

Strategic adaptation to digital disruption: A scoping review of firm responses in commercial printing

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ABSTRACT

Digital disruption has placed commercial printing firms under dual pressure: external substitution by digital media and internal pressure to digitalise production and service delivery. This study maps firm-level strategic responses to digitalisation in commercial printing and print-service firms. A scoping review was conducted following Joanna Briggs Institute methodology and PRISMA-ScR guidance. Searches in Scopus and Web of Science identified 54 studies published between 2010 and March 2026. The review identifies seven recurring responses: technology adoption and digital investment, business model innovation, market diversification, vertical integration and partnerships, process improvement, capability development, and supply chain adjustment. The findings show that firms rarely adapt through isolated actions. Most responses combine technological investment with movement toward service-oriented and hybrid business models. Internal conditions, particularly managerial capability, financial resources, and technological readiness, shape the pace and form of adaptation. External pressures, including digital substitution, changing customer demand, and competitive intensity, act as main drivers. The review contributes by consolidating fragmented evidence on strategic adaptation in commercial printing and showing that adaptation under digital disruption involves linked technological, business model, and capability-based responses. It also identifies gaps in longitudinal evidence, geographic coverage, and research on artificial intelligence and other emerging technologies.

1. INTRODUCTION

The commercial printing industry, long a stable business-to-business (B2B) sector, is undergoing significant change. Firms face two connected forms of digital disruption: the substitution of printed

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communication by digital and paperless media, and the pressure to modernise production, workflows, and service delivery through digital technologies (Vial, 2019; Magadán-Díaz & Rivas-García, 2021a; J. Oliveira et al., 2021). These external and internal pressures have contributed to declining print volumes, particularly in traditional publication-related segments, and have intensified competition among print-service providers (Khan & Luiz, 2023). As print products become less differentiated, firms may experience greater commoditisation and stronger customer price sensitivity (Reimann et al., 2010). Competitive advantage may also become more temporary, increasing the need for firms to renew their strategic positions (D'Aveni et al., 2010). Traditional production-focused models may therefore no longer sustain long-term viability.

This review focuses on commercial printing and print-service firms involved in producing text- and image-based materials for business customers (United Nations Department of Economic and Social Affairs Statistics Division, 2008). It includes firms using conventional and digital printing methods and offering related value-added services. It excludes 3D printing and heavy industrial packaging because these activities rely on different production technologies and market structures (Berman, 2012). Strategic adaptation is treated in this review as top-management decisions and coordinated organisational changes intended to support survival, repositioning, or renewed competitiveness. Recent printing studies report responses that include digital investment, servitisation and product–service development, crisis adaptation, diversification, and strategic repositioning (Abdelkafi et al., 2022; Suder et al., 2022; Khan & Luiz, 2023; Salwin & Kraslawski, 2025).

The resource-based view and industry-positioning theory help explain the resources available to firms and the competitive pressures they face (Barney, 1991; Porter, 2008). For the present review, however, dynamic capabilities theory offers a closer fit because the central concern is how firms renew and redeploy resources under technological and market change. Dynamic capabilities are expressed through sensing threats and opportunities, seizing strategic options, and reconfiguring organisational resources and activities (Teece, 2007). Research on established SMEs in mature industries shows that sensing and learning capabilities can support digital business-model change and customer-value creation (Matarazzo et al., 2021). More recent SME research also connects sensing, seizing, and reconfiguring capabilities with the enablers, barriers, and performance outcomes of digital transformation (Saeedikiya et al., 2024). Printing-related research has similarly applied this theoretical lens to adaptation within the printing-paper supply chain (Tarpey et al., 2023). In this review, digital disruption represents the external and internal pressures requiring change; dynamic capabilities explain how firms recognise and act on those pressures; and strategic adaptation is reflected in observable responses, including technology adoption, service development, diversification, partnerships, and process reconfiguration.

Recent studies have examined separate parts of this problem, including digitisation in printing houses Magadán-Díaz & Rivas-García, 2021a, paperless B2B processes (J. Oliveira et al., 2021), crisis responses among small printing firms (Suder et al., 2022), servitisation and sustainability in the professional printing supply chain (Abdelkafi et al., 2022), and diversification in a declining printing industry (Khan & Luiz, 2023). These strands remain dispersed across technology, operations, entrepreneurship, and strategic-management research. This dispersion makes it difficult to determine which responses recur across the literature, how firms combine them, and how internal conditions and external pressures influence their adoption. An initial search of Scopus, Web of Science, and Google Scholar conducted on 31 March 2026

found no published review specifically examining firm-level strategic responses in commercial printing. Given the breadth of the topic, variation in study designs, and absence of a consolidated evidence base, a scoping review was selected to map the available literature and identify remaining research gaps.

