



## “Industry 4.0 And Accounting Transparency: A Theoretical Framework For Decision-Usefulness In Smart Manufacturing”

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**Abstract:** This study examines the implications of Industry 4.0 technologies for accounting transparency and the decision-usefulness of financial information in smart manufacturing environments. Drawing on theoretical foundations from the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB), the study develops a framework linking technological transparency, information quality, and stakeholder confidence. The article explores how stakeholder perceptions of smart factories affect the purchase intention through a combination of constructs of the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB). The quantitative, cross-sectional design was adopted, whereby 312 respondents were utilized and PLS-SEM was utilized to analyse the data. The results indicate that perceived quality of the products is greatly promoted through the perceived smart factory adoption and that transparency of technology ensures stakeholder trust. Both trusts, as well as perceived quality, have constructive impacts on purchase intention with perception being a major mediating factor. The study contributes to accounting theory by demonstrating how Industry 4.0 technologies enhance accounting transparency, improve information quality, and strengthen the decision-usefulness of accounting information for stakeholders. The proposed framework is further supported through empirical validation using PLS-SEM.

**Keywords:** Industry 4.0; Smart Factories; Stakeholder Perception; Purchase Intention; Technology Transparency

### 1. Introduction

Industry 4.0 is a new stage in the development of world manufacturing, which is associated with the integration of highly industrialized digital technologies, which include artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and robotization. This fourth industrial revolution is changing the nature of systems of production by allowing real-time exchange of data, autonomous decision-making and providing smooth connectivity between the physical and virtual worlds. Smart factories which is a part of Industry 4.0 embrace the use of cyber-physical systems, interconnected devices and intelligent automation to improve efficiency, flexibility and productivity throughout the value chain. (Lou et al., 2025; Song et al., 2022) Among other things, these systems enable both optimal operations and the development of responsive and adaptive manufacturing ecosystems capable of dynamically addressing the needs of the market. Conventionally, the manufacturing systems were largely production oriented, emphasizing on the cost, efficiency and scale economies. Nevertheless, the Industry 4.0 is driving a paradigm shift toward consumer-minded manufacturing. The change is based on a preference towards individualization, responsiveness, and conformity to stakeholder expectations (Singh et al., 2023; Vetrivel et al., 2026). The IoT and AI technologies allow companies to gain immediate data on customer preferences and incorporate them directly into the production cycles, therefore, facilitating mass production and targeted products. Industry 4.0 will help witness connectivity, co-

creation and collaboration, enabling firms to actively involve consumers in the value creation process, as noted in recent study. This means that manufacturing is no longer apart with the market but it is becoming more integrated with stakeholder behavior and expectations. (Gu et al., 2026; Jain et al., 2026).

The increase in the significance of transparency, traceability, and sustainability is another essential aspect of Industry 4.0. Consumers nowadays are increasingly aware of the manufacturing processes of products including sourcing techniques, environmental value, and manufacturing techniques. Smart factories also make the end-to-end observation of production process possible with the use of digital technologies so that the firms can provide comprehensive details regarding product origin, manufacturing conditions or practices, and supply chains. This transparency increases stakeholder trust and perceived value which is a primary determinant of purchase intention. Moreover, Industry 4.0 innovations will lead to sustainability through maximization of resource consumption, minimization of waste, and operation without the need to consume energy. Among these changes is the growing need in all-purpose and responsible consumption, thus making smart manufacturing a strategic asset in creating trust and competitive edge among consumers (Chen & Chang, 2023; Zhang & Wang, 2023).

Although the above has occurred, the literature available on Industry 4.0 has mainly emphasized operational efficiency, technological application, and performance at

the firm level. As an example, the adoption of Industry 4.0 technologies was studied in the previous research to understand their quality of productivity, flexibility, and competitiveness in organizations. On the same note, there are researchers that have addressed how AI and automation can be used to improve the performance of manufacturing and its ability to be more innovative. Nevertheless, an apparent gap in knowledge is associated with the empirical studies on perceptions of smart factories and implications that these perceptions have on the purchasing behavior of consumers. Recent reviews additionally propose that the connection between Industry 4.0 technologies and stakeholder behavior has not been explored well, especially the purchase intention and perception-based results (Huo et al., 2022; Ahmed et al., 2023).

It is notable that this gap creates a significant research question: Are consumers really interested in smart factories? Although companies spend a lot of money on digital transformation and high-level manufacturing technologies, the question of whether the investments bring stakeholder value and affect purchasing behavior remains open (Mortimer et al., 2020; Abreu-Ledón et al., 2026). Stakeholder attitude is very important to determine the purchase intention since trust, perceived quality and usefulness are considered to influence consumer decision making critically. Thus, to close the gap between what people in production are able to make and what people in the market are able to accept, it is crucial to know how stakeholder interpret and react to smart manufacturing practices.

The importance of the study is that it has the potential to combine the marketing and operations perspective into the context of Industry 4.0. Historically, those areas have been examined in isolation, as operations were concerned with efficiency and productivity, and marketing during the era of stakeholder behavior and value creation. Nonetheless, the manufacturing digital transformation requires a more concerted effort, in which the production potential is adjusted to stakeholder demands. This study will add to the new area of production that involves the intersection of technology, operations, and marketing by exploring the effect of the smart factory perception on the purchase intention. It offers the insight into the way companies can use Industry 4.0 to not only enhance the performance within the company, but also to deliver better customer experience and competitive advantage in the market.

