

# Impact of Information Systems on Operational Efficiency: A Comprehensive Analysis.

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## Abstract:

**This study highlights several important ways information systems contribute to operational efficiency. Automation and streamlining of tasks reduces manual work, minimizes errors, and frees up employees to focus on value-adding activities. Data integration and analysis enables organizations to identify trends, patterns and insights that optimize processes and make informed decisions. This data-driven approach facilitates effective resource allocation, reduces waste, and improves overall operational performance.**

**Information systems facilitate improved communication and collaboration within and between departments, ensuring seamless coordination and knowledge sharing. It enables organizations to respond quickly to change, reduce risk, and keep operations running smoothly. Also, information systems play a key role in improving customer service through personalized interaction, efficient support and accurate tracking of customer preferences.**

**Furthermore, information systems provide performance measurement and continuous improvement tools that enable organizations to identify inefficiencies, set benchmarks, and drive continuous improvement. Key performance indicators (KPIs) help monitor progress and support data-driven decision-making, ultimately leading to sustained operational efficiency.**

**Keyword: Key performance indicators (KPI); Customer Relationship manager (CRM); Real time; Information systems.**

## 1Introduction:

The rapid pace of innovation in business environment, have put companies under pressure to increase operational efficiency and gain competitive advantage. In order to handle these challenges, many companies are turning to information systems as a strategic tool. Information systems consist of multiple factors such as technologies, software, networks which facilitate the collection, storage, processing as well as distribution of data within an organization. They have revolutionized the way businesses work, enabling streamlined processes, better decision-making, and more efficient use of resources [1].

There is significant effect of information systems on the performance of operation; the effect is relevant as well as pervasive. By using technology to integrate data, companies can automate tasks, streamline workflows, improve communication, and gain real-time insights into their operations. These skills have a huge impact on businesses across industries, from manufacturing and logistics to finance and customer service [2][3].

The core areas of information systems are task automation and streamlining. This contributes immensely to operational efficiency. Moving away from manual tasks, repetitive tasks and replacing with automated processes, organizations can significantly reduce the time and effort required to complete routine tasks. This not only minimizes the risk of human error, but also frees up employees to focus on value-added activities that contribute to innovation and strategic growth [4].

In addition, information systems enable the integration and analysis of data, which plays an important role in optimizing business processes. For instance, integrating verifiable facts from different departments of the business can guarantee a thorough appraisal of their activities and bring out patterns, trends and insights that enable informed decision making. Real-time give access to accurate data, which allows administrators to make timely adjustments, optimize resource allocation, and improve overall operational performance [5].

Effective communication and collaboration are also critical to efficiency in operation and information systems provide an avenue that enables seamless interaction as well as knowledge sharing. These systems enable teams to work together regardless of geographical boundaries, foster effective teamwork, and ensure a smooth flow of information across departmental and organizational levels. Better communication leads to better coordination, less duplication of effort, faster response times, and ultimately greater operational efficiency [6].

The real-time monitoring and control capabilities provided by the information system further contribute to operational efficiency. By integrating with sensors and Internet of Things (IoT) devices, organizations can continuously monitor operations and detect anomalies and deviations from expected performance. This enables immediate action, keeps operations on track, reduces risk, and proactively addresses potential disruptions.

The effect of information systems on efficiency of operations also extends to customer service. CRM (Customer Relationship Management) systems enable businesses to collect and analyze customer data, personalize interactions, and provide efficient support. This results in faster response times, higher customer satisfaction, increased loyalty, and ultimately improved overall operational efficiency [7].

Supply chain management is another area where information systems play an important role in improving operational efficiency. These systems enable efficient inventory management, demand forecasting and logistics optimization by integrating suppliers, manufacturers, distributors and retailers. Businesses can ensure that the right products are available at the right time, minimize out-of-stocks and overstocks, and reduce costs associated with supply chain inefficiencies.

Finally, information systems provide tools for performance measurement and continuous improvement. The ability to track and analyze key performance indicators (KPIs) helps organizations identify areas.

## 2 REVIEW OF LITREATURES AND JOURNALS:

Hardware, software, data people and process are the five major components of information systems. The first three originates from technology, which is thoroughly considered when explaining information systems. The remaining two factors, people and processes, illustrate the difference between information systems and more scientific field such as computer science. To have a comprehensive knowledge of information systems, we need to have a clear idea of how all these factors interrelates to provide benefit to any business.

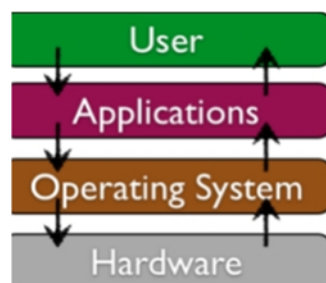


Fig1: Information system components. Source: [8]

- **Technology**

Technology is the scientific application of knowledge for practical purposes. From the innovations that brought us the wheel, to the use of electricity and artificial lighting, technology has permeated every aspect of our daily

lives and is considered ubiquitous. As mentioned earlier, the first three components of information systems (hardware, software and data) can be categorized under technology.

