



Intelligent Retail and Manufacturing Systems

Artificial Intelligence-Driven OSS/BSS Solutions and Infrastructure
Innovations

Shabrinath Motamary

● DeepScience
;

Intelligent Retail and Manufacturing Systems: Artificial Intelligence-Driven OSS/BSS Solutions and Infrastructure Innovations

Shabrinath Motamary

Software/Systems Architect, Saturn Business systems inc,
United States



DeepScience

Published, marketed, and distributed by:

Deep Science Publishing
USA | UK | India | Turkey
Reg. No. MH-33-0523625
www.deepscienceresearch.com
editor@deepscienceresearch.com
WhatsApp: +91 7977171947

ISBN: 978-93-49910-18-8

E-ISBN: 978-93-49910-26-3

<https://doi.org/10.70593/978-93-49910-26-3>

Copyright © Shabrinath Motamary

Citation: Motamary, S. (2025). *Intelligent Retail and Manufacturing Systems: Artificial Intelligence-Driven OSS/BSS Solutions and Infrastructure Innovations*. Deep Science Publishing. <https://doi.org/10.70593/978-93-49910-26-3>

This book is published online under a fully open access program and is licensed under the Creative Commons "Attribution-Non-commercial" (CC BY-NC) license. This open access license allows third parties to copy and redistribute the material in any medium or format, provided that proper attribution is given to the author(s) and the published source. The publishers, authors, and editors are not responsible for errors or omissions, or for any consequences arising from the application of the information presented in this book, and make no warranty, express or implied, regarding the content of this publication. Although the publisher, authors, and editors have made every effort to ensure that the content is not misleading or false, they do not represent or warrant that the information-particularly regarding verification by third parties-has been verified. The publisher is neutral with regard to jurisdictional claims in published maps and institutional affiliations. The authors and publishers have made every effort to contact all copyright holders of the material reproduced in this publication and apologize to anyone we may have been unable to reach. If any copyright material has not been acknowledged, please write to us so we can correct it in a future reprint.

Preface

The digital transformation of retail and manufacturing industries is accelerating at an unprecedented pace, driven by advances in Artificial Intelligence (AI), Machine Learning, and Cloud Computing. In this context, the role of Operational Support Systems (OSS) and Business Support Systems (BSS) has become increasingly critical to enabling smart manufacturing, real-time retail analytics, and agile business models. This book presents a comprehensive examination of how intelligent systems are redefining the future of enterprise operations. Focusing on the integration of AI-driven solutions in domains such as predictive billing, customer relationship management (CRM), enterprise resource planning (ERP), and supply chain optimization, this volume offers readers a well-rounded understanding of both foundational concepts and cutting-edge applications. Through a balanced blend of theory and practice, the book explores how Industry 4.0 technologies, such as data governance, business intelligence, and process automation, are reshaping retail and manufacturing infrastructures.

Each chapter explores key areas like digital transformation strategies, data management, CRM automation, and intelligent customer lifecycle management, emphasizing the need for scalable and interoperable systems that enhance operational efficiency and customer satisfaction. By integrating insights from both academic research and industry practice, this book serves as a valuable resource for professionals, scholars, and innovators aiming to harness AI for competitive advantage.

Shabrinath Motamary

Table of Contents

Chapter 1: Exploring the foundations and modern applications of operational and business support systems in retail and manufacturing	1
1.1. Introduction to Operational and Business Support Systems	1
1.2. Historical Evolution of Support Systems.....	2
1.3. Key Components of Operational Support Systems.....	4
1.4. Key Components of Business Support Systems	6
1.5. The Role of Technology in Support Systems	8
1.6. Operational Support in Retail	10
1.7. Operational Support in Manufacturing	12
1.8. Business Support in Retail	15
1.9. Conclusion	17
References	19
Chapter 2: Integrating artificial intelligence with business support systems for smarter billing, CRM, and customer lifecycle management	20
2.1. Introduction	20
2.2. The Role of Artificial Intelligence in Business Support Systems.....	22
2.3. Overview of Business Support Systems	23
2.4. Smart Billing Solutions.....	24
2.5. Customer Relationship Management (CRM) Enhancements	27
2.6. Customer Lifecycle Management	30
2.7. Data Management and AI Integration.....	33
2.8. Challenges in Implementing AI in Business Support Systems	35
2.9. Conclusion	39
References	40

Chapter 3: Enhancing efficiency in smart manufacturing processes through agentic artificial intelligence-driven autonomous systems.....41

3.1. Introduction	41
3.2. Overview of Smart Manufacturing	42
3.3. Understanding Agentic AI	45
3.4. The Role of Autonomous Systems in Manufacturing.....	47
3.5. Efficiency Metrics in Manufacturing Processes	50
3.6. Integration of Agentic AI in Manufacturing	52
3.7. Future Trends in Smart Manufacturing.....	55
3.8. Regulatory and Ethical Considerations.....	57
3.9. Conclusion	59
References	61

