MOT 2421 Emerging and Breakthrough Technologies

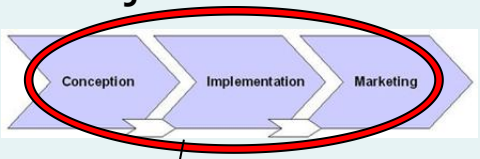
Prof. dr. J. Roland Ortt

Lecture 2: innovation process project-level

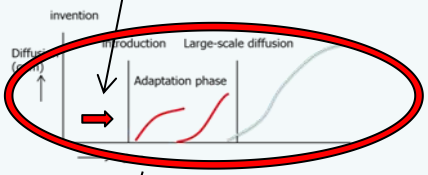
Key messages from the previous lecture

Levels

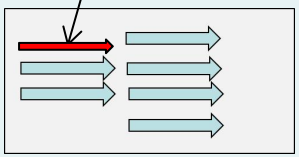
1. Project level



2. Pattern level development/diffusion



3. Discipline level



Focus MOT2421: Technological innovation as a complex phenomenon

- Many actors factors interact over time
- Company perspective.
- At different levels.

Innovation on the project-level:

Typical stages that tend to be forgotten

- Strategic phase: innovate or not
- Life cycle improvements after first intro
- Discuss different ways to gather innovation ideas

Project-level: Innovation 1

= New product version +

1. Service
2. Production
3. Marketing-mix
4. Organization
5. Supply chain (Fitting in broader market context)

What is the relevance of this idea?

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Kodak Single Use Camera
Fun Saver 27exp.

Some companies can not introduce (their own) innovation!

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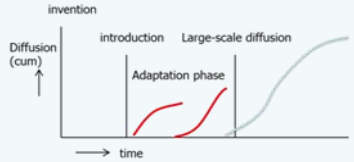
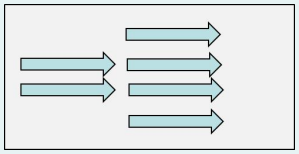
Focus MOT2421: Technological innovation as a complex phenomenon

- Many actors factors interact over time: company perspective.
- At different levels

Levels	Unit focus	Boundary	Outcome	Example
1. Project level 	Product version *(years)* (e.g. Samsung mobile phone)	Organization or network of organizations collaborating on one innovation	Innovation 1 = New product version + - Marketing-mix - Organization - Supply chain	Dickmann's Van project 
2. Technology level 	Generic product *(decades)* (e.g. mobile phone in general)	Cluster of organizations in industry in parallel or in sequence working on similar innovation	Innovation 2 = New type of product (generic)= ∑ Innovation 1i + - Complementary p/s - Network of org's - Customers - Institutions	Pattern for Autonomous vehicles; pattern for autonomous ships.
3. level 	Set of related technologies *(century)* (e.g. tele-communication)	Industry, (or a combination of industries) Multiple clusters of organizations working on related products	Inventions and New patterns How patterns influence each other and can be combined in new patterns	Autonomous systems (cars, ships, submarines, drones, robots, etc)

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Project aspects

1. Overview types of innovation projects
2. Stage-gate
3. Scrum
4. Comparison
5. Product innovation and its alternatives
6. Evolution of thinking about innovation
7. Contextual innovation management

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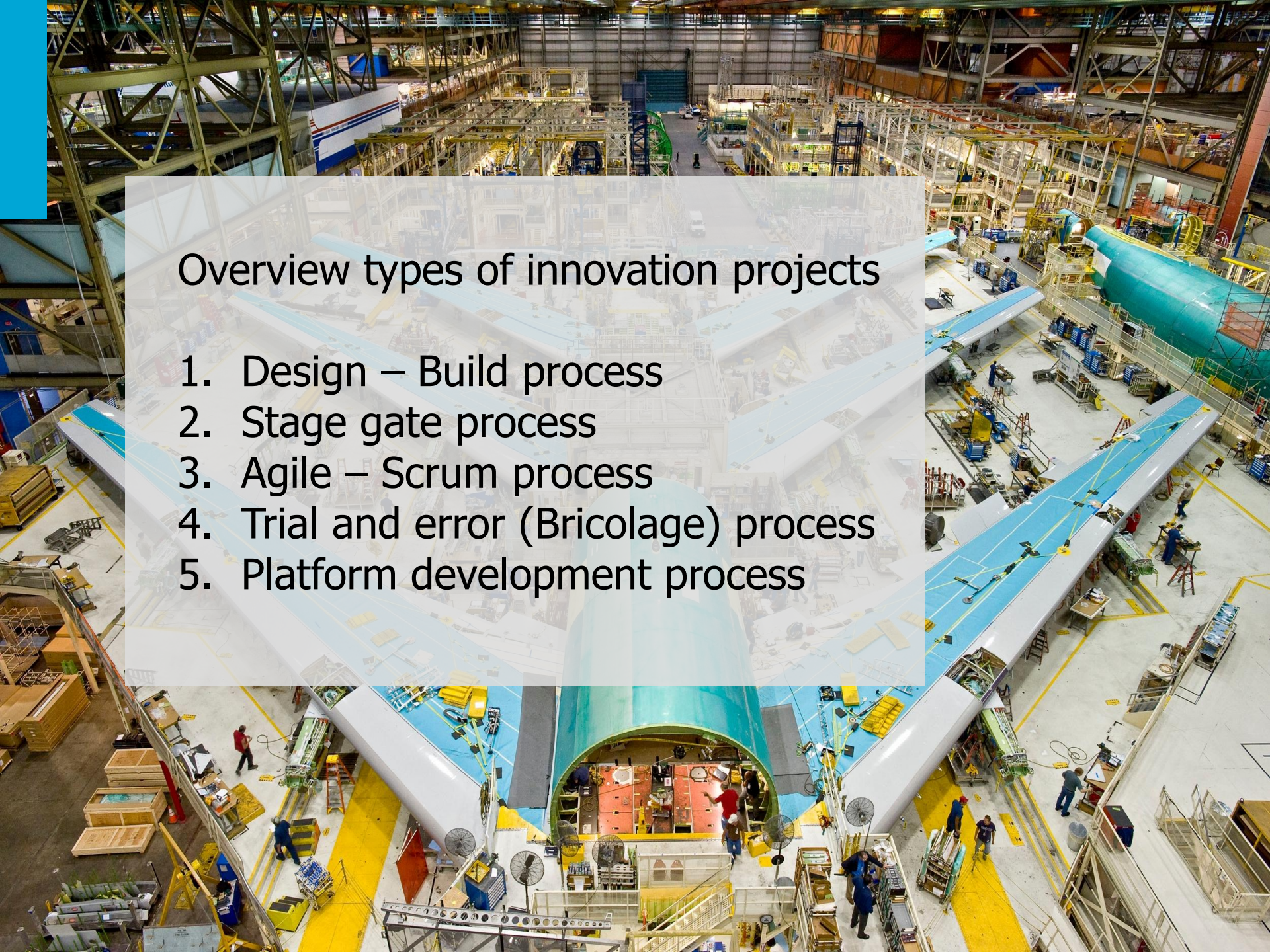
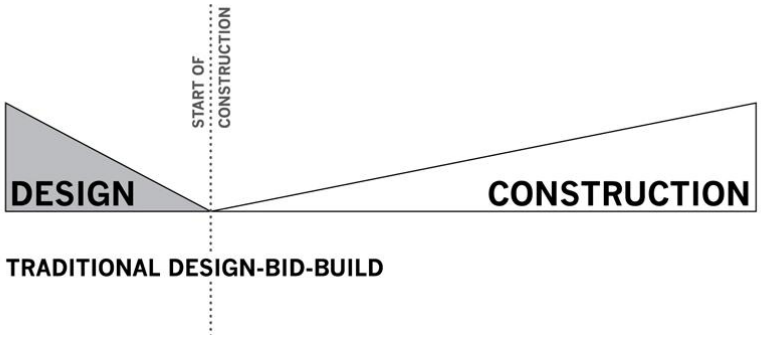
Topic	Source to study
Overview innovation projects	slides
Stage-gate	Cooper (1990) article on the stage-gate process
Scrum	Szalvay (2004) on agile software development
Comparison	Different approaches to cope with the same trends
Product innovation and its alternatives	slides
Evolution of thinking about innovation	The evolution of innovation management over time
Contextual innovation management	Contextual Innovation Management

