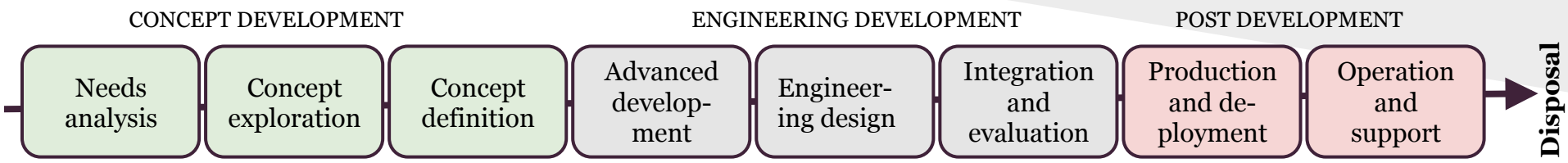
TISYE1 – Systems Engineering – (Winter/spring 2014)

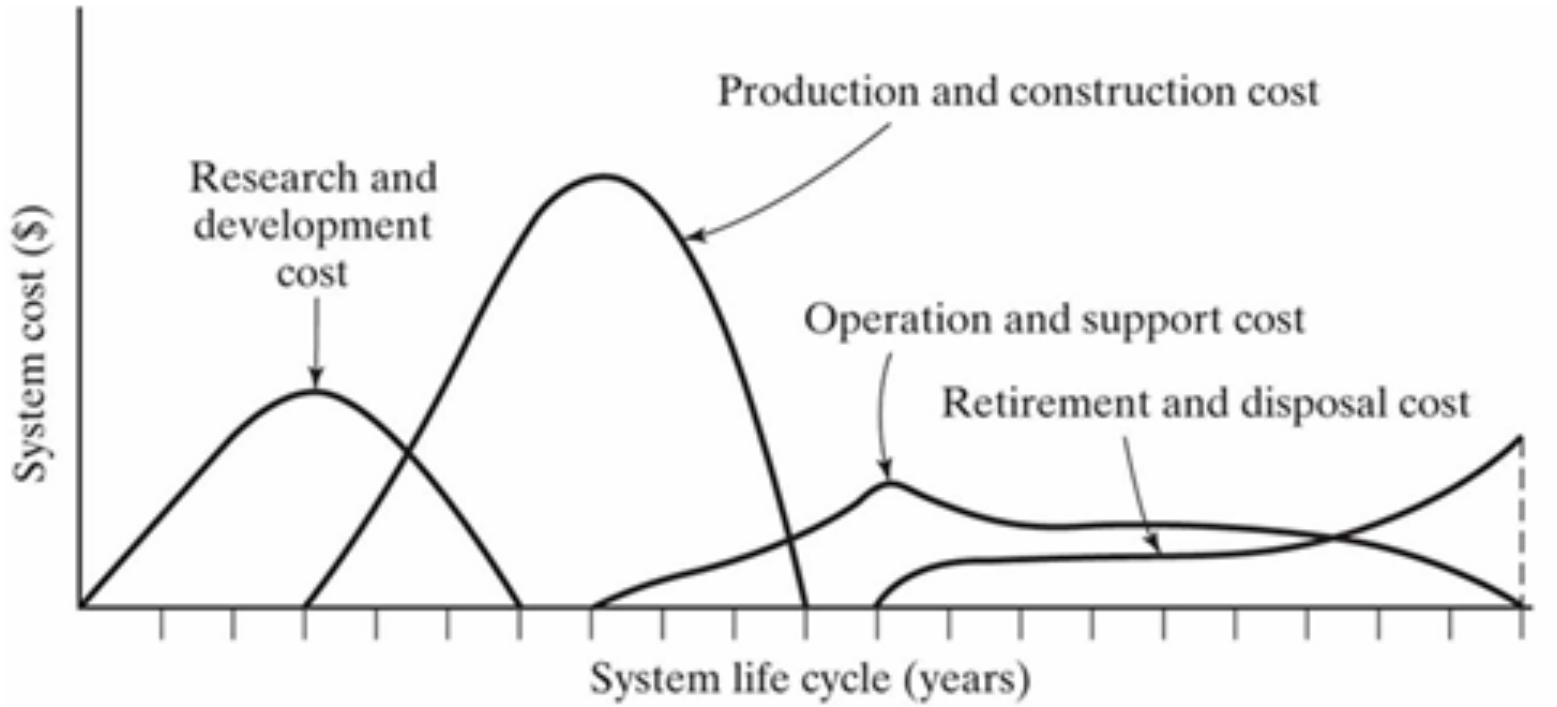
Post development stage

Lecture 7

Doc. no. TISYE1-13-002 R1.0

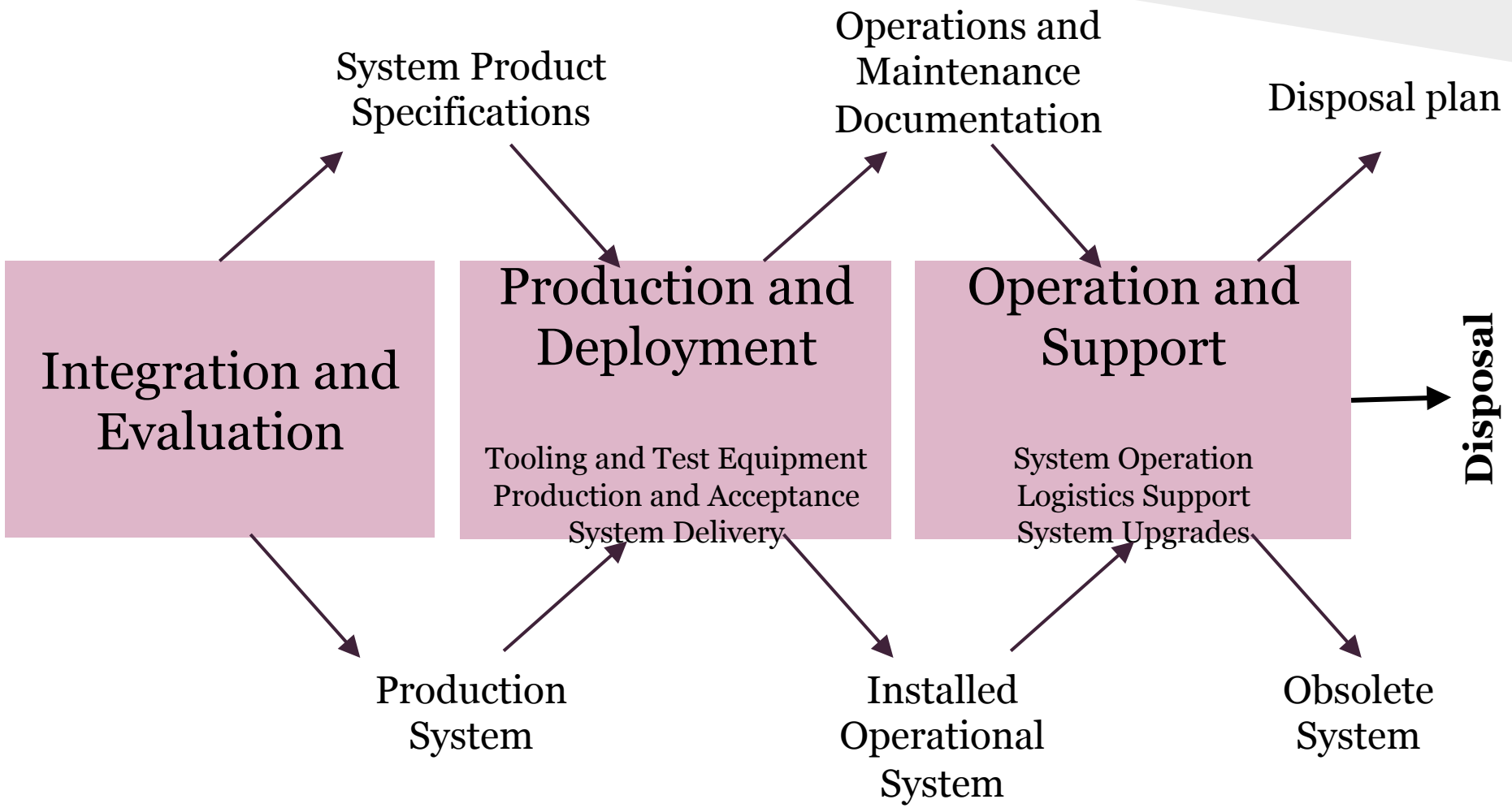
Life-cycle cost profiles





From: Blanchard and Fabrycky, 2011

