



Agile Development of Physical Products

History, Advantages, Framework, Peculiarities, Transformation

CO-Improve Consulting has 22 years of consulting experience and is the specialist for agile transformation in the manufacturing industry



Changing conditions require new forms of leadership and methods to work



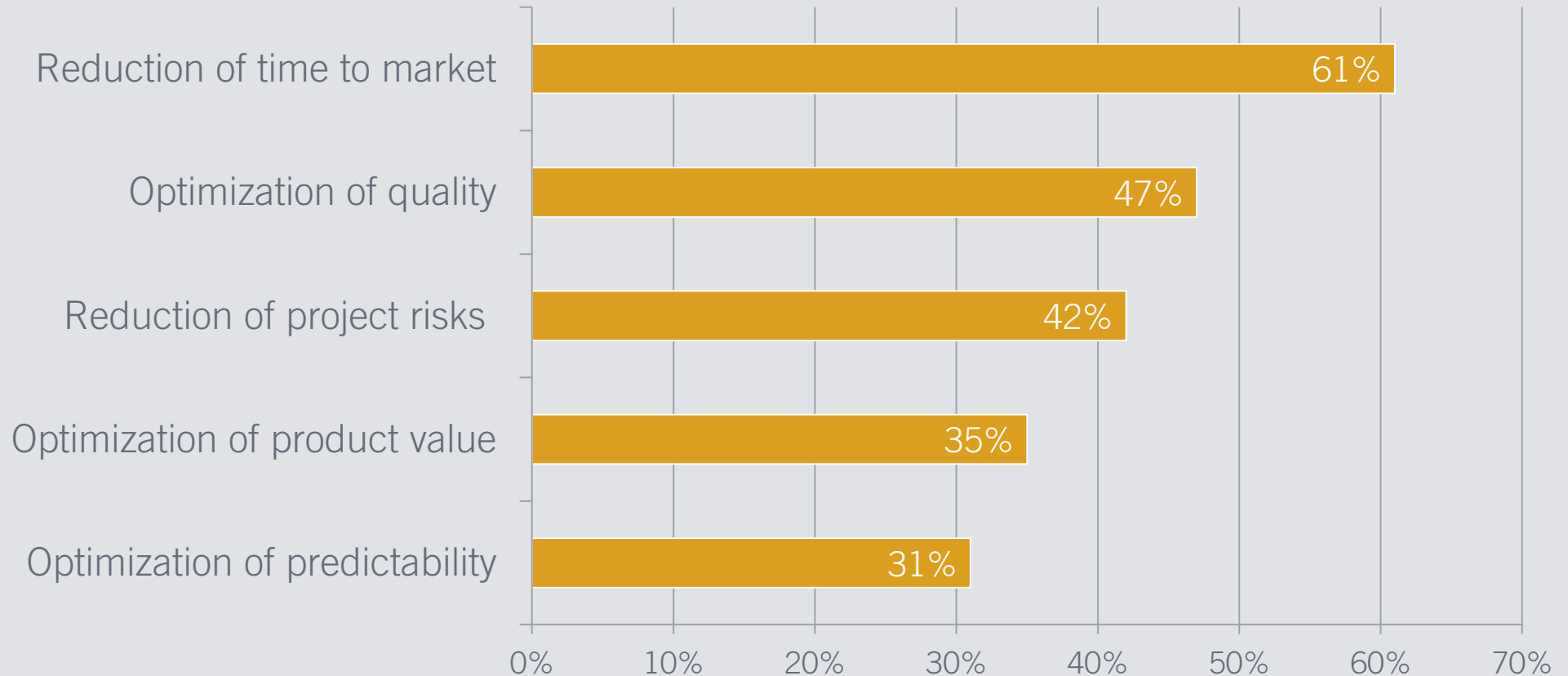
S	table	The environment is changing slowly
S	ecure	Changes are predictable
E	asy	Problems are relatively simple and solutions are well known
E	xplicit	Reality is certain



V	olatile	The speed of changes is increasing continuously
U	ncertain	Predictability is decreasing, changes are normal
C	omplex	Problems are no more linear, including complexly connected variables
A	mbiguous	Reality is uncertain

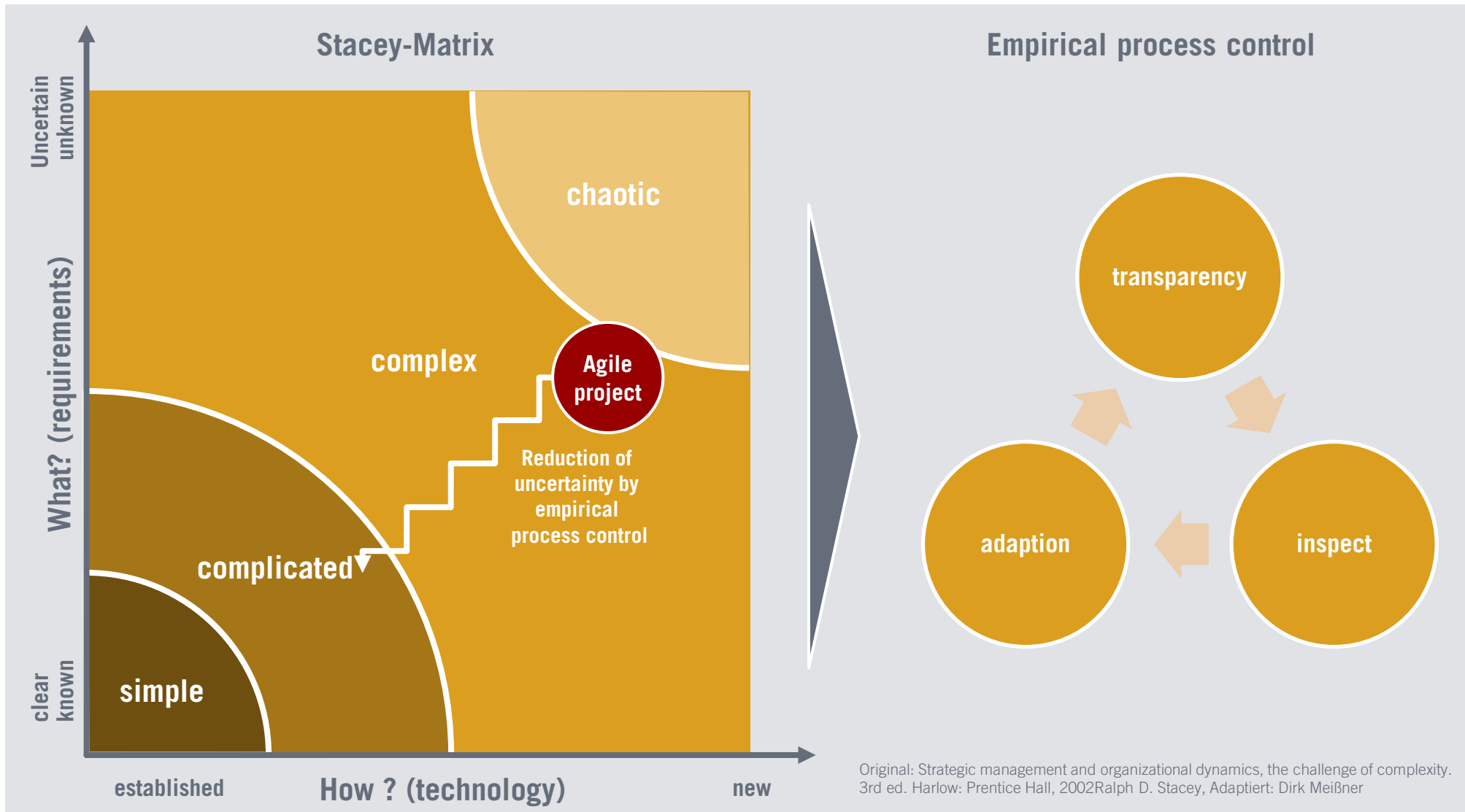
Reasons for the application of agile methods

