LEAN PRODUCTION
IN NON REPETITIVE COMPANIES

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Research problem and objectives

- The Board of a non-repetitive company has decided to implement the Lean principles.
- How should they modify the Management of the Operations of their company accordingly?

- ***How the implementation of the Lean principles would affect the management of Operations of a non-repetitive company?***
- ***Which advantages may be expected from the Lean implementation in non-repetitive companies?***

Non-repetitive companies

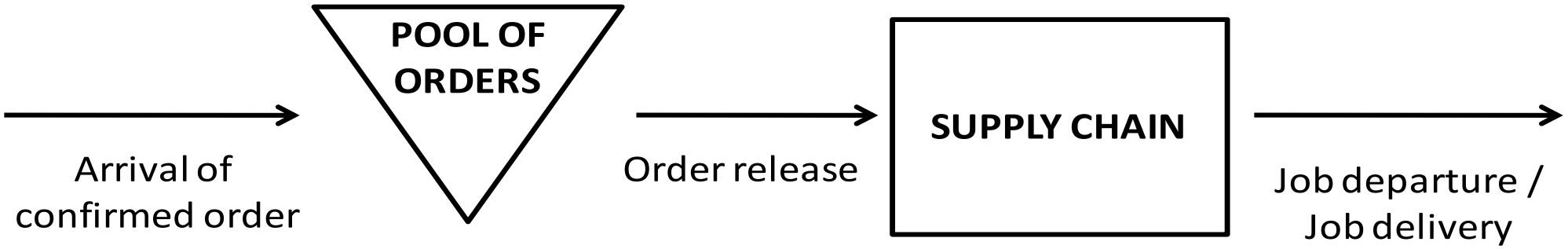
Literature tends to associate to these companies 3 main characteristics:

- Customized and quite complex products (MTO or ETO)
- Typically SMEs companies
- Functional organization and generally low level of vertical integration in the supply chain

Which peculiarities in comparison with repetitive companies?

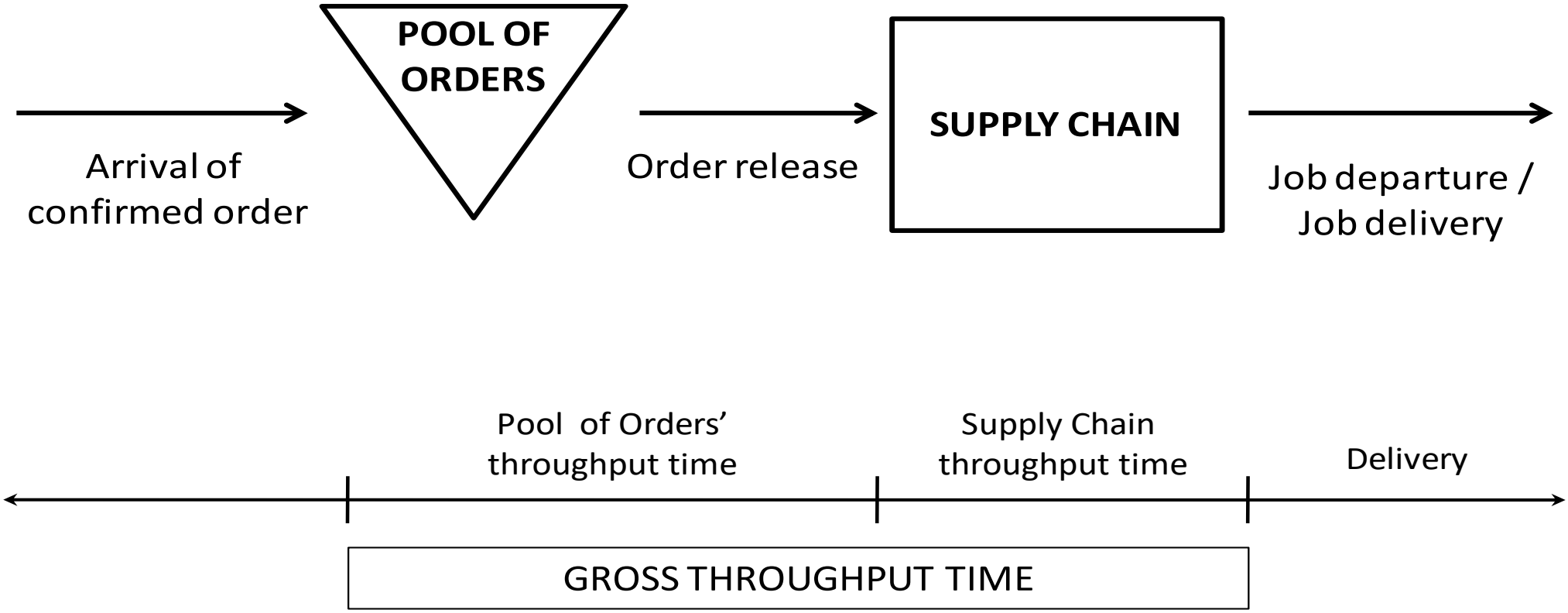
- Satisfying customer orders involves both shop floor activities and office activities.
- High variability and unpredictability in these contexts.
- Long queues between the different stages to absorb variability.
- Local efficiency logic due to the functional organization.
- High coordination efforts required to match due dates, and low integration between the different stages.

The non-repetitive companies production planning and control framework



- Pre-shop pool decouples the company from market variability.
- Pre-shop pool contains all the confirmed orders that can be released to the supply chain.
- Usually the release of orders is carried out with a load limiting logic (upper bound) with a very high upper bound.

