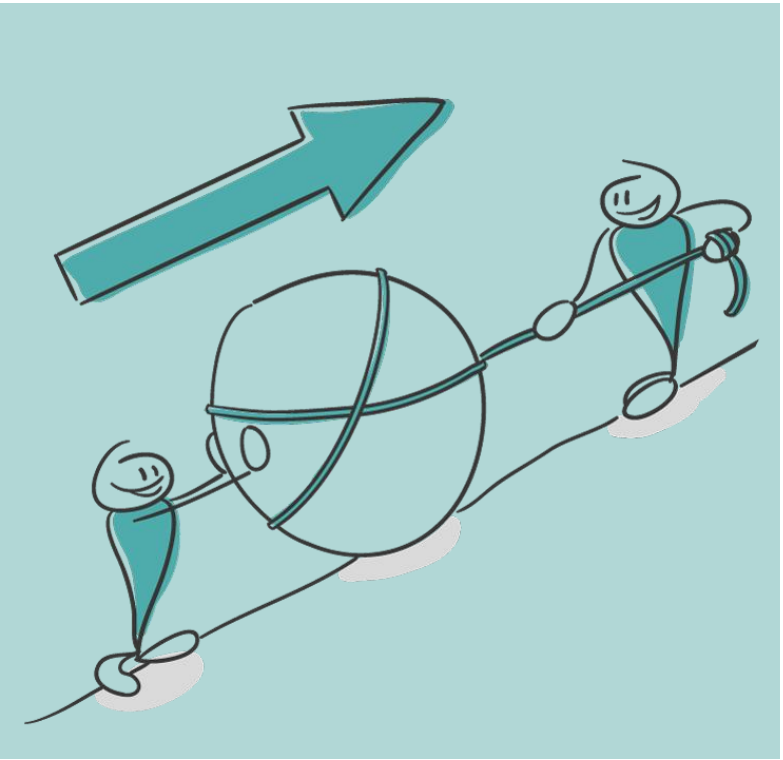
Releasing Rocks

AGIL INS ZIEL



Agile hardware & system development

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Can it really work and create value added?

Agile Tuesday March 13, 2018


What big challenge did you bring to this gathering?
What do you hope to get from this group/ community today?
What do you hope to give to this group/ community today?


It all starts with our VUCA-driven business world...
Volatility, Uncertainty, Complexity, Ambiguity

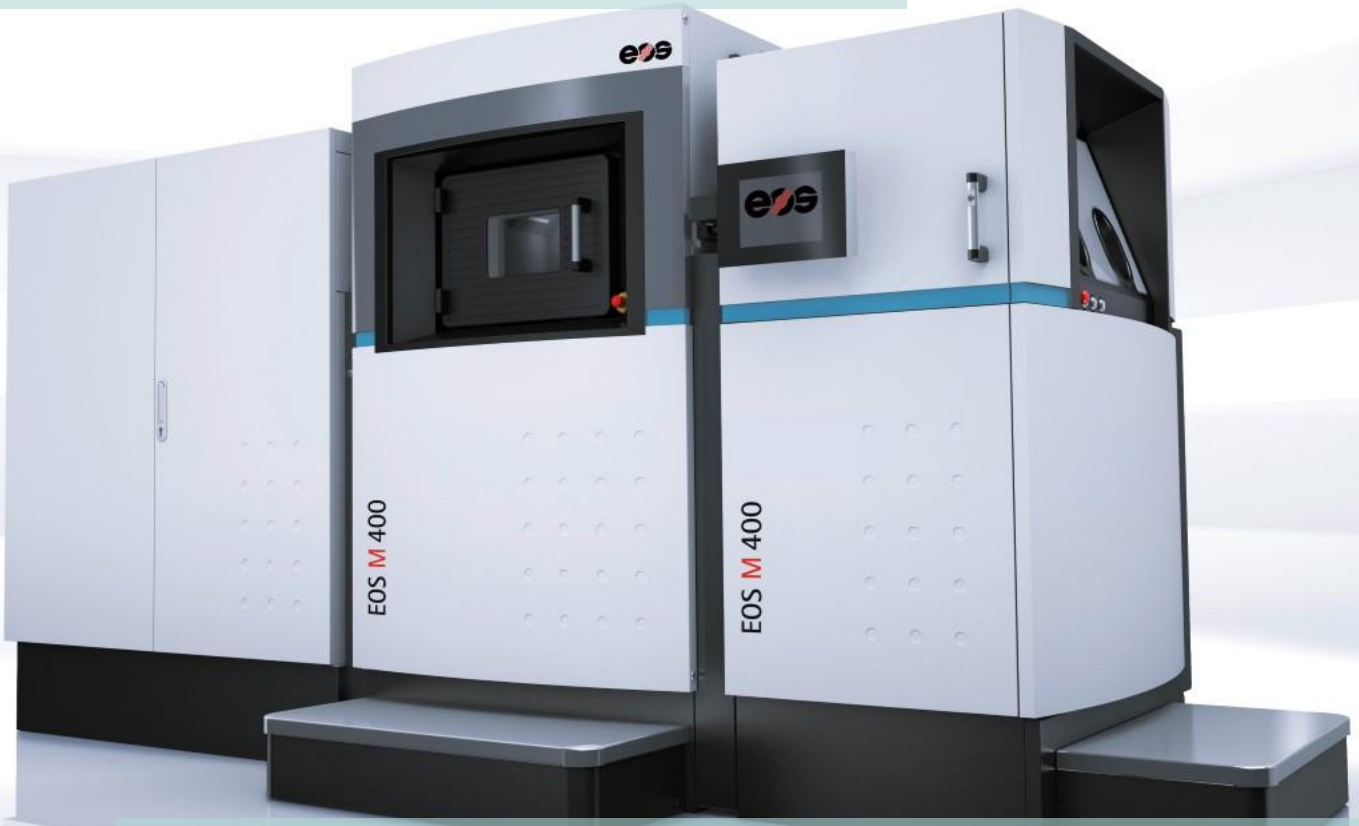
As a consequence companies typically want to become faster, cheaper, better with product development