Why has your company decided to work with agile methods?



Source 3. Study on the success and application of agile methods, Hochschule Koblenz, Prof. Dr. Ayelt Komus, 784 answers
<http://www.status-quo-agile.de>

Agile methods react with adaptive planning and empirical process control on increasing speed of changes and uncertainty in complex environments



The historical roots of Scrum go back to successful development of physical products in Japan

The development of agile methods is based on
the publication of

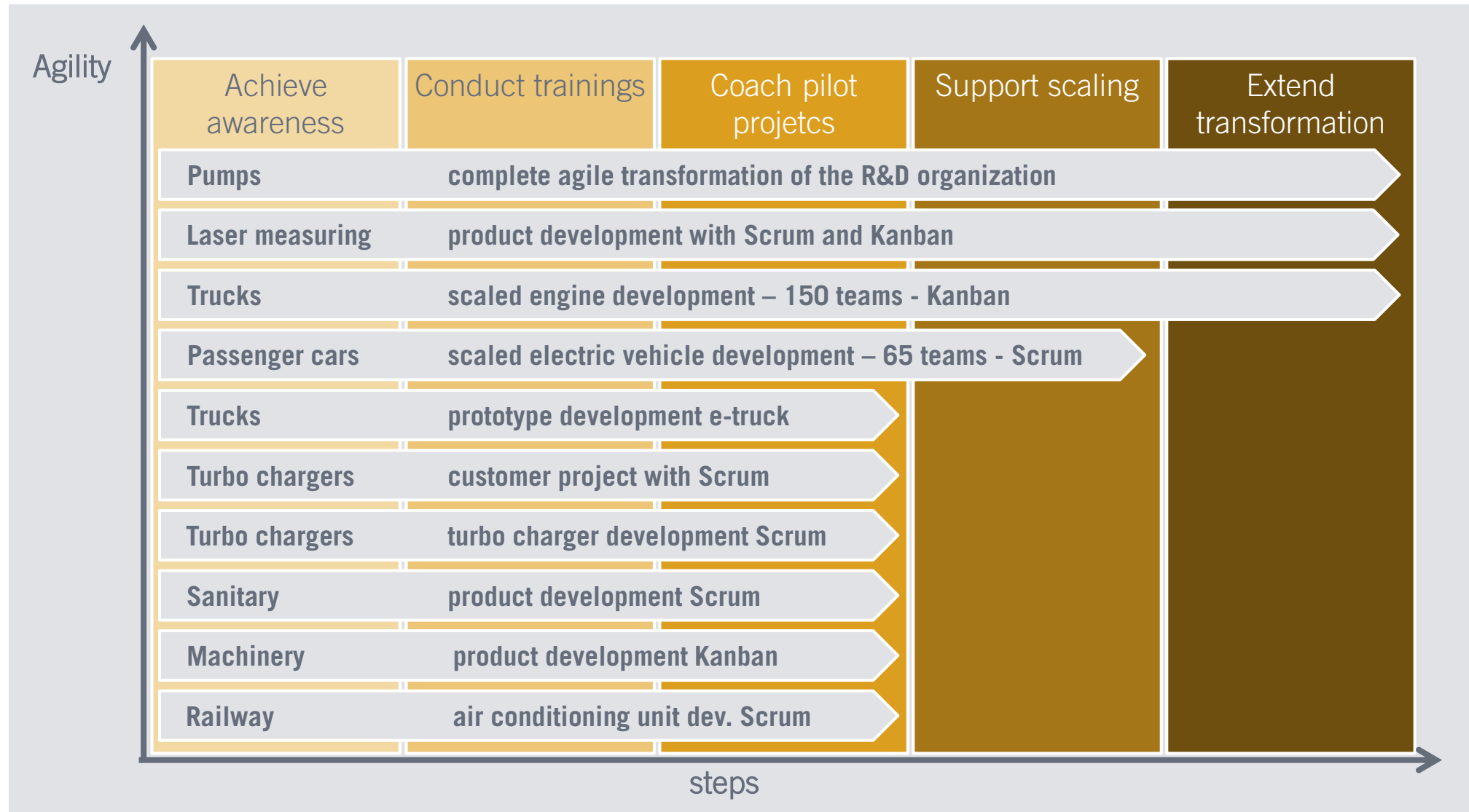


in the Harvard Business Review in 1986
“The New New Product Development Game”

Takeuchi/Nonaka called the success factors of the participating companies „Rugby Approach“ or „Moving the SCRUM Downfield”



Today the agile development of physical products is a common practice
 Selected agile transformation projects with our customers



Case Study 1: Complete Vehicle Development of an e-truck



Impossible Order
of the Board



We have nothing to loose
but much to win
Let`s try Scrum



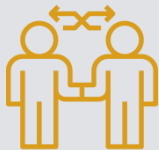
1 PO, 1 SM
10 developers
of different hierarchy levels



