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Supply Chain Collaboration in Baijiu Enterprises amid Digital and Intelligent Transformation: Challenges and Optimization Strategies

Feng Liu [1], Rui Yang [2]

[1] School of Management, Sichuan University of Science and Engineering, Zigong, Sichuan, 643000, China
[2] Suining Vocational College, Suining, Sichuan, 629000, China

Abstract: The Baijiu industry is changing its structure. This change shows limits in old supply chain management. The limits are in information sharing, production-sales coordination, inventory management, and risk response. Digital and intelligent transformation gives Baijiu firms new ways to solve these problems and improve supply chain efficiency. This study uses supply chain cooperation theory and dynamic capability theory. It uses a literature review and analytical synthesis. It looks at key supply chain problems in Baijiu. These problems come from long production cycles, strong reliance on traditional brewing, and changing market demand. Then it studies how digital and intelligent transformation helps supply chain cooperation through three mechanisms: information sharing, resource integration, and dynamic response. Then the study gives optimization strategies. These strategies are: build an integrated information-sharing system; improve production-sales coordination; strengthen resource integration between organizations; and improve supply chain risk management. The analysis shows that effective supply chain change depends on digital technology adoption. It also depends on combining data and organizational capabilities to support cooperation across the supply chain. These efforts can improve operating efficiency, strengthen supply chain resilience, and increase value creation. This study gives practical ideas for Baijiu firms and for digital and intelligent transformation in traditional industries.

Keywords: Baijiu Enterprises; Supply Chain Management; Digital and Intelligent Transformation; Supply Chain Cooperation; Value Creation.

1. Introduction

China's Baijiu industry is a key part of traditional manufacturing. It has complex production, long industrial chains, long storage periods, and large changes in market demand[1]. The Baijiu supply chain includes grain growing, raw material buying, brewing, base liquor storage, packaging and transport, and final sales. Its efficiency affects production cost, product quality, market response, and competitive advantage. The Baijiu market is moving from scale expansion to structural adjustment and quality-based competition. Old supply chain management relies on experience and split operations. This model now faces more problems [2].

In recent years, Digital technologies like big data, IoT, AI, and blockchain are being used more in Baijiu. They create new chances for supply chain innovation. Digital supply chains can break information silos, strengthen partnerships, improve demand forecasting, and improve quality management[2]. Intelligent manufacturing and information infrastructure are basic factors in supply chain cooperative innovation in Baijiu. Information sharing is very important[3]. Evidence also shows that digital and intelligent capabilities can improve Baijiu firms' international performance by strengthening supply chain resilience[4]. These findings suggest digital technologies can improve internal management. They may also increase overall value creation by strengthening supply chain cooperation and dynamic adaptability.

But existing studies mainly look at digital technology adoption, cooperative innovation, logistics management, and supply chain resilience from separate views. We still need a more integrated view of how digital and intelligent technologies become cooperation capabilities between organizations. We also need to know how these capabilities create value across the supply chain. The Baijiu industry has long brewing cycles, strong reliance on traditional craft, and multi-level distribution channels. So Baijiu supply chain transformation cannot simply copy digital transformation models from ordinary manufacturing[1].

This study focuses on supply chain cooperation in Baijiu firms. It uses supply chain cooperation theory and dynamic capability theory. It studies key supply chain management problems. It explores how digital and intelligent transformation supports information sharing, resource integration, and dynamic response. Then it gives optimization strategies. The aim is to give theoretical ideas and practical suggestions for high-quality supply chain development in Baijiu.

2. Key Challenges in Supply Chain Cooperation among Baijiu Enterprises

2.1. Supply Chain Information is Split, and Cooperation between Organizations is Limited

The Baijiu supply chain has many members. These members include grain suppliers, manufacturers, logistics providers, and distributors. They often use different computer systems and work rules. So they cannot exchange information easily. They also share little data across the chain. The goal of supply chain cooperation is to make the whole chain work better. It does this in three ways. It shares information. It combines resources. It coordinates work among firms before

and after them in the chain.

