

MMW project in WASP HS 2020-2024

# The Emergence of Complex Intelligent Systems and the Future of Management

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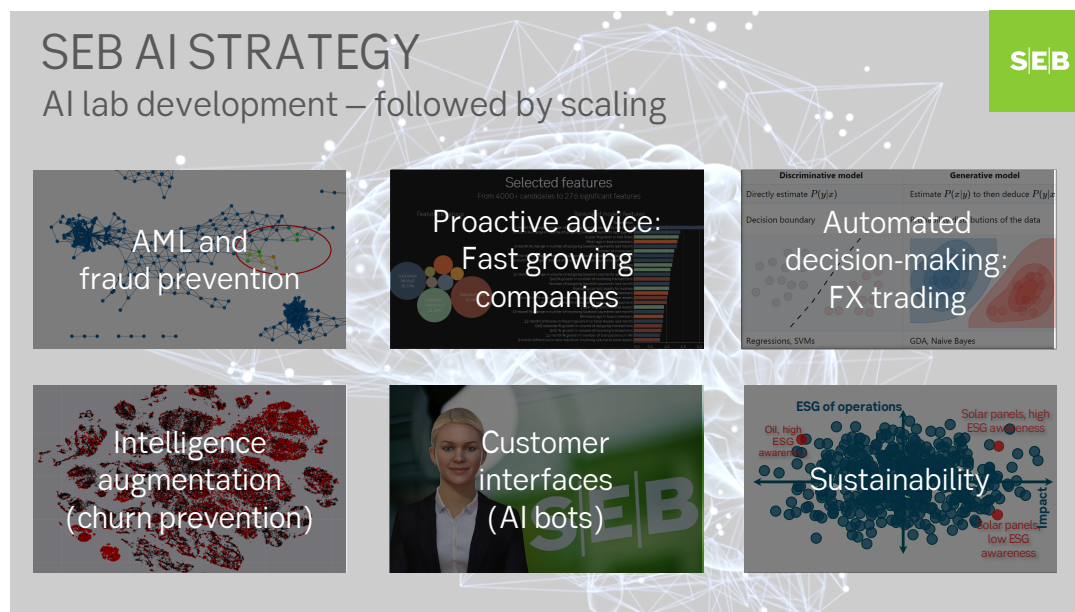
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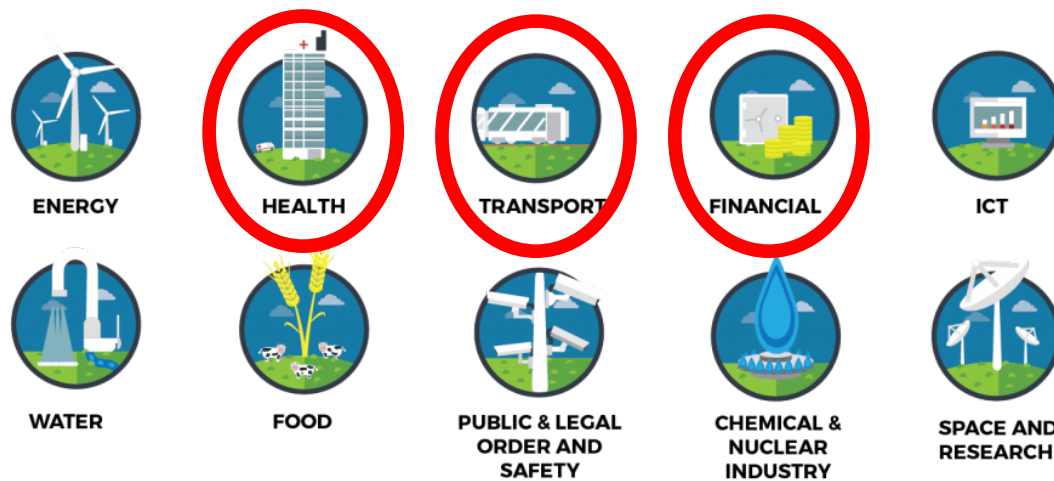


# From stand-alone applications to complex *intelligent* systems- Financial





## Complex *intelligent* systems – in all kinds of critical infrastructures



Critical infrastructures (CIs) are those physical and virtual systems or aggregation of assets that provide essential functions and services that support societal, economic and environmental systems.

