

A Case Study of Hindering Factors in Digital Transformation Processes

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Abstract—The application of new technologies and digital transformation processes has been a central aspect of industrial innovation and is increasingly gaining prominence. However, to fully leverage their potential, it is crucial to understand the socioeconomic barriers and challenges that arise during the implementation of these technologies. Such insights are essential for developing effective strategies and identifying success factors. While extensive research has contributed to the comprehension of what hindering factors to bear, there has been less focus on causal-driven studies. This paper aims to comprehensively investigate the causality of hindering factors in digital transformation processes through a single-case study, employing a triangulation of both qualitative and quantitative research methods in a German SME specializing in extrusion technology. The findings imply that hindering factors are essentially made up of three fundamental components. First, external influences often force decisions at the expense of digital transformation processes. Second, decision-makers frequently perceive the costs as outweighing the benefits, leading to reluctance to invest, and third, there is reason to assume that traditional habits limit decision-makers' awareness of potential obstacles, ultimately hindering timely interventions. Consequently, it is postulated that decision-makers need to thoroughly understand the implications of digital transformation processes.

Index Terms—hindering factors, barriers, challenges, strategies, success factors, digital transformation, Industry 4.0, digitalization, ERP systems.

I. INTRODUCTION

Digital transformation processes have emerged as a critical driver of growth and resilience in contemporary economies [1], contributing to prosperity through market expansion and workforce upskilling [2], [3]. Organizations operating within both secondary and tertiary sectors are increasingly leveraging digital technologies to bolster their competitiveness in the face of market volatility [4]. However, the realization of these potential benefits is contingent upon the effective implementation of digital transformation strategies [5], as numerous hindering factors may impede progress if not adequately addressed. Although the literature provides well-established frameworks for implementation [6]–[9] and highlights the aforementioned merits of digital transformation processes, a potential gap in empirical and theoretical understanding persists. This gap gives rise to the following research question:

Why do hindering factors occur that paralyze digital transformation processes?

II. THEORETICAL BACKGROUND

As Yin [10] postulates, the development of preliminary theoretical propositions constitutes a foundational element of the research design. Accordingly, this study undertook a comprehensive literature review [11], conflating insights from 50 peer-reviewed papers while maintaining close alignment with both the research subject and question, consistent with methodological principles outlined by Webster and Watson [12]. To this end, an exhaustive definition were employed [13]. Drawing upon the pertinent literature identified through this process, a total of 34 abstract conceptualizations of hindering factors (see Fig. 1) were derived, organized across three hierarchical levels of abstraction, and subsequently consolidated into seven major thematic categories, which are mentioned as follows.

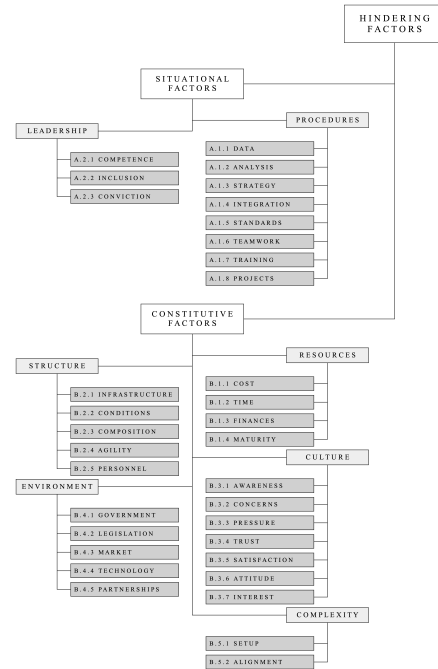


Fig. 1. Initial model.

A. Procedures

Procedures are vital to operations, requiring clear objectives and responsibilities across departments to ensure teamwork and stakeholder alignment. This conciseness enables decision-makers to identify training needs, which project management facilitates by providing a structured, analytical approach that improves data quality and leads to sound decision-making.

B. Leadership

Recognizing the importance of leadership is key to effective organizational management, as decision-makers shape behavior and guide change. Strong leader-follower relationships must be developed to facilitate inclusive decision-making. However, this necessitates top management commitment, as this engagement is a prerequisite for essentially initiating organizational change.

C. Resources

Resource considerations are crucial, as they directly impact an organization's ability to implement change, including system acquisition and operation. Time availability and stakeholder readiness also hinge on adequate funding, highlighting the need for strategic envisioning of financial planning.