Some large Baijiu firms have built digital platforms for procurement, production, and sales. But digital technology adoption is uneven across supply chain activities. Effective information exchange mechanisms are not fully built inside business systems or between upstream and downstream firms. Some Baijiu firms have digitized procurement and logistics. But cooperation still relies mainly on point-to-point information exchange. So it is hard to build cooperation networks with many stakeholders[5].

Split information raises communication and coordination costs between firms. It can also make procurement plans, production schedules, and logistics operations inconsistent. So overall supply chain efficiency falls. The main challenge for Baijiu supply chain management is not just digitizing single business activities. It is achieving information integration and cooperative decision-making across organizations and supply chain stages.

2.2. Production Cycles Do Not Match Market Demand, and Production-Sales Coordination is Hard

Baijiu production has clear cycles. Some products need long fermentation, aging, and storage. But market demand changes a lot because of holidays, consumption occasions, and consumer preferences. Baijiu sales in large supermarkets show clear seasonal patterns. Seasonal changes and different consumption occasions make supply chain management more complex[6].

Under old management practices, firms often make production and inventory plans from historical sales data and distributor orders. So they find it hard to respond quickly to end-consumer demand changes. When distributor orders differ from real consumer demand, too much inventory can build up in distribution channels. These changes can also grow and move upstream through the supply chain. This causes the bullwhip effect.

Also, base liquor storage and finished product inventory need different management. Base liquor management must consider storage time, product quality changes, and long-term production capacity planning. Finished product inventory management focuses more on market response and inventory turnover. Without different inventory management mechanisms, firms may have poor production-sales coordination and more capital tied up in inventory.

2.3. Supply Chain Resources are not Well Integrated, and Overall Operating Efficiency is Limited

Baijiu supply chain resources are spread across grain production bases, manufacturing facilities, storage facilities, warehouses, and distribution channels. Different participants often have different management goals and resource allocation practices. Some firms still focus on internal cost control and efficiency in single operations. They lack an integrated approach to resource allocation across the whole supply chain.

In logistics, firms share little warehousing, distribution networks, and transport resources. This can cause duplicate infrastructure investment, underused transport capacity, and high logistics costs. Baijiu logistics supply chain transformation should focus on intelligent, green, and integrated development. It should move from scale expansion to value improvement through technology and industrial cooperation[7].

So split supply chain resources reduce operating efficiency. They also limit cooperative benefits among firms.

2.4. Risk Response Mechanisms are not Enough, and Supply Chain Resilience Needs to be Stronger

The Baijiu supply chain is affected by grain prices, natural conditions, and production processes. It also faces outside risks from market demand changes, logistics disruption, and distribution channel adjustment. Supply chain participants depend strongly on each other in operations. A disruption at one stage can affect the stability of the whole supply chain.

Baijiu firms need stronger risk identification and management in market operations, procurement, and business management[8]. But risk management in some firms is mainly reactive. They lack mechanisms for sharing risk information between organizations and for dynamic early warning. When key suppliers have supply disruptions or market demand changes suddenly, firms may struggle to adjust procurement plans, inventory levels, and logistics resources quickly. So supply chain continuity is weakened.

3. How Digital and Intelligent Transformation Improves Supply Chain Cooperation in Baijiu Enterprises

Digital and intelligent transformation is not just moving old business processes to digital platforms. It changes organizational management and cooperation between organizations through data resource integration and intelligent technologies. This study uses supply chain cooperation theory and dynamic capability theory. It proposes that digital and intelligent transformation improves Baijiu supply chain cooperation through three linked mechanisms: information sharing, resource integration, and dynamic response.

3.1. Information Sharing Mechanism: From Split Information to Cooperative Decisions

Information sharing is a basic part of supply chain cooperation. In the past, firms before and after each other in the chain often decided alone. They used only the information they had. One side often had less information than the other. So buying plans, production plans, and sales plans did not match.