The aim of this review is to map the literature on firm-level strategic responses used by commercial printing and print-service firms facing digitalisation and related market pressures. It addresses the following primary question: What strategic responses, adaptation actions, and outcome indicators are reported in the literature on commercial printing firms under digital and market pressures? Three secondary questions guide the review:

- (i) Which internal factors and external pressures enable or constrain these responses?
- (ii) How do the reported responses differ across firm types, study designs, and geographic settings?
- (iii) What gaps remain in literature, and what directions are suggested for future research?

By consolidating the available evidence, the review maps the main response categories, clarifies how firm conditions and market pressures shape adaptation, and shows that adaptation in commercial printing involves connected technological, business-model, and capability-based changes.

2. METHODS

This scoping review was conducted to map the available evidence on firm-level strategic responses to digitalisation in the commercial printing industry. A scoping review was appropriate because the topic is broad, the literature uses varied concepts and study designs, and the aim was to identify patterns, categories, and research gaps rather than estimate an intervention effect or combine statistical outcomes. The review followed the Joanna Briggs Institute (JBI) methodology because it provides a transparent process for defining eligibility criteria, selecting evidence, charting data, and presenting results in a structured manner (Peters et al., 2020). Reporting was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR), which supports clear and reproducible reporting of scoping review procedures (Tricco et al., 2018). The objectives, inclusion criteria, and methods were defined in an a priori protocol. The study selection process is presented in the PRISMA-ScR flow diagram in Fig. 1.

2.1 Eligibility Criteria

Eligibility criteria were guided by the Population, Concept, and Context (PCC) structure (Peters et al., 2020). The population comprised commercial printing and print-service firms engaged in business-to-business mass reproduction of text and images on various substrates (United Nations Department of Economic and Social Affairs Statistics Division, 2008). This included firms using traditional and digital printing methods, as well as firms providing value-added print-related services. Firms operating mainly in 3D printing or additive manufacturing were excluded because these activities involve distinct production technologies (Berman, 2012). Heavy industrial packaging was also excluded because it fell outside the defined commercial-printing population and involved different production and market conditions.

The concept focused on firm-level strategic responses to digitalisation. Strategic responses were understood as managerial decisions, business model changes, capability development, diversification, service expansion, process modernisation, or other organisational changes aimed at survival, competitiveness, or repositioning (Amit & Zott, 2001; Teece, 2007; Matarazzo et al., 2021). The review also included studies addressing internal enablers and constraints, external market pressures, and reported outcomes such as competitiveness, performance, survival, or business growth (Barney, 1991; Porter, 2008). Studies limited to technical optimisation, material testing, machine-level improvement, or routine shopfloor practices without a clear strategic focus were excluded.

The context focused on commercial printing firms facing digitalisation and related market pressures. These pressures included digital substitution, through which digital and paperless media displace printed communication, and digital transformation within firm operations (Vial, 2019; Magadán-Díaz & Rivas-García, 2021a; J. Oliveira et al., 2021). Market pressures such as declining print demand, commoditisation, price competition, and margin reduction were also considered. Historical accounts of printing technologies prior to the digital era were excluded.

The review included qualitative, quantitative, mixed-methods, and conceptual studies. It prioritised peer-reviewed empirical, conceptual, and practice-oriented academic articles. Articles with an industry-oriented focus were retained where they met the PCC criteria and contributed evidence on firm-level strategic responses. Only English-language publications from 2010 to March 2026 were included to reflect recent developments in the sector. **Error! Reference source not found.** presents full inclusion and exclusion criteria.

Table 1. Inclusion and exclusion criteria for study selection

PCC Element	Inclusion Criteria	Exclusion Criteria
Population	B2B commercial printing/print-service firms; traditional and digital print.	3D printing; heavy industrial packaging; printer hardware manufacturers.
Concept	Firm-level strategic adaptation; business model innovation; internal/external factors; outcome indicators.	Low-level operational tactics; shopfloor behaviour; technical material optimisation.
Context	Digitalisation; technological displacement; market pressures (e.g., shrinking margins).	Historical reviews (pre-digital era); contexts unrelated to digital disruption.

2.2 Search Strategy and Study Selection

The search strategy was developed in two stages. An initial exploratory search was conducted in Scopus to identify relevant terms from the titles, abstracts, and keywords of articles related to commercial printing, strategic adaptation, and digitalisation. These terms were then used to build the final search strings for Scopus and Web of Science Core Collection. The search combined terms related to the printing industry, strategic adaptation, and digital disruption. Reference lists of included studies were also screened to identify additional relevant sources. The final search was limited to English-language publications from 2010 to March 2026. **Error! Reference source not found.** outlines the full search strings and database limits.

