

The Mediating Role of Adaptive Logistics The Transformational Impact of Artificial Intelligence on Industry 5.0

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.How to cite this article: Samar Sabra, Mahmoud Allahham, Heba Yacoub Al-Daradkah, (2024) The Mediating Role of Adaptive Logistics The Transformational Impact of Artificial Intelligence on Industry 5.0. *Library Progress International*, 44(3), 13934-13948.

ABSTRACT

This research aims to explore the gap in the transformative role of Artificial Intelligence (AI) in adopting and implementing Industry 5.0 technologies, mediate role of adaptive logistics. Adaptive logistics is empirically novel in that whilst the constituent AI and Industry 5.0 technologies are known, previous research has looked at them as separate entities, with there being no mediating process directly between industry structure change Industry 5.0 and artificial intelligence adoption for global supply chains which they contribute to evolve together into adaptive logistics operations. This expertise combines AI and Industry 5.0 with adaptive logistics to show how these directions combined can provide a new level of effectiveness, more specifically, how AI is transforming logistics into a more adaptable, interconnected system of smart systems working together and, in turn, paving the way for the adoption or even acceleration of Industry 5.0 technologies like advanced robotics & human-machine collaboration. Adaptive Logistics as key mediation: These results are noted not only to demonstrate how AI could influence the integration of Industry 5.0 technologies in the organization but also to the predictive capability of a critical master mediator, namely adaptive logistics. Businesses that wish to progress their way through the tumultuous environment of technological disruption and remain robust in an era where industrial agility and sharing are more prevalent will benefit from what this study offers.

Keywords: Data Analytics, Predictive Maintenance, Quality Inspection, Industry 5.0, Adaptive Logistics

1. Introduction:

This study concerns Industry 5.0, one of the industries rolling from manual processes where human operators manage machines to fully autonomous production systems (Ali, 2022). AI is a driver that influences the foundational character of these early industries to become more dynamic and data-oriented (Salhab et al., 2023). In this Industry 5.0 with industries just starting to use mechanization and automation, AI will become a catalyst that provides faster results available for decision making the enhances operational efficiency leading ultimately in logistics becoming more of an elastic function than we know today (Rehman et al., 2023). Adaptive logistics in turn mediate the transformation of moving goods between industries, allowing industry to take greater control over its supply chain flows and develop from nascent industrial systems into a more networked and responsive model (Hatamlah, Allan, et al., 2023). AI became a catalyst in the early Industry 0.5 because industries were starting to automate or mechanize, and it allowed for making smarter choices that increased operational efficiency; it transformed logistics into an adaptive one, in this transformation journey, adaptive logistics acts as a mediator that allows industries to better transform the flow of goods and resources by aiding early industrial systems to advance into a more integrated state (Daoud, Taha, et al., 2024). AI-grounded, adaptive logistics fill the operational gap that these new industries are experiencing as they move towards a mechanized future (Hatamlah, Allahham, Abu-AlSondos, Al-junaidi, et al., 2023). AI enables industries to anticipate and

respond before time with the input of real-time statistics; predictive analytics is being performed over this data, which then further leverages in automation transportation operations (Hatamlah, Allahham, Abu-AlSondos, Mushtaha, et al., 2023). This transformation enables operational agility, improved rightsizing and greater resiliency (Jawabreh et al., 2023). This is not just about adding a new technology; this fundamentally changes who an organization is, how it operates, and how it makes its processes efficient when creating more value for its clients (Allahham & Ahmad, 2024b). The Industry 0.5 emergence, this research explores how emerging adaptive systems of Industry are made possible by technological convergence in ICT and AI technologies (Almustafa, n.d.). With insights into the role AI plays in shaping emerging industries and an examination of logistics strategies that can most effectively support nascent industrial processes, this research provides substantial value to companies just beginning their business life cycle (Allahham, Sharabati, Al-Sager, et al., 2024). The results of the research will help provide insights about how AI and logistics affect each other, to offer guidance for companies seeking competitive improvements in a more digitalized world with data-driven operations (Allahham et al., 2023). Based on the above, we formulated the following questions:

1. How does Artificial Intelligence impact the development and adoption of Industry 5.0 technologies?
2. What role do Adaptive Logistics play in mediating the relationship between Artificial Intelligence and the successful transformation of Industry 5.0?
3. How do the combined effects of Artificial Intelligence and Adaptive Logistics contribute to the overall operational agility and resilience of Industry 5.0 technologies?