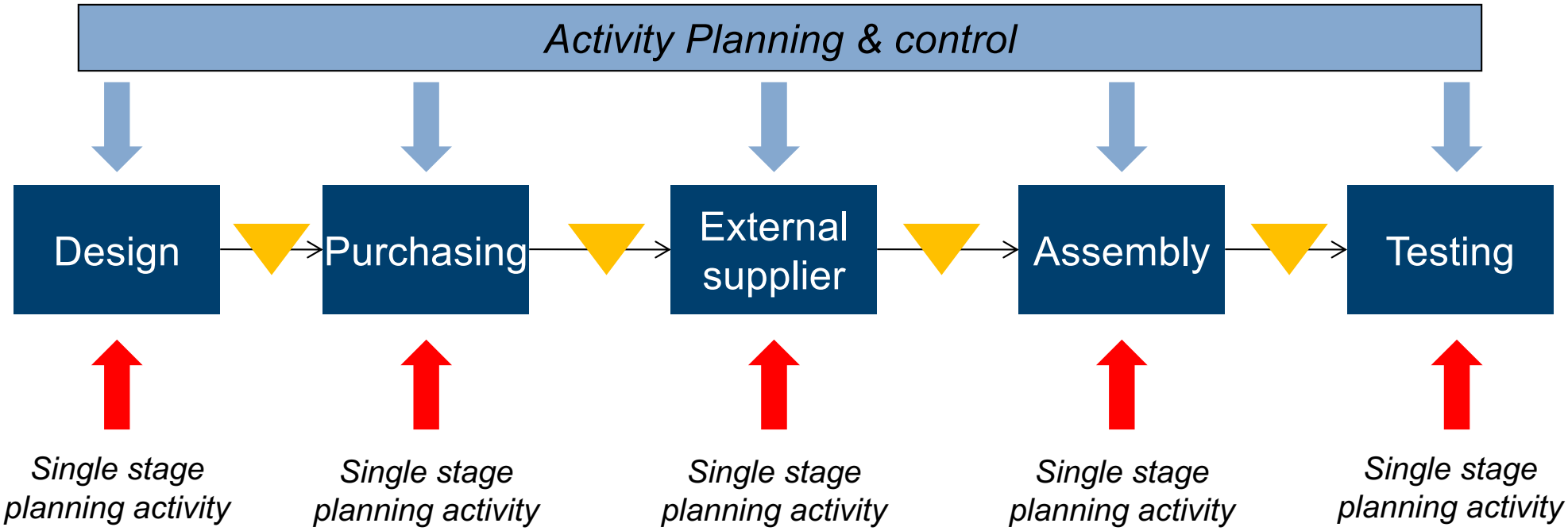
The non-repetitive companies production planning and control framework



Usually, the **Gross Throughput Time** is roughly equivalent to the **Supply Chain Throughput time**.

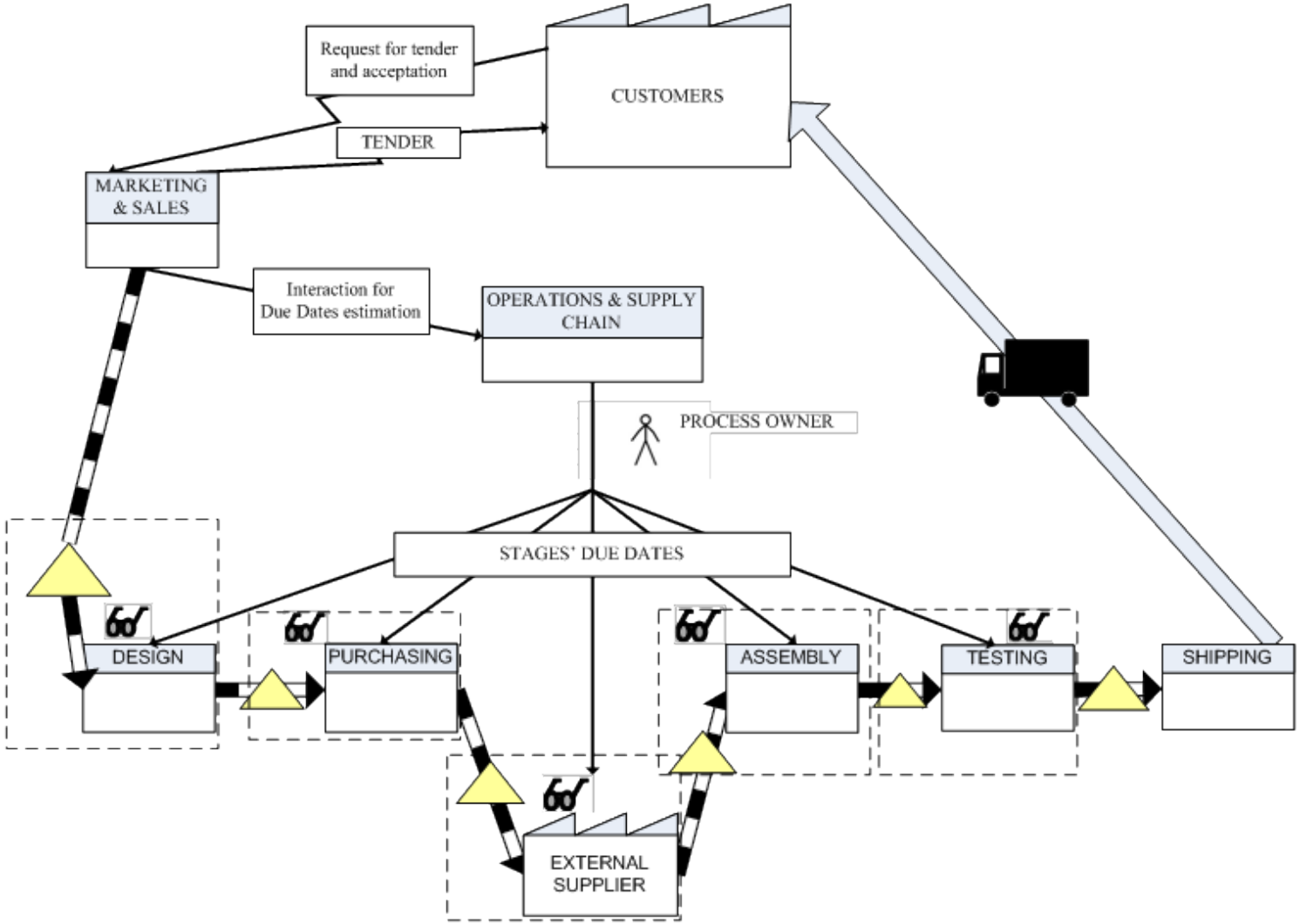
Operations management in non-repetitive companies

