

IoT and Mobile Learning

A Game Changer or Business as Usual?

teseolab.org

Monica Divitini

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Agenda

- Some background
- Some of our research on IoT and Learning
 - IoT as a medium
 - Reflective learning in the workplace
 - Interactive board games
 - IoT as subject
- Some reflection

TELL – Centre for Technology Enhanced Lifelong Learning



Co-leaders

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Our **vision** is to realize a better society through lifelong learning for all. The **main research goal** is to understand the interplay between learning and technology as both an *enabler* and a *transforming factor*, distinguishing mechanisms that are domain specific and general.

Increased need for lifelong learning

In 2020 there might be a shortage of almost 1 million ICT professional in Europe. Still most primary educational systems do not provide ICT education



3 million Syrian children have lost access to school. In addition, they are struggling with major traumas who impact on their capability to learn

2030: with the current model circa 60 - 70 % of all the newly educated should be working in health and well-being related jobs



In Norway 30% of the youth drop from high school and 7% live of different forms of social, lacking skills to get and remain into the job market.



By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

Our approach: Bridging the gap

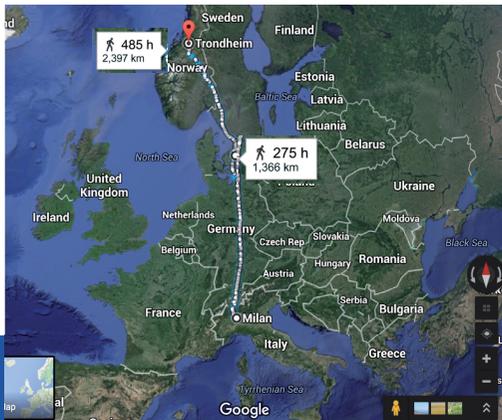
PRACTICE
and user
needs

TECHNOLOGY,
new spaces of
possibilities

Technologies for social interaction, learning,
and cooperation

THEORY and
learning
approaches

TESEOLab



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Research question

- Data is important to support reflection
 - Mainly relying on memory
 - Overview vs. local knowledge
 - Multiple perspectives
 - Time pressure
- 
- How can we use sensor data to improve reflection?

Working scenarios

- Scenario 1



- Scenario 2



The technological solution

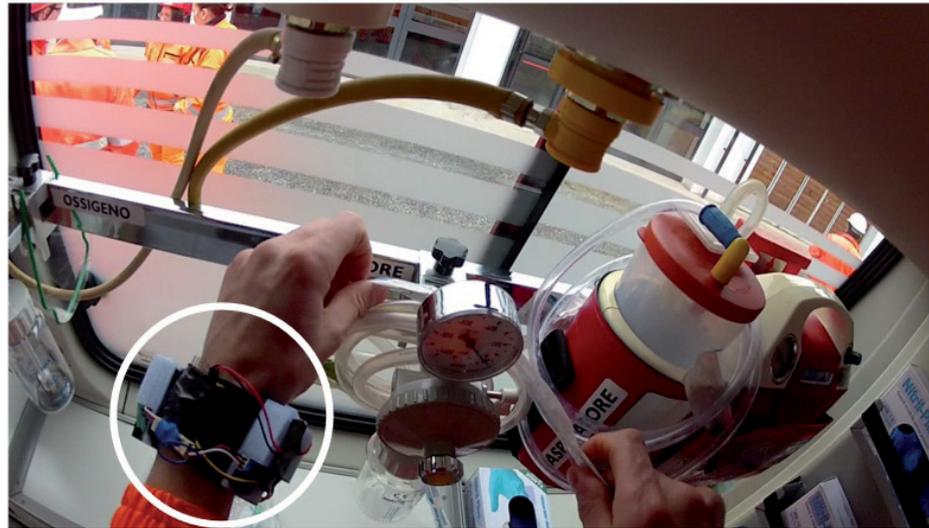
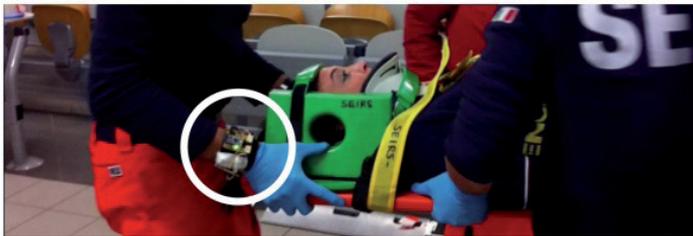
WATCHiT for capturing



