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Automation as an Answer to the Shortage of Skilled Labour and Cost Pressure

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ABSTRACT

This study assessed the capacity of automation to address skilled labor shortages and increasing cost pressure. The objective was to identify the organizational conditions that enable automation to produce measurable improvements in efficiency. A systematic review of recent research combined with OECD data from 2023 to 2025 was conducted to evaluate the interaction between technological implementation and governance structures. The analysis showed that automation achieved significant productivity gains only when embedded in clearly defined workflows supported by transparent decision-making and explicit responsibilities. Organizations with structured processes demonstrated stable operational improvements, while those lacking institutional clarity encountered delays, friction and failed implementations. The results confirmed that automation did not establish order independently but amplified existing organizational structures. Two central conclusions were drawn. First, automation enhanced performance when it reinforced institutional stability rather than merely digitizing existing procedures. Second, governance with clear accountability and adaptive management was a prerequisite for sustainable success. The study concluded that automation acted as a test of organizational readiness. Its effectiveness depended on leadership commitment, process consistency and structural clarity. Without these elements, automation intensified weaknesses instead of delivering relief.

Keywords: Organizational Behavior, Labor Productivity, Public Sector Management, Human Capital, Technological Change

INTRODUCTION

The shortage of skilled labor has developed into a structural brake on growth in Germany. According to calculations by the German Economic Institute, the economy loses up to 49 billion euros in added value every year, which corresponds to approximately 1.1 percent of production potential in 2024 [1]. As recently as January 2025, 28.3 percent of companies reported unfilled positions. In the service sector, the share was 35.1 percent, significantly above the EU average [2]. What was once considered a cyclical bottleneck has condensed into a systemic challenge. Traditional personnel instruments are no longer effective. At the same time, the pressure to remain productive is rising while resources are becoming scarcer and costs continue to increase.

This study combines a systematic literature review with OECD productivity and governance data from 2023 to 2025 to analyze the institutional conditions under which automation achieves measurable effects.

In this context, automation gains importance. It is expected to accelerate processes, relieve employees, and unlock efficiency potential. Yet technology alone is insufficient. Systems can standardize, stabilize, and ease workloads, but only if organizations are willing to question themselves. Automation is not a tool. It is a stress test for leadership capacity, structural clarity, and institutional maturity. Where responsibility remains diffuse and processes are historically grown and barely controllable, technology does not create relief but friction. Governance becomes the invisible infrastructure of effectiveness [3]. Digitalization unfolds its impact only when it is strategically embedded and institutionally supported [4].

RESEARCH QUESTION AND HYPOTHESES

Automation is not merely a technical advancement. It is a promise of leadership. Believing that efficiency is only a matter of the right software underestimates the power of institutional order. This study therefore asks a crucial question:

- When does automation succeed under the conditions of skilled labor shortages and cost pressure, and how do governance and implementation models contribute to its effectiveness?

This question cannot be answered with numbers alone. It requires conceptual precision, analytical depth, and an institutional perspective. Technology has impact only where organizations demonstrate a clear stance. From this conviction, two hypotheses are derived.

HYPOTHESIS 1

Automation provides relief when it not only digitizes processes but also stabilizes structures. Where workflows are defined, interfaces are aligned, and decisions are binding, efficiency emerges.

HYPOTHESIS 2

Governance is not an auxiliary measure but a prerequisite. Clear responsibilities, transparent decision-making paths, and adaptive management make organizations capable of change.

These hypotheses are not an attempt to relativize technology. On the contrary, they highlight what truly matters. Automation is not an IT project. It is a test of leadership and institutional design capacity. It does not work automatically but only where order provides support.

THEORETICAL BACKGROUND

Technology by itself does not bring about transformation. Change takes shape only when organizations are willing to adapt their internal structures. Productivity is not the direct outcome of machines or software; it emerges from the frameworks that support them. If workflows remain undefined, stability cannot take root. When responsibilities are blurred, even the most advanced systems fail to deliver. Automation becomes effective only in environments where organizations demonstrate clarity and the courage to reshape their processes.