Supply chain of non repetitive companies

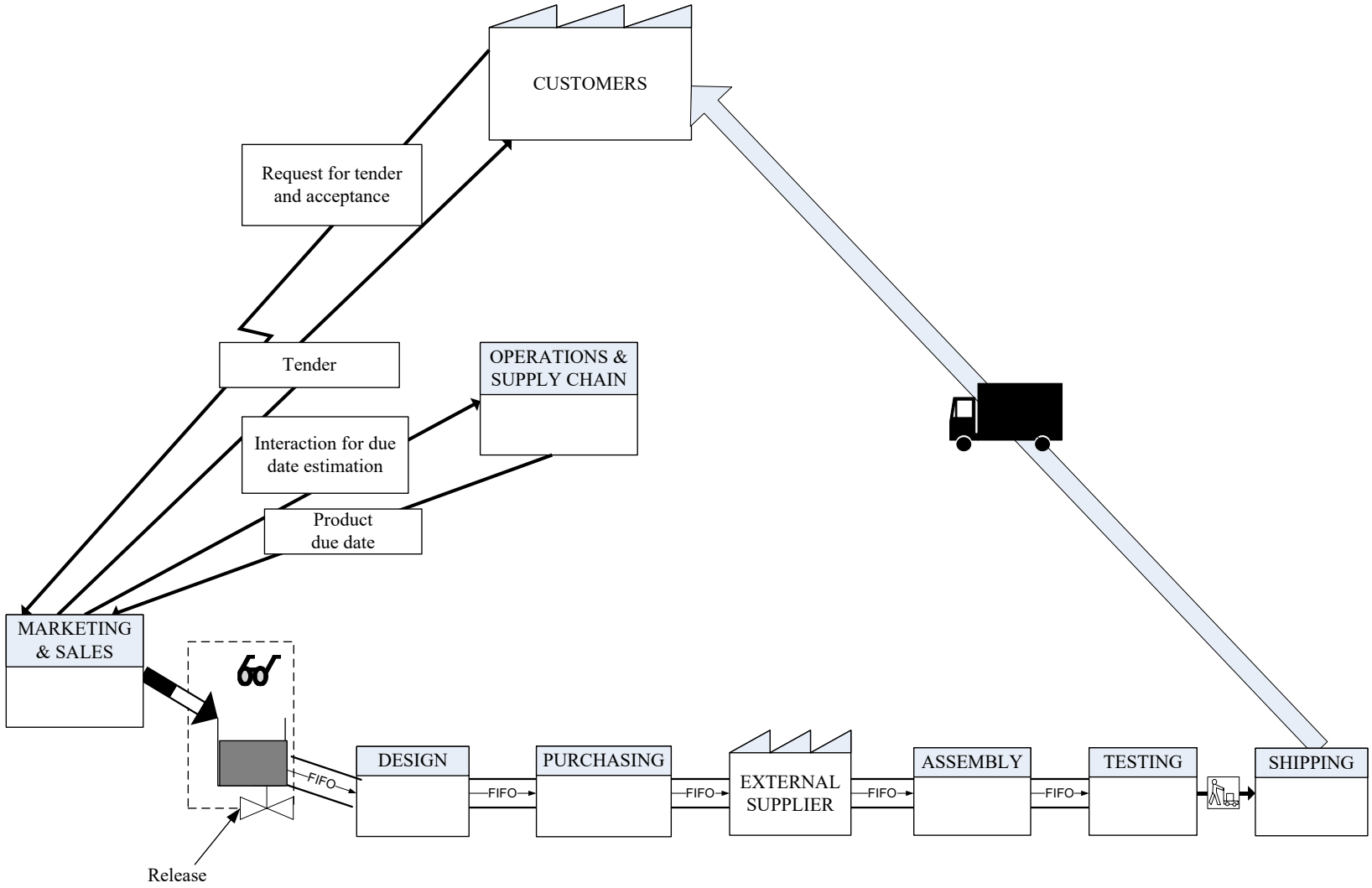


- Long Lead times
- Variable lead times
- High coordination efforts and low integration

Current state map of non-repetitive companies



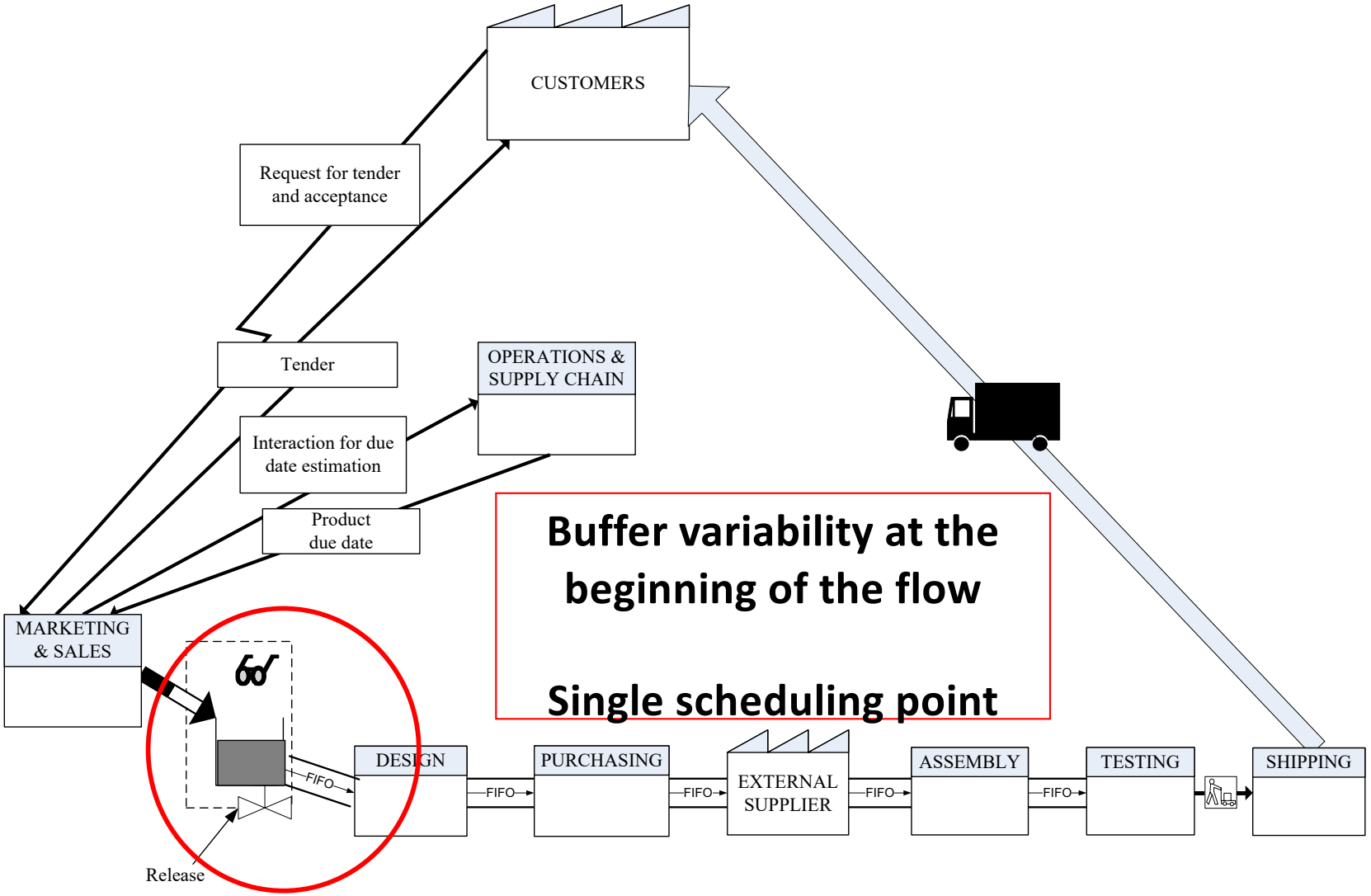
Future state map of non-repetitive companies



Guidelines for achieving Lean in non-repetitive companies

- Protect the system from external variability with a buffer upstream the first stage (in this case Design).
- Collect orders' processing times (if the precise information is not available, use classes of times (e.g. low/medium-low/medium/medium-high/high).
- Plan the flow in a single point (1 single actor plans the system).
- Level production by releasing constant amounts of workload for the different stages: Balance the Flow.
- Regulate the release of orders depending on the rhythm of the activities the along the supply chain in order to maintain the workload level in the supply chain stable (pull production).
- Try to maintain the flow between the stages of the supply chain. In order to maintain the sequence of orders, work to remove the causes of blocks and the causes of variation in the sequencing of the orders (e.g. set-ups).