All records retrieved from Scopus and Web of Science were exported and screened for eligibility. Duplicate records were removed before screening. Titles and abstracts were reviewed against the inclusion and exclusion criteria, followed by full-text screening of potentially relevant sources. Reasons for exclusion

at the full-text stage were recorded to support transparent reporting. The final included studies formed the evidence base for data charting and analysis.

Table 2. Search Strings for this scoping review

Database	Search Query String	Filters/Limits
Scopus	TITLE-ABS-KEY (("commercial print*" OR "print service provider*" OR "graphic arts industry" OR "lithographic print*" OR "offset print*" OR "digital print*" OR "print media") AND ("strategic response*" OR "adaptation" OR "business model innovation" OR "diversification" OR "servitization" OR "dynamic capabilit*" OR "strategic agility" OR "resilience") AND ("digital*" OR "technological displacement" OR "market pressure*" OR "disruption" OR "Industry 4.0"))	English; Journal Article; 2010–March 2026
Web of Science (Core Collection)	TS=(("commercial print*" OR "print service provider*" OR "graphic arts industry" OR "lithographic print*" OR "offset print*" OR "digital print*" OR "print media") AND ("strategic response*" OR "adaptation" OR "business model innovation" OR "diversification" OR "servitization" OR "dynamic capabilit*" OR "strategic agility" OR "resilience") AND ("digital*" OR "technological displacement" OR "market pressure*" OR "disruption" OR "Industry 4.0"))	English; Article; 2010–March 2026

2.3 Data Charting

Following JBI guidance, data extraction was conducted through data charting using a standardised extraction form. The form was pilot-tested on three studies and refined as familiarity with the evidence base increased (Arksey & O'Malley, 2005; Pollock et al., 2022). Data charting was used because the included sources varied in study design, terminology, and reported outcomes. Extracted data were organised according to the review objectives and PCC structure to support consistent comparison across studies. Table 3 lists the fields collected from each source.

Table 3. Data extraction fields

Domain	Description
Study characteristics	Authors, year of publication, region, and study methodology
Firm characteristics	Firm size and type of commercial printing services
Core PCC elements	Market pressures (e.g., digitalisation), strategic responses (e.g., diversification and servitization), and internal or external enablers and barriers
Outcomes	Reported performance measures (e.g., survival, earnings, and competitiveness) and key findings

2.4 Data Charting

The analysis was descriptive and interpretive, consistent with the purpose of a scoping review, which is to map the evidence rather than assess intervention effectiveness (Munn et al., 2018). Extracted data were summarised using descriptive statistics and qualitative content analysis (Pollock et al., 2022). Frequency counts and numerical summaries were used to describe publication year, geographic distribution, study design, and methodological trends. Textual data were analysed through open coding to group findings into categories related to strategic responses, influencing factors, outcomes, and research gaps. The coded data were then organised into an analytical matrix to compare patterns across the included studies. Results are

presented through tables, figures, and narrative synthesis aligned with the review questions (Peters et al., 2020; Pollock et al., 2022).

3. RESULTS

The study selection process is presented in Fig. 1 (PRISMA-ScR flow diagram). The initial search of Scopus and Web of Science yielded 517 records (351 from Scopus and 166 from Web of Science). After removing 90 duplicates, 427 titles and abstracts were screened. During screening, 364 records were excluded for not matching the Population, Concept, or Context criteria. The remaining 63 articles, 37 included and 26 marked as uncertain proceeded to full-text assessment. After full-text review, nine articles were excluded, mainly due to inaccessible full texts. The final sample comprised 54 studies: 51 empirical, one conceptual, and two empirical industry reports.