Institutional economics offers the conceptual lens for understanding this interplay. North (5) describes institutions as the “rules of the game” both formal and informal structures that shape expectations and guide behavior. They provide continuity while setting boundaries to arbitrary action. Building on this foundation, Ostrom (6) emphasizes that rules must be lived rather than merely codified. Institutions are not born from plans but from practice. They gain strength through feedback, collective learning, and shared commitment. Williamson (7) shows the close connection between transactions and governance. He analyses how organisations align their structures under uncertainty and control requirements. Brynjolfsson and McAfee (8) argue that digital technologies only have an impact if organisations are prepared to question established routines, decision-making paths and control models. Without this willingness, automation remains a technical shell without operational substance.

Despite their different emphases, these approaches converge on a critical insight.

Efficiency is not created by technology in isolation but through the institutional alignment of what is technically feasible with what is organizationally sustainable. Absent such alignment, automation becomes a façade: systems run without ownership, data accumulates without decisions, processes are mapped but lack legitimacy. Hayek's (9) contribution adds a further layer, suggesting that order cannot be centrally imposed. It grows from adaptive rules that create direction without suffocating change. This perspective underpins the modern concept of digital governance.

Recent studies reinforce this perspective. Zuboff (10) argues that digitalization extends beyond process optimization; it reconfigures power relations and shifts institutional responsibility. Automation alters control structures and reshapes the basis of institutional legitimacy. Filippucci, F et al. (11) emphasize a further point: institutional change often originates internally. Demographic trends, labor shortages and escalating cost pressure force organizations to adjust, irrespective of strategic intent.

The work of the Inter-American Development Bank (12) provides further evidence. Their comparative study shows that efficiency gains from automation emerge only when processes are both digitized and institutionally anchored. They call for a combined view of governance and automation not as separate elements, but as two sides of the same coin.

In sum, the theoretical discourse points to a simple but powerful conclusion. Technology does not act in a vacuum. Its effectiveness depends on its institutional environment. Automation is more than a technical intervention it is a test of organizational order, trust, and leadership capacity.

METHODOLOGY

This study does not aim to collect endless data. It aims to cut to the core. Numbers alone cannot answer the central question. What matters is understanding why technology drives efficiency in some organizations and fails completely in others. This is not a matter of measurement it is a matter of interpretation. The approach is unapologetically conceptual. It blends theoretical reasoning with structured analysis of existing evidence. Following the line of thought by North [5], Ostrom [6], and Williamson [7], the study assumes one thing: institutions are not written, they are lived. Technology does not work in a vacuum. It only becomes effective where governance creates order.

From January to March 2025, a systematic literature review was conducted using Web of Science, Scopus and the OECD iLibrary. The search focused on terms such as automation productivity OECD, AI governance public sector and cost efficiency digital government. Only peer-reviewed studies and policy papers from 2018 to 2025 were retained. Work limited to technical implementation without governance relevance was deliberately excluded to sharpen the conceptual and institutional focus. Of roughly 2,000 initial publications, 50 were analyzed in depth, and nine provided the strongest empirical foundation for the study.

Second, the findings were confronted with hard data. OECD statistics provided the backbone: productivity metrics, automation rates, digital infrastructure indicators, and governance models across the G7. The goal was not to build causal models but to check one thing plausibility. Does the evidence hold across different contexts?

Third, the data and theory were merged. This feedback loop revealed a simple truth: automation is powerless without institutional order. Where governance collapses, technology follows.