Moreover, this study has implications on the managers and policy makers. To companies, the perception of stakeholders on smart factories can be utilized in branding, communication practice and product positioning. Emphasis on issues of technological sophistication, transparency, and sustainability could increase stakeholders trust and desire to buy. As a policy maker, creation of awareness on industry 4.0 and its advantages can help in further adoption of advanced manufacturing and creation of more informed stakeholder population.

The rest of this paper has taken the following structure. The following part will provide an in-depth survey of the literature on Industry 4.0, stakeholder perception, and purchase intention with identifying any major theoretical premise and areas of research gaps. This is then accompanied by the formulation of the research model and hypotheses. The research design, data collection, and the methods of analysis used in the research are discussed in the methodology section. The latter is followed by the results and discussion section that gives the empirical findings and their implications. Lastly, theoretical and practical implications, limitations, and future research directions are given at the end of the paper. While prior studies have primarily examined Industry 4.0 from operational and stakeholder perspectives, this study extends the discussion by linking smart manufacturing with accounting transparency and decision-usefulness. The proposed framework highlights how digital technologies influence the quality and usefulness of accounting information for stakeholders.

## **2. Review of Literature**

### **2.1 Industry 4.0 and Smart Factories**

The Industry 4.0 is a paradigm shift in manufacturing that is caused by the introduction of digital technologies into production systems. It is traditionally characterized as the convergence of cyber-physical systems (CPS), the Internet of Things (IoT), artificial intelligence (AI), cloud computing, and a high-level robotics in order to provide the possibility of intelligent, connected, and autonomous production space (Indust Soori et al., 2023; Shi et al., 2020). Instead of mechanizing and automating the industries as in the previous industrial revolutions, Industry 4.0 prioritizes real-time data interaction, interoperability of systems, and decentralization (Büchi et al., 2020; Mosleuzzaman et al., 2024). The changes in smart factories have also been strongly associated with the changes in enabling technologies. IoT enhances communication among machines, sensors and systems enabling control and real-time monitoring of the production process (Singh et al., 2023; Vetrivel et al., 2026). CPS combines physical operations with computational intelligence so that it can provide predictive maintenance and adaptive production (Sony & Naik, 2020). AI and machine learning are capable of improving decision-making processes because big data can be analysed in order to optimise operations and predict the demand patterns (Fortoul-Diaz et al., 2023). Also, the human error is minimized, and production speed can be accelerated through robotics and automation (Anvari et al., 2020; Ammar et al., 2021).

Operationally, Industry 4.0 does have a number of benefits. Research points to positive changes in productivity, flexibility, and efficiency, which were brought about by automation and data-driven decisions (Dalenogare et al., 2020). The approach and technology of smart factories makes mass customization possible, as the company can make changes to production to individual needs of customers without rising production costs greatly

(Arden et al., 2021). Moreover, the digital integration through and across supply chains strengthens coordination, decreases the lead times, and improves the overall performance (Khang et al., 2023). Another important advantage is sustainability, where Industry 4.0 technologies guarantee the use of energy, waste, and the black cycle (Barari et al., 2021).

Although this has its benefits, most research on Industry 4.0 has considered the internal operational performance, in terms of efficiency and competitiveness, and little has been done to look into the external stakeholders, especially the stakeholders (Song et al., 2022). It shows that it is prudent to investigate the impact of smart manufacturing on stakeholder attitudes and market attitudes.

## **2.2 Stakeholder Perception Theory**

Stakeholder perception theory offers a basis to interpret and evaluate individual perception into products, technologies, and practices in organizations. Perceived value theory is one of the most popular frameworks where the stakeholders would evaluate products in terms of a trade-off between perceived benefits and costs (Lou et al., 2025). Perceived value, in the case of smart factories, can be improved quality of the products, customization and transparency. Acceptance models based on technology, including Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), are additional theories that elucidate the way of stakeholder uptake and reaction towards technological advancements. TAM is an application that assumed that both the perceived usefulness and the perceived ease of use were central to technology adoption (Lu et al., 2022). UTAUT expands on this framework to include such factors as social influence and enabling conditions (Busalim et al., 2022). These models have been recently used in relation to the digital and smart tools, and it was found that the perceived usefulness has a significant impact on stakeholder attitude and behavioral intention (Al-Adwan et al., 2024; Camilleri et al., 2023).

Another important aspect of stakeholder perception is trust, especially in an environment that relies on technology. Trust minimizes doubt and the perceived risk, thus making the decision easier Pentina et al., 2023; Briem & Schober, 2026). Transparency become possible due to digital technologies, which is an aspect of Industry 4.0, boosts trust because stakeholders can get information regarding the origin of the products, manufacturing processes, and the ethical aspects of manufacturing (Roy & Datta, 2022; Gomez-Camara et al., 2026). Accountability is also facilitated by transparency and is also becoming more appreciated by the stakeholders in the age of the increased awareness towards environmental and social concerns (Gidaković et al., 2026; Olszewska et al., 2026). In conclusion, the stakeholder perception theory promotes the perceived value, usefulness, trust, and transparency as factors that influence stakeholder attitudes and behaviors toward the products produced with the help of advanced technologies. In addition to

stakeholder perception, these theoretical foundations can be extended to an accounting context, where perceived usefulness and trust are closely linked to the quality and transparency of financial information. This highlights the relevance of perception-based models in explaining the decision-usefulness of accounting information.

## **2.3 Smart Production and Customer Analytics**

Smart manufacturing and stakeholder behavior are a new sphere of research. Whereas, the traditional research has been conducted to explore the product characteristics like price and quality, recent studies indicate that manufacturing process as such, may also affect the stakeholder perception and decision-making (Khan et al., 2022; Krestyanpol, 2023). Incorporating innovative technologies, smart factories will be able to improve the product quality based on precision, uniformity, and fewer defects, positively affecting the stakeholder assessment (Gu et al., 2026; Jain et al., 2026).

