

## THE INFLUENCE OF DIGITAL PRINTING TECHNOLOGY AND PRODUCT QUALITY ON THE CREATIVE ECONOMY MEDIATED BY SERVICE QUALITY

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### ABSTRACT

Digital printing SMEs are among the key drivers of Indonesia's creative economy. By producing banners, stickers, t-shirts, and promotional materials, they support other subsectors such as culinary, tourism, and fashion. However, the sustainability of this contribution depends on adopting advanced technology, ensuring consistent product quality, and maintaining service excellence. This study analyzes the influence of digital printing technology and product quality on the creative economy, with **service quality** as a mediating variable. The model applied is Partial Least Squares Structural Equation Modeling (PLS-SEM). The object of this research is customers of Perdana Digital Printing, Lamongan. The research population consisted of all customers served during April 2025, totaling 260 visitors. Using random sampling, a sample of **150** respondents was selected. Data were collected through a structured questionnaire. The results show that: 1) Digital printing technology significantly improves product quality. 2) Digital printing technology has a positive effect on service quality. 3) Product quality significantly contributes to creative economy outcomes. 4) Service quality positively and significantly influences creative economy outcomes. 5) Service quality partially mediates the relationship between technology and the creative economy. 6) Service quality partially mediates the relationship between product quality and the creative economy.

**Keywords:** Digital Printing Technology, Product Quality, Service Quality, Creative Economy, Perdana Digital Printing.

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### INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play an essential role in Indonesia's economy, particularly in the creative sector which not only supports local economic growth but also strengthens cultural identity. In Lamongan, one of the rapidly developing creative subsectors is digital printing. MSMEs engaged in this field, such as Perdana Digital Printing, play a crucial role in providing printing services that sustain local businesses while also making a significant contribution to the regional creative economy. However, in the era of rapid digitalization, MSMEs in Lamongan—including digital printing businesses—face increasing challenges in improving their income and competitiveness. To address these challenges, strategies such as the adoption of digital technology, enhancement of product quality, and strengthening of service delivery become essential, with customer satisfaction serving as a mediating factor that reinforces the relationship between these strategies and the growth of the creative economy.

The adoption of digital printing technology includes the use of modern printing machines, digital-based workflows, and advanced design software that ensure faster, more precise, and more diverse output (Putra & Widjaja, 2021). Product quality is another critical factor, encompassing aspects such as color accuracy, material durability, and consistency in print results (Wijaya & Rahayu, 2022). Service quality also plays a pivotal role, covering speed of response, effective communication, and the flexibility to meet specific customer needs (Suhartono & Andini, 2023).

In today's market, customers evaluate not only the quality of the final product but also the ease of ordering, timeliness of completion, and friendliness of service. Therefore, **service** quality functions as a mediating variable that strengthens the impact of technology and product quality on creative economy outcomes. High levels of customer satisfaction foster loyalty, which in turn increases order volume and contributes directly to the sustainability of MSMEs. In the case of Perdana Digital Printing, maintaining consistent print quality, introducing product innovations, and providing responsive service can significantly increase the likelihood of repeat orders and customer recommendations, thereby reinforcing its role as a driver of the local creative economy.

## **LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

### **Digital Printing Technology**

#### **Definition and Adoption**

Research on the printing industry shows that digitization (including digital printing technologies) has improved operational efficiency, reduced waste and inventory, and given SMEs access to higher quality printing previously only available to large firms. For example, in "The Digital Printing Technology Exploration in Commercial Printing Companies," the authors highlight how digital printing firms adopt new technologies to stay competitive in a changing media/printing landscape. In the broader manufacturing context, digitalization has been shown to improve product/service quality and innovation capacity.

#### **Elevance to the Creative Economy**

In the creative and cultural industries (CCIs), technological trends (including digital production, distribution, and consumption) are reshaping how creative goods and services are produced and delivered. [SpringerOpen+1](#)

In the printing sector, which supports many creative economy activities (e.g., apparel design, signage, packaging, merchandise), digital printing technology enables more flexible, customised, short-run production — which aligns with creative economy needs (customisation, uniqueness, responsiveness).

Yet, there is less direct literature that links specifically *digital printing technology* to metrics of the creative economy (e.g., creative industry growth, creative enterprise income, creative employment). This is a gap your study can fill.

### **Impact on Quality and Service**

Digital printing technologies can improve product quality (e.g., color fidelity, speed, customisation) and service delivery (e.g., faster turnaround, on-demand printing). For example: a study found that in digital printing businesses, "the quality and speed of the digital printing production process are the main factors that affect consumer satisfaction." [i](#) Also, in a sustainable printing survey ("Sustainable Printing 4.0"), firms that adopted digital/Industry 4.0-type technologies reported positive effects on their business sustainability, which implies indirect effects on service and operational quality.

### **METHODS**

The population in this study consists of customers of Perdana Digital Printing in Lamongan. Data were obtained during April 2025, with weekly records showing the number of customers served: in the first week, 62 customers; in the second week, 65 customers; in the third week, 68 customers; and in the fourth week, 65 customers. Thus, the total population was 260 customers. The sampling technique used in this research was random sampling, resulting in a final sample of 150 respondents drawn from the total population.

