

Internal Control in Auto Parts Manufacturing Under Digital Transformation: A Review

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Abstract

With the rapid development of digital transformation in manufacturing, internal control is increasingly supported by information systems, data platforms, and automated business processes. This trend is especially important for auto parts manufacturing firms, because their production processes are complex, their supply chains are highly connected, and their product quality and traceability requirements are strict. This paper reviews existing studies on digital transformation and internal control in the context of auto parts manufacturing. Based on organizational information processing theory, information timeliness theory, and agency theory, it examines how digitalization changes control activities, information and communication, monitoring mechanisms, and risk transmission in the supply chain. The review finds that digital transformation can improve the automation, accuracy, and timeliness of internal control. It can also reduce traditional agency problems by making business activities more transparent and traceable. However, digital internal control may also create new risks, such as information overload, false timeliness, data manipulation, excessive system permissions, and chain reactions caused by supply chain coupling. This paper argues that digital internal control has a double-edged sword effect. Auto parts manufacturing firms should therefore combine technological upgrading with organizational governance, data standardization, permission control, and supply chain risk management.

Keywords

digital transformation, internal control, auto parts manufacturing, information processing

1. Introduction

The importance of digital transformation in the manufacturing sector is growing rapidly. Companies are increasingly adopting enterprise resource planning systems, automation technologies, and data-driven operational processes. Verhoef et al. argue that digital transformation progresses from digitization to the comprehensive reshaping of the firm. This process requires organizations to develop corresponding information processing capabilities and strategic assets [1]. Based on organizational information processing theory, Yin et al. examine how digitalization can reduce operational risk by improving the quality of internal control [2]. In this context, firms increasingly rely on information systems to implement internal control rather than relying solely on manual procedures. Recent studies have examined the internal links among digital

transformation, internal control quality, and corporate governance structures [3, 4]. The auto parts manufacturing industry has complex production processes, high requirements for supply chain coordination, and strict standards for product quality and traceability. As a result, internal control in this industry is closely linked to data management and system integration. Based on a review of the relevant literature, this paper presents a structured review of this topic.

2. Research Objective

To examine these issues systematically, this paper focuses on the auto parts manufacturing industry and reviews the literature on how digital transformation affects internal control. Specifically, this paper examines how digitalization changes the basis of control activities, affects the quality of internal information and communication, and reshapes monitoring mechanisms and agency relationships. It then combines these three aspects to analyze how systemic risks are transmitted through digital internal control when firms are closely connected in the auto parts supply chain. Based on the above discussion, this paper sets out the following four research objectives:

Research Objective 1: Based on organizational information processing theory, identify the ways in which digital technology changes enterprises' information processing capabilities, and identify the impact of such changes on the automation and precision of control activities.

Research Objective 2: Based on information timeliness theory, this paper examines whether digitalization can truly improve the transparency, speed, and quality of internal information and communication, and identifies potential problems such as information overload.

Research Objective 3: From the perspectives of continuous monitoring and agency theory, this paper examines how digital monitoring mechanisms change information asymmetry and identifies the new agency problems that may result from these changes.

Research Objective 4: Combine the findings from the first three objectives, taking into account the characteristics of supply chain coupling in the automotive parts industry, to analyze the systemic risk transmission mechanism of digital internal control and illustrate the specific manifestations of the double-edged sword effect.

3. Theoretical Foundation

Internal control is generally defined as a process designed to provide reasonable assurance that a firm can achieve effective operations, reliable information, and compliance with laws and regulations. COSO's internal control framework divides internal control into five components: control environment, risk assessment, control activities, information and communication, and monitoring activities. This framework is widely used in both academic research and practice [5]. The following analysis of control activities, information and communication, and monitoring mechanisms is therefore mainly developed based on the component structure of this framework.

Automotive parts manufacturing encompasses interconnected stages, including procurement, production, and logistics. The supply chain in this industry exhibits a pronounced characteristic of deep coupling. Upstream operations require receiving real-time supply data from suppliers, while downstream operations need to respond to just-in-time production instructions from vehicle manufacturers. The ability to trace product origins throughout the entire process is directly linked to quality responsibility determination and recall management. These industry features make data consistency, system coordination, and information transmission timeliness carry significantly greater weight in internal control compared to general manufacturing industries.

