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Chapter 7: Intelligent Data Platforms in Healthcare, Finance, and Retail

7.1. Introduction

Technical advancements accelerate the market shift toward intelligent data platforms, capable of integrating, cataloguing, and delivering enterprise data. Beyond traditional data lakes, intelligent data platforms also provide operational and analytical capabilities for predictive and prescriptive analytics. Consequently, they are rapidly emerging across multiple industries.

Healthcare, finance, and retail industries rely on intelligent data platforms to maximize customer, patient, or stakeholder experience while mitigating fraud, security, or risk exposure. In finance, smart data platforms are tailored to managing risks, detecting fraudulent transactions, and ensuring regulatory compliance and business continuity. In retail, strong customer data integration capabilities support customer experience personalisation, optimising merchandising mix, and enhancing loyalty programmes. Successful deployment of intelligent data platforms ultimately hinges on sound information and technology governance and stewardship, as well as robust data cataloguing and management.

7.1.1. Background and Significance

Intelligent Data Platforms (IDPs) have gained policy attention for supporting mission-critical applications across domains, but case studies have been limited to the public sector. This paper explores IDPs in healthcare, finance, and retail, identifying how intelligent data management capabilities underpin IDPs for these sectors. Supporting clinical data integration and interoperability in healthcare, risk management and compliance in finance, and customer experience and merchandising in retail represent further expansions of IDPs into sector-specific territory. The trend highlights the need for IDP capabilities beyond those of traditional AI-ready and analytic-ready platforms,

and it advances the project of investigating their foundations across the private sector. Intelligent Data Platforms (IDPs) have gained policy attention for supporting mission-critical applications across domains, but case studies have been limited to the public sector.

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Fig 7.1: Intelligent Data Platforms in Healthcare, Finance, and Retail

7.2. Foundations of Intelligent Data Platforms

Foundations of Intelligent Data Platforms—Intelligent data platforms (IDPs) are a new category of cloud-based technology that help organizations overcome data management and analytics challenges. An IDP combines data engineering, data integration, data cataloging, data warehousing, and data science capabilities to collect, organize, govern, protect, and analyze all data. The needed set of core capabilities and technology foundation can be extended to support other key capabilities such as data lake formation

and support, advanced analytical processing, and deployment for advanced applications in AI and ML. Beyond the basic IDP technology foundation, IDPs add integrations needed to support industry-specific use cases in sectors such as financial services, healthcare, retail, manufacturing, supply chain, education, media and entertainment, telecommunications, and the public sector.

Embeddings—An IDP is an extensible category of cloud-based technology that combines data engineering, integration, cataloging, warehousing, and science capabilities with a core set of capabilities and foundation to met data management and analytics needs. It provides the needed core technology platform and the integrations required to meet industry-specific requirements. Beyond the core set, advanced analytical processing capability shapes the specific IDP offering. An IDP product embeds the database and data lake technologies, cloud infrastructure services, and workflow orchestration, security, and governance delivered by data-focused hyperscalers, reducing the number of component technologies an organization must manage.

7.2.1. Core Architecture and Components

In GDA's framework, an Intelligent Data Platform is defined as a core data and analytics repository where data is integrated, modelled and exposed to enable Intelligence Automation within the data architecture and use cases across domains. The Intelligent Data Platform combines intelligence and automation capabilities into a cohesive end-to-end data and analytics environment to elevate human intelligence. These capabilities are federated over an agnostic data model, with underlying domain-specific data sources leveraged through the intelligence and automation capabilities. The Intelligent Data Platform or GDA may be hosted centrally in a cloud, on-premises or multi-cloud hybrid environment by a single organisation, consortium or industry cloud. Consistent with Intelligent Data Platforms, Intelligence Automation capabilities feed into Data Supply Chains and Adjacency Services, and these combine Intelligence Automation with an Aspect Data Model that forms the foundation for defining use cases, and the Domain Data Model that informs data solution delivery and production deployment across the data architecture.