CroMAR for Scenario 1

Passo	Valutazione
Passo 1	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★
Passo 2	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★
Passo 3	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★
Passo 4	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★
Passo 5	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★
Passo 6	★ ★ ★ ★ ★
Saltato	★ ★ ★ ★ ★

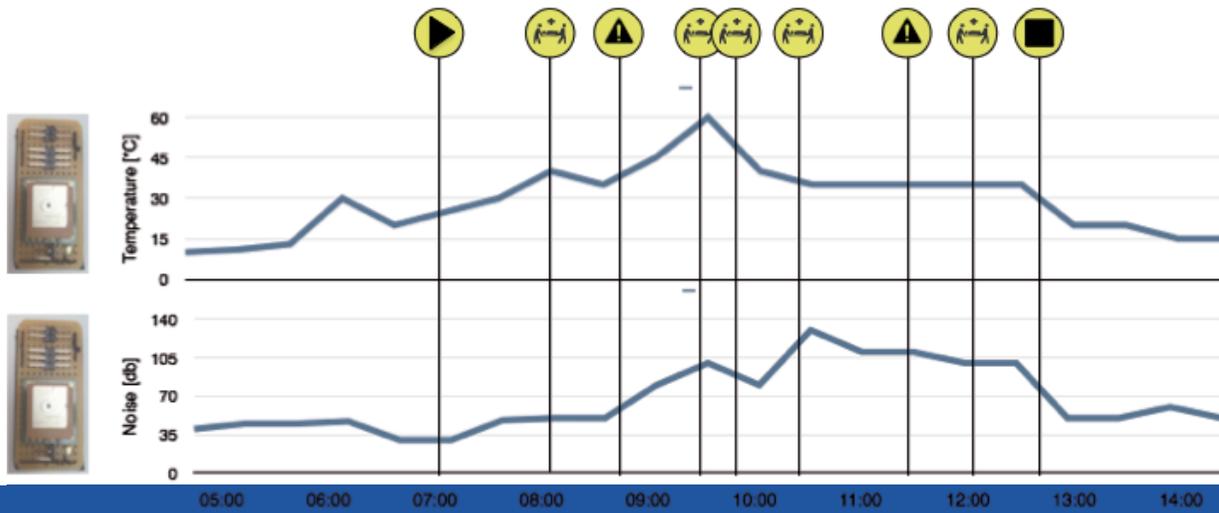
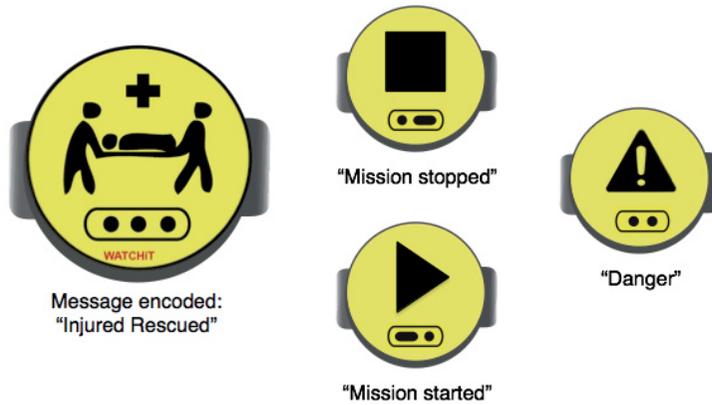
TRAINER for Scenario 2



User-generated data collection



wTAGS are **shortcuts** to bookmark specific data, with qualitative context information



Scenario 1

- Distributed work → difficult to get an overview
 - Multiple perspectives
 - Global vs. local perspective
 - Strong geographical component
-
- Focus on coordinators who might benefit from local knowledge from the field

