



COMP 354: Introduction to Software Engineering

Software Process Models

Based on Chapter 2 of the textbook



Essence of Software Engineering Practice

1. Understand the problem (communication and analysis).
2. Plan a solution (modeling and software design).
3. Carry out the plan (code generation/construction).
4. Examine result for accuracy (testing & quality assurance/deployment).

Generic Process Model

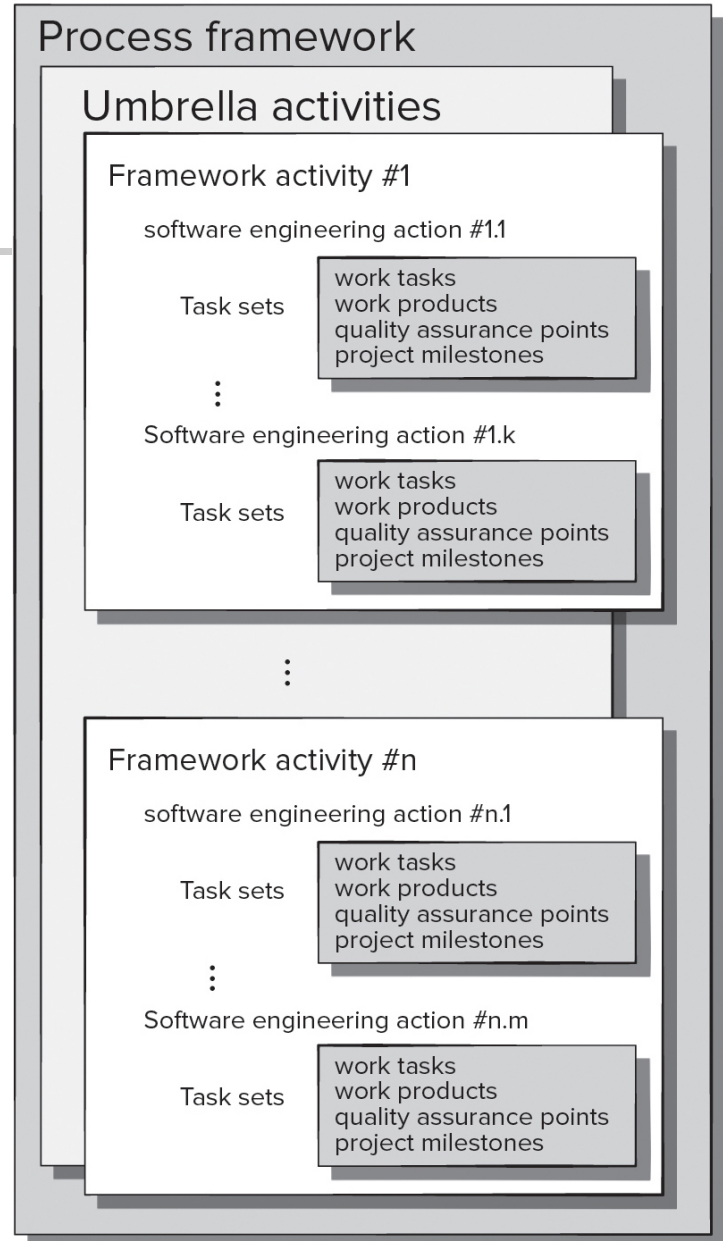
■ Framework Activities

- Communication
- Planning
- Modeling
- Construction
- Deployment

■ Umbrella Activities

- Project Tracking and Control
- Risk Management
- Quality Assurance
- Configuration Management
- Technical Reviews

Software process





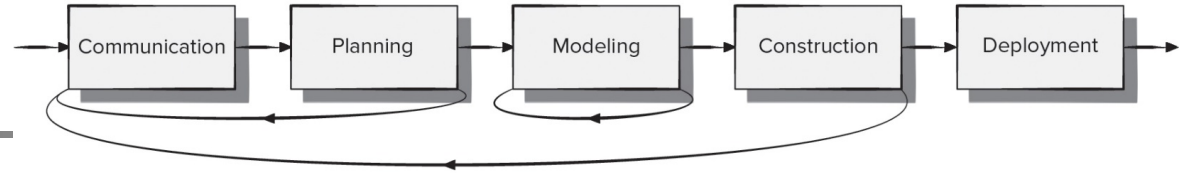
Identifying a Task Set

- A task set defines the actual work to be done to accomplish the objectives of a software engineering action.
- A task set is defined by creating several lists:
 - A list of the tasks to be accomplished.
 - A list of the work products to be produced.
 - A list of the quality assurance filters to be applied.