Digital and intelligent tools let firms put data in one shared place. The data cover grain buying, production progress, stock levels, and final market sales. Firms can see the whole chain more clearly. They can get current work data from partners before and after them. So information delays fall. Data work is not done again and again. Buying, production, and sales decisions can be made together.

Information sharing connects intelligent manufacturing technologies and supply chain joint innovation[3]. Digital and intelligent transformation does more than make information processing faster. It also helps supply chain members work together. Better data sharing makes this coordination possible.

3.2. Resource Integration Mechanism: From Local Efficiency to Supply Chain-Wide Optimization

Resource allocation is a central part of supply chain cooperation. In the past, Baijiu firms allocated buying, production, and logistics resources at the department level or firm level. This could make single operations work better. But it limited cooperation across the supply chain.

Digital and intelligent transformation helps firms find, combine, and reallocate supply chain resources. Firms can study market demand data together. They can also study data on production capacity, inventory, and logistics resources. Then they can adjust buying plans, packaging schedules, and distribution plans better. So resources are less likely to be used in the wrong way.

Digital cooperation platforms also help manufacturers, suppliers, logistics providers, and distributors work together. This moves resource optimization from single firms to cooperation between organizations. Digital and intelligent supply chain transformation can improve firm performance through cost control, better research and development efficiency, and sales channel integration[9]. These findings suggest resource integration is a key part of supply chain cooperation. It is also a possible way digital technologies create business value.

3.3. Dynamic Response Mechanism: From Reactive Response to Proactive Risk Management

Dynamic capability theory says firms must keep noticing outside changes. They must also combine and change resources fast when conditions are unclear. Baijiu firms can use digital and smart tools to see changes in market demand, grain supply, and logistics conditions. This helps them watch supply chain risk, give early warnings, and adjust work.

Firms can build monitoring and warning systems. These systems help them find supply stops, stock changes, and order changes in time. Then firms can act. They can find other suppliers. They can move stock. They can change delivery plans. These steps help the supply chain adapt and recover.

Evidence shows a clear positive link between digital and intelligent capabilities and supply chain resilience in Baijiu firms. Supply chain resilience is a middle link between digital and smart capabilities and international performance[4]. This is real evidence. It shows digital and smart transformation can create business value. It does this by making firms better at adapting.

Overall, the three parts work together. Information sharing gives the data base for supply chain cooperation. Resource integration supports coordination of business work and operational resources. Dynamic response helps the supply chain adapt to outside changes. These three parts form a framework. The framework shows how digital and smart transformation improves supply chain cooperation in Baijiu firms.

4. Optimization Strategies for Supply Chain Cooperation in Baijiu Enterprises amid Digital and Intelligent Transformation

4.1. Build an Integrated Information-Sharing System to Strengthen Supply Chain Cooperation

Baijiu firms should work for cooperation across the whole supply chain. First, they should use the same data rules and join their systems in buying, production, storage, transport, and selling. They can build one shared data connection and common work rules. Second, they should join their inside management systems. Third, they should bring main suppliers, transport firms, and sellers onto shared platforms step by step.

Firms need clear data rules. They should say who can see data, what data can be shared, and who does what. They should make data rules that keep data safe and let partners work well together. Small and mid-size Baijiu firms do not need to build their own systems. They can join shared platforms run by big firms or outside digital service firms. This costs less.

4.2. Improve Production-Sales Coordination to Align Supply and Demand

Baijiu production takes a long time. Market demand changes a lot. So firms should build production-sales coordination mechanisms. These mechanisms should be market-oriented. They should link sales forecasting, production planning, and inventory management more closely.

In production planning, firms can use past sales data and distributor inventory data. This helps them forecast demand better. Then they should put these forecasts into packaging schedules, finished product production plans, and logistics distribution plans.

In inventory management, firms should set different goals for base liquor and finished products. Base liquor needs long storage and quality control. Finished products need flexible inventory changes and stock moves between regions.

Firms should also share information more with distributors and end retailers. They need current data on real sales and distributor inventories. This can reduce inventory buildup caused by wrong or unclear demand data.