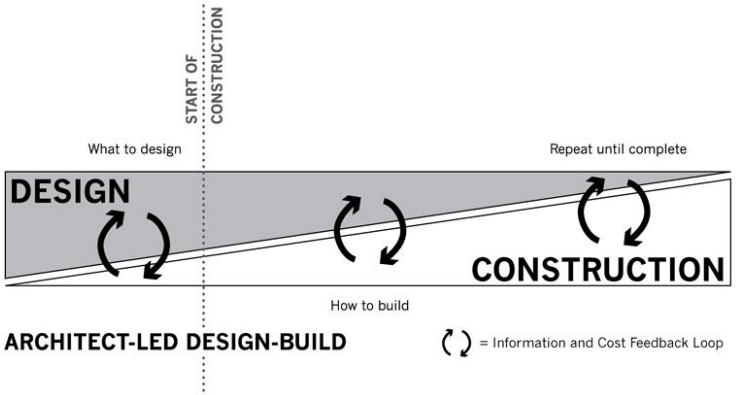


Overview types of innovation projects

1. Design – Build process
2. Stage gate process
3. Agile – Scrum process
4. Trial and error (Bricolage) process
5. Platform development process

1. Design – Build process





"The design–build procurement route changes the traditional sequence of work. It answers the client's wishes for a single point of responsibility in an attempt to reduce risks and overall costs. Although the use of subcontractors to complete more specialized work is common, the design-build contractor remains the primary contact and primary force behind the work. It is now commonly used in many countries and forms of contracts are widely available."

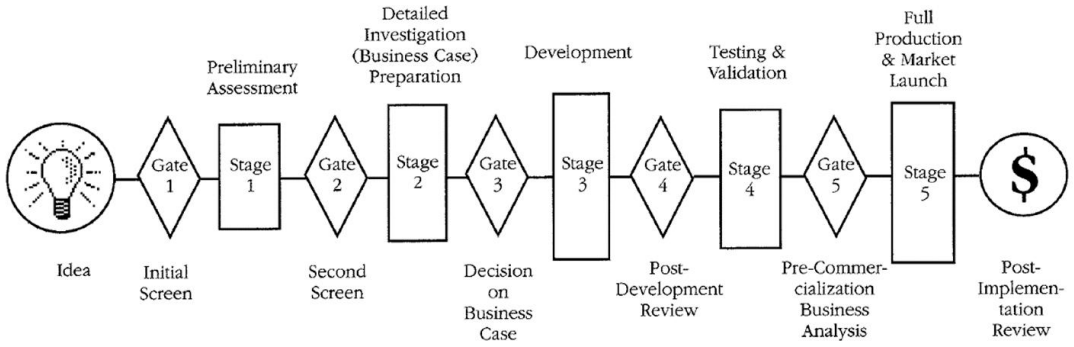
History of these approaches

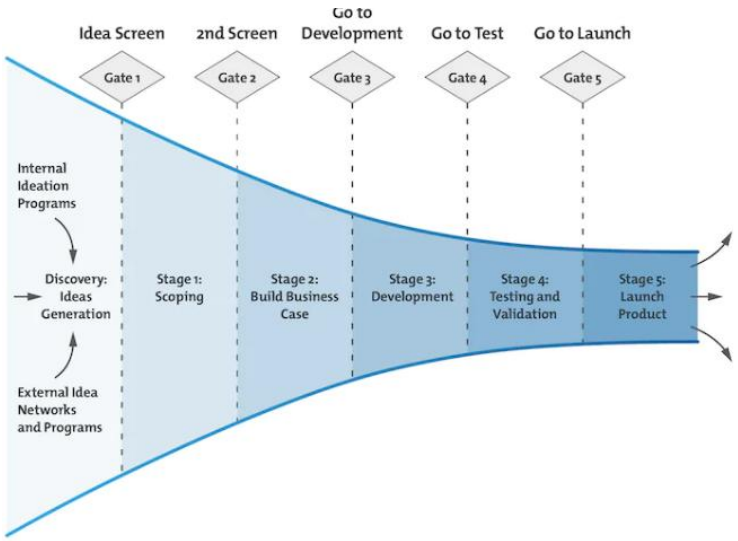
https://en.wikipedia.org/wiki/Design%E2%80%93build

https://www.pngegg.com/en/png-hhore

2. Stage gate process

Figure 2
An Overview of a Stage-Gate System





Funnel
(early late selection)

