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File Name
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**Question 1 – Managing Quality at Luckin Coffee**

To properly assess Luckin's quality efforts after 2020, the Total Quality Management (TQM) approach, as described by Deming, Juran, and Crosby, should be applied. In this model, TQM requires executives to be committed to quality, the use of statistical methods, the involvement of suppliers, and an organizational culture centered on customers and continuous quality improvement (Slack et al., 2022). It is important to emphasize that, in the 2020 fraud, the failure of Luckin concerned the quality of its governance rather than the quality of its beverages. In addition, the breach of confidence by stakeholders in the company necessitated the simultaneous enhancement of its quality governance and quality operations. Research has recently demonstrated that the effectiveness of internal control, which includes the composition of the board of directors, the expertise of audit committees, and the extent of financial disclosures, was a key factor in rebuilding stakeholder trust after a corporate scandal (Eugster et al., 2024). The change of management personnel at Luckin, the reshaping of its audit committee, and the strengthening of its internal control reporting structure fit the findings of recent governance literature on the recovery from misconduct.

Luckin's response can also be evaluated through the lens of quality management practices, specifically as embodied in the process orientation of ISO 9001:2015 and the modern quality management concept Quality 4.0, which combines contemporary Industry 4.0 tools with TQM (Peres et al., 2025). Luckin implemented standard operating procedures (SOPs) for all the key quality control points in the operation of its stores, including coffee beverage preparation, the treatment of raw materials, and food hygiene. The company then utilized its IT infrastructure to monitor adherence to these SOPs on a store-by-store basis in real time (Qu, 2025). As well as ensuring adherence to the ISO 9001:2015 process approach, this is also consistent with the classic statistical quality control model of Deming, which is based on the use of statistical methods to reduce variability of processes.

This is exactly the effect achieved by the introduction of automated coffee machines into all of Luckin's coffee shops; the devices ensure that the quality of the coffee is identical in each one

of the more than 20,000 stores that make up the company's system in terms of bean-grinding consistency, water temperature, and extraction time (Wang, 2024). Supplier quality control is the other part of this reform. Instead of each store independently buying coffee beans, milk products, and packaging materials, Luckin now purchases its supplies from a limited set of approved suppliers with documentation of their audit quality control. This change reflects quality planning, control, and improvement strategies (Juran's quality trilogy) applied to the suppliers. It is consistent with empirical evidence that supplier quality controls using digital monitoring systems lead to significant reductions in incoming materials defect rates for manufacturing and retail firms in China (Jing & Fan, 2024).

This is an important example for this study because Cândido (2023), in a Total Quality Management & Business Excellence study of firms that recovered ISO 9001 certifications from suspension, finds no performance benefit from re-certifications without concurrent leadership commitment and cultural change. This is an important finding because a mere standardization of procedures and a digital dashboard were meaningless if not accompanied by a fundamental reset at the board-level. This demonstrates that corporate governance and quality management can, and should, be integrated together such that transparency and quality assurance serve also as fraud deterrence (Eugster et al., 2024).

However, there are at least three major remaining issues or risks. First, the new management team is introducing new beverages at an aggressive rate, averaging a new drink every twenty days; such an aggressive pace is likely to cause significant process variation within the quality control standardization system (Qu, 2025). Second, the new quality system relies on equipment automation, which may only mask, rather than uncover, root cause quality issues if there were any sensor calibration or supplier material substitution issues (Peres et al., 2025). Third, the academic literature finds that trust restoration from a fraud event is likely to be non-linear and firms are subject to additional or renewed trust shocks from any further corporate governance lapses (Eugster et al., 2024). In general, these reforms represent a more meaningful set of substantive changes than merely cosmetic reforms and there have been significant improvements in operational reliability and a return of positive Net Promoter Scores for customer satisfaction, and the chain has regained access to capital markets. For Luckin to

maintain a long-term sustainable success, the leadership must maintain governance discipline in addition to sustaining the technical quality systems they have put in place.

