

Literature Review: Application of Computer Integrated Manufacturing (CIM) to Increase Operational Effectiveness and Company Productivity

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ABSTRACT

Keywords

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Computer Integrated Manufacturing (CIM) is a manufacturing method and the name of an automated computer system by which the individual engineering, production, marketing, and support functions of a manufacturing company are organized. In a CIM system, functional areas such as design, analysis, planning, purchasing, cost accounting, inventory control, and distribution are linked via computers providing direct control and monitoring of all process operations. This study aims to analyze and review the literature on Computer Integrated Manufacturing in previous research through references to international journal articles by considering the discussion of the application of CIM in a manufacturing industry case for production efficiency and company operations with article sampling parameters such as being indexed in Scopus Q3.

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1. Introduction

In the business world, the emergence of economic globalization has created a very tight level of competition among companies in the world. This tight level of competition is applied to the shift in market orientation, from producer orientation to consumer orientation. The shift in market orientation that occurred resulted in a change in product creation philosophy, from mass product creation (mass production) to product creation to meet consumer needs (mass customization). This situation encourages many manufacturing companies to use new, more advanced technologies, especially in the manufacturing sector. The application of advanced manufacturing technology is intended to increase flexibility, productivity, and product quality at a lower cost level. This environmental change in manufacturing has made the traditional manufacturing cost management system no longer appropriate and the company needs to create a cost management system that is relevant to the advanced manufacturing environment.

Introduction Computer Integrated Manufacturing (CIM) is a manufacturing method and the name of an automated computer system in which the individual engineering, production, marketing, and support functions of a manufacturing company are organized. In a CIM system, functional areas such as design, analysis, planning, purchasing, cost accounting, inventory control, and distribution are linked via computers providing direct control and monitoring of all process operations. The term computer integrated manufacturing (CIM) was coined to prove how widespread the use of computers is to design products, plan production, carry out operations, and perform various functions related to business operations needed in manufacturing companies. The CIM concept is considered to be one of the initiators and key factors in the development of industrial technology, where this paradigm shows that the modern manufacturing industry is currently being transformed

into a global manufacturing network and supply chain that allows the use of manufacturing systems and resources that are distributed globally.

The purpose of this study is to analyze literature studies related to the application of Computer-Integrated Manufacturing (CIM) in increasing production and operational effectiveness in several previous studies through reference articles and international journals by considering its application in various case studies in the manufacturing industry and investigating the results achieved. From the background explanation above, the researcher took the initiative to conduct this research with the aim of analyzing and reviewing the literature on Computer Integrated Manufacturing in previous research through references to international journal articles by considering the discussion regarding the application of CIM in a manufacturing industry case for production efficiency and company operations.

2. Research Methodology

The main objective of this study is to analyze and review the literature derived from previous research, where the literature discusses the application and use of computerized integrated manufacturing in an organization or company. This research focuses on articles/papers that aim to explain the application of CIM, and case studies on CIM. Of course, there are many similar research publications, but to narrow down and emphasize the research, the following parameters are used

- a. Research with a discussion of the application of CIM
- b. The research taken is the last 4 years of research
- c. Scopus indexed, minimum Scopus Q3 index

So from these parameters it can be obtained several studies that are in accordance with the above parameters with the results of 5 articles. The methodological structure of this study can be seen as follows:

