CENTER FOR HYBRID INTELLIGENCE

The hybrid intelligence systems development guide

3 tasks	• Human-AI language • Human-AI interaction • Systemic development and deployment
3 dilemmas	• Automation without deskilling • Automation without value erosion • Employee co-creation
5 principles	• Human centered AI + learning from AI failures • Mapping human skills + management commitment to upskilling • Business process re-engineering
12 questions	• Mapping the problem space • Mapping the technologies • Designing inclusive deployment
5 methodologies	• AI + AI systems discovery + automation-control canvases • Benefits dependency network mapping • AI-solutions mapping

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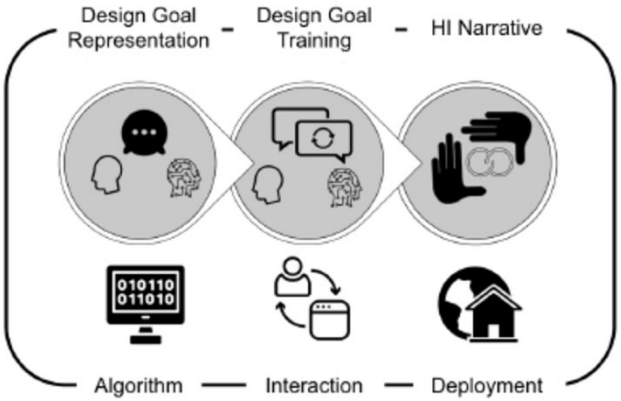
THREE TASKS FOR MAKING AI(HI) WORK

1. Establishing a common language around human-AI tasks and capabilities
2. Designing a synergetic interaction (with continuous learning)
3. Designing holistic systems solutions that work in the real world



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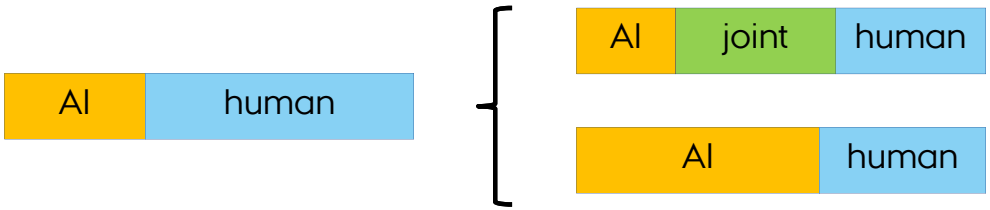
3 AI RELATED DILEMMAS

How to:

1. Implement AI performance optimization without customers "expecting more for less" (value-generation erosion)
2. Facilitate employee co-creation of human-AI interactions in the backdrop of fear of job loss?
3. Implement automation without deskilling employees?



High road: Upskilling + synergies (systemic solution)

Low road: automation (point solution)

