

# The Long Shadows from Digital Transformation Initiatives: A Research Agenda

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## Abstract

Structuring workplaces within a socio-technical paradigm aims for both efficiency and worker well-being. However, with the swift integration of digital and emerging technologies, maintaining this balance has become demanding. Current trends suggest a lag in the social system's adaptation to rapid IT investments, resulting in reduced job engagement and notable Digital Transformation (DT) setbacks. To address the unrealized potential, this study advocates integrating the socio-technical approach with the socio-economic theory of hidden costs. We quantify these concealed expenditures from DT initiatives in nine Scandinavian companies. We introduce the concept of a 'shadow' to illustrate how economic focus in DT-projects can obscure aspects of social costs. Our objective is to delineate a research agenda that underscores a balance between economic and humanistic aims within the socio-technical context.

**Keywords:** Sociotechnical, hidden costs, digital transformation, shadow

## 1. Introduction

In the realm of information systems (IS), the sociotechnical perspective has acted consistently as a unifying thread [1]. This perspective underscores the dual importance of economic and humanistic goals, especially when integrating recent technology into work processes [1,2]. Key to this approach is to tailor technological innovations to align with organizational attributes. Simultaneously, individuals must evolve their work methods in response to these technological advancements [3]. This relationship between technological and social aspects of work changes has underscored the significance of maintaining a harmonious balance to ensure both productivity and well-being benefits [1,3,4]. However, a review of IS research [1] and practical IT implementations [5] reveals a tilt towards prioritizing the economic- over the humanistic aspects of organizations. Consequently, outcomes grounded in tangible benefits, efficiency, and competitive advantages from digital transformation (DT) have taken precedence [1,3,6]. This economic emphasis in the management, consultancy, and IS research sectors has led to a dominance of the technical perspective in DT initiatives [1,3,5,7]. Recent studies suggest that this emphasis might be outpacing the ability of the social component to adapt accordingly [3,7].

The rapid evolution of digital technologies has profoundly impacted various industries [8]. Consequently, companies find themselves compelled to embark on expansive DT journeys [9;10]. However, recent observations suggest that the momentum of DT projects is waning, attributed to organizations and their personnel struggling to assimilate and acclimatize to such rapid changes [11]. Consequently, both management professionals and researchers are emphasizing the pivotal role of cultural and humanistic dimensions within organizations in steering successful DT outcomes [8,9].

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## 2. Research Agenda

In our ongoing research, we aim to chart a path that innovatively and practically reorients expansive DT endeavors, ensuring they address both economic and humanistic outcomes as outlined by the sociotechnical perspective. Central to our proposition is the metaphorical use of 'shadows.' Commonly, we perceive shadows as obscured areas resulting from an object blocking light rays, signifying regions of diminished visibility or entirely blocked. This can metaphorically underline hidden issues or elements that warrant attention. Yet, beyond this, the term 'shadow' also captures the essence of an overarching influence. When a phenomenon casts a shadow, it indicates a profound or enduring negative impact. Applying this to the influence from DT-projects, we envision the term to encapsulate how DT initiatives can overshadow and impact the inherent social and human capacities of an organization. Recognizing what lies in this metaphorical shadow becomes the initial step in our research.

Our research direction is twofold. Initially, we aim to identify and illuminate the humanistic concerns that remain obscured by the shadows of DT endeavors. This exploration allows us to grasp the depth of shadows that deterministic technological approaches might cast. Such an understanding can pave the way for integrating a more human-centric view of the outcomes from DT initiatives. Subsequently, our objective is to devise methodologies that provide insights into quantifying, in metaphorical terms, the 'length' of the shadow. This could heighten the awareness among DT managers about the potential adverse effects of certain DT strategies, prompting a strategic shift. In this paper, our focus is on the initial facet of our research trajectory. To that end, we delve into a socioeconomic paradigm known as the hidden cost theory. Addressing hidden costs is paramount as they pose potential detriments to organizations. These costs manifest from organizational dysfunctions and represent the latent power employees have—each deciding the extent of their participation in transformative projects, such as DT [12].

Our central research inquiry thus becomes: what hidden costs and performance dysfunctions manifest in companies amidst digital transformations? To unpack this, the paper commences by laying the theoretical foundations of hidden costs and associated dysfunctions. We then illustrate how this theory was operationalized in a survey instrument and share findings from our survey, undertaken across nine Scandinavian corporations. Finally, we deliberate on the prospective trajectory of our research and the ensuing steps in our research agenda.

## 3. Socio-economic theory – Hidden Costs and Dysfunctions

For the initial phase of our research, we are adopting the hidden cost methodology to assess the return on investment stemming from DT [12]. Invisible, or "hidden" costs, and their associated performance outcomes have been aptly termed "post-decision surprises" [13]. These denote unexpected financial burdens that materialize after strategic decision-making within organizations [14,15]. The emergence of such unforeseen costs can pose questions to the underlying logic of prior strategic decisions. Often, these costs remain undetected by managerial oversight, thereby becoming ex ante unforeseen costs [16]. While explicit costs such as labor or materials are captured by accounting systems, hidden costs elude these systems.