D. Structure

In addition to an adaptable organizational structure, special attention must be given to technical, organizational, and personnel infrastructure, ensuring agility and resilience in changing conditions evoked by the market and external actuators.

E. Culture

Recognizing cultural aspects is essential to extensively fostering issue awareness and to proactively addressing employee concerns, building collective trust, and creating a positive, change-ready environment that encourages ongoing curiosity and adaptability.

F. Environment

Considering environmental factors is pivotal to risk mitigation, as it highlights unavoidable challenges. Weak government frameworks and tough market conditions, like tech uncertainty, immature markets, competition, and labor shortages, can worsen risks. Therefore, building alliances and using leverage are vital for managing ongoing threats.

G. Complexity

Understanding complexity is indispensable in adopting analytical approaches that enhance performance in complex environments, avoiding system over-customization and data fragmentation. Simplifying complexity across technical, organizational, and business areas aids in guiding and aligning change effectively.

III. RESEARCH DESIGN

A. Classification procedure

Given the causal nature of the research question, the selection of an appropriate research method is limited to experiment, history, or case study [10]. However, as experiments require control over behavioral events and histories are confined to past phenomena [10], the case study emerges as the most suitable approach. It facilitates the examination of hindering factors and digital transformation processes within a clearly defined organizational setting. Consequently, the case study is designed in accordance with Yin's [10] methodological framework.

The research question targets an atypical case involving hindering factors that, despite numerous solution concepts [6]–[9], persist. Following Yin's [10] guidelines, the case study requires a carefully selected object aligned with the theoretical framework to ensure external validity. To comply with this, a suitable case was identified in a German SME, specialized in extrusion technology, which was undergoing a digital transformation process at the point of investigation, making it ideal for an in-depth case study. To point out the epistemological justification for this single-case research, according to Popper's [14] theory of science, scientific progress emerges from falsification. Hence, a single, theoretically challenging case can yield analytically generalizable insights without relying on statistical generalizability [10], [15].

To conduct an ethnographic analysis of the hindering factors to digital transformation processes, it is imperative to engage in a deep contextual immersion [16]. Consequently, a thorough mapping of the organizations's project landscape is developed through interviewing internal stakeholders from diverse departments to identify pertinent initiatives. The evaluation of projects is based on four criteria derived from the scientific definition of digital transformation processes: the use of digital technologies, strategic utilization of key resources and capabilities, radical improvements, and the redefinition of value propositions to stakeholders. An ordinal five-point response scale is employed to assess the extent of deviation, informed by approximate percentage thresholds [17]. Following this, the identified projects are prioritized by considering project status, budget allocation, and frequency of mention, in addition to the individual assessments. Median values are applied for the aggregation of ordinal value-based data [18]. Notably, the prioritization process is not aimed at excluding any projects but rather at highlighting those that require enhanced support due to their strategic importance.

B. Data Collection Procedure

In addition to adhering to fundamental ethical principles in data collection, including safeguards to prevent misuse, particularly with regard to participant anonymity — this study utilizes clearly defined, written research protocol, supported by detailed flowcharts, to ensure reliability and systematic execution [10]. Furthermore, construct validity is addressed through method triangulation, which is grounded in an ontological realist perspective and operationalized through the

sequential application of three research methods: participant observation, screening surveys, and expert interviews [10].

1) *Participant Observations*: To facilitate initial orientation and foster trust, informal conversations are conducted within routine work practices [10]. These participatory observations are used to explore interpersonal motives and behaviors, though reflexivity, selectivity, and active involvement may introduce bias [10]. To mitigate this, data is gathered across departments, hierarchy, and projects to capture multi-perspective viewpoints [10]. Open dialogue is encouraged, particularly on sensitive topics, by assuring confidentiality and managerial support for constructive contributions [10]. Empathy and a non-judgmental stance are maintained to ensure accurate interpretation [10]. Lastly, data collection is theory-neutral to avoid bias [10], and impressions are memory-logged promptly to preserve authenticity.