For SW development „agile“ has become a proven lever to reach these goals

Company experience with „agile“ in SW development

Source: https://explore.versionone.com/state-of-agile/versionone-11th-annual-state-of-agile-report-2
SW: Software

But what about hardware and system development projects?

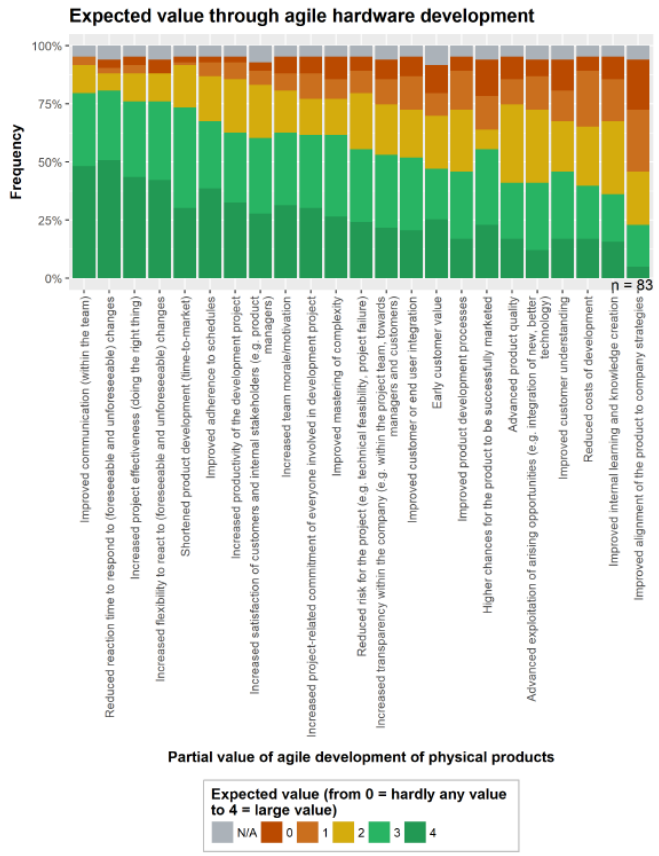


(System defined as complex, physical, mechatronic product, typically consisting of hardware and software components)

Source: www.eos.info

Not surprisingly companies have comparable goals for HW/ system development as with SW development when using „agile“

Expected value through agile hardware development



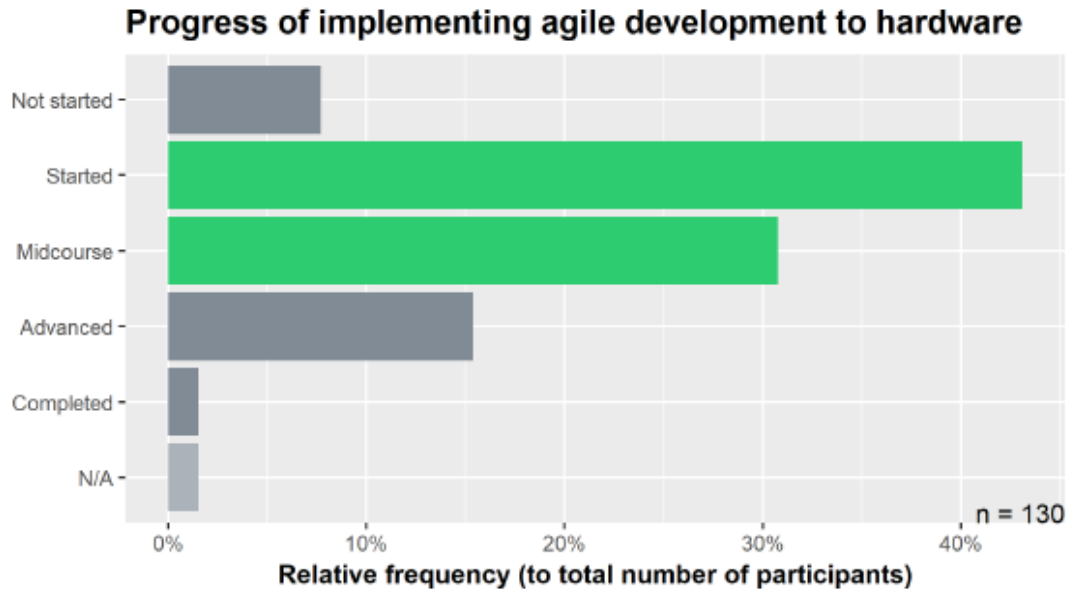
Key learnings

- Desired improvements through agile development are manifold.
- More than 75% expect agile development to improve communication, reaction time to changes, flexibility and project effectiveness.
- **Improved adherence to schedules, shortened time-to-market and increased productivity are among the Top 7. Expectations on agile development to have positive effects on classical KPI’s are relatively high.**