- **Hardware**

The physical and tangible part of an information system is referred to as hardware. Computers, hard disk, mother board, RAM and ROM are some of the components of hardware. These physical components that form the hardware interact and work together with other components to achieve desired result.

- **Software**

The step by step instructions that inform the hardware of activities to carry out is called the software. It is invisible and intangible, mostly written in languages that can be understood by the computer. Experts in the field create software by arranging a set of instructions that manipulates the hardware. Software can be classified into operating systems and application software. Operating system enables the interaction of the hardware and application software. Examples of operating systems are Microsoft Windows and Ubuntu Linux. The key players in the operating system for mobile devices are Google Android and Apple iOS. Application software allows the creation of documents, logging of data to spreadsheets, text messages to friends, and other tasks.

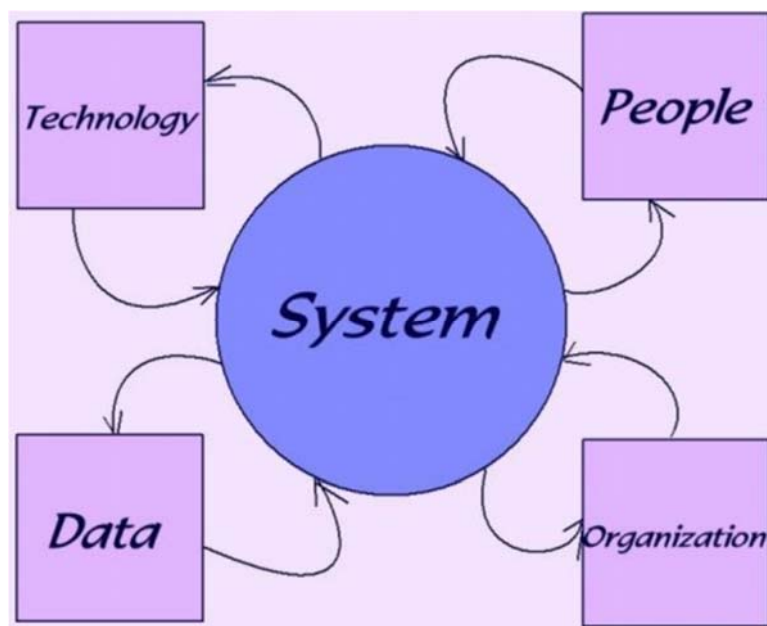


Fig 2: System analysis diagram. Source: [9]

- **Data**

The next component under technology is data. Data are set of facts that are verifiable. Addresses components like the street, zip code, state and city, phone numbers, and individual accounts for social networking are all examples of data. Raw facts collected needs to be organized and like software it is immaterial and invincible in its original form. Standalone or disorganized data is of less importance until arranged, indexed, and organized in a database. The refined output becomes a tool for business evaluation and planning. Businesses can obtain data from different sources, use it to make decisions and carry out business forecast. This analysis and forecast is used to improve organizational performance and efficiency.

### 2.1 People in information system

Information systems go beyond the scientific application components which are hardware, software, and data. However, to have an understanding of how these tools can be integrated into the workings of an organization, we need to look at what coordinates these tools. Peoples involvement in information systems implementation is critical, to coordinate the human interface with technology and evaluate the relevance to business performance.

Starting from front-line help desk staff to Chief Information Officers (CIOs), everyone involved in information systems is an important element that cannot be overlooked in making technology practically useful. Qualified

personnel are an integral part of any information system. Our professional staff includes but not limited to managers that can handle different aspect of the business. They range from operations managers, business analysts, systems analysts and designers, database administrators, programmers, computer security specialists to computer operators. In addition, all employees of the organization must be equipped to deliver on the potential of information systems as comprehensively as possible. Billions of people around the world use the web to learn about information systems operation, and maintenance procedures as part of the document information systems deploy for evaluation. Take for instance, to run a payroll program, there is a need to establish procedures such as who runs it, when is it run, and how to have access to the output. Autonomous effort in computing field is driving increasingly automated data center operations, with procedures built into the software that controls the data center.

## 2.2 Information System Processes

Process can simply be explained as “set of steps carried out to arrive at a set objective or result”. Information systems are increasingly incorporated into processes in businesses. This involvement improves performance and gives clear overview of these activities. However, using scientific processes to automate activities will involve several decisions.