2) *Screening Survey*: To investigate the causal mechanisms behind hindering factors and obtain systematically documented insights, a survey was conducted as a preliminary step before expert interviews, primarily to prioritize topics [10]. The survey uses positively worded statements rated by participants according to their level of agreement. Given the study's cross-departmental and cross-hierarchical scope, linguistic clarity is ensured through cognitive pretesting to promote inclusivity and ethical integrity [10], [17]. Structured in two parts, the survey first elicits expert knowledge from professional experience [17], then situates hindering factors within routine work practices. Consistent with the approach used during project identification, responses are captured using a five-point ordinal scale with an abstention option to reflect knowledge limitations [17]. To reduce order effects, statements are randomized based on a uniform probability distribution [17]. Participants are briefed on the survey's purpose, with confidentiality and voluntary participation emphasized [10]. Administered on-site, the setting ensures privacy and allows for technical support. Upon completion, participants receive a printed, anonymized summary highlighting individually prioritized hindering factors.

3) *Expert Interviews*: Given that the primary hindering factors are information-related, semi-structured expert interviews are particularly suitable [17] for eliciting causal mechanisms by probing underlying reasons until thematic saturation is reached or respondents indicate limited knowledge. However, potential biases — such as recall errors, reflexivity, and preconceptions — must be carefully considered, necessitating preliminary pretests [10], [17]. One resulting methodological refinement involves systematic documentation of stated causes via active note-taking to ensure traceability and precision. Furthermore, open-ended questions are, in principle, used to preserve neutrality, avoiding explanation suggestion. Another refinement involves the use of a structured interview guide, which emphasizes paraphrasing to facilitate mutual understanding and which leads to the inclusion of indirectly formulated questions that address the underlying causes, consequences, and potential solutions to the identified hindering factors, particularly advantageous when participants exhibit

emotional detachment [10]. As in the screening survey, extensive preparation precedes the interviews, including advance distribution of informed consent forms and optional non-response on specific items, with full anonymity ensured. Interviews are conducted in distraction-free settings and proceed in two stages: an initial briefing on purpose and structure, followed by the recorded core discussion, structured around the prioritized hindering factors in descending order of relevance.

C. Evaluation procedure

As part of the evaluation process, it is essential to employ appropriate procedures for the analytical preparation of the collected data to enhance internal validity [10]. Accordingly, scientifically rigorous methods are applied to ensure a valid and reliable analysis of the data.

1) *Participant Observations*: The memory-logged participant observations were analyzed deductively [10] using the qualitative content analysis according to Mayring's [16] deductive category application with nominally defined scales. Notwithstanding the omission of anchor examples, this approach was carried out with conceptual precision by including 132 nuanced individual definitions and coding rules.

2) *Screening Survey*: The screening survey includes both ordinal and nominal variables, requiring different measures of central tendency [18]. While the median and mode are applicable to ordinal data, only the mode is valid for nominal data due to its lower scale level [17], [18]. Consequently, nominally scaled abstentions are excluded from median calculations, though their frequencies are reported to ensure transparency and support interpretation.

3) *Expert Interviews*: While causal inference in empirical social research is inherently uncertain and difficult to establish definitively, it nonetheless retains significant analytical relevance [17]. For the purpose of systematic analysis [10], [17], coding protocols are applied in accordance with Mayring's [16] method of deductive category application, utilizing nominally defined scales. However, such procedures alone are insufficient for establishing causality, thereby necessitating the integration of logic models [10]. In response, individual transcripts were translated into causal diagrams to reconstruct the underlying argumentative structures, identify relevant hindering factors, and subsequently classify them into causal and non-causal factors. In this paradigm, factors are categorized as non-causal unless they themselves do not emanate from upstream domains, but represent the cause itself. In cases involving conceptual loops, causal inference is assessed contextually. Owing to the complexity and high degree of interdependence, modeling was conducted separately for each transcript rather than simultaneously. Ultimately, the identified causal factors were subjected to convergent data triangulation employing the aforementioned methodological approaches [10].

IV. RESULTS

In the course of the participant observations, screening survey and expert interviews, 74 memory logs were prepared

by 27 individuals, 36 quantitative data sets were collected and 20 recordings with a total length of more than nine hours were recorded. The latter contributed to the analytical distinction of the 34 hindering factors, initially sourced from the literature, within digital transformation processes, resulting in the classification of 18 as causal (see Fig. 2).

