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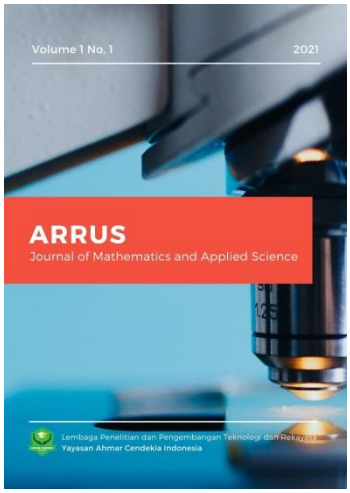

RESEARCH ARTICLES

A Public Sector Innovation: Determinants Analysis of Sustainability for Examining the Role of User Impact Mediation in the Dolan Banyumas Application

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Abstract: This study examines the determinants of sustainability of public sector innovation by examining the mediating role of user innovation impact in the Dolan Banyumas application. This study uses a quantitative approach with *the Structural Equation Modeling* method based on *Partial Least Squares* (SEM-PLS). Data was collected through an online survey of 60 respondents who used the Dolan Banyumas application who were selected using *the purposive sampling technique*. The research model examines the relationship between three main constructs, namely the perception of innovation novelty, the impact of innovation, and the sustainability of innovation. The results of the study show that the perception of innovation novelty has a positive and significant effect on the impact of innovation and the sustainability of innovation. In addition, the impact of innovation has been shown to have a significant effect on the sustainability of innovation and effectively mediates the relationship between the perception of innovation novelty and innovation sustainability. The value of the determination coefficient shows that this research model is able to explain 73.9% variation in innovation impact and 73% variation in innovation sustainability. The main findings of this study show that the sustainability of digital innovation in the public sector is not only determined by the aspect of technological novelty alone, but is highly dependent on the benefits or real impacts that are directly felt by service users.

Keywords: Public Sector Innovation, Digital Governance, Innovation Sustainability, Innovation Impact, SEM-PLS.

1. Introduction

Digital transformation is now at the top of the global public administration reform agenda to create adaptive and responsive governance (Osborne & Brown, 2011). In Indonesia, local governments are actively developing electronic-based service innovations such as the Dolan Banyumas application to improve service efficiency (Sadat et al., 2025). However, the main challenge that arises is the innovation sustainability problem, where many innovations fail to survive in the long term after the implementation phase (De Vries et al., 2016).

The sustainability of innovation is greatly influenced by the perception of novelty (perceived novelty) which is able to attract interest in early adoption (Rogers, 2003). However, technological novelty alone is not enough if it does not provide real added value for society. This is where the role of user innovation impact becomes crucial; The immediate benefits

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that users perceive will determine whether the service will continue to be used or abandoned (Wirtz et al., 2020).

So far, the public sector innovation literature is still dominated by discussions of internal organizational factors such as leadership and policy (Walker, 2014), while the perspective of users as determinants of sustainability is still limited. Filling the research gap, this study aims to analyze the determinants of the sustainability of public sector innovation by examining the mediating role of the impact of user innovation on the relationship between the perception of novelty and the sustainability of digital innovation in the Dolan Banyumas application. Theoretically, this research strengthens the study of innovation sustainability mechanisms, while practically providing guidance for governments in designing sustainable innovations.

2. Literature Review

2.1. *Public Sector Innovation and Digital Governance*

Public sector innovation involves the introduction of new ideas or technologies to improve organizational performance and service quality (Osborne & Brown, 2011). In the digital era, this transformation triggers the creation of digital governance that increases efficiency, transparency, and public participation (Firman, 2024; Sadat et al., 2025). However, the success of innovation does not only depend on technology, but on its long-term sustainability which is often hampered by low use and real benefits to society (Fitriani et al., 2025).

2.2. *Perception of Innovation Novelty and Innovation Impact*

Based on the theory of innovation diffusion, the perception of novelty (perceived novelty) is the main determinant that attracts the interest of user adoption (Rogers, 2003). Innovations that offer new and different solutions from conventional systems tend to provide a better user experience, thus contributing directly to the positive impact that society feels.