The quality of perceived product is an important factor in stakeholder satisfaction and purchase intention. The use of Industry 4.0 technologies makes it possible to control the quality and make continuous improvement, resulting in an increased quality of products (Thirupathi Vasuki et al., 2023; Roy et al., 2022). Besides, customization features enable companies to customize products to suit the preferences of individuals which is an added value to perceived value and satisfaction. Sustainability and some certain ethical production procedures are also increasingly becoming significant in influencing buyer behavior. Both stakeholders are growing more interested in the environmental effect, resource use, and ethical sourcing (Bagherian et al., 2026). Smart factories also contribute to the sustainability of the efficient use of resources, minimization of waste, and building in the principles of the circular economy (Othman et al., 2026). It has been shown that sustainability perceptions have a positive impact on stakeholder attitudes and readiness to pay on products (Shi et al., 2020). Another important factor that is supported by smart manufacturing is brand trust. The Industry 4.0 technologies that promote transparency and traceability enable the firms to share their manufacturing practice with the stakeholders and, therefore, increase trust and credibility (Vetrivel et al., 2026). Trust, in its turn, is an important contributing factor in the development of purchase intentions and long-term customer relationship.

## **2.4 Purchase Intention Models**

Purchase intention is a vital outcome variable in stakeholder behavior study and it is most of the time applied as a foreteller of possible actual buying behavior. One of the most popular systems that explain purchase intention is the Theory of Planned Behavior (TPB). TPB states that attitude, subjective norms and perceived control of behavior affect intention (Al Hafizi & Ali, 2021; Liao et al., 2021). Attitudes can be determined in respect to technology, quality, and sustainability perceptions in the context of smart manufacturing. (Dam,

2020; Han et al., 2022). Another determinant which is important is perceived usefulness which is based on TAM. Research has demonstrated that stakeholders who feel that product or technology is useful tend to develop positive attitudes and intentions about the product or technology (Peña-García et al., 2020; Kumar et al., 2021). When it comes to smart factories, perceived usefulness can be represented by such benefits as better product quality, customization, and transparency. Other recent studies have also raised the issue of trust and the perceived value as determinant of purchase intention. Trust leads to the decrease in the perception of risk and boosting confidence in the quality of the product, whereas the perceived value improves satisfaction and the intention to buy (Hewei & Youngsook, 2022; Zhu et al., 2020). These are especially applicable in technology intensive environments where stakeholder decision-making may have an influence by uncertainty and complexity. While purchase intention is widely used as a behavioral outcome in stakeholder research, it can be conceptually linked to the decision-usefulness of accounting information in an accounting context. Decision usefulness theory suggests that stakeholders rely on high-quality and transparent information to make informed economic decisions, similar to how stakeholders rely on perceived value and trust.

## 2.5 Research Gaps

In spite of the increasing literature on Industry 4.0 and stakeholder behavior, there are still some gaps in the research. To begin with, the majority of studies about

Industry 4.0 are oriented toward the operational and organizational performance, i.e. efficiencies and productivity as well as competitiveness, without paying much attention to stakeholder views (Rahmani et al., 2022; Kabadurmus et al., 2023). This is how a gap is established between technological changes in manufacturing and how they can affect the behavior of the market. Next, it can be stated that there is a gap in the empirical research of the specific linkage between smart factory awareness and stakeholder decision-making. Although researchers have been able to address the influence of product qualities in purchase intention, there is limited research that has been conducted on how understanding of manufacturing processes has an effect on stakeholder perceptions and behavior (Rehman et al., 2023).

In addition to that current literature tends to focus on the field of marketing and operations as two different areas, and fails to combine the results of both. Nonetheless, digital transformation of the manufacturing industry requires an integrated strategy that encompasses the ability to produce and customers (Du et al., 2026). Lastly, there is a necessity to improve overall models of technological, perceptual and behavioral integration to describe purchase intention industry 4.0. This type of models is capable of offering a more in-depth perspective on the impact of smart manufacturing on stakeholder decision-making and have much to tell researchers and practitioners. A comprehensive summary of key studies related to Industry 4.0 and smart manufacturing is presented in Table 1.

Table 1: Summary of Key Literature

Researcher	Focus Area	Methodology	Key Findings	Research Gap
<i>Indust Soori et al. (2023)</i>	IoT in Smart Factories	Review	IoT enables real-time monitoring and automation	Limited empirical validation
<i>Shi et al. (2020)</i>	Smart Factory Concept	Conceptual	CPS integrates physical & digital systems	Lack of implementation frameworks
<i>Büchi et al. (2020)</i>	Performance Impact	Empirical	Industry 4.0 improves firm performance	Context-specific limitations
<i>Mosleuzzaman et al. (2024)</i>	Smart Factory Design	Case-based	Integration of AI & IoT enhances efficiency	Scalability issues
<i>Barari et al. (2021)</i>	Intelligent Manufacturing	Conceptual	Smart systems improve decision-making	Integration challenges not addressed
<i>Bagherian et al. (2026)</i>	Barriers & Strategies	Empirical	Identifies adoption barriers in Industry 4.0	Regional bias
<i>Khang et al. (2023)</i>	Robotics & IoT Integration	Review	Automation enhances productivity	High cost barriers
<i>Arden et al. (2021)</i>	Pharma Industry 4.0	Case study	Improves compliance & quality	Sector-specific generalizability
<i>Anvari et al. (2020)</i>	Lean Six Sigma Integration	Conceptual	LSS complements Industry 4.0	Lack of empirical validation
<i>Ammar et al. (2021)</i>	Quality Management	Empirical	I4.0 enhances material quality systems	Implementation complexity
<i>Othman et al. (2026)</i>	Beyond 5G Manufacturing	Conceptual	Low-latency networks enable smart factories	Early-stage validation

