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What has digital transformation changed? – A Chinese case study of hidden costs using a socio-economic approach to management

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Abstract : Digital transformation is regarded as a way to solve business problems in an organisation. However, the impact on the company's hidden costs should also be more precisely analysed. This research relies on the socio-economic approach to management to describe the impact of digital transformation maturity growth on hidden costs in a Chinese manufacturing company. This paper combines the case study research method with some quantitative techniques by conducting correlation analyses of staff turnover, low-quality work and occupational injuries and diseases. The results indicate that digital transformation maturity growth is correlated with the financial consequences of staff's excess salary in terms of turnover and with non-production in terms of occupational injuries and diseases. Moreover, this study suggests that future studies should consider the impact of digital transformation maturity growth on these three factors in light of the corresponding contextual factors regarding organisational contexts and cultures.

Keywords : Digital transformation, Maturity growth, Socio-economic approach to management, Hidden costs

Qu'est-ce qui a changé avec la transformation numérique ? Une étude de cas en Chine fondée sur les coûts cachés et le management socio-économique.

Résumé : La transformation numérique est considérée comme un moyen de résoudre les problèmes de gestion des entreprises. Cependant, l'impact sur les coûts cachés des entreprises devrait être analysé de manière plus précise. Cette recherche est fondée sur l'approche du management socio-économique afin de permettre de décrire l'impact du niveau de maturité de la transformation numérique sur les coûts cachés dans une entreprise industrielle en Chine. Cet article combine la méthode des cas en tant que méthode de recherche avec des techniques quantitatives permettant le calcul de corrélations reliées au taux de rotation des employés, à la qualité du travail et aux accidents du travail. Les résultats suggèrent que le niveau de maturité de la transformation numérique est corrélé avec les conséquences financières d'excès de salaire pour le taux de rotation du personnel, et avec la non-production pour les accidents du travail. Des recherches futures devraient être entreprises afin d'évaluer l'impact du niveau de maturité de la transformation numérique sur ces trois facteurs par rapport à des facteurs contextuels, notamment le type d'organisation et les cultures.

Mots clés : Transformation numérique, niveau de maturité, approches socio-économique du management, coûts cachés

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1. INTRODUCTION

Digital transformation is defined here as the integration of computer-based technologies into the products, processes and strategies of a corporation (Pratt & Sparapani, 2021). A key driver in the success of implementing digital transformation in a company is often identified as employee engagement (Kare-Silver, 2019). Motivating employees requires a social understanding of their mindset (Lissillour, 2021b) and shared beliefs (Lissillour & Wang, 2021). Physical and human capital, as well as technological innovation, are key drivers of economic development (Giordano & Giugliano, 2015). However, technical innovation that does not take into account the human side is likely to be resisted and thus does not lead to more profit (Lissillour, 2021a; Monod et al., 2022).

Moreover, Conbere and Heorhiadi (2018) stated, "An efficient workspace must deal with the human side as well as the profit, or economic, side, and this is what socio-economics is about" (p. 1). The socio-economic approach to management (SEAM) (Savall & Zardet, 2008) combines economics, accounting and a socio-technical systems approach. SEAM also connects qualitative interviews and observation methods with hidden costs, and an economic analysis of corporate strategy has also been identified as an important success factor. However, hidden costs are often not assessed in digital transformation (Boje, 2002).

This research is a case study on the impact of digital transformation on hidden costs using SEAM (Savall & Zardet, 2008). The research setting is a manufacturing company in China that has been implementing a digital transformation strategy since 2016. The installation of many sensors and the application of 5G technology have made data acquisition and transmission easier than ever before. Various digital platform software, such as enterprise resource planning (ERP) systems, manufacturing execution systems, customer relationship management systems and supply chain management systems, have brought information interconnection to new heights. Highly automated equipment, artificial intelligence (AI), big data, virtual reality and other technologies make employees' work more convenient. With increasing digital transformation maturity, the challenges and problems from the employees' perspectives are of interest to the authors. This case study relies on the SEAM method and, more precisely, on the "hidden costs" concept.