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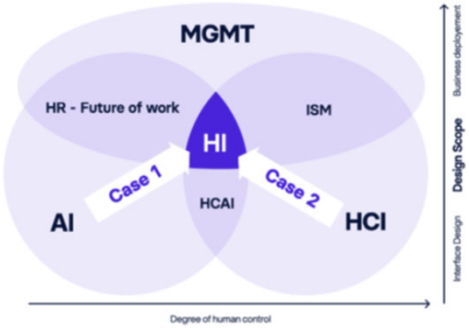
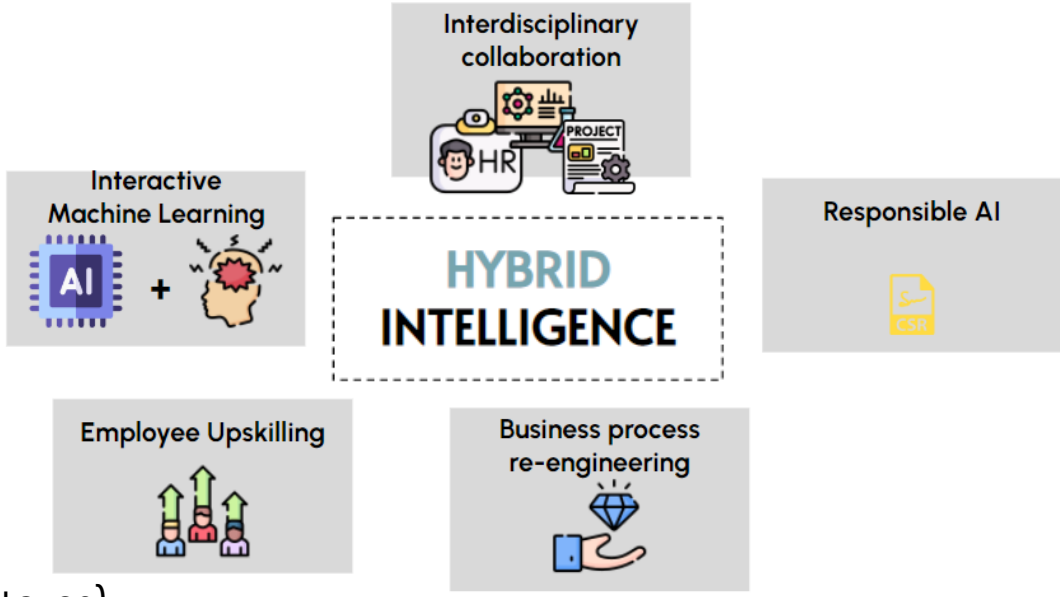
5 PRINCIPLES OF AN INTERDISCIPLINARY FRAMEWORK OF HYBRID INTELLIGENCE





1. Computational understanding of human skills
2. HI pact between management and employees (upskilling)
3. Business process re-engineering (HI workflow patterns)
4. Human-centered interactions
5. Learning from AI failures

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Towards Hybrid Intelligence workflows: integrating interface design and scalable deployment, J. Rafner, C. Bantle, D. Dellermann, M. Söllner, M. A. Zaggl, J. Sherson, Frontiers in Artificial intelligence and Applications, Vol 354: HHAI2022 Augmenting Human Intellect, 2022

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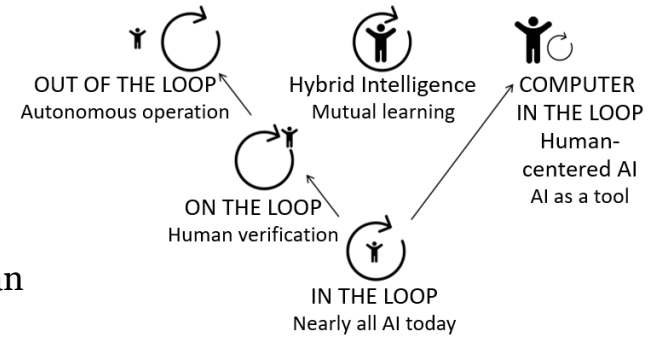
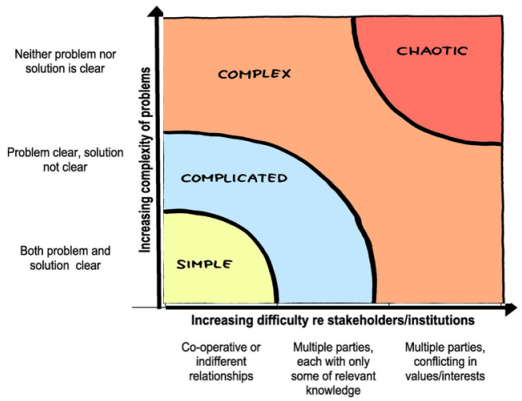
12 high level questions to discuss about any AI transformation

1. How do you (want to) use corporate big data
2. Your (potential) AI related projects
3. List your AI-related stakeholders
4. Is your AI system HITL, HOTL, HOOTL, HCAI-tool or HI?
5. Reflect on (potential) AI failures
6. Is your problem simple, complicated, complex or chaotic? Do you need human specific or general skills?
7. Is your AI system, high-low on risk, open or closed task, based on turn-taking or integrated work, machine or human in control, a tool or a partner
8. How can you create a psychologically safe space for employees to discuss their AI fears and dreams?
9. How could you measure/quantify human upskilling?
10. Does human and/or AI "learn"? What is the time scale? Is human learning at individual or organizational level?
11. Could the freed up human resources be used to create new value chains?
12. Could a hybrid intelligence narrative be used to create brand-differentiation?





