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Study on Security System Management Analysis at Hailstone Technology Using the Ai Tool Jamovi

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ABSTRACT :

In the dynamic and highly competitive security system manufacturing industry, businesses face constant pressure to enhance operational efficiency, maintain high product quality, and control production costs. Traditional decision-making approaches, largely based on intuition and historical patterns, have often led to inefficiencies, delays, and increased operational expenses.

The integration of business analytics and artificial intelligence (AI) offers an innovative solution by enabling data-driven insights, real-time monitoring, and predictive analysis that optimize manufacturing processes. This study explores the impact of business analytics on improving operations, quality control, supply chain management, and overall business performance within the security system manufacturing sector. Through a combination of primary data collection via surveys and secondary research, the study identifies how the adoption of analytics helps address critical industry challenges, such as resource utilization, defect reduction, customer satisfaction, and forecasting demand.

Furthermore, the study analyzes the barriers to analytics adoption, including high costs, lack of skilled professionals, and organizational resistance to change. Data visualization techniques such as charts, graphs, and tables have been used to interpret survey results and extract actionable insights. The research concludes with recommendations to overcome these barriers and maximize the strategic benefits of analytics integration. This project ultimately highlights the vital role of business analytics in driving sustainable growth and innovation in the security systems manufacturing industry.

1.INTRODUCTION

1. The global security system manufacturing industry is undergoing a substantial transformation driven by technological advancements, growing market competition, and rising demand for intelligent and integrated security solutions. From surveillance cameras and biometric systems to alarm systems and access control, the manufacturing of security systems involves intricate production processes, stringent quality standards, and the need for rapid innovation. Amid this complexity, manufacturers are increasingly recognizing the power of data and analytics in optimizing their operations.

2. Traditionally, manufacturing decisions have relied heavily on human experience, historical records, and standard operating procedures. However, these conventional methods are proving insufficient in today's fast-paced and data-rich environment. Businesses that fail to adapt to data-driven methodologies risk falling behind competitors, facing delays, quality issues, or inflated operational costs. As such, business analytics has emerged as a strategic tool for enhancing efficiency, minimizing waste, ensuring product quality, and achieving better financial outcomes.

1.1.INDUSTRY PROFILE

ORGANIZATION PROFILE

Name of the Company	: Hailstone Technology
Field of Organization	: Electronic manufacturing
Year of Establishment	: Founded in 2012
Address	: 76, bharathiyat road, pn palayam, cbe-37
Contact	: +91 8056429903
E-mail	: hailstonetechnology@gmail.com
Founder of the Company	: Vignesh

ABOUT ORGANIZATION

Founded in the heart of Coimbatore, Hailstone Technology has emerged as a pioneering force in the field of technological innovation and sustainable solutions. With a commitment to excellence and a passion for progress, we specialize in developing cutting-edge technologies that cater to diverse industries, including manufacturing, renewable energy, and automation.

VISION:

Hailstone technology vision is to be a global leader in technological innovation, recognized for our commitment to sustainability and excellence. They aim to empower businesses and communities by providing them with the tools they need to thrive in an ever-evolving digital landscape. By integrating sustainability into our core business practices, we aspire to contribute to a greener future

MISSION:

At Hailstone Technology, mission is to harness the power of technology to create sustainable solutions that improve the quality of life while minimizing environmental impact. They believe that innovation should not only be about advancements in technology but also about responsibility towards our planet and society. Our goal is to lead the way in creating products and services that are both efficient and eco-friendly.

GOAL

Hailstone Technology, based in Coimbatore, is a research and development company specializing in electronics, electricals, automation, and information technology. Their goal is to create world-class products with the highest quality, ensuring safety and reliability. They offer services including research and development, PCB designing and manufacturing, contract manufacturing, prototyping, live telecasting, and reverse engineering.

1.2.SCOPE OF THE STUDY

This study explores the transformative role of business analytics in the security system manufacturing industry, with a particular focus on companies like Hailstone Technology in Coimbatore. As global demand for security systems rises, manufacturers are under pressure to enhance efficiency, quality, and cost-effectiveness. This study investigates how data-driven strategies using business analytics can streamline operations, improve decision-making, and increase overall productivity. The scope primarily centers around Indian manufacturing firms, especially small and medium enterprises (SMEs), that are navigating challenges such as lack of analytics expertise, high implementation costs, and resistance to change. It includes multiple levels of stakeholders from senior management to technical teams and operational staff to provide a 360-degree view of analytics adoption in real-world scenarios.

The study employs tools such as Microsoft Excel, Power BI, Tableau, and Python to demonstrate how data visualization, reporting dashboards, and automation can support real-time decision-making. It examines how these tools impact four key operational areas: operational efficiency, quality control, supply chain management, and strategic financial planning. By analysing these dimensions, the study highlights how business analytics contributes to reducing production downtime, minimizing waste, forecasting demand, and improving customer satisfaction.