From an organizational resilience perspective, Chen et al.'s study examined auto parts manufacturing companies and found that digital technology innovation improves enterprise performance by strengthening supply chain resilience [6]. Zhang Pei's research on auto parts supply chain resilience shows that the different links in this industry's supply chain are deeply connected, and risks tend to spread through the supply chain network [7].

4. Literature Review

4.1 Organization Information Processing Theory

The origin of organizational information processing theory lies in the classic framework established by Galbraith. The basic proposition of this theory is that organizational design, at its root, is a set of mechanisms used to cope with information processing needs. Organizational performance depends on how well information processing needs match information processing capabilities [8]. Information processing needs mainly arise from two sources: task uncertainty and task interdependence. The higher the task uncertainty, the more difficult it is to know in advance the information needed for decision-making. The stronger the task interdependence, the greater the amount of information that needs to be exchanged between individuals or units. When information processing capabilities are insufficient to meet the demands, the organization will encounter information overload, leading to a decline in both decision quality and response speed. Conversely, when capabilities far exceed demands, resource waste may occur, and attention can become easily scattered.

The auto parts manufacturing industry faces high uncertainty and strong interdependence at the same time, which makes its information processing needs especially important. Vehicle manufacturers often change orders, add urgent orders, and revise production orders, creating high uncertainty on the demand side. The material arrival status and production process parameters of multi-tier upstream suppliers depend on each other, and an abnormality in any link may affect the entire value chain. In addition, vehicle recall regulations require products to be traceable throughout the whole process, which further increases the information processing load.

Digital transformation can systematically improve information processing capabilities by using vertical information systems and horizontal coordination mechanisms, including ERP, MES, supply chain platforms, and data warehouses [1]. Verhoef et al. argue that digital transformation moves step by step from the digitization of individual information to the data-driven reshaping of the whole organization. In essence, this process continuously expands the limits of information processing capabilities [1]. Based on OIPT, Yin et al.'s empirical study shows that firm digitalization can reduce operational risk by improving the information processing quality of internal control systems. The transmission path is digitalization, information processing capability, internal control quality, and risk management [2]. When MES automatically collects real-time production data and shares it with ERP and quality management systems, internal control shifts from manual judgment to real-time, data-driven verification.

However, information processing needs often grow along with the development of information processing capabilities. After auto parts firms adopt digital technologies, real-time data from sensors, RFID tags, and EDI messages can increase sharply. If they only deploy technical tools without adjusting organizational design elements such as information filtering rules, decision authority allocation, and exception handling procedures, a mismatch may occur between upgraded capabilities and expanded needs. This mismatch may lead to frequent false alarms caused by rigid automatic verification rules, or allow real abnormalities to be missed because the data are not detailed enough.

4.2 Information Timeliness Theory

The timeliness of information is one of the key dimensions of accounting information quality. It means that information should be available and useful when decisions are made. In the field of internal control, the COSO framework requires its information and communication component to identify, capture, and communicate information in a timely way and within an appropriate time frame. This helps ensure that control functions operate properly [5]. For auto parts manufacturing firms with very high requirements for supply chain collaboration, timeliness is not only needed for accounting disclosure. It is also a precondition for internal control to respond quickly at the early stage of risk.

Gullberg's qualitative study shows that the timeliness of accounting information depends not only on the technical features of the information artifact, but also on organizational factors such as management style, organizational routines, and technical experience [9]. An empowering management style can greatly reduce the time lag between the occurrence of information and management awareness. In contrast, a rigid hierarchy and an organizational culture that focuses on stability and avoids responsibility may cause information to lose its timely value during repeated approval procedures. Fixed management reporting cycles and existing organizational routines, such as monthly business meetings, may also create artificial waiting time and delay

information, even when back-end systems already provide real-time updates. In addition, if employees lack technical experience with the new system or doubt the accuracy of real-time data, information may already be captured by the system but still fail to enter the actual decision-making process. This creates a gap in which information is technically updated in real time but remains delayed in practice.