Open innovation
(open vs closed funnel)

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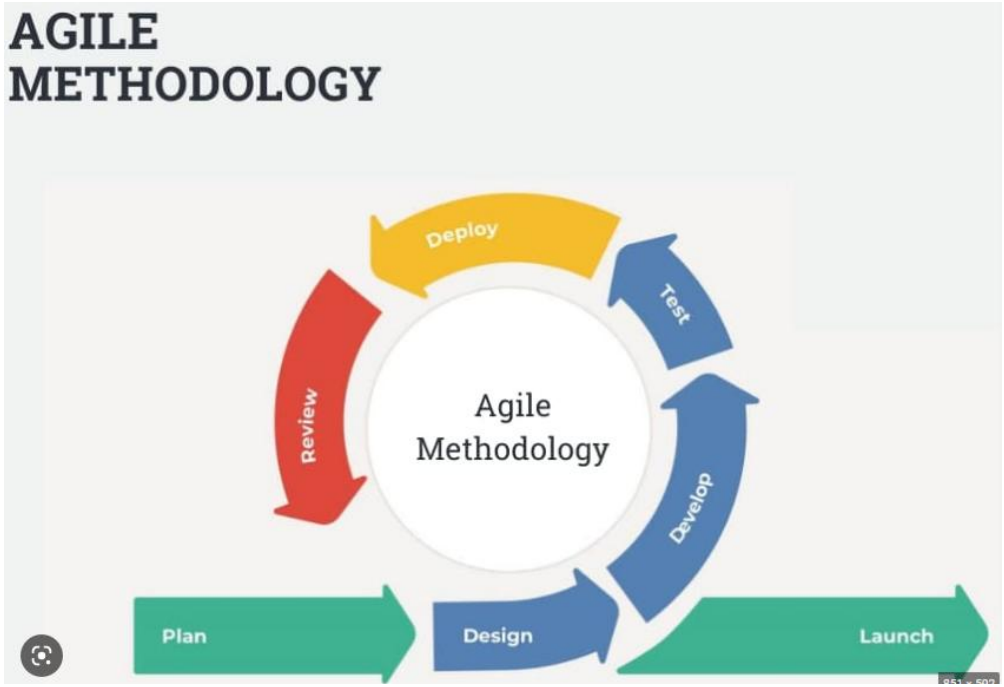
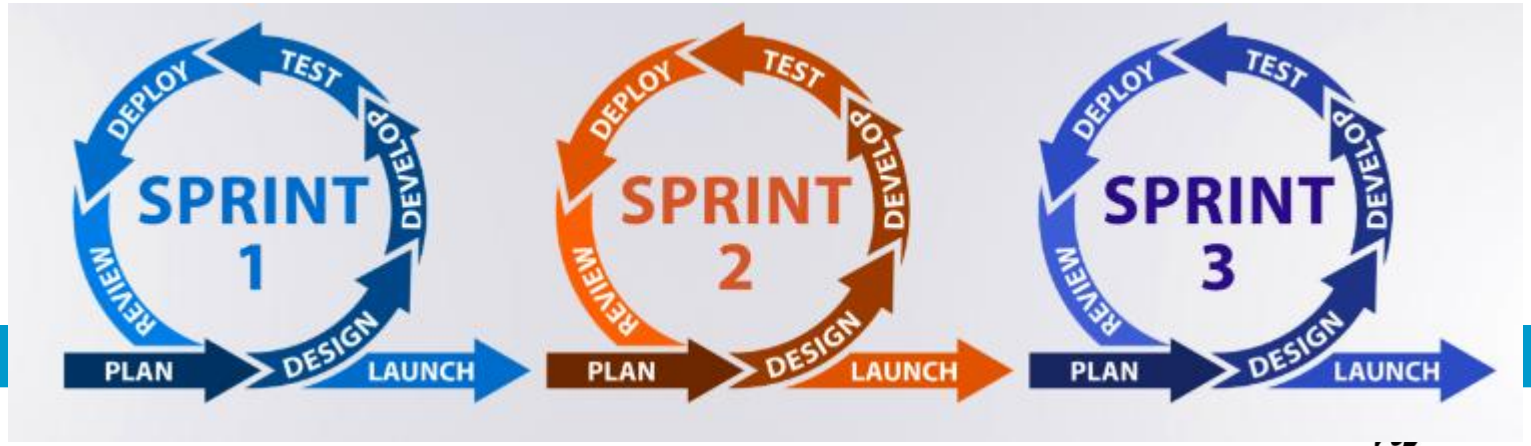
operation == "MIRROR_X":
irror_mod.use_x = True
irror_mod.use_y = False
irror_mod.use_z = False
operation == "MIRROR_Y":
irror_mod.use_x = False
irror_mod.use_y = True
irror_mod.use_z = False
operation == "MIRROR_Z":
irror_mod.use_x = False
irror_mod.use_y = False
irror_mod.use_z = True
selection at the end -add
_ob.select= 1
er_ob.select=1
ntext.scene.objects.acti
("Selected" + str(modifier
irror_ob.select = 0
bpy.context.selected_ob
ata.objects[one.name].se
int("please select exact
OPERATOR CLASSES
types.Operator):
X mirror to the selecte
ject.mirror_mirror_x"
ror X"
ontext):
ive object is not

3. Agile – Scrum process



https://interqualitybg.com/en/resources/scrum-and-agile-resources/agile-methodology



https://kruschecompany.com/agile-software-development/

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Shirin Neshat

4. Trial and error (Bricolage)

Visual arts[edit]