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1: THE AI CANVAS

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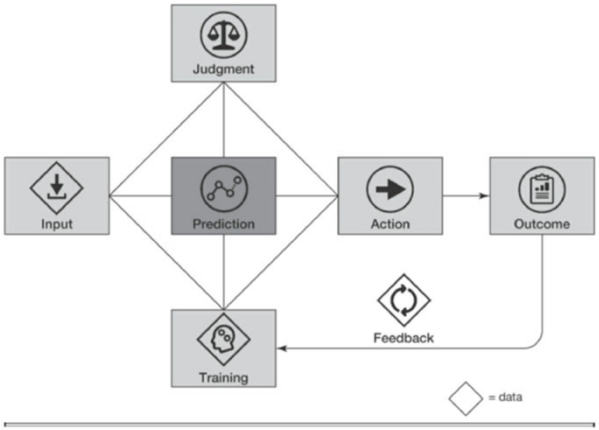
Disentangling Prediction from Judgement

FIGURE 7-1

Anatomy of a task



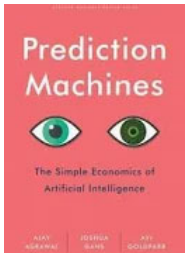
Prediction: takes information you have (data) and generates information you don't have
A prediction is worthless without a judgement (evaluation of benefits of all possible outcomes)

- Drop in price of prediction will increase value of complements (data, judgement and action) + decrease the value of substitutions (human prediction) eg London cabbies.
- Seemingly small changes in prediction accuracy (98% to 99.9%) can mean dramatic transformational reductions in errors rates
- Amazon shop-then-ship to ship-then shop potential transformation

The AI canvas for Atomwise

Prediction	Judgment	Action	Outcome
Binding affinity	Balance binding affinity of disease proteins and potential side effects	Conduct test (expensive)	Test results (successful tests that lead to new drug treatment)

Input	Training	Feedback
Protein characteristics	Binding affinity of molecules and proteins from past studies, along with molecule and protein characteristics	New data on binding from their recommendations



The AI canvas for MBA recruiting offer

Prediction	Judgment	Action	Outcome
Predict whether an applicant would be among the 50 most influential alumni 10 years after graduation	Determine the relative value of accepting a top 50 versus the cost of a false positive (accepting a non-top 50), versus the cost of a false negative (missing a top 50), versus not targeting a non-top 50	Accept applicants into the program	Higher-quality alumni, as measured by global influence 10 years after graduation

Input	Training	Feedback
= Application forms = Résumés = GMAT scores = Social media = Outcome (impact measure)	= Application forms = Résumés = GMAT scores = Social media	Update with applicant and career outcomes annually

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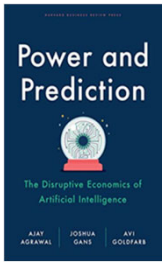
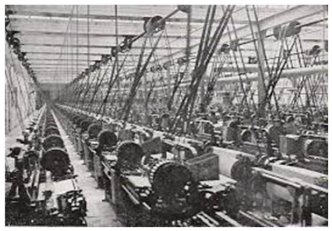
2: A CLEAN SLATE: THE AI SYSTEM DISCOVERY CANVAS



Decade long in-between times before massive monetization



Market leader's Innovation dilemma in-between times

Point Solution

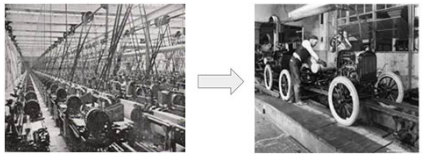
A point solution improves an existing procedure and can be adopted independently, without changing the system in which it is embedded.

