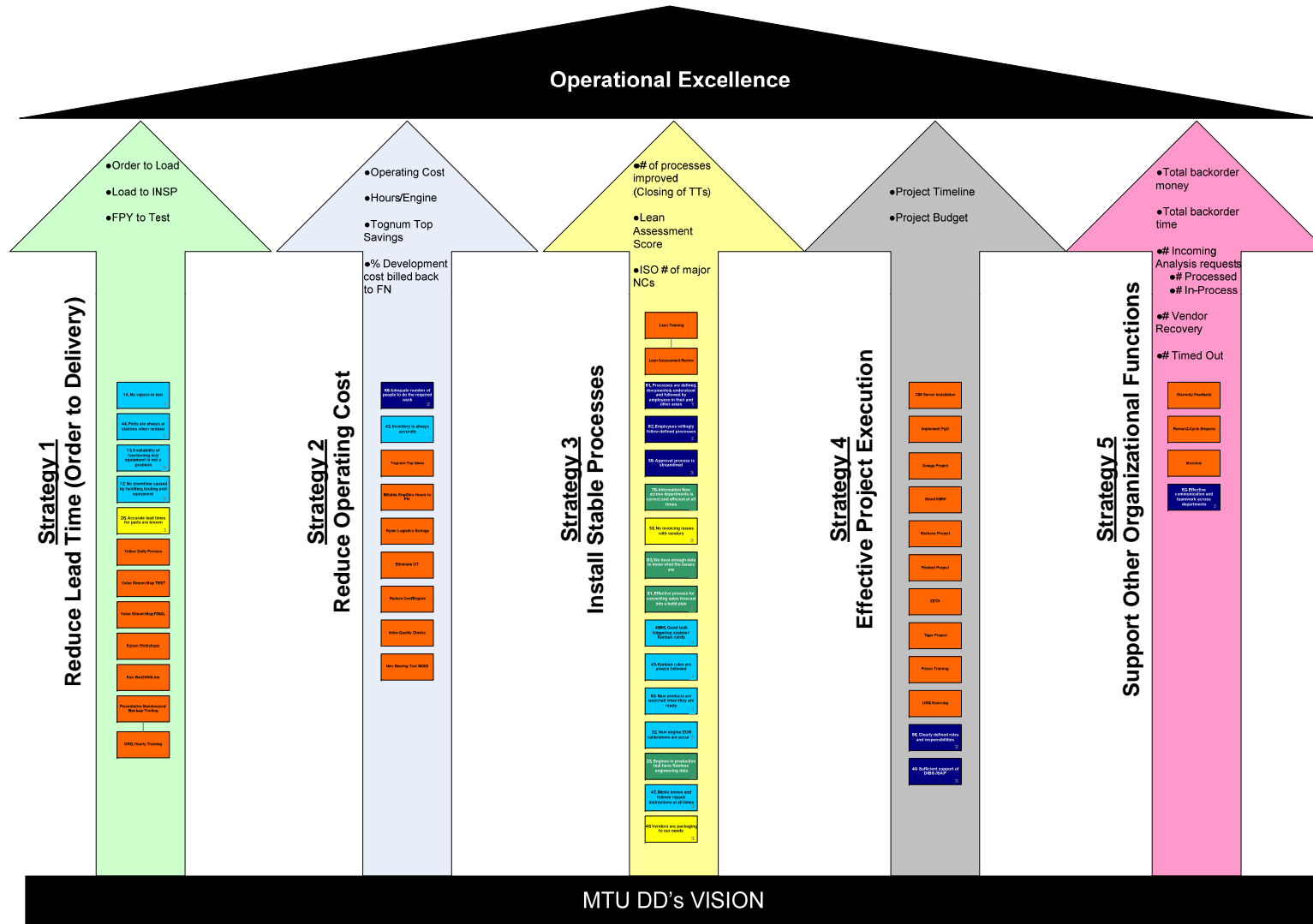
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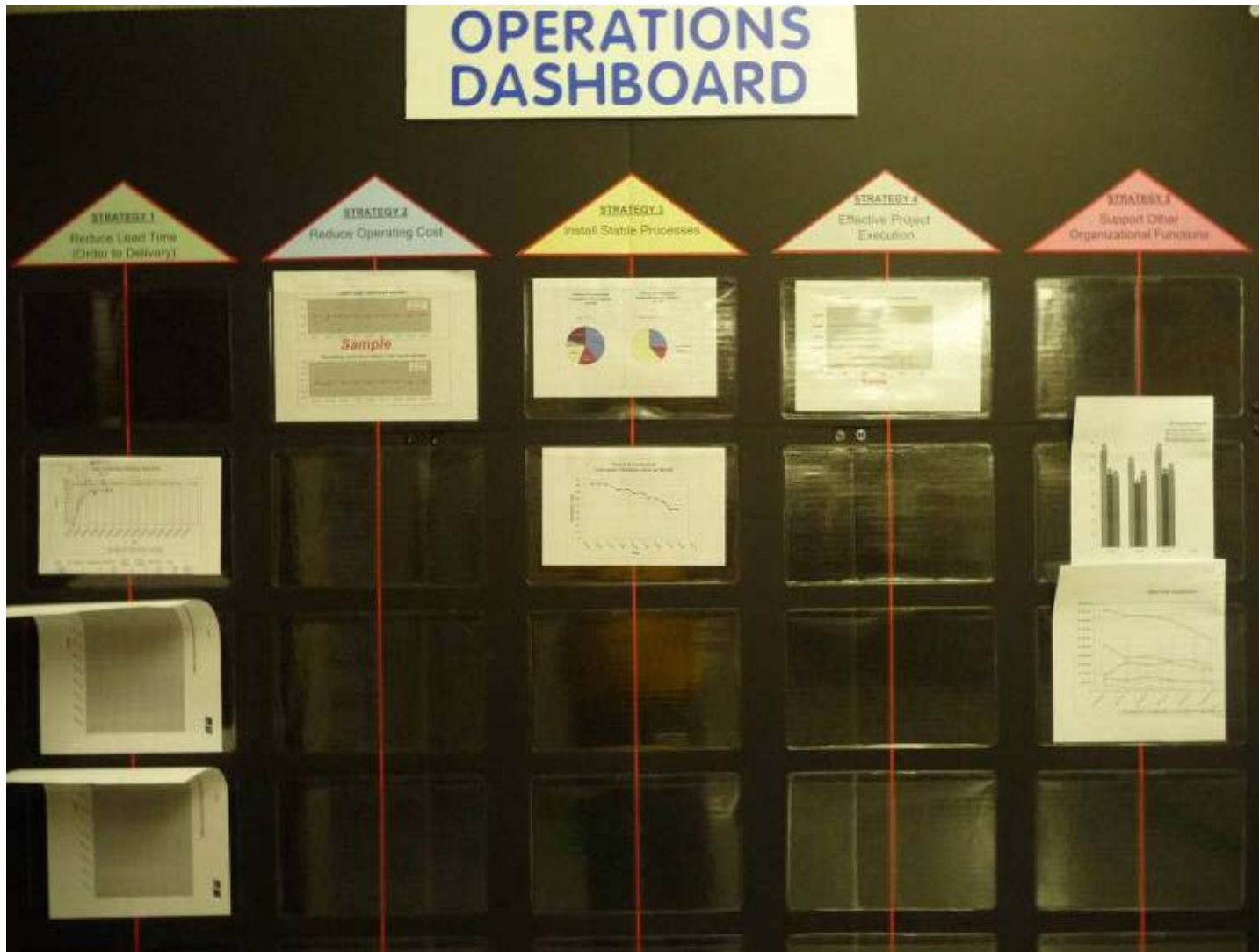
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# TOC 2.0 - Strategy Map



