

PhD Candidate full name: Filipa Rente Ramalho

Dissertation Title: Augmented Reality Adoption In Complex Manufacturing Systems: A Human-Centred Informational Approach

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Abstract or Public Summary: Manufacturing systems are undergoing sustained transformation driven by higher product variability, compressed innovation cycles, and intensified quality and traceability requirements. As shopfloor work becomes increasingly information-intensive, operators and supervisors must coordinate action, support learning, and exercise judgement under time pressure and operational risk, in contexts where unanswered information needs or unreliable content carry immediate consequences. Augmented Reality (AR) has attracted considerable research and industrial interest as a means to deliver contextualised, spatially anchored information precisely where and when it is needed. Despite this attention, stable long-term adoption in real industrial environments remains rare, with most deployments confined to controlled pilots that fail to institutionalise. This doctoral thesis addresses the transition from initial AR deployment to sustained adoption and institutionalisation in complex manufacturing systems. Conceptualising AR as an information mediation technology embedded within a socio-technical information ecology, it shifts the explanatory focus from technical performance to the informational, organisational, and governance conditions that determine whether AR-delivered content remains trustworthy and actionable over time. Methodologically grounded in Design Science Research, the study combines a multi-site qualitative corpus (comprising 20 semi-structured interviews across 12 manufacturing companies) with participatory, workshop-based evidence and longitudinal evaluation within a focal industrial partner. The thesis advances four main contributions: a consolidated taxonomy of AR adoption factors across technological, human, organisational, and informational dimensions; a requirements catalogue of 49 specifications for adoptable AR systems; an adoption framework articulating five socio-technical alignment dimensions with empirically quantified inter-dimensional relationships; and an information management model specifying how AR-mediated shopfloor content should be structured, contextualised, governed, and maintained across its lifecycle with trustworthiness as an emergent property of sustained governance quality. The central argument is that durable AR adoption depends not on technical feasibility alone, but on the joint alignment of work

practices, information conditions, organisational capacity, and governance arrangements, reframing adoption as a systemic design challenge rather than a technological deployment problem.

Doctoral Programme: Doctoral Programme in Digital Media

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Scientific Domain: Systems Engineering and Management

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