

Towards Hybrid Intelligence Workflows: Integrating Interface Design and Scalable Deployment

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1. Introduction

Companies are currently investing enormous resources into AI solutions, motivated by the potential benefits ranging from greater efficiency, faster and more accurate results to more effective and improved strategic outcomes at the organizational level. However, up to 70% of AI projects generate little impact, leaving the majority of AI initiatives a failure [1]. This failure is often attributed to the brittleness of deep learning systems [2] and consequently human-centered AI (HCAI) systems currently rise to prominence by considering AI as a tool for human augmentation and pursuing high levels of automation *and* user control simultaneously [3]. However, just as crucial factors for AI failures are cognitive, structural, and organizational deployment issues [1]. Isolated AI solutions usually fail because they only automate human workflows without managing organizational and behavioral change. Although HCAI is derived from the human-computer interaction (HCI) field [2,3] with its solid emphasis on user centered and participatory design, it usually does not take into account the complex business workflows within a socio-technical system. Such business workflows however are well studied in the information systems management (ISM) [5] and future of work (FoW) [6] literature; both can be subsumed under the umbrella discipline “management” (MGMT). The current challenge is to integrate HCAI with ISM principles to optimize business, societal and human values.

The purpose of this work is to explore the interdisciplinary boundary of the fields of AI, HCI and MGMT research (see Fig. 1). The introduction of management principles into AI-development projects is expected to lead to increasingly successful adoption into corporate settings. On the other hand, the complex nature of HCAI projects demands a fundamental introspection within ISM about whether AI can be considered to be “just another technology” or if some of the fundamental assumptions in the field need to be

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revisited. Here, we take as a point of departure a ,hybrid intelligence (HI) framework (HCAI with an additional criterion of continuous mutual human-AI learning), rooted in the management field [4] and explain how two concrete HCAI corporate implementation cases led us to start framing the foundations of a new updated HI-ISM field.

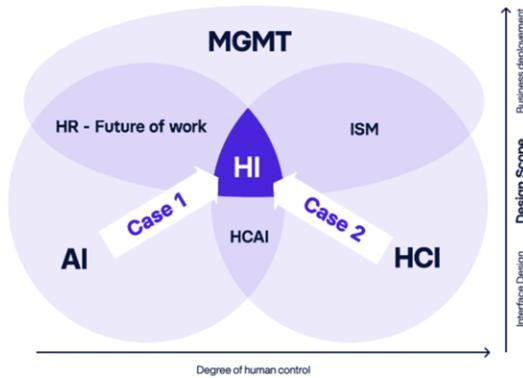


Figure 1. The interdisciplinary boundary of the fields of AI, HCI and management research. Human-centered AI (HCAI) combines HCI and AI. Traditionally, Information Systems Management (ISM) deals with the organizational deployment of a particular interface technology whereas Future of Work deals with the general impact of AI-technologies. As explored in the cases below, deploying HCAI solutions with appropriately upgraded ISM-methodologies enables Hybrid Intelligence (HI) workflows. Arrows denote the starting point of the two cases from existing AI- and HCI-based solutions respectively that were upgraded to HCAI interaction principles and adopted into the organization with hybrid intelligence inspired deployment principles.

In the first use case, HI-ISM is applied to an existing AI-based process automation solution. Suggestions are made for HCAI augmentation of the particular interface as well as how to enhance hybrid intelligence based business process re-engineering based on enhanced employee co-creation and adoption by explicitly addressing the employees’ fears of job-automation and replacement. The second use case applies HI-ISM design principles to an existing non-AI based decision- and prediction interface with the purpose of supporting development and adoption of an integrated expert advice and reinforcement learning system featuring continuous mutual human-AI learning.

2. Use Cases

2.1. Case 1: turning production-line photo editing into a creative studio

- **Business model:** real estate photo editing company (850+ employees) with European main and sales offices and an off-shore editing unit followed by stages of quality control and assurance.
- **AI- status:** have performed pilots with AI-preprocessing suggesting 40% efficiency increase, but huge problems of technology adoption due to combination of in-grown editing habits and fear of job-automation.
- **HI-pilot:** A new “Hybrid Intelligence Development Life-Cycle” is conceptualized with the phases “Analysis → Design → Development → Testing → Implementation → Maintenance”. Then, based on ISM literature, customized and actionable HI guidelines are developed for the Analysis and Design phase and tested on a case study. HCAI-principles are introduced using

interactive machine learning and active learning. The empirical part of the study compares conventional employee onboarding with a specially developed hybrid intelligence corporate narrative in facilitating employee interface and work process co-creation willingness. Finally, HI business process reengineering suggests entirely new value chains by freeing up editor creative resources to enable product customization based on customer preferences rather than the currently standardized workflow.

2.2. Case 2: hybrid intelligence in corporate strategic decision making

- **Current workflow:** Decision support tool offered by a hybrid intelligence startup. For a given corporate strategic decision, several business analysts provide predictions/forecasts, the effects are aggregated, and computed/simulated and high-level decisions are made.
- **AI-status:** pilots are conducted with reinforcement learning exploration of the strategic space.
- **HI-pilot:** an HI-interface is developed combining i) real-time personalized feedback to experts on e.g., their historic bias and level of conservatism to stimulate meta-cognitive reflection and ii) augmenting the reinforcement learning exploration with expert advice queried using active learning. User adoption of i) is compared with an AI and with a HI-ISM overall development narrative introduction.

3. Preliminary candidates for founding HI-ISM principles:

- **HI-pact between management and employees:** Management commitment to measuring implementation success measured on employee *upskilling* [8] in addition to improved outcomes in efficiency and other success metrics. Alleviated from fear of displacement, employees lean into workflow mapping and reengineering.
- **Computational understanding of human skills:** Describe all human tasks in the entire workflow in computational terms in order to highlight human strengths and weaknesses and potentials for hybrid synergies (see e.g. [9])
- **Business process reengineering** with emphasis on *hybrid intelligence workflow patterns* such as automation of routine tasks and development of specialization and customization value chains drawing on human expertise
- **Human-centered interactions:** Human-AI interaction developed according to HCAI principles in addition to the HI criterion of mutual human-AI learning
- **Learning from failures:** Capture fine grained and comprehensive process data of the entire human workflow and enable user feedback in cases of AI failure for continuous system improvement

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