Source: Schmidt, Weiss, Paetzold: Agile development of physical products, 2018: p51/ 52, Fig 5.1
HW: Hardware, SW: Software

But most companies have little experience in „agile“ development of HW/ systems

Progress of implementing agile development to hardware



Key learnings

- **Most companies have little experience in agile development of physical products.**
- Some companies are much ahead of the bulk.

Source: Schmidt, Weiss, Paetzold: Agile development of physical products, 2018: p88, Fig 7.9
HW: Hardware, SW: Software

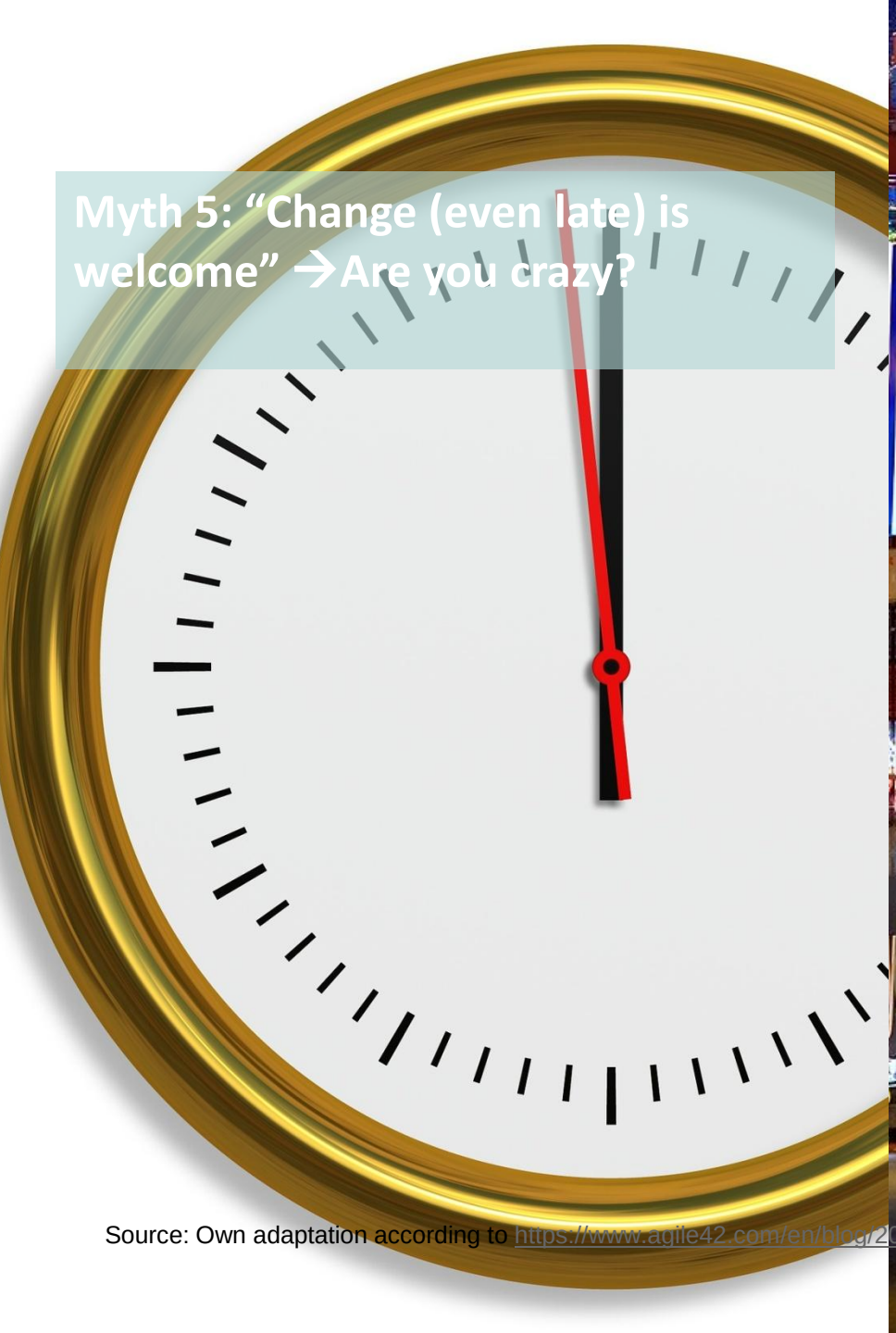

And are even hesitant to start applying “agile“ with HW/ system development as there are numerous myths...

Myth 1: We cannot have potential releasable functionality in 4 weeks or less!

Myth 2: There is too much diversity in the required skills for a cross-functional team…

Source: Own adaptation according to https://www.agile42.com/en/blog/2014/02/17/agile-embedded-software-development-whats-wrong-it/

Source: Own adaptation according to https://www.agile42.com/en/blog/2[illegible]/agile-embedded-software-development-whats-wrong-1/



Myth 5: “Change (even late) is welcome” →Are you crazy?