The research question is defined as follows: What is the specific impact of increasing digital transformation maturity on hidden costs based on SEAM?

The first section of this work introduces the theoretical background. The second section describes the research methodology used in this study. The third section presents the findings.

2. THEORETICAL BACKGROUND

2.1 The Socio-Economic Approach to Management (SEAM)

SEAM was developed to connect economics, accounting and a special socio-technical systems approach to large system change (Savall & Zardet, 2008). It is also considered an alternative method implemented in the fields of organisational management and organisational change. SEAM is much like an umbrella that covers socio-economic theory, SEAM change intervention and SEAM management tools and tactics, as it tightly interweaves these elements.

In more concrete terms, socio-economic theory supports practice, which, in turn, is based on theory (Savall & Zardet, 2008). At the same time, hidden costs and poor performance are the consequences of organisational dysfunction and a failure to properly adjust the structure and behaviour of actors in the organisation.

Savall and Zardet (2008) proposed a fundamental hypothesis about the relationships among these factors based on their respective perspectives.

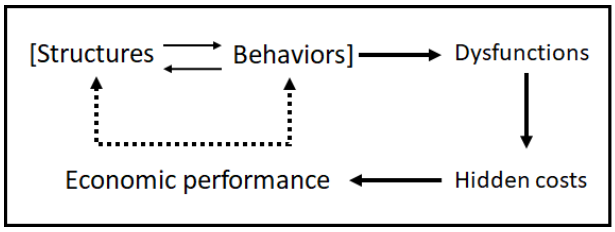


Figure 1: The fundamental hypothesis (Savall & Zardet, 2008, p. 8)

As their research progressed, Savall and Zardet (2008, p. 17) confirmed this hypothesis and then developed a related socio-economic analysis method. This method contains three basic tools: dysfunction analysis, hidden costs assessment and job-training adjustment (competency grids). Furthermore, they depicted the specific linkages of corresponding elements to be analysed (dysfunctions, structures, behaviours and hidden costs) in the socio-economic four-leaf clover model illustrated in Figure 2.

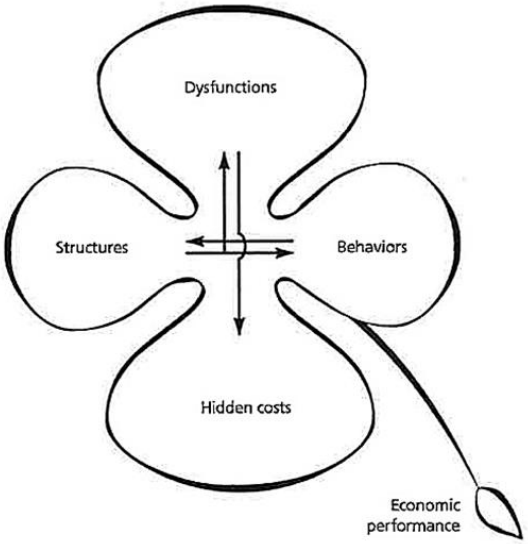


Figure 2: The socio-economic four-leaf clover (Savall & Zardet, 2008, p. 17)

2.2 Hidden Costs

Henri Savall first proposed the concept of hidden costs in 1974, and it was further developed by Veronique Zardet and the Institute of Enterprises and Organisations (ISEOR) team (Savall & Zardet, 2008). Hidden costs were defined as the costs that are not included in accounting or information systems (Perroux, 1981). Savall and Zardet (2008) also shed light on the explicit linkage between hidden costs and the financial consequences of organisational dysfunctions. According to the indicators of hidden costs, specific items such as absenteeism, occupational injuries and disease, staff turnover, low-quality work and direct production gaps are involved in this aspect (Savall et al., 2008, p. 149). At the same time, the financial consequences of dysfunctions are more relevant to the regulation of organisational dysfunctions, and all of the hidden costs generated by dysfunctions are classified into human activities and product (goods or services) consumption (Savall & Zardet, 2008). Savall et al. (2008, p. 149) identified the concrete features of dysfunctions to include five main modules: excess salary, waste time and overtime, overconsumption, non-production and non-creation of potential risks. The specific items are displayed in Table 1.