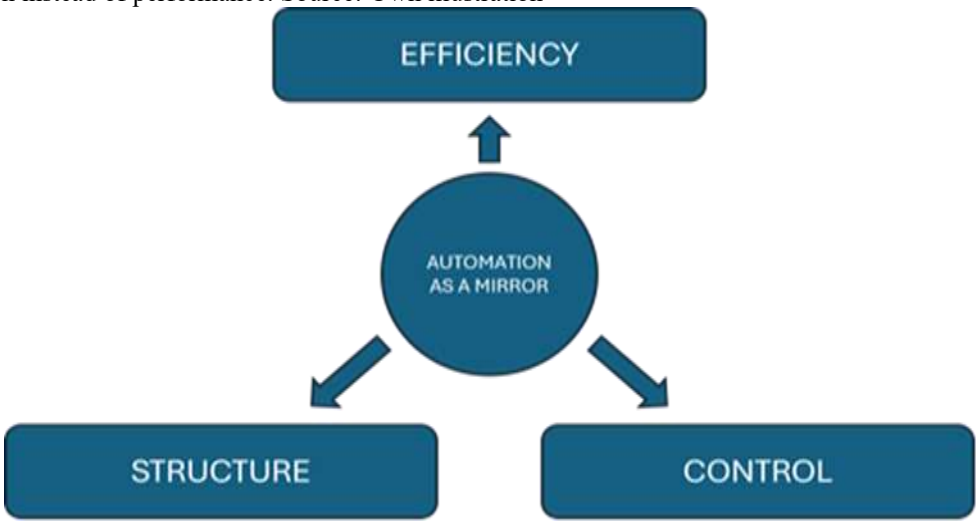
The methodology does not hide its limits. No primary data were gathered, and no interviews or surveys were conducted. This is not a flaw it is a conscious decision. The study does not aim to capture every variable but to focus on the structural conditions that make or break automation. OECD data at the national level inevitably reduces granularity, but the trade-off is clear: conceptual precision over anecdotal detail.

Boundaries are strength. This research chooses clarity over completeness and depth over breadth. It asks not what technology could theoretically achieve, but under what institutional conditions it actually delivers. The answer is never neutral. It always comes back to governance.

ANALYSIS

Automation does not live in a lab. It lives in organizations under pressure. The combination of theoretical insights, OECD data, and empirical studies draws one sharp conclusion. Automation is never neutral. It either amplifies order or accelerates chaos. Three axes define its impact: efficiency, governance, and structure.

***Figure 1*:** Causal framework of automation as a mirror. The effectiveness of automation depends on institutional order along three axes: structure, control, and efficiency. Without structural clarity, automation accelerates dysfunction instead of performance. Source: Own illustration



1. Automation delivers only on solid ground.

Where workflows are standardized, roles are unambiguous, and systems are aligned, automation acts as an accelerator. The data are consistent. Productivity gains between 0.4 and 0.9 percentage points per year are documented when handovers, approvals, and responsibilities are clearly set [11, 13]. These effects are strongest in highly repetitive sectors such as tax administration or contract management. Estonia is the prime example. Full automation reduced the processing time of tax returns to mere minutes while cutting costs and raising service quality [14]. In finance, AI-driven document review systems cut processing times by up to thirty percent. The pattern is clear: where structure exists, automation multiplies it.

2. Governance is the lever.

Organizations that leave steering to chance waste their technological potential. OECD data show that two-thirds of member states rely on data-driven governance strategies to manage public and corporate services [15]. These frameworks create transparency, feedback loops, and stable decision paths. Countries scoring high on the Digital Government Index such as Estonia [0.87] and Denmark [0.81] report stronger efficiency gains and higher acceptance of automation. Where such frameworks are absent, friction dominates. Systems run, but accountability dissolves. Data exist, but no one acts on them.

3. Structure decides everything.

Automation reflects the organization it enters. It is not the task that determines success, but the institutional setup. Denmark's healthcare system demonstrates this vividly. Digital patient records and automated scheduling reduced administrative load per case while improving staff satisfaction [16]. Conversely, where

responsibilities are vague and interfaces undefined, automation amplifies confusion instead of creating relief.

The verdict is unambiguous. Automation is not a technical add-on. It is a strategic project. Where institutional clarity reigns, technology becomes a lever. Where it is absent, technology exposes the cracks. Automation does not fix dysfunction it reveals it.

DISCUSSION

Automation is not just another technological trend. It marks a structural turning point. The evidence leaves little room for doubt: technology only works where order exists. Without institutional clarity, friction replaces progress. The potential is undeniable. Automation cuts error, speeds up processes, and relieves staff when workflows are defined and structures are stable. OECD data and case studies confirm measurable productivity gains between 0.4 and 0.9 percentage points per year when automation is embedded in robust governance frameworks [11, 13]. The practical examples speak for themselves. Estonia turned tax filing into a matter of minutes through near-complete automation [14]. Denmark's digital patient records and automated scheduling eased administrative burden while raising service quality [16].