Myth 6: Lead time can be six to 12 weeks or far more… We are depending on our R&D- & production suppliers…

Source: Own adaptation according to https://www.agile42.com/en/blog/2014/02/17/agile-embedded-software-development-what-goes-wrong-it/

Myth 7: User Stories do not work for HW-/ system-development…

Myth 8: Quality- & safety requirements are much higher with HW and limit us much more…

Source: Own adaptation according to https://www.agile42.com/en/blog/2014/02/17/agile-embedded-software-development-whats-wrong-it/

Myths or not: What are your experiences and opinions?

Reflection

1. **Reflection in groups: Are the myths true or not?** 5 min
   - **What are your (practical) experiences?**
   - **What is your opinion?**

2. **Presentation per group.** 2 min.

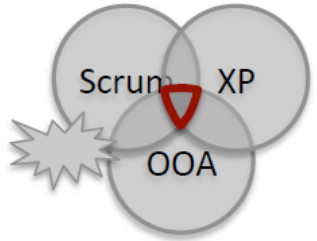
Initially, Agile methods such as Scrum etc. were conceived in and framed for software development.

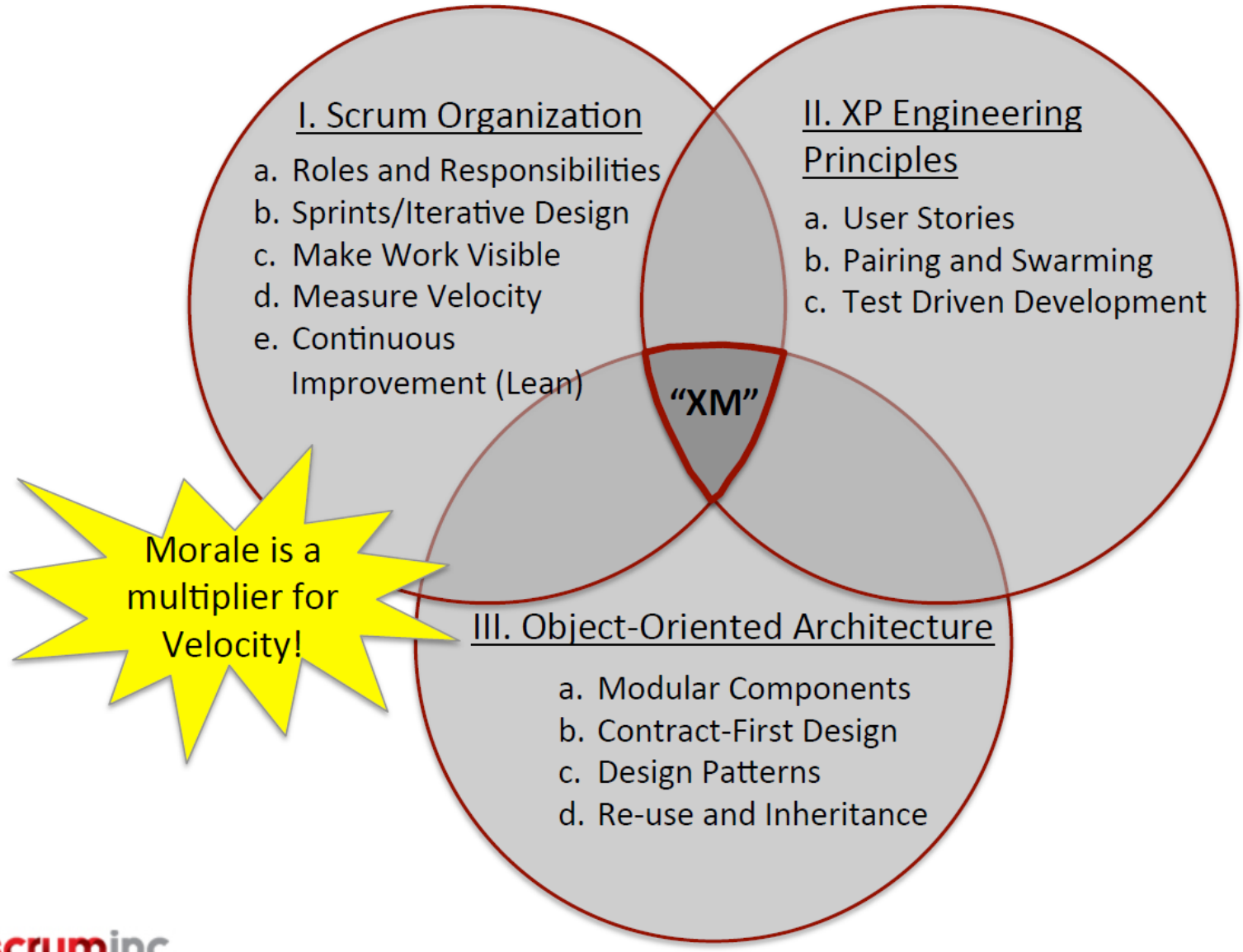
TRUMPF's experience shows that these methods need further development and adaption, need a certain scale of freedom and flexibility to live up to the differences in each products, solutions and markets.