Table 1: Financial consequences of dysfunctions, with indicators of hidden costs (Savall et al., 2008, p. 149)

ISEOR Model	***Characteristics***
Indicators of hidden costs	1. Absenteeism 2. Occupational injuries and disease 3. Staff turnover 4. Low-quality work 5. Direct production gaps
Financial consequences of dysfunctions	1. Excess salary 2. Wasted time and overtime 3. Overconsumption 4. Non-production 5. Non-creation of potential risks

Furthermore, Monod et al. (2021) proposed that the investment return on a digital transformation can be assessed by implementing a hidden costs approach. They have already conducted specific research on the impact of hidden costs on research companies undergoing digital transformation. Based on their findings, the authors intend to conduct further research on the potential relationship between the financial consequences of dysfunctions generated from the specific indicators of hidden costs and digital transformation maturity in the company described in the current paper.

3. RESEARCH METHODOLOGY

To identify the most significant concerns of the managers in the operational departments of the organisation, the authors conducted focus groups that generated data from the research participants' communication. Carter and Wheeler (2019) claimed, "Focus groups can offer some insights on the opinions and underlying rationales of different groups of people" (p. 241). The authors of the current research thus conducted a focus group discussion to accumulate all the participants' perspectives and beliefs on the specific discussion topic (Copley Focus Centers, 2012). All managers in the production, production planning, quality and maintenance departments were involved. The authors asked them to talk openly about the problems in their departments' operations in the company and their personal feelings about the company's digital transformation maturity and growth as they relate to the daily business management of their departments. The managers were divided randomly into four groups, with seven people in each group so that participants had an equal chance of being assigned to an experimental or control group. This resulted in a sample that, in theory, was representative of the population (May, 2017). In general, "random assignment helps ensure comparable groups, minimizing the influence of individual characteristics" (May, 2017, p. 1399). In total, 28 participants were involved in the discussion, and the overall statistics were displayed in the number of groups. The authors organised two rounds of discussion, and the entirety of the discussions lasted for five hours, with the first round of discussion in the morning lasting three hours and the second round of discussion in the afternoon lasting two hours. Throughout the two rounds of discussion, the authors took notes on the whiteboard in front of the podium while using a tape recorder to record all the conversations. After the discussions, the authors took all the problems that the managers proposed and conducted a statistical analysis based on the number of times each of the problems was mentioned to identify the most important ones among all of them. This specific focus group implementation process is summarised in Table 2.

Table 2: Summary of focus group implementation (by the authors)

Number of people attendance	***Functions***	***Departments***	***Specific date***	***Focus group discussion duration***	***Specific time***
28	*Managers (Head of departments)* *(7 participants for each department)*	*Production planning and control, production, quality and maintenance*	*May/20th/2022*	*Total: 5 hours* *(2-rounds)* *First round: 3 hours* *Second round: 2 hours*	*First round: 9:00 a.m. – 12:00 a.m.* *Second round: 1:30 p.m. – 3:00 p.m.*
Data collection	***Mean of transcription***	***Method of data analysis***	***Guide of focus group***	***Number of exploration questions***	***Specific exploration questions***
Note-taking *and voice recording*	*Written texts on whiteboard*	*Statistics on number of frequency in terms of different categories (Pareto chart display)*	*Provide exploration questions to the participants for the further discussion*	*2*	*What are the major concerns in your responsible department?* *How has the development of the company's digital transformation in recent years affected your day-to-day work?*

By the end of the first round of discussion in the morning, the participants had identified 14 significant business challenges in the company. Then, the authors counted the number of times that the participants mentioned each business challenge and presented the statistical results in the form of charts. Since the "Pareto principle defines that 80% of the outcomes are controlled or decided by 20% of the activities or factors" (Jana & Tiwari, 2021, p. 36), the top five items with the highest frequencies were selected, respectively, as follows: 1) "employee turnover rates (staff turnover)", 2) "high customer requirements", 3) "low efficiency, high costs (low-quality work)", 4) "cross-department communication" and 5) "work-related injuries (occupational injuries and disease)".