Ballou views information as an information product and identifies timeliness as one of the three key dimensions used to track information product quality [10]. They emphasize that if a data product is not available when it is needed, its value will be greatly reduced, even when it is highly accurate and complete. For digital internal control, information artifacts such as real-time data dashboards and dynamic warning dashboards become truly useful information products only when decision makers read them and take action within the operating window.

In theory, digital systems can report abnormalities and trigger controls within seconds. However, in the auto parts industry, where firms must coordinate across organizational boundaries, achieving timeliness still faces deep constraints. When firms in the supply chain use different data collection standards, delays or distortions in semantic translation between systems may create information with false timeliness. Although the timestamp is updated, the meaning of the information may be wrong, so it cannot be directly used for internal control. At the same time, when large amounts of real-time data enter control nodes without proper filtering, key abnormal signals may be buried in data noise. Decision makers may then face attention overload, which can lengthen the time needed to identify problems and respond to them. Therefore, digital internal control design must build data priority classification and filtering mechanisms at the same time. Only in this way can technical real-time capability be turned into an advantage in control timeliness.

4.2.1 Agency Theory

Jensen and Meckling view the firm as a nexus of contracts. They argue that information asymmetry between owners and managers creates agency costs, which include monitoring costs, bonding costs, and residual loss. Traditional internal control creates points of information symmetry through procedures such as separation of duties, approval authorization, asset reconciliation, and regular inventory counts. These procedures limit the space for agents to hide information or take hidden actions. In essence, traditional internal control serves as an institutional response to information asymmetry [11].

Digital technology makes it possible to conduct remote monitoring in real time, on a continuous basis, and at a low marginal cost. Functions such as automatic reconciliation, system log records, and automatic alerts for abnormal transactions make agents' behavior more transparent and easier to trace. Huang et al. find that internal governance mechanisms can strengthen the effect of digital transformation in reducing firm idiosyncratic risk. This finding shows, from the perspective of governance structure, that digitalization can help ease agency problems [3]. Based on resource dependence theory, Song et al.'s empirical study finds that enterprise digital transformation can significantly improve accounting information quality by optimizing internal control and other related paths [4]. Xu Hanyou and Yang Xinyu further find that digital transformation, internal control, and financial flexibility are closely connected. Good internal control serves as a bridge linking digital investment with financial capability [12].

Digital monitoring does not simply reduce information asymmetry. While it helps ease traditional agency problems, it may also create new parties that hold information advantages. Technical staff who control system permissions, algorithm model configurations, and data warehouse access keys, together with developers who design control rules and system logic, may in fact become a new group of agents. They can decide the form, frequency, and level of aggregation in which information is reported to management. At the system level, they may hide or smooth abnormal data flows in ways that appear formally legitimate. At this point, the traditional agency problem between owners and managers is partly transformed into a technical information asymmetry between code holders and business decision makers. Traditional separation of duties and approval systems can hardly fully cover hidden operations at the code level. Auto parts firms rely heavily on core information systems for bills of materials, process formulas, quality judgment standards, and full-process traceability records. If system-level permissions are too centralized or changes are not effectively audited, agency costs may take new forms, such as data manipulation and parameter tampering.

The problem becomes more complex because of the supply chain agency relationships that are specific to the auto parts industry. Digital collaboration platforms are designed to reduce cross-organizational agency costs. However, because these platforms are led by core firms, the core firms set the data standards, access permissions, and abnormality reporting rules. This creates new agency problems at the platform level. In a multi-layered agency structure, how to ensure fair control and information symmetry remains an important issue for further research on digital internal control.

5. Key Finding

5.1 Embedded Transformation of Control Activities and Matching Conditions

Digitalization pushes the control activities of auto parts firms to move from paper-based manual approval after transactions to automatic pre-checking embedded in business information flows. For example, when a purchase order is created, the system can automatically check the supplier's certification status. When production work orders are reported, it can verify the upper and lower limits of process parameters in real time. During logistics delivery, it can also require the verification of batch traceability codes. This transformation embeds control rules directly into system logic, which greatly improves the efficiency and consistency of execution. However, its effectiveness depends heavily on whether the organization's information processing capabilities match its information processing needs. When firms face extremely high data density caused by frequent urgent orders from vehicle manufacturers and mixed production of wide varieties in small batches, automatic control may become ineffective if system rules are not updated in time, exception handling processes are unclear, or data filtering standards are inconsistent. Rigid execution may wrongly block many normal activities and reduce production efficiency, while mistaken release of defective products may create gaps in quality control. Yin et al.'s path from information processing capability to internal control quality is clearly reflected here. Automatic control alone does not mean good internal control. Only when capabilities and needs remain continuously aligned can automatic control truly support risk prevention and control [2].