The core architecture consists of six major components. First, Sourcing and Delivery enables Self-Service Data Acquisition from across an organisation or ecosystem, including public, proprietary and open data feeds, tools for DataOps, Data Engineering, Data Preparation, Data Quality and Data Governance, and capabilities for sustainably managing data supply chains. Second, Data Science and Engineering delivers governed Data Science Models and other Data and Analytics Use Cases through Data Science-as-a-Service, plug-and-play model management and templates for intelligent data

engineering. Third, Generation of Intelligence and Automation capabilities includes Machine Learning, Deep Learning, and AI as a Service, intelligent cloud ETL, and an Intelligent Automation Engine that handles RPA and more. Fourth, Monitoring sustains DataOps and broader Data Quality and Governance by managing alerts, triggers and workflows pertaining to key operational parameters and process outcomes. Fifth, Usage enables end-user consumption of all types of semantic data and models, federating access to analytic outputs, and integrating with Adjacency Services and third-party dashboards or Business Intelligence (BI) platforms such as Microsoft Power BI. Finally, Adoption provides the Art of the Possible, co-creation and Change Management capabilities that underpin the broader success of the Intelligent Data Platform across the organisation or ecosystem.

7.3. Intelligent Data Platforms in Healthcare

IDPs in Healthcare assist healthcare providers in integrating clinical data, ensuring data interoperability for advanced analytics and reporting, and enabling data retrieval from disparate sources.

Healthcare organizations are under constant pressure to drive down costs while improving quality and outcomes—all key aspects of value-based care—without compromising compliance or cybersecurity. A major contributor to these challenges has been the large and disparate volume of clinical data across an organization's enterprise systems and departments. Among the obstacles to treating this data as a strategic asset are data silos, lack of interoperability, and ownership issues. Clinical Data Integration and Interoperability Boston Consulting Group and the Healthcare Information and Management Systems Society, therefore, view Intelligent Data Platforms as particularly beneficial in addressing these needs. Moreover, as healthcare organizations migrate clinical data to a centralized location, they give business analysts, data scientists, and academic researchers a unified and consistent view of clinical data, enabling them to rapidly develop and test analytics models and visualizations for performance monitoring or predictive analysis, and these models and visualizations are subsequently deployed into production for ongoing evaluation and triage of patients based on a multitude of historical clinical data.Healthcare organizations are navigating mounting pressure to reduce costs, enhance quality, and improve patient outcomes—core pillars of value-based care—while simultaneously maintaining strict regulatory compliance and safeguarding against cybersecurity threats. A significant barrier to achieving these goals is the vast and fragmented landscape of clinical data dispersed across enterprise systems, departments, and care settings. Data silos, limited interoperability, inconsistent standards, and unclear data ownership prevent organizations from leveraging clinical information as a true strategic asset. To address these challenges, organizations such as

the Boston Consulting Group and the Healthcare Information and Management Systems Society advocate for the adoption of Intelligent Data Platforms that enable seamless clinical data integration and interoperability. By centralizing and harmonizing data from disparate sources, these platforms provide business analysts, data scientists, and researchers with a unified and reliable view of patient and operational data. This integrated environment accelerates the development, testing, and deployment of advanced analytics models and visualizations that support performance monitoring, predictive insights, and proactive patient triage. Ultimately, transforming fragmented clinical data into actionable intelligence empowers healthcare organizations to deliver higher-value care while improving operational efficiency and long-term sustainability.

Fig 7.2: Intelligent Data Platforms in Healthcare

7.3.1. Clinical Data Integration and Interoperability

Intelligent Data Platforms, through the combination of data and advanced analytics enable a cohesive system for integration of clinical data from disparate sources and systems operated by different stakeholders to support cross-organization use of data while improving the decision processes for healthcare organizations and directed toward patients. Examples are All of Us in the United States, Beating Diabetes in Singapore, and EHRs and SG-HTS in Singapore.

All of Us is a research program of the National Institutes of Health with the intention of collecting health, lifestyle, and genetic data from the largest and most diverse group of individuals, to build one of the largest datasets of its kind that will integrate EHRs with genomic, physiological, and behavioral data to enable precise medicine. With the cooperation of more than 220 health care organizations across the USA, Beating Diabetes was launched in 2019 with the objective to give insights into how data can be shared across various stakeholders to reduce the risk of diabetes by building a risk profile from longitudinal data and enabling early clinical and personal behavioral interventions.

7.4. Intelligent Data Platforms in Finance

Intelligent Data Platforms Across Healthcare, Finance, and Retail: Architectures, Capabilities, and Implications—Intelligent Data Platforms (IDPs) integrate data and analytics capabilities in a self-service form, utilizing multiple cloud technologies as well as the synergy of on-premises and edge facilities. IDPs support diverse uses across many industries. A comprehensive literature review reveals common architectural components and core capabilities. Industry-specific narratives emphasize the central role of data in enabling critical business functions. In finance, IDPs facilitate capital and liquidity management, risk measurement and management, trade surveillance, payment processing, transaction monitoring, and customer experience. Potential future developments include improved self-service provisioning, federated learning for data privacy and security, optimized querying for environment sustainability, and more accurate forecasting.