After the second round of discussion in the afternoon, the authors and these managers agreed to initiate further analysis of the main problems – respectively, staff turnover, low-quality work and occupational injuries and disease – as they realised that top management in the organisation emphasised these three items more than the other two in recent years. Thus, the authors coded these challenges and obtained the corresponding indicators of hidden costs. Subsequently, the authors matched them with the corresponding financial consequences of the dysfunction in Table 1. The matching results are displayed in Table 3.

Figure 3: Business problems (challenges) in the departments (production & production planning and quality control & maintenance) (by the authors)

Table 3: Challenges in the research company in terms of indicators of hidden costs, with the financial consequences of dysfunctions (by the authors)

Indicators of hidden costs	Financial consequences of dysfunctions
Staff turnover	Excess salary
Low-quality work	Wasted time and overtime
Occupational injuries and disease	Non-production

Afterward, these managers shared their personal experiences of the company's increasing maturity in digital transformation in recent years, and some responded that the number of occupational injuries and diseases has decreased gradually in recent years. Meanwhile, as the digital transformation maturity of the company increases year by year, the production process becomes more efficient, the

product yield improves, and the stability of employees on the job is relatively good. Despite this, the authors still believe that the three identified indicators of hidden costs, which are indeed influenced by digital transformation maturity growth, should be considered from the perspective of quantitative analysis and provide some valuable references for future research in related fields. In light of this, according to the research question raised at the beginning of this paper, the authors further developed two main research purposes. The first was to calculate the corresponding financial consequences of dysfunctions in the form of specific amounts, and the second was to analyse the correlation between digital transformation maturity and the corresponding financial consequences of dysfunctions. A correlation study was chosen because the authors decided to implement a quantitative analysis of this research question to identify the strength of the relationship between digital transformation maturity and the corresponding financial consequences of dysfunctions. Correlational research is a quantitative methodology used to determine whether and to what degree a relationship exists between two or more variables within a population (or a sample; Oberiri, 2017). In this study, the degree of the relationship should identify the correlations between digital transformation maturity growth and the financial consequences of dysfunctions due to the specific hidden cost indicators embodied within the company. The authors collected the quantitative data ahead of time from the management information systems in the organisation by using a "typical quantitative data gathering strategy that includes obtaining relevant data from management systems" (Kabir, 2016, p. 203).

4. DATA ANALYSIS

To collect the data, the authors adopted the method of document review, a process by which researchers collect data by reviewing existing documents. The authors used supplemental data in the company files to enhance and support data from other quantitative data collection methods. As shown in Table 4, the specific data on the indicators of hidden costs in the organisation were collected for the last five years (2016–2020), since the company's digital transformation project officially began in 2016.

Table 4: Indicators of hidden costs in the organisation from the years 2016–2020 (by the authors)

Year	2016	2017	2018	2019	2020
Number of current staff	3 064	3 125	3 019	2 963	3 130
Staff turnover	Number of staff turnover				
	1 042	956	951	701	575
	Staff turnover rate				
	34%	31%	32%	24%	18%
Low-quality work	Rework rate				
	1,7%	3,0%	4,0%	2,3%	3,8%
	Number of staff on rework				
	18	33	42	24	42
	Rework wasted time (Hours per day)				
	8 hours				
Occupational injuries and disease	Occupational injuries and disease (Number of people involved for each frequency)				
	1				
	Occupational injuries and disease (Number of frequency)				
	98	65	69	49	43
	Absence times (Hours)				
	1 003	717	921	488	679
Normal working days (Per month)	20.5 days				
Normal working hours (Per day)	8 hours				

Further analysis was carried out to better understand the relationship that the maturity growth of digital transformation had with staff turnover, low-quality work and occupational injuries and disease in each year from 2016 to 2020. In Table 4, some fundamental information was provided by the principals in the company's Human Resource Department and the Finance & Controlling Department. Moreover, the calculation formulas of the further financial consequences of dysfunctions, along with the specific calculation results, are displayed in Tables 5–7.

