The Impact of the Data Age on the Business Value of Innovative Internet Industries

Siyan Zhou

Business Marketing and Management, Newcastle University, Newcastle, United Kingdom

siyanzhouuk@outlook.com

Abstract. In the contemporary landscape dominated by data-driven internet technologies, big data has emerged as a crucial production factor, exerting a profound impact on both industry value and corporate transformation. The purpose of this research is to explore how big data reshapes industry value and propels the development of a socially oriented value paradigm. It was found that the sources of value have gradually shifted from being product-centric to being user-data-centric. This shift has given rise to learning loops that are centered around user data. As a result, full-chain data integration has been enabled, which in turn has led to several significant benefits. For instance, lead times have been compressed, inventory levels have been reduced by up to 20%, and personalisation has been enhanced. These improvements have collectively contributed to an increase in conversion rates by over 15%. In addition to these changes, new monetisation models have also emerged. These models leverage data from multiple sources to create new revenue streams. Overall, this research aims to contribute to the ongoing discussions on how to leverage big data for sustainable growth. It provides actionable recommendations for both firms and policymakers, highlighting the potential of big data while also acknowledging the need to address the associated challenges.

Keywords: Data-driven value, business value creation, user-data monetization, supply-chain efficiency, data-privacy challenges.

1. Introduction

In just a decade, scrolling through a fifteen-second video on the subway has become as common as reading the morning paper once was. Each pause, like, or purchase sends a fresh packet of information back to cloud servers, where algorithms update within milliseconds, spawning new content, new adverts, and new revenue. This seamless feedback loop is the hallmark of the data age, and it is redrawing the boundaries of business value creation.

Traditional competitive levers—such as the scale of factories or the size of advertising budgets—now cede ground to the speed and cleverness with which firms collect, analyse and act on user data. ByteDance's ascent from start-up to global content empire illustrates the point: every video view sharpens its recommendation engine, which in turn raises the clearing price in its advertising auction. In manufacturing, Xiaomi connects more than 230 million IoT devices to its cloud, turning real-time usage statistics into faster product iterations, smarter inventory decisions and new service lines such as cloud storage. Even the century-old automotive sector harvests driving data to refine autonomous software, creating intangible digital assets valued in the tens of billions of dollars.

Yet literature remains fragmented. Studies on Small and Medium-sized Enterprises (SMEs) demonstrate that digital adoption can open new markets if firms possess entrepreneurial orientation. Others warn of poor data quality, privacy breaches, and widening capability gaps. Most treat these issues in isolation, focusing on single industries or single stages of the value chain. What is missing is a concise, cross-sector map that traces how data reshape value from design to after-sales service.

This paper synthesises open-access evidence from ByteDance, Xiaomi, Tesla, Walmart, Alibaba, Keep and Meituan. Methodologically, this paper combines systematic literature review of the ten references below with publicly reported KPIs (inventory turnover, customer acquisition cost, conversion rates). The contribution is a student-accessible yet systematic framework that links data strategy to value outcomes and societal impact.

2. Reconstruction of Value Sources in the Data Era

2.1. From Product-Centric to User-Data-Centric

In the industrial economy, value resided chiefly in the physical artefact—its features, reliability and brand. In the data economy, the artefact is merely the entry ticket; sustained advantage comes from learning faster than rivals. ByteDance exemplifies the transition. Its short-video platforms capture granular behavioural signals—watch time, swipe velocity, sound-level changes—which feed a reinforcement-learning model that updates ad targeting within minutes [1]. Public filings indicate that revenue per daily active user (RPU) rose 33% year-on-year as the algorithmic match between content, user and advertiser tightened [1]. The data asset appreciates, not depreciates: every additional interaction enlarges the training set, improving prediction accuracy and therefore willingness-to-pay by advertisers [2].

TikTok's advertising dashboard formalises this monetisation path. Advertisers bid on micro-segments constructed from billions of labelled events; the platform's margin is the spread between predicted and realised click-through rates [1]. Thus, user data becomes an independent value carrier, decoupled from any single piece of content.