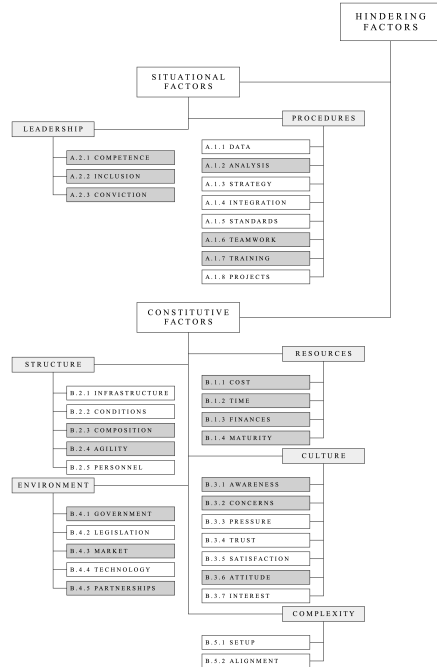


Fig. 2. Intermediate model.

A. Finance

First, the uncertainty of investment returns is highlighted (I1, I3, I12, I18), with I3 and I18 noting the difficulty in quantifying potential gains. I1 adds:

"Everything is always connected with money. Perhaps it was simply the fear of investing so much money in something without knowing how and whether it would work." (I1)

As a result, managers are hesitant to invest (I1, I18). Additionally, I12 suggests rigid, rule-based procedures may have reduced agility and competitiveness. O18 agrees, adding financial concerns influence investment levels. It is noted, however, that this hindering factor underlying the mode and the median cannot be considered to be present, whereby nine abstentions are to be taken into account.

B. Concerns

Several employees (I4, I9, I11, I12, I13, I15, I17) raised concerns about digital transformation processes, particularly fears of job loss (I4, O9) and increased control (I15). O9 adds that perceived injustice and a lack of transparency from managers fuel job security concerns. I11 and I15 stressed the need to generate enthusiasm for the change. Past delegative management styles, focused on blame, led to defensiveness

among staff (I12, I13, I17) and reluctance to make decisions (I9). This culture of blame has also led to restricted information flow and the filtering of critical content (I4, I13, I17). However, as I17 notes, inclusive communication and transformational leadership have begun to alleviate these concerns:

"The very first thing people were against digitalization was because they thought it would be a control. But later, when they realized that it was about something else after all [...] their concerns were relatively quickly dispelled." (P17)

In addition, this hindering factor can be considered to have a moderate presence based on the mode and median, though three abstentions should be taken into account.

C. Agility

The company's limited adaptability is seen as a barrier (I7, I10, I11, I15, I20). Caused externally, the coronavirus pandemic forced a disruptive major reorganization at the expense of digital transformation processes (I15). Paradoxically, rapid expansion has also stalled transformation, as internal structures failed to keep pace with growth (I7, I10, I11, I15, I20). I20 notes stagnation in thinking, while I11 and I12 highlight that the continued reliance on a once-successful lean structure now hinders necessary updates. I11 adds that clinging to outdated practices delays essential changes. I7 concretized:

"I think it has grown a bit historically. The fact that we have grown bigger and bigger, but the structures have basically not grown with us." (I7)

O2 and O17 confirm this slows business processes, while O1 adds that limited digital systems reduce organizational flexibility. In addition, this hindering factor can be considered to have a moderate presence based on the mode and median, though two abstentions should be taken into account.

D. Government

Moreover, the complexity of enacted government laws leads to obstacles due to their confusing, multi-layered nature (I3, I6, I14, I18). I3 and I6 argue that politics is disconnected from the free market, leading to impractical regulations. I18 also criticizes this.

"Legislation has actually made it rather complicated." (I18)

With special regards to this, financial support is weighed against the effort required to apply for it (I3, I14, I18). I3 highlights that the application process and its demands influence whether funding is seen as worthwhile. While I14 notes that strict conditions prevent advance claims, this is not seen as a barrier to digital transformation processes. Also, this hindering factor can be considered to have a moderate presence based on the mode and median, though 27 abstentions should be taken into account.

E. Composition

At the same time, it becomes apparent that internal conflicts of interest are intensified by the absence of structural incentives that promote a shared entrepreneurial perspective (I2, I4, I6, I7, I15, I18, I19). I2 and I6 note a lack of holistic

guidelines, with matters always considered within their own individual boundaries. I18 and I19 stress the need to consider departmental processes from a company-wide perspective to foster mutual understanding. I15 highlights the challenge of anticipating events across steps, an understanding I19 says is currently missing:

"Because the person in question [...] thought for himself, but didn't think about others." (I19)

I7 strongly emphasizes this point, drawing a clear connection to unevenly developed structures, a view shared by O17 and O19. In addition, this hindering factor can be considered to have a moderate presence based on the mode and median, though only one abstention should be taken into account.