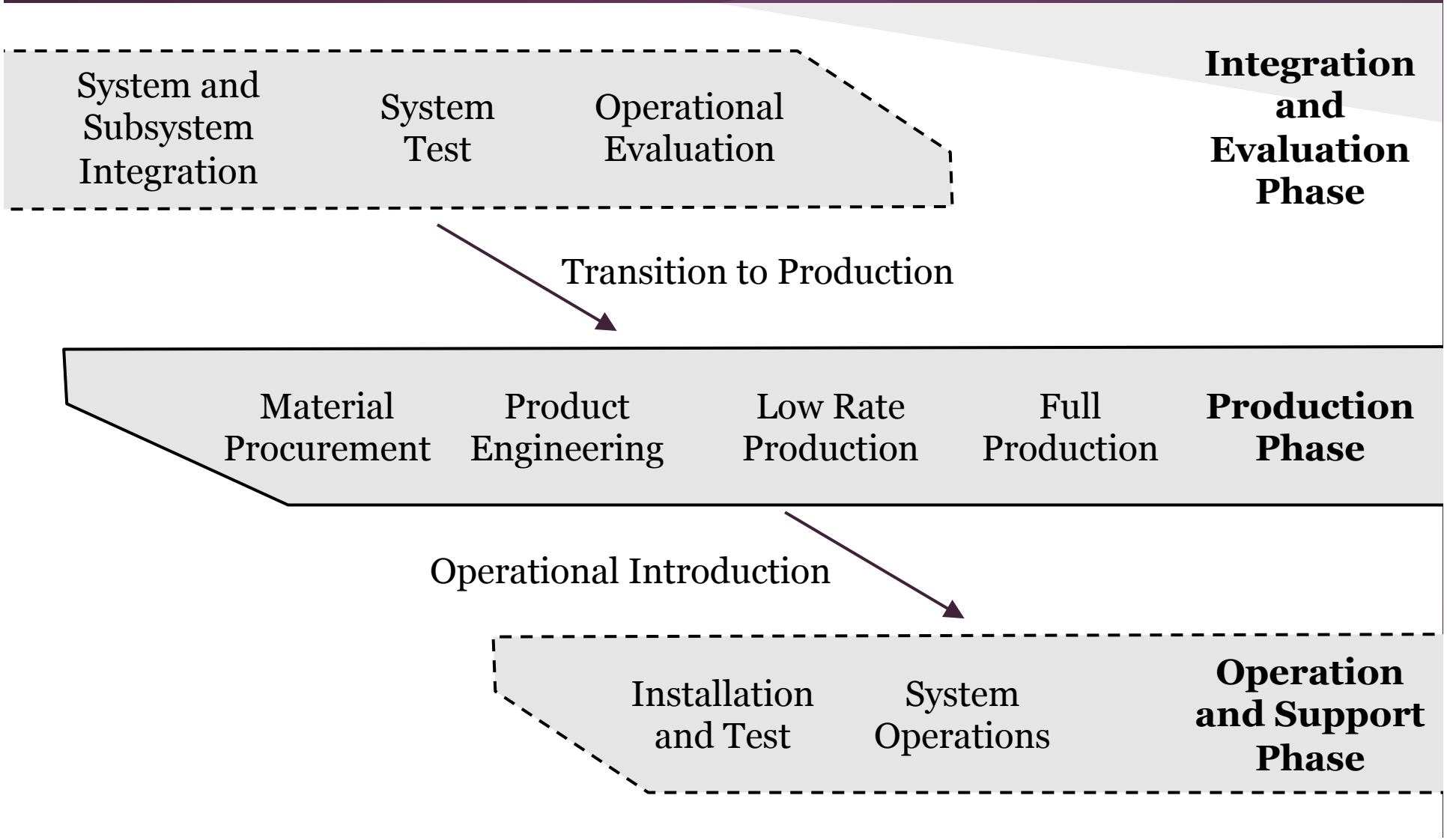
Production and Operations & Support phase



A perfect balance of –ilities!

Maneuverability versus manufacturability

Production phases



Problems in transition

- Advancing Technology
  - Gain in capability; examples: digital processors; miniturization
  - Preclude premature obsolescence
- Competition
  - Insufficient **funds;** lack of experienced **staff**; lack of access to **facilities** etc.
- Specialization
  - Engineering -> Manufacturing: Typically new

The transition phase for a system can be described as a project by itself.

