Upscaling digital STEAM innovations in schools

Mart Laanpere

Professor of mathematics & computing education

Centre for Educational Technology

Tallinn University, Estonia

Educational statistics of Estonia

Number of schools: 530, including:

- 351 basic schools (grades 1-9)
- 143+21 secondary schools (grades 1-12 or 10-12)

50% of high schools have <100 students

Number of students (K-12): 143 713

Number of teachers (K-12): 14 581

Population: 1.3 Million

Size: 45 227 km²

Capital: Tallinn (pop. 450 000)

Official language: Estonian

Ethnic Estonians: 69%

Member of EU, NATO: since 2004

Inf**ormation society index**:
#1 in Europe (public e-services)

Strong ICT sector (employs 5,3%)

The startup nation: the highest number of IT-startups, Skype

Home of EU IT Agency & NATO CDC

STEM vs STEAM

- STEM: Science, Technology, Engineering, Mathematics
- Inspired by concern of math & science teachers on "the lost battle for students' souls"
- Opposing to humanities and arts
- Nostalgy for "good old time" when math & science were more important and "sexy"

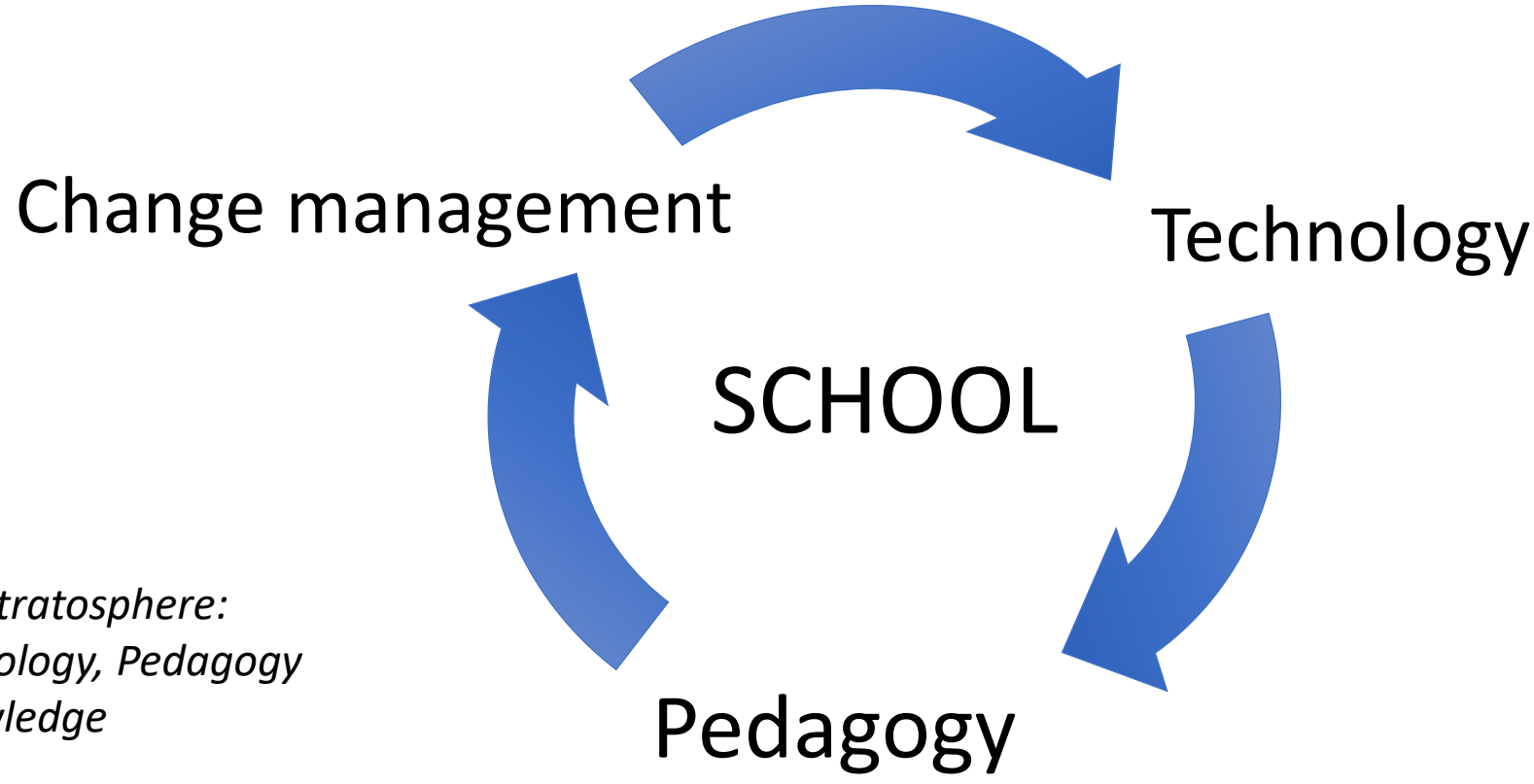
- STEAM: Science, Technology, Engineering, Arts/All, Mathematics
- Inspired by the ideas of wholistic education: in real life, everything is integrated and contextualised
- Embracing all subjects
- Looking for the future, experimenting with new teaching & learning strategies