Effective decision-making in finance requires rapid access to high-quality and up-to-date data on all aspects of an institution's operations. Intelligent Data Platforms support a variety of uses related to capital and liquidity management, risk measurement and management, trade surveillance, payment processing, transaction monitoring, and customer experience. For instance, they address the emerging need for sustainability-related forecasting and financial planning with risk and scenario analysis on models for a wide range of emissions and other sustainability-related data disaggregation. Climate scenarios and key individual risk drivers, without assuming correlation between them, are crucial for accurate and timely forecasts, particularly for longer-term horizons. Avoiding the challenges of traditional machine learning, federated learning enables multiple institutions to learn a shared prediction model while keeping the training patterns decentralized and safe.

7.4.1. Risk Management, Fraud Detection, and Compliance

Corporate risk management requires a breadth and depth of data from multiple sources and domains in a timely manner. For example, managing the credit, market, and operational risk of banking and insurance firms requires accessing both internal and external data. Similarly, insurance fraud detection requires monitoring multiple streams of data, including social networks, and fraud-management strategies must evolve in tandem with changing patterns of fraud. Anti-money-laundering measures can be made more effective with self-learning algorithms applied to transaction data across financial institutions' payment networks.

Compliance rules and regulations often require monitoring a wide variety of events that can go unnoticed if viewed in isolation. Integrating these events with algorithms for anomaly detection enables data alerts for regulatory compliance and adherence in both banking and insurance firms. Data from multiple sources—automated sharing of mortgage defaults with tax records, for example—helps detect illegal behavior.

7.5. Intelligent Data Platforms in Retail

Retail-oriented Intelligent Data Platforms empower organizations to address key business priorities such as enhancing customer experience, strengthening customer loyalty, and optimizing merchandise offering. The literature identifies several scenarios across the retail industry where these platforms play an instrumental role. Customer experience through improved service and support enables organizations to understand product fulfillment, agent efficiency, and the roots of expensive cases related to returns and cancellations. By gaining insights into customer service, networks drive augmented customer experience and facilitate product identification and availability.

Fig 7.3: Intelligent Data Platforms in Retail

Merchandising analytics offers insights into what is on the shelf, where, and how. Through assessments of shelf compliance, out-of-stock incidences, overselling detection, price effectiveness, and promotional performance, organizations optimize merchandising autopilots. Customer loyalty through customer data enablement allows companies to combine enterprise, loyalty, and from-the-field data for smartening-up and creating cutting-edge activation at scale, allowing personalized offerings over large customer bases at low marginal cost. Transactional, customer, and service data combined with machine learning form a datascience factory that promotes tailored loyalty and activation campaigns while enhancing multiplex service offerings.

7.5.1. Customer Experience, Merchandising, and Loyalty

Exceeding customer expectations is now a necessity rather than a differentiator, making data-driven enterprise-wide understanding of customer preferences imperative. Intelligent data platforms help retailers rapidly and accurately analyze customer behavioral patterns to identify existing customers' needs and future expectations. The rapid integration of primary customer data and secondary market data with an intelligent data platform enables a unified view of customers, their journey across touch points, sentiment, and feedback. The fine-detail intelligence gathered from customer-experience data helps retailers automate and enhance day-to-day customer-service interactions.

Advanced analytics models aggregate historic data to understand individual preferences, offering personalized customer interactions and recommendations that increase sales conversion rates and improve customer retention. Robust data-testing capabilities help retailers improve product assortments and collections at individual-store levels to meet the distinct preferences of target customers and mitigate markdown risk. Specialist models analyze customer-product affinities and category-item affinities to help merchandising teams fine-tune category-management and merchandising-decisions frameworks. The easy presentation of insights helps business users act swiftly, ensuring that rapid developments and innovations in the retail market do not leave companies vulnerable to competition. Loyalty modeling helps identify high-value loyal customers while managing the overall loyalty spend of the organization and individual campaigns.

7.6.Conclusion

Seven Intelligent Data Platforms—across healthcare, finance, and retail—support fundamental transformations in customer experience, operational performance, and risk management in substantiated three characteristics: 1.____Data integration at scale using active metadata driven and standard property taxonomies, 2.___Supplying business-

ready data, experience data and AI models for the organization, 3.___Embracing anti-fragility in data management to provide cost-effective, quality, and low-latency data.