The visual arts is a field in which individuals often integrate a variety of knowledge sets in order to produce inventive work. To reach this stage, artists read print materials across a wide array of disciplines, as well as information from their own social identities.[21] For instance, the artist Shirin Neshat has integrated her identities as an Iranian exile and a woman in order to make complex, creative and critical bodies of work.[22] This willingness to integrate diverse knowledge sets enables artists with multiple identities to fully leverage their knowledge sets. This is demonstrated by Jeffrey Sanchez-Burks, Chi-Ying Chen and Fiona Lee, who found that individuals were shown to exhibit greater levels of innovation in tasks related to their cultural identities when they successfully integrated those identities.[23]

https://en.wikipedia.org/wiki/Bricolage

Full article: CHENG, Chi-Ying; SANCHEZ-BURKS, Jeffrey; and LEE, Fiona, "Increasing innovation through identity integration." (2007). Research Collection School of Social Sciences. Paper 2139. https://ink.library.smu.edu.sg/soss_research/2139

Information systems[edit]

In information systems, bricolage is used by Claudio Ciborra to describe the way in which strategic information systems (SIS) can be built in order to maintain successful competitive advantage over a longer period of time than standard SIS. By valuing tinkering and allowing SIS to evolve from the bottom-up, rather than implementing it from the top-down, the firm will end up with something that is deeply rooted in the organisational culture that is specific to that firm and is much less easily imitated.[19]

https://en.wikipedia.org/wiki/Bricolage

Full article: Ciborra, C. U. (1992). From thinking to tinkering: The grassroots of strategic information systems. The information society, 8(4), 297-309.

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5. Platform development process

Basis + all possible modules

Different cars (VW, Audi, Skoda, Seat,

Different designs over time fitting in the platform

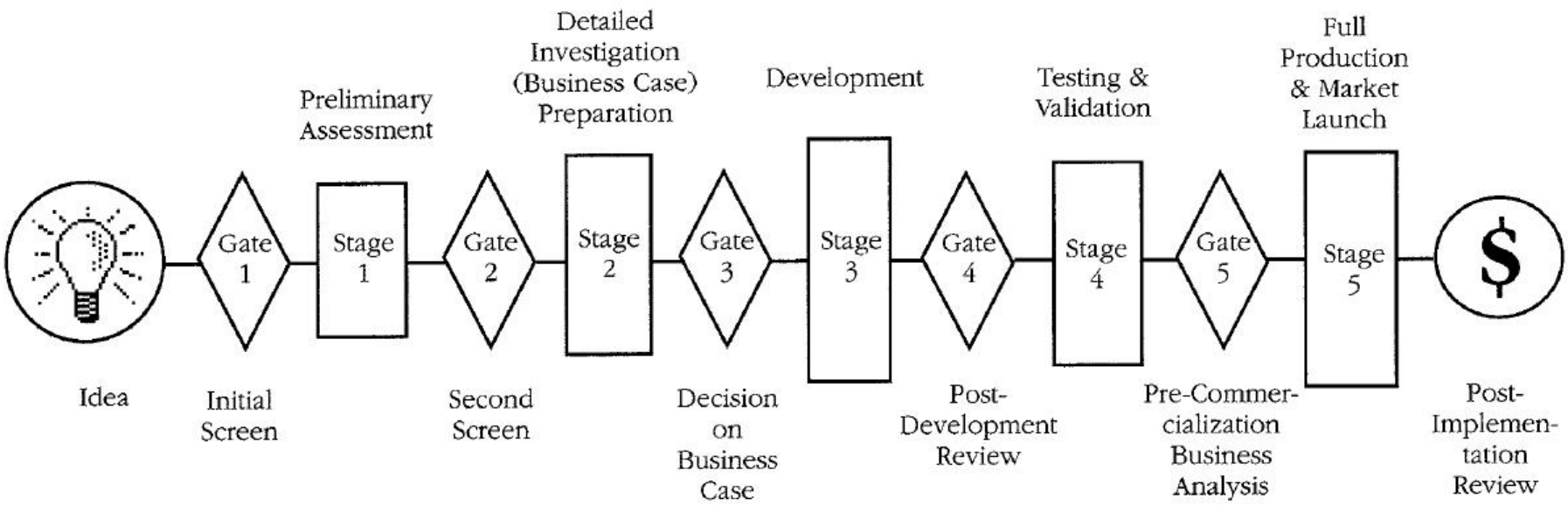
Type of innovation projects contrasted

	Type project	Structure of project	Evolution of idea/concept during process	Organization around project	Type of innovation	Staring conditions
1	Design – Build	Stages; focus on pre-specified innovation	Minimal. Design is specified fully prior to construction.	One main contractor, possibly sub-contractors	Building, bridge, railway track, …	One customer; Requirements, process and outcome known upfront.
2	Stage-gate	Stages; focus on innovation meeting pre-set requirements	A lot of variants funnelled towards one (a few) innovation(s)	One multi-disciplinary project-team, mostly from matrix organization;	Household electronics, …	Segment of customers; Requirements, process, stages known, outcome unknown.
3	Agile Scrum	Rounds; focus on process to meet general goal	Variation from minimum viable concept with first functionality to complete system with extended functionality	Agile/scrum team members can be from network, or different parts of main organization.	Software, complex unique systems, …	Usually one main customer; Requirements uncertain, process set, outcome
4	Trial and error (Bricolage)	Iterative unspecified process	Can be large, from one conceptual idea to the other and from one innovation to the next.	Small teams, sometimes individuals (artists, inventors, scientists)	Art, technological inventions, complex systems	Requirements, process, and outcome uncertain
5	Platform	Two developments: platform and later on innovation based on platform	Upfront in the specification of platform, many innovation variants are possible.	One team to create platform, another team to create innovations on the platform.	Cars, equipment, and other modular systems on one shared basis	Platform allows large variation but the platform itself needs to be stable for long.