5.2 The Trap of False Timeliness in Information Timeliness

Digitalization improves the speed of internal information transmission. However, information timeliness is not achieved by technology alone. It also depends on consistent data standards, semantic interoperability between system interfaces, and decision-making rhythms that fit the organization. Differences in data standards among firms in the supply chain and delays in interface conversion between systems may create the problem of false timeliness. In this situation, information appears to be real-time but is not accurate, which may lead to misjudgment. At the same time, the factors identified by Gullberg, such as management style and organizational routines, also affect the digital environment. If management still holds business meetings only once a month, real-time data may remain unused between meetings and lose its timeliness advantage in practice [9]. In addition, information overload may bury key signals and reduce timeliness in practice. The collaborative nature of the auto parts supply chain further increases these constraints. This is because information timeliness depends not only on the core firm, but also on the digital maturity and data management standards of upstream and downstream firms.

5.3 Agency Cost Reduction and the Emergence of New Agency Problems

Real-time and continuous monitoring can greatly reduce the space for managers to hide information or take hidden actions, thereby lowering visible traditional agency costs. However, the monitoring system itself may create new information advantages for technical staff and other groups, which may lead to new agency problems based on data manipulation. This form of control, based on code and system permissions, goes beyond what traditional separation of duties and approval procedures can fully cover. It therefore creates a kind of technical information asymmetry. If an organization does not set up governance mechanisms such as system change audits, minimum permission controls, and algorithm explainability reviews, a paradox may arise. The internal control system itself may become a source of agency risk. Huang et al.'s study shows that a strong internal governance structure can strengthen the effect of digitalization on risk governance. This suggests that, while upgrading technology, firms should also extend governance to system managers and algorithms, and redefine the boundaries of supervision and accountability [3]. In the auto parts industry, bills

of materials, process formulas, and quality judgment standards are highly dependent on core information systems. If system-level permissions are not properly controlled, agency costs may appear in hidden forms, such as data manipulation and parameter tampering.

5.4 The Double-edged Sword Effect of Deep Supply Chain Coupling

Each link in the industry supply chain relies heavily on timing coordination and data consistency. Digital internal control can provide efficient information sharing and collaborative control capabilities for all parties in the supply chain, which helps improve supply chain resilience and overall performance [6]. However, this close system coupling also means that any data defect, interface failure, permission leakage, or rule configuration error at a key node may quickly spread through integrated digital pipelines. As a result, the control activities of related firms may fail one after another. Based on the DEMATEL and ISM methods, Zhang Pei's study of the factors affecting auto parts supply chain resilience shows that information sharing and strong cooperative relationships can promote resilience. However, weaknesses in these areas may also become channels for the transmission of vulnerability [7]. In a deeply coupled digital environment, local failures may spread through the network and develop into a chain collapse of internal control. This risk is significantly amplified. This is the double-edged sword effect of digital internal control. On the one hand, sharper control and faster information flow strengthen the ability to block risks. On the other hand, homogeneous digital connections make system-level risks more hidden and easier to spread. Therefore, when promoting digital internal control, auto parts firms should not focus only on their own organizational boundaries. They must also include the security of digital collaboration with upstream and downstream firms in the evaluation and design of internal control.

6. Future Direction

This review has some limitations. Since there are still relatively few studies that focus directly on auto parts manufacturing firms, this paper relies to a considerable extent on findings from general manufacturing studies and cross-industry research. Future studies are needed to provide stronger empirical evidence on how specific industry contexts affect internal control mechanisms.