F. Market

The market plays a key role by providing significant impetus (I2, I5, I10, I12–I15, I17, I20). Labor shortages have compelled decision-makers to urgently rethink their current approaches (I13, I14), underscoring the need for deeper digital transformation to reduce dependence on human labor in production (I14). However, as O2 notes, the scarcity of labor extends beyond roles susceptible to automation, also impacting non-automatable services. Furthermore, the demand for customized solutions reduces the urgency of standardization, which, in turn, is seen as a barrier to digital transformation processes (I11, I12). I12 reports:

"You have a wide variety of factors that you may not be able to influence. So, it starts with the fact that a customer has a special request." (I12)

Difficulties in keeping up with rapid technological change are also noted (I10, I14). I10 highlights a gradual shift from operational efficiency to a more technological focus. However, this hindering factor can be considered to have a minor presence based on the mode and median, though twelve abstentions should be taken into account.

G. Partnerships

Apart from that, insufficient collaboration with external partners is seen as an impediment (I7, I10, I11, I14, I15, I18). As far as system vendors are concerned, this significantly delays implementation (I11, I14, I15, I18), with I11, I18, and O2 citing poor-quality advice and offering as a barrier. Aggravatingly, internal coordination issues at the provider further affect performance and implementation speed (I15, I18):

"When the internal programmers [...] make changes, they have to coordinate internally so that one doesn't change or overwrite the other's changes and then it crashes." (I15)

Failure to meet deadlines with external stakeholders further has a major negative effect on commissioning speed (I10, O8, O14, O21). In the same way, this hindering factor can be considered to have a medium presence based on the mode and median, though 13 abstentions should be taken into account.

H. Maturity

A crucial issue is the lack of concrete knowledge on how to specifically undertake digital transformation processes (I4, I11,

I12, I15, I18), slowing progress and hindering the company's adaptation to modern demands (I4, I12, I15). I4 underpins the absence of experience:

"I think it's simply because nobody has done it before." (I4)

Despite there was initially inadequate grasp of the long-term risks of not following digital system standards, leading to custom adjustments based on personal preferences, these early missteps helped raise awareness of ongoing challenges (I11, I18). Furthermore, O15 highlights that weak HR management limits access to qualified IT staff, while O14 points out that lacking knowledge of core processes hinders proper technical integration. By the same token, it becomes apparent that this hindering factor can be regarded as medium to strong based on the mode, and as medium on the median, with only one instance of abstention.

I. Competence

Managers often lack the skills and experience needed to lead digital transformation processes effectively (I1–I6, I9, I13–I17, I20), resulting in poor decision making (I1, I2, I4–I6, I9, I13, I16, I17) and unclear communication (I3). I3 highlights the need to trust middle managers and encourage them to take deliberate control of change. I15 stresses the importance of strategic clarity established by top management, which I2 supports, noting its impact on infrastructure and staffing:

"I don't think we have anyone here who has perhaps mastered something like this [...] in this area to such an extent that they can safely specify how something like this should work." (I2)

Managers often develop a narrow perspective due to long-held roles (I5, I9, I17, I20), while newly recruited managers bring fresh, valuable ideas that support digital transformation processes (I5, I9, I17). According to I5, the latter prompted a heightened focus on training needs, which subsequently translated into concrete implementation. Overall, personnel fluctuation is perceived as enriching, paving the way for more comprehensive and fitting approaches. However, this comes with differing leadership styles that lack consensus, hindering decisive actions (O2, O6, O17), and making unity of leadership a top priority (O1). In addition, this hindering factor can be considered to have a moderate presence based on the mode and median, with only one abstention.

J. Training

Inadequate training often leads to poor digital system skills (I5, I6, I8, I10, I12, I13, I15–I17, I19, I20) and weak language abilities, which hinder internal communication and information flows (I5, I13, I17). I10 adds:

"I don't think you can use all the functions if you don't have any training." (I10)

I15 emphasizes that training is key to helping employees and managers adopt new routines, while I4, I6, I8, I15, and I20 underpin that it is crucial for building expertise during workforce stagnation. O17 notes that digital systems are often introduced with few rules, leading to uncoordinated and paralyzing situations. Moreover, this hindering factor can

be considered to have a strong presence based on the mode and median, with only one abstention.