Creative project work in Estonian curriculum

- Compulsory in 8th grade, runs from October til April
- Students select their own topic
- Supervised by a teacher or adult from outside school
- Usually implemented as a collaborative project
- Public presentation
- Examples: film review web site, silver cleaning tutorial, viking-age iron casting, viking boat model, concert,
- Digital creative project: pre-defined strands (VR, AR, IoT, robotics, coding, multimedia), joint online platform (Trello-like Taiga): smart phone app prototype, Living Library with AR, SmartPlant with IoT

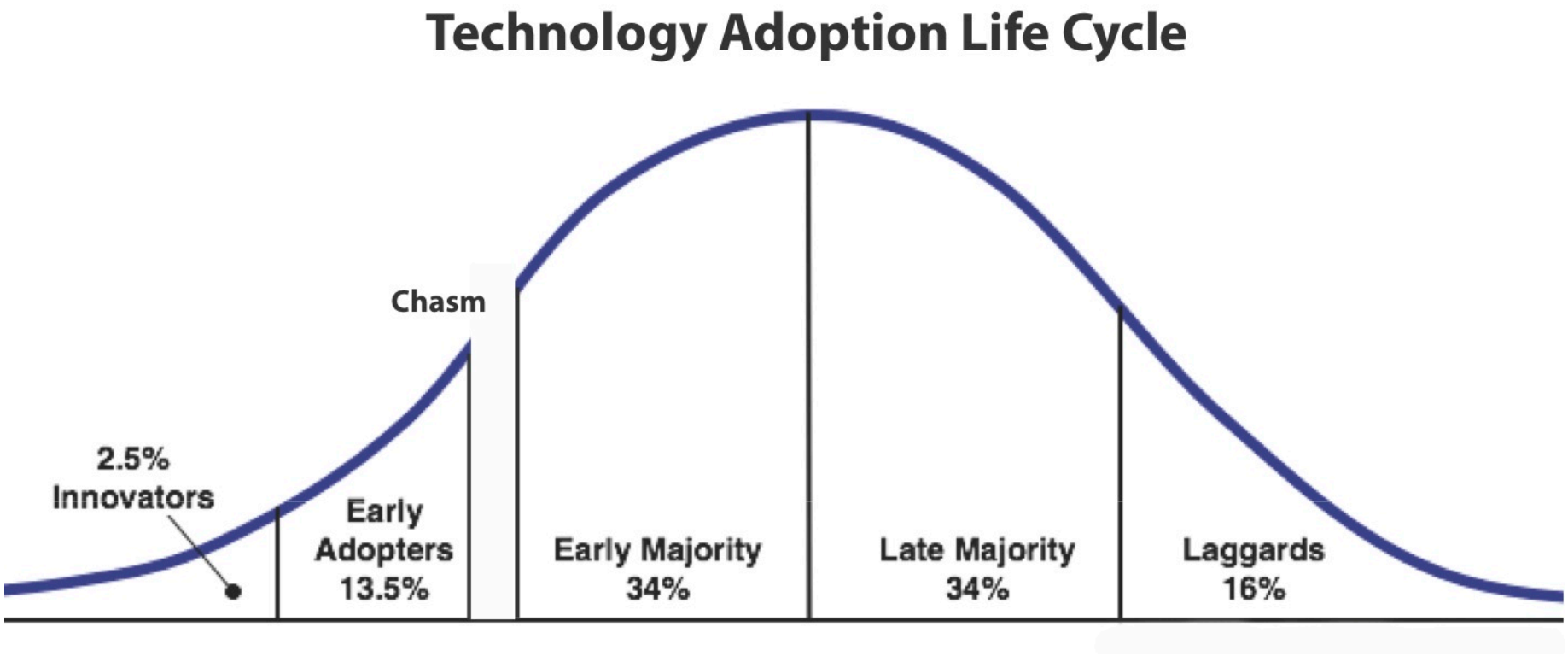
Implementing the STEAM innovation in schools