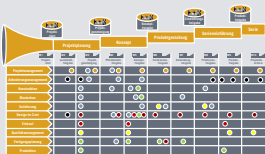
Own team
space



Sprint length
4 weeks



Agile cooperation
with development
service provider



Permission to
reduce
the PEP



decision-makers
are weekly
on the project area



Minimal
reporting
effort



Realization in
24 instead of 60
months

Case Study 2: Agile Transformation of the entire engineering organization



Agile Awareness
In executive board
January 2016



Step 1
Product family as
Scrum Pilot
April 2016



1 PO, 1 SM
Hydraulics, mechanics, firmware, electronics



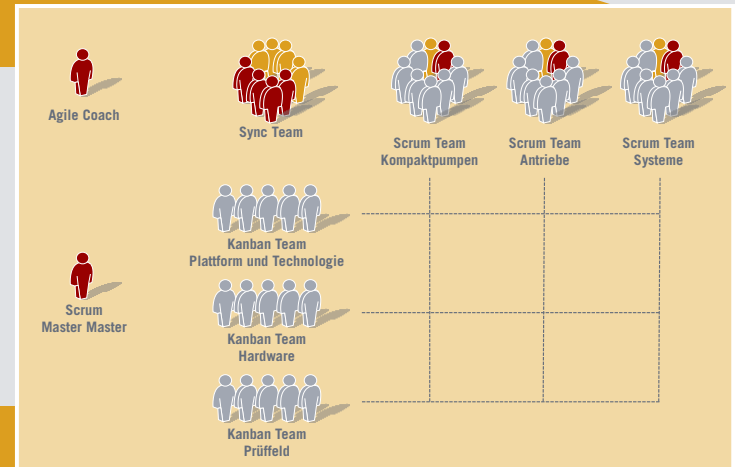
Sprint length
4 weeks



accompanying
team and
individual coaching

Step 2

Conversion of the whole
Product range of
“pump systems” and “drives”
until September 2017
3 Scrum teams, 3 Kanban teams
in one location



Step 3
Rollout on
all locations
until march 2018



Advantages

- Shorter development times
- Better fulfillment of market requirements
- by
- High transparency
- Open dealing with problems
- Reduction of technical debt

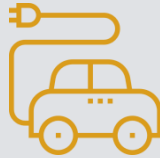


Step 4
Rollout outside
development
from June 2018

Case Study 3: Scaled Scrum to develop a new e-passenger car family



Announcement
to become agile
by the CEO
in Sep 16



The e-car project
was most appropriate
due to it's complexity



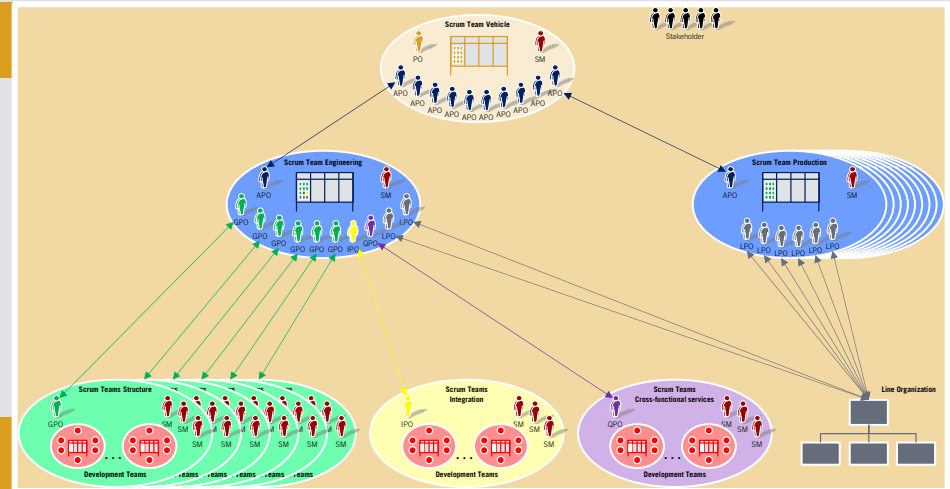
A cross-functional team
derived the
suitable scaled approach
Nov 16 – Jan 17



Completely new
“fancy” project area



Sprint-length
2 weeks



Scrum teams were
established in
several waves
4 → 50
Jan 17 - today



decision-makers
CTO+1
are bi-weekly
on the project area

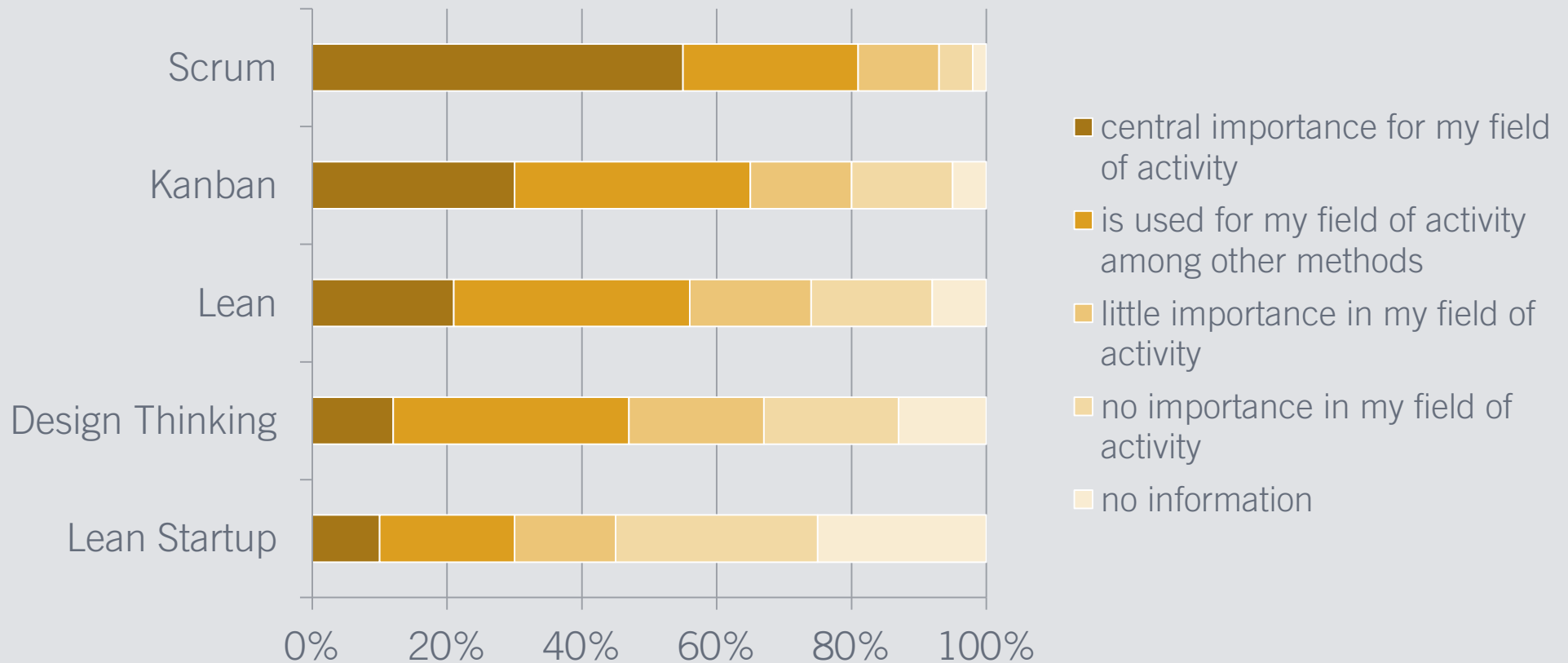


Advantages

- Shorter reaction times
- Better fulfillment of market requirements by
- High transparency
- Cross-functional co-operation
- Faster decisions