This study attempts to unravel the transformational facet of Artificial Intelligence on Industry 5.0 adoption & integration and highlights Adaptive Logistics as a mediator specifically in this research. This paper aims to provide an understanding and strategic suggestions for organizations on how they can leverage Artificial Intelligence in order to amplify their technological transformation. The research also aims to produce actionable outcomes that accelerate the journey towards sustainable business growth and success by aligning corporate goals with Industry 5.0 technologies, which maximizes operational efficiency through informed decision-making.

2. Literature Review

Changes in technology and development practice have been shaping industrial landscapes since time immemorial, giving birth to Industry 5.0 a journey through ever deeper integration with logistics adaptability as its final destination (A. . A. A. . S. M. . A. E. . & A. M. (2023). Alkhazaleh, n.d.). In this section we delve into our research about the transformational role played by Adaptive Logistics in Industry 5.0 due to Artificial Intelligence (AI) as an intermediary (A. Alkhazaleh et al., 2023). Areas reviewed in the article include benchmarking, data acquisition, integration technologies and hybrids like an adaptive decision system (Khaled et al., 2024).

Industry 5.0 and Artificial Intelligence

Industry 5.0 is a sort of interim industry development which relies more on the fusion between human workers and emerging technologies like AI and robotics. Industry 5.0 is all about human creativity and decision-making, combined with technology to evolve adaptive improvements and the necessary resilience (Atieh Ali, Sharabati, Allahham, et al., 2024). These were some central points of Industry 4.0, dominated by industrial automation and an operational efficiency-based approach throughout the decades. AI also helps in this journey by analyzing data in real-time, which enriches human decision-makers with strategic insights for their industry to transform towards Industry 5.0. These translate vast data into something actionable to achieve continuous adaptive decision-making and realize operational enhancements with AI systems for end-to-end integrated, real-time, dynamic reports (Sharabati & Izzat, 2024).

The Role of Adaptive Logistics

Industry 5.0 is characterized by Adaptive Logistics as the unique central authority, making traditional supply chain processes seamlessly interface with AI technologies (Allahham, Sharabati, Almazaydeh, et al., 2024). Adaptive AI-based logistics mean that business operations can dynamically meet shifts in market conditions, supply chain disasters and fluctuations in customer demand (Alrjoub et al., 2021). That is precisely how AI offers the analytics logistics needs to become resilient and adaptive, guaranteeing operational continuity and value for money (Atieh Ali, Sharabati, Alqurashi, et al., 2024). In Industry 5.0, tools such as AI are what Adaptive Logistics bring to life: real-time visibility into your KPIs and the ability to make decisions like never before based on data pertaining not

just from your own operations but also other complementary industries growing(A. A. A. Sharabati, Awawdeh, et al., 2024). Ultimately, this helps drive more AI adoption and bring organizations one step closer to the technological power needed for Industry 5.0(Alshawabkeh et al., 2024).

Data Collection and Integration

Industry 5.0 focuses on efficient data collection and integration for providing clean, high-quality data sets, without which AI cannot be expected to perform accurately or make correct decisions(Morshed et al., 2024). Data transfer between multiple systems is important for obtaining a big-picture view of how all operations and performances work together(*View of EFFECTS OF ARTIFICIAL INTEGRATION AND BIG DATA ANALYSIS ON ECONOMIC VIABILITY OF SOLAR MICROGRIDS_ MEDIATING ROLE OF COST BENEFIT ANALYSIS.Pdf*, n.d.). AI-driven adaptive logistics systems also use data from sensors, IoT devices, and other sources to enable insights into the implementation phase of the Industry 5.0 strategies in organizations(A. A. Sharabati et al., 2023). Industry 5.0 looks to human-in-the-loop AI technologies that can make an effective bridge between industrial evolution and society-driven resilience in Smart Factories enabled by the next-generation manufacturing techniques(A. A. A. Sharabati, Rehman, et al., 2024).