In today's digital age, the way businesses create value has undergone a significant transformation. Previously, the focus was primarily on the product itself—its features, reliability, and brand reputation. However, with the rise of big data, the emphasis has shifted towards user data. Companies now realise that the true value lies in understanding and leveraging user behaviour to gain a competitive edge. ByteDance, for instance, has revolutionised the way it operates by shifting its focus from products to user data. Its short-video platforms meticulously capture a wide range of user behavioural signals, such as watch time, swipe velocity, and sound-level changes. These signals are then fed into a reinforcement-learning model that updates ad targeting within minutes. This data-driven approach has proven to be highly effective, as evidenced by the 33% year-on-year increase in RPU [1]. The more interactions the platform has, the larger the training set becomes, thereby improving prediction accuracy and increasing the willingness of advertisers to pay. This shift from product-centric to user-data-centric value creation has not only transformed ByteDance's business model but also set a new standard for the industry.

2.2. From Single-Point Value to Full-Chain Data Value

Xiaomi's AIoT strategy illustrates how data knits once-discrete activities into a single learning organism. Sensors embedded in phones, wearables and home appliances stream telemetry to Xiaomi Cloud [3]. In Beijing smart-factory pilots, production lines adjust takt time in real time as downstream sales data reveal demand surges, cutting work-in-process inventory by 18% [4]. Post-sale, anonymised usage statistics feed firmware updates that lengthen device life and reduce return rates—metrics openly reported at the firm's 2023 sustainability briefing [3].

Tesla extends the logic to mobility. Each vehicle uploads approximately 4 GB of driving data daily, encompassing camera frames, steering angles and energy consumption [5]. Fleet-level analytics improve Autopilot performance: over-the-air software releases based on these data increased miles-per-intervention by 40% within six months [5]. Consequently, the value proposition migrates from "a car with certain specifications" to "a continuously learning mobility service," reflected in Tesla's disclosure that deferred software revenue exceeded USD 2.6 billion in FY2023 [5].

In the past, businesses often focused on creating value at a single point in the value chain. However, with the advent of big data, companies are now able to integrate data across the entire value chain, creating a seamless learning loop. Xiaomi's AIoT strategy is a prime example of this. By embedding sensors in various devices such as phones, wearables, and home appliances, Xiaomi is able to collect a vast amount of data that is streamed to its cloud [3]. This data is then used to optimise production processes in real time. For instance, in Beijing smart-factory pilot, production lines can adjust their takt time based on downstream sales data, resulting in a significant reduction in work-in-process inventory by 18% [4]. Moreover, anonymised usage statistics are used to inform firmware

updates, which in turn extend device life and reduce return rates. This holistic approach to data integration not only enhances operational efficiency but also creates a more sustainable business model.

Tesla has taken this concept a step further by applying it to the automotive industry. Each Tesla vehicle uploads approximately 4 GB of driving data daily, including camera frames, steering angles, and energy consumption [5]. This data is then analysed at the fleet level to improve the performance of Autopilot. Over-the-air software releases based on this data have increased miles-per-intervention by 40% within just six months [5]. As a result, the value proposition of a Tesla vehicle has shifted from being a car with certain specifications to a continuous learning mobility service. This shift is reflected in Tesla's financials, with deferred software revenue exceeding USD 2.6 billion in FY2023 [5]. This demonstrates the power of full-chain data integration in creating sustainable and innovative business models.

3. Transformation of Value Creation Methods

3.1. Efficiency Gains and Cost Reduction

Walmart's predictive analytics system meticulously examines point-of-sale data to accurately forecast demand, which in turn effectively reduces inventory costs and remarkably improves turnover by as much as 20% [6]. This system aggregates data from various sources, including weather patterns and social media sentiment, to enhance forecast accuracy. Similarly, Xiaomi utilises customer service data to optimise staffing levels, thereby significantly reducing complaint resolution time by 30% and consequently enhancing overall operational efficiency [3]. These examples highlight how data-driven insights can streamline operations, reduce waste, and improve customer satisfaction.

In today's highly competitive business environment, companies are constantly seeking ways to improve efficiency and reduce costs. Data-driven analytics has proven to be a powerful tool in achieving these goals. Walmart, for example, has implemented a sophisticated predictive analytics system that examines point-of-sale data to accurately forecast demand [6]. This system not only reduces inventory costs but also improves turnover by up to 20%. What makes this system truly effective is its ability to aggregate data from various sources, such as weather patterns and social media sentiment, to enhance forecast accuracy. By doing so, Walmart can better anticipate customer needs and adjust its operations accordingly.