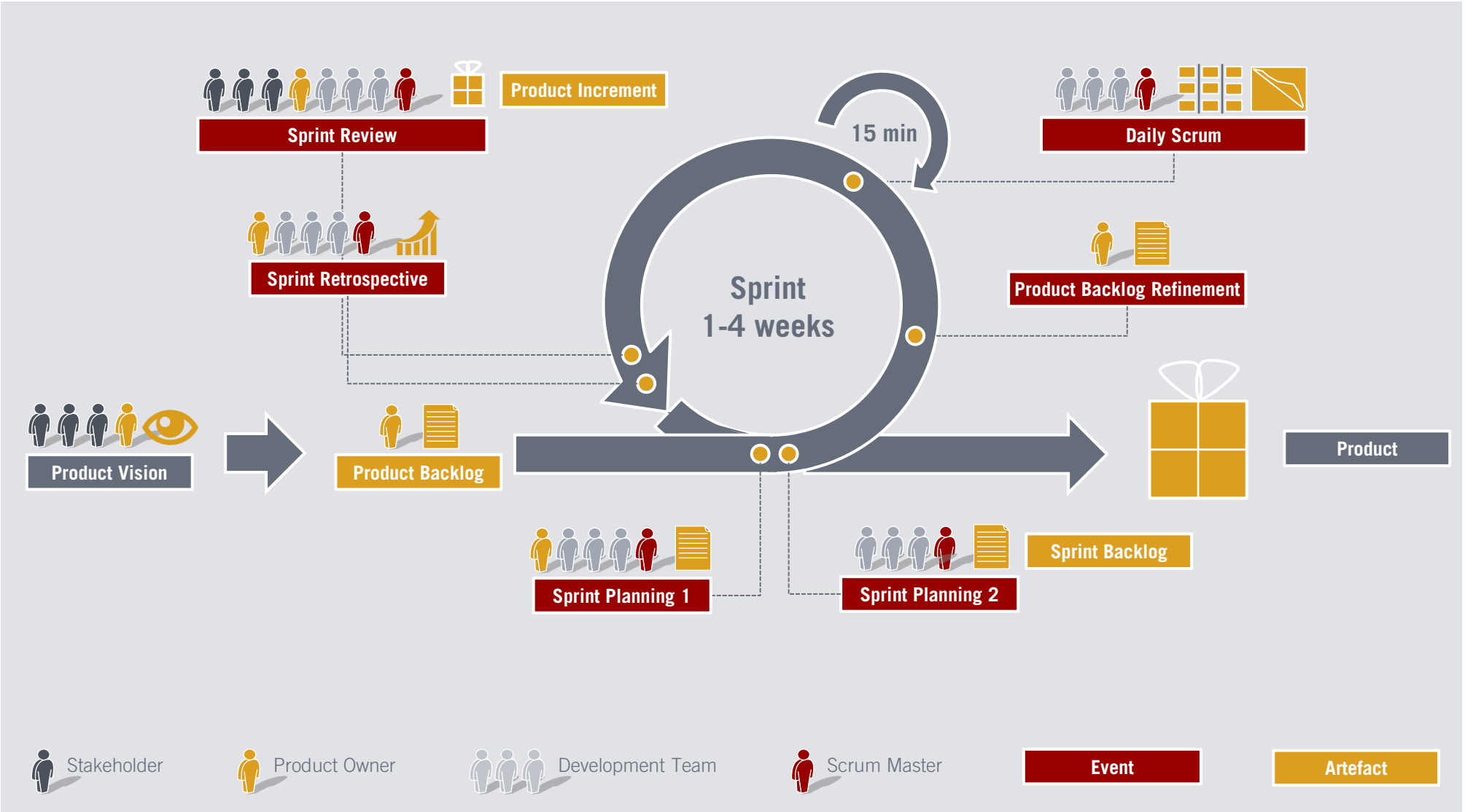
Scrum is the most important agile method

What significance do the respective methods have for your area?



Source 3. Study on the success and application of agile methods,, Hochschule Koblenz, Prof. Dr. Ayelt Komus, 240 answers for non-IT
<http://www.status-quo-agile.de>

The Scrum Framework can be applied to the development of physical products without any changes