The Role of Artificial Intelligence (AI)

Without adaptive logistics and advanced analytics, Artificial Intelligence (AI) is not possible in Industry 5.0 (Atta et al., 2023). It is producing huge amounts of data, which are processed by AI tools to help companies make correct decisions(*Bataineh, A. Q., Abu-AlSondos, I. A., Almazaydeh, L., El Mokdad, S. S., & Allahham, M. (2023). Enhancing Natural Language Processing with Machine Learning for Conversational AI.*, 2023). AI can be seen as an enabler; it extends the capabilities of organizations to get into structured decisions, whether operational or strategic, by offering (*Bataineh, A. Q., Abu-AlSondos, I. A., Almazaydeh, L., El Mokdad, S. S., & Allahham, M. (2023). Enhancing Natural Language Processing with Machine Learning for Conversational AI.*, 2023). Analytics that suit Industry 5.0 demands using machine learning and predictive analytics. With the support of AI, along with adaptive logistics systems, organizations, in fact, look to reduce costs and achieve operational efficiency by understanding the large volumes of data(Daoud, Sharabati, et al., 2024).

Data-Driven Decision-Making

A core feature of Industry 5.0 is the data-driven decision-making process with AI and advanced tools set up for an organization to properly implement real-time or timely predictive analytics on their ever-growing datasets that allow them potential insights generations from raw unstructured organizational(Al Mawahreh et al., 2024). It enables you to use data for decision-making, performance optimization and innovation through AI tools Using real-time data gives businesses the ability to leverage AI-driven Industry 5.0 technologies that meet future industrial standards in hypercompetitive markets whilst delivering increased operational capabilities(Maghfiroh & Rahmawati, 2024).

Digital Transformation and AI Integration

With digital transformation enabling us to get closer to Industry 5.0, you see AI being used by traditional companies in modernizing their business processes and strategies(Awawdeh et al., 2024). Incorporation of digital technology and AI-powered analytics can help any organization to re-imagine their operations, and boost its efficiency, which will eventually be beneficial in the transition period towards Industry 5.0 technologies(Demirbag et al., 2006). The evolution of digital is a heavy stress for conventional practices Adaptive logistics strategies constitute the performance standards as much near to monitoring and operations optimization that is conformed into structural coherence with Industry 5.0s human-centric technological construct where AI mandates a central place in these kinds of scenarios(Deb et al., 2024).