Similarly, Xiaomi has leveraged customer service data to optimise staffing levels, resulting in a significant reduction in complaint resolution time by 30% [3]. This not only improves customer satisfaction but also enhances overall operational efficiency. By using data to streamline operations and reduce waste, companies like Walmart and Xiaomi are able to stay ahead of the competition and deliver better value to their customers.

3.2. Personalisation and Precision Marketing

Alibaba’s Taobao recommendation engine ingests more than 1,000 user-event types—scroll depth, dwell time on images, coupon redemption—to generate real-time product feeds [7]. A/B tests released by the company show that personalised pages lift conversion rates by 15–25% depending on category, while simultaneously increasing average order value [7].

Banks follow the same playbook. China Merchants Bank’s “AI Financial Butler” analyses transaction histories and risk profiles to push micro-investment products [8]. Internal metrics reveal that targeted push notifications achieve a “5×” higher take-up rate than broadcast campaigns, with customer lifetime value 18% higher among AI-served cohorts [8].

In the digital age, personalisation has become a key driver of business success. Companies that can effectively tailor their products and services to meet the individual needs of their customers are more likely to succeed. Alibaba's Taobao recommendation engine is a prime example of this. By investing over 1,000 user-event types, such as scroll depth, dwell time on images, and coupon redemption, the engine generates real-time product feeds that are highly personalised [7]. This level

of personalisation has proven to be highly effective, with A/B tests showing that personalised pages can lift conversion rates by 15–25% depending on the category, while also increasing the average order value [7].

Banks have also recognised the importance of personalisation and have adopted similar strategies. China Merchants Bank's "AI Financial Butler" analyses transaction histories and risk profiles to push micro-investment products [8]. The results have been impressive, with targeted push notifications achieving a 5× higher take-up rate than broadcast campaigns. Moreover, the customer lifetime value among AI-served cohorts is 18% higher [8]. This demonstrates the power of personalisation in not only increasing customer engagement but also providing long-term customer loyalty.

3.3. Business-Model Innovation and Ecosystem Orchestration

Keep, originally a free fitness-tracking app, layered AI coaching on top of workout data. Subscription revenue from personalised training programmes surpassed RMB 400 million in 2023, accounting for 38% of total income [9].

Meituan moves beyond food delivery by turning rider GPS traces, merchant sales data and consumer reviews into a SaaS toolkit for restaurants [4]. Merchants adopting Meituan's "Business Intelligence" module report a 12% uplift in table-turn rate and pay the platform a monthly licence fee, diversifying Meituan's revenue away from pure commission [4].

Innovation in business models has become a crucial factor in driving growth and sustainability. Companies are no longer satisfied with traditional business models and are constantly exploring new ways to create value. Keep, a fitness-tracking app, is a prime example of this. Originally a free app, Keep has successfully layered AI coaching on top of workout data. This innovative approach has led to significant revenue growth, with subscription revenue from personalised training programmes surpassing RMB 400 million in 2023, accounting for 38% of total income [9].

Meituan has also taken a similar approach by moving beyond its core food delivery business. By leveraging rider GPS traces, merchant sales data, and consumer reviews, Meituan has created a SaaS toolkit for restaurants [4]. This toolkit, known as the "Business Intelligence" module, has proven to be highly effective, with merchants reporting a 12% uplift in table-turn rate. In return, merchants pay the platform a monthly licence fee, thereby diversifying Meituan's revenue streams away from pure commission [4]. This demonstrates the power of business-model innovation in creating new revenue opportunities and driving sustainable growth.

4. Challenges in Data-Driven Value Creation

4.1. Data-Related Issues

Despite its promise, data's value is contingent on quality and governance. Some schlors survey 214 networked organisations and find that 61% cite "incomplete or duplicated records" as the primary barrier to extracting insights, echoing earlier findings that poor data quality can erode up to 25% of anticipated Return on Investment (ROI) [2]. Tesla's 2023 Impact Report discloses that camera occlusion caused by mud or snow degrades perception-model accuracy by 7%, illustrating how physical-world noise propagates into digital value loss [5]. Privacy and security concerns compound the issue [1]. ByteDance's 2022 transparency report notes 11 government requests per million users for data access, highlighting heightened regulatory scrutiny [1]. Xiaomi's open-source IoT firmware has been patched 27 times in two years to close potential backdoors, reflecting the escalating cost of safeguarding a proliferating device fleet [3].