5 reasons for the superiority of agile product development



Meeting customer needs in a volatile world

through short-cycle, regular feedback from customers and stakeholders



High effectiveness and value enhancement

through consequent prioritizing



Shorter Time-to-Market and schedule reliability

Through focus, commitment and faster decisions



High transparency

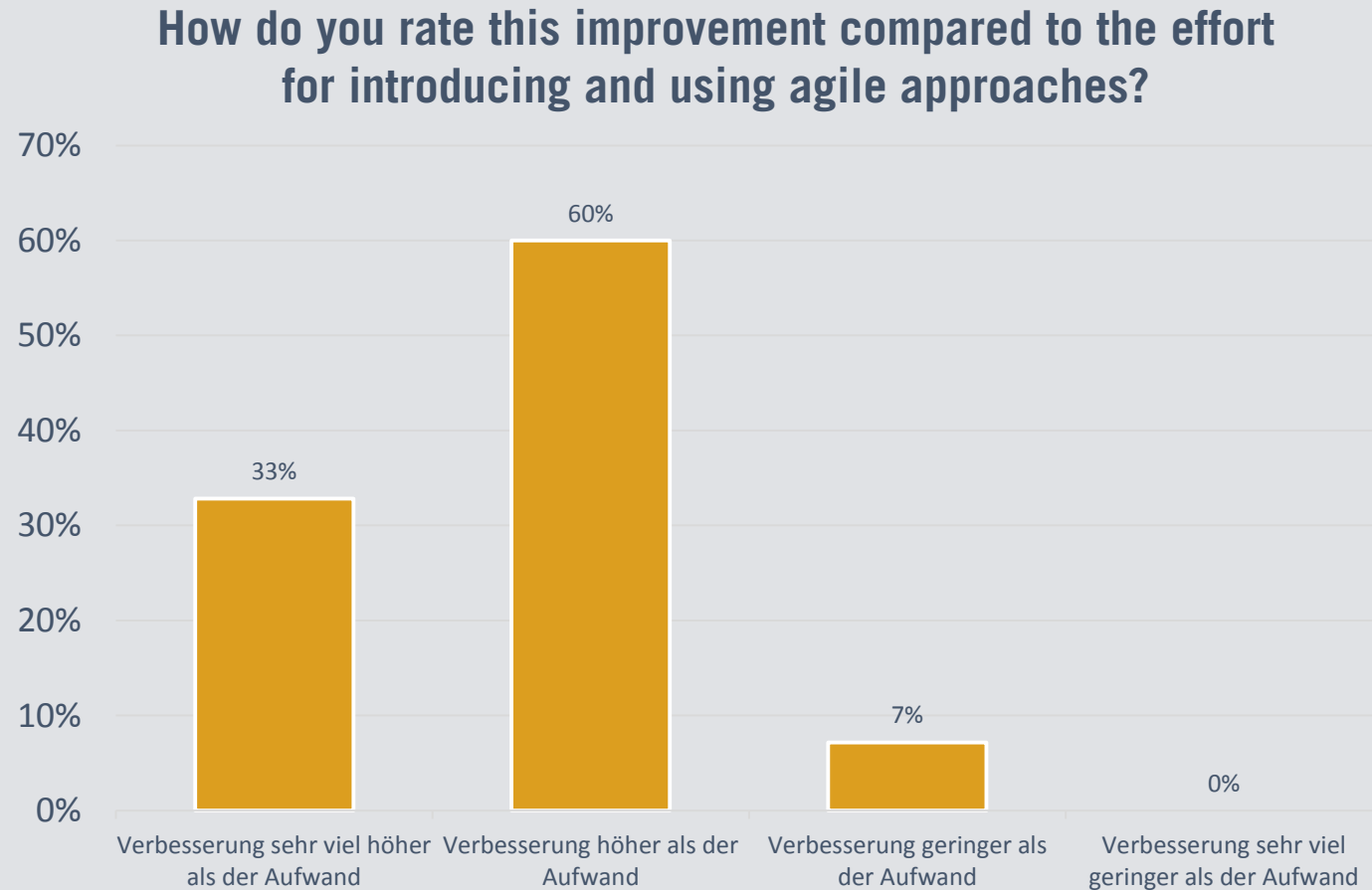
through defined events, open information and more personal responsibility



Efficiency increase

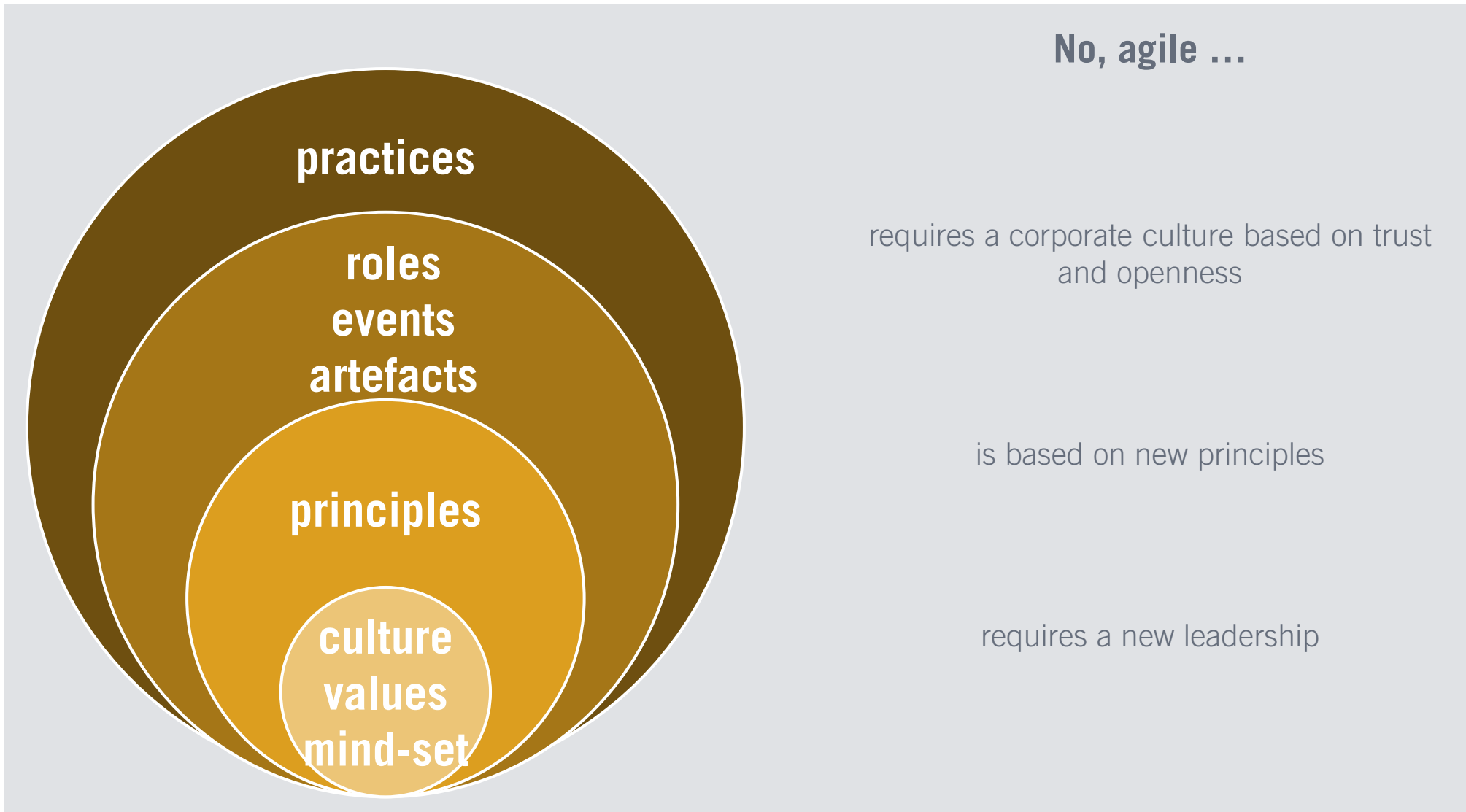
through continuous improvement

The benefit / expense ratio is predominantly positive

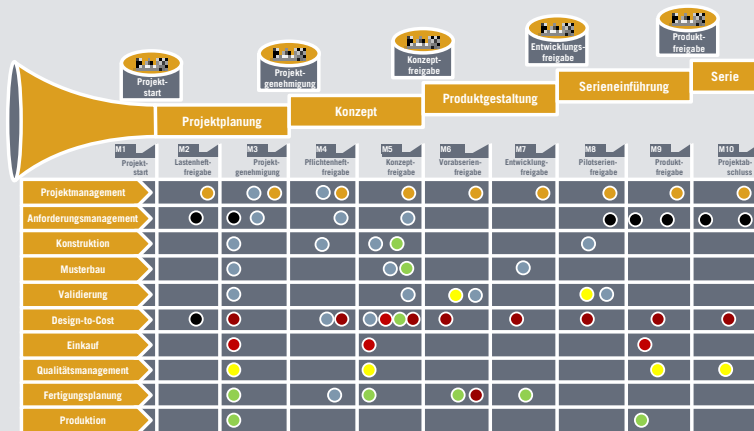


Source: 3. Study on the success and application of agile methods, Hochschule Koblenz, Prof. Dr. Ayelt Komus, 195 answers for non-IT
<http://www.status-quo-agile.de>

