



EUROPEAN
ROBOTICS FORUM

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Analyzing effectiveness and efficiency of HRI in logistic processes

Wolfgang Echelmeyer, Edinburgh, 22-24/03/2017



Hochschule Reutlingen

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Advancement in robot abilities – Technology view

CONFIGURABILITY

ADAPTABILITY

INTERACTION CAPABILITIES

COGNITIVE ABILITY

MANIPULATION ABILITY

PERCEPTION ABILITY

DECISIONAL AUTONOMY

DEPENDABILITY

MOTION ABILITY



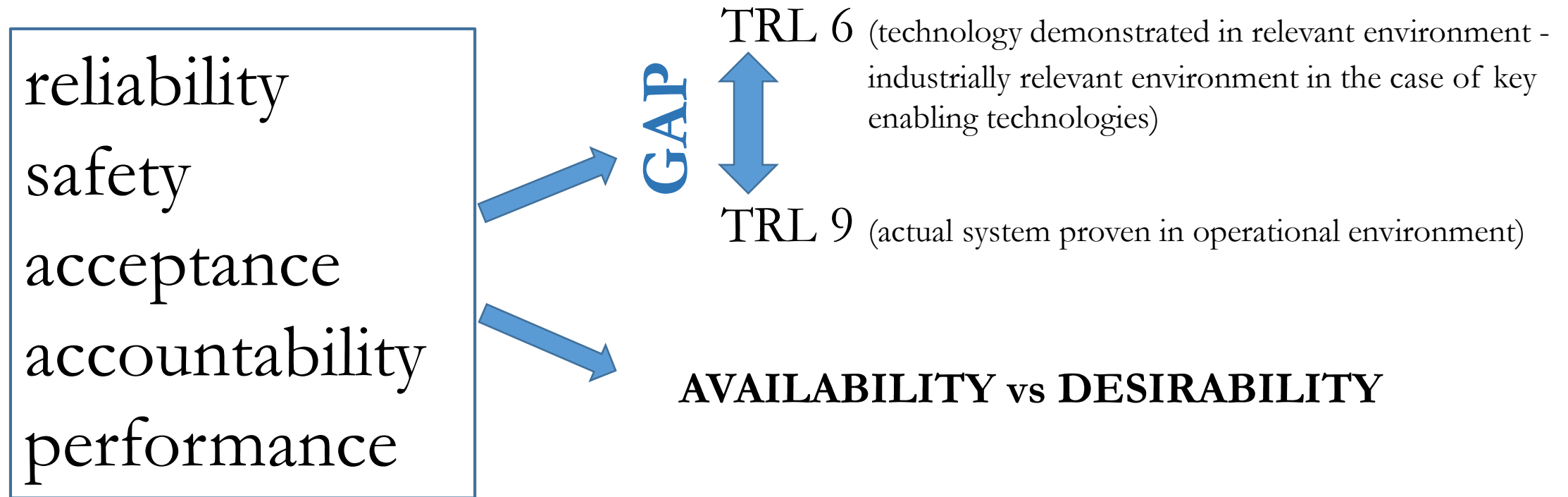
Robotics 2020 Multi-annual Road map - For Robotics in Europe
Horizon 2020 Call ICT-2017 (ICT-25, ICT-27 & ICT-28)

Toughest application requirements – Process view

Real world application have some tough requirements to be fulfilled such as:
reliability, safety, acceptance, accountability and performance



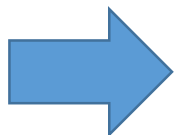
Toughest application requirements – Process view



So what is the best way an automation oriented process designer has to fulfill these requirements?

