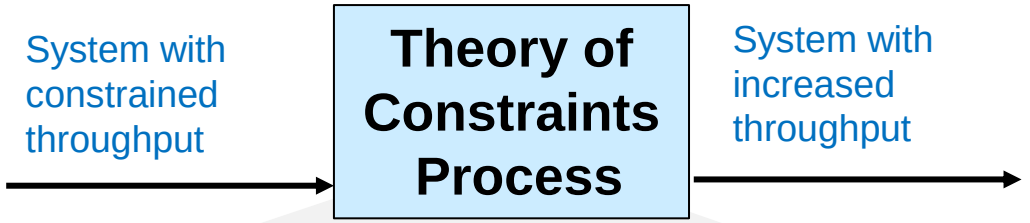
Theory of Constraints (TOC)

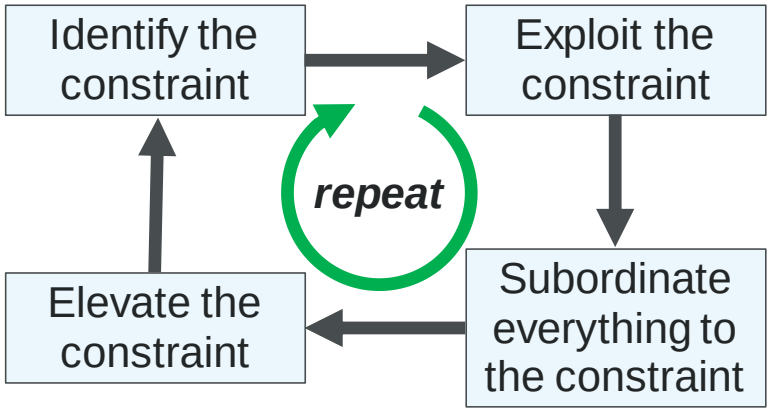
Problem
How to identify and remove bottlenecks?

Difficulty
Some training required

The **Theory of Constraints** **(TOC)** states:

- System throughput is limited by a bottleneck, called the *system constraint.*
- An increase in throughput can only be achieved by making an improvement in the system constraint.
- Improvements in other parts of the system are wasted effort.

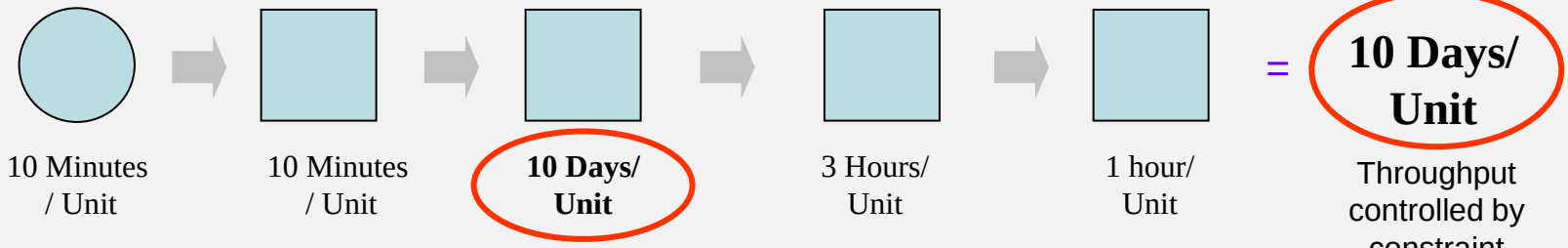




1. **IDENTIFY** the constraint
   - This is the resource preventing the process from obtaining more of the goal.
2. **EXPLOIT** the constraint
   - Ensure the constraint's time is not wasted doing things that it should not do.
3. **SUBORDINATE** all other processes to the above decision
   - Align the whole process to support the decision made above.
4. **ELEVATE** the constraint
   - If possible, permanently increase capacity of the constraint; perhaps "buy more."
5. **REPEAT**

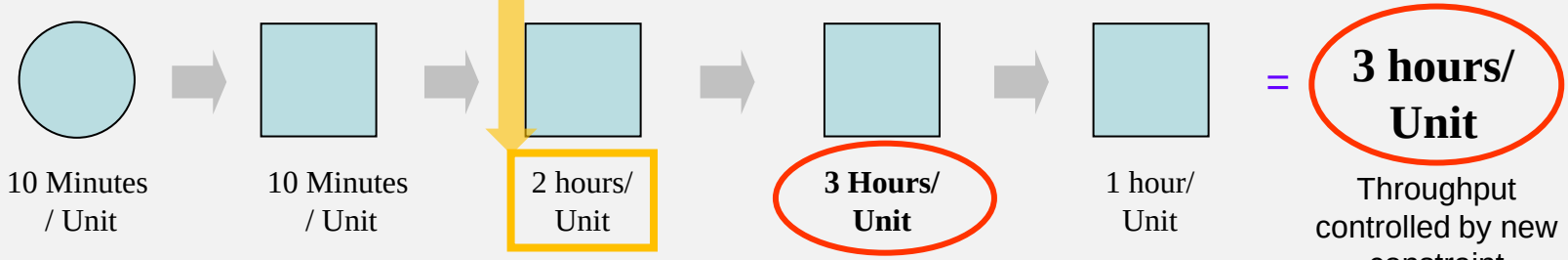
Theory of Constraints – Example

Initial process flow … find bottleneck controlling throughput .. and reduce it



Given process flow, identify constraint, in this case reduce to 2 hours/unit

Revised process flow #1 … find next bottleneck controlling throughput …



Given revised process flow, identify new constraint, reduce to …

Revised process flow #2 … keep iterating the process …

Theory of Constraints – Notes

Slide 1

1. The throughput of every process is constrained by bottlenecks; whether it is a manufacturing process or a people process.
2. The key activity is to identity the bottleneck and then address it. There are often many ways in which a bottleneck can be addressed. For example, it is often the case that the constrained step can be parallelized (use two machines where there is now one).
3. After the bottleneck has been addressed, there will be a new bottleneck … and the process can be repeated.

Slide 2

1. In this manufacturing example, the original output rate is “10 days/unit”.
   A. Looking at the process, the third step is limiting the process to “10 days/unit”, so that is the final output rate.
   B. Once that bottleneck is addressed, the new output rate becomes “3 hours/unit”.
   C. Looking at the process, there is a bottleneck of exactly that rate. Hence, the “3 hours/unit” bottleneck should be addressed next.
2. Depending on how well the “3 hours/unit” bottleneck is addressed, the next system bottleneck could be in different places.
3. The TOC was developed by Goldratt in the book “The Goal”.
4. If the Theory of Constraints is applied to scheduling problems, the result leads to *Critical Chain Project Management* (CCPM).