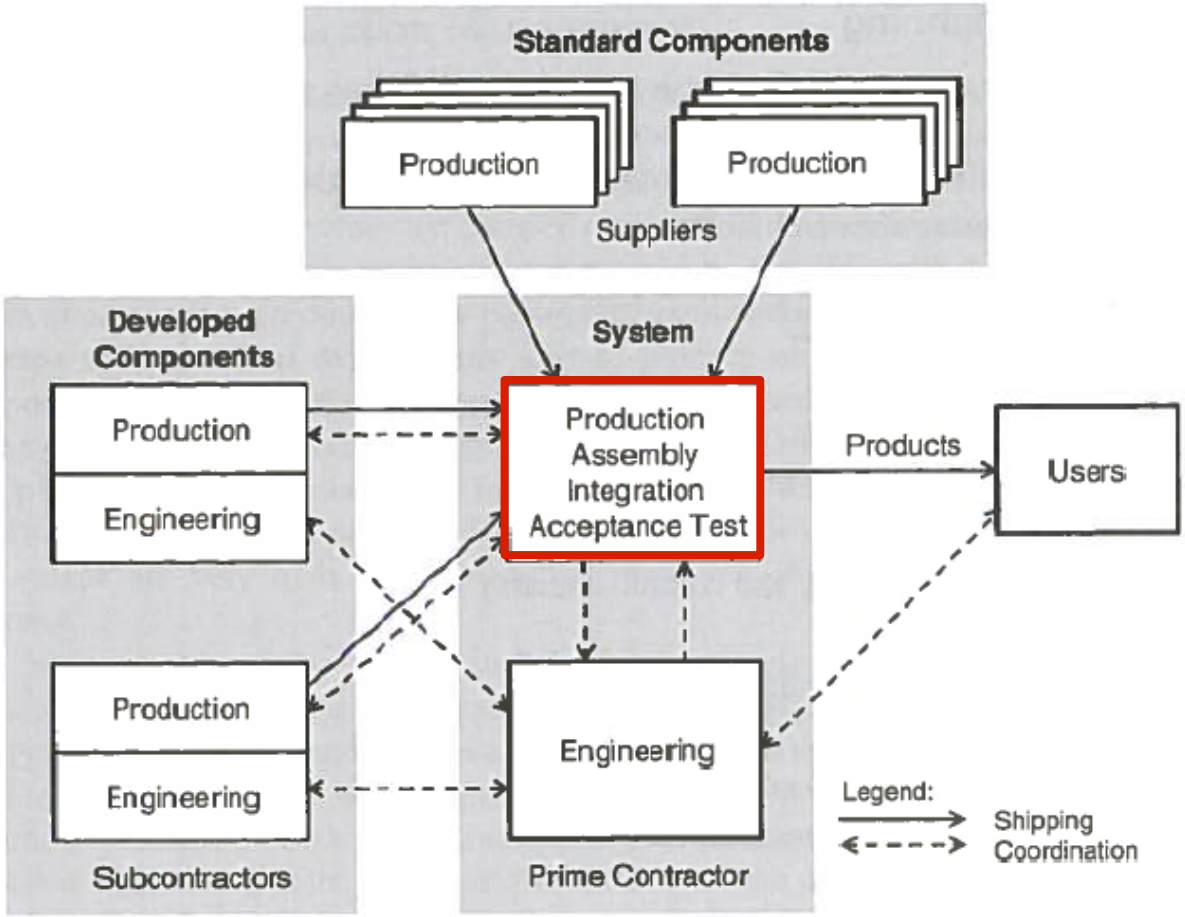
Product preparation

Typical engineering activities:

- Select manufacturing **procedures** and **equipment**.
- Complete a **pre-production prototype**
- **Demonstrate** effectiveness of final **product design** and performance; **installation** and start-up plans for the manufacturing process; selection of **material**, **components** and subsystem **vendors** and **logistics**; design of a field support system etc.
- **Associated activities**:
  - Logistics support plans
  - Configuration control plans, and
  - Document control plans and procedures