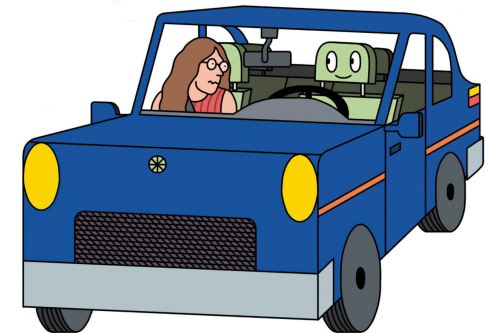
# Future with complex *intelligent* systems

- Many expected benefits for AI will materialize in complex environments
- Complex systems often build on a combination of software, electronics, hardware and mechanics
- Increasingly intelligent content in the wake of AI
- System complexity beyond human cognition



**The New York Times**  
**Would You Buy a Self-Driving  
Future From These Guys?**

By The Editorial Board  
Oct. 14, 2017



# AI more than technology

*“Like the steam engine or electricity in the past, AI is transforming our world, our society and our industry. Growth in computing power, availability of data and progress in algorithms have turned AI into one of the most strategic technologies of the 21st century. The stakes could not be higher. **The way we approach AI will define the world we live in.**”(EU Commission report, Artificial Intelligence for Europe)*

<https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-237-F1-EN-MAIN-PART-1.PDF>

*“In the coming years, AI will continue to contribute to economic growth and will be a valuable tool for improving the world, as long as industry, civil society, and government work together to develop the positive aspects of the technology, manage its risks and challenges, and ensure that everyone has the opportunity to help in building an AI-enhanced society and to participate in its benefits.”*

[https://obamawhitehouse.archives.gov/sites/default/files/whitehouse\\_files/microsites/ostp/NSTC/preparing\\_for\\_the\\_future\\_of\\_ai.pdf](https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsites/ostp/NSTC/preparing_for_the_future_of_ai.pdf)

# Complexity beyond human cognition – more than technology

**Also a MANAGEMENT challenge**

Example Boeing 737 Max -



Technology focus MCAS or Management and Organizational Perspective?

# MCAS beyond technology - the role of management?

Initial MCAS	Final Certified MCAS	Beyond technology
<ul style="list-style-type: none"> <li>• Extreme corners of the flight envelope</li> <li>• Low authority</li> <li>• Low criticality</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded use</li> <li>• Increased authority</li> <li>• High criticality but not classified as that</li> </ul>	<p><b>Why wasn't the safety analysis reevaluated and the system classified as critical?</b></p>
<ul style="list-style-type: none"> <li>• Based on two sensor types: AoA and gravity</li> </ul>	<ul style="list-style-type: none"> <li>• Based on a single AoA sensor</li> </ul>	<p><b>Why a single type of sensor and even single sensor?</b></p>
<ul style="list-style-type: none"> <li>• Expected to almost never play a role</li> </ul>	<ul style="list-style-type: none"> <li>• Triggers e.g. when the AoA sensor is faulty</li> </ul>	<p><b>Principle of switch off confusing system – why not ensured?</b></p>
<ul style="list-style-type: none"> <li>• Deemed not need to be known by pilots as it behaves like trim runaway</li> </ul>	<ul style="list-style-type: none"> <li>• Behaves differently from trim runaway</li> <li>• Could cause confusion in cockpit</li> </ul>	<p><b>In safety-focused organization with competent employees - how could this happen?</b></p>

## The Emergence of Complex Intelligent Systems and The Future of Management

**OVERALL PURPOSE** – Unravel the management implications for complex intelligence systems emergence

**HOW TO STUDY** – Continuous synthesis of results in themes, in frequent project meetings, structured workshops, and IAB meetings, by primarily senior researchers

### THEME 1

#### Decision making in the unknown

**THEORETICAL PERSPECTIVES** - managerial decision making, design theory, visual analytics

**HOW TO STUDY** - Comparative case study of existing and future scenarios in public safety area (e.g. WASP WARA PS)

### THEME 2

#### Organizational design and interaction in ecosystems

**THEORETICAL PERSPECTIVES** – mirroring, platform innovation, system architecture, ecosystems, organizational design

**HOW TO STUDY** – In-depth qualitative analysis of complex intelligent system, it's ecosystem, traditional and new types of actors (e.g. data factories)

### THEME 3

#### New perspectives on rationality

**THEORETICAL PERSPECTIVES** – bounded rationality, generativity, knowledge integration, MBSE, boundary objects

**HOW TO STUDY** – In-depth case study of interaction between human and system intelligence, and emerging management approaches