Companies that want to use their information systems effectively need synergizing of these processes. The climax and focus is to use technology to carry out and improve transactions in every facet of the business and improve stakeholders’ satisfaction. Acronyms could be coined to re orientate people, operations and re-engineering technology as well as business process to have continuous improvement of the vision and mission. Companies seeking to have an edge and comparative advantage over their fellow stakeholders should leverage on improving their information systems.

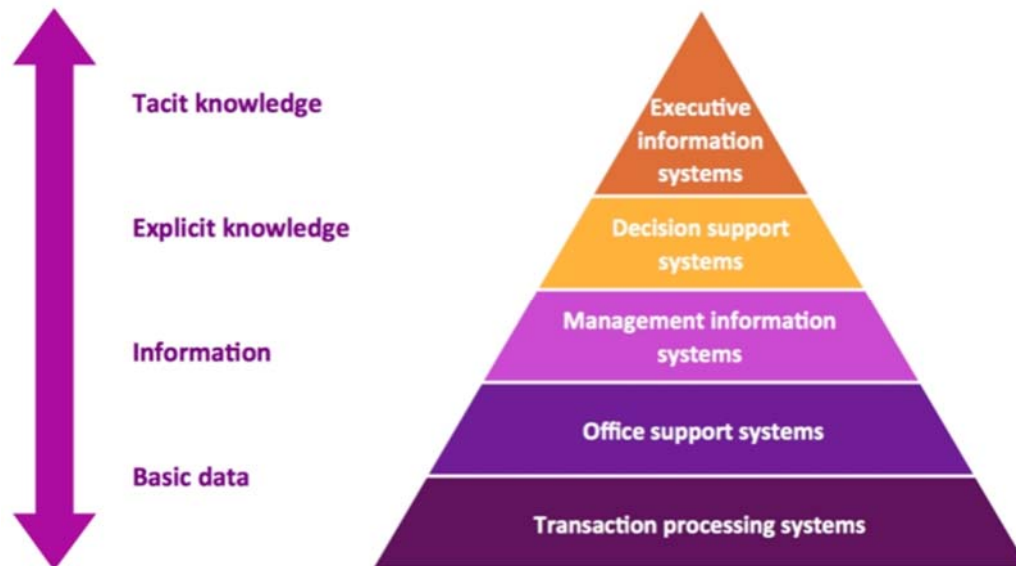


Fig3: 5 level pyramid model diagram. Source: [10]

## 2.3 Review of journals

This review section provides an in-depth exploration of the key concepts related to business intelligence, analytics, and impact of information system for operational efficiency. Although the primary focus of the review is to include empirical research, it will also involve prescriptive and conceptual contributions, ensuring a detailed analysis. Ten interconnected academic papers were analysed, providing details of the article's title, authors, the problem under investigation, the methodology employed to address the problem, the achieved outcomes, and the identified research gap.

2.3.1 Title: *Working around insufficient information systems in their working environment: An empirical study in Romania [11].*

Author: Wong, L.H.M., Hurbean, L., Davison, R.M., Ou, C.X., Muntean, M.

Problem: The problem addressed in this study is the existence of insufficient information systems in the areas where staff carry out their day to day activities and the consequences that Romanian workers face.

Methodology: Researchers conducted an holistic study in to investigate how workers in Romania deal with not having enough information systems in their work environment. The study used qualitative research techniques

such as interviews and observations to collect data from employees in various industries and organizations. This study also uses a research model that integrates workaround and coping theories to explore the relationship between employee attitudes toward inappropriate information systems (IS), corporate policies, and workaround behavior. . Data for this study was collected from his 310 employees working in Romanian organizations that currently use enterprise systems.

*Findings:* This study revealed several important findings. First, Romanian employees faced many challenges due to inadequate information systems, such as delayed access to relevant information, difficulty in sharing information, and reduced work efficiency. Second, the study identified various strategies and workarounds employed by employees to address deficiencies in information systems. B. Seeking information from alternative sources, using informal communication networks, and developing personal workarounds. Finally, the study explored the impact of inadequate information systems on employee satisfaction, productivity and overall job performance.

*Gaps:* Potential gaps include the lack of research on the specific challenges faced by Romanian workers in relation to inadequate information systems, the strategies and avoidances that workers apply to address these challenges. Lack of studies examining strategies and detailed analysis leads to poor information systems on deliverables in the Romanian context.

### 2.3.2 Incorporating blockchain technology in information systems research [12].

*Author:* Dubey, R., Gupta, M., Mikalef, P., Akter, S.

*Problem:* The issue addressed in this article is the present situation of findings on blockchain technology in information systems. The article highlights that while blockchain technology has received a lot of attention and is being hailed as a breakthrough innovation with great potential, research in this area is still in its early stages. The problem is the lack of comprehensive and detailed research on blockchain technology in the context of information systems.

*Methodology:* This article invites papers from researchers and the broader academic community.

*Result:* This article provides results, insight and emphasizes the need to invite research from the broader academic community to further our understanding of blockchain technology in information systems.

