

## **Top managers' entrepreneurial orientation and industry 4.0 adoption intentions in SMEs**

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## **Introdução**

Technology adoption in SMEs often depends on top managers, whose personal traits shape strategic decisions. While models like TAM-TOE explain adoption behaviour, they neglect individual-level factors such as individual traits. This study explores how individual entrepreneurial orientation (iEO) and its subdimensions affect Industry 4.0 (I4.0) adoption in Portuguese SMEs. Integrating iEO into TAM-TOE is especially relevant for SMEs and during major technological shifts, clarifying the framework's limits (boundary conditions) in contexts where entrepreneurial traits are decisive.

## **Problema de Pesquisa e Objetivo**

SMEs face unique challenges in adopting complex and disruptive technologies like Industry 4.0, including limited resources, structural constraints, and reliance on top managers. While TAM-TOE explains adoption behaviour, it fails to capture the influence of personal traits that may be decisive in such contexts. This study investigates how iEO influences I4.0 adoption intentions in Portuguese SMEs and proposes extending TAM-TOE to better reflect SME-specific decision-making dynamics.

## **Fundamentação Teórica**

This study extends TAM-TOE by integrating iEO to explain I4.0 adoption in SMEs. TAM (Davis, 1989) captures perceived usefulness (PU) and ease of use (PEU), while TOE (Tornatzky and Fleischer, 1990) adds technological, organisational, and environmental context. Drawing on Upper Echelons Theory (Hambrick and Mason, 1984), we argue that top managers' traits, especially in SMEs, are critical in shaping adoption. Recent studies reaffirm the theory's relevance in digital contexts, highlighting the strategic role of managerial attributes in technology-driven transformation.

## **Metodologia**

Data were collected via an online survey of 270 top managers from Portuguese SMEs, using validated TAM-TOE and iEO scales. The sample was drawn from the ANI's Compete 2020 official database. PLS-SEM was used for model testing, suitable for exploratory research and complex models. Common method variance was addressed through procedural and statistical controls. Power analysis confirmed sample adequacy, and construct reliability and validity were established through standardised assessments.

## **Análise dos Resultados**

The model confirmed TAM-TOE's relevance and highlighted the added value of integrating top managers' iEO. At the subdimension level, Proactiveness had a direct effect on I4.0 adoption intentions, while risk acceptance moderated the PU-adoption intentions link. Internally, readiness and compatibility positively influenced adoption intentions via PEU, while complexity had a negative effect via PU. Externally, competitive advantage and partner support positively influenced adoption intentions via PU. Overall, iEO enhanced TAM-TOE's explanatory power of I4.0 adoption intentions.

## **Conclusão**

This study confirms the importance of contextual factors - organisational readiness, compatibility, complexity, and perceptions of competitive advantage and external support - in shaping I4.0 adoption intentions in SMEs. It also highlights the added value of integrating top managers' iEO into TAM-TOE. Proactiveness and risk acceptance emerged as key drivers, suggesting that fostering these entrepreneurial traits can enhance digital transformation amid major technological change.

## **Contribuição / Impacto**

This study extends the TAM-TOE framework by incorporating individual entrepreneurial orientation and highlighting the influence of internal and external factors - such as organisational readiness, compatibility, complexity, partner support, and perceived competitive advantage - on I4.0 adoption in SMEs. It offers practical insights for aligning technological, organisational, and environmental factors with individual attitudes to support effective digital transformation.

## **Referências Bibliográficas**

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