Chapter 4: Implementing artificial intelligence-powered predictive maintenance and inventory forecasting in retail supply chains.....62

4.1. Introduction	62
4.2. Overview of Retail Supply Chains	64
4.3. The Role of AI in Supply Chain Management	65
4.4. Predictive Maintenance in Retail	66
4.5. Inventory Forecasting Techniques	69
4.6. Data Collection and Management.....	72
4.7. Machine Learning Algorithms for Predictive Maintenance.....	74
4.8. Integrating AI Solutions into Existing Systems	77
4.9. Conclusion	80
References	81

Chapter 5: Architecting Scalable Cloud Infrastructure to Support High-Volume OSS/BSS Workloads in Real-Time Environments82

5.1. Introduction	82
5.2. Understanding OSS/BSS Workloads	83

5.3. Cloud Infrastructure Fundamentals.....	87
5.4. Design Principles for Scalability	90
5.5. Architectural Patterns for OSS/BSS	93
5.6. Data Management Strategies	96
5.7. Security Considerations	99
5.8. Monitoring and Performance Optimization	101
5.9. Conclusion.....	104
References	106

Chapter 6: Developing robust data engineering pipelines for complex retail analytics and manufacturing intelligence.....107

6.1. Introduction	107
6.2. The Importance of Data Engineering in Retail and Manufacturing	109
6.3. Understanding Data Pipelines.....	110
6.4. Key Components of Data Engineering Pipelines.....	111
6.5. Technologies and Tools for Data Engineering	116
6.6. Challenges in Building Data Pipelines	119
6.7. Best Practices for Designing Data Pipelines	122
6.8. Conclusion.....	125
References	126

Chapter 7: Utilizing machine learning to optimize product lifecycle management from design to end-of-life128

7.1. Introduction	128
7.2. Overview of Product Lifecycle Management	129
7.3. Machine Learning Fundamentals.....	132
7.4. Integration of Machine Learning in Product Lifecycle Management	135
7.5. Design Phase Optimization.....	137
7.6. Manufacturing Process Enhancement.....	140
7.7. Sales and Marketing Strategies.....	142

7.8. Product Usage and Performance Monitoring.....	144
7.9. End-of-Life Management	146
7.10. Conclusion.....	148
References	150

Chapter 8: Improving customer engagement through behavior-driven artificial intelligence recommendations and interactive platforms151

8.1. Introduction	151
8.2. Exploring Customer Engagement Dynamics	153
8.3. Behavior-Driven AI: An Overview	155
8.4. The Role of AI Recommendations in Customer Engagement	157
8.5. Interactive Platforms: Enhancing User Experience	159
8.6. Integrating AI Recommendations with Interactive Platforms.....	162
8.7. Measuring Customer Engagement.....	164
8.8. Conclusion.....	166
References	168

Chapter 9: Applying predictive algorithms to monitor, maintain, and evolve OSS network performance efficiently169

9.1. Introduction	169
9.2. Understanding OSS Networks	170
9.3. Predictive Algorithms Overview	173
9.4. Data Collection and Analysis	175
9.5. Implementation of Predictive Algorithms.....	177
9.6. Monitoring Network Performance	180
9.7. Maintenance Strategies.....	182
9.8. Evolving Network Performance	184
9.9. Conclusion.....	187
References	188

Chapter 10: Deploying agentic artificial intelligence models to automate high-stakes decisions in product placement and store operations189

10.1. Introduction.....	189
10.2. Understanding Agentic AI Models	190
10.3. The Role of AI in Retail	193
10.4. High-Stakes Decisions in Product Placement.....	195
10.5. Automating Store Operations with AI	197
10.6. Ethical Considerations	199
10.7. Challenges in Deployment.....	201
10.8. Data Requirements for Effective AI Deployment.....	203
10.9. Conclusion.....	205
References	207

Chapter 11: Accelerating the adoption of industry 4.0 with intelligent manufacturing and IoT-integrated systems208

11.1. Introduction.....	208
11.2. Understanding Industry 4.0.....	210
11.3. Intelligent Manufacturing	212
11.4. The Role of IoT in Industry 4.0	215
11.5. Challenges in Adoption	218
11.6. Strategies for Accelerating Adoption.....	221
11.7. Future Trends in Industry 4.0	224
11.8. Case Studies of Successful Implementation	226
11.9. Conclusion.....	228
References	230

Chapter 12: Establishing secure, ethical, and sustainable artificial intelligence frameworks in retail and manufacturing infrastructure231

12.1. Introduction.....	231
12.2. The Importance of AI in Retail and Manufacturing.....	233

12.3. Current State of AI Technologies	234
12.4. Ethical Considerations in AI Deployment	236
12.5. Security Frameworks for AI Systems	238
12.6. Sustainability in AI Practices.....	241
12.7. Regulatory and Compliance Issues	243
12.8. Conclusion	245
References	246