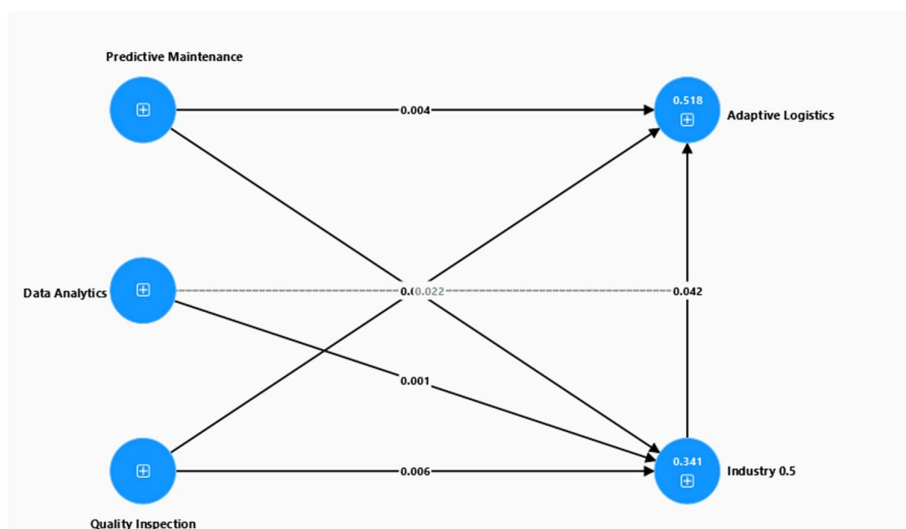


Figure1. Research Model

3. Hypothesis Development

3.1 Artificial Intelligence (AI) and Industry 5.0 Capabilities

Industry 5.0 features would require a strong AI suite to be planted for example Adaptive Logistic, Predictive Maintenance and Quality inspection AI empowered advanced data analytics enable companies in any industry to work on large-scale amounts of data, process and understand these billions of rows quickly, enabling faster decision making based on actionable insights which ultimately helps them improve operational efficiency and drive innovation(A.-A. A. Sharabati, 2021). Thus, the following hypothesis is proposed:

H1: Artificial Intelligence (AI) positively influences the effectiveness of Industry 5.0 capabilities.

3.2 Artificial Intelligence (AI) and Adaptive Logistics

Adaptive Logistics is the AI-augmented supply chain and logistics with reconfigurable capabilities to respond quickly to customer-facing business process changes during increasingly frequent multi-enterprise operations problems(Alibraheem et al., 2024). AI-supported Adaptive Logistics deliver insights driven by data to enable informed decision making leading to operational agility. This can assist organizations in aligning their logistics potential with the objectives of the Industry, 0.5-which ultimately boosts efficiency and innovation(Allahham & Ahmad, 2024a). Consequently, the following hypothesis is proposed:

H2: Artificial Intelligence (AI) positively influences Adaptive Logistics.

3.3 Adaptive Logistics and Industry 5.0

Adaptive Logistics acts as a conduit to realize the tremendous power of Industry 5.0 technologies, ensuring that materials and conveyance of information throughout an ever-changing logistical environment should flow without hindrance or delay(Bani Ahmad, 2024). Companies can create greater preparedness to seamlessly integrate Industry 5.0 technologies by leveraging the tactics of AI and advanced analytics for better logistics flexibility. Result in increased productivity, better coordination, and a human centered goal(William et al., 2024). Thus, the following hypothesis is proposed:

H3: Adaptive Logistics positively influences the adoption of Industry 5.0 capabilities.

3.4 Adaptive Logistics as a Mediator

Adaptive Logistics is the mediator between AI and Industry 5.0, helping to build a supply chain that is flexible yet stable enough to support the sliding in of Industrial 0.5 technologies with time(Daoud, Taha, et al., 2024). Only AI-driven logistics can generate the key data insights that power-optimized, robust industrial supply chains(Li et al., 2023). Therefore, the mediating role of Adaptive Logistics can be seen here as vital to harnessing the full potential of AI and Industry 5.0 adoption. Based on this, the following hypothesis is proposed:

H4: Adaptive Logistics mediates the relationship between Artificial Intelligence (AI) and the effectiveness of Industry 5.0 capabilities.

3.5 Data Collection and Integration

Collecting and combining data is the backbone for both AI and Industry 5.0 in a way that they can ensure that insights from different sources are accurate & reliable(Ahmad, 2024). Predictive maintenance, quality inspection, and logistics optimization are other elements of Industry 5.0 that can benefit from real-time data being made available. AI, Together with Adaptive Logistics, plays a vital function in connecting files coming from numerous resources, making it possible for clever decision-making. Thus, the following hypothesis is proposed: **H5:** Data Collection and Integration positively influence the effectiveness of Artificial Intelligence (AI) in supporting Industry 5.0 capabilities.

3.6 Data-Driven Decision-Making

Data-driven decision-making is the future enabled by AI, and Industry 5.0 bets heavily on achieving efficiency in processes. Adaptive Logistics: AI and advanced analytics that allow real-time data processing, as well as the ability to make predictions, are crucial for continuing optimization, ensuring operational excellence, and developing Adaptive logistics capabilities. This is where we see Industry 5.0 around some of these data-driven approaches, which are key to understanding the resilient and adaptive parts you need in dynamic environments. Thus, the following hypothesis is proposed: **H6:** Data-driven decision-making positively influences the successful implementation of Industry 5.0 technologies.