Guidelines for achieving Lean in non-repetitive companies



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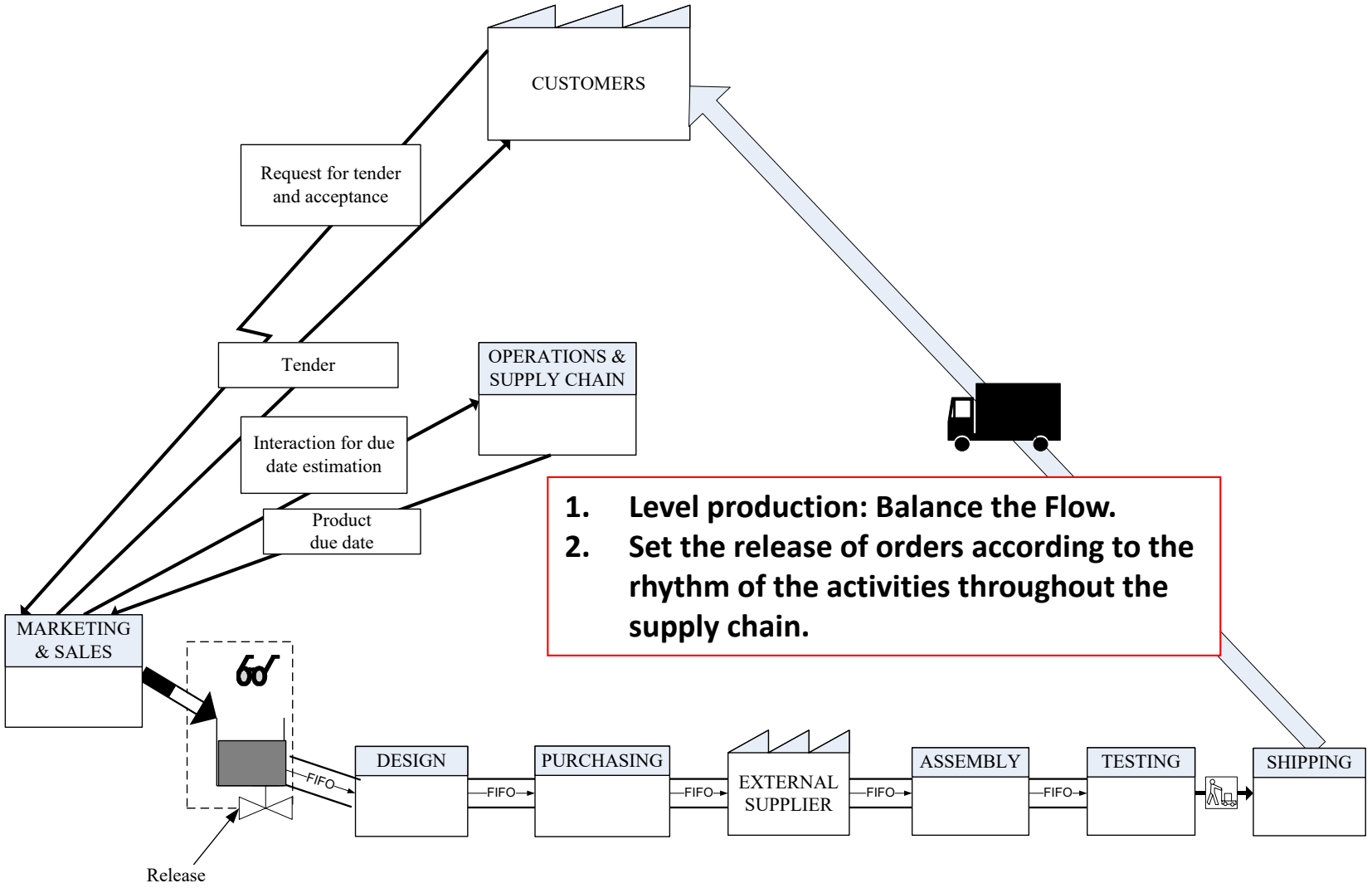
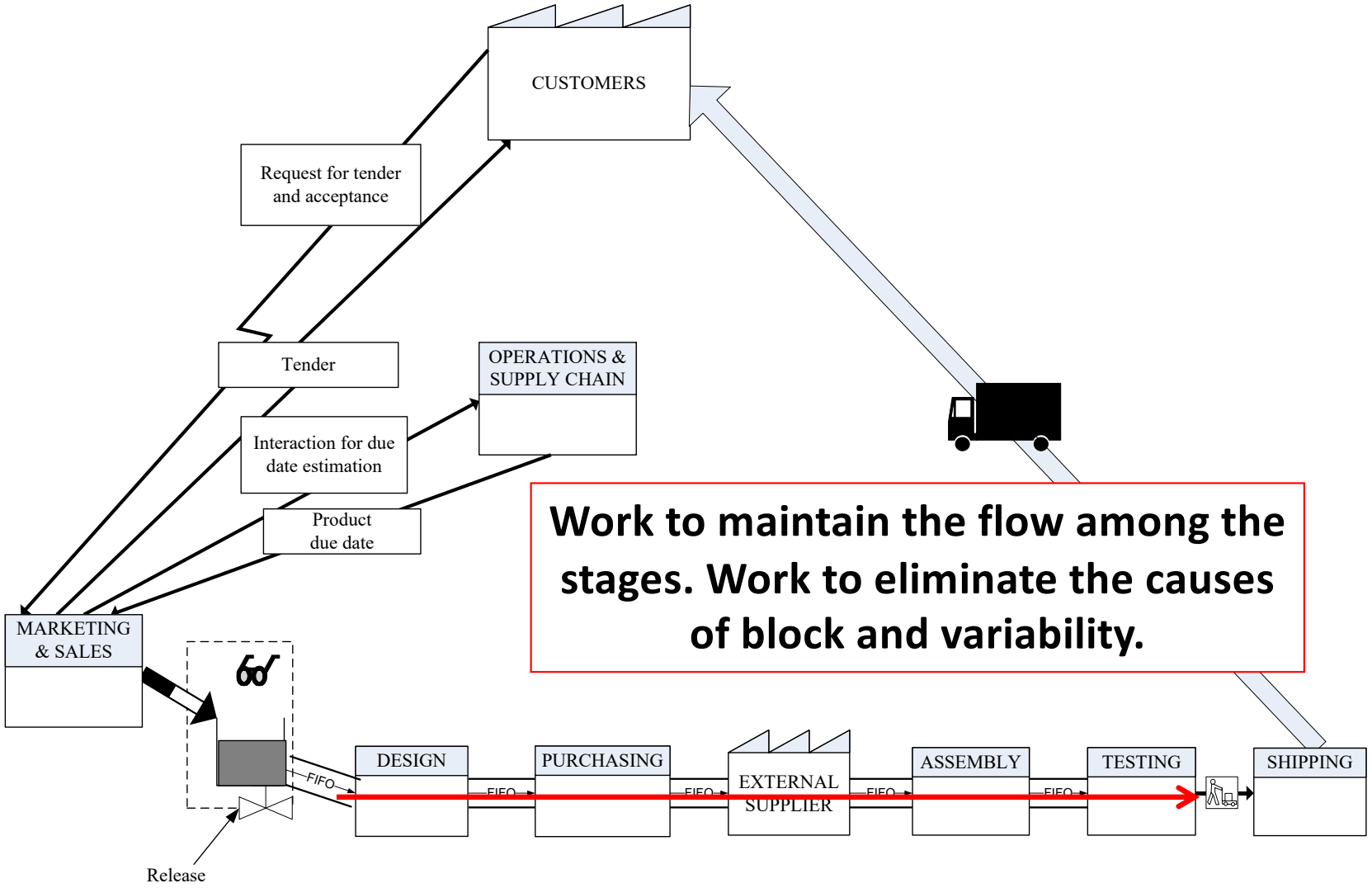
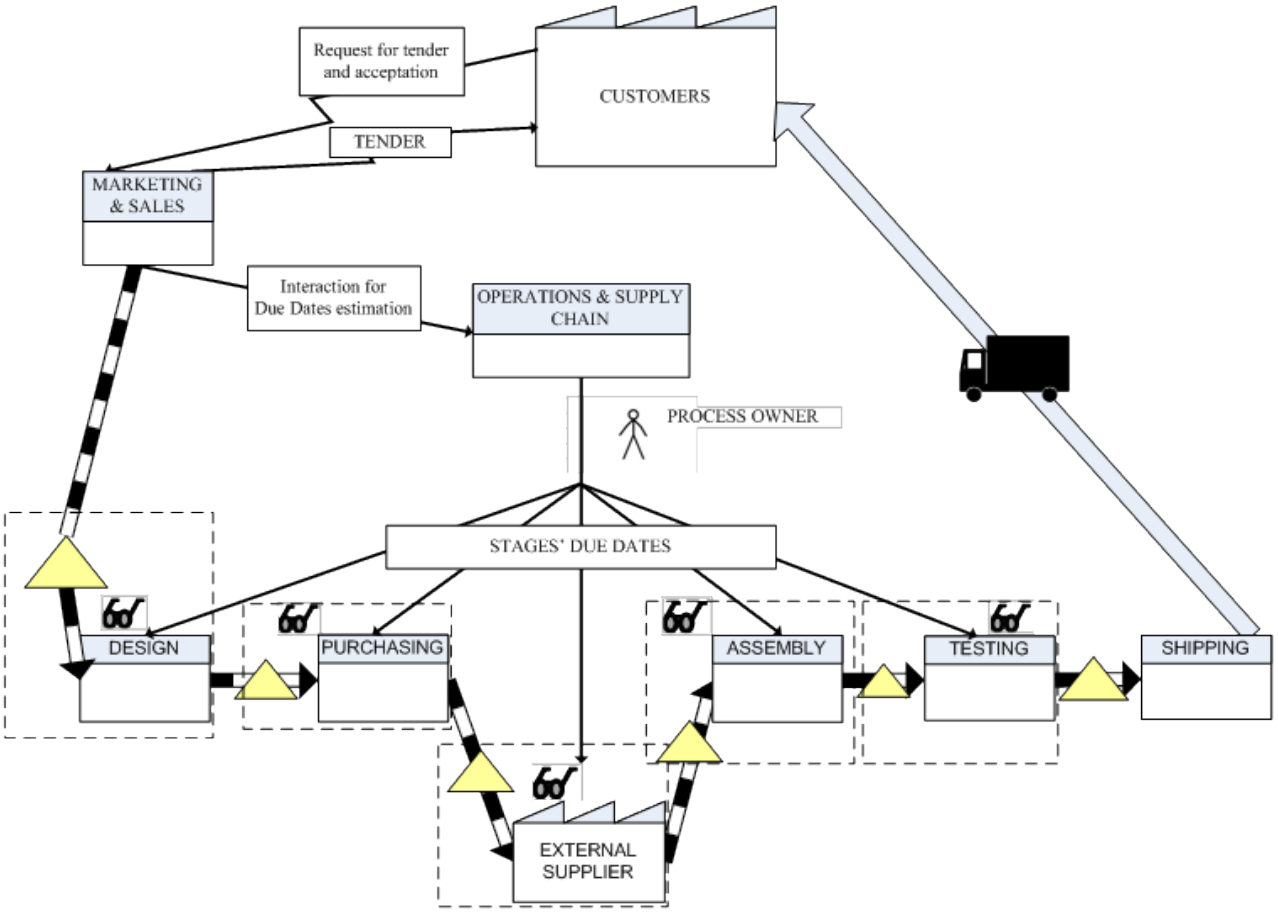