Table 5: Financial consequences of dysfunctions (staff turnover) from the years 2016–2020 in the organisation (by the authors)

Year	2016	2017	2018	2019	2020
Number of staff turnover	1 042	956	951	701	575
Recruitment (Per person)	€ 87	€ 87	€ 116	€ 116	€ 145
Training (Per person)	€ 203	€ 203	€ 218	€ 218	€ 218
Additional costs during probation period (Per person)	€ 2 786	€ 2 902	€ 3 018	€ 3 192	€ 3 366
Excess salary	€ 3 206 192	€ 3 051 552	€ 3 167 752	€ 2 471 726	€ 2 144 175

Excess salary caused by staff turnover:

Excess Salary (Caused by Staff Turnover) = Number of Resigned Employees × (Recruitment Fee + Training Fee + Additional Costs During Probation Period)

Table 6: Financial consequences of dysfunctions (low-quality work) from the years 2016–2020 in the organisation (by the authors)

Year	Indicator				Financial consequences of dysfunctions (Low-quality work)		
	Number of people involved	Number of frequency (Months per year)	Rework wasted time (Hours per day)	Normal working days (Per month)	Hourly contribution value-added variable cost (HCVAVC)	Calculation details	Over-time
2016	18	12 months	8 hours	20.5 days	€58	18 people x 12 months x 8 hours x 20.5 day x €58	€ 2,054,592
2017	33				€70	33 people x 12 months x 8 hours x 20.5 days x €70	€ 4,546,080
2018	42				€56	42 people x 12 months x 8 hours x 20.5 days x €56	€ 4,628,736
2019	24				€59	24 people x 12 months x 8 hours x 20.5 days x €59	€ 2,786,688
2020	42				€62	42 people x 12 months x 8 hours x 20.5 days x €62	€ 5,124,672

Wasted time and overtime caused by low-quality work:

Wasted Time and Overtime (Caused by Low-Quality Work) = Number of People Involved x Number of Occurrences x Rework Wasted Time (Hours Per Day) x Normal Working Days x HCVAVC (Hourly Contribution to the Value Added on Variable Costs).

Table 7: Financial consequences of dysfunctions (occupational injuries and disease) from the years 2016–2020 in the organisation (by the authors)

Year	Indicator			Financial consequences of dysfunctions (Occupational injuries and disease)		
	Number of people involved for each frequency	Number of frequency (Times)	Absence times (Hours)	Hourly contribution value-added variable cost (HCVAVC)	Calculation details	Non-production
2016	1	98	1003	€58	1 people x98 Timesx 1003 hours x €58	€5,701,052
2017		65	717	€70	1 people x65 Timesx 717 hoursx €70	€ 3,262,350
2018		69	921	€56	1 people x69 Timesx 921 hours x €56	€ 3,558,744
2019		49	488	€59	1 people x49 Timesx 488 hours x €59	€ 1,410,808
2020		43	679	€62	1 people x43 Times x 679 hours x €62	€ 1,810,214

Non-production caused by occupational injuries and disease:

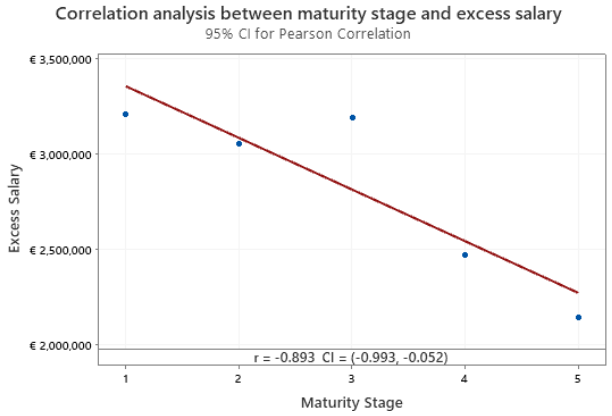
Non-Production (Caused by Occupational Injuries and Disease) = Number of People Involved for Each Occurrence x Number of Occurrences (Times) x Absence Times (Hours) x HCVAVC (Hourly Contribution to the Value Added on Variable Costs).