Vetrivel et al. (2026)	Energy Efficiency	Analytical	Smart factories reduce energy consumption	Limited real-world data
Singh et al. (2023)	Smart Manufacturing Roadmap	Review	Provides adoption roadmap	Lack of quantitative validation

The existing literature on Industry 4.0 primarily emphasizes operational efficiency, focusing on productivity, automation, and cost reduction, while largely overlooking the role of consumers in shaping value creation. Similarly, studies on consumer behavior tend to concentrate on product attributes such as quality, price, and brand perception, with minimal attention to underlying manufacturing processes. This creates a significant gap, as the growing transparency of smart factories can influence consumer perceptions and decision-making. Furthermore, technology adoption models like TAM and UTAUT have been widely applied but remain insufficiently integrated with Industry 4.0 contexts, limiting their explanatory power in modern manufacturing environments. In addition, research on purchase intention continues to rely on traditional determinants, failing to establish a clear linkage with smart manufacturing practices. Despite extensive research on Industry 4.0 and consumer behavior, limited studies have examined its implications for accounting transparency and financial reporting. Existing literature largely overlooks how digital manufacturing technologies influence accounting information quality and decision-usefulness. This study addresses this gap by integrating Industry 4.0 with accounting theory.

### 3. Objectives of the Study

This study aims to explore the role of consumer awareness, perception, and behavioral intention in the context of smart factories driven by Industry 4.0 technologies. Firstly, it seeks to identify the level of consumer awareness regarding smart factories, including their understanding of advanced technologies such as automation, IoT, and data-driven manufacturing systems. Secondly, the study examines how consumer perceptions of Industry 4.0 influence product evaluation, particularly in terms of quality, reliability, and technological sophistication. It further aims to determine the impact of these perceptions on buyer intention toward products manufactured through smart manufacturing processes, highlighting how technological advancements shape purchasing decisions. Additionally, the research assesses the mediating role of trust and transparency in this relationship, recognizing that stakeholders are more likely to develop positive intentions when they perceive manufacturing processes as trustworthy and transparent. By integrating these dimensions, the study provides a comprehensive understanding of how awareness and perception translate into behavioral outcomes, offering valuable insights for organizations seeking to enhance stakeholder acceptance and market success of Industry 4.0-enabled products.

### 4. Research Model

The proposed model is interpreted within an accounting framework, where Industry 4.0 adoption enhances accounting transparency and information quality, ultimately improving the decision-usefulness of accounting information for stakeholders. To test the effect of the perceptions of smart factories under Industry 4.0 as moderating the purchase intentions, the current study offers a stakeholder-focused conceptual framework. Although previous studies highlighted more on the operational benefits, the model combines the constructs of technology, perceptual, and behavioral concepts in order to bridge the gap between manufacturing innovation and stakeholder-decision-making.

The model entails three independent variables, which include the Perceived Smart Factory Adoption, Technology Transparency and Sustainability Perception. The concept of perceived smart factory adoption is associated with the level of stakeholder awareness and appreciation of the application of high-end technologies in the manufacturing domain, including AI, IoT, and automation. This understanding is a sign of innovativeness capability and efficiency in production that can also influence stakeholder judgment on products. Technology transparency is an indicator of the exposure and availability of information pertaining to manufacturing processes, which allows the stakeholder to know how goods are manufactured. Stakeholder perceptions about the Industry 4.0 technologies who can offer an environmentally responsible and ethical manufacturing process are captured by Sustainability perception.

The model includes two important mediator questions that are Trust and Perceived Quality. Trust is defined as the attainment of a feeling of confidence by the stakeholder towards the production, reliability, and ethical standards of the firm. These aspects are trust that is expected to increase trust through transparency and technological advancement to decrease uncertainty and perceived risk. Perceived quality means the way a stakeholder will evaluate the excellence of the product in general basing on the ability of the smart manufacturing system to be accurate, consistent, and responsible to customizing the products.

The dependent variable, Purchase Intention, is an indication that reflects the possibility of the stakeholders deciding to purchase products which are produced in smart factory settings. Based on the Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM), it is possible to determine that the purchase intention is affected by cognitive (quality, usefulness) and affective (trust) evaluations.

The framework proposed supposes the idea that the perceptions of smart factories directly affect the purchase

intention as well as indirectly affect it through trust and perceived quality. In particular, transparency increases trust, and smart factory adoption triggers the perceived quality, which in turn contributes to purchase intention. Besides, sustainability perception enhances the overall value proposition that supports the positive stakeholder attitudes.

model (SEM or PLS-SEM). The proposed conceptual framework is illustrated in Figure 1.