Yet these effects are never automatic. The analysis draws a hard line. Technology alone achieves nothing. Its power depends entirely on institutional embedding. Automation is not a repair tool it is a mirror. It reflects weak interfaces, unclear responsibilities, and missing feedback loops with brutal clarity. OECD's Digital Government Index illustrates this gap. Countries with mature governance frameworks such as Estonia or Denmark harness technology. Those without see stalled systems, mistrust, and wasted investments.

Governance is the decisive factor. Clear roles, transparent decision paths, and adaptive control models unlock the potential of automation. Tokura [17] shows that cost optimization in infrastructure management fails unless responsibilities are explicitly defined. Dalsaniya and Patel [4] argue the same: intelligent automation delivers only when embedded in structured governance frameworks.

The findings confirm both hypotheses. First, automation raises cost efficiency under labor shortages and rising cost pressure. Second, governance is not a side factor but the foundation. Technology provides the tool. Governance provides the plan.

The implication is blunt. Automation is not an IT project. It is a strategic process. Organizations that treat it as a technical upgrade are setting themselves up for failure. Those that embed it in institutional clarity create leverage far beyond efficiency. They gain resilience. The findings demonstrate that automation can increase efficiency, yet they also uncover serious risks when implementation is rushed. Pushing automation too far can create lasting dependence on technical systems and undermine essential organizational knowledge. When employees are not actively involved and changes lack transparent communication, resistance becomes certain, turning potential gains into setbacks. Governance must therefore do more than manage processes efficiently. It has to establish clear accountability, uphold ethical and social standards and safeguard institutional integrity. Without these foundations, automation threatens stability instead of strengthening it. It is not a neutral tool but a structural intervention that requires decisive and responsible guidance.

PRACTICAL IMPLICATIONS AND RECOMMENDATIONS

The message is direct. Companies facing structural labor shortages and rising costs cannot afford to treat automation as a technical upgrade. It is not an IT task to be delegated. It is a leadership project. Technology does nothing on its own. It demands institutional readiness.

First, automation must be anchored in a clear organizational framework. Before any process is digitized, it must be defined,

aligned, and legitimized. Automation amplifies what already exists. It does not create structure. Companies must therefore audit their workflows relentlessly. Where are the gaps? Where are responsibilities unclear? Only once these questions are answered can technology have real impact.

Second, governance is the foundation of every successful automation initiative. Data-driven steering, binding decision paths, and role-based accountability turn automation from a tool into a strategic asset. The creation of "Centers of Excellence" for process automation, as implemented by leading organizations [18], has proven to be an effective governance instrument.

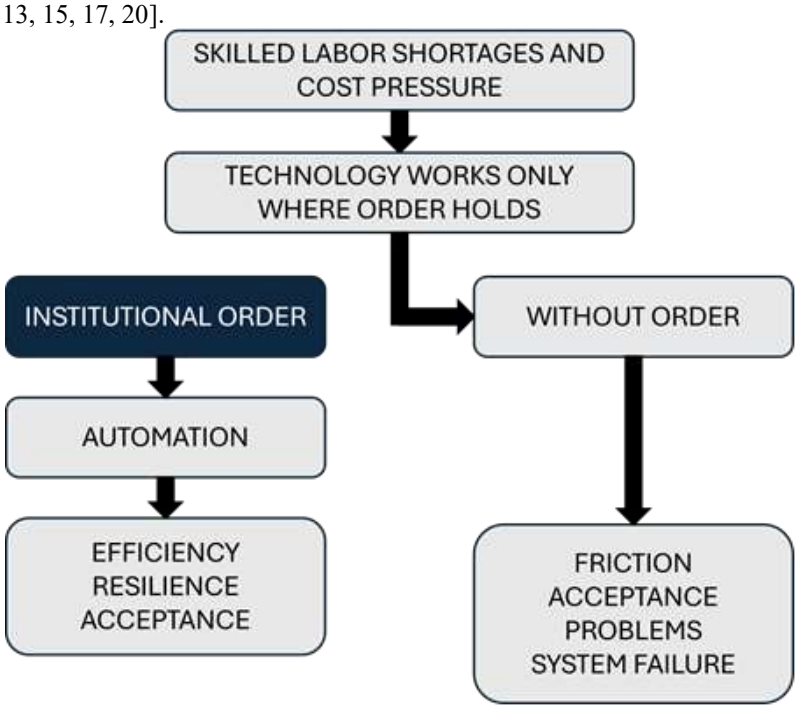
Third, organizations must break with entrenched routines. Automation cannot preserve the status quo; it must drive structural change. Permanent monitoring and rigorous KPI-based evaluation are essential. They are not supportive tools but the core mechanisms that secure transparency and enable decisive control. Metrics are not decoration they are steering instruments.