The organisation started adopting digital software earlier than 2016. It also has a well-established professional digital software development team. Hence, the organisation has a good foundation for technology development and the implementation of digital transformation. Digital transformation contains the dimensions of organisational products and services, corporate assets, leadership, organisational strategy, customer focus, measurement analysis and information management, workforce development and operations (National Institute of Standards and Technology, 2016), and technologies development and implementation have been attributed to the items in these dimensions. Meanwhile, the company's digital transformation platforms and

software were continuously developed and implemented by establishing an integrated quality and planning system in 2016. The following, along with their functions, were constantly updated and improved: an e-learning system for virtual classroom training and a digital communication platform (including both functions of Enterprise WeChat and WebEx Team) in 2017; an intelligent equipment maintenance system, a digital finance dashboard and a manufacturing execution system in 2018; an AI visualisation system emphasising onsite defects detection, a products yield prediction and recording system and a detailed scheduling and planning system in 2019; and an automatic reports generation dashboard, a production work-in-process traceability system, a digital purchasing management system and a data storage and integration system in 2020. Hence, the maturity of digital transformation technologies has deepened every year, and the authors were determined to take into account the annual maturity of digital transformation technologies when exploring the relationship and the correlated relationships between the growth of digital transformation maturity and the respective financial consequences of excess salary on staff turnover, of wasted time and overtime on low-quality work and of non-production on occupational injuries and disease over the past five years. Nevertheless, the term "maturity" has been described as a "state of being complete, perfect or ready" (Lahrmann et al., 2011, p. 2). Teichert (2019) claimed that "digital transformation maturity is not a static concept because the digital landscape is continuously changing". Additionally, the researcher must assess the maturity of digital transformation technologies in the organisation over time (Shahiduzzaman, 2017, p. 6). As digital transformation maturity growth keeps up with the annual development and introduction of new digital software in the company under study, the authors only had access to the collected data for the past five years (2016–2020), as presented in the previously summarised table. In this research, the authors discovered that the maturity of digital transformation has been developing every year, and the relevant digital platforms and software development have been increasing annually over the corresponding five years. Therefore, they defined the stages of digital transformation maturity over the five years as Stage 1 (2016), Stage 2 (2017), Stage 3 (2018), Stage 4 (2019) and Stage 5 (2020).

The specific data analysis of the relationships was conducted using Minitab (Version 2019), a software that provides statistical analysis, data visualisations and data analytics to assist users in making decisions based on data-driven evidence (Kaur, 2022), and the authors implemented the quantitative research method (correlation) with the functional execution of this software.

The authors considered two critical factors in the correlation studies: The P-value, which is a probability value that measures the evidence against the null hypothesis (McLeod, 2019), and the correlation coefficient of the analytical results. Given the null hypothesis, McLeod (2019) stated, "There is no relationship between the two variables being studied (one variable does not affect the other). It states the results are due to chance and are not significant in supporting the idea being investigated". McLeod (2019) also noticed that the theory of alternative hypotheses is opposite to the null hypothesis, where "the alternative hypothesis is the independent variable that did affect the dependent variable, and the results are significant in supporting the theory being investigated (i.e., not due to chance)". Apart from this, the correlation coefficient represents the linear correlation measurement between two variables, and the range of value tends to be within the interval of -1 and 1. The closer the absolute coefficient value is to 1, the stronger the linear correlation between the two variables. The following explains the specific analysis processes and results.

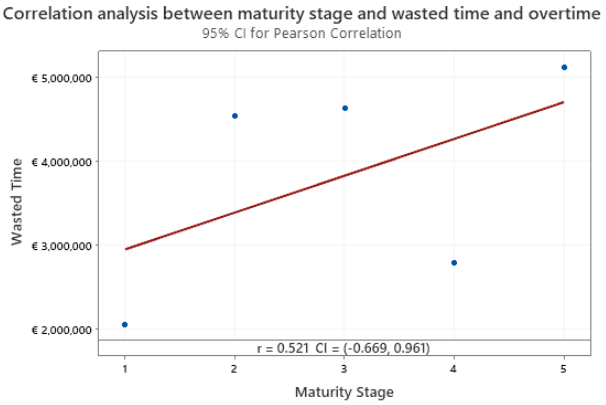


Pairwise Pearson Correlations

Sample 1	Sample 2	N	Correlation	95% CI for ρ	P-Value
Excess Salary	Maturity Stage	5	-0.893	(-0.993, -0.052)	0.041