Reiner Köttgen, Expert Agile Transition, TRUMPF GmbH & Co. KG

Source: Schmidt, Weiss, Paetzold: Agile development of physical products, 2018: pvi

How Wikispeed Did It: Extreme Manufacturing (XM)

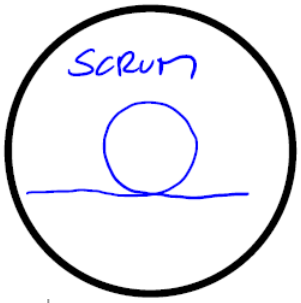




Our experience shows that at least 4 frameworks have to be orchestrated to make „agile“ development of HW/ systems work

Framework for „agile“ development of HW/ systems

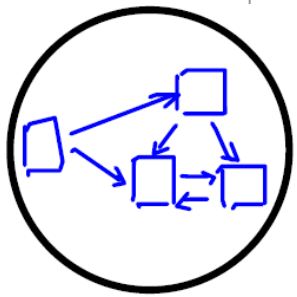
Scrum



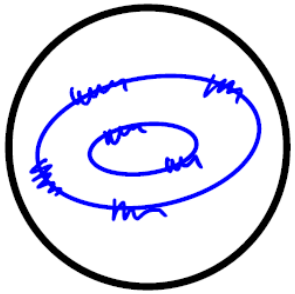
- Pillars: Transparency, Inspect & Adapt
- Values: commitment, courage, focus, openness and respect
- Roles
- Events
- Artefacts

Systems Thinking/ Engineering

- Modularity, Object-orientation
- Minimization of interfaces
- Minimal prejucing
- Incremental design/ “Piecemeal engineering”



Engineering-Principals

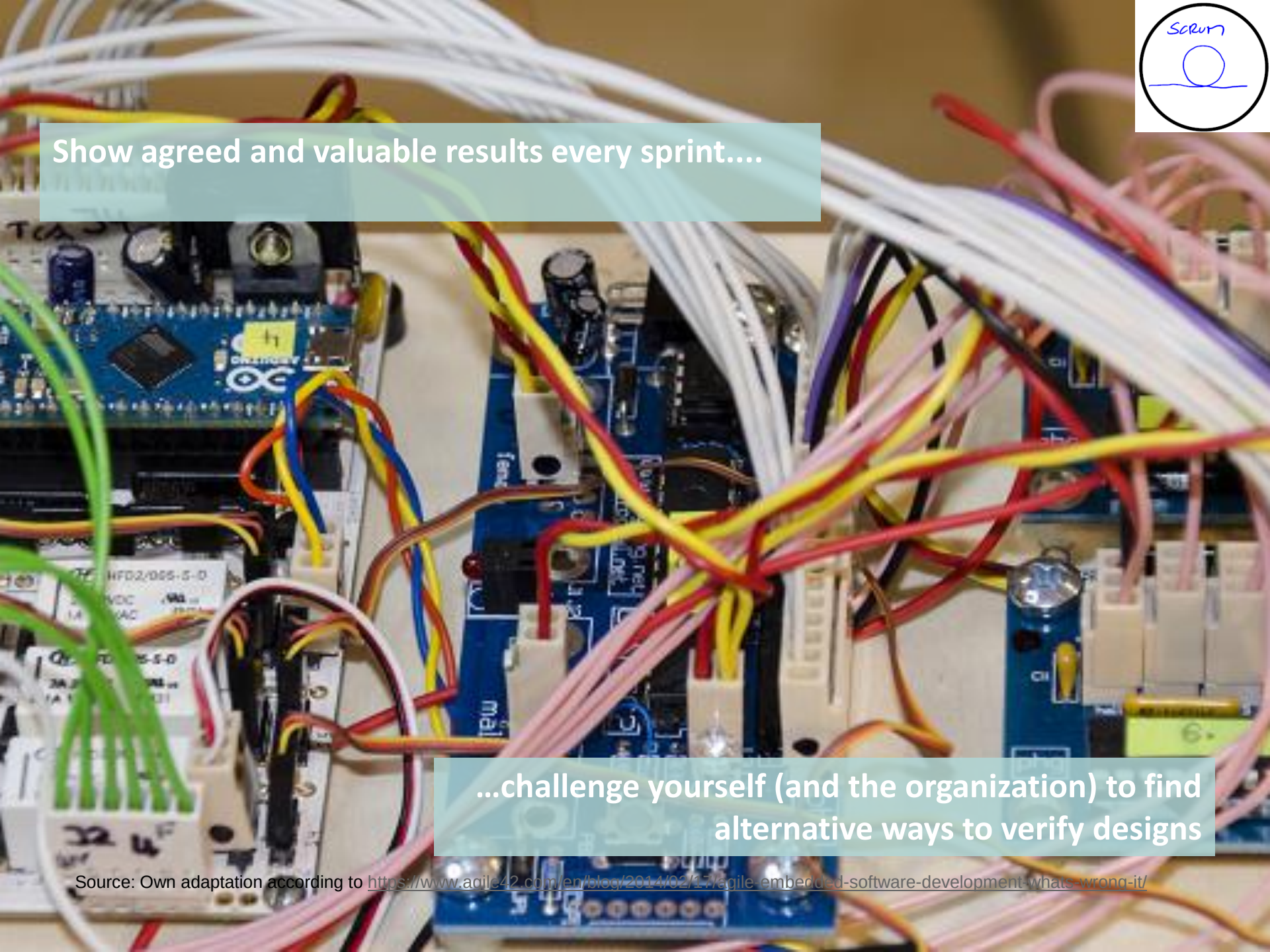


- User Stories
- Pairing & swarming
- Test-driven development
- Continuous integration/ deployment
- Collocation of teams