Project aspects of the innovation process

1. Stage gate innovation project (a)

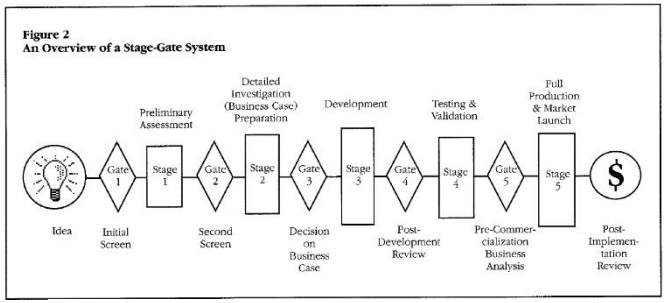
Figure 2
An Overview of a Stage-Gate System



Project aspects of the innovation process

1. Stage gate innovation project (b)

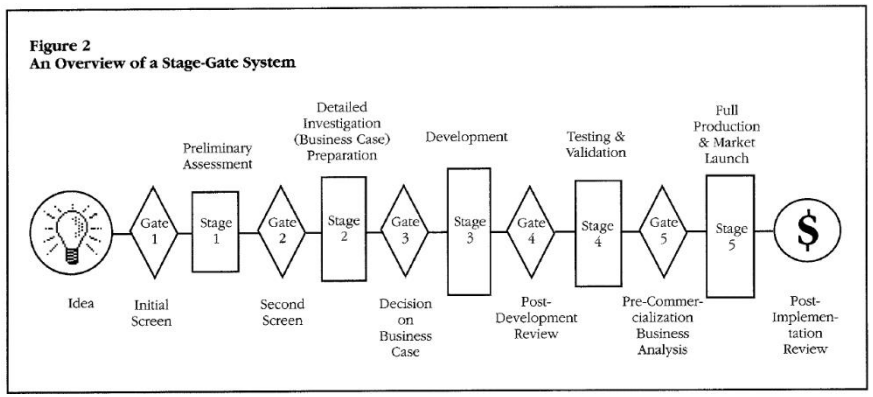
- Activities are divided in stages:
  Stage-gate approach claims that good process consists of a complete set of (13) activities.
- Between stages are gates:
  At each gate inputs are evaluated using criteria and that yields an output (decision mngt).
  Four decisions are possible:
  Go, Kill, Hold, Recycle (store?)
- Results of this stage-gate project:
  Higher success rate
  More senior/top management involvement (gate)
  More market orientation
  More focus on pre-development activities
  Explicit evaluation, quality of execution



- Initial Screening
- Preliminary Market Assessment
- Preliminary Technical Assessment
- Detailed Market Study/Marketing Research
- Business/Financial Analysis
- Product Development
- In-House Product Testing
- Customer Test of Product
- Test Market/Trial Sell
- Trial Production
- Pre-Commercialization Business Analysis
- Production Start-Up
- Market Launch

Project aspects of the innovation process

1. Stage gate innovation project (c)



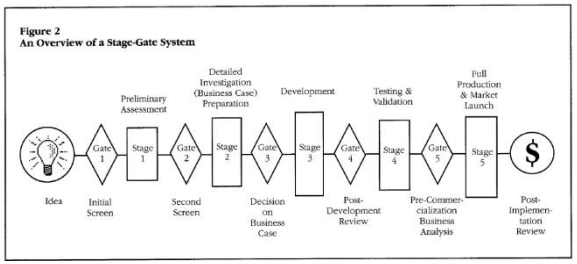
Discussion points regarding the stage-gate process

- Is the process complete (stages missing)?
- Where is market and technology information?
- Organizational consequences?
- Sequential or also parallel processes?
- Prescribed process or also adaptable process?

1. Stage gate innovation project (d)

Discussion points regarding the stage-gate process

- Is the process complete (stages missing)?
  - Decision to innovate and life cycle management?
- Where is market and technology information?



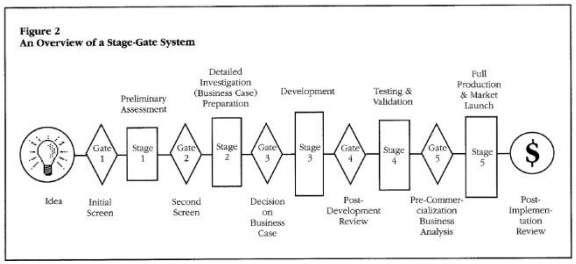
(p.46)

> Each project leader is required to provide the specified deliverables and meet the stated criteria at a given gate. For example, at Gate 3 in Figure 2, the inputs might include: results of the user "needs and wants" market study; the competitive analysis; the detailed technical appraisal; and the financial assessment. The inputs and the criteria

1. Stage gate innovation project (e)

Discussion points regarding the stage-gate process

- Organizational consequences?



> The implementation of stage-gate systems requires certain organizational changes within some firms. For example, a project team approach to organizing new product projects is fundamental to stage-gate approaches. No longer can projects be handed from department to department within the firm; a team and leader must carry the project in all stages.

- Sequential or also parallel processes?
  - Sequential regarding stages, parallel within the stages
- Prescribed process or also adaptable process?
  - Same basic process, variations across companies, industries