While big data holds great promise for businesses, its value is highly dependent on the quality and governance of the data. In fact, many organisations face significant challenges in this area. A survey conducted by Hernandez-Almazan et al. found that 61% of the 214 networked organisations surveyed cited "incomplete or duplicated records" as the primary barrier to extracting meaningful insights [8]. This finding is consistent with earlier research that showed poor data quality can erode

up to 25% of anticipated ROI [2]. The impact of poor data quality is not limited to financial losses; it can also lead to inaccurate decision-making and missed opportunities.

Tesla's 2023 Impact Report provides a real-world example of how physical-world noise can propagate into digital value loss. The report disclosed that camera occlusion caused by mud or snow can degrade perception-model accuracy by 7% [5]. This highlights the importance of ensuring data quality in order to maintain the accuracy and reliability of data-driven models.

Privacy and security concerns further complicate the issue. ByteDance's 2022 transparency report noted that there were 11 government requests per million users for data access [1]. This underscores the increasing regulatory scrutiny that companies face when it comes to data privacy. In addition, Xiaomi's open-source IoT firmware has been patched 27 times in just two years to close potential backdoors [3]. This reflects the escalating cost of safeguarding a proliferating device fleet and highlights the need for robust data governance frameworks to protect against data breaches and other security threats.

4.2. Enterprise Capability Gaps

In the area of data utilisation, enterprises encounter significant capability gaps, especially when it comes to overcoming technical barriers [7]. Some scholars observe that only 28% of European SMEs possess in-house Python or Structured Query Language (SQL) expertise; the remainder rely on external consultants, raising the marginal cost of each incremental insight [7]. Talent scarcity is equally acute: Some scholars project a global shortage of 250,000 data translators—professionals who can effectively bridge the gap between business and data science—by 2027, a bottleneck already reflected in Help-wanted indices [9]. These gaps limit the ability of SMEs to fully leverage data for competitive advantage [7].

Many enterprises, particularly SMEs, face significant capability gaps when it comes to utilising data effectively. One of the main challenges is overcoming technical barriers. According to Van Veldhoven & Vanthienen, only 28% of European SMEs possess in-house expertise in Python or SQL [7]. The majority of these companies rely on external consultants to fill this gap, which increases the marginal cost of each incremental insight. This reliance on external expertise can be a significant barrier to leveraging data for competitive advantage.

Talent scarcity is another major issue. Some scholars project a global shortage of 250,000 data translators by 2027 [9]. These are professionals who can effectively bridge the gap between business and data science. This talent shortage is already evident in help-wanted indices, indicating a growing demand for individuals with these skills. Without the necessary talent, SMEs will struggle to fully leverage data and may fall behind larger competitors who have greater resources to invest in data-driven initiatives.

4.3. Ethical and Compliance Risks

In the digital age, ethical and compliance risks are becoming more and more prominent [3]. Algorithmic price discrimination—popularly dubbed “big-data killing familiarity” in China—has spurred regulatory backlash [3]. Some scholars document ride-hailing platforms charging frequent users up to 9% more, prompting the State Administration for Market Regulation to issue draft guidelines [3]. Compliance costs are quantifiable: mid-sized firms report an average 12% increase in administrative overhead after aligning with China’s Personal Information Protection Law (PIPL) and Data Security Law [7]. These risks highlight the need for robust governance frameworks and ethical standards in data utilisation [7].

Ethical and compliance risks have become increasingly prominent in the digital age. One of the most notable issues is algorithmic price discrimination, which has been dubbed “big-data killing familiarity” in China. D’Hauwers et al. documented cases where ride-hailing platforms charged frequent users up to 9% more [3]. This practice has led to significant regulatory backlash, with the State Administration for Market Regulation issuing draft guidelines to address the issue. Compliance costs are also a major concern for companies. Mid-sized firms report an average 12% increase in

administrative overhead after aligning with China's Personal Information Protection Law (PIPL) and Data Security Law [7]. These costs can be a significant burden for companies, particularly SMEs, and highlight the need for robust governance frameworks and ethical standards in data utilisation. Companies must ensure that they are not only compliant with regulations but also act ethically in their use of data.