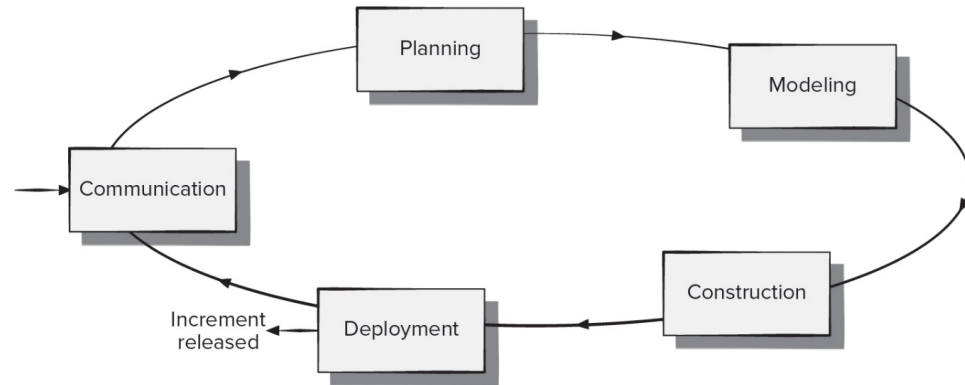
Process Flow



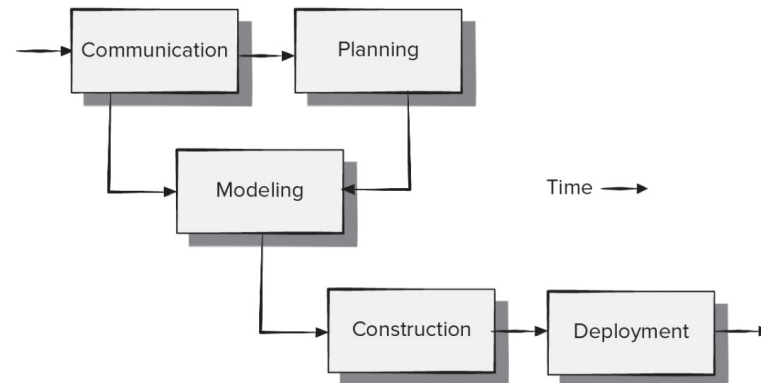
(a) Linear process flow



(b) Iterative process flow



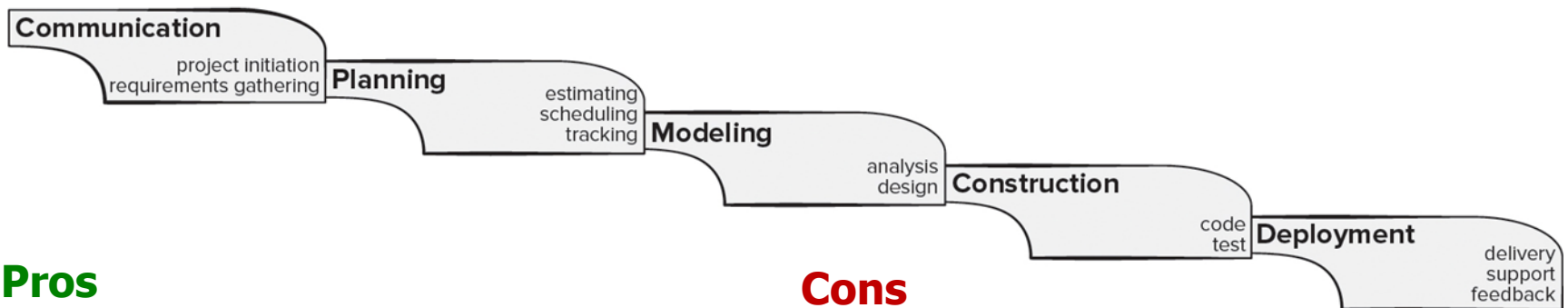
(c) Evolutionary process flow



(d) Parallel process flow

Waterfall Process Model

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Pros

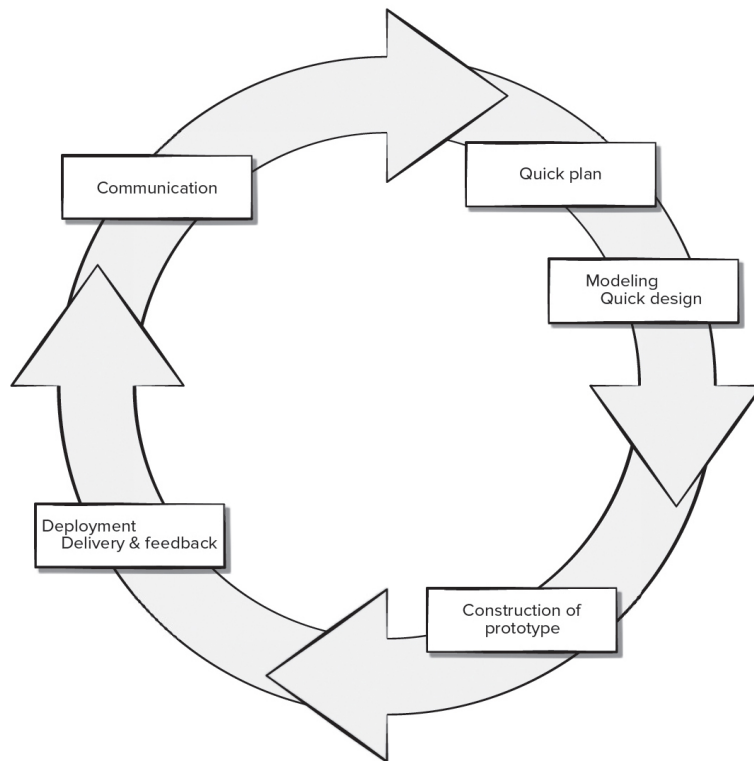
- It is easy to understand and plan.
- It works for well-understood small projects.