Application Solution

An application solution enables a new procedure that can be adopted independently, without changing the system in which it is embedded.

System Solution

A system solution improves existing procedures or enables new procedures by changing dependent procedures.



AI Systems Discovery Canvas: Emergency

What are the fewest decisions you can reduce your business to?

1. Mission	Improve the outcomes of acutely ill and injured patients through high-quality, cost-efficient care	
2. Decision	**Treatment:** Decide which treatment to prescribe	**Resourcing:** Decide how much of each type of equipment and staffing should be deployed
3. Prediction	**Diagnosis:** Predict the reason for the patient's symptoms	**Number and type of patients:** Predict the quantity of patients and the distribution of diagnoses
4. Judgment	What are the consequences of overtreating, undertreating, and incorrectly treating patients?	What are the consequences of having too little equipment and staff on hand relative to having too much?

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3: HUMAN CENTERED AI: AUTOMATION AND HUMAN CONTROL

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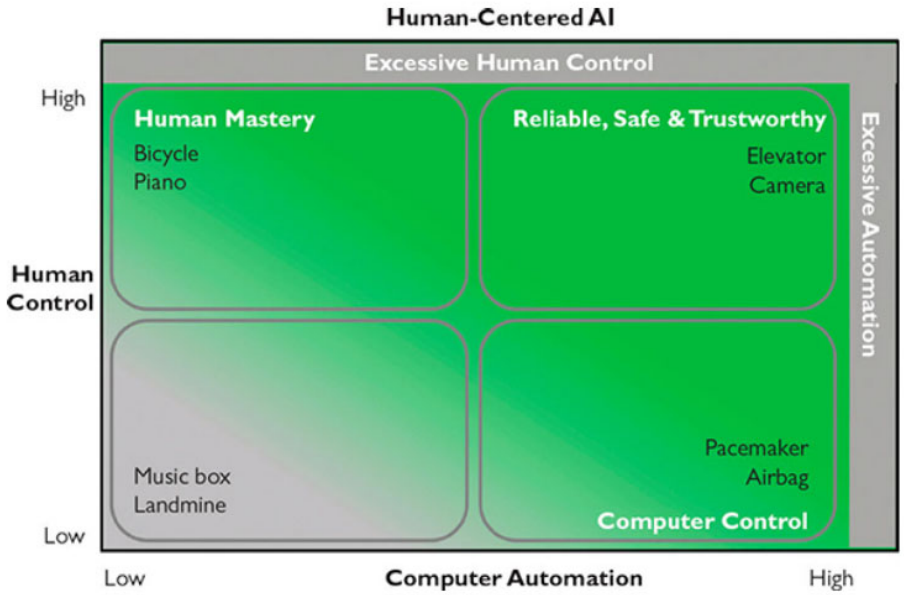

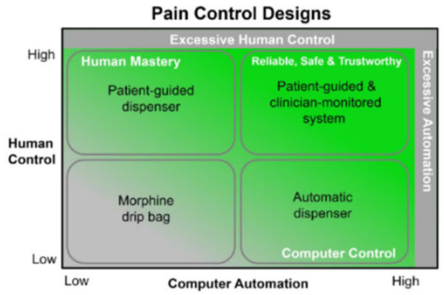

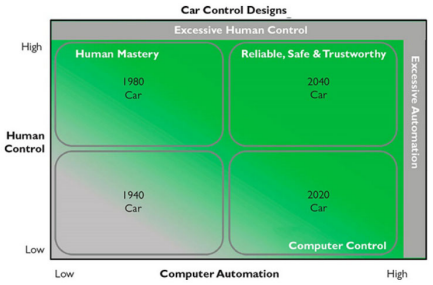

- Principle: consider AI a tool for human augmentation
- Algorithms: interactive machine learning, inverse reinforcement learning, active learning…