Misunderstanding 1: Agile is just a new project management method

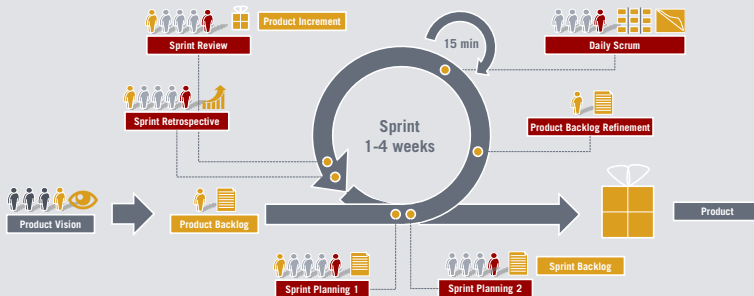


Misunderstanding 2: Agile works without processes



No, ...

We continue to apply our individual process elements, methods and tools and also comply with regulatory requirements



but, ...

we do not create complete specifications at the beginning of a project, disintegrate the sequential stage-gate systematic and work cross-functionally and incrementally according to value-oriented priorities

Misunderstanding 3: We have to deliver a „Potentially Shippable Increment“ at the end of every sprint



No, ...

we deliver something “complete” to which our customers and stakeholders can give feedback.

this may also be virtual models, simulations or rapid prototypes.

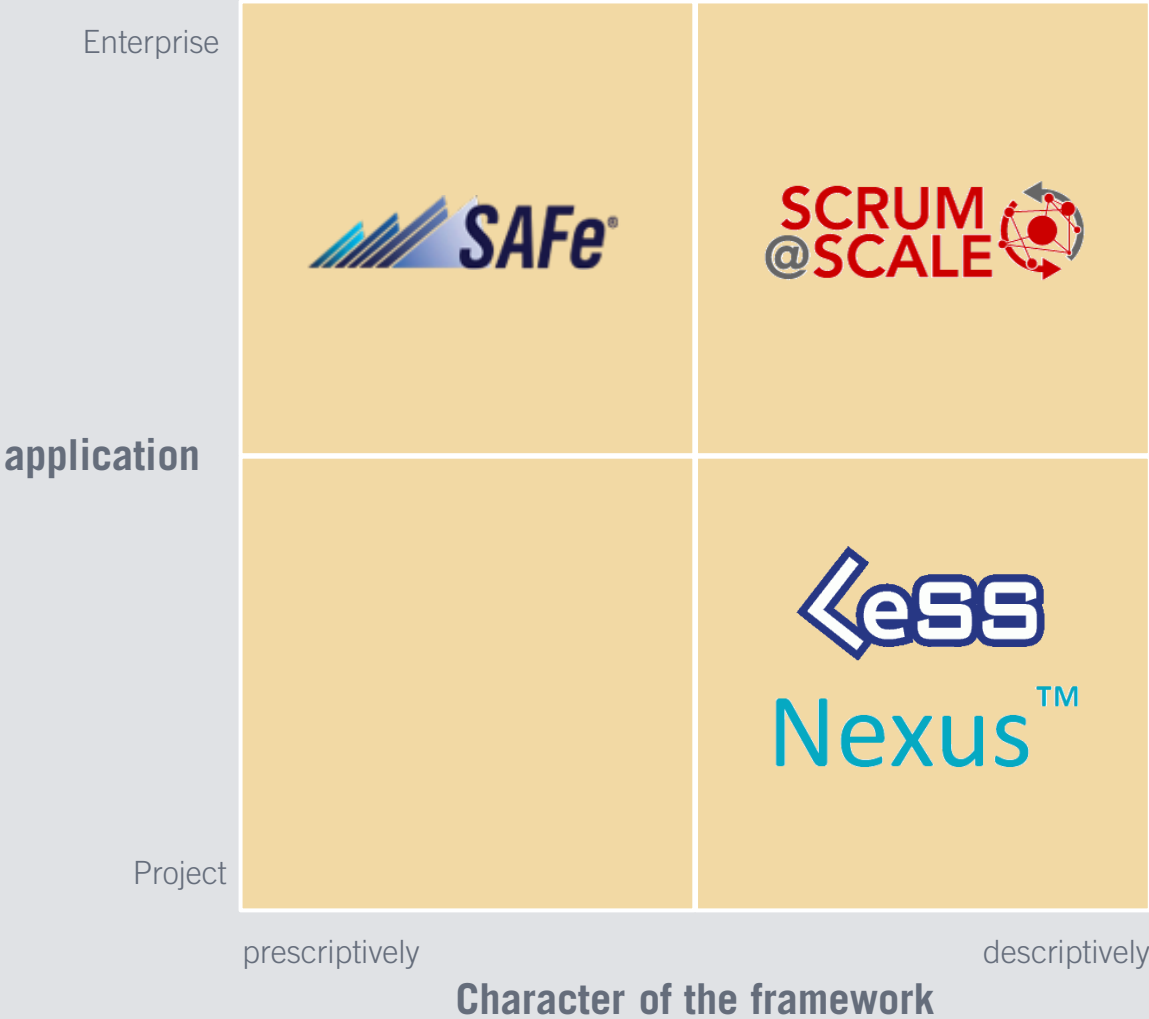


virtual development methods, 3D printing and augmented reality help us demonstrate product increments earlier than ever before.