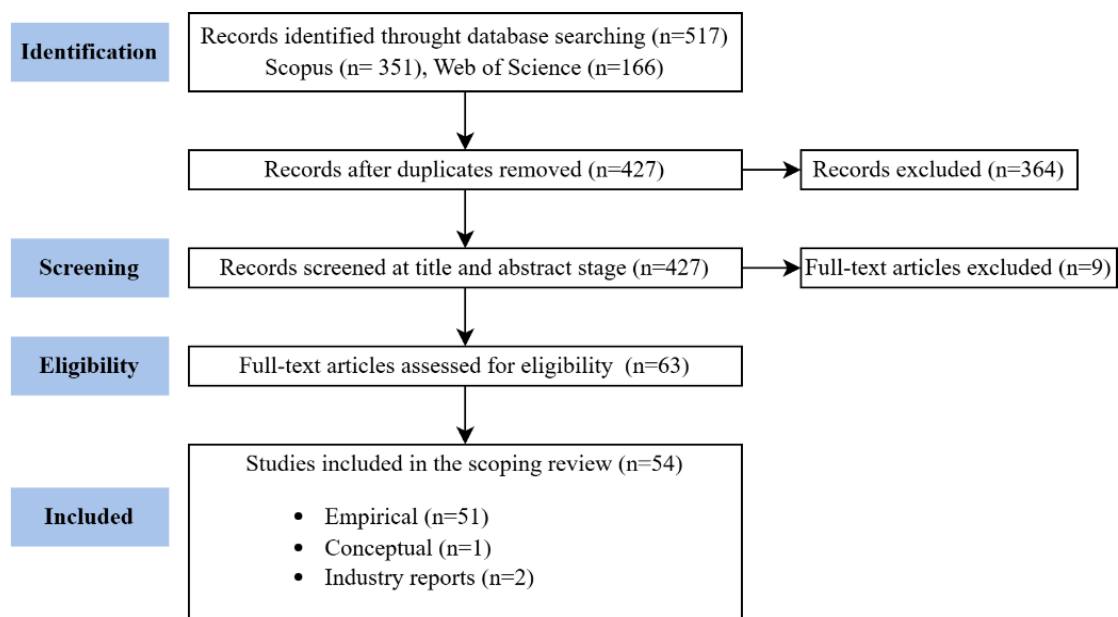


Fig. 1. PRISMA-ScR Flow Diagram for this scoping review (adapted from Moher et al., 2009)

Six categories of pressure were identified across the 54 included studies. Digitalisation and technological change were the most frequently reported pressure, followed by price pressure, shrinking margins, and commoditisation, as well as shifts in demand, customisation, and short production runs. Competition and market turbulence were also widely reported, whereas sustainability-related and wider economic pressures appeared less frequently. Table 4 summarises the frequency of each category, while detailed study-level coding is provided in Appendix A, Table A. The pressure categories were not mutually exclusive. Several studies reported combinations of technological change, price competition, changing customer requirements, and unstable market conditions, indicating that commercial printing firms often faced multiple pressures simultaneously.

Table 4 Reported pressures affecting commercial printing firms

Pressure category	Studies, n
Digitalization and technological change	41
Price pressure, shrinking margins and commodisation	19
Demand shift, customisation and short runs	19
Competition and market turbulence	17
Sustainability, policy and regulation	10
Economic, globalisation and crisis conditions	8

3.1 Characteristics of included studies

Table 5 lists the characteristics of the 54 included studies. Most are empirical (94.4%). Quantitative designs are the most common (44.4%), followed by qualitative (33.3%) and mixed methods (16.7%). Research is concentrated in Europe (53.7%), with Asia (16.7%) and North America (14.8%) less represented. SMEs are the primary focus in 44.4% of studies, while 35.2% use mixed-size samples. The most common firm types studied are mixed print models or industry-wide samples (37.0%), followed by traditional (25.9%), hybrid (20.4%), and digital (16.7%) operations. Many studies draw on frameworks related to business models, servitisation, and entrepreneurship.

Table 5 Characteristics of included studies

Characteristics	Category	n	%
Study type	Empirical	51	94.4
	Conceptual	1	1.9
	Industry report	2	3.7
Methodology	Quantitative	24	44.4
	Qualitative	18	33.3
	Mixed-methods	9	16.7
	Other	3	5.6
	Not clearly reported	3	5.6
Region	Europe	29	53.7
	Asia	9	16.7
	North America	8	14.8
	Multi-country	3	5.6
	Oceania	1	1.9
	Africa	1	1.9
	Not clearly reported	3	5.6
Firm size	SME	24	44.4
	Mixed	19	35.2
	Large	6	11.1
	Not clearly reported	5	9.3
Firm type	Mixed	20	37.0
	Traditional	14	25.9
	Hybrid	11	20.4
	Digital Print	9	16.7
Theory use	Business model & servitisation	13	24.1
	Entrepreneurship & leadership	10	18.5
	Market-embeddedness & inertia	3	5.6

When region and firm size are examined together, two patterns emerge. The literature is concentrated in a small number of countries, particularly Poland and the United States. It also focuses mainly on SMEs or mixed-size samples, with fewer studies addressing only large firms. Evidence is therefore stronger for

smaller firms in European and North American contexts and more limited for large firms and underrepresented regions such as Africa and Oceania.