Based on this review, future research can be developed in the following directions: First, future research can conduct case studies of auto parts firms to examine how data quality problems appear in real supply chain collaboration in this industry. Second, based on agency theory, future research can examine whether the centralization of system permissions creates new forms of agency problems that are different from traditional ones. Third, future research can examine digital collaboration between upstream and downstream firms in the auto parts supply chain and study whether internal control development in core firms affects their suppliers and customer firms. At the practical level, managers of auto parts firms should pay attention to proper system configuration and the development of permission management systems when promoting digital internal control. They should also include the data capabilities of supply chain partners in their internal control evaluation.

7. Conclusion

This paper reviews the existing literature on digital transformation and internal control in the manufacturing industry. The relevant literature shows that digital technologies, data management, and system applications are now closely integrated into internal control research. At the same time, previous studies have also identified many current problems, including data quality issues, system stability issues, and risk management challenges. These findings suggest that research on internal control in the digital context should not be limited to technical tools, but should also consider technological factors and organizational factors together. Future research can further examine these issues through more in-depth studies of specific industries, such as auto parts manufacturing.

References

- [1] P. C. Verhoef et al., Digital transformation: A multidisciplinary reflection and research agenda, *Journal of Business Research*, vol. 122, pp. 889–901, Jan. 2021, doi: 10.1016/j.jbusres.2019.09.022.

- [2] Q. Yin, Y. Wang, D. Song, F. Lai, B. Collins, and H. Guo, The impact of digitalization on operational risk: An organizational information processing perspective, *International Journal of Production Economics*, vol. 276, p. 109369, Oct. 2024, doi: 10.1016/j.ijpe.2024.109369
- [3] H. Huang, C. Wang, L. Wang, and L. Yarovaya, Corporate digital transformation and idiosyncratic risk: Based on corporate governance perspective, *EMERGING MARKETS REVIEW*, vol. 56, Sep. 2023, doi: 10.1016/j.ememar.2023.101045.
- [4] H. Song, Y. Lu, and Z. Yang, Digital Transformation of Enterprises and Accounting Information Quality: A Resource Dependence Theory Perspective, *Emerg. Mark. Financ. Trade*, vol. 62, no. 5, pp. 1328–1344, Apr. 2026, doi: 10.1080/1540496X.2025.2552882.
- [5] Committee of Sponsoring Organizations of the Treadway Commission (COSO), *Internal Control — Integrated Framework*. COSO, 2013. Available: <https://www.coso.org/guidance-on-ic>
- [6] X. Chen, C. Sun, and F. Wang, Digital technology innovation, supply chain resilience and enterprise performance: The case of listed automotive parts manufacturing companies, *PLOS ONE*, 2025, doi: 10.1371/journal.pone.0313929.
- [7] Zhang Pei (Wen), Research on Influencing Factors of Automobile Parts Supply Chain Resilience Based on DEMATEL-ISM from the Perspective of Procurement Management, *China Logistics and Purchasing*, no. 5, pp. 68–70, 2026, (in Chinese) doi: 10.16079/j.cnki.issn1671-6663.2026.05.018.
- [8] J. R. Galbraith, Organization Design: An Information Processing View, *Interfaces*, vol. 4, no. 3, pp. 28–36, 1974, doi: 10.1287/inte.4.3.28.
- [9] C. Gullberg, What makes accounting information timely, *Qualitative Research in Accounting & Management*, doi: 10.1108/QRAM-09-2012-0038.
- [10] D. Ballou, R. Wang, H. Pazer, and G. K. Tayi, Modeling information manufacturing systems to determine information product quality, *Manage. Sci.*, vol. 44, no. 4, pp. 462–476, 1998, doi: 10.1287/mnsc.44.4.462.
- [11] M. C. Jensen and W. H. Meckling, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics*, vol. 3, no. 4, pp. 305–360, Oct. 1976, doi: 10.1016/0304-405X(76)90026-X.
- [12] H. Xu and X. Yang, Enterprise Digital Transformation, Internal Control and Financial Flexibility, *Communication of Finance and Accounting*, no. 6, pp. 29–33, 2025, (in Chinese) doi: 10.16144/j.cnki.issn1002-8072.20241203.001.

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Conflicts of Interest

The authors declare no conflict of interest.

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