Furthermore, the study integrates data visualization techniques such as charts, graphs, and dashboards to make analytical insights more accessible to non-technical decision-makers. It also investigates current trends and challenges such as data integration issues, training requirements, and the need for scalable analytics solutions while suggesting practical recommendations for smooth implementation.

2.REVIEW OF LITERATURE

Waller(2013):

Waller is a professor of supply chain management and Dean at the Sam M. Walton College of Business. In his articles titled as Revolution That Will Transform Supply Chain Design and Management authors emphasize the strategic importance of predictive analytics in supply chain decision-making. They argue that real-time analytics helps companies forecast demand, manage risks, and improve responsiveness in production environments.

Chen, Hsinchun(2012):

Hsinchun Chen is a Regents Professor at the University of Arizona. In his article titled as Business Intelligence and Analytics: From Big Data to Big Impact in this article explores how big data analytics helps transform traditional businesses into insight-driven enterprises. It emphasizes the importance of organizational readiness and data infrastructure in analytics adoption.

Sharma, Ritu(2014):

They are Scholars in information systems and digital transformation, with affiliations to institutions like University of Maryland and National University of Singapore. In his article titled as Research Agenda for Understanding the Impact of Business Analytics the authors outline a framework for analytics-driven transformation. They highlight how analytics enhances operational transparency, enabling better planning, particularly in complex industries like manufacturing.

Schoenherr(2015):

Professors at Michigan State University with expertise in operations management and supply chain analytics. In his article titled as Data Science, Predictive Analytics, and Big Data in Supply Chain Management the article outlines how manufacturing and logistics companies use predictive tools to streamline operations and manage supply chain uncertainties, especially in high-precision industries.

Dursun Delen & Haluk Demirkan(2013) :

Delen is a professor at the University of Oklahoma with expertise in business analytics. Demirkan is a senior researcher in analytics-based decision support systems. Their article titled as Data, Information and Analytics as Services – Decision Support Systems introduces the concept of analytics-as-a-service, focusing on how cloud platforms enable SMEs to access advanced analytics affordably and effectively.

Wamba, Samuel Fosso (2015):

Global researchers in IT and analytics. Their article titled as How 'Big Data' Can Make Big Impact This systematic review explores how big data analytics contributes to improved organizational agility, innovation, and efficiency across the manufacturing value chain.

McAfee, Andrew, Brynjolfsson (2012):

Renowned academics and consultants in digital business, data science, and innovation. McAfee and Brynjolfsson are associated with MIT.In their article titled as Big Data: The Management Revolution The authors show that companies leveraging big data achieve better performance. The study highlights how data shifts power from experience-based decisions to evidence-based operations.

Gunasekaran(2018):

International scholars in agile manufacturing and supply chain management, associated with UK and US universities. Their article titled as Agile Manufacturing Practices: The Role of Big Data and Business Analytics the authors show that analytics enables agile manufacturing by supporting real-time responses to customer needs and production shifts.

Ransbotham, Samm(2017) :

Analysts and researchers affiliated with MIT Sloan and the Boston Consulting Group, focused on digital transformation. In their article titled as shaping Business with Artificial Intelligence the article details how analytics (including machine learning) is being embedded in manufacturing systems to reduce waste and improve forecasting

PROBLEM STATEMENT

The security system manufacturing industry is undergoing rapid transformation, driven by increasing demand for smarter, more reliable, and cost-effective security solutions. To stay competitive, manufacturers must strike a delicate balance between efficiency, quality, and cost management.

The security system manufacturing industry faces increasing pressure to enhance efficiency, maintain quality, and reduce costs amidst growing market demands. Traditional decision-making approaches, often based on intuition and past trends, contribute to inefficiencies and rising operational expenses. Business analytics offers a powerful solution through real-time insights and predictive decision-making. However, the industry's adoption is hindered by challenges such as high implementation costs, lack of skilled personnel, and resistance to change.

This study examines how business analytics can optimize operations, improve quality and supply chain processes, and drive overall performance, while also addressing the barriers to successful implementation.

3.RESEARCH METHODOLOGY

A. RESEARCH DESIGN

The research design adopted for this study is descriptive and analytical in nature. It aims to explore how the integration of business analytics influences various operational areas in the security system manufacturing sector such as production, supply chain, and quality control. This study utilizes both primary and secondary data sources to gain in-depth insights into real-time decision-making, cost efficiency, and data-driven improvements.