**Question 2 – Supply Chain Management at Luckin Coffee**

According to the integrated approach to supply chain management set out by Christopher (2022), competitive advantage in the modern age is derived from the seamless management of upstream, internal, and downstream linkages of material, information, and finance. Luckin Coffee's centralized supply chain may be analyzed using this theory of supply chain integration. In this model, the company has adopted a network design that links regional roasting centers and distribution hubs to a network of approximately 22,000 stores across the nation (Qu, 2025). This approach allows the company to leverage economies of scale in raw material procurement, to maintain consistent quality standards throughout the supply chain, and to reduce the volatility in demand often observed in the supply chain of retail companies, commonly referred to as the bullwhip effect. The findings of a study carried out in the Chinese manufacturing context by Jing and Fan (2024) lend empirical support to the above supply chain design, arguing that digital transformation and supply chain integration are jointly associated with improved firm performance.

Regarding the issue of supply chain relationships, from the lens of transaction cost economics, the preference of Luckin Coffee to form long-term relationships with a selected number of coffee bean and dairy suppliers is aimed at reducing opportunism and asset specificity issues, as well as leveraging economies of scale to secure bulk purchase discounts (Christopher, 2022). A recent study in the Journal of Business Logistics carried out by Wu et al. (2025) supports these claims, demonstrating that the positive relationship between digital supply chain capabilities and supply chain performance is moderated by the intensity of relationship-specific investments with suppliers. This offers an explanation as to why Luckin Coffee has been able to successfully utilize its digital supply chain technology and its integrated supply chain approach, while other retail competitors that did not adopt the integrated approach had limited success utilizing their digital tools.

Regarding supply chain logistics and visibility, Luckin's use of proprietary cloud-based technology to integrate its supply chain enables it to connect the point-of-sale data collected from its retail outlets with inventory management, suppliers' order logs, and delivery networks, including local delivery platforms such as Meituan as well as national logistics providers such as SF Express (Wang, 2024). Research carried out on digitalization and Industry 4.0 has demonstrated that supply chain integration and visibility are the key mechanisms through which digital investments affect supply chain performance (Fatorachian & Kazemi, 2024), particularly in sectors like fast moving consumer goods. For Luckin specifically, visibility into the end-to-end supply chain enables the detection of ingredient demand patterns in real time and inventory repositioning prior to the onset of widespread stockouts.

Balancing the need for low cost with the need for high quality and reliability is a common dilemma in supply chain management. The company's supply chain model lowers the unit cost of goods, but at the expense of increasing concentration risk at the node of a particular regional hub or key supplier in terms of the scale of disruptions. Research carried out in this area is highly relevant in this regard. According to a 2024 retail resilience article, adaptive retail supply chains have increased the use of multi-sourcing, distributed distribution, and AI-based resilience capabilities (Belhadi et al., 2024). In turn, Luckin's decision to expand its supply base of coffee roasting hubs at the regional level, as well as to partner with multiple coffee bean suppliers in Yunnan, Ethiopia, and Brazil are steps to mitigate supply risk while continuing to benefit from the centralized structure of its supply chain.

Finally, the scalability of its centralized supply chain has been demonstrated with the firm's growth of the franchise program, whereby stores are operated by partners who are required to draw inventory exclusively from a centralized source of supplies and incur a royalty fee to the company to use the Luckin name (Qu, 2025). This type of supply chain model is consistent with other retailers that have a supply chain integrated franchise business model, addressing the principal agent concerns noted by Wu et al. (2025), where the company retains quality control over its product through the central supply chain, yet can increase the pace of expansion of its retail footprint with a franchise model. The company is subject to geopolitical risk of the supply chain due to potential conflicts and unrest in coffee producing nations as the firm has no option to diversify beyond a centralized model. In the end, the Luckin model of a centralized

digitally driven supply chain appears to be consistent with the state of the art in supply chain management and will continue to serve as a competitive platform for growth, provided the firm continues to invest in supply chain resiliency as part of its growth strategies (Christopher, 2022, Wu et al., 2025).