Successful educational innovation requires combination of three forces on the school level:



M.Fullan (2013) Stratosphere: Integrating Technology, Pedagogy and Change Knowledge

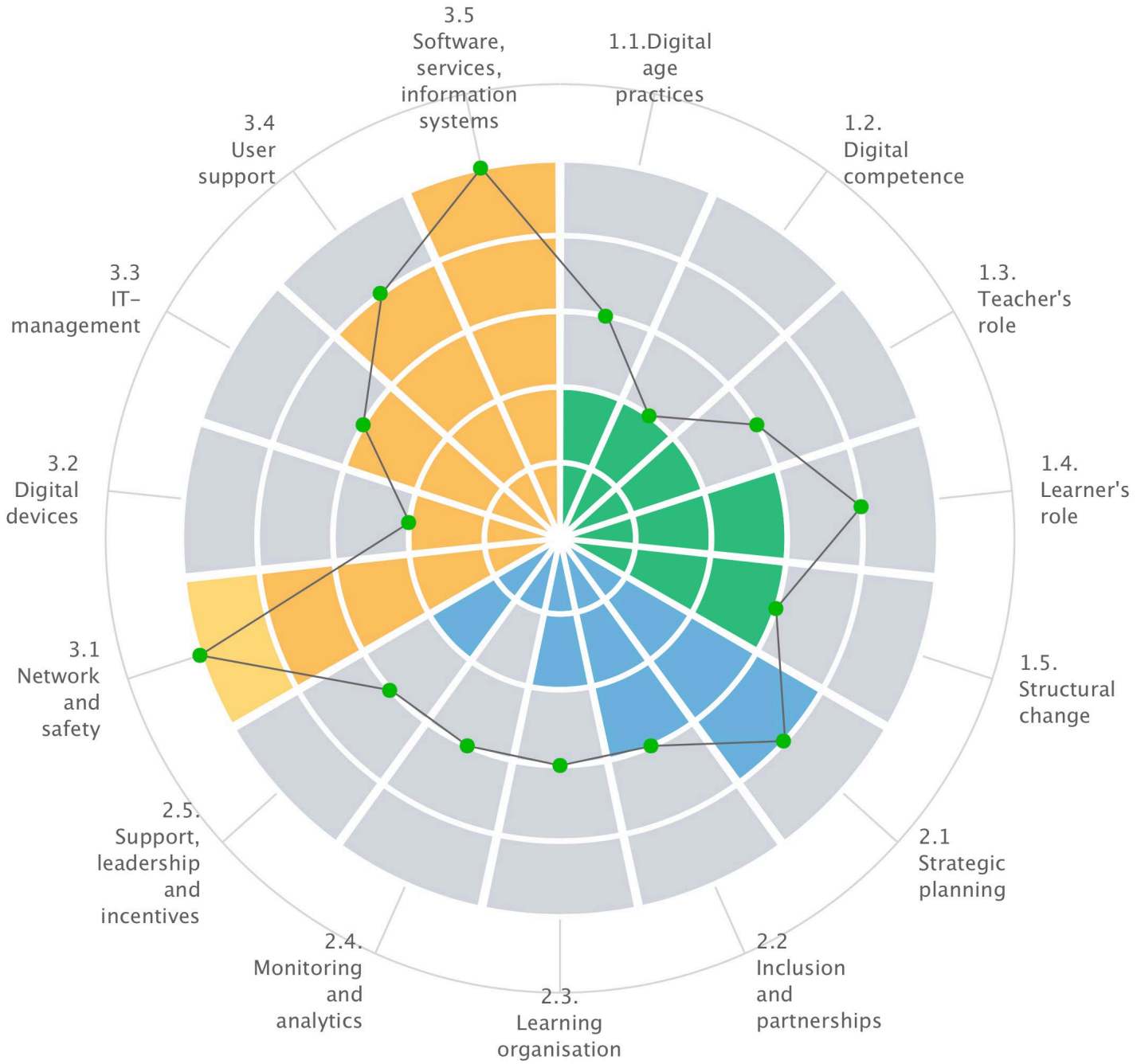
Diffusion of innovations (Rogers, 1969)