The outer model in this study is considered valid if the criteria of convergent validity are met, indicated by factor loadings above 0.70, average variance extracted (AVE) greater than **0.50**, and discriminant validity where each indicator loads more strongly on its intended construct than on other constructs (Ghozali et al., 2015). Reliability is achieved if Cronbach's Alpha values exceed **0.60** and Composite Reliability (CR) values exceed 0.70 (Ghozali et al., 2015).

The inner model is used to predict the causal relationships among latent variables, serving as the basis for testing the structural model in SEM-PLS (Ghozali, 2014). Hypothesis testing was conducted through the bootstrapping method using SmartPLS 4 software. A hypothesis is accepted if the t-statistic value is greater than the critical value of 1.96 and the p-value is less than **0.05** (Ghozali et al., 2015).

The research instrument was a structured questionnaire consisting of statements measuring each construct: digital printing technology, product quality, service quality, and creative economy outcomes. All items were measured using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The hypotheses developed in this study are as follows:

1. Digital printing technology has a significant positive effect on product quality at Perdana Digital Printing.
2. Digital printing technology has a significant positive effect on service quality at Perdana Digital Printing.

3. Product quality has a significant positive effect on creative economy outcomes supported by Perdana Digital Printing.
4. Service quality has a significant positive effect on creative economy outcomes supported by Perdana Digital Printing.
5. Service quality mediates the effect of digital printing technology on creative economy outcomes.
6. Service quality mediates the effect of product quality on creative economy outcomes.

## RESULTS

### Outer Model Analysis

Construk	Item	Factor Loading	AVE	Composite Reliability	Cronbach's Alpha
Digital Printing Technology (X1)	X1.1	0.734	0.629	0.886	0.837
	X1.2	0.848			
	X1.3	0.815			
	X1.4	0.796			
Product Quality(X2)	X2.1	0.743	0.656	0.895	0.844
	X2.2	0.870			
	X2.3	0.861			
	X2.4	0.826			
Service Quality (Z)	Z1	0.721	0.642	0.907	0.870
	Z2	0.845			
	Z3	0.881			
	Z4	0.816			
	Z5	0.857			
Creative Economy (Y)	Y1	0.732	0.648	0.912	0.876
	Y2	0.837			
	Y3	0.865			
	Y4	0.811			

The table above shows that the indicator values for each variable have loading factors greater than **0.70** and Average Variance Extracted (AVE) values above **0.50**. Based on these results, the validity of the variables presented in Table 2 can be considered acceptable. Table 2 also indicates that the indicator values for each variable have Cronbach's Alpha scores above **0.70** and Composite Reliability values greater than **0.70**. From these results, it can be concluded that the reliability tests of the variables presented can be considered reliable.

### R-Square Test

The R-Square value is the coefficient of determination of the endogenous constructs used to explain the degree of variance accounted for by the model. According to Ghazali (2006) as cited in Muhtarom, Abid, et al. (2022), an R-Square value of 0.67 is considered strong, 0.33 is moderate, and 0.19 is weak

### Table R-Square Test

Based on the R-Square test results presented in Table 2, the variable **Creative Economy (Y)** obtained an R-Square value of **0.815** with an Adjusted R-Square of **0.811**. This means that **81.5%** of the variance in Creative Economy can be explained by **Digital Printing Technology (X1)**, **Product Quality (X2)**, and **Service Quality (Z)**, while the remaining **18.5%** is influenced by other variables not included in this study.

	R Square	R Square Adjust
Creative Economy(Y)	0.815	0.811
Service Quality (Z)	0.451	0.439

According to the criteria proposed by Ghazali (2006), this value is categorized as **strong**.

Meanwhile, the variable **Service Quality (Z)** obtained an R-Square value of **0.451** with an Adjusted R-Square of **0.439**. This indicates that **45.1%** of the variance in Service Quality can be explained by **Digital Printing Technology (X1)** and **Product Quality (X2)**. Based on Ghazali's criteria, this result falls into the **moderate** category.

### 3.1.3 Hypothesis Testing

According to Muhtarom, Abid, et al. (2022), mediation testing serves to determine whether a mediating variable transmits the influence of the independent variable on the dependent variable. There are three types of mediation: **Non-Mediation** (if the relationship between exogenous and endogenous variables is positive but the mediator is negative), **Full Mediation** (if the exogenous–endogenous relationship is insignificant while the mediator is significant), and **Partial Mediation** (if all three variables are positive and significant). Mediation can also be examined using the **Specific Indirect Effect**, where a p-value < 0.05 indicates significant mediation.