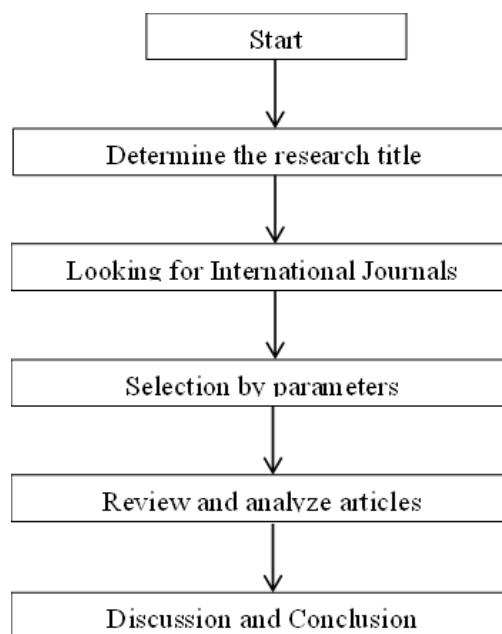


Fig. 1.Literature Review Methodology

3. Results and Discussion

3.1. Results of Literature Review Articles

Table 1. Article Identity		
Journal	Journal Identity	
1	Title	Product Design And Manufacturing System Operations: An Integrated Approach For Product Customization
	Journal	International Journal of Latest Technology in Engineering, Management & Applied Science (IJLTEMAS)
	Index Scopus	Q3
	Writer	Charles C., Okpala
	Year	2020
	Volumes and Pages	Vol. 8, Issue 3, Pages 1-8
	ISSN	2278-2540
2	Title	Using IOT Technology For Computer-Integrated Manufacturing Systems In The Semiconductor Industry
	Journal	Applied Soft Computing
	Index Scopus	Q2
	Writer	Yu-Qiang C., Biao Z., Chien Ming C.
	Year	2020
	Volumes and Pages	Vol 89, Issue 4, Pages 106065
	ISSN	
3	Title	An IIoT-Driven And Ai-Enabled Framework For Smart Manufacturing System Based On Three-Terminal Collaborative Platform
	Journal	Advanced Engineering Informatics
	Index Scopus	Q2
	Writer	Heshan L., Xin Y., Jia G., Su H.
	Year	2021
	Volumes and Pages	50, 101370
	ISSN	1474-0346
4	Title	An Integrated Intelligent Manufacturing Model Based On Scheduling And Reinforced Learning Algorithms
	Journal	Computers & Industrial Engineering
	Index Scopus	Q1
	Writer	Chang L., Renqing L., Letian S.

	Year	2021
	Volumes and Pages	155, 107193
	ISSN	0360-8352
5	Title	Human-Computer-Machine Interaction for the Supervision of Flexible Manufacturing Systems: A Case Study
	Journal	IFAC-PapersOnLine
	Index Scopus	Q2
	Writer	Edgas SC, David AG, David DL, Giacomo B
	Year	2020
	Volumes and Pages	53, 10550-10555
	ISSN	2405-8963

Table 2. Summary of CIM Implementation Methods and Approaches

Journal	Summary of Methods and Approaches in Implementing CIM	
1	Title	Product Design And Manufacturing System Operations: An Integrated Approach For Product Customization
	CIM Method/Approach	Computer Aided Manufacturing (CAM), Computer Aided Design (CAM)
	Applied to	Air Conditioner (AC) Production Quality at the Electronics Development Institute (ELDI) in Nigeria
2	Title	Using IOT Technology For Computer-Integrated Manufacturing Systems In The Semiconductor Industry
	CIM Method/Approach	Internet Of Things with deep learning methods
	Applied to	Semiconductor industry company
3	Title	An IIoT-Driven And Ai-Enabled Framework For Smart Manufacturing System Based On Three-Terminal Collaborative Platform
	CIM Method/Approach	Artificial Intelligent Programs, Industrial Internet of Things
	Applied to	Manufacturing industry companies using autonomous connect manufacturing machines (ACMMs)
4	Title	An Integrated Intelligent Manufacturing Model Based On Scheduling And Reinforced Learning Algorithms
	CIM Method/Approach	Integrated Automatic Manufacturing using Applications
	Applied to	Laundry Industry
5	Title	Human-Computer-Machine Interaction for the Supervision of Flexible Manufacturing Systems: A Case Study
	CIM Method/Approach	Human Computer Machine Interaction

3.2. Application of Computer-Integrated Manufacturing in Efforts to Increase Company Productivity and Operations

The five selected articles have been summarized in the table above. Based on this, this study will provide an in-depth discussion of the five articles related to CIM.