1. **Level production: Balance the Flow.**
2. **Set the release of orders according to the rhythm of the activities throughout the supply chain.**

Guidelines for achieving Lean in non-repetitive companies



Traditional managerial approach

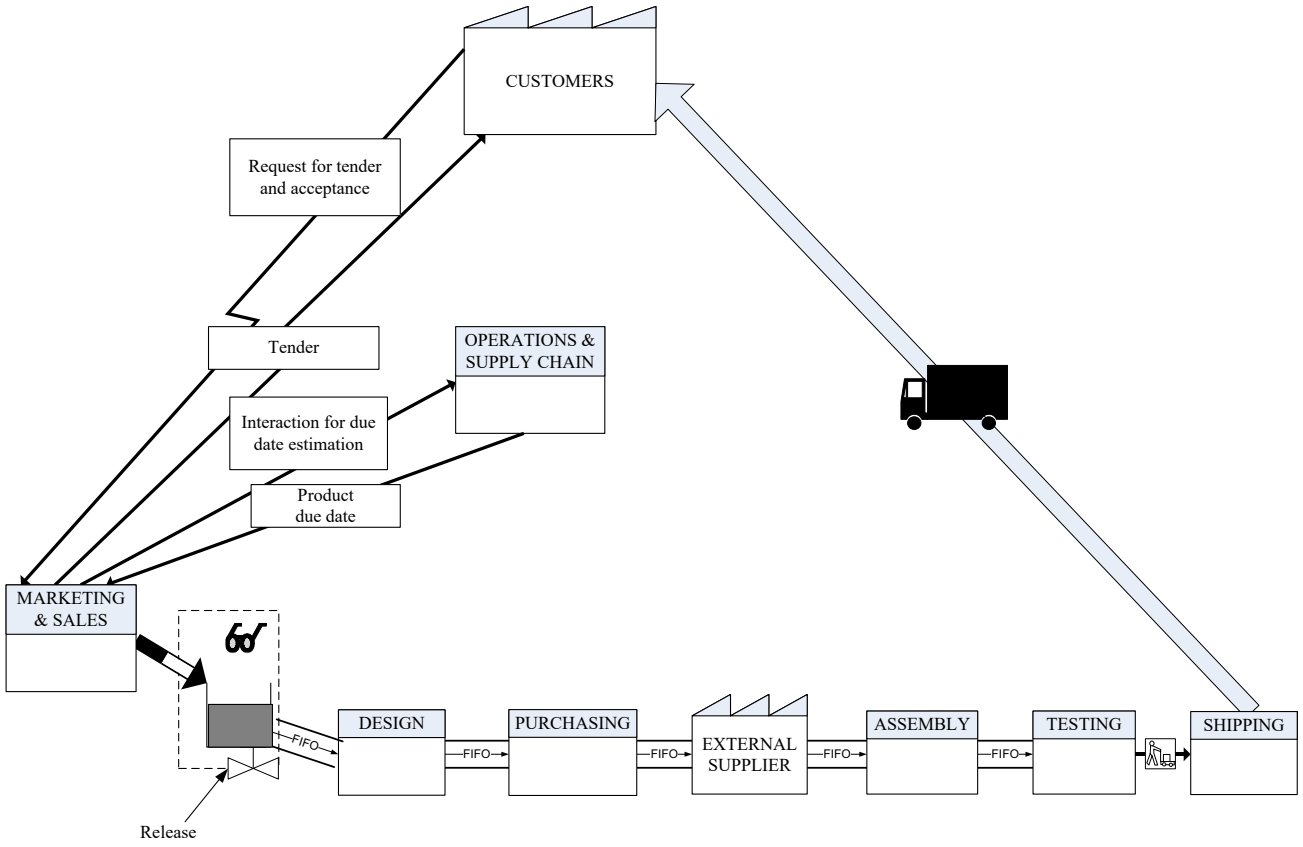


Order entry:
Accept orders in order to maintain the System Workload constant

Order release:
Upper bound release (Worklaod Limiting approach) with high Load Limits