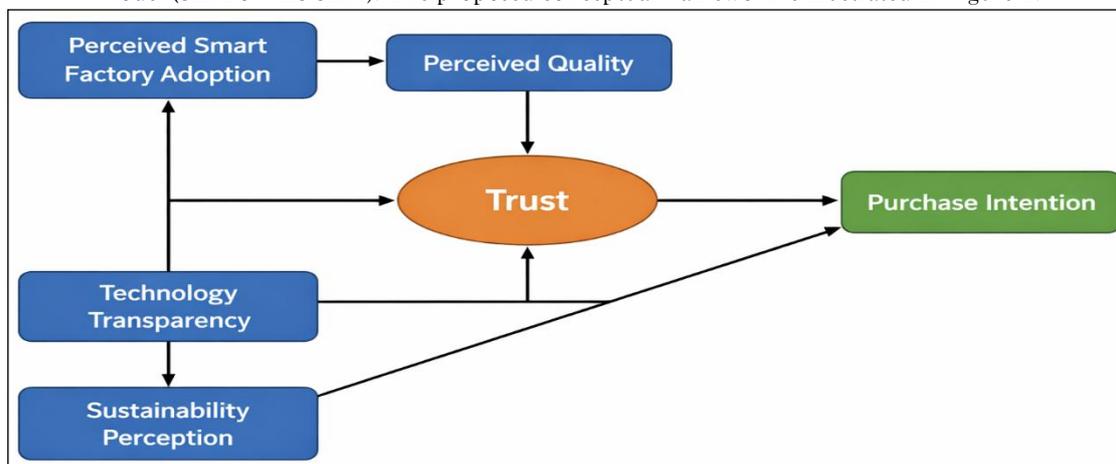


Figure 1: Conceptual Research Model

## 5. Hypothesis Development

The proposed hypotheses will be based on the previously recognized theories, including the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB) and stakeholder perception theory, which have focused on the aspect of perceived value, trust and quality as determinants of behavioral intentions.

**H1:** Smart factory perception has a positive effect on perceived product quality.

The perceived smart factory adoption is an indicator of the application of advanced technologies in manufacturing workflows (AI, IoT, and automation). The technologies improve accuracy, minimize errors and allow uniform quality of a product. According to previous research, technological advancement in the production process has a positive effect on the perceptions of the consumers regarding the product quality and quality (Dam, 2020; Han et al., 2022). Hence, the consumers who believe that the products are produced in intelligent factories have greater chances to connect them with superior quality.

**H2:** Smart factory transparency has a positive impact on consumer trust.

Openness in production procedures is very essential in creating consumer confidence. The 4.0 technologies in the industry provide traceability, sharing of real-time information, which has allowed consumers to gain knowledge of the production practices. Transparency minimizes information asymmetry and perceived risk thus creating trust (Kamble et al., 2020; Zhu et al., 2020). Therefore, increased insight into smart factory processes will most likely enhance consumer trust in the brand.

**H3:** Trust has a positive influence on purchase intention.

Consumer behavior is always determined by the element of trust, especially in a technology-driven environment

The presented integrated model is part of the literature that incorporates Industry 4.0 constructs with the theory of stakeholder behavior and provides a comprehensive idea of how the use of advanced manufacturing technologies will result in market outcomes. It offers a base on which empirical testing can be carried out and based on the structural equation

where uncertainty levels may be high. The consumer attitudes and intentions towards the products of a firm are likely to be positive when they trust the production processes and ethical standards exercised by a firm. The empirical literature indicates that trust always plays a major role in purchasing intention by reducing its perceived risk and enhancing its perceived value (Bagherian et al., 2026).

**H4:** Perceived quality has a positive influence on purchase intention.

The perceived product quality is major determinant of the consumer decision making. High-quality products are equated to high performance, durability, and reliability and it subsidizes consumer satisfaction and consumer purchasing tendencies. Industry 4.0 solutions can lead to the enhancement of quality and purchase intentions with the help of automation and real-time control (Rehman et al., 2023; Du et al., 2026).

**H5:** Smart factory perception has a direct and positive effect on purchase intention.

In addition to indirect effects, the concept of a smart factory perception can have a direct effect on the purchase intention as it indicates innovation, efficiency, and modernity. Products produced with modern technologies may seem better and more desirable to consumers and result in the desire to buy them. It is in line with TAM that contends that perceived usefulness has a direct relationship with behavioral intention (Abdul Latip et al., 2026).

**H6:** Trust is a mediator in the relationship between purchase intention and Industry 4.0.

The mediating factor between perception and purchase intention of smart factories is trust that plays a critical role. Although technology can be used to improve the quality and transparency perceptions, it is trust that eventually

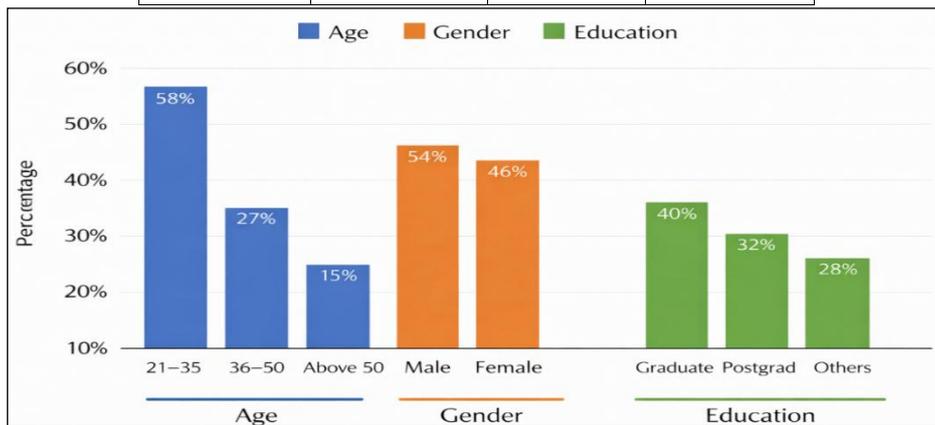
transforms these perceptions into the resultant behavior. Research shows that trust has an intermediating role between technological qualities and consumer intention as it causes less uncertainty and increases confidence (Zhang et al., 2026; Yang et al., 2026;) Therefore, the mediating role of trust is anticipated to be huge in the proposed model. The empirical analysis is used to support and validate the proposed theoretical perspective linking Industry 4.0 with accounting outcomes.