Research conducted by Okpala and Charles C.[1] , discusses the impact of the manufacturing strategy on the Institute Electronics Development (ELD) in Awka-Nigeria. The many benefits of manufacturing processes are covered, but not limited to faster response to data changes for manufacturing flexibility, increased flexibility with new product introductions, increased accuracy and quality in manufacturing processes, and improved product quality are also discussed in detail. As a result, during the production pace of manual AC stabilizers, ELDI had many orders delayed due to production delays. However, with the application of CIM in manufacturing stabilization, the increase in production rate is very significant. In addition, other advantages that can be achieved by using CIM in companies include flexibility,

Yu-Qiang C., Biao Z., and Chien Ming C [2] in their research discussed the Internet of Things-based Computer Integrated Manufacturing system using deep learning methods into FABs in semiconductor companies. The application of CIM with IoT RFID technology is considered better than using a smart tag barcode system, where it is estimated that companies can save US\$ 2.8 million by adopting IoT RFID compared to other technologies. In addition, when viewed from a productivity perspective, it can be said to be more efficient in terms of efficiency in operational and production activities because it can reduce errors from the previous system. Finally, the technology can work with equipment engineers and key equipment vendors to improve the reading quality of RFID tags in both hardware and software.

Heshan L., Xin Y., Jia G., and Su H. [3] in their research discussed the application of Artificial Intelligence and Industrial Internet of Things in Smart Manufacturing Services (SMS). In this research it is proven that AI-enabled/derived services and IIoT-driven services can facilitate collaborative production and improve production efficiency. From this study it can be concluded that ACMM (autonomous connect manufacturing machine) can be designed with the concept of smart manufacturing by using and implementing Enable-AI and IIoT-Driven systems, where these services can optimize production, manage production and network.

Chang L., Renqing L., and Letian S. [4] in their research discusses the application of automation systems that are useful for the laundry industry, especially hotels with laundry contractors. The research explained that at first the traditional laundry business for hotels and contractors was inefficient and opaque. With mismatched information, out-of-control logistics and inconsistent quality-control standards, both parties found themselves trapped in a cycle of complaints, negotiations and compromises. Hotels and contractors need creative business models to process real-time dynamic order flows, schedule optimal logistics, and initiate integrated laundry with consistent laundry quality control parameters predefined at the optimal workload for each laundry terminal. In this study, An innovative entrepreneurial model for the next generation of commercial laundry businesses has been proposed to demonstrate theoretical and empirical feasibility for the integration of computer algorithms, industrial automation, and information systems in the Web 2.0 era. The business uses cutting-edge interdisciplinary technologies from Web 2.0, Operations Research, AI, and Integrated Automatic Manufacturing to solve practical problems for hotels outsourcing their laundry functions and for contractors practicing laundry services.

Edgas SC, David AG, David DL, and Giacomo [5], in their research discussed Human Computer Machine Interaction in the control of flexible manufacturing systems. In this study, the HCMI architecture is designed to support operator supervision activities in accordance with the objectives of the FMS (Flexible Manufacturing System). The proposed interactions are implemented and validated in case studies – ie. a robot that simulates cutting operations. The results obtained confirm how the proposed HCMI architecture enables seamless interaction between operators, computers and machines (i.e. robots). In addition, the proposed HCMI enables near real-time monitoring of manufacturing systems in adapting to production changes.

4. Conclusion

From several international journals/articles described in the results and discussion sections, it is observed and it can be concluded that CIM is a concept/philosophy for integrating various business functions (marketing, design, delivery, transportation, production, and distribution) with automation functions in a manufacturing . system. The automation function in question is the integration of process automation with data communication using a computer network. This study summarizes and identifies that Computer Integrated Manufacturing (CIM) integrated with Manufacturing Information Systems is a computer-based manufacturing technology concept/system that works in conjunction with other functionalities.

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