Supply chain management & “Wertschöpgungstiefe”

- In R&D (e.g. rapid prototyping)
- In production

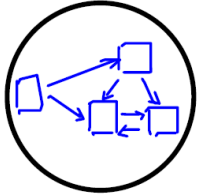
Source: Based on http://wikispeed.org/extreme-manufacturing/ with many new and own ideas



Source: Own adaptation according to https://www.aoiic42.com/en/blog/2014/02/17/agile-embedded-software-development-whats-wrong-it/

The more the team is cross-functional, the less you will have to deal with handover, reducing waste

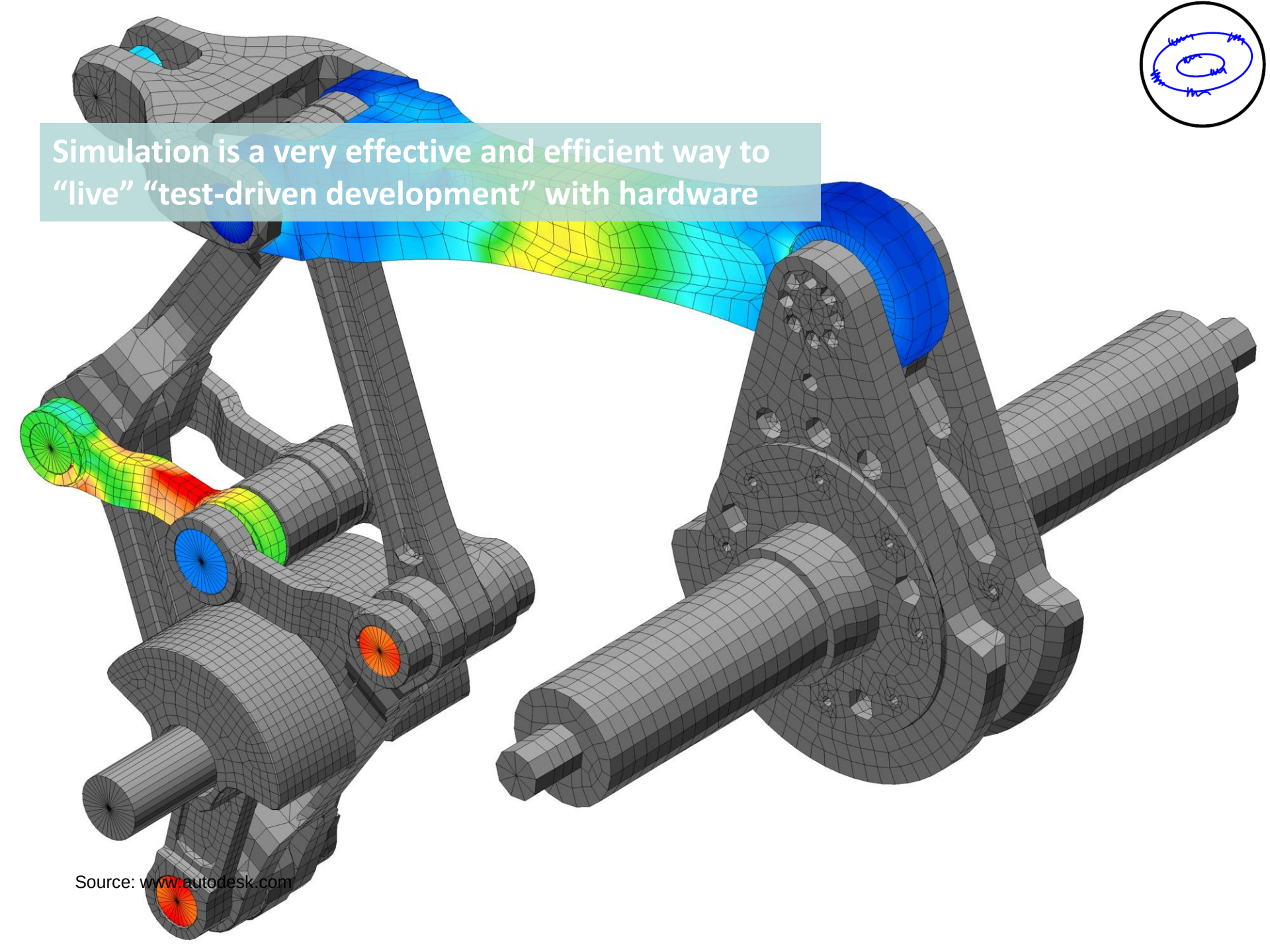
Source: Own adaptation according to http://www.agile42.com/en/blog/2014/02/17/agile-embedded-software-development-whats-wrong-it/



Modularization is important to enable self-organized teams with “vertical” responsbility