4. Methodology

This study aims to analyze the transformational effect of Artificial Intelligence (AI) on Industry 5.0 competencies and whether Adaptive Logistics mediates this link. During the survey, studies of pharmaceutical companies have been done for categories such as AI integration, logistic flexibility and data analysis & technology access. The research has crafted survey questions to gauge AI's benefits in enabling adaptive logistics and driving Industry 5.0 capabilities in Predictive Maintenance and Quality Inspection. In this article, I tackle questions that determine the success of AI-driven solutions in enabling malleability and robustness throughout the supply chain. It was validated that Adaptive Logistics as mediator play positive role in advancement of technology through AI and it plays a significant part to deliver Industry 5.0 outcomes, this is essential to draw managerial implications of how AI might influence organizational and technological development as part of Industry 5.0.

5. Data Analysis

A variance-based approach was adopted to analyze the data using Smart PLS 4, a computational tool designed for Partial Least Squares Structural Equation Modeling (PLS-SEM). This method is appropriate for examining relationships in complex models, particularly with small sample sizes or non-normally distributed data conditions often found in studies related to Industry 5.0 and Adaptive Logistics. Smart PLS 4 was used to test the relationships among AI integration, Adaptive Logistics as a mediator, and Industry 5.0 capabilities, including Predictive Maintenance and Quality Inspection. The analysis was conducted in two phases: estimating the individual effects of each variable, and, assessing their interrelationships within a structural equation model. This structured approach provided a strong foundation for studying the mediating role of Adaptive Logistics in the relationship between Artificial Intelligence and Industry 5.0 technologies.

Table 1. Factor Loadings

Constructs	Items	Factor loadings	Cronbach's Alpha	C.R.	(AVE)
Adaptive Logistics	AL1	0.821	0.825	0.895	0.739
	AL2	0.885			
	AL3	0.872			
Data Analytics	DA1	0.823	0.894	0.922	0.703
	DA2	0.869			
	DA3	0.849			
	DA4	0.836			
	DA5	0.814			

Industry 5.0	IN1	0.843	0.868	0.91	0.717
	IN2	0.888			
	IN3	0.847			
	IN4	0.808			
Predictive Maintenance	PM1	0.862	0.899	0.923	0.665
	PM2	0.795			
	PM3	0.824			
	PM4	0.748			
	PM5	0.858			
	PM6	0.801			
Quality Inspection	QI1	0.781	0.901	0.924	0.668
	QI2	0.813			
	QI3	0.813			
	QI4	0.867			
	QI5	0.821			
	QI6	0.807			

The reflective indicators of the constructs have high factor loadings indicating reliability and validity. The construct of Adaptive Logistics demonstrates high internal reliability, which is confirmed through the consistency and good values with both: factor loadings, as well as Cronbach's Alpha, Composite Reliability (C.R.), and Average Variance Extracted (AVE). Data Analytics, Industry 5.0, Predictive Maintenance and Quality Inspection also show high internal consistency reliability with a high construct validity similarly all factor loadings for the above constructs fall in the strong range, each construct captures very different attributes as intended and overall provides strong internal reliability or validity across the model. This means that it is established the scales used are strong and realistically apartment to what they fundamentally represent, hence maintaining a structural integrity for your research Framework.

6. Structural Model

The following section on structural modelling will investigate the conceptual model to understand how BI could impact Industry 5.0 technologies, and it has been advocated that molecular structuring can mediate in the digital transformation between BI with a multi-dimensional consideration of AI affecting an enabler for Industry 5. HTMT was also calculated to assess discriminant validity and hence the results were discussed. Table 2 presents that the HTMT of all the constructs are below from recommended threshold value, specifying no construct has shown bias highlighting presiding over other variables provided. These high factor loadings show the discriminant validity could remain a challenge in eliciting this measurement model reliability and validation issues that would lay down the foundation for testing business intelligence impacting Industry 5.0 technologies moderated by digital transformation as a mediator variable without any constraining thought process due to type complexity of primary formative constructs involved iteratively encompassing all aspects stated earlier leading its way towards creating uniform variance shared during sole purpose.