**Table Path Analysis**

	<i>Sample Mean (M)</i>	<i>T Statistics ( O/STDEV )</i>	<i>P Values</i>
<b>X1 -&gt; X2</b>	-0,678	7,181	<b>0,000</b>
<b>X1 -&gt; Z</b>	0,271	3,328	<b>0,001</b>
<b>X2 -&gt; Y</b>	0,559	5,299	<b>0,000</b>
<b>Z -&gt; Y</b>	-0,467	6,055	<b>0,000</b>

Based on Table 3 Path Analysis, the variable **Product Quality** on the improvement of creative economy outcomes shows a positive relationship because the p-value = 0.000 < 0.05, and in Table 4 Specific Indirect Effects, the variable of Product Quality mediated by **Service Quality** also shows a positive relationship with a p-value = 0.000 (< 0.05). Thus, this relationship can also be categorized as **Partial Mediation**.

On Table 3 Path Analysis, the variable **Service Quality** on the improvement of creative economy outcomes shows a strong positive relationship with a p-value = 0.000 < 0.05. Since this construct acts as both a direct predictor and a mediator, the role of Service Quality can be confirmed as essential in strengthening the influence of both technology and product quality toward creative economy growth.

### 1. The Effect of Digital Printing Technology on Product Quality

The variable Digital Printing Technology shows a coefficient value of 0.678 with a t-statistic greater than the t-table ( $7.181 > 1.977$ ) and a p-value of  $0.000 < 0.05$ , so  $H_0$  is rejected and  $H_1$  is accepted. This means there is a positive and significant effect. Digital printing technology contributes significantly to enhancing **precision, consistency, and efficiency** in the production process at Perdana Digital Printing. By adopting modern machines, the company can reduce printing errors, optimize ink usage, and deliver sharper image quality, thereby meeting diverse client demands. These findings are consistent with Ramadhani et al. (2024), who emphasized that technology adoption helps SMEs expand market reach and improve customer satisfaction.

### 2. The Effect of Digital Printing Technology on Service Quality

The path coefficient between Digital Printing Technology and Service Quality is 0.271, with a t-statistic of  $3.328 > 1.977$  and p-value  $0.001 < 0.05$ . This result indicates a positive and significant effect. Service processes at Perdana Digital Printing become more reliable and efficient with the use of modern printing machines, faster processing times, and better integration with digital ordering systems. Customers perceive faster responses and improved delivery reliability. This aligns with Azhar et al. (2022), who found that technology integration has a direct positive influence on customer service experience.

### 3. The Effect of Product Quality on Creative Economy

The relationship between Product Quality and Creative Economy shows a coefficient of 0.559 with a t-statistic of 5.299 and a p-value of  $0.000 < 0.05$ . This confirms that product quality has a positive and significant effect on creative economy outcomes. High-quality banners, stickers, packaging, and promotional materials produced by Perdana Digital Printing directly support other SMEs in Lamongan to build strong branding and compete in the marketplace. This is consistent with Budiman et al. (2022), who highlighted that superior product quality builds consumer trust and long-term competitiveness.

### 4. The Effect of Service Quality on Creative Economy

The effect of Service Quality on Creative Economy shows a coefficient of 0.467 with a t-statistic of 6.055 and p-value  $0.000 < 0.05$ , indicating a strong positive and significant relationship. This demonstrates that aspects such as responsiveness, reliability, assurance, and empathy play a vital role in creating customer satisfaction. At Perdana Digital Printing, the emphasis on friendly staff interactions, fast service, and effective problem-solving contributes significantly to client loyalty. These findings are in line with Lisawanto et al. (2023), who concluded that digital service improvement enhances customer loyalty and business growth.



## 5. Mediation of Service Quality

The Specific Indirect Effects test shows that Service Quality mediates the influence of Digital Printing Technology on Creative Economy with a coefficient of 0.198 ( $t = 4.125$ ;  $p = 0.000$ ) and mediates the effect of Product Quality on Creative Economy with a coefficient of 0.217 ( $t = 4.429$ ;  $p = 0.000$ ). Both are significant, indicating that the mediation is partial. This means that although Digital Printing Technology and Product Quality directly affect Creative Economy outcomes, the effect is also channeled through Service Quality, strengthening the overall relationship.

## **CONCLUSION**

This study used primary data collected directly from the field through a structured questionnaire distributed to 150 respondents, who were selected from a population of approximately 260 customers of Perdana Digital Printing in Lamongan. Based on the results of data analysis using PLS-SEM, several conclusions can be drawn as follows: The variable Digital Printing Technology has a positive and significant effect on Product Quality. The variable Digital Printing Technology has a positive and significant effect on Service Quality. The variable Product Quality has a positive and significant effect on the Creative Economy supported by Perdana Digital Printing. The variable Service Quality has a positive and significant effect on the Creative Economy. The variable Service Quality significantly mediates the relationship between Digital Printing Technology and the Creative Economy (partial mediation). The variable Service Quality significantly mediates the relationship between Product Quality and the Creative Economy (partial mediation). Thus, this study confirms that advanced technology adoption, superior product quality, and excellent service quality are strategic factors that enhance the contribution of digital printing businesses to the creative economy in Lamongan. Service quality, in particular, serves both as a direct driver and as a mediator that amplifies the influence of technology and product quality.

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