Source: VDI Wissensforum GmbH/Audi AG

...but please minimize interfaces


Simulation is a very effective and efficient way to
“live” “test-driven development” with hardware
Source: www.autodesk.com

Hardware Prototyping Tools: Microcontrollers

For applying continuous integration/ deployment there are plenty, but often unknown solutions on the market

BeagleBoard

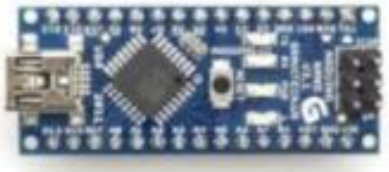
Open-source computer

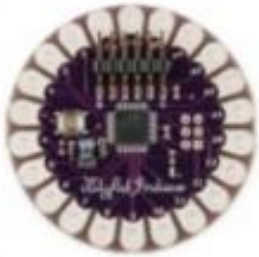
Raspberry Pi

Low-cost computer

Intel Edison

Make it Wearable!





Arduino

Intended for Makers

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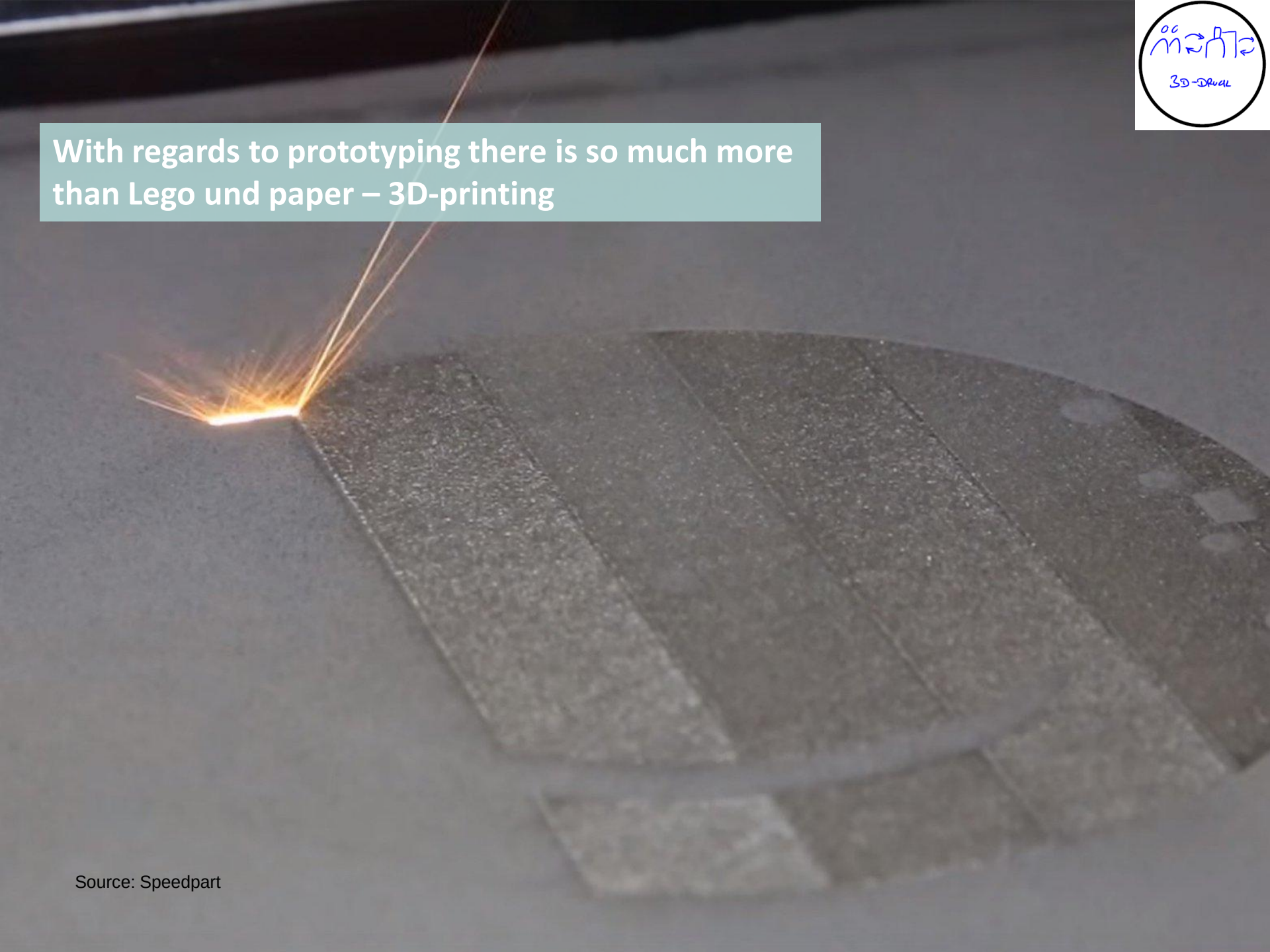
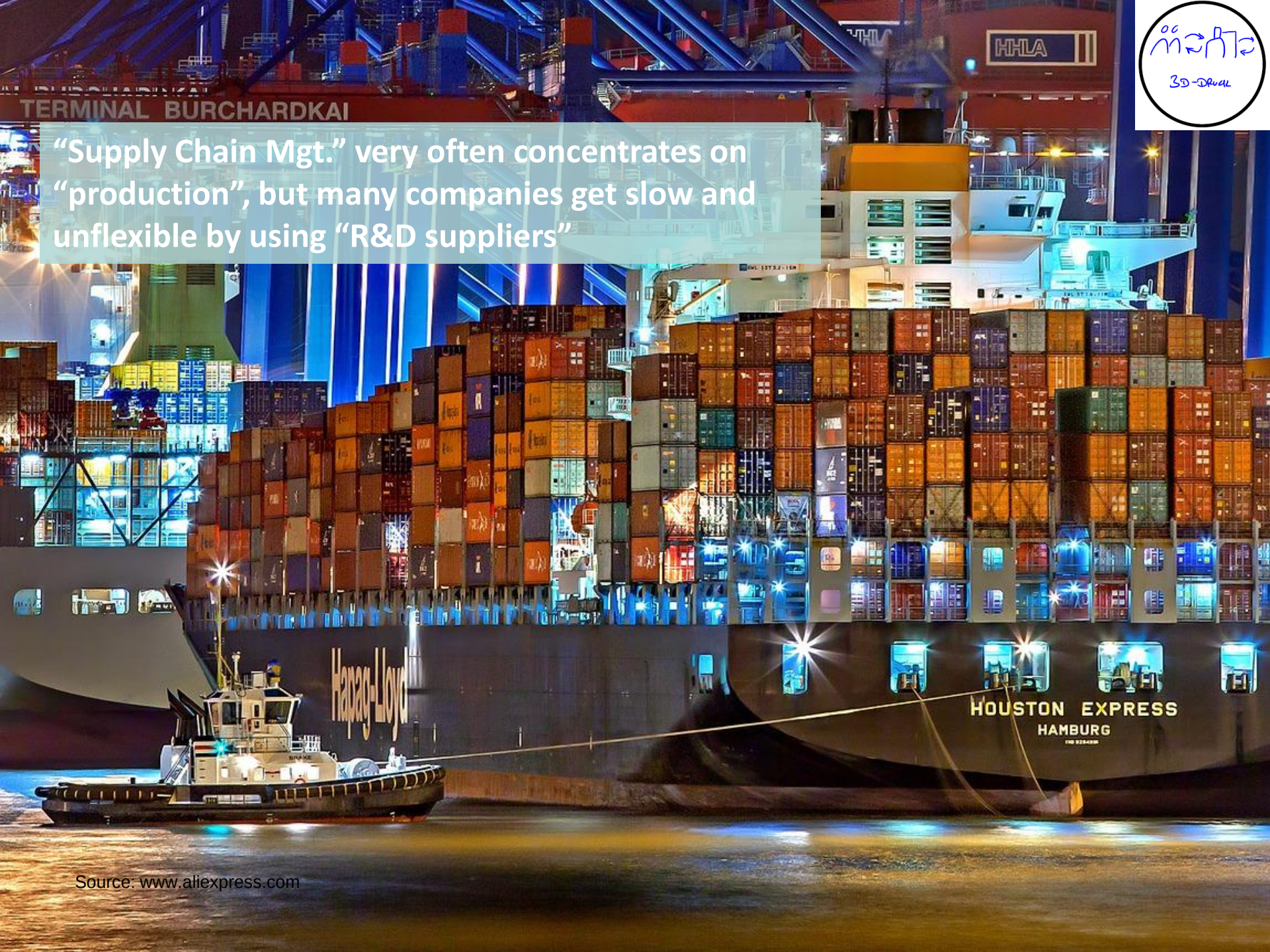
cover