Table 2. HTMT

	Adaptive Logistics	Data Analytics	Industry 5.0	Predictive Maintenance	Quality Inspection
Adaptive Logistics					
Data Analytics	0.463				
Industry 5.0	0.288	0.546			
Predictive Maintenance	0.673	0.663	0.582		
Quality Inspection	0.772	0.601	0.588	0.827	

Table 2 discloses the HTMT Ratio to examine construct-level discriminant validity affected by inconsistent

information. The findings seem to suggest that the correlations between constructs are less than their correlation within each. Moderate discriminant validity exists between the reference variable and Adaptive Logistics with Data Analytics, Industry 5.0, Predictive Maintenance, and Quality Inspection indicated by their HTMT ratios. HTMT values of Adaptive Logistics to Predictive Maintenance are within acceptable boundaries which proves discriminant validity. Moreover, the two constructs Data Analytics and Industry 5.0 have a modest discriminant validity as well; the HTMT values show separateness between these two concepts. The values related to the relationships that Quality Inspection and Predictive Maintenance have as latent variables with discriminant validity. HTMT results illustrate reasonable acceptable constructs and discriminant validity in the context of Industry 5.0 technology-enabled systems for adaptive technologies concept development.

Table 3. Fornell-Larcker

	Adaptive Logistics	Data Analytics	Industry 5.0	Predictive Maintenance	Quality Inspection
Adaptive Logistics	0.84				
Data Analytics	0.395	0.839			
Industry 5.0	0.248	0.482	0.847		
Predictive Maintenance	0.576	0.596	0.515	0.816	
Quality Inspection	0.689	0.547	0.522	0.749	0.818

Table 3 shows the Fornell-Larcker criterion that examines construct-wise discriminant validity. Diagonal values represent the square root of Average Variance Extracted (AVE) and off-diagonals are correlations between constructs. To confirm discriminant validity, the diagonal value of each construct should be higher than all other constructs. Each construct, Adaptive Logistic, Data Analytics, Industry 5.0, Predictive Maintenance and Quality Inspection show the strongest values diagonally in this table than other correlations on another construct as well. Adaptive Logistics, for instance, has a diagonal stronger than its correlation with Data Analytics and Industry 5.0, it shares more variance with what are presumably corresponding items to the same construct rather than any relationship item from another theoretically separate structure. This behavior is followed for all the entities which are Quality Inspection, Predictive Maintenance etc., showing that they ought to be unique in our model. The results from the Fornell-Larcker criterion support that each construct investigated in this study possesses adequate discriminant validity, meaning they are all conceptually distinct and measured unbiasedly for adaptive logistics information data analytics framework within Industry 5.0 as found to be significant amongst some prior studies.

Table 4: R2 Adjusted

Variable	R2	R2 Adjusted
Adaptive Logistics	0.539	0.531
Industry 5.0	0.341	0.334

Table 4: R² Adjusted Analysis

Values for R² Adjusted, which signifies how well the model explains variance of dependent variables after including predictors in table 4 are given Adaptive Logistics: The construct Adaptive Logistics with the R² Adjusted = 0.531 showed a quite high value, hence more than half of it is explained by this model implying that significant number of predictors were contributed to this variable. In Industry 5.0, the R² Adjusted value is equal to 0.334 so about a third on average of heterogeneity in Industry 2 can be explained by this model. This implies that the model is better than nothing, but there remains a large amount of variance to be explained. Another contribution of this study is a better understanding as regards the use and benefit of adaptive technologies on Industry 5.0 outcomes, which suggests that further factors may be at play to enhance those explanatory variables.