Production operation system

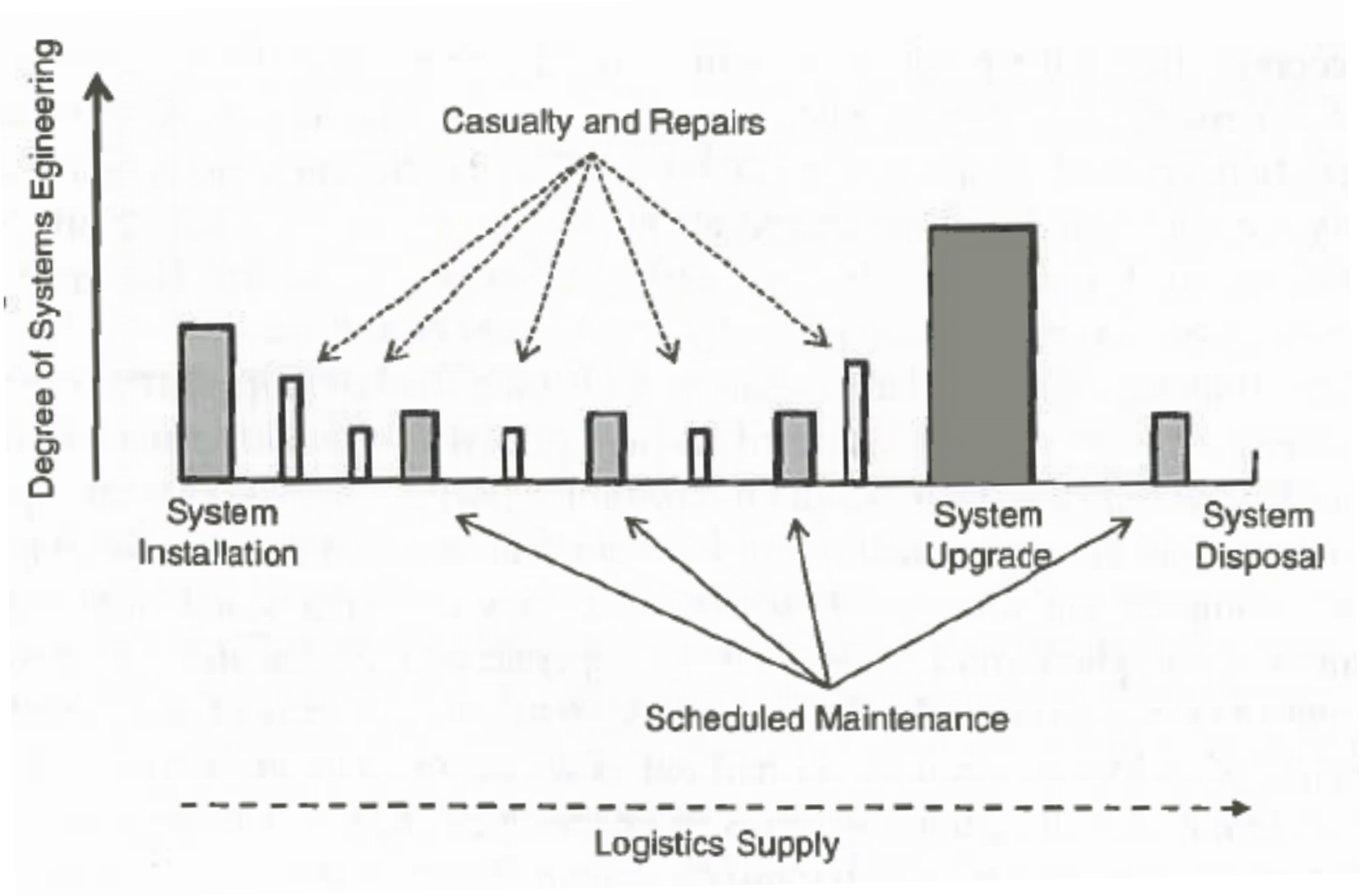
Production organization as a complex system



Production planning

- Key elements of a **production plan**:
  - **responsibility** and delivery schedule
  - manufacturing **sites** and **facilities**
  - **tooling** requirements, including special tools
  - factory **test equipment**
  - component fabrication
  - components and parts inspection
  - quality control
  - production **monitoring** and control assembly
  - **acceptance test**
  - **packaging** and shipping
  - discrepancy, schedule and cost reports
  - production readiness review

System operations history



Installation and test

- Effort required for system installation is dependent on
  - **degree of integration** (physical and functional)
  - number and complexity of **interfaces** between system and operating site
- Concerns of the system engineer:
  - **Internal System Interfaces**: ensure system integrity
  - **System integration site**: specially equipped site to support integration (may be separate facility)
  - **External System Interfaces**: System of system (SoS) challenges
  - **Non-disruptive installation**: Via simulation or duplicate SoS

In-service support

- Periodic operational readiness testing
- Operational problems
  - Software and hardware faults
- Field service support
- Scheduled Maintenance
- Severe Operational Casualties
  - --> Issue handling
- Logistics Support
  - stations, spare parts, repair kits, documentation ...

End of Lecture and Course