The definition of hidden costs is: "those costs and performances that are not detected by the company information system, including budgets, income statements (P&L), general accounting, analytical accounting, or piloting logbooks" [17, p. 27]. To elaborate, these costs escape identification and quantification by standard accounting practices and budgetary measures. It is noteworthy that while certain strategies like layoffs may diminish explicit costs, they might introduce other challenges such as diminished employee expertise, amplified organizational chaos, and eroded trust. At the heart of these hidden costs are organizational challenges termed "dysfunctions" [17, p. 28]. Dysfunctions encapsulate persistent operational issues that hinder companies from optimally achieving their aims and capitalizing on human and material resources [17, p. 28]. These dysfunctions necessitate interventions, which in turn, generate hidden costs.

In [17] dysfunctions are categorized into six distinct types: working conditions, work organization, communication/coordination/cooperation (3C), time management, integrated training, and strategy implementation. Examples include communication barriers resulting from departmental silos, misalignment between client quality expectations and existing company procedures, and more. These dysfunctions create a ripple effect leading to tangible operational disturbances and hidden costs. Such costs span staff turnover, compromised work quality, absenteeism, occupational hazards, and direct production discrepancies.

Delving deeper, these hidden costs are classified into direct disturbances and the costs associated with resolving these dysfunctions. They encompass both human endeavors and product consumption. This detailed classification subsequently informs the calculation of hidden costs, encompassing overconsumption, production deficits, unrealized potential, risks, wage premiums, and time inefficiencies. Collectively, these components symbolize the financial manifestations of organizational dysfunctions [17].

## 4. Methodology

In its inception, our research design and approach were rooted in the foundational framework stemming from literature on hidden costs and dysfunctions [12,18]. Following this, we employed a cross-sectional questionnaire, previously formulated, and validated through research involving seven Chinese firms, see [12]. We distributed the questionnaire electronically, ensuring a swift data collection process at a singular point in time [19]. Our sampling methodology was a straightforward single-stage approach, underpinned by the researchers' familiarity with and access to the target audience [20, 21]. To source participants, one of the researchers reached out to managers in Danish corporations during DT-projects via LinkedIn. The study represents diverse contextual facets [22] by including an array of Scandinavian companies from varied sectors such as banking, telecommunications, engineering, education, consulting, ingredients, and pharmaceuticals, detailed in Table 1. The participant spectrum spanned senior managerial positions with a diverse range of experiences. In total, we gathered nine completed questionnaires from businesses across different sectors.

**Table 1.**  
**Characteristics of the case study companies**

<i>Industry Sector</i>	<i>Employees</i>	<i>Current DT Projects</i>
Ingredients	3.000	Yes
Education and research	200	Yes
Pharma	100	Yes
Banking	28.000	Yes
IT and Business Services	8.000	Yes
Engineering	10.000	Yes
Telco	1.000	Yes
Financial services	300	Yes
Chemical engineering	2.300	Yes

Centered on the dimensions of hidden costs and dysfunctions within DT, we structured the questionnaire towards specific sub-categories. It delved into dysfunctions, markers of hidden costs, and the economic implications of these dysfunctions. Each category pivoted around a central inquiry: *Could DT initiatives ameliorate the outlined issues?* Responses were assessed on a 4-point Likert scale: 1 representing "strongly agree", 2 for "agree", 3 for "disagree", and 4

indicating "strongly disagree". Additionally, we incorporated a comment section to capture nuanced insights from respondents [23]. The data collected from the questionnaire underwent a structured, yet qualitative, analysis to provide a comprehensive view of how hidden costs and dysfunctions influence the returns from DT efforts. Adhering to established ethical protocols, our study guarantees data confidentiality and participant anonymity [19]. Subsequent sections offer a thorough analysis of the research outcomes.

## 5. Results

Managers responsible for - or participating in - DT projects completed the questionnaire. In table 2,3 and 4, we present the specifics of the questionnaire. We categorized and analyzed the data based on the six types of dysfunctions, the indicators of hidden costs, and the financial implications of these dysfunctions, explained in section 2. Subsequently, we conducted an explorative analysis of the results. This initial analysis serves as a foundation for more in-depth future research. The scores in tables 2, 3, and 4 reflect the average ratings for each subcategory, accompanied by the standard deviation.