K. Analysis

An unstructured, insufficiently rule-based approach prevents proper assessment of individual actions, leading to negative consequences (I2-I6, I8, I9, I11, I13, I15-I17) and preventable long-term costs (I6, I13, I16, I17). I3 links stress to poor planning, highlighting that only increased planning enables a smooth, fearless transformation. I4 reinforces by stating:

"On the whole, we just kind of throw everything into a pile and see what comes out of it." (I4)

This approach creates a persistent feedback loop, as its flaws are deeply embedded in processes and systems, making correction intricate and lengthy (I6, I11). It leads to cross-departmental inconsistencies and uncertainty among staff (I3, I9, I13), turning digital transformation processes into an added burden (I8, I11, I15). O2 and O25 criticize rushed, rudimentary implementation, with O25 linking it to hasty actions. In addition, this hindering factor can be considered to have a medium presence based on the mode and median, with only one abstention.

L. Cost

Regardless of solvency, there is a strong reluctance to invest due to perceived high costs (I1, I2, I4-I6, I8-I14, I17, I18), as digital systems are often seen merely as tools, not part of core operations, which skews how investment needs are evaluated (I14). I14 further states:

"The company earns its money by selling [products]. And then we have contact with customers. And they tell us what to do. That's our main business. Digitalization is a means to an end. [...] You don't focus on that." (I14)

However, it is evident that the combination of investment reluctance and short-term thinking leads to costs (I6, I9, I14, I18). A key challenge is identifying when further investment in existing systems is no longer viable (I9, I14, I18). Limited investment also results in poor training (I4, I8) and reduced communication skills, hindering digital transformation processes (I2, I5, I8, I10, I13, I17). Furthermore, cost pressure weakens employee focus significantly (O13) and the allocation of necessary resources and competencies (O5, O10, O13, O15, O18, O21, O22). However, this hindering factor can be considered to have a minor presence based on the mode and median, though six abstentions should be taken into account.

M. Attitude

A strong collective culture persists, with rigid behavioral patterns that resist change (I3, I4, I6-I9, I11, I13, I15, I16, I19, I20), hamper the acceptance of new approaches (I3, I7, I9, I11, I15, I16, I19) and limits unbiased assessment (I7). Poor information flow, driven by punitive leadership, heavily obstructs decision making (I4, I6, I9, I13). Furthermore, systems are customized to mimic old versions, sometimes fully recreated at great cost (I11, I15). I15 hints at this:

"And [...] people [...] implemented things that they still hold on to today, very strongly. [...] Because [they] [...] had a very clear idea [...] and didn't want to be dissuaded [...]." (I15)

O13 notes that major rethinking only occurs when business processes are severely impacted, with problems often identified too late. In addition, it is noted that this obstacle factor has a medium level underlying the mode and median, with seven abstentions.

N. Time

Time constraints become apparent as recurring impediments (I2, I4-I6, I8-I12, I14, I15, I18-I20), worsened by a shortage of qualified specialists (I10, I11, I12, I15). I14 emphasizes the challenge of achieving organizational ambidexterity. A correlation exists between the severity of negative consequences for neglecting a task and the likelihood of addressing it promptly (I6, I14). I2 observes:

"You have to take time for things. [...] Then there is very little staff, other things are also pressing. [...] It all just takes time. And then there's often not enough time. [...] And these things then fall by the wayside." (I2)

The lack of time plays a crucial role in training needs arising from increasing digital complexity (I8, I10). Inadequate training results in disparity knowledge levels among employees, placing extra strain on IT specialists (I11). I19 suggests undirected work also contributes to time shortages, a finding corroborated across all staff levels (O5, O19, O21, O22). I2, I4, I5, I10, I12, I18, and I11 link time constraints to limited financial investment in staffing, while I15 connects them to overall insufficient training. As a result, only priority topics receive more attention, leaving others neglected (I15, I19), which impacts system usability and satisfaction among users (I19). Also, this hindering factor can be considered to have a moderate presence based on the mode and median, with two abstentions.

