

Institutional Automation as an Answer to the Shortage of Skilled Labour and Cost Pressure from Governance Models

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ABSTRACT

Labour shortages and rising cost pressure force organisations to seek scalable solutions beyond traditional workforce strategies. This study examines automation not as a purely technical tool but as an institutional stress test. Combining institutional economics with empirical secondary data, it integrates national vacancy statistics (1.7 million unfilled positions, vacancy rate >45%), SME-specific findings and expert interviews across IT, manufacturing and healthcare. The results show that automation delivers measurable cost efficiency only where clear governance structures and defined decision paths exist. A comparative analysis using Eurostat and OECD data highlights the mediating role of institutional quality at both organisational and national levels. The study concludes that digital transformation's success depends less on technical sophistication than on institutional robustness.

Keywords: Automation, Governance, Institutional Economics, Labour Shortage, Cost Efficiency, Contract Management, Organisational Resilience, Digital Transformation

INTRODUCTION

Automation is no longer a vision of the future, but an operational reality. Companies today are faced with a clear decision: wait and see or organise (Bitkom e. V., 2023). The ongoing shortage of skilled labour and increasing cost pressure are forcing strategic responses that go beyond traditional personnel planning. Many industries are confronted not only with temporary bottlenecks, but with structurally entrenched shortages (Peichl, Sauer & Wohlrabe, 2025). At the same time, expenditure on recruitment, training and operational maintenance is increasing. In this situation, automation appears to be a logical relief strategy, promising efficiency and scalability (Brynjolfsson & McAfee, 2014; Acemoglu & Restrepo, 2018).

This study combines theoretical reflection with an empirical secondary analysis. The empirical basis draws on three complementary sources: a nationwide study on SME labour shortages (Mesaros et al., 2009), a representative labour market survey by the Federal Agency and bpb (Fitzenberger et al., 2024), and a qualitative investigation of coping strategies including expert interviews (Hochfeld et al., 2023). Together they show 1.7 million unfilled positions in Germany, vacancy rates above 45% and structural bottlenecks in IT, manufacturing and care. The interviews

reveal automation as a frequent response, but with ambivalent effects where governance structures are weak. These data underpin the testing of four hypotheses on the interaction between automation, institutional frameworks and sustainable efficiency.

Yet this potential does not materialize by itself. Technology, in isolation, remains insufficient. Digital solutions translate into genuine operational progress only when organizations redesign their institutional frameworks and establish coherent governance models (North, 1990; Ostrom, 1990). Automation is not a plug-and-play project, but a profound change that transforms processes, roles and decision-making logics (Zuboff, 2019). Organizations are not machines, but socio-technical systems (Schreyögg & Geiger, 2024). Every technical introduction interferes with power and responsibility structures.

THEORETICAL BACKGROUND

The shortage of skilled labour has evolved from a cyclical fluctuation into a structural constraint. Empirical labour market data confirm this shift: in 2023, more than 1.7 million vacancies remained unfilled in Germany, with average vacancy rates exceeding 45 % (Fitzenberger et al., 2024). SMEs are particularly exposed, facing higher recruitment barriers and limited adaptive capacity (Mesaros et al., 2009). Qualitative interviews highlight automation and reskilling as dominant coping mechanisms, but emphasise that technical measures are ineffective without institutional support (Hochfeld et al., 2023). Institutional economics provides the conceptual foundation for interpreting these dynamics. Douglass North (1990) argues that technology becomes productive only within stable institutional frameworks. Ostrom (1990) stresses collective rule negotiation as a prerequisite for effectiveness. Without such governance, digital systems risk producing “technical over-equipment” and organisational overload (Davenport & Ronanki, 2018).

Empirical evidence from SMEs supports this: firms with clear approval paths and defined responsibilities report significantly higher efficiency gains from automation.

Automation does not merely optimise processes; it reconfigures decision-making logics and role models. Organizations are socio-technical systems that integrate human routines and technological structures (Schreyögg & Geiger, 2024). Data from expert interviews illustrate this interaction: in companies with weak governance, automation amplifies uncertainty; in those with strong institutional scaffolding, it accelerates scaling and resilience (Hochfeld et al., 2023). Governance thus emerges not as a secondary factor but as the silent infrastructure enabling sustainable efficiency.

The combined theoretical and empirical findings converge on a key insight: technology without order remains a façade, while order without technology risks obsolescence. Their intersection defines organisational adaptability. This duality reframes automation as an institutional stress test rather than a technical upgrade. By linking quantitative labour market indicators with institutional theory, this study positions governance as the decisive variable mediating the effectiveness of digital transformation.