The Future Directions section highlights some significant areas requiring additional work. A cry for a targeted Intelligent Data Platform has surfaced in at least three areas—Cyber Security, Workforce Resilience and Public Health & Safety.

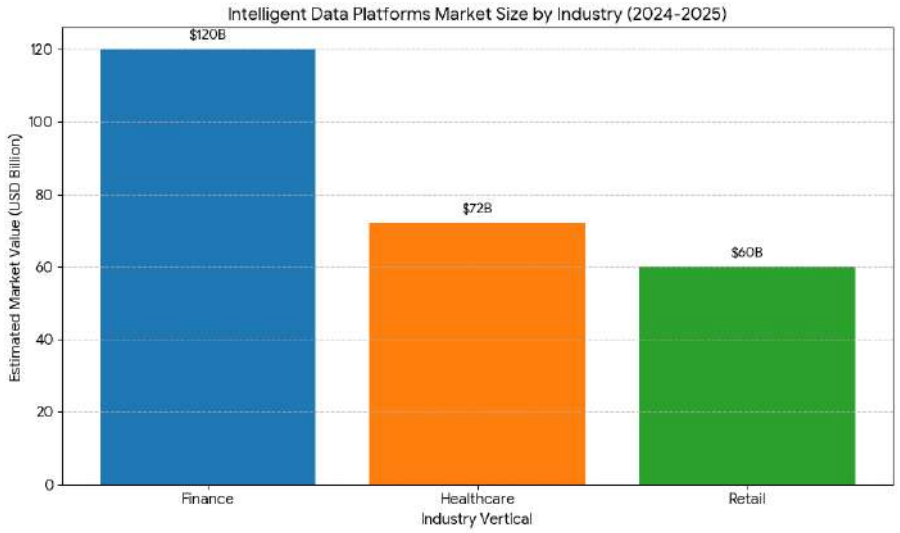

Fig 7.4: Intelligent Data Platforms in Healthcare, Finance, and Retail

7.6.1. Future Directions

Despite significant advancements, research on intelligent data platforms remains in early stages. Future exploration must address fundamental questions regarding architecture, capabilities, implications, and the broader ecosystem surrounding such platforms. Investigating capabilities of intelligent data platforms across other domains is also warranted. Additionally, pursuing novel implementations, such as risk management within smart data platforms in the finance sector, could yield valuable insights. Consequently, multifaceted research may yield meaningful contributions, moving the field toward the next level of abstraction.

Industry adoption of intelligent data platforms is still in its infancy. Consequently, real-world implementations seldom match theoretical descriptions. Greater maturity and investment in operational deployments will subsequently enhance opportunities for evidence-based research and perspective articles.

References

Alabdulatif, A., Khalil, I., & Saidur Rahman, M. (2022). Security of blockchain and AI-empowered smart healthcare: Application-based analysis. Applied Sciences, 12(21), 11039. https://doi.org/10.3390/app122111039

Aldoseri, A., Al-Khalifa, K. N., & Hamouda, A. M. (2023). Re-thinking data strategy and integration for artificial intelligence: Concepts, opportunities, and challenges. Applied Sciences, 13(12), 7082.

Ramesh Inala. (2023). Big Data Architectures for Modernizing Customer Master Systems in Group Insurance and Retirement Planning. Educational Administration: Theory and Practice, 29(4), 5493–5505. https://doi.org/10.53555/kuey.v29i4.10424

Awrahman, B. J., Aziz Fatah, C., & Hamaamin, M. Y. (2022). A review of the role and challenges of big data in healthcare informatics and analytics. Computational Intelligence and Neuroscience, 2022, 1–10. https://doi.org/10.1155/2022/5317760

Aitha, A. R. (2021). Optimizing Data Warehousing for Large Scale Policy Management Using Advanced ETL Frameworks.

K., & Ślęzak, A. (2022). The use of big data analytics in healthcare. Journal of Big Data, 9(1).

Varri, D. B. S. (2020). Automated Vulnerability Detection and Remediation Framework for Enterprise Databases. Available at SSRN 5774865.