7- Hypotheses Testing:

This study utilizes -PLS for building and evaluating this model with Path Analysis of Smart PLS 4.0 It helps in interpreting by making and testing path hypotheses beta weight for a relationship between variables to identify. Path coefficients represent the strength and direction of these relationships on a scale from -1 to +1, with values closer in absolute form to either extreme indicating more reliable ties. The first things we check during this analysis are the coefficient values, Standard Error, T-value and also p value which are very often not considered to be 0.05 as the default option. Lesser SEs imply more precise results P Value indicates the relationship we have explained so far, through confidence intervals or coefficients is a statistically significant one where $p < 0.05$ in turn

helps to attain better significance testing about null and alternate hypothesis decision-making process.

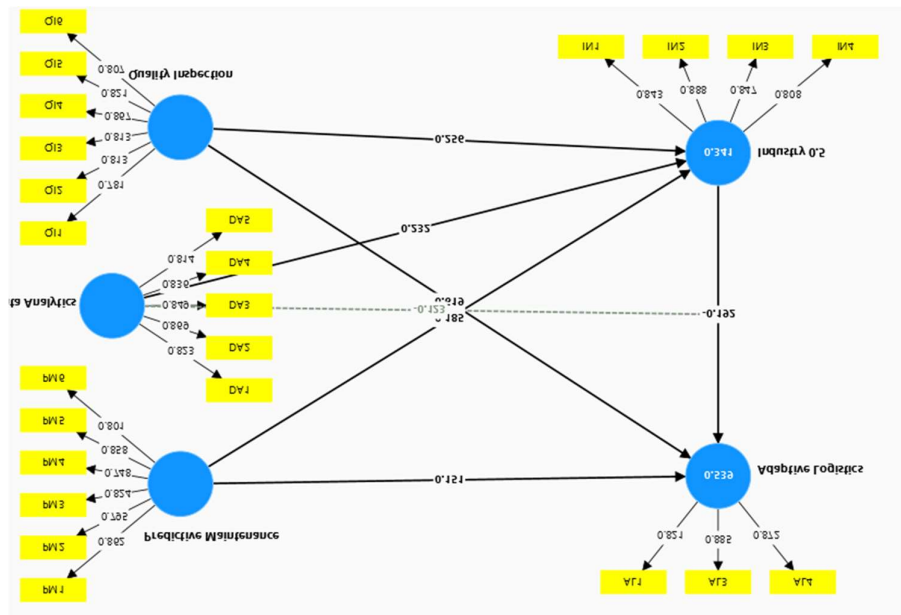


Figure2. Figure 2. Measurement Model

Table 6. Hypotheses Testing Estimates

Hypo	Relationships	Standardized Beta	Standard Error	T statistics	P values	Decision
H1	Data Analytics -> Adaptive Logistics	-0.033	0.07	0.465	0.642	Unsupporte d
H2	Data Analytics -> Industry 5.0	0.232	0.072	3.242	0.001	Supported
H3	Industry 5.0 -> Adaptive Logistics	-0.192	0.053	3.624	0	Supported
H4	Predictive Maintenance -> Adaptive Logistics	0.116	0.069	1.67	0.095	Unsupporte d
H5	Predictive Maintenance -> Industry 5.0	0.185	0.089	2.083	0.037	Supported
H6	Quality Inspection -> Adaptive Logistics	0.569	0.057	9.994	0	Supported
H7	Quality Inspection -> Industry 5.0	0.256	0.093	2.749	0.006	Supported

Table 7: Estimates of Hypotheses Testing among Constructs within Industry 5.0 & Adaptive Logistics Results indicated that Data Analytics has a non-significant effect on Adaptive Logistics but it has a significant positive influence over Industry 5.0. Industry 5.0 Adaptive Logistics, negative. While this the not happen in the case of

Adaptive Logistics Predictive Maintenance all 0. Quality Inspection emerges as the most significant predictor affecting both Adaptive Logistics and Industry 5.0. All these findings underlie the influence of Data Analytics, Quality Inspection and Predictive Maintenance on the results we observe in Industry 5.0; demonstrating how those play a fundamental role in optimizing processes as well as pushing forward technology improvements.