*Gaps:* The gaps identified in the literature are the foundational stages of blockchain technology research in information systems. The article states that most of the existing research is purely descriptive, focusing on technical aspects and applications of blockchain technology in various fields. Beyond the technical aspects, this gap lies in the lack of comprehensive research that provides greater insight into the adoption, implementation and management of blockchain technology in complex business environments, especially area of latest technology.

### 2.3.3 The effect of information systems and non-financial information on company success

*Author:* Albertina Paula Monteiro, Joana Vale, Eduardo Leite, Marcin Lis, Joanna Kurowska-Pysz [13].

*Problem:* The problem addressed in this study measures the effect of accounting information system on validity, in-house control process and non-financial information quality on business performance, particularly thought evaluation process and non-financial information quality. The aim of the investigation is to leverage on the synergy between these components and understand their impact on business success.

*Methodology:* Structural Equation Modeling (SEM) was adopted in this research as a methodology to analyze the relationships between various components. Data was collected from managers of 381 Portuguese companies and the model is empirically tested against this dataset. The study assesses the effect of accounting information system quality, in-house control system quality, and non-financial information quality on decision-making success and non-financial performance.

*Results:* The output reveals that both the integrity of accounting information systems and the quality of internal control systems directly affects the quality of non-financial information. Moreover, these quality elements of information and control systems have an indirect consequence on successful thought process. Furthermore, we found that high-quality non-financial information determines effective decisions and indirectly have influence on non-financial evaluation. Exploratory variables, including information and control system quality factors, account for over half of the non-monetary appraisal.

*Gaps:* A gap identified in the literature is a narrow focus on the quality of non-monetary report and its effect on decision on steps to take to be efficient and non-financial result indicators. Previous studies have focused primarily on the quality of monetary report and financial appraisal. This research empirically shows that the significance of the content of information and management systems add positively to the exact value and usefulness of non-financial report, which in turn produces business success.

### 2.3.4 Information system and corporate income tax enforcement: Evidence from China

*Author:* Chengrui Xiao, Yuchen Shao [14].

*Problem:* The problem addressed in this study is the effect of the introduction of information system, specifically the Chinese tax administration reporting system "CTAIS-3" Corporate Income Tax Enforcement (CIT) Pilot Project. The aim of this research was to find out how CTAIS-3 pilot project which lowers information asymmetries between tax authorities in different regions, affects corporate tax avoidance behavior and corporate tax enforcement.

*Methodology:* This study uses the regional differences created by the actualization of CTAIS 3 pilot project which comes up during year 2013 to explore the causal relationship between information systems and corporate tax enforcement. The authors utilize a comprehensive information system that collects and confirms the business and financial conditions of companies from third parties, and makes available the information in tax offices in other regions. This study may use econometric or statistical modeling techniques to analyze data and draw conclusions.

*Results:* The results bring to reality the implementation of the CTAIS 3 pilot has appreciably reduced compliant and non-compliant tax evasion by businesses. Enforcement of tax brought improvement which is particularly important for low and medium businesses under the jurisdiction of state tax authorities, non-state enterprises, and businesses in cities having high local tax burdens. In addition, CTAIS-3 has improved corporate tax enforcement by restraining companies from understating or overstating their receivables, liabilities, inventories and employee numbers. Overall, the introduction of CTAIS-3 will make it almost impossible for companies to evade tax authorities and falsify their tax report.

*Gaps:* A gap identified in the literature is the small number of research on the role of information systems in corporate tax administration, especially in developing countries. Previous studies have explored the effect of information on tax enforcement in advance countries and value-added tax in third world countries but research on the role of information systems in corporate tax adherence in developing countries is lacking. This study identifies this gap by cross checking the causal relationship between the CTAIS-3 pilot and corporate tax compliance in China.

### 2.3.5 A business strategy, operational efficiency, ownership structure, and manufacturing performance: The moderating role of market uncertainty and competition.

*Author:* Sofik Handoyo, Harry Suharman, Erlane K. Ghani, Slamet Soedarsono [15].

*Problem:* The problem addressed in this study is to investigate the immediate consequence of internal factors like business strategy, operational efficiency, and acquisition structure on performances in areas of manufacturing. The study also aims to analyze how these internal factors interact with external factors like market unpredictability and competitive intensity to affect performance in manufacturing sector. Additionally, this aims to find the similarities and the differences in manufacturing performance between firms with aggressive and defensive strategies, and between firms owned by foreign firms and firms owned locally, in terms of operational efficiency.

*Methodology:* The research uses a specimen of manufacturing companies registered on the Indonesian Stock Exchange between 2014 and 2021. Quantitative research and statistical analysis techniques are used to explore relationships between variables of interest. This study may use regression analysis or structural equation modeling to assess the direct and interacting effects of internal and external factors on manufacturing performance.