5 special challenges of agile product development of physical products

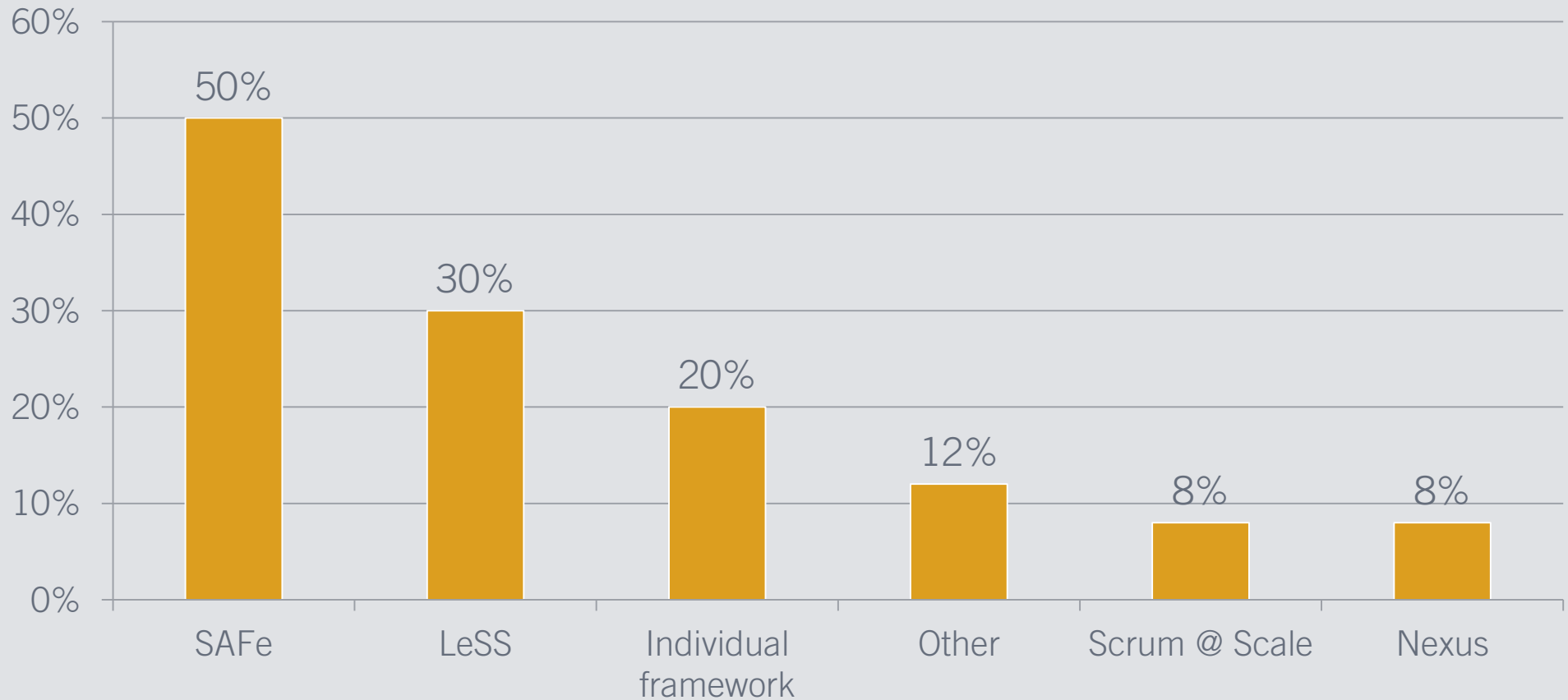
Product Increments	Results are initially never working potentially deliverable results.	Virtual models, simulations or rapid prototypes also provide valuable feedback and directional decisions.
Matrix organization and specialization	Cross-sectional areas ensure standardization and synergies. Experts can not be assigned to 100% individual Scrum teams.	Then we organize cross-sectional areas with Kanban and also let product-oriented Scrum teams work with them agile.
Cross-functional teams	Product development does not only require development engineers.	That's why we also integrate purchasing, industrial engineering and other non-development disciplines into the Scrum team.
Huge projects	Complex physical products can not be developed by one Scrum team.	No problem! There are different Scaling Frameworks like SAFe, Scrum@Scale, LeSS or Nexus
Integration to every Sprint	Scrum requires integrated results for every sprint review.	virtual models and consistent modularization in the prototype phase help to integrate earlier.

Scaling frameworks range from large projects with 70 employees (LeSS) to the entire company with all levels (SAFe or Scrum @ Scale)



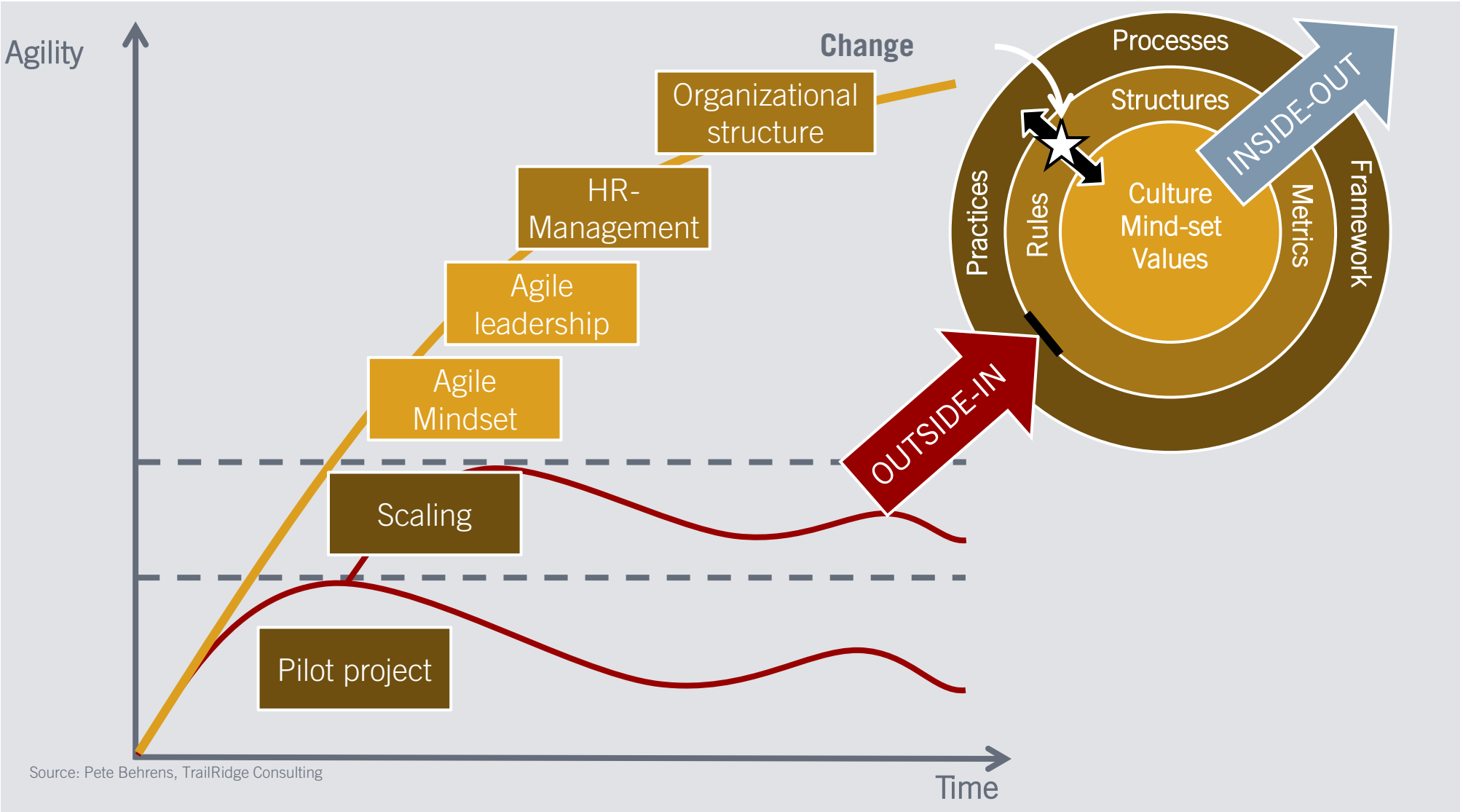
SAFe is the most used Scaling Framework in the DACH region