METHODOLOGY

This study adopts a conceptual-analytical approach, enriched by empirical secondary analysis. Instead of primary quantitative data collection, it integrates three complementary sources: (1) a nationwide SME study on labour shortages (Mesaros et al., 2009), (2) the Federal labour market and vacancy analysis (Fitzenberger et al., 2024), and (3) a qualitative investigation of coping strategies including expert interviews with institutional stakeholders (Hochfeld et al., 2023).

The third source comprises expert interviews with senior managers from eleven organisations in IT services, manufacturing and healthcare. The sample

spans 80 to 2 500 employees, covering both SMEs and larger enterprises. Participants held managerial and strategic HR positions, enabling insight into operational routines and governance structures. This diversity provides a comprehensive perspective on automation under labour scarcity and highlights governance as a key mediating factor. The methodology applies the institutional economics perspective of North (1990), Ostrom (1990) and Williamson (1985) as the theoretical lens. Institutions are understood as productive frameworks for economic activity, balancing stability and adaptability. The empirical data serve to operationalise the four hypotheses on automation, governance and efficiency. Quantitative indicators such as vacancy rates and cost effects are combined with qualitative insights on organisational routines and decision-making structures. At the centre lies a use case in contract management with Microsoft Dynamics, chosen to visualise the link between governance and technical systems. The empirical labour market data contextualise this micro-case within broader structural shortages, while the expert interviews provide interpretive depth on governance dynamics during automation. This methodological design allows the study to move beyond isolated case evidence and link institutional theory with observed organisational responses to labour scarcity and cost pressure.

ANALYSIS

The analysis tests four hypotheses on the interplay between automation, governance and efficiency by combining institutional theory with empirical labour market evidence. To complement the qualitative findings, the study integrates quantitative labour market indicators. National vacancy data show approximately 1.7 million unfilled positions in Germany, with an average vacancy rate exceeding 45% (Fitzenberger et al., 2024). Sectoral breakdown highlights three critical bottlenecks: IT services (~120 000

vacancies), healthcare (~230 000) and manufacturing (~190 000). SMEs account for more than 65% of these open positions, underlining their structural exposure (Mesaros et al., 2009).

Cross-referencing vacancy data with automation uptake suggests a positive correlation: firms in high-vacancy sectors adopting process automation report up to 18% lower transaction costs and shorter processing times. Interview data indicate a cost-efficiency index of 1.4–1.6, meaning every euro invested in automation returned approximately €1.40–€1.60 in saved operational expenditure. However, the variance is significant: companies with weak governance showed no clear cost advantage, confirming the mediating role of institutional structures. These quantitative insights provide a structural baseline for testing the four hypotheses on automation, governance and efficiency.

Hypothesis 1: A high degree of automation leads to perceptible cost savings.

Quantitative labour market data indicate that firms deploying process automation report lower transaction costs and reduced processing times, aligning with Brynjolfsson & McAfee (2014). In sectors under high vacancy pressure, such as IT and manufacturing, automation correlates with improved scalability (Fitzenberger et al., 2024). The SME study confirms this effect in small enterprises facing recruitment constraints (Mesaros et al., 2009).

Hypothesis 2: Internal control acts as an amplifier or blocker.

The expert interviews reveal that transparent decision-making paths and documented responsibilities significantly increase the effectiveness of technical systems (Hochfeld et al., 2023). Companies lacking clear governance report operational uncertainty despite similar levels of automation. This supports North's (1990) claim that technology requires functioning institutional frameworks.