Source: Speedpart

Source: www.aliexpress.com

Source: www.staedtler.de



“Supply Chain Mgt.” very often concentrates on “production”, but many companies get slow and unflexible by using “R&D suppliers”

Source: www.aliexpress.com

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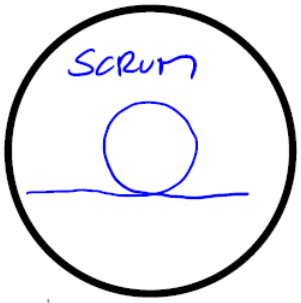

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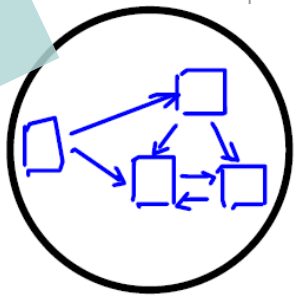

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What do you think?

Source: Based on http://wikispeed.org/extreme-manufacturing/ with many new and own ideas

What big ideas would you recommend?

1-2-4-ALL

1 **Silent self-reflection by individuals** on a shared challenge. 1 min

- **Did you work with one or more methods/ tools of the introduced framework in of your (last) agile Hardware-/ System development projects? Which exactly?**
- **Which positive / negative experiences can you share?**
- **What big ideas would you recommend?**

2 **Generate ideas in pairs**, building on ideas from self-reflection. 2 min.

3 **Share and develop ideas from your pair in foursomes** (notice similarities and differences). 4 min.

4 **Ask, "What is one idea that stood out in your conversation?"** Each group shares one important idea with all (repeat cycle as needed). 5 min.