Phases of adoption:

Knowledge > Persuasion > Decision > Implementation > Confirmation

Digital Mirror



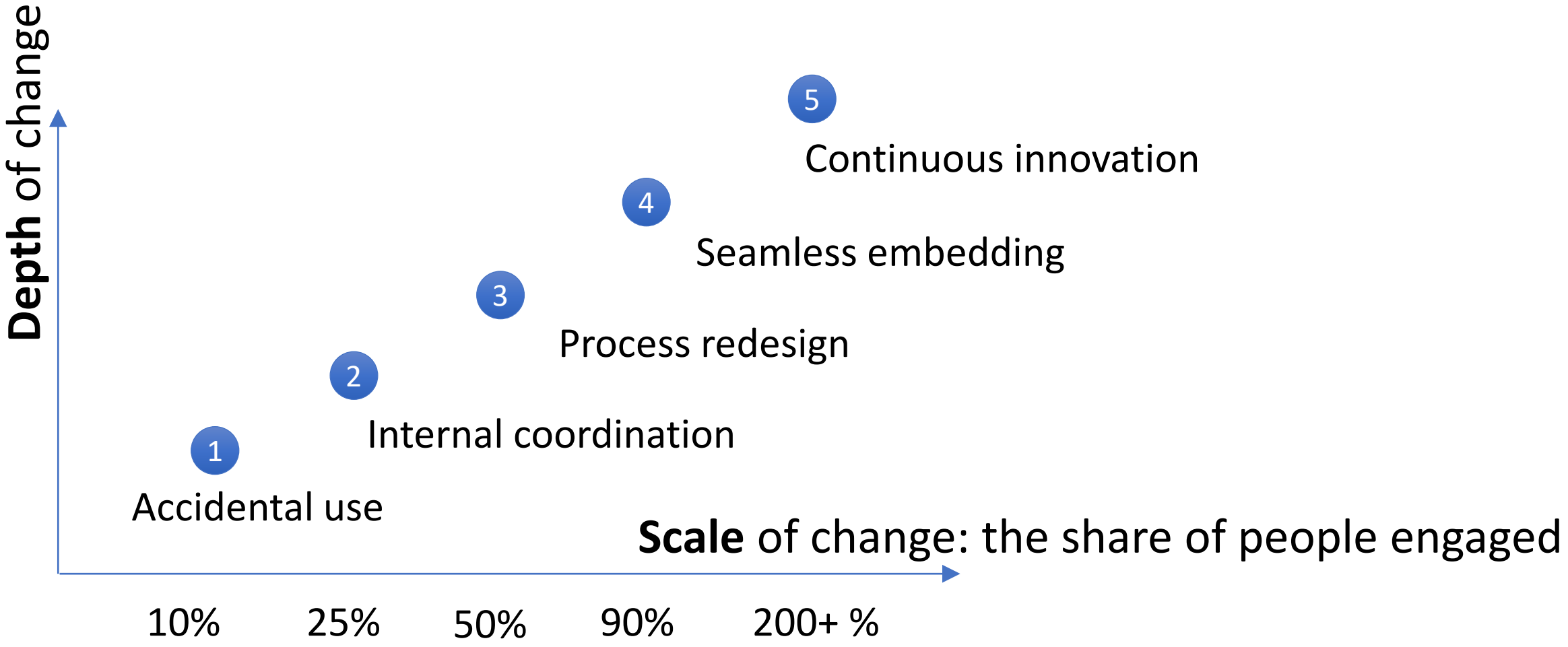
Self-assessment:

- By the principal
- By digi-team
- By peer team

Data-driven decision-making:

- Benchmarking
- Strategic goals
- Action plan
- School-owners' digital strategy

Dimensions of digital turn



Creating the "ownership of change"

- Strategies for upscaling the innovation:
  - nudging,
  - delegating (students as IT ambassadors),
  - sharing stories & resources (digital breaks),
  - co-teaching (project days/weeks, open lessons)
  - involving parents and local community
  - PR, mass media, social media for visibility
  - Your strategies?

STEAMpunk Tallinn by V. Voitekhovitch