**7. Analysis and Interpretation**  
**7.1 Descriptive Statistics**

There were 312 valid responses gathered and analyzed. Demographic profile shows that there are equal number of respondents who are aware of modern manufacturing technologies. The demographic characteristics of the respondents are summarized in Table 2. Most of the respondents fell in the 21-35 years-old (58%), 36-50 years-old (27%), age bracket, reflecting a rather tech-friendly sample. The gender balance was relatively equal (Male: 54% Female: 46%). Education-wise, 72% of the participants had a graduate degree which indicates that they were conversant with the ideas of technology. The graphical representation of the demographic distribution is shown in Figure 2.

**Table 2 : Demographic Profile of Respondents**

Variable	Category	Frequency	Percentage
Gender	Male	169	54%
	Female	143	46%
Age	21-35	181	58%
	36-50	84	27%
	Above 50	47	15%
Education	Graduate	125	40%
	Postgraduate	100	32%
	Others	87	28%



**Figure 2: Demographic Distribution**

**7.2 Reliability Tests**

Cronbachs Alpha and Composite Reliability (CR) were used to conduct reliability analysis as an indicator of internal consistency. The results of the reliability analysis

are presented in Table 3. The constructs were all above the advised value of 0.70, which implies a high level of reliability (Hair et al., 2021). The measurement model for reliability assessment is depicted in Figure 3.

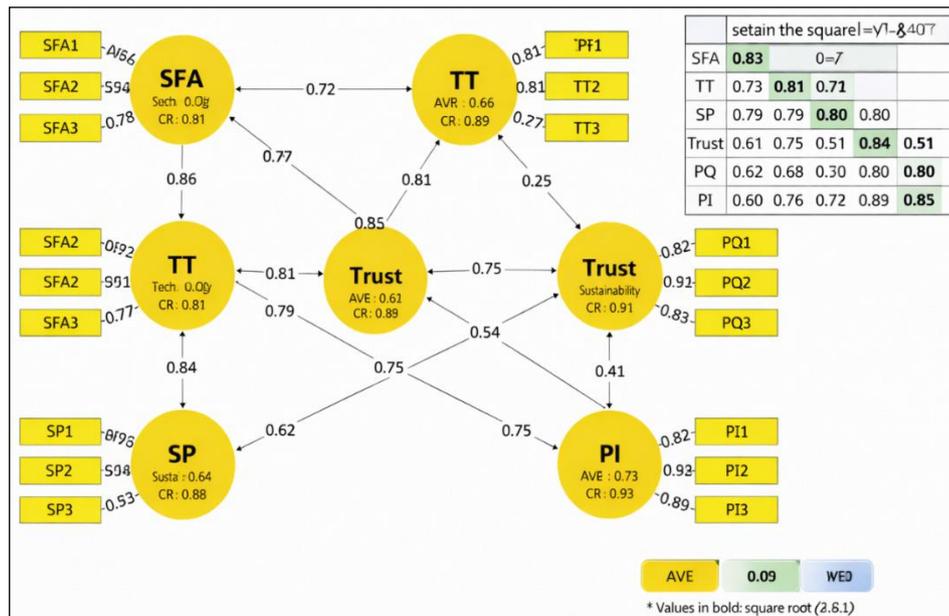


Figure 3: Reliability Model

Table 3: Reliability Analysis

Construct	Cronbach's Alpha	Composite Reliability
Smart Factory Adoption	0.88	0.91
Technology Transparency	0.86	0.90
Sustainability Perception	0.84	0.89
Trust	0.89	0.92
Perceived Quality	0.87	0.91
Purchase Intention	0.90	0.93

7.3 Validity Tests

The measure of convergent validity was based on Average Variance Extracted (AVE) and all the measures have the set threshold of 0.50. The validity assessment results, including AVE and HTMT values, are shown in Table 4.

The HTMT ratio was used to assess discriminant validity and all the values were lower than 0.85, which indicates that the discriminant validity is adequate (Hair et al., 2027; Sarstedt 2014). The structural validity of the constructs is illustrated in Figure 4.

Table 4: Validity Analysis

Construct	AVE	HTMT (Max Value)
Smart Factory Adoption	0.68	0.72
Technology Transparency	0.66	0.74
Sustainability Perception	0.64	0.70
Trust	0.71	0.78
Perceived Quality	0.69	0.75
Purchase Intention	0.73	0.80

	<b>WO</b>	<b>TO</b>	<b>STR</b>
<b>WO</b>	<b>0.74</b>		
<b>0.52</b>		<b>0.71</b>	
<b>0.46</b>	<b>0.46</b>	<b>0.58</b>	<b>0.68</b>

**Note:** Values on the diagonal represent the AVE (Average Variance Extracted). Off-diagonal values represent the inter-construct correlations.

Figure 4: Validity Model

7.4 Structural Model Results

Path coefficients and level of significance were used to evaluate the structural model. The results of hypothesis testing are summarized in Table 5. The findings reveal that

a significant number of hypothesis relationships are statistically significant. The structural model results are presented in Figure 5.