Cro
MAR

CroMAR

Mobile Augmented Reality for supporting reflection on crowd management



MIRBOR

NTNU

Department of Computer and Information Science

NTNU



DURING

AFTER



Scenario 2

- Highly coupled cooperative work
- Mostly shared perspectives
- Geographical component not particularly relevant
- No formal debriefing

- Focus on team members

DURING



AFTER

(c) MOBILE APPLICATION

Step	Self-assessment	Reality check	Reality check	Optimal	Reflection
Passo 1 Completed	★★★★☆		Passo 1 Completed 0 errors	00:00:01	00:00:03
Passo 2 Completed	★★★☆☆		Passo 2 Completed 0 errors	00:00:08	00:00:25
Passo 3 Completed	★★★★★		Passo 3 Completed 1 error	00:00:14	00:00:30
Passo 4 Completed	★★★★★		Passo 4 Completed 2 errors	00:00:18	00:01:55
Passo 5 Skipped	★★★☆☆		Passo 5 Skipped 0 errors	00:00:08	00:01:50
Passo 6 Completed	★★★★★		Passo 6 Completed 0 errors	00:01:06	00:01:00

Step	Rating	What could be improved and why?
Passo 1 Completed	★★★★★	Type an answer

Evaluation scenario 2

- 9 teams from different organizations
- The collected information was perceived as accurate (3,9, SD= 0,6), relevant (4,03, SD=0,50), and collection of data was effortless (3,81, SD=0,47)
- Respondents were overall satisfied with the use of the system (4.11, SD=0.49) and perceived it as a useful tool for training (4.22, SD=0.62)

Question	All (n=27 ^a)	Experience ≥ 5 years (n=13)	Experience <5 years (n=13)
I gained a deeper understanding of my work life.	3.96 (SD=0.71)	4.15 (SD=0.55)	3.79 (SD=0.83)
I made a conscious decision about how to behave in the future.	4.07 (SD=0.62)	4.08 (SD=0.76)	4.07 (SD=0.49)

Lessons Learned (1)

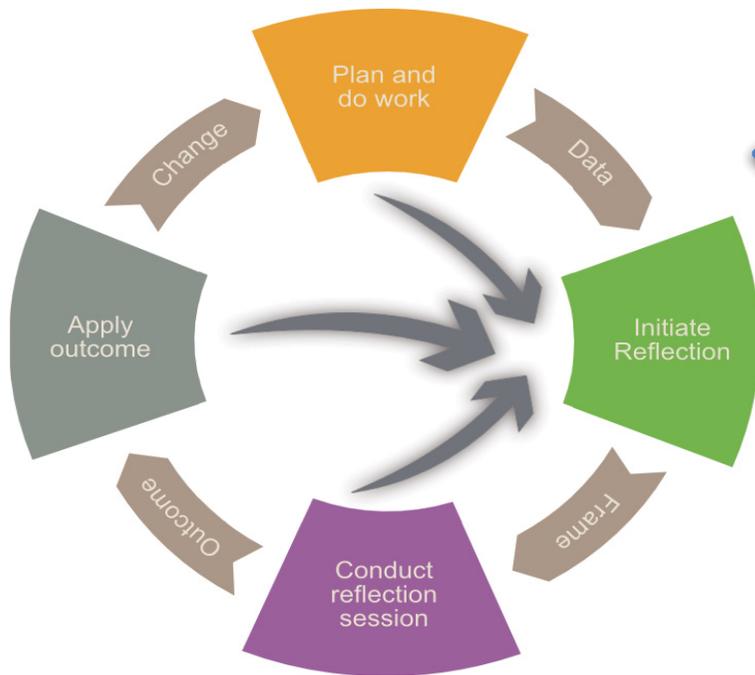
- Sensor data can be successfully used to support learning from experience
- User-generated content is important
 - To avoid control and privacy
 - To empower users
 - Qualitative data
- Different degree of sharing must be supported

Lessons Learned (2)

- **The curse of simplicity**
 - Easy to capture and to manipulate, e.g. compare, aggregate, ...
 - Get the “right” data, not the one that is easy to capture
 - Beware complexity if multiple data is collected, both for capturing and using it
- **Making sense of data**
 - Visualization
 - Storytelling (in and outside the supporting apps)
- **Privacy**, very low awareness among some users

Reflective learning @ work

THEORY



PRACTICE



TECHNOLOGY



Open questions?