- Analysis and testing are straightforward.

Cons

- It does not accommodate change well.
- Testing occurs late in the process.
- Customer approval is at the end.

Prototyping Process Model

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Pros

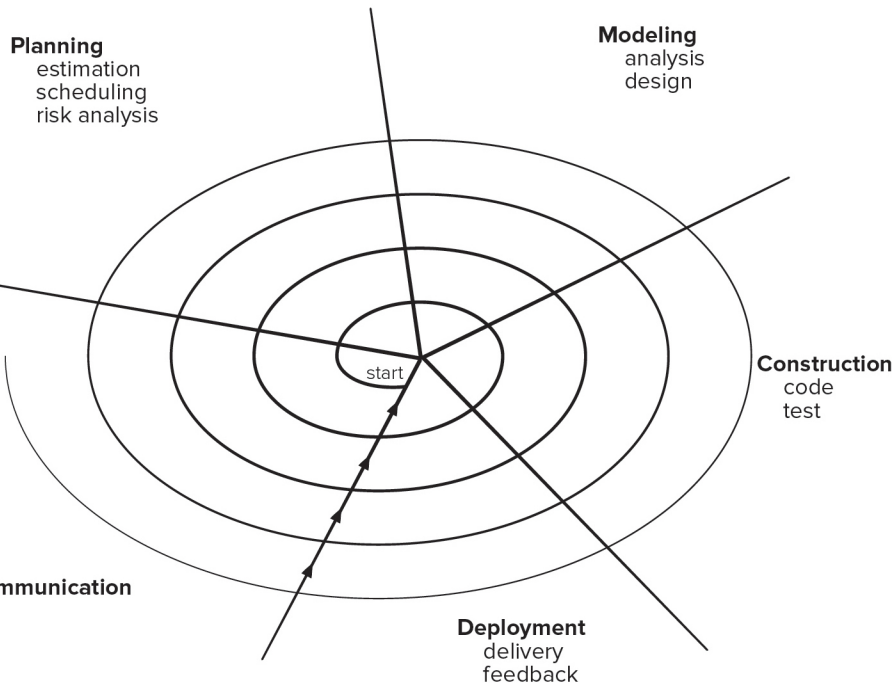
- Reduced impact of requirement changes.
- Customer is involved early and often.
- Works well for small projects.
- Reduced likelihood of product rejection.