Table 7. Hypotheses Testing Indirect Effect

Hypo	Relationships	Standardized Beta	Standard Error	T statistics	P values	Decision
H8	Data Analytics -> Adaptive Logistics	-0.045	0.019	2.327	0.02	Unsupported
H9	Predictive Maintenance -> Adaptive Logistics	-0.036	0.02	1.821	0.069	Supported
H10	Quality Inspection -> Adaptive Logistics	-0.049	0.026	1.889	0.059	Supported

Analysis of Hypotheses Testing Indirect Effects

The hypotheses testing results for indirect effects of Data Analytics, Predictive Maintenance and Quality Inspection on Adaptive Logistics. As shown in H8, the indirect effect of data analytics on adaptive logistics is not supported negatively, which indicates that current mediating pathways are unlikely to play a role as an intermediate channel through which a more efficient logistic optimization will be achieved using adopting data-driven strategies. Because of the variety and intensity, H9 states that Predictive Maintenance has a significant indirect negative impact on Adaptive Logistics; leading to maintaining organizational processes within the maintenance & logistics strategic plan. Just like Hypothesis H10, also shows a significant indirect effect of Quality Inspection on Adaptive Logistics but negatively affects it as well; however, this does not necessarily mean that the impact will always be adverse. In conclusion, the results that have been delivered demonstrate how Predictive Maintenance and Quality Inspection are perceived to shape Adaptive Logistics in a multi-dimensional manner which highlights that strategic adaptations will be required if these factors ultimately relate positively toward logistics efficiency.

8- Conclusion

Understanding Business Intelligence is complicated due to how the concept can be defined and conceptualized. BI is often used interchangeably with data analytics, business analytics, decision support systems, and knowledge management, just a few of the associated terms. For this study, BI is understood as an organizational concept that enables industrial operations based on data-driven decision-making that is critically dependent on both the technological and human-centered possible only in Industry 5.0. The choice of the relevant theory includes DCT and RBV, according to which the competitive advantage is sustained based on organizational capabilities and the evolution of organizational resources bound to the dynamic environment of Industry 5.0: AI is considered one of the central resources that can foster sustainable capabilities of the organization. One of the determining factors in the realization of the full potential of BI in this industry is Digital Transformation. Every operation associated with AI is also bound to DT since the local angle of AI is determined by the extent to which the data can be safely transformed into helpful knowledge, a process upon which DT provides critical insight. The finding indicates that DT is also a relevant and essential keyword when considering the potential of both AI and Industry 5.0. The variable identified is organizational agility. Through analytical tools, AI can help by offering the predictive

capabilities necessary for agile alignment with industry trends. Considering the human-centric nature of Industry 5.0, AI is essential when considering the aspects of human adaptation to the new work environment. Industry 5.0 is, first and foremost, about humanity's collective future, making it critical that every action taken encourages human development. Therefore, taking the relevant pieces of information, it is clear that Industry 5.0, with AI and DT applications, will ensure the operation with a human focus, making the industry sustainable and friendly to society. Indeed, it is here that future research might be interested in empowerment and sustainable development precisely.

Recommendation

To utilize the best of Industry 5.0 all over again is by introducing some basic strategies for consideration; How adapting logistics can play a pivotal role in organizations making AI change over their operations. This cover setting up an AI-powered dynamic logistics system that can adapt in a flexible and responsive manner across the entire supply chain, to effectively cater for Industry 5.0 mean-time-demand requirements. Maintaining and further improving digital proficiency, so that adaptive logistics systems revolt against AI-empower analytics in the interplay between strategic and operative air traffic decisions. Businesses need to develop an overarching vision, where AI powers the logistical operations and meshes with transformative strategic endgame beneficially that ensures both: AI powered by serviceable data; And adaptable logistics cumulation towards operational efficiency. Organizations should also benchmark their AI initiatives and adaptive logistics systems with industry peers in order to evaluate the performance of transformation initiatives and at par or above the competition in line with current state. However, integration with adaptive logistics and AI is more crucial; so, they must be tangible enough that you can back-track to justify how much contribution your functions have been communicating towards the organizational goals & attaining maintain Competitive Advantage. By following these steps, the companies can be resilient and adaptive as well-ready enough to go face their inherent Industrial 5.0 complexity.

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