- What does it mean to learn in this context (and in general in the workplace)? How do we measure learning?
- How do we integrate learning processes with existing working practices?
- How do we educate people to take care of their data?

Agenda

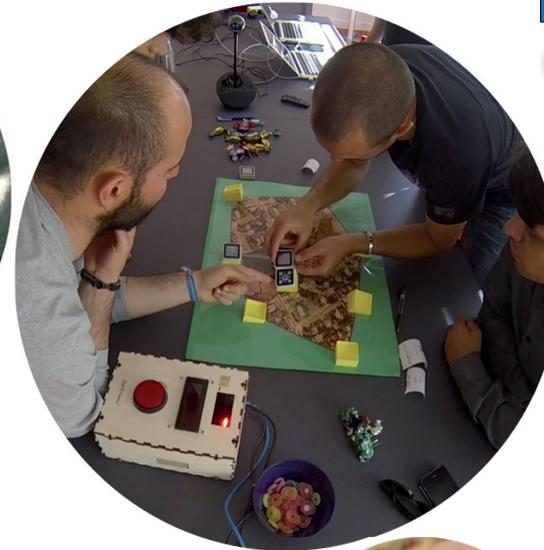
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PRACTICE

THEORY

TESEO

TECHNOLOGY



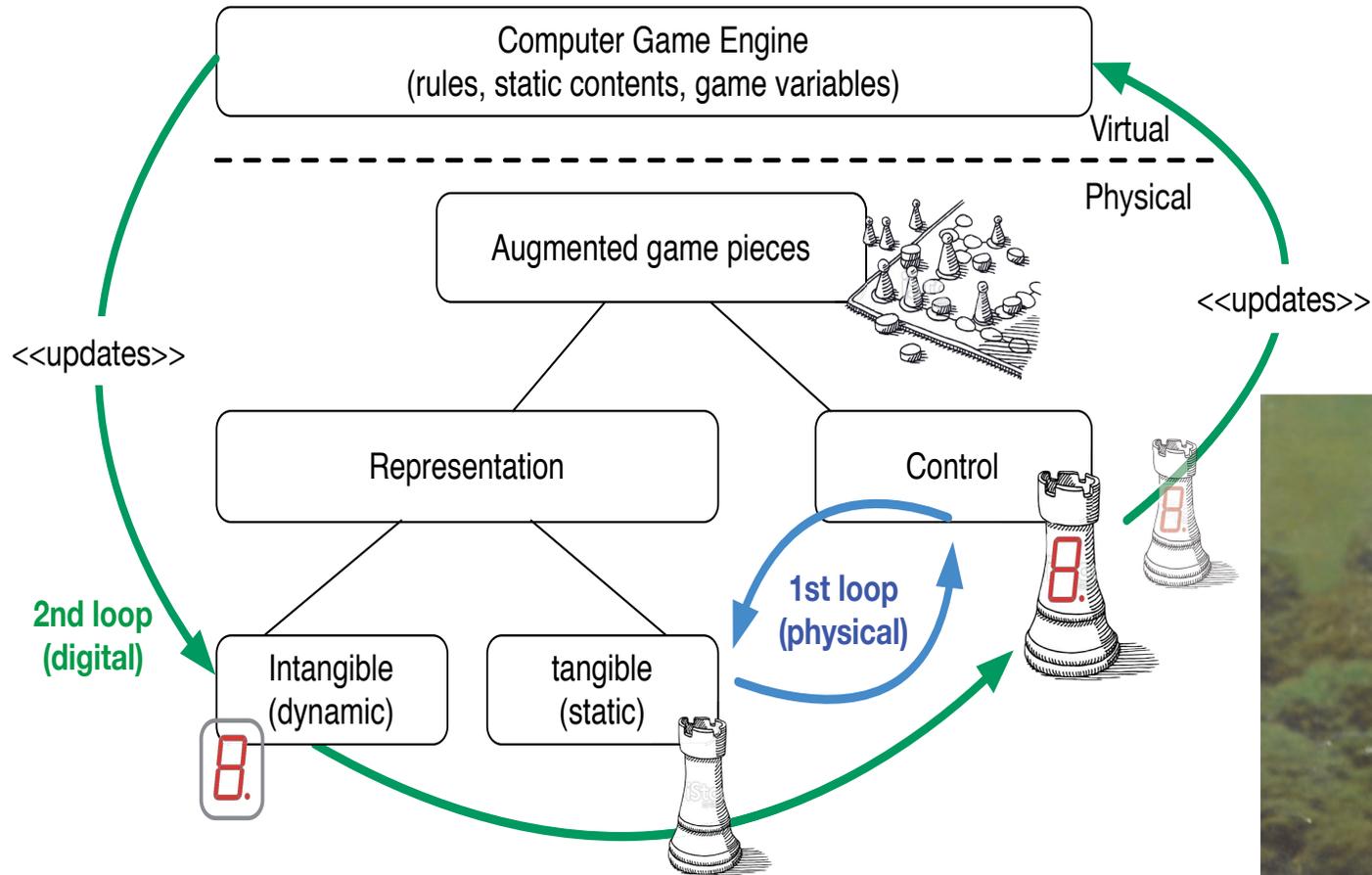
Interactive board games to learn soft skills in crisis training: Don't Panic