Figure 4: Correlation analysis (digital transformation maturity stage and excess salary) (by the authors)

In the correlation study of the relationship that digital transformation maturity stages and employees' excess salaries have on turnover, the P-value was 0.041, which is less than the significance value (0.05), indicating that the correlation between them is statistically strong. Furthermore, the coefficient between the digital transformation maturity level and employees' turnover rates was -0.893, which shows a relatively strong negative correlation. This indicates that the employees' excess salaries have declined over the past five years, likely due to the growth in digital transformation maturity. This further suggests that the growth of digital transformation maturity may have a positive impact on the reduction in staff turnover.

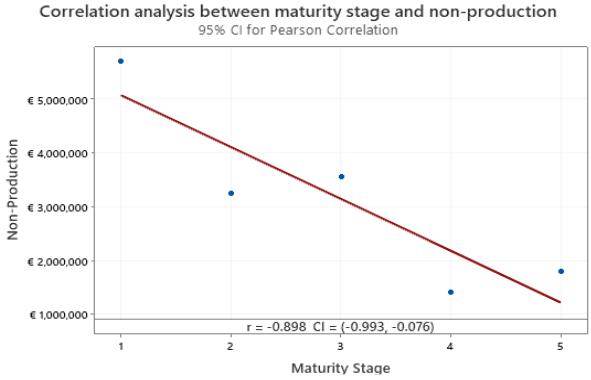


Pairwise Pearson Correlations

Sample 1	Sample 2	N	Correlation	95% CI for ρ	P-Value
Wasted Time	Maturity Stage	5	0.521	(-0.669, 0.961)	0.368

Figure 5: Correlation analysis (digital transformation maturity stage, and wasted time and overtime) (by the authors)

The Minitab analytical results illustrate that the P-value was 0.368 for the costs of wasted time and overtime for low-quality work. This number is greater than the significance value (0.05). Hence, the correlation is not statistically significant, which is in line with the null hypothesis, and it seems that there is no significant statistical correlation between these two factors.



Pairwise Pearson Correlations

Sample 1	Sample 2	N	Correlation	95% CI for ρ	P-Value
Non-Production	Maturity Stage	5	-0.898	(-0.993, -0.076)	0.038

Figure 6: Correlation analysis (digital transformation maturity stage and non-production) (by the authors)

Finally, the Minitab analytical results illustrate that the P-value of the analytical result, in terms of the digital transformation maturity impact on non-production, was 0.038, which is smaller than the significance value (0.05). The correlation between the digital transformation maturity stages and non-production is statistically significant for the hypothesis. Moreover, the correlation value was -0.898, which explains the relatively strong negative correlation between them. It seems that growth in digital transformation maturity has a certain statistically negative correlation with non-production and further suggests that growth in digital transformation maturity may have a positive impact on the reduction of occupational injuries and diseases.

5. DISCUSSION

According to the research question – *What is the specific impact of increasing digital transformation maturity on hidden costs based on SEAM? – the* authors first identified the key research objects, which are the indicators of hidden costs in staff

turnover, low-quality work, and occupational injuries and diseases, and then calculated the specific financial consequences corresponding to these indicators. Due to the further correlation of the analytical results with the utilisation of Minitab software, the authors discovered that digital transformation maturity growth had overt impacts on both the relationship between the staff's excess salary and their turnover and that between non-production and their occupational injuries and disease over the corresponding five years (2016–2020). This reveals that the maturity and growth of digital transformation in the company studied may have positively affected employees, decreasing the probability of their turnover and occupational injuries and disease in their daily work. However, it had no significant effects on the financial consequences of their wasted time and overtime in terms of low-quality work.