*Results:* The outcomes reveal that business strategy, operational efficiency and ownership structure have a substantial positive impact on manufacturing performance. The study also found that increased competition among firms boosts manufacturing efficiency. In fierce business competition, foreign manufacturers tend to have a competitive advantage over domestic companies. Furthermore, manufacturers with aggressive business strategies (Prospector and Analyzer) perform appreciably better than those with defensive strategies (Defender and Reactor).

*Gaps:* A gap identified in the literature is the need for a comprehensive understanding of the interactions between internal and external factors and their impact on manufacturing performance. Previous research has investigated the impact of individual factors on performance, but a comprehensive approach that considers the combined impact of business strategy, operational efficiency, ownership structure, market uncertainty, and the intensity of competition research is lacking. This research aims to fill this gap by finding out how these factors interact and by developing a higher-level understanding of their impact on manufacturing performance.

### 2.3.6 An information model for highway operational risk management based on the IFC-Brick schema

*Author:* Bencheng Zhu, Fujin Hou, Tao Feng, Tao Li, Cancan Song [16].

*Problem:* The purpose addressed in this study is the insufficiency of data model for highway operational risk management (HORM) adopting digital twin technology. Digital twin technology is being used in various fields, including expressways, but its application to HORM is still in its early stages. In addition, the HORM phase needs to bridge the gap between static highway models and dynamic data, as existing data prototypes from other areas are not useful to highways.

*Methodology:* This study proposes an information prototype for HORM by analyzing data needs and architecture of highway regions. This includes sensors and devices used by HORM. a) Sensors for collecting traffic operation data, sensors for collecting weather data, devices for transmitting administrative information, and devices for data transmission. This research uses Industry Foundation Classes (IFC) standards and Brick Ontologies as the basis for the data model. A new class and set of attributes are defined, and an integrated method for implementing system that joins static and dynamic figures is proposed.

*Results:* Findings of this research include the development of data architecture for HORM, sensor and device identification and classification code methods, data relationship methods, and system development. Information model proposed consists of five components: basic highway products, traffic sensors and equipment, traffic rules, traffic flow, and weather. These layers fall into another categories: highway product data, topology data, and sensor data. The integration of static highway models in IFC format with dynamic data is facilitated by the proposed data model.

*Gaps:* Insufficient data model specifically designed for HORM in the context of digital twin technology is one of the gaps identified. Digital twin technology is used at various stages of highway development, but has limited application in the operational stage, especially in risk management. Data models available from other areas are not directly useful for highways, so we need to develop data models that bridge the gap between static and dynamic data. The proposed information model has the potential to fill this gap and facilitate data exchange and application in highway operational risk management.

### 2.3.7 Integration of operational lockout/tagout in a joint production and maintenance policy of a smart production system

*Author:* Victor Delpla, Jean-Pierre Kenné, Lucas A. Ho [17].

*Problem:* The problem addressed in the research activity is the optimization of production and maintenance plans in intelligent manufacturing systems. The biggest challenge is minimizing production and storage costs and not jeopardizing safety. Lack of power interlocks, especially in the form of lockout/tagout procedures (LOTO), has been identified as a significant cause of accidents during maintenance operations. However, LOTO is often a productivity hindrance and is not effectively incorporated into optimization guidelines. The problem is therefore to find a solution that reconciles cost optimization with occupational safety and incorporates his LOTO measures in operations that allow production to continue.

*Methodology:* In this study, we apply stochastic optimal control theory and dynamic programming techniques to develop models of collaborative production and maintenance control in intelligent production systems. Decision variables in the model include production and preventive maintenance rates as a function of usage. The objective is to find the optimal control policy that minimizes costs while considering the possibility of machine failure and repair. Optimality conditions are derived based on the Hamilton-Jacobi-Bellman (HJB) equation and numerical methods are used to solve the equation and obtain the optimal values of the decision variables.

*Result:* Developed model is validated using numerical examples to bring to reveal the least cost and optimal figures of the working variables. Numerical analysis shows effectiveness of the proposed operational LOTO strategy in reducing costs and improving production continuity compared to the traditional LOTO strategy. The results provide insight into system behavior and the impact of various parameters on the optimal control policy.

*Gap:* This research paper highlights that despite extensive research on joint production and maintenance management in creative industries, managing risks associated with chronic unease circumstances when carrying out maintenance activities can be categorized as untapped area. Aspects of security, especially his LOTO operationally, have not been integrated into the optimization guidelines. A gap identified in the study, therefore, lies in the need for improved approaches and policies that effectively ensure worker safety in maintenance activities while optimizing production and maintenance planning in intelligent manufacturing systems. The proposed model and results help fill this gap by introducing a common optimization approach and demonstrating the benefits of operational LOTO in reducing costs and ensuring production continuity.