3.2 Reported strategic responses, adaptation actions, and outcomes

Table 6 categorises the strategic responses, adaptation actions, and outcome indicators reported across studies. The analysis identifies seven main response types: technology adoption and digital investment; business model and service innovation; market diversification; vertical integration and network changes; process improvement; capability development; and supply chain adjustments. Firms implement these strategies through varied actions tailored to their context. Across the 54 studies, 94 instances of strategic responses were recorded, indicating that many studies report multiple strategies. Of these studies, 48 reports at least one strategic response. The remaining six contribute contextual or outcome-related information. The main responses involve technological and structural changes. Firms invest in digital equipment, digitise workflows, and upgrade systems to support automation, ERP, and web-to-print platforms. Many studies also report shifts in business models, with firms moving toward service-oriented and hybrid offerings. These shifts include introducing new customer solutions and redefining how value is delivered.

Firms also adjust their market positioning and external relationships. Market diversification is common, with entry into new segments, niche markets, or adjacent services. Changes in organisational boundaries include forming alliances, building collaborative networks, and integrating downstream activities to secure market access. Internal adjustments support these changes. Firms improve processes through lean practices and quality control, develop capabilities through training and learning, and modify supply chains by changing suppliers or delivery systems. These actions are linked to outcomes such as improved efficiency, cost control, competitiveness, and firm survival. Business model changes and diversification are associated with new revenue streams, niche market access, and customer retention. Network adjustments improve market access and organisational stability, while supply chain changes enhance cost management and responsiveness.

Table 6. Categorisation of reported strategic responses, adaptation actions, and outcomes

Strategic Response	Description in the Studies	Reported Adaptation Actions	Reported Outcomes
Technology adoption & digital investment	Adoption of digital technologies, automation, ERP, web-to-print, or digitally enabled production systems	Investment in digital equipment; workflow digitisation; system upgrades	Efficiency gains; competitiveness; service expansion; survival
Business model innovation	Shift toward value-added services, servitization, hybrid offerings, or redesigned value propositions	Introduction of service packages; customer solutions; business model redesign	Revenue diversification; customer retention; repositioning
Market diversification	Expansion beyond traditional commercial printing into new customer segments, niche markets, or adjacent services	Targeting niche customers; entering new market segments; expanding product and service offerings	New revenue streams; wider market access; reduced dependence on traditional print markets
Vertical integration & partnerships	Reworking inter-firm ties, collaboration, supply relationships, or integration arrangements	Alliances; vertical integration; collaborative arrangements	Capability extension; market access; stability
Process improvement, quality & efficiency	Strengthening managerial systems, workflow discipline, quality, or process efficiency	Lean initiatives; process redesign; quality supervision	Productivity; consistency; cost control

Capability building & workforce development	Development of workforce, managerial, and technological capabilities to support adaptation	Training; technological learning; cross-functional coordination; mentoring; SOP development	Improved quality, productivity, innovation, resilience, and profitability
Supply chain & sourcing strategies	Changes in sourcing, logistics, or supply coordination	Supplier changes; sourcing adjustments; delivery redesign	Responsiveness; cost management

3.3 Factors enabling or hindering strategic responses

Internal and external factors shape strategic responses, as highlighted in Table 7. The table maps these factors as either enabling or constraining adaptation. The review identifies a range of influences rather than testing causal effects. These factors are often discussed alongside specific strategies, showing how firms respond within their operating conditions. Internal factors relate to resources, capabilities, and organisational structure. Leadership and managerial capability are frequently cited as key enablers. Firms with strong technological capabilities, skilled employees, and effective learning networks tend to adopt proactive strategies such as digital investment and business model innovation. Limited financial resources restrict such shifts, particularly those requiring high capital. Organisational culture and structural inertia can also slow change. In contrast, strong internal coordination can support adaptation.

External factors reflect broader environmental conditions. Digitalisation is the most common pressure, followed by changing customer expectations for speed, customisation, and multi-channel delivery. Market competition and economic disruptions, including the COVID-19 pandemic, drive both diversification and consolidation. Supply chain instability and regulatory changes also prompt structural adjustments. These findings show that external pressures create the need for change, while internal conditions shape how firms respond. Firms with stronger managerial capacity, financial resources, and technological readiness are more likely to adapt successfully.