Nevertheless, other factors in the organisational culture and related policy formulation were found to have some potential impacts on staff turnover. Mobley (1982) and Arthur (2001) confirmed that employee turnover rates could be affected by some factors, such as recruitment efforts from the supporting departments (human resources) in the company, relevant compensation offerings, leadership styles and supervision in different departments of the company, organisational communication and commitment, flexible working hours, the establishment of staff turnover regulations and appreciations and others. Meanwhile, some social and human factors also influence employee retention or departure. For instance, a lack of trust among employees in the leader and in the digital system can undermine retention, but trust can also be promoted through the proper use of information systems, such as social media (Lissillour & Ruel, 2022; Lissillour & Sahut, 2022).

Moreover, employees' age and seniority were deemed grounds for their disposition towards resignation in the company (Griffeth et al., 2000; Ng & Feldman, 2009; Oshagbemi, 2000; Singh & Schwab, 2000). Apart from this, gender differences, marital status and child-rearing, nationality differences, the distance between home and the company, and satisfaction with salaries are also relevant and considerable factors in social and human aspects (Rombaut & Guerry, 2021). The possibility of benefitting from an efficient telework platform also provides social benefits that boost employee engagement (Sahut & Lissillour, 2023).

Similarly, some additional elements contribute to low-quality work through staff rework rates and costs, as well as through absenteeism. Su et al. (2009) found that the inappropriate design of products, defective parts of products, variance in the operating devices and systems and operator errors are the four most common categories regarding the primary root causes of product production and assembly defects. The forced use of a new information system is sometimes resisted by teams of employees who then engage in deviant behaviours (Lissillour & Rodríguez-Escobar, 2020; Monod et al., 2022).

Therefore, it is indispensable for future researchers to discover the potential influencing factors behind the correlations between digital transformation maturity growth and hidden costs. It is also significant for researchers to analyse the weight of the contributions of digital transformation maturity growth to the indicators of hidden costs, as well as the corresponding financial consequences, in future studies.

6. CONTRIBUTIONS TO RESEARCH

In this study, the authors implemented a quantitative research method (correlational research) to highlight the link between digital transformation maturity growth and the financial consequences of dysfunctions in terms of the corresponding indicators of hidden costs. Such a result is not surprising and might be a universal phenomenon in companies, at least in the manufacturing industry. For managers, the implications of this study demonstrate the necessity of implementing digital change in the manufacturing company used in this case study. The study also provides a reference for suitable research methodologies for future researchers. This paper provides a case study conducted in a manufacturing company closely related to two characteristics:

SEAM and hidden costs. The analytical results in this paper can be used as evidence of a specific practical implementation based on the theories, and these research results serve as a reference point for other researchers who may wish to conduct further in-depth research in related areas.

7. RESEARCH LIMITATIONS AND FUTURE STUDIES

As the authors define the digital transformation maturity from the years 2016–2020, an external professional consulting company must evaluate the digital transformation maturity and validate the maturity assessment. In terms of implicit cost analysis, the results came from a correlation analysis implemented with statistical software (Minitab). However, other factors could have affected the analysis results. Therefore, relevant researchers, including the authors, must consider all potential influencing factors and the contribution weights between these factors and digital transformation maturity growth in subsequent studies. Simultaneously, the research analysis concentrated on the data from the past five years, and the research company is a medium-sized manufacturing company located in China. Hence, more relevant studies should be concerned with different regions, company sizes and products in the manufacturing industry.

8. CONCLUSION

This research aimed to examine the impact of digital transformation maturity growth on hidden costs in the manufacturing industry. Applying the theories of hidden costs using SEAM, the study results described the effects of digital transformation maturity growth. In this study, correlation analysis was utilised in the concentration of the research with multiple dimensions in a dynamic working environment. However, the authors neglected most of the factors in organisational cultures, humans and societies. The study suggests that future research should be tailored to the corresponding contextual factors, such as age, gender, marriage status and types of manufacturing industries. Furthermore, the research results show a lack of further evaluation and verification by external professional consulting companies at the maturity stage of the digital transformation of the research companies, and the research results need additional verification and supplementation.

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