# TOC 2.0 - Dashboard



*Thank You!*  
*Vielen Dank!*



# About Joerg Klisch

Joerg Klisch is Director of Operations with MTU Detroit Diesel in Redford, Michigan.

He is with the company for 9 years of which he has spent more than four years in the US.

Before coming into the US he spent 4 years with MTU in Friedrichshafen, Germany, another 8 years within the Daimler distribution net and 12 years in the German Navy.

During 2005 to 2008 he led his team to several improvements in production, that led to an increase in throughput, improvement in Quality and a reduction in operating cost. The improvements were made based on the Theory of Constraints approach.



# About Anshum Jain

Anshum Jain leads a Continuous Improvement team at MTU Detroit Diesel.

He has worked in manufacturing industry for over 12 years.

He has a Masters degree in Industrial and Manufacturing Engineering from University of Cincinnati and is currently studying for a Masters degree in Business Administration at Wayne State University.

During his professional career he has led several large scale improvement projects.

Certified as Theory of Constraints Jonah (Wayne State University), Six Sigma Green Belt and Lean Certified Professional (university of Michigan).



# About Dr. James T. Low

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Dr. James T. Low is an Emeritus Professor in the Marketing Department of the School of Business Administration at Wayne State University in Detroit.

For the last several years, he has taught BA7260, Theory of Constraints Breakthrough Solutions, as a regular M.B.A. elective course, as a full equivalent of the TOC Jonah Course.

He has an M.B.A. in Marketing and Operations Research from the University of Michigan. Dr. Low earned his Ph.D. in Marketing at the University of Michigan.

Dr. Low holds Certification in Production and Inventory Management (CPIM) from APICS.

He is also the first Marketing Ph.D. in the world to become a Certified Jonah and Jonah's Jonah of the Avraham Y. Goldratt Institute.

**In the last 10 years, Dr. Low has spoken on Theory of Constraints topics at over 80 conferences, dealing with applications in manufacturing, accounting, operations research, problem solving, and organizational change.**