Dispatching logic:
As to increase the local efficiency of the single stage

Lean managerial framework

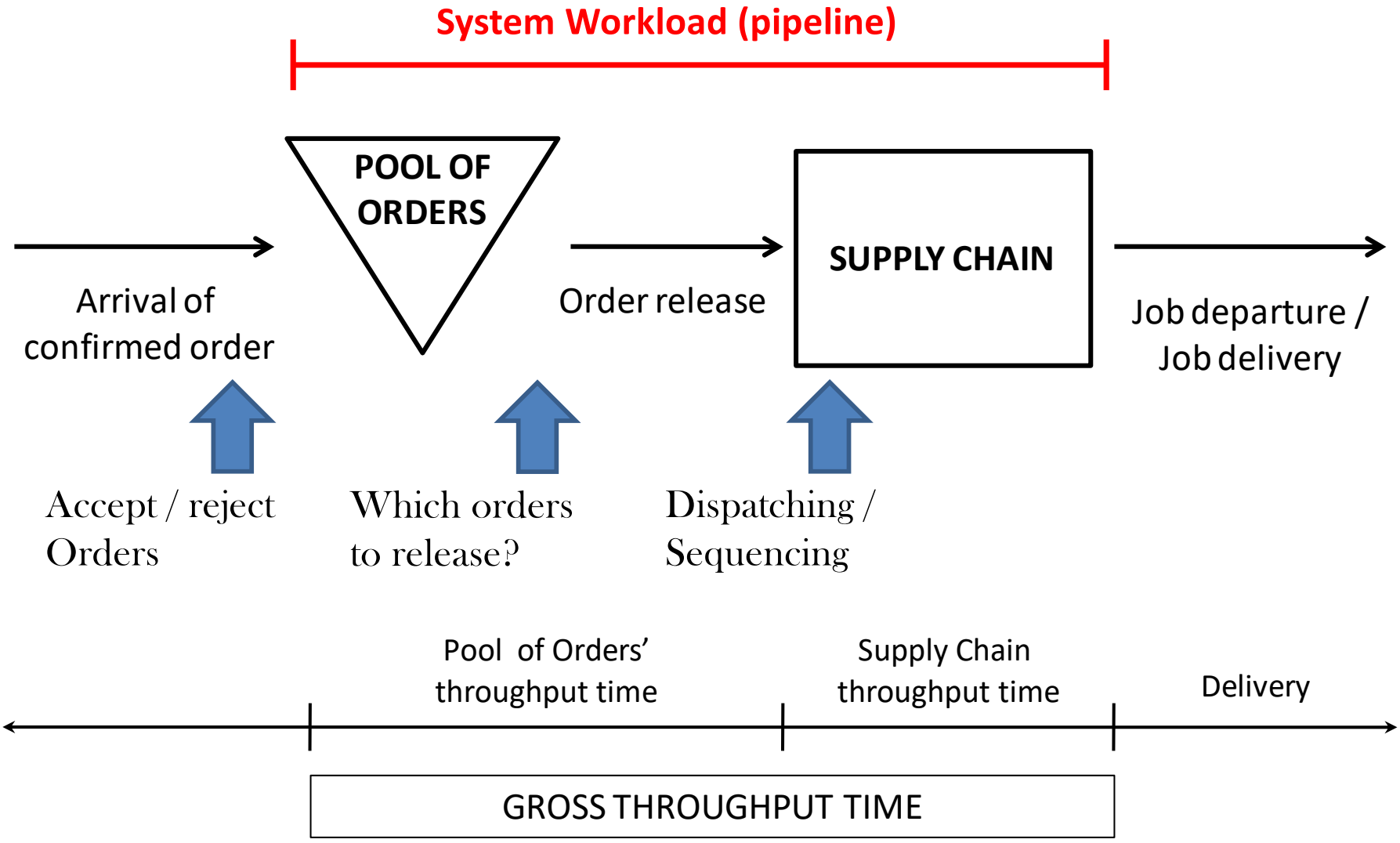


Order entry:
Accept orders as to maintain the System Workload constant