4.3. Promote Resource Integration Between Organizations to Improve Overall Supply Chain Efficiency

Baijiu firms should not manage only their own firm. They should strengthen resource sharing and work cooperation with grain suppliers, logistics providers, and distributors.

First, in buying, long-term partnerships and joint buying can make raw material supply steadier. Second, in production, firms should coordinate production schedules, raw material supply, and packaging material buying more closely. Third, in logistics, firms can try shared regional warehousing, joint distribution, and smart transport planning. These steps can improve the use of storage facilities and transport capacity.

Digital technology integration must go with data rules, cooperation between groups, and the ability to coordinate resources. This can keep expanding value creation[1]. So Baijiu firms should pay more attention to organization and management innovation during digital transformation. They

should turn technology use into long-term supply chain cooperation abilities.

4.4. Strengthen Supply Chain Risk Management to Improve Dynamic Adaptability

Baijiu firms should build a full risk monitoring system. The system should cover grain supply, production quality, storage, transport, and sales. Digital tools can help firms find work problems at main points in the supply chain.

Firms should act in each area. In grain buying, they should build steady supplier ties. They should also build backup buying plans. These plans should fit the quality needs and the place where each raw material comes from. In production, firms should watch equipment work and main process measures more closely. In sales and transport, firms should improve stock warning systems and emergency delivery plans.

Firms should also share risk information with partners before and after them in the chain. They should coordinate emergency work with these partners. They can build shared rules. These rules should help partners find risks together, share resources, and get work back to normal. These steps can help keep the supply chain running when conditions are unclear.

4.5. Promote Green Supply Chain Cooperation to Achieve Sustainable Value Creation

Baijiu firms should improve operating efficiency and supply chain resilience. They should also integrate green development principles into supply chain cooperation. Digital technologies can monitor energy consumption, logistics operations, and resource use. This supports coordinated improvements in green procurement, energy-efficient production, and low-carbon logistics.

Digital supply chains can support the green and low-carbon transformation of the Baijiu industry. They do this by supporting coordinated improvements across grain cultivation, brewing production, logistics transport, and environmental management[10].

In practice, firms can strengthen environmentally sustainable partnerships with grain production bases. They can optimize energy and water use during brewing. They can promote resource recovery and use of by-products like distillers' grains. They can also explore green packaging and circular logistics systems. These actions can support joint creation of economic and environmental value.

5. Conclusion and Future Research

This study looks at the main supply chain characteristics of the Baijiu industry. It examines major problems in supply chain cooperation amid digital and intelligent transformation. It also builds an analytical framework to explain how digital and intelligent transformation improves supply chain cooperation through three linked mechanisms: information sharing, resource integration, and dynamic response.

The analysis suggests that the main supply chain problems in Baijiu firms are moving from efficiency problems inside single operations to broader problems of cooperation between organizations. Digital and intelligent transformation can help solve information splitting, poor production-sales coordination, and weak risk management. It does this by improving information sharing, strengthening resource integration, and improving dynamic response. But technology investment does not automatically improve supply chain cooperation performance. Firms must also build effective data governance, organizational coordination, and cooperation mechanisms. These mechanisms turn technology advantages into competitive advantages across the supply chain.

From a practical view, Baijiu firms should use different digital and intelligent transformation strategies that fit the industry's special features. These features include long brewing cycles, strong reliance on traditional craft, and complex distribution channel structures. Firms should pay special attention to building integrated information systems, improving production-sales coordination, strengthening resource integration between organizations, and developing supply chain risk management capabilities. These efforts can help move from local efficiency improvements to value creation across the whole supply chain.

This study mainly uses a literature review and theoretical synthesis approach. It does not independently test the proposed mechanisms with empirical data. Future research could combine survey data from Baijiu firms with in-depth case studies. It could examine the links among digital and intelligent capabilities, supply chain cooperation, supply chain resilience, and firm performance. Such studies would give more empirical evidence for supply chain management innovation in the Baijiu industry.

Competing Interests

The authors declare that they have no competing interests.

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