MOT 2421
Contents Today

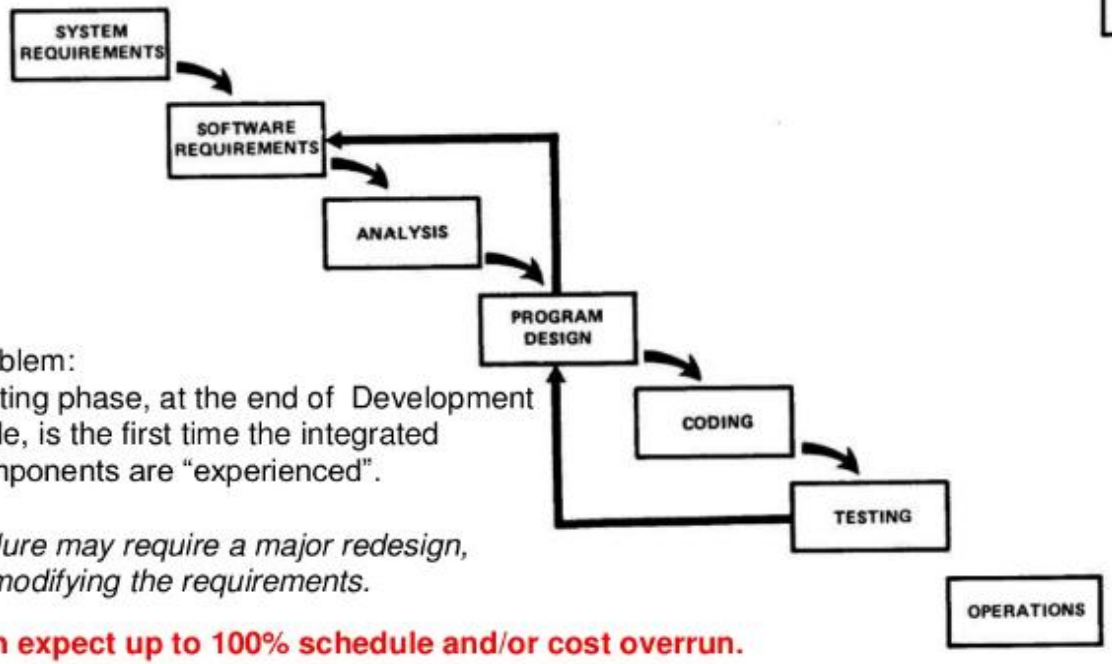
Project aspects

1. Stage-gate
2. Scrum
3. Comparison
4. Product innovation and its alternatives
5. Evolution of thinking about innovation
6. Contextual innovation management

2. SCRUM innovation p

Start: linear software developmer

Winston Royce's "Probler

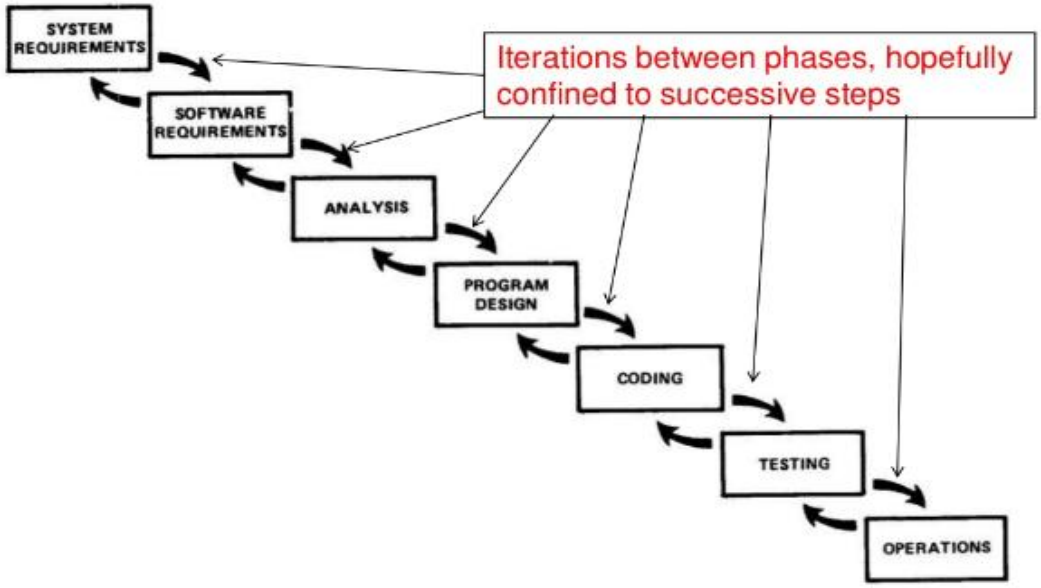


Problem:
Testing phase, at the end of Development cycle, is the first time the integrated components are "experienced".

Failure may require a major redesign, or modifying the requirements.

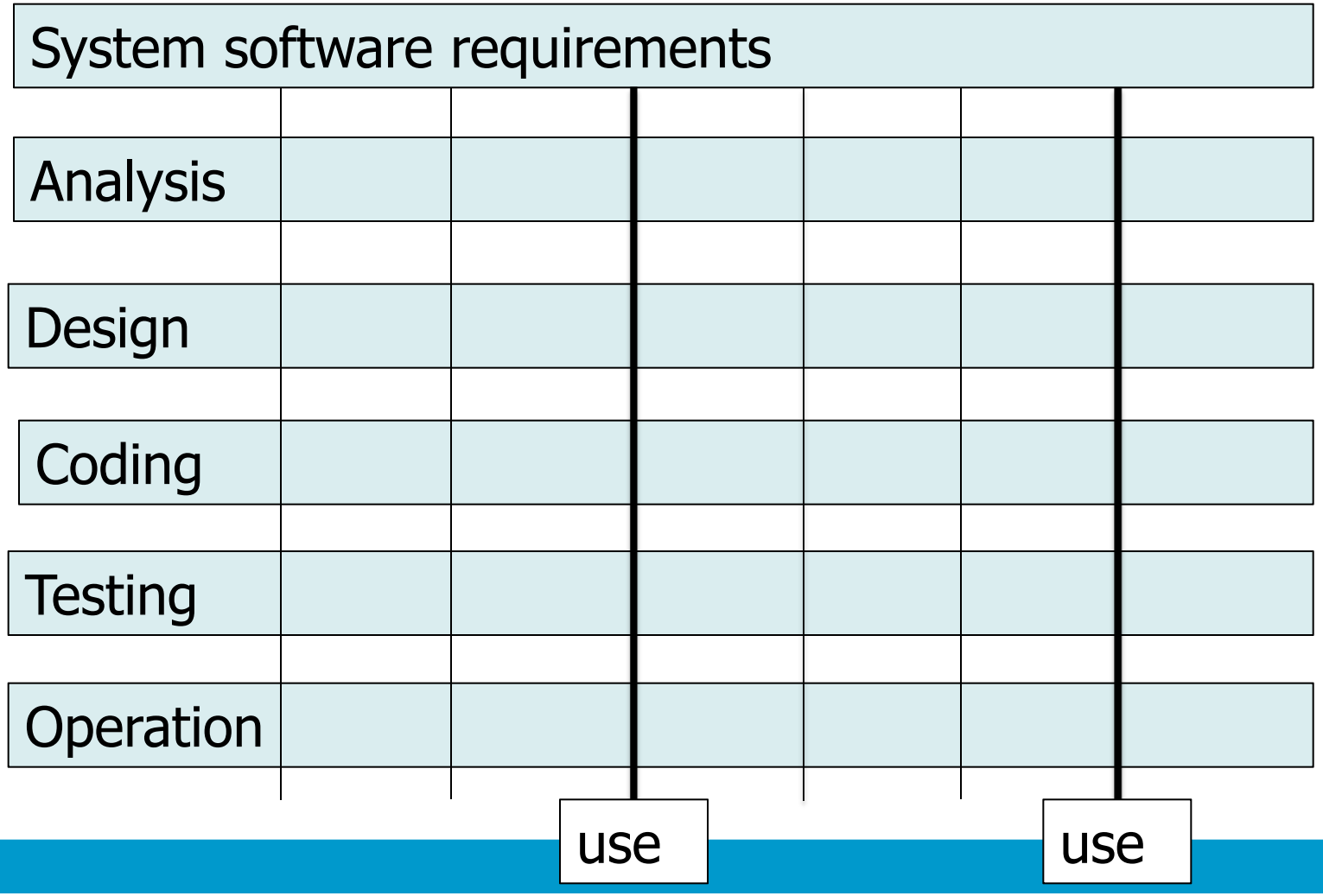
Can expect up to 100% schedule and/or cost overrun.