### 2.3.8 Estimating the operational and service efficiency of bus transit routes using a non-radial DEA approach

*Author:* Samet Güner , Erman Coşkun [18].

*Problem:* Problem identified in the study is the limitation of existing DEA (data envelopment analysis) models in simultaneously assessing service and operational efficiency of public transportation system. Existing DEA models combine efficiency variables into one model or develop separate models for operational and service efficiencies, resulting in conflicting performance indicators for non-efficient routes and overlooking interrelationships between input variables.

*Methodology:* The methodology proposed in this research is a non-radial DEA approach that considers limitations of existing models. It considers the mathematical relationship between the operational efficiency and the service efficiency model where the aim is to identify most efficient values that provide input/output targets peculiar to specific bus route.

*Solution:* The solution proposed in this paper is to develop a single linear model that evaluates both operational and service efficiency models simultaneously. By taking into account the interrelationships between input variables and equating the efficiency values for each route in both models, the proposed approach allows a proportional correlation of relevant parameters that guarantees both linear and non-proportional changes in input. Not related to each other (such as service hours).

*Gaps:* Based on the problem description, the proposed non-radial DEA approach fills a gap in the literature by providing a comprehensive method for evaluating both service and operational performance of bus movement scheme. This approach overcomes limitations encountered in previous models by allowing people to make decision to manage discrepancies between service and operational efficiencies and provide applicable input/output targets for individual route.

### 2.3.9 The impact of firms' social media initiatives on operational efficiency and innovativeness

*Author:* Hugo K.S. Lam, Andy C.L. Yeung, T.C. Edwin Cheng [19].

*Problem:* An issue identified in the overview is the lack of understanding of the operational implications of implementing social media within an organization. More and more businesses are using social media for organizational purposes, but the specific impact it has on operational efficiency and ability to innovate is largely unknown. Additionally, there are concerns about the downsides and possible negative impacts of social media use on productivity and intellectual property.

*Methodology:* The study adopted a resource-based perspective of viewing companies on social media efforts as a strategic resource for operational improvement. This study empirically investigates the effect of social media engagement on firms' effective operations and innovative capacity. Researchers collect secondary data in longitudinal planes from different sources to create a Dynamic Panel Data model (DPD). System Generalized Moment Estimation (GMM) is used to analyze the data.

*Findings:* Research suggests companies' social media efforts improve operational efficiency and innovation. By facilitating information flow, knowledge sharing and collaboration within and between organizations via social media platforms, companies improve internal communication, cross-departmental coordination and management. In addition, social media allows companies to access external knowledge sources and improve business intelligence across the organization and supply chain network.

*Gap:* The abstract suggests that while anecdotal evidence supports the benefits of social media engagement for operational efficiency and innovation, the existing literature lacks empirical evidence. A research gap identified is the need for empirical research investigating the specific effects of corporate social media initiatives on operational efficiency and innovation. This research objective bridge the lapses identified by providing numerical proof for positive effects of social media adoption in organizations.

### 2.3.10 Understanding the impacts of energy efficiency measures on a Company's operational performance: A new framework

*Author:* Enrico Cagno, Davide Accordini, Andrea Trianni, Mile Katic, Nicolò Ferrari, Federico Gambaro [20].

*Problem:* The issue addressed in the abstract is the low acceptability of energy efficiency measures (EEM) for industrial enterprises, despite the potential benefits they offer. Traditional approaches to assessing EEM focus primarily on energy savings and often overlook broader impacts and interactions with production systems. This incomplete analysis introduces uncertainty and risk perception to industry decision makers, limiting the deployment of more complex and large-scale EEMs that could significantly improve production systems and increase their competitiveness.



*Methodology:* This study proposes a new framework to help a key decision maker thoroughly evaluate his EEM implementation. This framework includes a complete characterization of his EEM, identifying the various impacts of EEM implementation and measure impact with our new performance measurement system. This is defined at the manufacturing level and includes sustainability characteristics. The framework is theoretically validated by a literature review and then numerically verified using heterogeneous sample of Italian firms.

*Result:* Initial results show that this scenario has been effective in evaluating his EEM, highlighting characteristics and impacts considered by industry decision makers to be more important than energy savings. This framework provides a comprehensive analysis of his EEM that considers the broad impact on organizational operational performance and production resources. This helps the decision maker make informed decisions regarding her EEM implementation.

*Gap:* The research gap identified lacks a comprehensive framework to thoroughly analyze his EEM implementation in industrial enterprises, considering both the characteristics of the EEM and its impact on operational performance, several studies have explored the potential impact of EEM, but a comprehensive framework is needed that links EEM characteristics with their impact on manufacturing resources and operational performance. The proposed framework aims to fill this gap and provide the decision maker with a comprehensive assessment tool for her EEM implementation.