Simone Mora, Tomas Fagerbekk, Ines Di Loreto, Monica Divitini

Norwegian University of Science and Technology



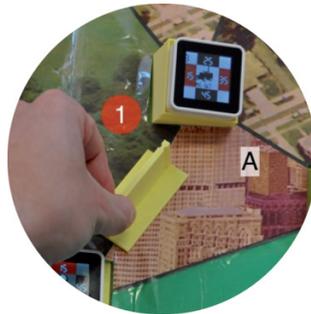
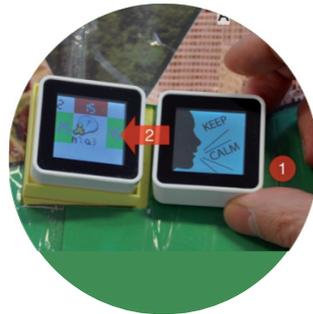
Architectural view





Navigate

Manage information under stress



Calm, move or restrain citizens

Evaluation of Don't Panic



Evaluation of don't Panic (2)

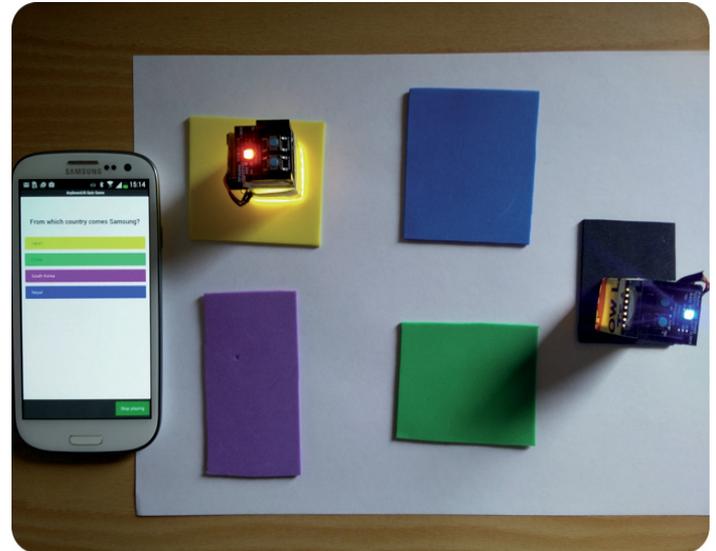
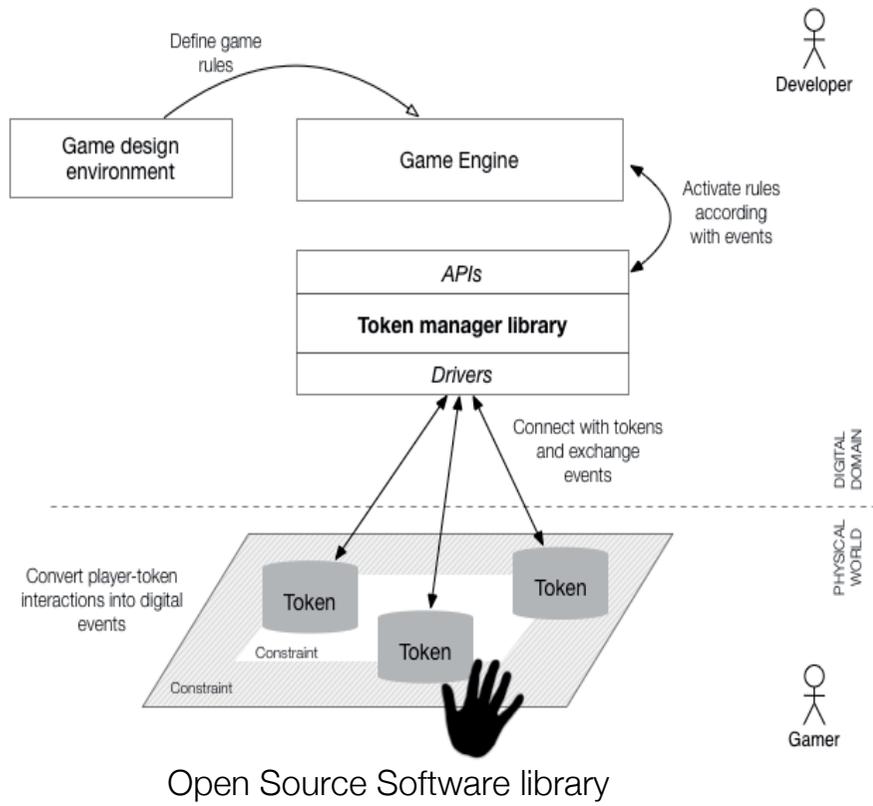
- The *Don't Panic* prototype was tested with 16 players
- The game affords social interaction and collaboration
- Usability of the system was high, but with some issues identified through observation
- Interactivity was highly appreciated, as:
 - Memory helpers
 - Facilitators for social interaction
 - Engagement and fun

Some reflections

- Blending strengths from the physical and digital domain, e.g. printer
- Unconstrained interactivity
 - Distributed and mobile distributed across an ecology of tokens (private/public, outside board, ...)
- Balancing tangible and intangible representations
 - How to distribute the representation, see example
- Lack of technology toolbox



From Don't Panic to Anyboard: Towards a toolkit for making interactive board games



Computer-augmented game tokens

Stay tuned ...

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The TILES toolkit

Design workshop and cards to:

- involve citizens in the co-design of meaningful services
- Improve pupils awareness of IoT
- Support transition from idea generation to prototyping

- If we want IoT to become a game changer we need to involve users with different perspectives

- Innovativeness is a challenge!!!

More information available at <http://tilestoolkit.io/>



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Learning and IoT