Cons

- Customer involvement may cause delays.
- Temptation to “ship” a prototype.
- Work lost in a throwaway prototype.
- Hard to plan and manage.

Spiral Process Model

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Pros

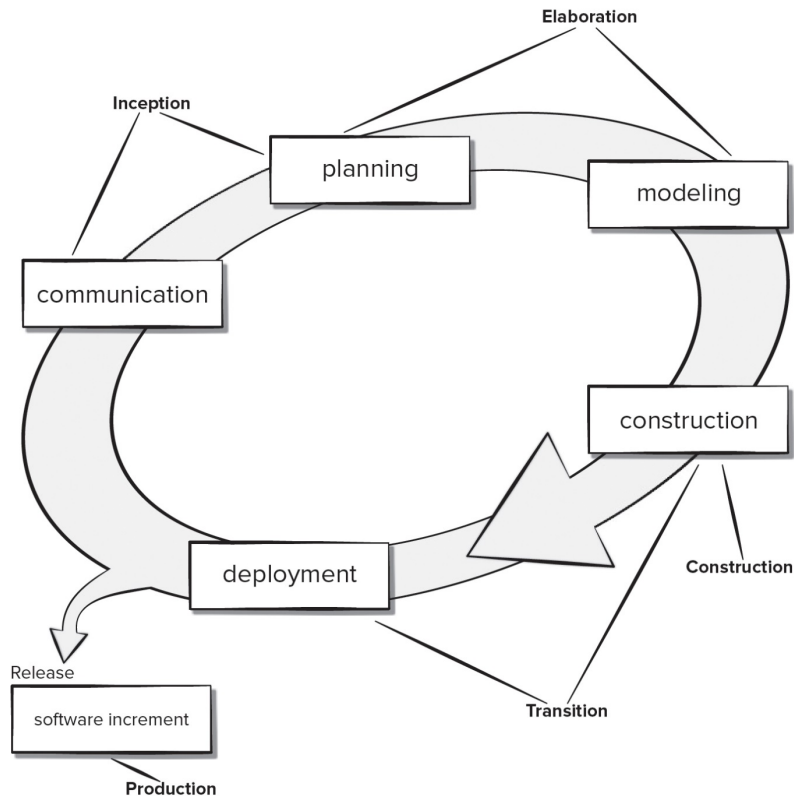
- Continuous customer involvement.
- Development risks are managed.
- Suitable for large, complex projects.
- It works well for extensible products.

Cons

- Risk analysis failures can doom the project.
- Project may be hard to manage.
- Requires an expert development team.

Unified Process Model

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Pros

- Quality documentation emphasized.
- Continuous customer involvement.
- Accommodates requirements changes.
- Works well for maintenance projects.

Cons

- Use cases are not always precise.
- Tricky software increment integration.
- Overlapping phases can cause problems.
- Requires expert development team.



Process Assessment and Improvement

- The existence of a software process is no guarantee that software will be delivered on time, or meet the customer's needs, or that it will exhibit long-term quality characteristics.
- Any software process can be assessed to ensure that it meets a set of basic process criteria that have been shown to be essential for successful software engineering.
- Software processes and activities should be assessed using numeric measures or software analytics (metrics).



Prescriptive Process Models

- Prescriptive process models advocate an orderly approach to software engineering.
- *That leads to two questions:*
 - If prescriptive process models strive for structure and order, are they appropriate for a software world that thrives on change?
 - If we reject traditional process models and replace them with something less structured, do we make it impossible to achieve coordination and coherence in software work?