Table 7. Reported internal and external factors linked to strategic responses

Factor Domain	Main Categories	Strategic responses most often linked	References
Internal	Leadership and managerial capability	Technology adoption and digital investment, Business model innovation	Mejtoft, 2010; Mejtoft, 2014; Powers et al., 2014; Safonov et al., 2022
	Financial and resource capacity	Technology adoption and digital investment, Supply chain and sourcing strategies	Mejtoft, 2010; Mejtoft, 2014
	Skills, knowledge and learning	Capability building, Process improvement, quality and efficiency	Toiviainen & Vetoshkina, 2018
	Technology and innovation capability	Process improvement, quality and efficiency, Market diversification	Staub et al., 2019
	Culture, inertia and resistance	Technology adoption and digital investment	Cöster & Petri, 2014
	Relationships, trust and coordination	Vertical integration and partnerships	Mejtoft, 2014; Murphy & Sashi, 2018
External	Technological environment	Technology adoption and digital investment	Cöster & Petri, 2014; Magadán-Díaz & Rivas-García, 2021
	Customer demand and preferences	Business model innovation, Market diversification	Simões & Nogueira, 2022

Competition and market structure	Supply chain and sourcing strategies	Mejtoft, 2010; Mejtoft, 2014
Economic and crisis conditions	Process improvement, quality and efficiency	Mejtoft, 2010; Suder et al., 2022 ; Kusa et al., 2022b
Supply chain and partnership	Vertical integration and partnerships, Supply chain and sourcing strategies	Mejtoft, 2010; Mejtoft, 2014; Acharyulu, 2014
Policy, regulation and government support	Process improvement, quality and efficiency	Mejtoft, 2014; Gladysz et al., 2021

3.4 Variation in reported responses and remaining research gaps

This section examines how strategic responses vary across study characteristics and identifies gaps in the literature. The sample shows a strong concentration in Europe (53.7%). Many studies from Poland and Ukraine focus on entrepreneurial orientation and flexibility in response to crisis conditions such as the COVID-19 pandemic and regional conflict. Studies from Asia (16.7%) and North America (14.8%) emphasise different themes. Research in India and China often highlights informal networks, global supply links, and second-hand equipment markets. North American studies focus more on executive traits and high-capital digital technologies.

Firm size also shapes responses. SMEs (44.4%) tend to rely on flexibility to enter niche markets, such as packaging or customised services. They often depend on collaboration and informal networks to address resource constraints. Large firms (11.1%) emphasise structured servitisation and vertical integration, supported by ERP systems and capital-intensive investments. Studies with mixed samples (35.2%) suggest that while technology adoption is widespread, approaches to efficiency differ. Larger firms benefit from scale, while smaller firms rely on agility.

Study design influences reported findings. Quantitative studies (44.4%) examine links between innovation, proactiveness, and performance, often using subjective measures due to limited financial data. Qualitative studies (33.3%) provide detailed accounts of organisational change, including shifts in mindset required for service-oriented models. Fig. 2 presents variations in responses across firm sizes using a cross-tabulated heatmap.

The literature also reveals several gaps. Much of the evidence is based on cross-sectional data. Longitudinal research is needed to assess whether gains from digitalisation or diversification persist over time. There is also a lack of standardised performance indicators for measuring outcomes such as paperless transitions and resource use. Future studies should address how digital strategies affect overall sustainability.

Research on emerging technologies remains limited. Few studies examine the effects of Industry 5.0, artificial intelligence, or advanced robotics on the printing sector, including their implications for employment and wages. More work is also needed on AI adoption in this industry. Finally, most studies reflect the views of top management. Future research should include perspectives from customers and partners to better assess the value of integrated print and service offerings.

Strategic response	Firm Size			
	SMEs	Large firms	Mixed	Not reported
Technology adoption & digital investment	7	4	11	1
Business model innovation	5	4	9	0
Market diversification	10	1	7	1
Vertical integration & partnerships	6	2	8	0
Process improvement, quality and efficiency	6	2	4	0
Capability building & workforce development	4	0	1	1
Supply chain & sourcing strategies	1	0	2	0

Fig. 2. Strategic response approaches by firm size visualised through heatmap

4. DISCUSSION AND CONCLUSION

4.1 Discussion

The findings show that strategic adaptation among commercial printing and print-service firms generally involves a combination of technological, organisational, and market responses. Digital equipment and workflow automation were frequently reported, but these investments were commonly accompanied by business model innovation, servitisation, market diversification, process improvement, and new forms of customer value creation. This suggests that technology adoption alone is unlikely to sustain competitiveness. Firms appear to derive greater strategic value from digital investment when it supports changes in how services are designed, delivered, and positioned within the customer's value chain.

Compared with broader manufacturing research, commercial printing shares common digitalisation concerns related to technology adoption, operational impacts, enabling conditions, and implementation barriers (Matt et al., 2023). However, commercial printing faces an additional demand-side challenge because digital media can substitute for the industry's core printed products. This dual pressure may explain why firms frequently combine production digitalisation with servitisation, diversification, and strategic repositioning rather than relying on operational modernisation alone.