Guerrero, P., Ernebjerg, M., Holst, T., Weese, D., DiBello, H., Ibing, S., Schmidt, L., Ungaro, R., & Renard, B. (2024). AIR·MS data platform for artificial intelligence in healthcare. JAMIA Open, 8(6). https://academic.oup.com/jamiaopen/article/8/6/ooaf145/8328335

Okwor, I. A., Hitch, G., Hakkim, S., Akbar, S., Sookhoo, D., & Kainesie, J. (2024). Digital technologies impact on healthcare delivery: A systematic review of artificial intelligence (AI) and machine-learning (ML) adoption, challenges, and opportunities. AI, 5(4), 1918–1941. https://doi.org/10.3390/ai5040095

Subrahmanya, S. V. G., Shetty, D. K., Patil, V., Hameed, B. M. Z., Paul, R., Smriti, K., Naik, N., & Somani, B. K. (2021). The role of data science in healthcare advancements: Applications, benefits, and future prospects. Irish Journal of Medical Science, 191, 1473–1483. https://doi.org/10.1007/s11845-021-02730-z

Keerthi Amistapuram. (2023). Privacy-Preserving Machine Learning Models for Sensitive Customer Data in Insurance Systems. Educational Administration: Theory and Practice, 29(4), 5950–5958. https://doi.org/10.53555/kuey.v29i4.10965

Xu, S. (2022). Translational gaps and opportunities for medical wearables in digital health. Science Translational Medicine, 14(645).

Kushvanth Chowdary Nagabhyru. (2023). Accelerating Digital Transformation with AI Driven Data Engineering: Industry Case Studies from Cloud and IoT Domains. Educational Administration: Theory and Practice, 29(4), 5898–5910. https://doi.org/10.53555/kuey.v29i4.10932

Aris, A., et al. (2024). Evolution of FinTech and its sustainability dimensions: A post-2020 acceleration. International Journal of Innovation and Technology Management. https://doi.org/10.1142/S0219877025400085

Bhattacharjee, S., et al. (2024). Foundational framework linking FinTech with financial inclusion and sustainability. Journal of Digital Financial Services.

Guntupalli, R. (2025, August). AI-Enhanced Data Encryption Techniques for Cloud Storage. In 2025 International Conference on Artificial Intelligence and Machine Vision (AIMV) (pp. 1-6). IEEE.

Murgai, A. (2018). The impact of artificial smart data platforms on operational efficiency in finance. Global Business Review.

Gottimukkala, V. R. R. (2020). Energy-Efficient Design Patterns for Large-Scale Banking Applications Deployed on AWS Cloud. power, 9(12).

Ogutu, A. A. (2024). Big data analytic dynamics and performance of FinTech firms in Nairobi City County, Kenya (Master's thesis). Kenyatta University.

Vadisetty, R., Polamarasetti, A., Goyal, M. K., Rongali, S. K., Prajapati, S. K., & Butani, J. B. (2025, March). Smart Sorting Systems: Implementing IoT, Generative AI, and AI for Real-Time Monitoring of Plastic Waste Sorting. In Doctoral Symposium on Computational Intelligence (pp. 101-125). Singapore: Springer Nature Singapore.

Zavolokina, L., Dolata, M., & Schwabe, G. (2016). FinTech – What's in a name? Proceedings of the 37th International Conference on Information Systems (ICIS).

Dutta, S., & Crosson, M. (2005). Knowledge exploration and exploitation through big data initiatives. Information Systems and e-Business Management.

Segireddy, A. R. (2025). GENERATIVE AI FOR SECURE RELEASE ENGINEERING IN GLOBAL PAYMENT NETWORK. Lex Localis: Journal of Local Self-Government, 23

Okwechime, E., Duncan, P., & Edgar, D. (2017). Big data and smart cities: A public sector organizational learning perspective. Information Systems and e-Business Management, 16(3), 601–625.

Qu, Z. (2020). The application of smart data in customer service and marketing. Journal of Marketing Research.

Garapati, R. S. (2023). Optimizing Energy Consumption in Smart Build-ings Through Web-Integrated AI and Cloud-Driven Control Systems.

Xia, S., Song, J., Ameen, N., Vrontis, D., Yan, J., & Chen, F. (2024). What changes and opportunities does big data analytics capability bring to strategic alliance research? A systematic literature review. International Journal of Management Reviews, 26(1), 34–53. https://doi.org/10.1111/ijmr.12350

Davuluri, P. S. L. N. . (2024). AI-Driven Data Governance Frameworks for Automated Regulatory Reporting and Audit Readiness. Metallurgical and Materials Engineering, 30(4), 996–1010. Retrieved from https://metall-mater-eng.com/index.php/home/article/view/1936

Zhu, S. (2021). A discussion on how to apply smart data for precision marketing in the global economy: Asian context. Economit Journal: Scientific Journal of Accountancy, Management and Finance, 1(2), 70–84. https://doi.org/10.33258/economit.v1i2.441