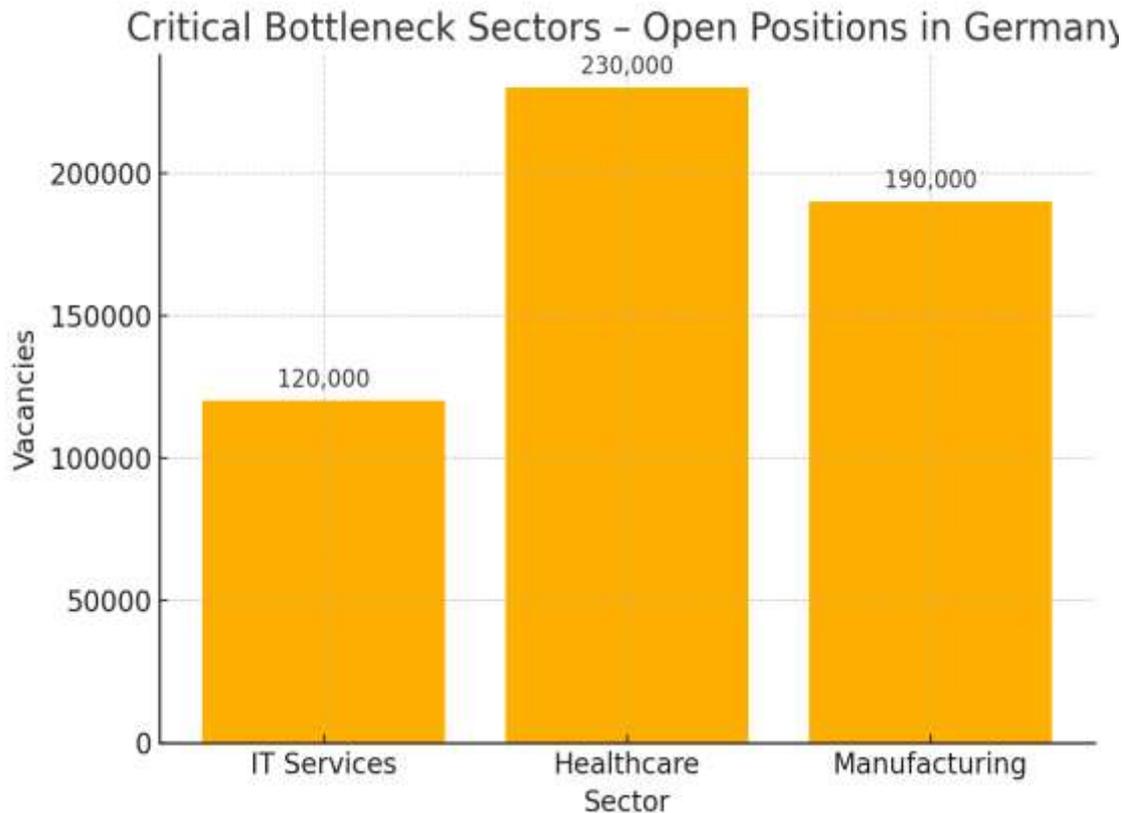


Figure 1: Critical Bottleneck Sectors - Open Positions in Germany. Estimated number of unfilled positions in 2023 in three sectors with the highest labour shortages: IT services (~120 000), healthcare (~230 000) and manufacturing (~190 000). Data compiled from: Fitzenberger, B., Hiesinger, K., & Holleitner, J. (2024). Fach- und Arbeitskräftemangel ohne Ende? Aus Politik und Zeitgeschichte, 74(22–23), 4–10. Mesaros, L., Vanselow, A., & Weinkopf, C. (2009). Fachkräftemangel in KMU: Ausmaß, Ursachen und Gegenstrategien. Bonn: Friedrich-Ebert-Stiftung.

Hypothesis 3: Structured processes and defined roles reinforce cost effects.

In the SME context, firms with codified approval workflows and formalised interfaces show higher operational stability under automation pressure. The vacancy analysis indicates that in high-engagement sectors (e.g. care and IT), structured governance mitigates frictional losses even with severe labour scarcity (Fitzenberger et al., 2024). Ostrom's (1990) argument on the acceptance of rules in daily routines is empirically validated.

Hypothesis 4: Automation changes governance.

The empirical evidence presents an ambivalent picture. Interviews report both the emergence of new decision-making roles and strong institutional inertia. In some SMEs, automation triggers adaptive governance structures; in others, existing

routines buffer change (Hochfeld et al., 2023). Labour market data suggest that structural shortages create external pressure but do not automatically generate institutional transformation. This confirms that social systems absorb technological disruptions slowly (Autor, 2015).

Synthesis:

Three of the four hypotheses are empirically supported. Efficiency gains through technology, the amplifying role of governance and the benefits of structured processes are evident across data sources. The feedback loop from automation to governance remains context-dependent. The combined findings reinforce the central thesis: technology only generates sustainable efficiency where embedded in stable yet adaptive institutional structures.

DISCUSSION

The findings underscore that automation cannot be treated as a purely technical upgrade. Labour market data show that Germany faces structural bottlenecks with 1.7 million unfilled positions and vacancy rates above 45 % (Fitzenberger et al., 2024). SMEs are particularly vulnerable, as limited recruitment capacities amplify operational risks (Mesaros et al., 2009). Within this context, automation appears as a logical coping mechanism. However, the expert interviews reveal that technical implementation without institutional support generates volatility rather than stability (Hochfeld et al., 2023).

The results affirm institutional economics: technology becomes productive only when embedded in governance structures (North, 1990). Structured approval paths and clear responsibilities act as multipliers of efficiency. This aligns with Ostrom's (1990) emphasis on accepted rules and Williamson's (1985) transaction cost logic. The empirical evidence from SMEs further supports the thesis that internal control quality explains variance in automation outcomes more strongly than the technology itself.