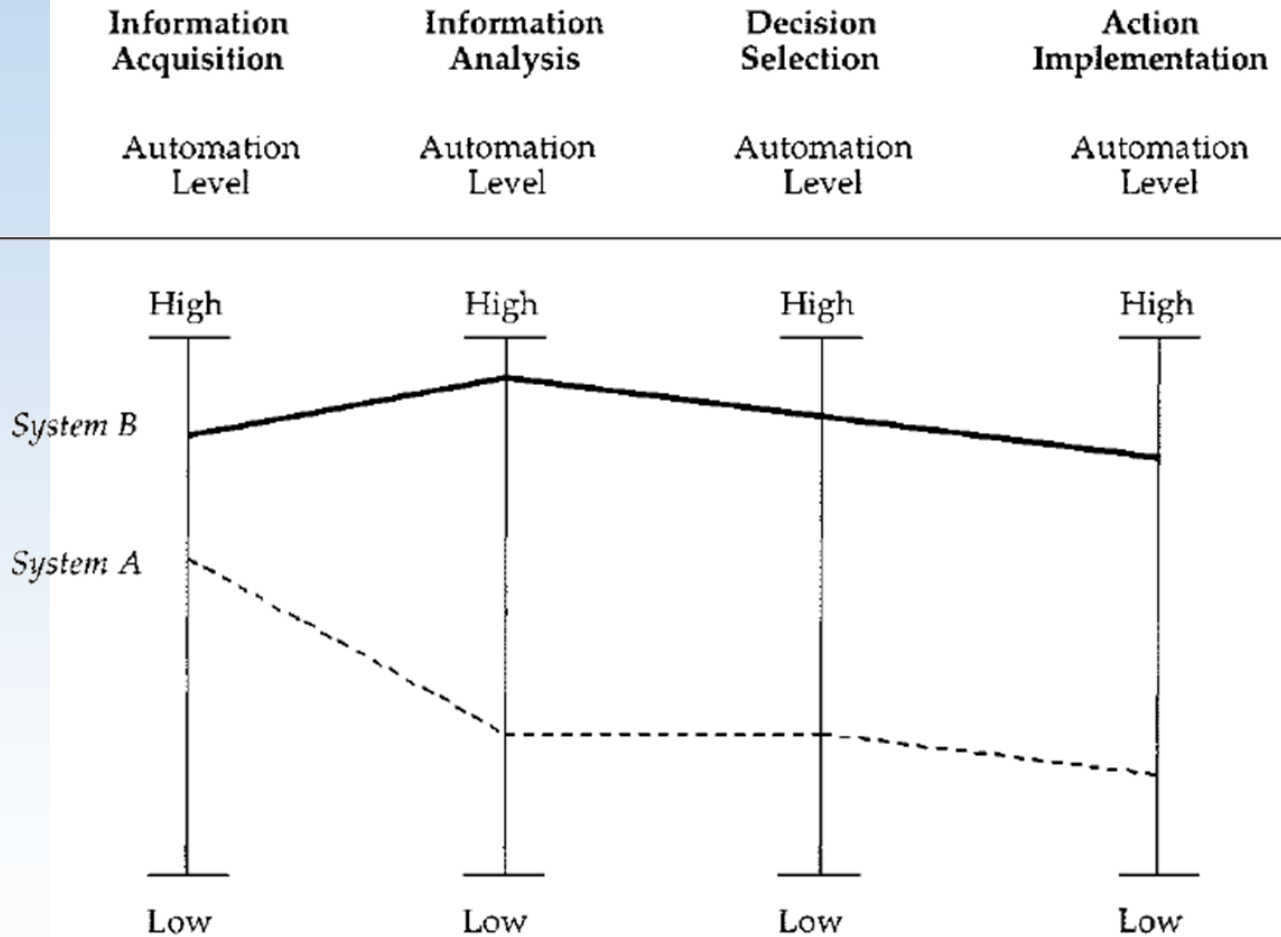
Maximizing added value - HRI

- Points of strength:
 - **Humans** can easily deal with unexpected, take complex decision rather quickly, sense and process data of large variety and have great dexterity for complex handling tasks. Having human personnel in- and on-the-loop assures accountability and increases probability of acceptance
 - **Robots** (more generally automation) can deal with high precision repetitive tasks without getting tired or bored and can quickly and reliably sense and process a relatively homogenous but large amount of input and data



The process designer's goal is to get the best of both worlds

Configuration of HRI (for maximum added value)



Configuring HRI means to allocate different functions to the human or the automation (robot), namely [1]:

- Information acquisition
- Information analysis
- Decision and action selection
- Action implementation