Fourth, automation is never neutral. It is a cultural intervention. Success depends on its integration into organizational culture. Acceptance cannot be bought with training alone it requires communication, involvement, and legitimate structures. Ethics-based auditing procedures, as suggested by Mokander et al. (19), can strengthen trust and minimize resistance.

Fifth, policymakers have a role to play. OECD analyses show that public investment in digital infrastructure, interoperable standards, and adaptive regulatory frameworks accelerates the transfer of automation potential into business and administration [20,21]. GovTech alliances and open-government platforms can provide critical leverage especially for small and medium-sized enterprises.

These are not checkboxes. They form a roadmap for systemic change. Automation demands clarity, consistency, and institutional design power. Technology solves nothing on its own. Its effect arises only through governance. Companies that grasp this do more than save costs. They build resilience.

Figure 2: Causal logic of automation effectiveness under conditions of labour shortages and cost pressure. Automation only works where institutional order is present. Otherwise, friction and failure prevail. Source: Based on [5-7, 11, 13, 15, 17, 20].



CONCLUSION

Automation is not a side note of technology. It is a structural test for the future viability of organizations. The study demonstrates that under conditions of labor shortages and cost pressure, automation can indeed provide relief. But this effect is never automatic. It emerges only where organizations are prepared to rethink responsibility and embrace structural clarity.

The findings confirm both hypotheses. First, automation increases operational cost efficiency especially in areas with standardizable, repetitive tasks. Second, its success depends fundamentally on governance and implementation models. These are not supporting structures they are the very foundation of technological effectiveness.

Where organizations maintain clear decision paths, role-based accountability, and adaptive management systems, automation becomes a lever for productivity and resilience. The examples of Estonia and Denmark underscore this point. Their combination of digital infrastructure and robust governance frameworks transforms technology into measurable results. In contrast, where institutional order is absent, automation collapses into noise. Systems run without direction, processes clash, acceptance erodes.

Yet the implications go deeper than efficiency. Automation reshapes power relations, legitimacy structures, and leadership expectations. It is not just a technical implementation it is a cultural shift. Organizations must therefore invest not only in systems but in institutional learning capacity. Ethics-based auditing and adaptive governance frameworks can act as stabilizers during this transition.

The conclusion is clear and uncompromising. Automation is not a repair kit for dysfunctional organizations. It is a catalyst for institutional change. Companies that treat it as an isolated IT project risk failure and friction. Those that embed it as part of a strategic governance process create not just short-term relief but long-term resilience. Technology does not work by itself. It works only where leadership and structure give it purpose.

LIMITATIONS

This study draws a sharp boundary. It does not ask what technology could theoretically achieve but what organizations can structurally sustain. That is both its strength and its limitation. The analysis relies on theoretical reasoning, a condensed literature review, and solid OECD data. No primary data were collected no surveys, no interviews. This was not due to convenience but by design. What is examined here cannot simply be counted it must be understood.

The scope is deliberately narrow. The focus is on the years 2018 to 2025 and on OECD countries. Developments beyond this time frame or outside this institutional context were intentionally excluded. Technical details such as IT infrastructure or legal frameworks were left aside. This study does not analyze tools it analyzes organizational posture. These boundaries create clarity but also leave open flanks. Organizational culture, power dynamics, and implicit routines were only touched upon, not explored in depth. That is a trade-off, not an oversight. The goal was not to map every variable but to frame the core question: under what institutional conditions does automation truly work?

These limitations are not weaknesses. They are a choice. Attempting to explain everything explains nothing. This study chooses focus over breadth, depth over coverage. It does not provide universal answers but a clear perspective. And that perspective is simple: technology has no power without governance.

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