### 3. METHODOLOGY

Methodologies for studying effect of information systems on efficiency of operation may involve combination of quantitative and qualitative research approaches. Here are the methods adopted.

1. **Data Analysis:** Leveraging existing data within an organization, such as operational metrics, performance metrics, and financial data, can provide quantitative insight into the impact of information systems. By analyzing this data using statistical techniques, organizations can assess the relationship between information system usage and operational efficiency and identify patterns, trends, and correlations.

2. **Comparative Analysis:** Comparing organizational performance and efficiency measures before and after the introduction of information systems provides insight into the impact of those systems. This comparative analysis can involve both quantitative measures, such as productivity levels, cost savings, and cycle times, as well as qualitative factors like employee satisfaction and customer feedback.

3. **Literature Review and Meta-analysis:** A comprehensive literature review will help synthesize existing research and identify trends, gaps, and limitations in the understanding of the effect of information systems on efficiency of operation. Meta-analysis techniques will be used to quantitatively analyze the discoveries and outcome from several studies, providing a very comprehensive and numerically significant overview.

It is important to select and adapt methodologies based on specific context of research, available resources and the research goals. A mixed-method approach combination of quantitative and qualitative techniques gains better comprehensive result.

### 4. RESULT AND DISCUSSION

The findings and arguments that may be obtained when studying the impact of information systems on operational efficiency may vary depending on the particular research methodology and circumstances. However, here are some findings and discussions that arise from the studies.

1. **Improved Operational Efficiency:** Perhaps one of the most important discoveries is the identification of operational efficiency improvements resulting from the implementation and use of information systems. This can be demonstrated through quantitative measures such as increased productivity, shorter cycle times, reduced costs and improved resource utilization. Discussions may revolve around the specific areas or processes in which the information system has had the greatest impact and the factors contributing to the observed improvement [21].

2. **Streamlined Processes and Automation:** Findings can indicate how information systems have facilitated automation and streamlining of operational tasks. This can lead to discussions about eliminating manual and repetitive tasks, reducing errors, and improving accuracy. Discussions can also focus on the reallocation of resources to higher value activities and the resulting impact on operational efficiency [22].

3. **Data-driven Decision-making:** Findings may highlight the role of information systems in enabling data integration, analysis, and its impact on decision-making. Discussions can center around how data-driven decision-making has improved operational efficiency by identifying trends, patterns, and insights that optimize processes, resource allocation, and overall performance. The discussions may also explore the challenges and opportunities associated with effectively utilizing data for decision-making purposes [5].

4. **Enhanced Communication and Collaboration:** Results may showcase how information systems have facilitated improved communication and collaboration within and across departments. Discussions will focus on the use of collaboration platforms, knowledge sharing tools and real-time communication channels and how they have improved coordination, teamwork and knowledge sharing. The impact of improved communication and collaboration on operational efficiency can be examined in terms of reduced latency, increased responsiveness, and optimized information flow [23].

5. **Real-Time Monitoring and Control:** The results demonstrate the benefits of real-time monitoring and control capabilities provided by information systems. The discussion centers around how companies have used sensors, IoT devices, and real-time data to detect anomalies, monitor performance, and proactively address issues. The impact of real-time monitoring on operational efficiency, risk mitigation, and overall performance can be explored [22].

6. **Customer Service and Satisfaction:** Findings may indicate how information systems have contributed to enhanced customer service and satisfaction. Discussions can focus on the use of CRM systems, personalized interactions, and efficient support, leading to improved customer experiences. The impact of information systems on customer retention, loyalty, and overall operational effectiveness can be explored [6][4].

7. **Supply Chain Optimization:** Results may highlight how information systems have optimized supply chain operations, leading to improved operational efficiency. Discussions can center around the integration of suppliers, manufacturers, distributors, and retailers, and how it has enhanced inventory management, demand forecasting, and logistics optimization. The impact of supply chain optimization on operational efficiency, cost reduction, and responsiveness can be examined [21].

8. **Continuous Improvement:** Findings may emphasize the role of information systems in supporting performance measurement and continuous improvement initiatives. Discussions can explore the use of KPIs, benchmarking, and data analysis for identifying inefficiencies, setting targets, and driving ongoing operational for improved operational performance.

## 5. CONCLUSION

Finally, the study highlights the critical impact of information systems on an organization's operational efficiency. Through automation, data integration, enhanced communications, real-time monitoring, and continuous improvement, information systems have the potential to streamline processes, optimize resource allocation, and drive informed decision-making. Research findings suggest that strategic use of information systems can lead to increased productivity, fewer errors, better collaboration, and better customer service. By implementing and leveraging information systems, organizations can automate manual tasks, minimize errors, and free up resources for value-added activities. Integrating data from disparate sources gives companies real-time insight into their operations, facilitating data-driven decision-making and process optimization. Information systems enhance effective communication and collaboration, facilitating seamless coordination and knowledge sharing across departments. Real-time monitoring and control capabilities enable organizations to proactively address issues, reduce risk, and maintain smooth operations. In addition, information systems play a key role in improving customer service and satisfaction by personalizing interactions and providing efficient support.