B. HYPOTHESES FORMULATION

1. H_0 (Null Hypothesis)
2. H_1 (Alternative Hypothesis)

C. TOOLS USED FOR THE STUDY

The study uses both qualitative and quantitative techniques to analyze the data.
- Primary Data Collection Tool: Structured Questionnaire
- Statistical Tools Used for Analysis:
1. **Percentage Analysis**

2. **Chi-Square Test**

3. **ANOVA (Analysis of Variance)**

4. **SEM (Structural Equation Modeling)**

   • **Software Used**: Microsoft Excel ,Power BI,Jamovi.

   • **Secondary Data Collection:**

1. **Company Internal Reports**

2. **Product Manuals and Technical Documentation**

3. **Industry Whitepapers and Market Analysis Reports**

4. **Academic Journals and Research Papers**

5. **Web Sources**

OBJECTIVES OF THE STUDY

- To evaluate the level of adoption of business analytics tools in security system manufacturing companies.
- To assess the impact of business analytics on operational efficiency and quality control.
- To identify the challenges and barriers in implementing analytics solutions.
- To analyze how predictive and real-time analytics influence supply chain and cost optimization.
- To suggest data-driven strategies for enhancing business performance in the manufacturing process.

4.DATA ANALYSIS AND INTERPRETATION

CHI SQUARE TEST

Hypothesis:

H_0: There is no Significant association exists

- H_1:There is Significant association exists

- **Expected Frequencies (E):**
  (Row Total × Column Total) / Grand Total
  Example: IT Professional "Yes" = $(16 \times 38)/43 = 14.14$

Chi-Square Calculation:

- $\chi^2 = \Sigma[(O - E)^2/E]$
  Example: IT Professional "Yes" = $(15-14.14)^2/14.14 = 0.05$

Degrees of Freedom (df):

(rows - 1) × (columns - 1) = $(4-1)\times(2-1) = 3$
Critical χ^2 ($\alpha=0.05$, df=3): 7.815

Conclusion:

Since $1.69 < 7.815$ ($p > 0.05$), no significant association exists between profession and familiarity

INTERPRETATION

96% of respondents answered **"Yes"**, indicating a strong familiarity with security system products.A small portion of **4%** , answered **"Somewhat"**, suggesting limited awareness.

ANNOVA

Hypothesis:

- H_0: There is no Significant differences exist in perceived importance of real-time monitoring across professions.
- H_1: Significant differences exist in perceived importance of real-time monitoring across professions.

Step 1: Data Grouping

Step 2: Calculate Sum of Squares (SS)

1. **Total SS (SST):**16.85
2. **Between-Group SS (SSB):**6.10
3. **Within-Group SS (SSW):**10.75

Step 3: Degrees of Freedom (df)

- **df between (k-1):** 5 professions - 1 = 4

- **df within (N-k):** 60 - 5 = 55

Step 4: Mean Squares (MS)

- **MSB:**
  MSB=SSB/dfbetween =1.53
  MSB=dfbetween/SSB =1.53

- **MSW:**
  MSW=SSW/dfwithin =0.20
  MSW=dfwithin/SSW =0.20

Step 5: F-Value & Significance

F=MSB/MSW=1.53/0.20=7.65(Critical F4,55=2.54 at $\alpha=0.05$)
F=MSW/MSB=0.20/1.53=7.65(Critical F4,55=2.54 at $\alpha=0.05$)

Result: Significant ($p < 0.001$)

Final ANOVA Table

Source	SS	df	MS	F-value	p-value
Between	6.10	4	1.53	7.65	<0.001***
Within	10.75	55	0.20		
Total	**16.85**	**59**			

Conclusion: Significant differences exist ($p < 0.001$) in perceived importance of real-time monitoring across professions.

INTERPRETATION

- 62.7% of respondents consider real-time monitoring and alerts as Important.
- 27.5% believe it is Very Important, emphasizing a strong preference for proactive security features.
- 9.8% are Neutral, suggesting they do not prioritize or consider this feature critical.

5.CONCLUSION

A.MAJOR FINDINGS

1. **High Familiarity with Security Systems:**
2. **Purchase Behaviour:**
3. **AI and Analytics Adoption:**
4. **Operational Impact:**
5. **Workflow Challenges:**
6. **Competitive Advantage:**
7. **Cost Improvement Areas:**

B. SUGGESTIONS/RECOMMENDATIONS

1. **Enhance Analytics Adoption**:
   - Companies should invest in training programs to bridge the skill gap and promote data-driven decision-making.
   - Pilot analytics projects in high-impact areas like inventory management before scaling.
2. **Focus on Real-Time Monitoring**:
   - Prioritize AI-powered real-time alerts, as 90.2% of respondents valued this feature. This can improve responsiveness and security effectiveness.
3. **Address Cost and Inventory Issues**:
   - Implement analytics tools to optimize workforce productivity (51% priority) and reduce inventory costs (20.4%).
   - Adopt predictive analytics for demand forecasting to minimize raw material wastage (18.4%).
4. **Stakeholder Engagement**:
   - Leadership should communicate the benefits of analytics to overcome resistance and foster a data-centric culture.
   - Collaborate with analytics providers to reduce implementation costs and technical barriers.
5. **Customer-Centric Innovations**:
   - Align analytics-driven improvements with customer priorities (e.g., product features, brand reputation) to enhance satisfaction.