Winston Royce's Recommendation



Source: http://www.slideshare.net/fullscreen/wasitova/pmbok-and-scrum-can-we-be-friends/ (2016-04-23)

2. SCRUM innovation project (b)

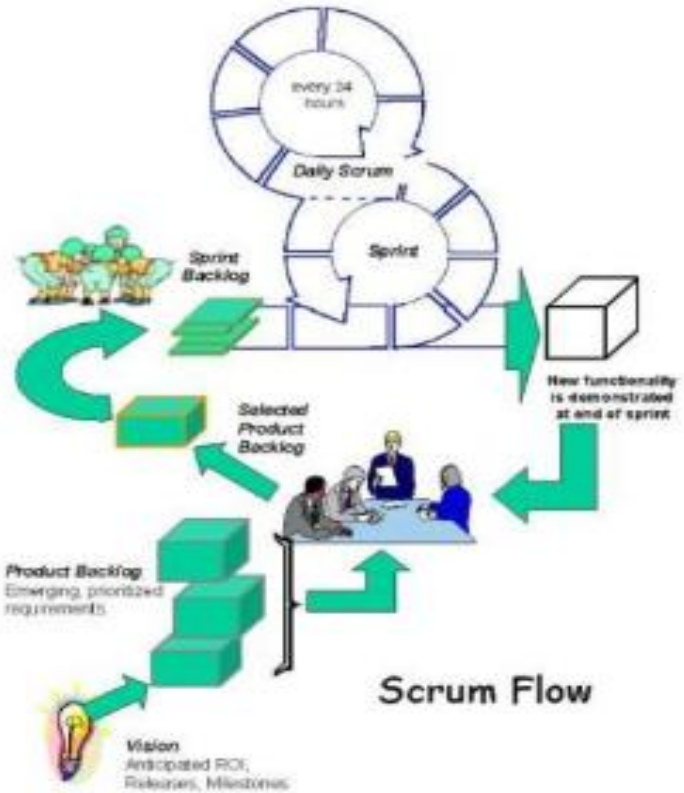


2. SCRUM innovation project (b)

https://kruschecompany.com/agile-software-development/

2. SCRUM innovation project (c)

Scrum Process



Key Practices

- Self-directed; self-organizing teams (preferably co-located)
- 15 minute daily stand up meeting with 3 special questions
- 30-calendar day iterations
- Iterative Adaptive planning
- Stakeholder/Customer Involvement
- Team measures progress daily
- Each iteration delivers tested, fully-functional software for demonstration
- Iterative Retrospective Process
- Always 30-days from potential production release

Source: http://www.slideshare.net/fullscreen/wasitova/pmbok-and-scrum-can-we-be-friends/ (2016-04-23)

2. SCRUM innovation project (d)

Agile Strengths

- ☐ Empowered, self-organizing team
  - Collaboration, cross-fertilization, disciplined, shared responsibilities & commitments
- ☐ Welcomes adjustments and learnings
  - Produces better results
- ☐ Risk mitigation practices
  - Smaller units of work → more accurate
  - Frequent checks → fewer surprises & delays
- ☐ Welcomes voice of the customer
  - Build the right thing

Agile may limit the paper work (administrative burden for the project team)

Agile limitations?

- Innovation needs to be a system that can be decomposed in subsystems, each of which can be designed separately (Platform with modules)
- Agile does not apply to simple (design-construct type of) projects. That is by the way explicitly mentioned in agile documentation.
- It is difficult to stop the iterations because requirements keep on changing (and end-result is never perfect)
- Scale up of many projects in a larger program or corporation can become difficult if teams are self-organizing.