What kind of Scaling Frameworks are in use in your business?

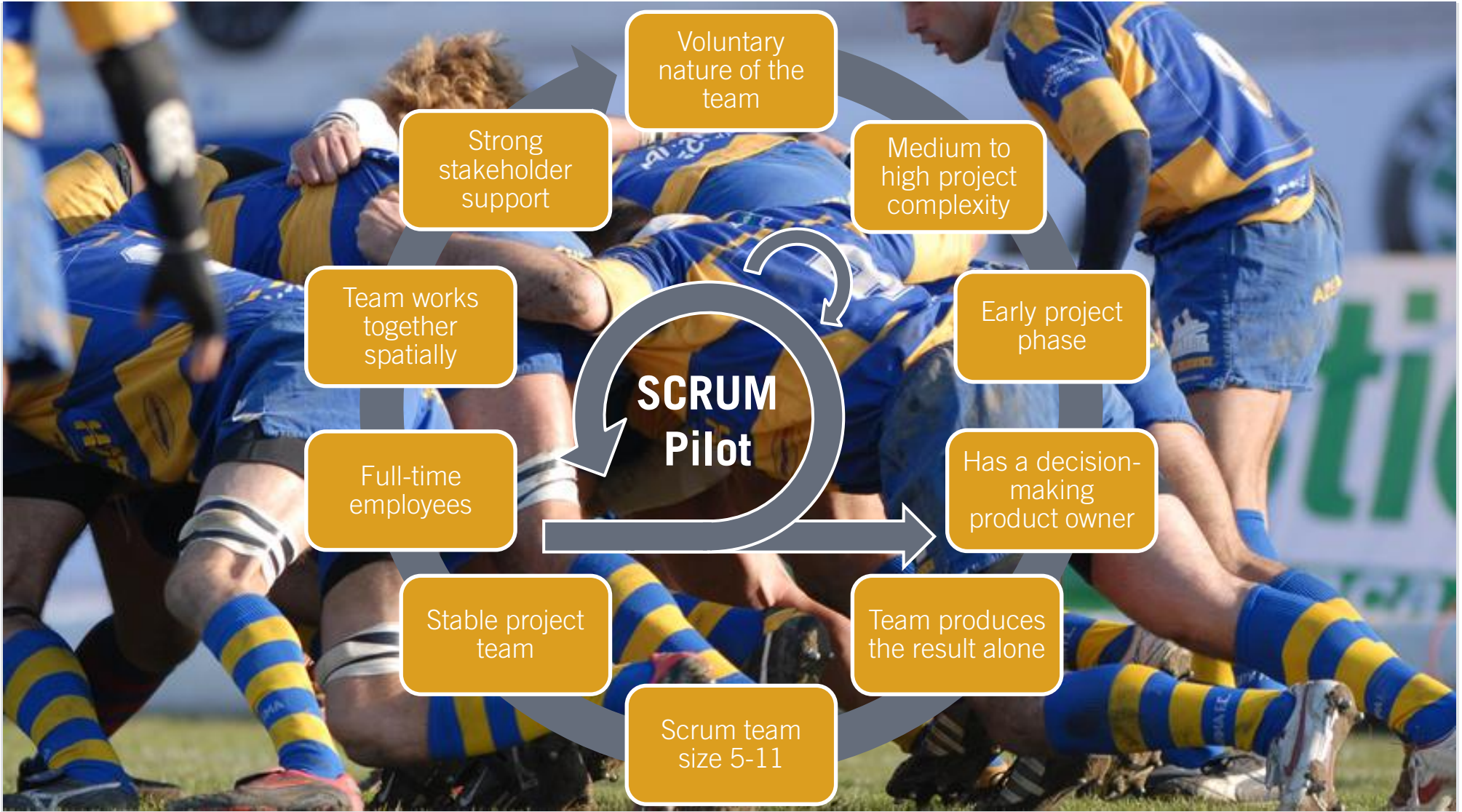


Source: 3. Study on the success and application of agile methods, Hochschule Koblenz, Prof. Dr. Ayelt Komus, 131 answers
<http://www.status-quo-agile.de>

The agile transformation must come from the outside and from the inside, and change structures and rules sustainably



Criteria for the selection of the ideal SCRUM pilot project



Meet us at the **agile@hardware** conference on September 24th/25th



The conference for novices and experienced practitioners from R&D, HR, organizational development

Case Studies, Tutorials and Workshops about the concrete application of agile methods in the manufacturing industry and the development of agile structures and cultures as swarms organization or Sociocracy 3.0



<http://www.co-improve.com/events/agilehardware-konferenz/agilehardware-2018.html>



Agile Learning Visits for executives and practitioners

One concrete agile Case Study including the visit of the working areas and direct conversation with managers, product owners, scrum masters and development teams



<http://www.co-improve.com/events.html#agilelearningjourneyscap>

9 hints for the agile transformation

1. Perform agile transformation agile.
2. Implement a cross-functional agile transformation team.
3. Agile ways of working have to be experienced, start with a pilot area or pilot project and generate quick visible results.
4. Parallel to the implementation of the framework also work on a change of the mind-set from the beginning.
5. Start the mind-set change top down.
6. Use Scrum and Scaled Scrum only for complex business units or projects, use Kanban for simpler topics and in cross-sectional areas.
7. Start with an implementation of the frameworks "by the book", adapt with the retrospectives.
8. Occupy new roles only by competence, consistently remove old roles.
9. Start with physical scrum boards and switch to digital tools later.



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