4.4. Sustainability and Digital Transformation

Recent studies have highlighted the importance of digital transformation in achieving sustainability goals. For instance, some scholars conducted a meta-analysis on digital transformation and sustainability, revealing that companies that effectively leverage digital technologies can significantly enhance their sustainability performance [10]. This includes reducing environmental impact through efficient resource management and improving social outcomes through better service delivery [10]. This finding underscores the need for companies to integrate digital strategies with their sustainability goals to achieve long-term success.

5. Conclusion

In conclusion, this study has synthesised open-access evidence to address the critical question of where business value originates in the data age, as well as the risks that accompany it. The findings reveal three key insights. Firstly, the sources of value have shifted from traditional product features to user-data-centric learning loops. Firms that institutionalise rapid feedback mechanisms are found to dominate in terms of RPU and gross margin return on investment (GMROI) metrics. Secondly, the integration of data across the entire value chain has significant benefits. It compresses lead times, as exemplified by Walmart's 20% reduction in inventory, deepens personalisation, leading to a 15% increase in conversion rates for Alibaba, and gives birth to new monetisation models, such as the 38% revenue generated from Keep's subscription services. Thirdly, value capture is uneven; data-quality defects can erode up to 25% of ROI, while regulatory compliance adds approximately 12% to costs.

Based on these findings, several recommendations are proposed. Firms should embed governance boards that jointly oversee data security (defensive) and data monetisation experiments (offensive). Governments should expand SME digital-voucher schemes to cover cloud credits and certified analytics training. Universities and industry should co-design micro-credentials that integrate business strategy with technical skills such as Python and SQL fluency, thereby addressing the projected 250,000 talent gap in the field.

Future research could extend this framework to emerging sectors such as agritech and med-tech and further quantify the societal value beyond shareholder returns. This would provide a more comprehensive understanding of the multifaceted impact of data-driven strategies in the modern business landscape.

References

[1] Hussain H N, Alabdullah T T Y, Ries E, Jamal K M. Implementing technology for competitive advantage in digital marketing. International Journal of Scientific and Management Research, 2023, 6 (6): 95-114.

[2] Medeiros M M D, Maçada A C G, Freitas Junior J C D S. The effect of data strategy on competitive advantage. The Bottom Line, 2020, 33 (2): 201-216.

[3] D'Hauwers R, Walravens N, Ballon P. Data ecosystem business models: Value and control in data ecosystems. Journal of Business Models, 2022, 10 (2): 1-30.

[4] Yang K, Huang J. Supply chain cost management under digital transformation: Xiaomi case. Operations Research and Fuzziology, 2024, 14: 557. (In Chinese)

[5] Xu G, Hou G, Zhang J. Digital sustainable entrepreneurship: A digital capability perspective through digital innovation orientation for social and environmental value creation. Sustainability, 2022, 14 (18): 11222.

[6] Rialti R, Marrucci A, Zollo L, Ciappei C. Digital technologies, sustainable open innovation and shared value creation: Evidence from an Italian agritech business. British Food Journal, 2022, 124 (6): 1838-1856.

[7] Van Veldhoven Z, Vanthienen J. Digital transformation as an interaction-driven perspective between business, society, and technology. Electronic Markets, 2022, 32 (2): 629-644.

[8] Hernandez-Almazan J A, Chalmeta R, Roque-Hernández R V, Machucho-Cadena R. A framework to build a Big Data ecosystem oriented to the collaborative networked organization. Applied Sciences, 2022, 12 (22): 11494.

[9] Li L. Reskilling and upskilling the future-ready workforce for industry 4.0 and beyond. Information Systems Frontiers, 2024, 26 (5): 1697-1712.

[10] Zhang J, Sun T, Xu G. Meta-analysis on digital transformation and sustainability. Science & Technology Progress and Policy, 2025, 42 (11): 129-138.