C. LIMITATIONS

1. **Self-Reported Data**:
   - Responses were subjective and prone to biases (e.g., overestimation of analytics' impact).
2. **Lack of Financial Metrics**:
   - The study lacked access to quantitative operational/financial data (e.g., cost savings, ROI) due to confidentiality constraints.
3. **Technological Evolution**:
   - Rapid advancements in AI/analytics tools may outdate some findings.
4. **Organizational Culture**:
   - Human factors (e.g., resistance to change) were not deeply explored but are critical for successful analytics integration.

D. SCOPE FOR FUTURE STUDY

1. **Expanded Industry Coverage**

- o Future research should include a larger and more diverse sample, encompassing security system manufacturers of varying sizes (SMEs to large enterprises) and regions (global markets). This would enhance the generalizability of findings.

2. **Integration of Advanced Technologies**
   - o Explore the role of emerging technologies like IoT, blockchain, and edge computing in enhancing security system analytics.
   - o Investigate how generative AI (e.g., predictive maintenance, automated threat detection) can further optimize manufacturing processes.

3. **Human and Organizational Factors**
   - o Assess the impact of organizational culture, leadership support, and employee training on successful analytics adoption.
   - o Examine resistance to change and strategies to foster a data-driven mindset in traditional manufacturing environments.

4. **Customer-Centric Analytics**
   - o Study how analytics can improve customer experience (e.g., personalized security solutions, post-purchase support).
   - o Analyze the role of sentiment analysis from customer feedback in product innovation.

E.CONCLUSION

The study highlights the significant role of AI-powered business analytics in revolutionizing the security system manufacturing industry. Findings indicate that analytics enhances operational efficiency, quality control, and decision-making, with real-time monitoring and predictive insights proving particularly valuable. Despite these benefits, challenges such as high implementation costs, skill gaps, and resistance to change hinder widespread adoption.

To remain competitive, manufacturers must prioritize data-driven strategies, invest in workforce training, and align analytics with customer expectations. Future research should explore advanced technologies (IoT, generative AI), organizational culture, and sustainability to further optimize industry performance. By embracing analytics, security system manufacturers can achieve greater innovation, cost savings, and long-term growth, ensuring their relevance in an increasingly digital and competitive market. This study underscores the need for continuous adaptation, positioning analytics not just as a tool but as a strategic imperative for future success.

BIBLIOGRAPHY

1. Waller, M. A., & Fawcett, S. E. (2013).
   Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management. Journal of Business Logistics, 34(2), 77–84. https://doi.org/10.1111/jbl.12010

2. Chen, H., Chiang, R. H. L., & Storey, V. C. (2012).
   Business intelligence and analytics: From big data to big impact. MIS Quarterly, 36(4), 1165–1188. https://doi.org/10.2307/41703503

3. Sharma, R., Mithas, S., & Kankanhalli, A. (2014).
   Transforming decision-making processes: A research agenda for understanding the impact of business analytics. MIS Quarterly Executive, 13(4), 213–231.

4. Schoenherr, T., & Speier-Pero, C. (2015).
   Data science, predictive analytics, and big data in supply chain management: Current state and future potential. Journal of Business Logistics, 36(1), 120–132. https://doi.org/10.1111/jbl.12082

5. Delen, D., & Demirkan, H. (2013).
   Data, information and analytics as services. Decision Support Systems, 55(1), 359–363. https://doi.org/10.1016/j.dss.2012.05.044

6. Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015).
   How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. International Journal of Production Economics, 165, 234–246. https://doi.org/10.1016/j.ijpe.2014.12.031

7. Chae, B. (2015).
   Insights from hashtag #supplychain and Twitter analytics: Considering Twitter and Twitter data for supply chain practice and research. International Journal of Production Economics, 165, 247–259. https://doi.org/10.1016/j.ijpe.2014.12.037

8. McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D. J., & Barton, D. (2012).
   Big data: The management revolution. Harvard Business Review, 90(10), 60–68.

9. Gunasekaran, A., Yusuf, Y. Y., Adeleye, E. O., & Papadopoulos, T. (2018).
   Agile manufacturing practices: The role of big data and business analytics with multiple case studies. International Journal of Production Research, 56(1–2), 385–397. https://doi.org/10.1080/00207543.2017.1395488

10. Ransbotham, S., Kiron, D., Gerbert, P., & Reeves, M. (2017).
    Reshaping business with artificial intelligence: Closing the gap between ambition and action. MIT Sloan Management Review and Boston Consulting Group.