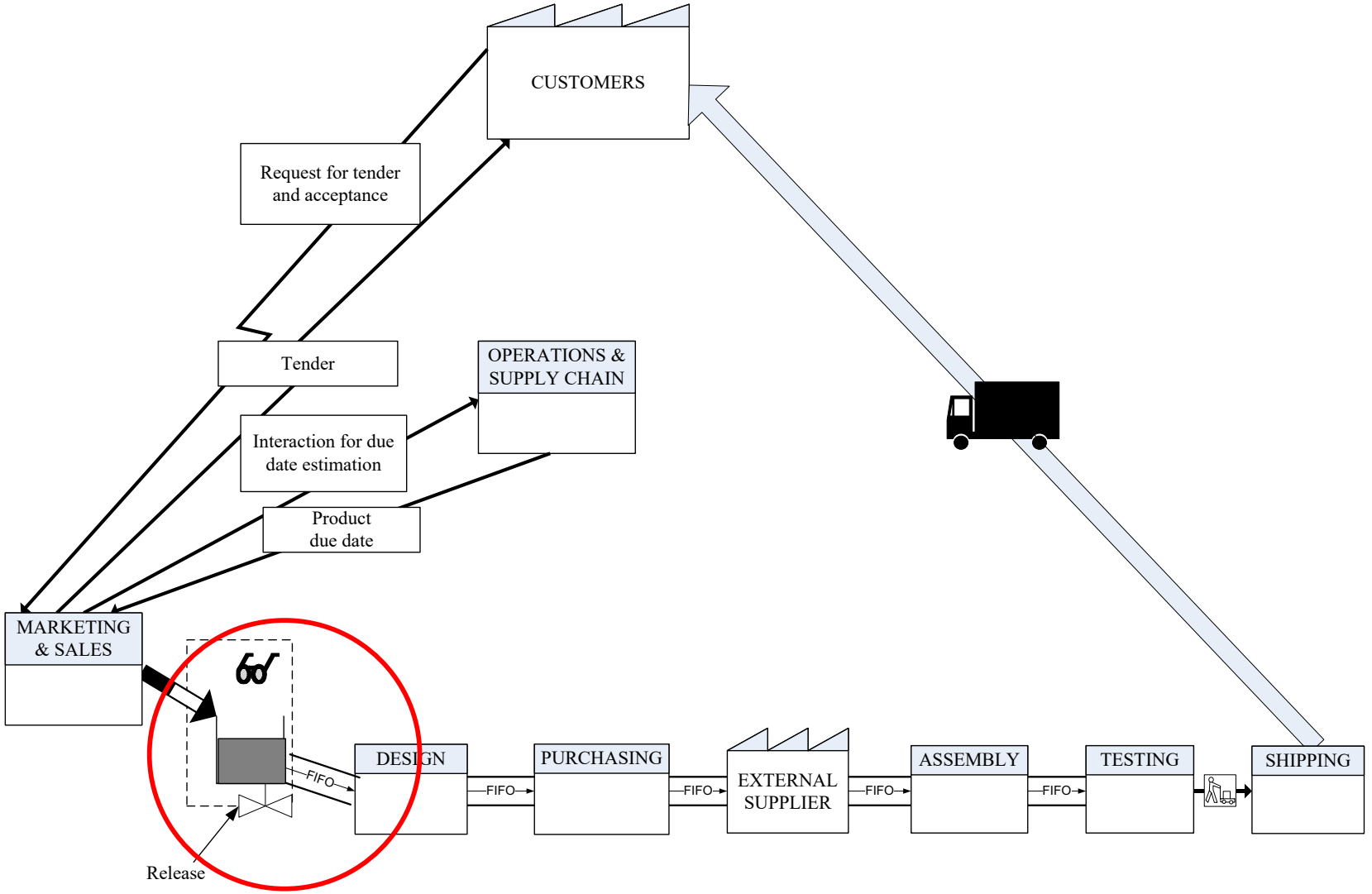
Order release:
Balance the flow

Dispatching logic:
FIFO

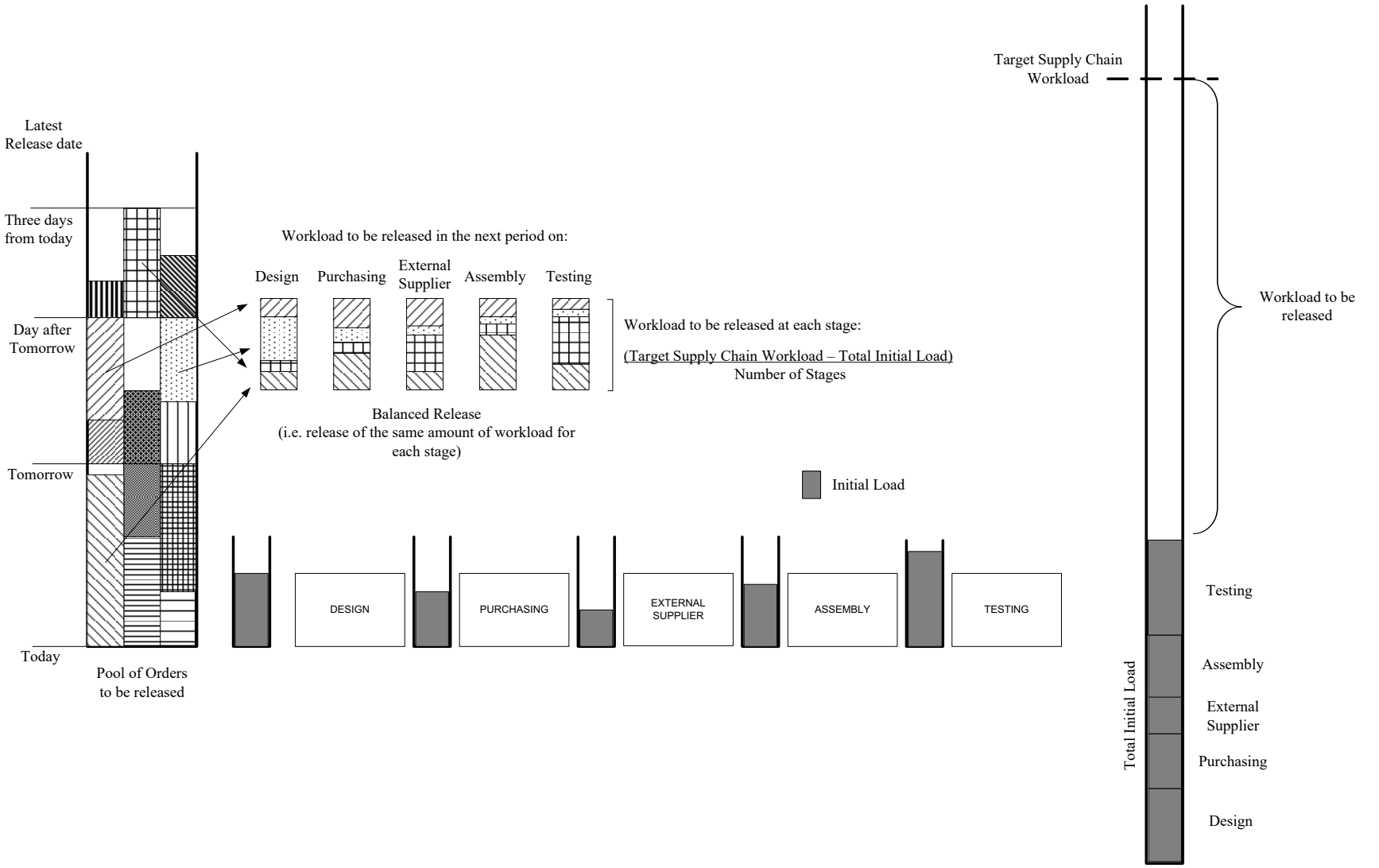
Framework adopted (from workload control theory)