Table 9.1 ***Eight Golden Rules for design***[14]

1. Strive for consistency
2. Seek universal usability
3. Offer informative feedback
4. Design dialogs to yield closure
5. Prevent errors
6. Permit easy reversal of actions
7. Keep users in control
8. Reduce short-term memory load

Table 9.2 ***An HCAI pattern language***

1. Overview first, zoom and filter, then details-on-demand
2. Preview first, select and initiate, then manage execution
3. Steer by way of interactive control panels
4. Capture history and audit trails from powerful sensors
5. People thrive on human-to-human communication
6. Be cautious when outcomes are consequential
7. Prevent adversarial attacks
8. Incident reporting websites accelerate refinement

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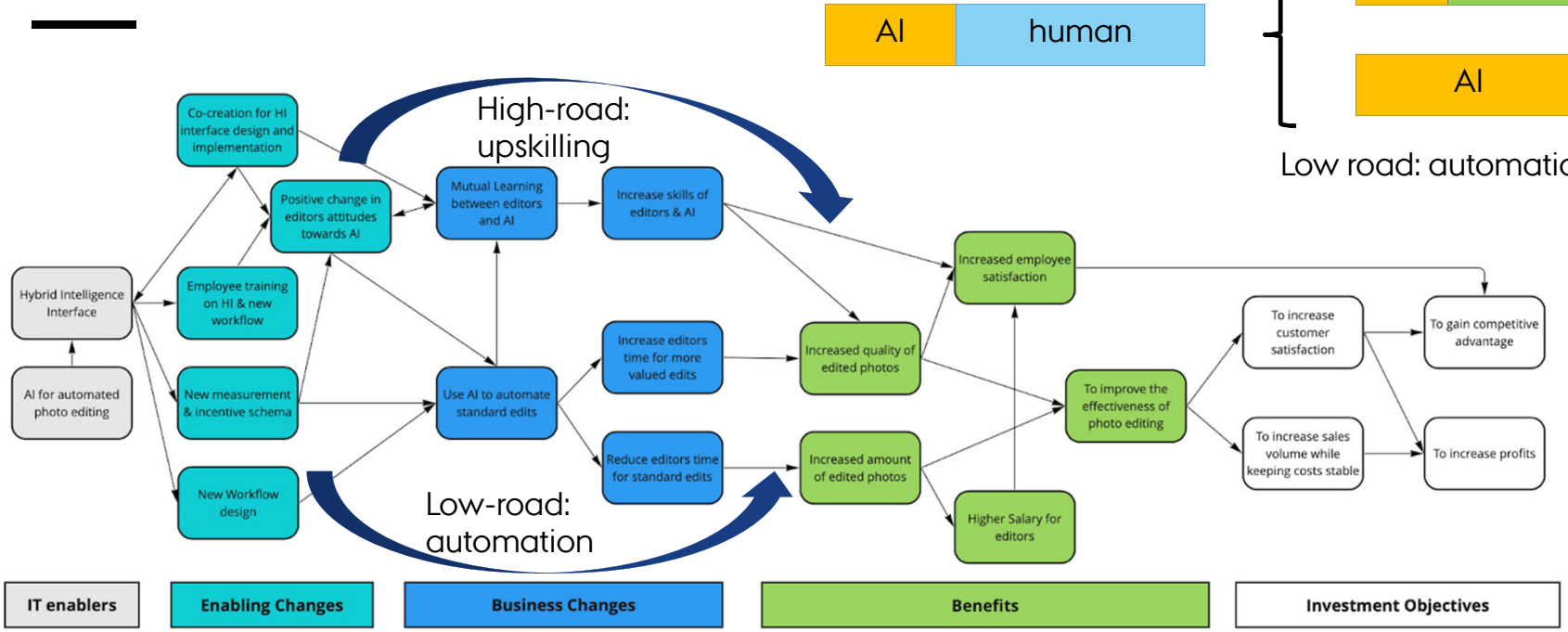
4: HI AS COMPANY STRATEGY: BENEFITS DEPENDENCY NETWORK