**Question 3 – Inventory Management at Luckin Coffee**

Luckin Coffee has adopted a more data-centric inventory replenishment model, a departure from the standard periodic-review system. It follows the latest academic research on this topic which indicates that the era of data-driven inventory replenishment has begun (Stevenson, 2021; Heizer et al., 2023). The fundamental logic behind the popular economic order quantity (EOQ) and reorder point (ROP) models remains relevant: It is about striking a balance between the costs of holding items, ordering them, and stocking out. As Luckin Coffee has noted in its recent earnings presentation and financial report, it has integrated demand forecasting models based on machine learning into store-level replenishment systems. It utilizes over five years of historical data, weather and holidays, plus sales promotion data to predict daily store demand (Wang, 2024).

In line with the above, some recent academic studies show evidence that the use of machine learning techniques has resulted in improved demand forecasts for supply chain and retail firms. Douaioui et al., (2024), for example, published an extensive review of studies on supply chain demand forecasting using machine learning and deep learning models that found that such techniques performed better than the popular ARIMA forecasting technique in their analysis of short life cycle and promotion driven products.

With Luckin Coffee having a system in place for automating store-level replenishment, its inventory system follows a continuous inventory review (i.e., s, S) policy. This is when the replenishment of items in the stores is triggered when the stock on hand reaches a set threshold as per consumption levels of each store (Qu, 2025). By automating the replenishment process, Luckin Coffee is reducing the human error that could lead to poor inventory management in the stores. Furthermore, this follows the Just-in-Time (JIT) inventory management approach

(Stevenson, 2021). The study by Wu et al. (2025) found evidence to suggest that supply chain digitalization can contribute towards a company having higher turnover of inventory when it has a large variety of products and those products have relatively short life cycles.

ABC analysis can be applied to Luckin Coffee's inventory where A-products are items that need constant monitoring, such as espresso bean and milk, and C-items are non-essential items like napkins and paper stirrers (Wang, 2024). Wang (2024) notes that the automated digital inventory system Luckin Coffee uses applies varying replenishment policies across items as part of ABC analysis which is a principle based on the classical concept of Pareto and a common practice in modern-day digitally managed inventory systems.

A company may consider several considerations when balancing the risks of holding too much inventory versus too little. It is important to note that the inventory level is a compromise between service levels and holding costs. Holding less inventory reduces the working capital required to run the business as well as reducing spoilage. However, having too little inventory means that if an interruption in supply occurs, or if there is higher than predicted demand, the firm would be unable to meet demand and likely experience stock outs (Peres et al., 2025; Wu et al., 2025). While AI-enabled inventory management techniques have been found to increase efficiency of supply chains, Belhadi et al. (2024) and Li and Sun (2024) noted how such techniques may not be robust enough to handle extreme disruptions. This was particularly the case in the 2024 retail resilience literature where supply chain bottlenecks like port strikes or port closures and sudden quality or contamination in ingredients resulted in supply chain failures. However, Luckin Coffee has implemented a number of resilience measures, such as placing safety stock in regional centers, sourcing from multiple suppliers, and stockpiling items for major promotion campaigns and seasonal promotions. They align with the recommendations made by Ding et al. (2024) in the international journal of production research about resilience design in a supply chain.

Digital technologies have also helped improve inventory accuracy. Peres et al. (2025) suggest that cycle counts with IoT based smart shelves and inventory tracking, as well as automated SKU identification systems and POS integrated automated stock deduction, are contributing

towards better inventory management accuracy. However, these technologies are also subject to issues. Data accuracy has been a persistent problem that could lead to inaccurate demand forecasts and overstocking or stock out if not corrected. This is especially true in the digital age where the speed at which inventory information can be shared across systems and organizations could be quite fast. Overall, Luckin Coffee's automated, digital inventory replenishment system provides a competitive advantage that is in line with the latest inventory management research (Heizer et al., 2023; Wu et al., 2025; Belhadi et al., 2024).