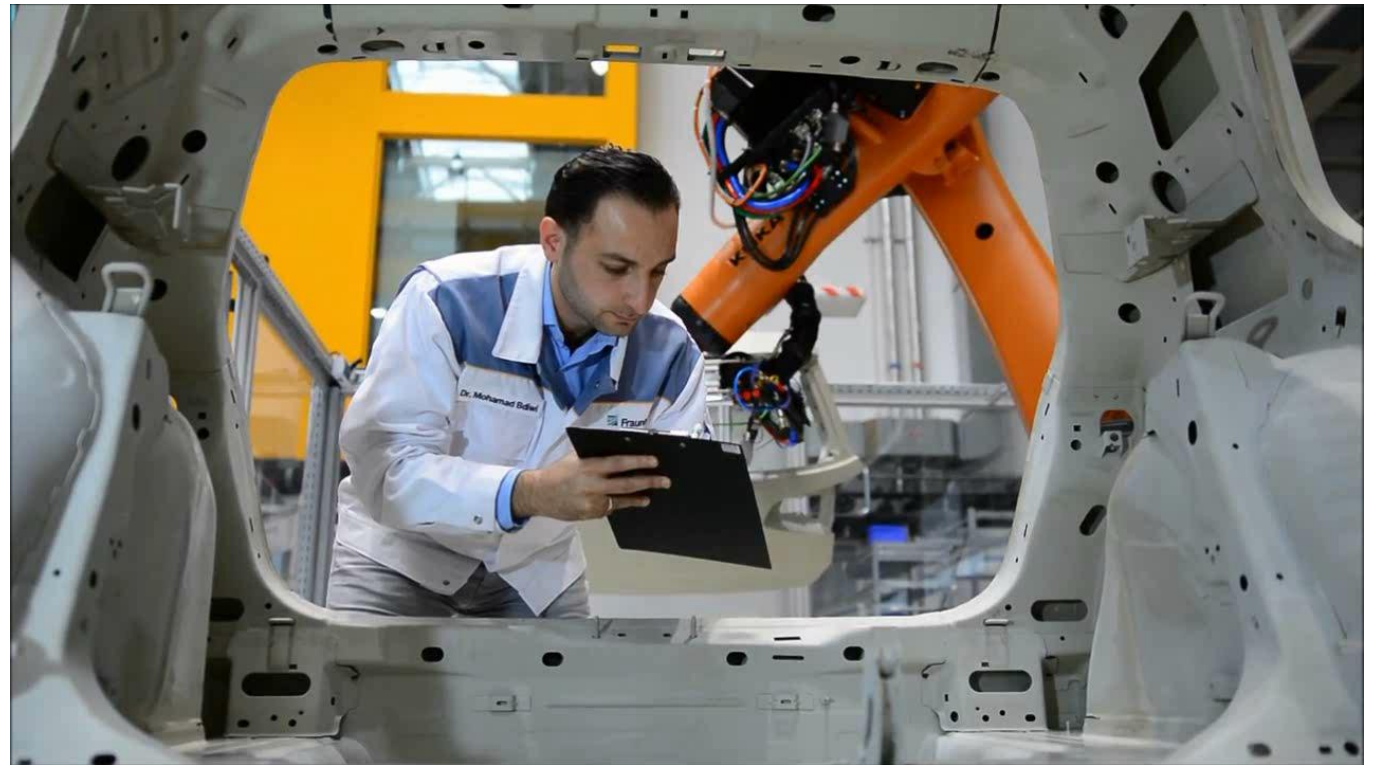
[1] Parasuraman, R., Sheridan, T. B., & Wickens, C. D. "A model for types and levels of human interaction with automation". *IEEE Transactions on Systems Man and Cybernetics*, 2000

Configuration of HRI (for maximum added value)

Maximizing the HRI added value means to

allocate each functionality to the most efficient agent

verify that the generated scenario is feasible and resulting interfaces between human and automation guarantee the necessary process fluency



Configuration and evaluation tool for HRI scenarios

The process designer needs a model, embedding a method for configuration of efficient and effective HRI, so that all customers requirements are satisfied



The model uses a qualitative and a quantitative approach and serves as a decision-making tool for efficient and effective HRI

Kollaborative Systeme zur Flexibilisierung der Intralogistik

BOSS
HUGO BOSS



Hochschule Reutlingen
Reutlingen University



INTRALOGISTIK
NETZWERK BW



FESTO



TRANS **PHARM**



BOSCH
Technik fürs Leben



MAGAZINO
simple storage

- Ongoing development in the German project “Kollaborative Systeme zur Flexibilisierung der Intralogistik” – (Collaborative Systems for increasing flexibility in Intralogistics). It will be published within the year
- Stay tuned!

**Thank you
for
your kind attention**

Questions?!