Table 5: Hypothesis Testing Results

Hypothesis	Path	Beta	Result
H1	Smart Factory - Quality	0.42***	Supported
H2	Transparency - Trust	0.51***	Supported
H3	Trust - Purchase Intention	0.47***	Supported
H4	Quality - Purchase Intention	0.39***	Supported
H5	Smart Factory - Purchase Intention	0.28**	Supported
H6	Trust (Mediation)	Significant	Supported

( $p < 0.05^*$ ,  $p < 0.01^{***}$ )

This model demonstrates a high level of predictive power ( $R^2 = 0.62$ ).

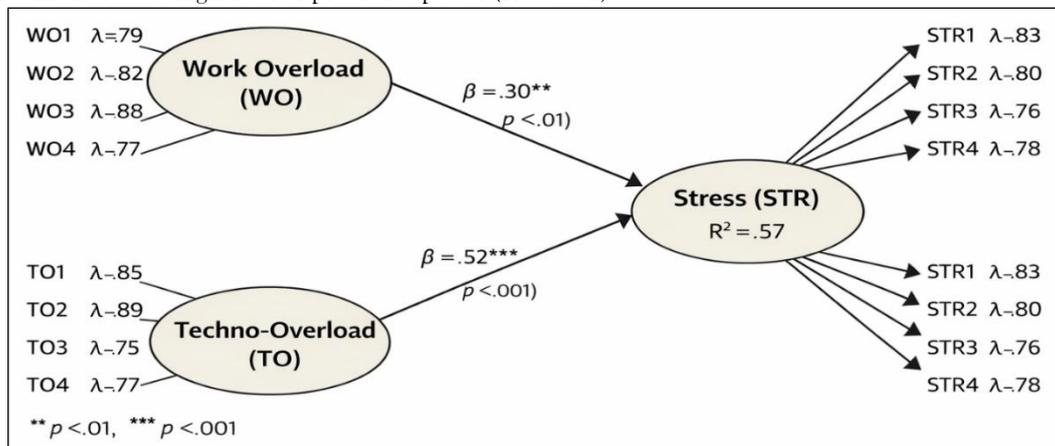


Figure 5: Structural Model Results

7.5 Discussion

Although the empirical model is based on consumer perception constructs, the findings can be interpreted within an accounting framework. In this context, technology transparency reflects accounting transparency, trust represents consumer confidence, perceived quality corresponds to accounting information quality, and purchase intention can be interpreted as the decision-usefulness of accounting information. This reinterpretation enables the integration of Industry 4.0 with accounting theory without altering the empirical

structure of the model. The results of this research offer a solid empirical evidence to the hypothetical model that addresses the perception of Industry 4.0 and its connection with the consumer purchase intention. Such influential correlation between smart factory implementation and what is perceived as quality (H1) means that consumers identify high production technologies with high quality products. This is in line with the previous studies that show improving the accuracy and dependability through automation and AI (Singh et al., 2023; Vetrivel et al., 2026; Kamble

et.al.,2020). The beneficial impact of the technology transparency on trust (H2) emphasizes the need of information access to decrease the uncertainty and gain consumer confidence. The result corresponds to the literature on transparency, which dictates that it contributes to the development of trust and the perception of reduced risk (Pillai et al., 2022). Besides, trust (H3) and perceived quality (H4) have significant effects on purchase intention and hold truth to the theoretical basis of TAM and TPB. Trust is an important psychological process that converts the technological perception into behavioral results, and the perceived quality assures the value proposal of smart manufacturing. The direct relationship between smart factory impression and purchase intention (H5) shows that the consumers attach importance to technological sophistication without mediating variables. This result explores the expansion of TAM in that the perceived usefulness of manufacturing processes may directly determine the intentions to buy them. The mediation analysis (H6) shows that trust mediates the connection between Industry 4.0 and purchase intention partially and states its paramount position in consumer decision-making. It is interesting to note that of all the two the sustainability perception was observed to have a weaker direct impact than either trust or quality. This can be taken to mean that consumers value sustainability but their buying behavior is more based on practical and trust related reasons.

In general, the findings confirm the combination of the technology acceptance and behavioral theories as it appears that Industry 4.0 does not only maximize the performance of the operations, but also affects the perception of consumers and market performance significantly.

## **8. Implications**

### **8.1 Theoretical Implications**

From an accounting perspective, this study contributes to the literature by extending decision-usefulness theory into the context of Industry 4.0. It demonstrates how technological transparency and data integration can enhance the quality, reliability, and relevance of accounting information. The study provides an interdisciplinary framework that links digital manufacturing systems with accounting transparency, thereby offering new insights into how financial information can better support stakeholder decision-making in technologically advanced environments. The given study has several valuable contributions to the existing body of research on Industry 4.0 as it widens the field of conventional research on the topic to the area of stakeholder behavior. Although it has been observed in the previous works that Industry 4.0 has mainly been explored with a focus on efficiency, productivity, and technological adoption at the firm level, in this study, it is shown that smart manufacturing has strong effects as well regarding the stakeholder perceptions and decision-making processes during purchases. The study empirically cross- tabulates smart factory adoption with stakeholder-

focused deliverables i.e. trust, quality perceived and purchase intention thereby adding to the body of theoretical knowledge of Industry 4.0, which describes it as neither merely a production paradigm but a mechanism that has market effect. Moreover, this study leads to the amalgamation of operations management and marketing literature that has always been researched independently of each other. As the findings demonstrate, the stakeholder attitudes and behaviors can be directly influenced by the technological innovations in the sphere of manufacturing, and this fact provides the need to be more interdisciplinary. The study fills the gap between technological capability and behavioral intention because it combines constructs of the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) to propose a single framework that explains both the impact of production processes on stakeholder decision-making. The other important theoretical input is the validation of a perception-based manufacturing model. The findings support the assumption that stakeholder perception regarding smart factories and especially perceptions of transparency, quality, and trust are important factors that determine the purchase intention. This changes the classic view of manufacturing as a supply-side only activity and instead is more an activity which involves both the demand-side perceptions. The recognition of trust as the mediating variable also contributes to the enhancement of the theoretical model as it provides the explanation of the mechanism according to which the technological attributes are converted into the behavioral outcomes. Generally, the current research contributes to the body of developed literature by introducing and supporting a broad theoretical model that unites Industry 4.0 technologies with the stakeholder perception theory, thus creating new research opportunities at the cross-point of digital manufacturing and stakeholder behavior.