- Maybe not a game changer... but it depends from our creativity
- For sure a big space of opportunities
- Anytime and anywhere, but also [here and now](#)

Time for a new learning?

- Learning that is highly situated in
 - Places
 - Communities
 - Ecologies of artifacts
- Learning experiences that become
 - Fluid
 - Difficult to predict, control, replicate

IoT as enabler, but with other ICT

- Social media
- Mobile phones
- Sensors, ...



- New type of data/information
- New ways of interacting with data
- New ways of sharing and making sense of data

Concluding reflections

- Need to rethink the design process of learning technology
 - Design for participation and empowerment
 - Do not forget people in the field → practice based learning, learning by doing
 - Be humble – Design with and for the learners and their communities
- New technologies (mobiles, social media, sensors...) – a new space of possibility to investigate (New type of data, ways of interacting with data, way of sharing and making sense)

Open challenges

- Missing **theoretical understanding** of new forms of learning, e.g. to understand the interleaving of technology and learning processes, the learning context and its relevance to the learning process, unintentional learning through daily activities (learning as a continuum).
- Limited **design support** to make the development sustainable
- Limited understanding of **assessment**
- Limited understanding of how to **deploy** and scale up technical solutions, especially when learning happens outside organizations that can promote adoption.

design learning systems as socially embedded systems

Thank you for your attention



Thanks to my colleagues -
For more about our work see teseolab.org