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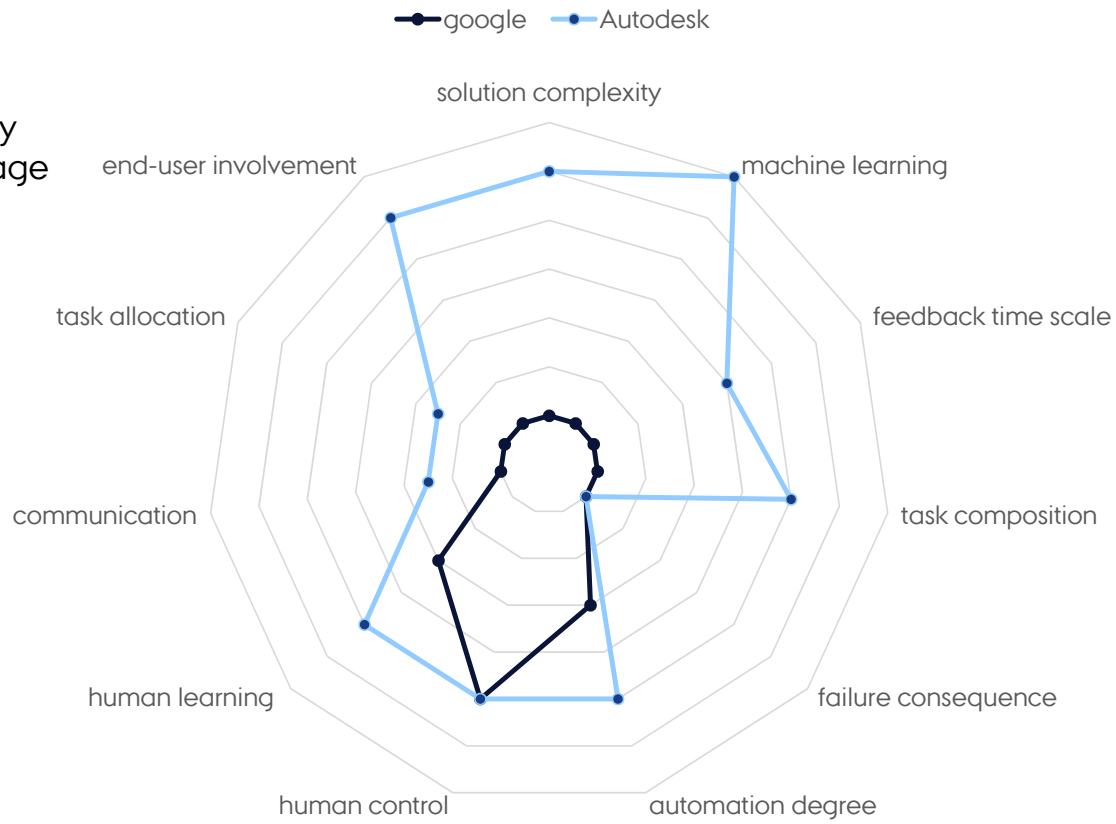
5: THE AI-SOLUTION OVERVIEW

- Map you current development and deployment strategy
- Consider alternatives to maximize competitive advantage



Dimensions:

Solution complexity (point solution, systemic solution)
Machine learning (single shot, continuous)
Feedback timescale (short, long)
Feedback data acquisition (automatic, manual)
Task decomposition (prediction, judgement)
Failure consequences (light, severe)
Automation degree (none, full)
Human control (none, full)
Task allocation (sequential, parallel)
Communication (constrained, free)
Human learning (none, individual, organizational)
End-user involvement (resistive, passive, engaged)