**Table 2.**  
**Results: Dysfunctions**

Category	Subcategory	Average	STD
<i>Working conditions</i>	Work hours/ work schedule	1.9	0.74
	Physical work conditions	2.6	0.83
<i>Work organization</i>	Distributions of tasks, missions, and functions	1.6	0.68
	Regulation of absenteeism	2.0	0.82
	Interest of the work \job motivation	2.2	0.63
	Autonomy of the job	2.2	0.92
	Workload	2.0	0.67
<i>Communication/ coordination/ Cooperation</i>	Communication/coordination within the department	2.0	0.82
	Communication/coordination with other departments	2.0	1.05
	Communication/coordination between the headquarter and distributors	2.7	0.67
	Communication/coordination between the headquarter and the branch office	2.1	0.99
	Communication/coordination at the level of the board of directors	2.3	0.67
	Transmission of information within the company and with third parties	1.6	0.68
	Vertical communication/ coordination	2.2	0.92
	Horizontal communication/coordination	1.7	0.67
<i>Time management</i>	Respecting deadlines	2.0	0.82
	Scheduling of activities	1.8	1.03
	Improvement of poorly assumed tasks	1.8	1.03
	Improvement of factors disturbing time management	1.9	0.74
<i>Integrated training</i>	Adequacy of job training	2.1	0.57
	Improving available competencies	2.2	0.42

<i>Strategy</i>	Connection with the corporate strategy	1.8	0.79
<i>implementation</i>	Implementation of the corporate strategy	1.8	0.79
	Improvement of information systems	1.7	1.05
	Improvement of HR management	2.4	0.96
	Overall improvement of the mode of management	1.9	0.31

As illustrated in Table 2, managers believe that DT can ameliorate dysfunctions. For an initial analysis of the results, we have color-coded responses: those shaded in green to yellow indicate dysfunctions that DT projects have positively addressed. This encompasses twelve sub-categories. Conversely, the orange shade points to dysfunctions that DT failed to rectify, and this category contains eight sub-categories.

From a positive standpoint, there is a consensus that DT initiatives bolster 'Strategy implementation.' This aspect displays the most favorable correlation with DT, holding an average score between 1.8-1.9. Notably, the sub-category 'Improvement of HR-Management' was an exception, securing a higher average of 2.4. Furthermore, there is a collective agreement among companies that DT initiatives are expected to enhance general management practices, with an average score of 1.9 and a standard deviation (STD) of 0.31. It is worth noting that a score of 1 corresponds to 'strongly agree'. While 'Improvements in information systems' were deemed to be positively influenced by DT, with an average score of 1.7, there is a relatively high STD of 1.05, suggesting some disparity in opinions across companies.

Most participants expect a positive impact from DT on 'Work organization.' The range in this category is from 1,6 – 2,2, with the subcategory of 'Distribution of tasks, missions, and functions', being the most positively influenced by DT (1,6), with a low STD (0,68) and high agreement across companies. 'Regulation of absenteeism' has an average score of 2.0, but low agreement (with STD=0.82). 'Work motivation' and 'Job autonomy' appear to have a less positive relation with DT as they both score highest in this category with 2,2.

Most participants expect both negative and positive impacts of DT on 'Working conditions.' 'Work hours and work schedule' (1.9, with STD=0.74) and 'Physical work conditions' (2,6, with STD=0.83).

In addition, the results in the category of communication/coordination/cooperation (3C) show both negative and positive impacts. The sub-category 'Transmission of information to third parties' is anticipated to be strengthened rather than weakened by DT projects (Average range 1.6 with STD 0,68), while 'communication/coordination between headquarters and distributors' will be weakened (2,7 with STD 0,67). The majority agrees that that DT improves 'horizontal communication/coordination' (1.7, STD=0.67) while the agreement of positive impact on 'vertical communication' is more diverse and negative (2,2 with STD 0,92).

Similarly, 'Time Management' within companies appears to be improved by the implementation of DT projects, given the average range of 1.8-2.0 (STD range 0.74-0.1.03). While employees are pushed to comply with deadlines, they witness an 'improved scheduling of their activities' within the company. However, given the high standard deviation (1.03), the interviewed companies do not agree that DT enables better task achievement.

Neither do the companies seem to be convinced with the criticality and 'Adequacy of job training' when implementing DT projects given that our results highlight a relatively high average of 2.1 (with a 0.57 STD). Interestingly, respondents are not fully persuaded that their competencies will be improved by DT. Our results draw a high average for Competency Improvement (2.2, STD=0.42).

Table 3, which outlines the 'Indicators of hidden costs', presents significant concerns related to DT projects. It implies that companies are skeptical about DT's capacity to address their concealed costs. Upon initial analysis, it is evident that DT does not provide a solution for the issues in 3 out of the 5 sub-categories. Furthermore, no sub-category indicated an improvement due to DT efforts. More alarmingly, DT projects exacerbate issues of 'absenteeism' (with an

average score of 2.3 and a standard deviation of 0.67) and ‘occupational injuries and diseases.’ The latter sub-category scores the highest across all metrics, with an average of 2.9 and a standard deviation of 0.74. Also, the data in Table 3 reveals that both work quality (avg. 2.2, STD 0.92) and production levels (avg. 2.0, STD 0.67) experience negative impacts from DT projects.