O. Awareness

Sensitivity to digital transformation processes is often lacking (I1-I9, I11-I15, I17, I19, I20). Many fail to grasp that such complex alterations affect the entire company environment (I4, I6, I9, I15, I19, O2, O24, O25, O27), resulting in poor system usability (O24). I6 notes that in-depth analysis is viewed as a misallocation of time resources, reflecting a culture favoring pragmatic over comprehensive approaches (I12, I15). This is tied to a broader lack of awareness of potential consequences (I3, I4, I12, I14, I15). I4 states:

"Because I think it's always easier to imagine things as they actually are." (I4)

Awareness that reality no longer aligns with initial assumptions arises when systems or regimes become dysfunctional (I7, I8, I11, I14). I20 notes a preference for reactive over proactive behavior. I9 and I17 highlight that empathic distance between leaders and followers influences the recognition of change needs, linking empathy and awareness. Accelerated digital transformation processes often begin as managerial awareness develops (I3, I7, I11, I14), but this awareness can

be short-lived (I2, I9, I11). Despite past failures, the learning curve remains shallow (I2, I9, I11). Still, some individuals use their insights to avoid repeating mistakes (I11). Also, it is also noted that this hindering factor has a medium level based on the mode and median, with two abstentions.

P. Teamwork

One major issue identified is poor interdepartmental co-operation (I2, I5-I7, I9, I10, I13, I15, I17, I19, I20, O2-O4, O17, O19, O21-O23, O26, O27), worsened by low language proficiency (I5, I10, I13, I17, I20, O3, O4). These language barriers limit communication of key measures (I5, I17, I20) and lead to misunderstandings that slow processes and reduce both efficiency and effectiveness (I5, I17). Fragmented collaboration often results in digital systems that only work within departmental boundaries (I2, I6, I7, I9, I19). With respect to this, lack of scheduling coordination and stakeholder involvement fosters further obstacles (I6, I19). I6 states:

"That there needs to be more dialogue across departments when several departments are involved." (I6)

I9 observes a shift toward written communication over personal or phone contact, which slows issue resolution and downplays the value of direct interaction. I2, I9, and I19 note a lack of proactive root cause analysis, causing recurring problems. In addition, it is noted that this hindering factor has a medium level underlying the mode and median, with one abstention.

Q. Inclusion

Employee involvement by managers is seen to be crucial (I1-I6, I8, I9, I12, I13, I15-I17, I19, O2, O20-O23), resulting in recurring fields of complaint (O21). However, this is hindered by challenges such as time constraints, insufficient problem-solving training, weak error culture (I3, I12), and language barriers (I9, I13). Despite some employees' willingness to engage more (I2), it rarely leads to impactful outcomes, as supervisors act restrictively. I16 and I17 stress involving frontline staff, who are most affected by digital changes, and note the positive effects of regular internal, involving meetings. The level of employee involvement varies widely due to inconsistent managerial approaches (I1, I5, I6, I9, I16, I17, I19), as a organization-wide inclusion strategy is lacking (I1, I4, I6, I9, I13, I15), partly due to time constraints (I15), though I1 underscores its importance:

"That would have to come from the top again. [...] But of course there are also managers who come up with the idea on their own to perhaps place certain responsibilities on certain people." (I1)

In addition, this hindering factor is found to have a medium level of expression based on the mode and median, with one abstention.

R. Conviction

Last but not least, a key obstacle is the lack of conviction and determination among managers to view digital transformation processes as essential (I1-I20). I1, I3, I5, I9, I14, I15,

I16, and I17 note that how well critical issues are addressed depends heavily on the individual manager. The severity of challenges correlates with how much priority managers give them (I1-I20). I1 summarizes this view as follows:

"You don't train anything that you don't change. [...] And if I don't want to change anything, then I don't need to train anyone in this direction. Because the person who sends you for training probably hasn't thought about it themselves." (I1)

I3 and I15 stress that recognizing the need for strategic orientation is key to making sound personnel and infrastructure decisions. This link between managerial awareness and resource availability (O5, O9, O10, O13, O15, O20-O22) is particularly echoed by I14, who sees managerial awareness as the deciding factor, with O5, O10, O13, O15, O21, and O22 tying it to lean personnel practices. I2 adds that self-reflection and balancing openness with consistency are essential. I1, I3, I5, I8, I9, I11, I14, I18, and I20 indicate the role of efficiency and effectiveness as transformation drivers, noting that viewing effectiveness as a driving force for change can be heavily impairing, as countermeasures may be implemented only as soon as proceedings come to a complete standstill (I8, I20). Also, rational decision-making is often clouded by subjective bias, which shapes work practices and ultimately impacts transformation scope (I1-I3, I6, I9, I13, I16, I17, I19). This hindering factor is, based on mode and median, rated as moderately severe, with three abstentions.