**Question 4 – Lean Operations at Luckin Coffee**

Luckin Coffee's service blueprint embodies the five lean principles identified by Womack and Jones, which determine value from the customer's point of view, identify the value stream, make flow happen, let the customer pull the product, and pursue perfection, as translated into a retail environment mediated by digital technologies (Slack et al., 2022). At Luckin, customer value means quick, consistent and cheap cups of coffee in a friction-free mobile experience. Their compact stores (often 20 to 60 square metres) avoid the real estate cost and time cost of a traditional coffee shop with seating. The use of mobile app ordering removes order taking as a step in the value stream within the store, with the barista concentrating on making and handing over the coffee (Qu, 2025; Wang, 2024), which is an example of value-stream mapping in a service setting, removing the waste of non-value adding steps.

The seven (or eight) wastes of lean are:

- overproduction
- waiting
- transportation
- over-processing
- inventory
- motion
- defects
- unused creative human talent

These are useful as an aid to analysis. Luckin attacks waiting waste by using the app to order ahead. They attack transportation waste by locating stores that are usually within five to seven minutes walking distance in Tier 1 cities. They attack over-processing waste by using

standardised recipes produced by automated machines. They attack inventory waste through the demand-based replenishment discussed previously. This is not just about cost; in operations it is also about quality in that eliminating variability makes for a better customer experience. The recent literature on the convergence of lean and industry 4.0 (Garza-Reyes et al., 2024) calls this lean 4.0 or lean digital transformation where digital technologies are seen as catalysts to lean, and not as a replacement for it (Zheng et al., 2024).

In-store work flow is designed for takt time, that is how quickly a customer should get what they ordered, based on demand. In the stores this translates into production being paced to customer throughput with workers and machines working to the optimum level for that throughput as calculated by the order management system. Wang (2024) shows that Luckin has an intelligent staffing and task allocation module where staff in stores are allocated to tasks as needed based on forecast customer demand (a capability that traditional coffee shops lack). From a lean manufacturing perspective, this is heijunka, level loading the factory, but for the service environment on the scale of the chain. The work of Garza-Reyes and co-authors on the integration of lean and industry 4.0 and dynamic capabilities (Garza-Reyes et al., 2024) provides empirical evidence that organisations successfully combining lean and digitalisation are more successful than those that just lean or just digitally transform.

Standardization at the operational level is what makes this all run efficiently. Every drink at Luckin Coffee has a set recipe. Machines are standardised and calibrated so that the same beverage, such as an Americano, has the same recipe in Shanghai and Kuala Lumpur. Such standardization is essential to grow a business without compromising quality. This approach conforms to the process strategies identified in literature (Heizer et al., 2023). Importantly, standardization is also linked to continuous improvement. New drinks are tested by the central R&D department, new drinks are tested and evaluated on the mobile app, and new recipes are introduced at stores every 20 days (Qu, 2025). The rapid cycle of PDCA (Plan-Do-Check-Act) made possible by digital systems is a perfect example of kaizen on a network-wide scale.

The key question is whether Lean principles can be sustained as an operational philosophy for long-term operational excellence in a digital enabled service organization. The literature on this is generally positive but does add caveats regarding evolution. First, the human elements of lean, respect for people, empowerment, and front line problem-solving, can be eroded as the algorithm does most of the decision making, and the emerging Industry 5.0 literature is

explicitly trying to make sure humans are kept at the heart of lean-digital systems (Garza-Reyes et al., 2024). Second, the way that Lean is understood in a consumer-experience context is different from manufacturing Lean, in that for services it is co-created with the consumer, and over standardization can lead to homogenization-fatigue on the consumer side. Third, the sustainability concerns around waste now extends the idea of waste from the purely physical to carbon, water and packaging waste that calls for a green lean integration (Garza-Reyes et al., 2024). Luckin has shown that lean in operations, as enabled by digital tools, can scale and can be consistent in quality performance. However, long-term performance will also require that the company continues to evolve lean towards the human-centric design, the consumer-experience innovation, and environmental stewardship, rather than viewing it as a fixed playbook (Slack et al., 2022; Garza-Reyes et al., 2024).

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