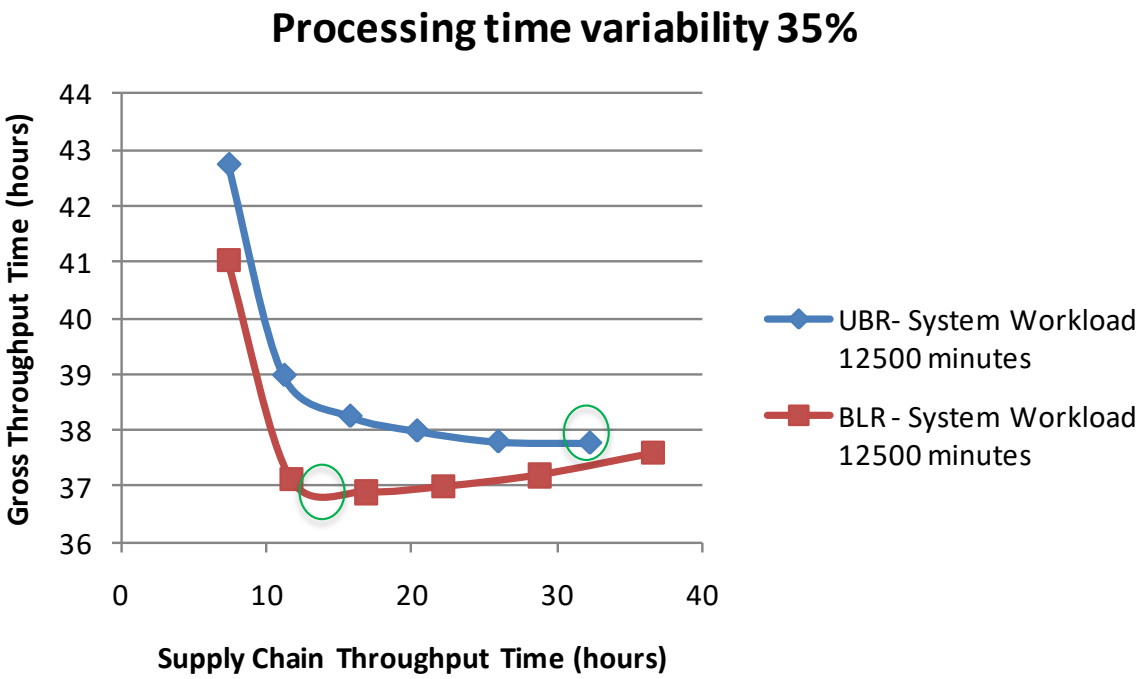
Orders release method



Guidelines for achieving Lean in non-repetitive companies



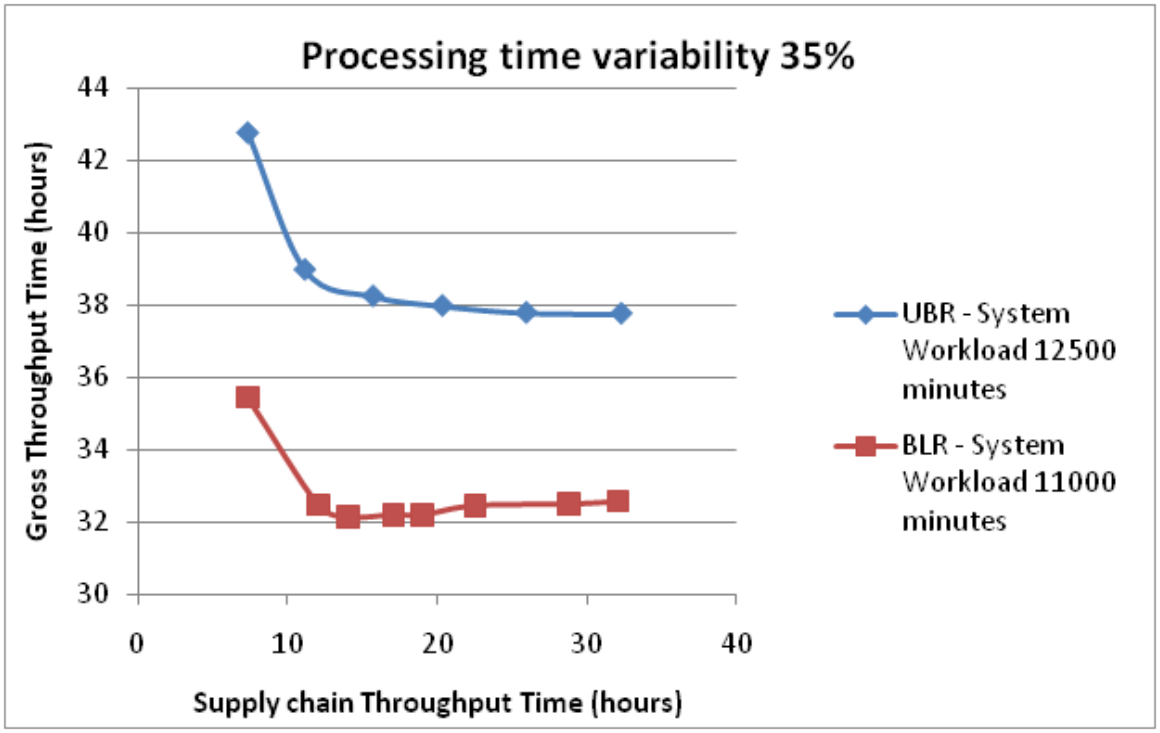
Impact on performances



Best point for running the system

Lean allows to achieve better performances and function at a much lower WIP level → with much higher level of orders in the pre-shop pool to choose from

Impact on performances



For Lean approch it is therefore possible to lower the level of orders in the pre-shop pool and still have an output that is not lower than the benchmark, thus decreasing even further the Gross Throughput Time

Workload distribution

Traditional system

Lean system

Pre shop pool

Supply chain

Whole System

Conclusions

- Lean managerial framework is particularly suitable for non-repetitive companies.
- Focus on the flow and on considering the entire supply chain as a unique system to be optimized at a global level – a flow shop in this case –.

  Balance the flow!
- Focus on maintaining the flow among the different stages and on avoiding the causes of blocks and the causes of variation.
- Managers in Lean companies can exploit the System Workload (in particular the extra-amount of non-released orders) to choose the best mix of performances for their company.
- System Workload in Lean non-repetitive companies can be seen at some extent as a lever, not only a mere consequence of the variability as it is in the Traditional non-repetitive companies.

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