Source: http://www.slideshare.net/fullscreen/wasitova/pmbok-and-scrum-can-we-be-friends/ (2016-04-23)

Project aspects of the innovation process

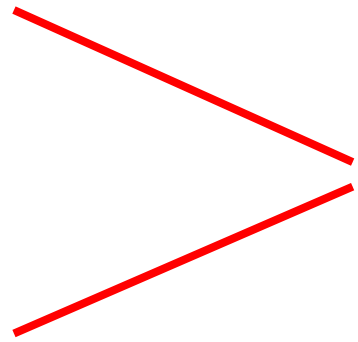
3. Comparing Stage-gate and Scrum

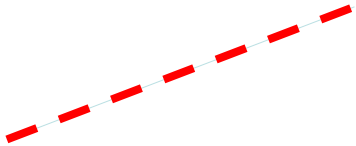
	Stage-gate	Scrum
Starting conditions	Innovation requirements are know upfront	Requirements are not (all) known upfront.
	Innovation can be both modular or can be one coherent system (without clear modules/parts)	Innovation needs to be modular or can be split up in parts.
Evolution of idea /concept during process	Selection (selection is possible using the known requirements): From many ideas to one product; Growth: Ideas cover almost all aspects, these aspects are elaborated over time (all parts from the beginning) for the selected ideas/concepts/product variants.	Selection is now hardly possible because selection criteria (requirements) are not known; Growth: From module completed to next module (part after part).
Structure project	Linear stages with gates. (The more specified upfront, the more activities can be scheduled in parallel)	Development of modules in cycles or "sub-projects".
Organization	Management (gates), project leader and team (in stages)	Scrum master and team members (self-directed), customer/problem-owner (after 30 days).
Process	No prescribed rhythm (plan-dependent) (process is specified in terms of results per phase yet timing depends on project plan)	Daily rhythm, 30-day (month) rhythm (process rhythm helps to deal with uncertainty)
Flexibility	Overall plan is created upfront, (limited) changes are possible after each stage.	Plan is made per run of 30 days. Changes and new insights are welcomed and searched for.
Implementation	Implementation is at the end with handover.	Implementation can be done per module.

Project aspects of the innovation process

3. Comparing Stage-gate and Scrum

1 Selection versus growth





2 All aspects from beginning or not?

3. What to do when Stage-gate and Scrum fail

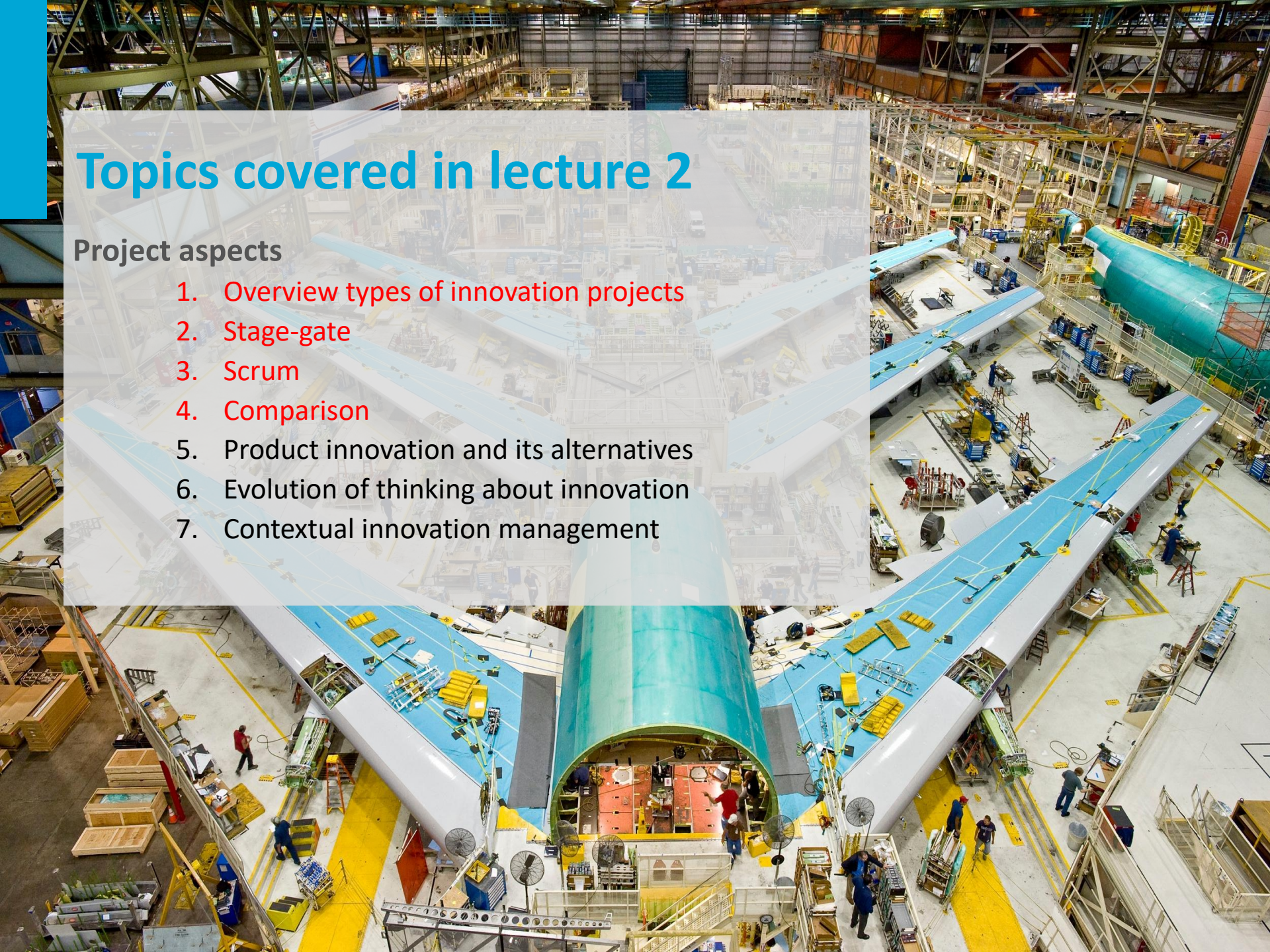
Stage-gate requires that you have some starting point for ideation after innovation is chosen as a strategy: unmet needs, competitive technology, product/market combination to focus at, a problem formulated by a business customer, etcetera. Requirements are known upfront.

- If not available start with an exploration project to explore scenario's and then decide about npd-project later on with customer.

Scrum requires that you have an initial requirement to start working on a subsystem.

- If not available start with exploring the system and after that define a Scrum-project.

Source: http://www.slideshare.net/fullscreen/wasitova/pmbok-and-scrum-can-we-be-friends/ (2016-04-23)



Topics covered in lecture 2

Project aspects

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Questions?

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