**Table 3.**  
**Results: Indicators of hidden cost**

Category	Subcategory	Average	STD
Indicators of hidden cost of the ISEOR model	Absenteeism	2.3	0.67
	Occupational injuries and disease	2.9	0.74
	Staff turnover	2.1	0.99
	Non-quality	2.2	0.92
	Direct production gap	2.0	0.67

Table 4 showcases results related to the ‘financial consequences of dysfunctions.’ Immediately, these outcomes appear more positive compared to ‘Indicators of hidden costs.’ In four out of the six sub-categories, the managers experience mild improvements due to DT, falling within the green-yellow classification. However, feedback suggests that DT might lead to increased salary expenditures, with an average score of 2.8 and a standard deviation of 0.63. On the positive side, there is an indication that both ‘Wasted time and overtime’ could see reductions, evidenced by an average score of 1.7 and a standard deviation of 0.67. Additionally, managers agree that issues with ‘non-production’ are being ameliorated, with an average score of 1.8 and a standard deviation of 0.42. Participants also seemed aligned on the topic of harnessing worker potential, averaging a score of 2.0 with a standard deviation of 0.47. However, the overall sentiment suggests that risks to the company might escalate following implementation, as seen with an average score of 2.2 and a standard deviation of 0.63.

**Table 4.**  
**Results: Financial consequences of dysfunctions**

Category	Subcategory	Average	STD
Financial consequences of dysfunctions of the Iseor model (problems)	Excess salary	2.8	0.63
	Time wasted/ overtime	1.7	0.67
	Overconsumptions	2.0	0.67
	Non-production	1.8	0.42
	Non-creation of potential	2.0	0.47
	Risks	2.2	0.63

## 6. Discussion and further research

The results offer insights into the spectrum of hidden costs and dysfunctions associated with DT activities. From our preliminary research undertakings, it becomes evident that applying the dysfunctions and hidden cost theory provides a more lucid understanding of the organizational and human-centric concerns lurking in the shadows of DT initiatives. Utilizing the questionnaire

modelled by [12], we pinpointed elements crucial to the efficacy of DT initiatives. While diminishing these hidden costs may momentarily reduce visible costs, it unconsciously triggers significant dysfunctional costs that hinder sustained economic viability. These observations hint at potential reasons behind why DT activities are slowing down in industry [10].

For instance, the data from the nine Scandinavian firms highlights concerns surrounding the capacity of DT to enhance job satisfaction, motivation, and autonomy. These facets, pivotal from a socio-technical vantage point, are instrumental not just for fostering well-being but also for driving productivity amidst change initiatives [1-3].

This analysis marks the commencement of our journey to unearth the obscured facets of DT initiatives spanning diverse sectors. Hence, the preliminary insights from this select group substantiate our research agenda's core premise: mainstream DT strategies inadequately address human-centric considerations in DT projects. For enterprises to truly harness the promise of their DT endeavors, they must holistically integrate both the human and technological elements.

For our forthcoming research steps, we recommend an in-depth exploration tailored to the nuances of individual industries. This arises from the observed high standard deviations in several sub-categories. Furthermore, a deeper analysis is essential to discern the nuances of the DT projects and to ascertain whether the timing of data collection influences the responses.

Our subsequent research directive remains an open query: How might one quantify the influence—conceptualized as the 'shadow'—of DT initiatives on an organization's humanistic dimensions? During our preliminary analysis, we employed a color-coding system, using shades to indicate the consensus about the efficacy of DT in resolving humanistic and organizational challenges. Here, 'orange' signals disagreement, whereas a spectrum from 'green' to 'yellow' suggests agreement. Our intention is to refine and validate this color-graded methodology to determine its efficacy in measuring the 'shadow' cast by DT projects. The underlying logic is straightforward: A dominance of the orange shade indicates escalating hidden costs and dysfunctions, suggesting an extended shadow from DT and an increased likelihood of project failure. To substantiate this, we advocate for extended case studies, adopting a comprehensive methodological approach that intertwines both qualitative and quantitative techniques.

Revisiting our previous assertion, we can attribute the decline in DT project successes to cultural and personnel-related challenges, with projects at peril of not fulfilling their set objectives. These setbacks frequently stem from neglected organizational and humanistic issues hidden in the shadows. Given these circumstances, the trajectory of our research holds significance for the IS academic community. Our objective is to provide industry leaders with pragmatic methodologies that emphasize a sociotechnical framework. We perceive this approach as paving the way for the next phase of DT initiatives and warmly invite our academic peers to contribute to and enhance our research journey.

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