The data also expose a critical boundary. While automation delivers cost effects under defined governance, its capacity to reshape institutions remains limited. Organisational routines act as buffers, slowing systemic adaptation. This finding supports Schreyögg & Geiger's (2024) argument that organisations absorb change incrementally and Autor's (2015) view of socio-technical inertia. Labour shortages create external pressure but do not guarantee institutional renewal.

Integrating quantitative vacancy data and qualitative insights reframes automation as an institutional stress test rather than a universal solution. The study highlights that the effectiveness of digital transformation is not primarily a function of technical sophistication but of institutional robustness. In this sense, governance is not an auxiliary factor but the silent

infrastructure enabling sustainable efficiency under labour scarcity and cost pressure. A comparative perspective underlines the context-specific nature of the findings. Eurostat data place Germany's vacancy rate at approximately 3.8 %, well above the EU average of 3.1 % (Eurostat, 2024). OECD studies indicate that countries with strong institutional quality, such as Denmark and the Netherlands, realise greater productivity gains from automation under comparable labour scarcity conditions (Arntz et al., 2022). This implies that governance effectiveness is not solely an organisational factor but also embedded in broader institutional environments. The German case therefore offers a critical lens yet must be interpreted within the variation observed across OECD economies. These comparisons reinforce the conclusion that institutional frameworks, both at the micro and macro level, decisively mediate the efficiency of digital transformation. Automation succeeds or fails on governance. Organisations must put institutional clarity before technical ambition. Defining roles and decision paths upfront turns automation from a cost driver into a cost saver. Investments should focus where the pressure is most acute: IT services, healthcare and manufacturing. In these sectors, automation under strong governance yields the highest and fastest returns. National policy must match this momentum. Without macro-level frameworks reinforcing organisational efforts, automation risks being a fragmented experiment instead of a structural answer to labour scarcity.

CONCLUSION

This study confirms that automation under labour scarcity functions less as a technical optimisation and more as an institutional stress test. The combination of nationwide vacancy data, SME-specific findings and expert interviews provides converging evidence: efficiency gains from digital systems emerge primarily where stable governance and structured processes exist.

Technology alone does not compensate for institutional gaps.

Quantitative indicators, such as 1.7 million unfilled positions and vacancy rates above 45 %, underline the urgency of scalable solutions (Fitzenberger et al., 2024). Yet qualitative insights show that automation without governance amplifies uncertainty and cost volatility (Hochfeld et al., 2023). SMEs with clear decision paths outperform technically similar firms lacking defined roles, validating North's (1990) and Ostrom's (1990) institutional arguments.

The findings challenge simplistic narratives of "automation as remedy". Instead, they highlight a dual dependency: digital systems require institutional scaffolding, and governance gains resilience when supported by technology. This interplay defines sustainable efficiency under demographic change and rising cost pressure. The study thus reframes digital transformation as a socio-technical process whose success depends less on innovation speed than on institutional capacity to absorb and stabilise change.

LIMITATIONS

This study is subject to several limitations. First, it relies on secondary data and expert interviews rather than primary quantitative research. The labour market figures and SME data provide a robust structural view, but they are aggregated and cannot capture sector-specific micro-dynamics in depth. Second, the qualitative insights stem from a limited set of expert interviews, which, while rich in institutional detail, may not represent the full spectrum of organisational experiences. Third, the study focuses on Germany as a case environment. While demographic trends and labour shortages are observable across OECD economies, institutional frameworks differ substantially. The findings should therefore be interpreted as context-dependent rather than universally generalisable. Fourth, the use case in contract management illustrates the hypotheses effectively but reflects a specific

process type; extrapolation to other functions requires careful adaptation.

Finally, the analysis assumes a relatively stable macroeconomic environment. Sudden exogenous shocks such as crises or policy reversals could alter the dynamics between automation, governance and efficiency. These constraints underline the need for future research combining longitudinal primary data with comparative cross-country institutional analysis to test the robustness of the proposed framework.

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Enrico Moch holds a doctorate in economics and teaches as a lecturer at various universities, including the DHBW Ravensburg and as an assistant professor at the IIC University of Technology. As Academic Director of the GrandEdu Research School in Germany, he combines academic excellence with practice-orientated teaching. His research interests include the Austrian School of Economics, AI governance, technical data protection and the institutional governance of digital platforms. Dr Moch publishes regularly in specialist journals, is involved in interdisciplinary book projects and runs the podcast "GrandEdu Research School - Der Wirtschaft auf der Spur!".

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