V. DISCUSSION

The aim of this study was to investigate the emergence of hindering factors within digital transformation processes by narrowing them down to their underlying causal elements. However, the findings reveal that even these distilled factors exhibit significant interdependencies, thereby precluding definitive causal attribution. Nonetheless, their continued relevance as foundational elements justifies their reduction to elementary components, a deduction that enables a deeper understanding of causality and reveals a fundamental distinction among three primary origins (see Fig. 3).

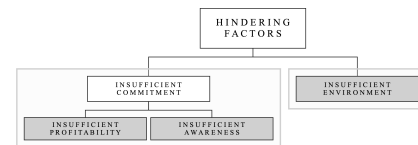


Fig. 3. Final model.

A. Insufficient Environment

First, hindering factors arise due to an insufficient external environment, which prevents the necessary resources and competencies from being mobilized. This is not due to a lack of factual knowledge, but to unforeseen events, in particular force majeure, the effect of which are both unavoidable and disruptive. While this perspective remains open to debate,

given that preventive interventions could have been anticipated, incapacity is axiomatically fixed by a persistent lack of information.

B. Insufficient Profitability

Second, hindering factors arise due to an insufficient profitability perceived by decision-makers, which prevents the necessary resources and competencies from being mobilized willingly. Decision-makers constantly consider whether and to what extent the organization can benefit from the investment. Beyond the challenge of accurately quantifying the monetary impact in terms of value creation, the risk of time-intensive bureaucratic decision making procedures may hinder organizational agility. Despite the intent of digital transformation processes to increase overall efficiency, rejection is likely if decision-makers fail to perceive their positive potential.

C. Insufficient Awareness

Third, hindering factors arise due to an insufficient awareness on the part of decision-makers, which prevents the necessary resources and competencies from being mobilized willingly. However, the decisive difference to the aforementioned is that this refusal is due to the failure of recognizing hindering factors as such. When decision-makers lack awareness of the existence of hindering factors, they are unable to initiate countermeasures, as this presupposes knowledge of the cause itself. While economic interests may reduce the willingness to acknowledge hindering factors, their absence does not necessarily enhance it. Furthermore, it becomes apparent that financial solvency is not considered to be insufficient in this case. In fact, given that the absence of digital transformation processes does not inherently result in immediate declines in profitability, and that human behavior tends to favor routines that lack short-term negative consequences rather than those offering long-term value, this provides a potential account of why hindering factors are frequently overlooked. The realization of major projects demands substantial discipline and confidence, as their total payoffs often unfold only after extended periods and are frequently preceded by challenges related to finances, personnel, infrastructure, and organizational aspects. In this respect, the inherent characteristics of human behavior and the nature of digital transformation processes can be seen as fundamentally antagonistic.

Albeit internally, it can be inferred from the underlying exposition that decision-makers and their commitment are attributed an overriding role. Nevertheless, the assertion of insufficient profitability can only be substantiated within a framework of rationality, which presupposes the prior initiation of rigorous, data-driven decision making. Thus, commitment is contingent upon a comprehensive awareness of the implications inherent in digital transformation processes. By doing so, more precise decisions can be made regarding the allocation of resources and competencies and, ultimately, fewer hindering factors are likely to emerge within digital transformation processes.

VI. LIMITATIONS AND OUTLOOK

Despite considering internal and external validity, construct validity, and reliability, certain limitations remain. This study focused on perceived, not objective, causality behind hindering factors within digital transformation processes. Therefore, the extent to which the data reflects objective truth is uncertain, as personal biases and conflicts of interest may have influenced responses. In this regard, all research methods used were markedly shaped by subjective viewpoints, ranging from the selection of participants to the framing of their contributions and the interpretation of the resulting data. Additionally, the study's scope was limited to a single organization, preventing both statistical and generalizable conclusions.

Nevertheless, the results offer valuable insights for future research. Further studies should validate and complement these findings, and explore why decision-makers lack commitment to digital transformation processes, particularly examining the role of cultural, habitual, and intellectual factors in shaping this awareness.

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