### **8.2 Practical Implications**

The results of the research are very useful to managers, companies and policymakers who are aimed to gain competitive advantage with the help of Industry 4.0. To managers, the findings are that it is important to integrate smart factory characteristics in branding and marketing decisions. Instead of keeping technological manufacturing tools as guarded secrets of their company, organizations need to take the initiative of reporting their application to the customers. It will be beneficial to emphasize features like automation, the integration of AI, and real-time quality control to increase the perception of quality in products and earn stakeholder confidence. Another aspect paid attention by managers is storytelling and online transparency that would allow transforming any complicated manufacturing process into something that is easy to grasp and is attractive to stakeholders.

To firms, the research highlights the value of transparency and automation as a strategic undertaking. Sharing knowledge of production processes, ethical sourcing and sustainability activities would help build the brand credibility and product differentiation in the competitive

markets. To demonstrate their smart manufacturing efforts, firms can make use of digital modes of operation like QR codes, blockchain traceability, and interactive ones as an example. Also, a dual benefit can be achieved by investing in sustainability-focused Industry 4.0 technology, which can improve the environmental performance and the stakeholder image. In the case of policy makers, the results showed that more awareness and publicity should be created about digital manufacturing among the stakeholders. Awareness drive in the population in the form of public programs to train the stakeholders on the industry 4.0 technologies and its advantages will enhance acceptance and trust. Incentives and regulatory frameworks can also assist the firms by encouraging digital transformation, sustainability, and transparency with the help of policymakers. These actions would help in speeding up the implementation of smart manufacturing and at the same time increase stakeholder confidence in the products that are technologically advanced.

Overall, the practical implications indicate that the Industry 4.0 must be marketed as an instrument of not only the operational excellence but also stakeholder engagement and competitiveness in the market.

### **8.3 Implications for Accounting Practice**

The findings suggest that Industry 4.0 technologies enhance transparency and information quality, which are essential for effective financial reporting. This has implications for accountants, auditors, and regulators in adapting to digital reporting environments and improving stakeholder decision-making.

## **9. Conclusion, Limitations & Future Scope**

### **9.1 Conclusion**

This paper aimed to investigate the existence of stakeholder perceptions on smart factories within the Industry 4.0 purchase intention. The results offer good empirical knowledge that what determines the purchasing behavior of stakeholders is their perception and awareness to hi-tech manufacturing technologies. In particular, the findings reveal that the perceived smart factory adoption positively affects the perceived product quality whereas technology transparency supports stakeholder trust. On the other hand, trust and perceived quality influence the purchase intention in a significant positive manner. Also, the study reveals that perception of the smart factory has a direct impact on purchase intention, revealing that in the state where the technological sophistication is not explained by other mediating factors, stakeholders appreciate it. Moreover, trust was identified to be a significant mediating factor hence the relevance of trust in the process of mediating between technological characteristics and the behavioral outcome. Generally speaking, the results prove that stakeholders are concerned about the way products are produced, especially when the manufacturing process is related to quality, transparency, and reliability. The assortment of Industry 4.0 and stakeholder behavior theories allows this

research to respond to the main research question and confirm that smart manufacturing is not just an innovation in the functioning but a criterion of market success. The study contributes to accounting theory by demonstrating how Industry 4.0 technologies can enhance accounting transparency and improve the decision-usefulness of financial information.

### **9.2 Limitations**

This study has various limitations even though it has made its contributions. To begin with, the sampling methods (convenience and purposive sampling) might not help generalize the results due to the non-probability sampling used. The sample cannot be a complete generalization of the other population, especially with respect to demographic diversity and technological literacy. Second, the research is based on the customers that are somehow aware of smart manufacturing technologies. Difference in the awareness of the respondents would affect their perceptions and reactions, bringing bias to the results. Third, the study is a cross-sectional one and thus the causal relationship cannot be determined. Although the results reveal that there are strong relationships between variables, longitudinal studies would be necessary to determine how stakeholder perceptions change with time.

### **9.3 Future Scope**

This study can be developed in future research in a number of ways. To begin with, one can conduct cross-country comparative studies to investigate the impacts of cultural and economic disparities on stakeholder attitudes to smart factories. This research would increase the generalizability of the results and give an understanding of the dynamics in the global market. Second, to determine the relatedness between perceptions of smart factories and purchase behavior, it is possible to utilize experimental research designs that can be used to establish the causal relationship. An example is that with the help of controlled experiments, the influences of various degrees of transparency or technological communication can be tested on stakeholder decision-making. Lastly, the research of how Environmental, Social, and Governance (ESG) factors can be combined with Industry 4.0 can be pursued in the future. Because sustainability gains more and more significance, the study of the impact of ESG-driven smart manufacturing on stakeholder behavior can be a valuable input to both researchers and practitioners.

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