The reported responses can be interpreted through the sensing, seizing, and reconfiguring processes described by Dynamic Capabilities theory (Teece et al., 2009). Firms sense change by recognising declining demand for traditional print, shifts in customer requirements, and opportunities in specialised or service-oriented markets. They seize these opportunities through digital investment, value-added offerings, and diversification into areas such as packaging and integrated communication services. Reconfiguration is

reflected in redesigned workflows, altered business models, new partnerships, and changes to organisational resources and capabilities (J. C. Oliveira & Azevedo, 2018; Thomas & Douglas, 2021; Khan & Luiz, 2023; Suder et al., 2022). The findings therefore support the view that adaptation depends not only on the resources available to firms, but also on their ability to redirect those resources as technological and market conditions change.

The evidence also indicates that adaptation is shaped by competing advantages and constraints. SMEs may respond quickly because of flexible structures, entrepreneurial leadership, and close customer relationships, but they may lack the financial and technical resources required for substantial digital investment. Larger firms may have greater investment capacity, yet legacy systems and organisational complexity may make reconfiguration more difficult. Similar tensions apply to servitisation. Service-oriented offerings may reduce reliance on commoditised print products, but they also require capabilities in customer management, workforce development, data use, and service delivery. These findings suggest that neither firm size nor technology adoption alone determines successful adaptation.

The concentration of studies in European and SME settings limits the wider applicability of the evidence. More than half of the included studies were conducted in Europe, while SMEs represented the largest firm category examined. Current accounts of agility, niche positioning, and informal collaboration may therefore reflect the conditions of European smaller firms more strongly than those of large or capital-intensive enterprises. Evidence from Asia, Africa, and Latin America remains limited, making it difficult to determine how access to finance, digital infrastructure, workforce capability, and institutional conditions influence strategic responses in other regions.

The literature also provides stronger evidence on the actions firms adopt than on the outcomes of those actions. Cross-sectional designs offer limited understanding of how digital investment, servitisation, and diversification develop over time (Reynolds et al., 2020). Measures of financial, organisational, and environmental outcomes are also inconsistent. Efficiency improvements may not necessarily reduce total resource consumption where rebound effects lead to increased production or greater use of digital infrastructure (J. Oliveira et al., 2021). Evidence is similarly limited on how customers, advertising agencies, and other business partners assess the value of service-oriented offerings. Current research therefore explains the immediate forms of strategic adaptation more clearly than their long-term effectiveness.

4.2 Implications

The findings have implications for both theory and managerial practice. The review supports the use of dynamic capabilities theory by showing that adaptation among commercial printing and print-service firms involves connected processes of recognising market change, pursuing new opportunities, and reconfiguring organisational resources. The evidence also suggests that these processes do not occur through technology adoption alone. Digital investment, business model innovation, servitisation, diversification, and capability development appear to operate as interrelated responses. This extends the application of dynamic capabilities theory to an industry facing both the substitution of printed media and the internal digitalisation of production and service delivery.

For managers and decision-makers, investment in digital printing equipment alone is unlikely to sustain competitiveness. Digital adoption appears more valuable when it is combined with service repositioning, process redesign, and value-added offerings (Cramer & Hipp, 2012; Salwin et al., 2020). Managers should

reduce reliance on commodity-based production by developing hybrid product–service offerings and strengthening their role within the customer’s value chain. Leadership, organisational learning, technological readiness, and investment capacity are also important in supporting adaptation (Setiawan et al., 2019). Entrepreneurial orientation may help management teams respond more proactively to technological and economic pressures (Suder, 2024a; Suder, 2024b). However, strategies should be adjusted to firm size, available resources, market conditions, and regional circumstances, particularly because current evidence is concentrated in European SME settings.

4.3 Conclusion

This scoping review consolidates fragmented evidence on how commercial printing and print-service firms respond to digitalisation and related market pressures. The findings show that adaptation commonly combines technology adoption, business model innovation, servitisation, market diversification, process improvement, and network reconfiguration. These responses are shaped by leadership, organisational capabilities, and resource readiness. The review contributes by showing that strategic adaptation in commercial printing is not limited to operational modernisation, but involves coordinated technological, organisational, and market change. Current evidence remains concentrated in European SME settings and relies heavily on cross-sectional studies, limiting understanding of long-term outcomes and wider regional differences. Future research should use longitudinal and comparative designs, examine customer and partner assessments of service-oriented offerings, and investigate the effects of artificial intelligence, Industry 5.0, advanced automation, and digital ecosystems on commercial printing firms.

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6. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

7. AUTHORS’ CONTRIBUTIONS

Muhammad Yusuf Masod: Conceptualisation, framework development; research design and execution; investigation; methodology; formal analysis; validation; writing-original draft, writing-review and editing.

8. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

During the preparation of this work, the author used ChatGPT to support the development of search terms and to assist in the formulation of database search strings. The tool was also used for general brainstorming of ideas. No AI tools were used to generate the core content, analysis, or conclusions of the manuscript.

After using this tool, the author reviewed and edited all material as needed and take full responsibility for the content of the publication.

9. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS

No primary datasets were generated for this study, as the research is based on a scoping review of existing literature. All data supporting the findings of this study, including search strategies, inclusion criteria, and extracted study characteristics, are fully reported within the article. Additional details can be made available from the corresponding author upon reasonable request

10. ETHICS STATEMENT

The authors declare that this research did not involve human or animal subjects. The study is based on a scoping review of previously published literature and did not require ethical approval.

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12. APPENDIX

A. Table A1. Study-level coding of reported pressures affecting commercial printing firms

Authors	Digitalization and technological change	Price pressure, shrinking margins and commodisation	Demand shift, customisation and short runs	Competition and market turbulence	Economic, globalisation and crisis conditions	Sustainability, policy and regulation
Mejtoft, 2010	•	•	–	•	–	–
Nair, 2011	•	•	–	•	•	–
Dixit & Bhowmick, 2011	•	•	•	–	–	–
Baum et al., 2011	•	–	•	•	–	–
Y. Wan et al., 2013	•	–	–	•	•	–
Cramer & Hipp, 2012	•	•	–	–	–	–
González et al., 2012	•	•	–	•	–	–
Mejtoft, 2014	•	•	–	•	–	–
Powers et al., 2014	•	•	–	–	•	–
Cöster & Petri, 2014	•	–	–	–	–	–
Acharyulu, 2014	–	–	•	•	•	–
Shao, 2016	–	•	•	–	•	–
Tongxue, 2016	•	•	–	–	–	–
J. C. Oliveira & Azevedo, 2018	•	•	–	–	–	–
Murphy & Sashi, 2018	•	–	–	–	–	–
Shenderivska & Guk, 2018	•	–	•	•	•	–
Toiviainen & Vetoshkina, 2018	•	–	•	–	–	•
Setiawan et al., 2019	–	•	–	•	–	–
Staub et al., 2019	•	–	–	•	–	–
Reynolds et al., 2020	•	–	•	–	–	•
Salwin et al., 2020	–	•	–	•	–	•
R. I. Williams et al., 2020	•	–	–	•	–	–

Bhatt & Singh, 2020	•	—	•	—	—	—
Korinko & Zhelikhovskyi, 2020	•	—	—	—	—	—
J. Oliveira et al., 2021	•	—	—	—	—	•
Magadán-Díaz & Rivas-García, 2021a	•	•	•	—	—	—
Magadán-Díaz & Rivas-García, 2021b	•	—	•	—	—	—
Bhat et al., 2021	—	•	•	—	—	—
Thomas & Douglas, 2021	•	—	•	—	—	—
Gładysz et al., 2021	•	—	•	—	—	—
Suder et al., 2022	•	—	•	—	—	—
Kusa et al., 2022a	—	—	—	—	•	—
Simões & Nogueira, 2022	—	—	•	—	—	—
Safonov et al., 2022	•	•	—	—	—	—
Abdelkafi et al., 2022	•	•	—	•	•	•
Suder & Okręglicka, 2023	—	—	—	•	—	—
Tarpey et al., 2023	•	—	—	—	—	—
Safonov et al., 2023	—	•	—	—	—	—
Khan & Luiz, 2023	•	—	—	—	—	—
Masod & Zakaria, 2023	•	—	—	—	—	—
Suder et al., 2024a	•	—	—	•	—	•
Tolstov, 2024	•	•	—	—	—	—
Cicchiello et al., 2024	•	—	—	—	—	—
Suder, 2024a	•	—	—	—	—	—
Merritt & Vilchis-Flores, 2024	•	—	—	•	—	•
Bahri & Ramaditya, 2024	•	—	—	—	—	•
Suder, 2024b	—	—	•	—	—	—
Ligonenko et al., 2025	—	—	•	—	—	—
Suder, Kusa, Duda, & Karpacz, 2025	•	•	—	—	—	—
Suder, Kusa, Duda, & Okręglicka, 2025	•	—	•	—	—	—
Kusa, 2025	—	—	—	—	—	•
Salwin & Kraslawski, 2025	•	—	•	•	—	—
R. Williams et al., 2025	•	—	—	—	—	—
Dacre et al., 2026	—	—	—	—	—	•

‘•’ indicates that the pressure was reported in the study; ‘—’ indicates that the pressure was not identified. Categories were not mutually exclusive because individual studies could report more than one pressure.