Supply chain management is also positively impacted by information systems that enable companies to streamline inventory management, demand forecasting and logistics. In addition, information systems provide performance measurement and continuous improvement tools that enable organizations to track key performance indicators, identify areas for improvement, and drive continuous operational improvement.

This study highlights the importance for organizations to strategically harness the power of their information systems to achieve operational excellence and gain competitive advantage. By effectively utilizing these systems, organizations can increase operational efficiency, improve decision-making, and adapt to dynamic business environments.

However, it is important to recognize potential challenges and limitations associated with the implementation and management of information systems. These may include concerns about data security, system integration complexity, organizational resistance to change, the need for ongoing training and support, and more. Addressing these challenges and effectively managing information systems are critical to realizing their full potential to improve operational efficiency. Information systems have become critical tools for organizations seeking to streamline operations, improve resource allocation, and achieve operational excellence. By implementing and leveraging these systems, organizations can thrive in a rapidly evolving business environment.

## 6. RECCOMENDATION

The following recommendations are proposed for future research on the topic “impact of information systems on operational efficiency”.

1. **Longitudinal Studies:** Longitudinal studies can be carried out to evaluate the long-term effect of information systems on operational efficiency. Long-term impact studies make available a more robust understanding of the enduring benefits, challenges, and impacts of information system development on operational practices.
2. **Industry-Specific Studies:** Specific industries or disciplines could be chosen as samples to conduct studies of the impact of information systems on operational efficiency. Different industries may have their own operational challenges and requirements, and examining the implementation of information systems in these contexts can reveal industry-specific insights and best practices. .
3. **Implementation and Implementation Factors:** Consider the factors that influence the implementation and successful implementation of information systems to improve operational efficiency. This research may focus on identifying critical success factors, overcoming implementation barriers, and understanding the critical role of culture change in organization, change management, and leadership in maximizing the usefulness of information systems.
4. **Integrating New Technologies:** Explore how combining and integrating new innovations such as machine learning, artificial intelligence, block-chain, and boost reality with information systems can further improve operational efficiency. Evaluate the potential benefits, challenges, and deployment strategies of these technologies to improve operations [6].
5. **User Experience and Adoption:** Examine user experience and acceptance factors for information systems to increase operational efficiency. Consider how user interface design, training programs, and user support mechanisms can affect effective use of information systems and maximize their impact on operational efficiency.
6. **Performance Measurements and Metrics:** Develop a comprehensive framework and methodology for measuring and evaluating operational efficiency in the context of information systems. Consider selecting and tracking key performance indicators (KPIs), bench marking methods, and performance evaluation models that effectively capture the impact of information systems on operational efficiency [3].
7. **Decision Support:** Explore how information systems can be better used to support decision-making processes in various business areas. The discovery of advanced analytic, data visualization techniques and decision support systems can provide real-time insights and predictive capabilities to improve operational decisions.

## 7. SUGGESTION FOR FUTURE RESEARCH

Below are some suggestions for future research.

1. **Acceptance and Resistance:** Factors that influence information system acceptance and resistance to operational efficiency can be examined for thorough assessment. This can further be extended to the role of organizational culture, personal attitudes and change management strategies in successfully implementing information systems and overcoming resistance.
2. **Cybersecurity and Risk Management:** Examine the impact of information systems on cybersecurity and risk management in operational processes. It examines challenges and strategies for ensuring data security, protecting against cyber threats, and managing operational risks associated with the use of information systems.
3. **Integrating Big Data Analytics:** Examine the integration of big data analytics into information systems and its impact on operational efficiency. Explore how companies can use big data analytics to uncover actionable insights, improve decision-making, and streamline operational processes.
4. **Human Factors and Employee Happiness:** Examines the impact of information systems on employee happiness and satisfaction. Explore the impact of system usability, user experience, workload, and work-life balance on employee performance, engagement, and overall operational efficiency.
5. **AI and Automation:** Examine the impact of artificial intelligence (AI) and automation technologies on operational efficiency. Explore how organizations can use AI, machine learning, and robotic process automation to automate tasks, streamline workflows, and improve overall operational efficiency.
6. **Impact on Small and Medium Enterprises (SMEs):** Examines the specific effect of information systems on the operational efficiency of small and medium enterprises. Understand the unique problems and opportunities that can expose challenges faced by small organizations in implementing and using information systems to improve their business.

## 8. Conflict of interest.

The authors have no conflicts of interest to declare.

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