H1: The perception of innovation novelty has a positive effect on the impact of innovation.

2.3. *The Impact of Innovation and Innovation Sustainability*

The impact of innovation reflects the tangible benefits that users get. Innovations that provide significant added value will gain support and a level of continued use (Wirtz et al., 2020). In contrast, innovations with no real benefits tend to be left behind, making it difficult to survive in the long run.

H2: The impact of innovation has a positive effect on the sustainability of public sector innovation.

2.4. *Perception of Innovation Novelty and Innovation Sustainability*

In the context of digital governance, technological novelty is often the initial driver for people to switch to digital services. If the new system is perceived to be more effective than the previous system, then the probability of continuous use in the long term will increase.

H3: The perception of innovation novelty has a positive effect on the sustainability of public sector innovation.

2.5. *The Role of Innovation Impact Mediation*

The relationship between the characteristics of innovation and long-term success is often mediated by certain mechanisms. The novelty of innovation may spark initial interest, but its sustainability depends largely on whether it is able to transform into a real impact on users (Moore, 2020). The impact of innovation plays a role in bridging the perception of novelty to achieve innovation sustainability.

H4: The impact of innovation mediates the influence of the perception of innovation novelty on the sustainability of public sector innovation.

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2.6. *Research Conceptual Framework*

Based on the literature review and hypothesis development, this research develops a conceptual model that explains the relationship between the perception of innovation novelty, the impact of innovation, and the sustainability of public sector innovation.

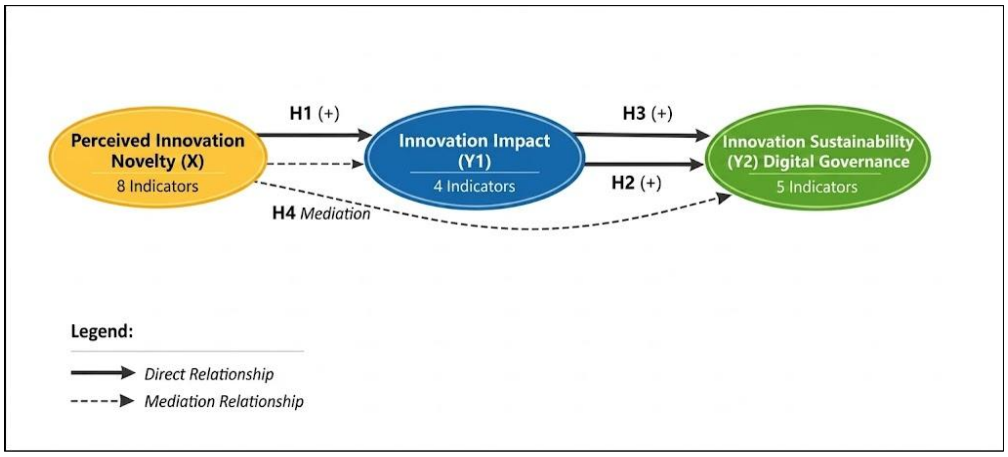

Figure 1. Research Conceptual Model

This model explains that the sustainability of public sector innovation is influenced by the perception of innovation novelty and the impact of innovation felt by service users. The impact of innovation also acts as a mediating variable that explains the mechanism of the relationship between innovation novelty and innovation sustainability.

3. Research Methods and Materials

This study uses a quantitative approach with an associative design that aims to test the causal relationship between variables through numerical measurement and statistical analysis, where the research model is analyzed using the Structural Equation Modeling method based on Partial Least Squares (SEM-PLS) with the help of SmartPLS 4 software (Hair et al., 2019). The object of this research is the Dolan Banyumas application as a digital service innovation of the Banyumas Regency Government, with the population of the people using the application which is taken through purposive sampling techniques based on the criteria of experience in using digital public services so that a sample of 60 respondents is obtained (Sarstedt et al., 2017). Primary data were collected online using a questionnaire with a five-level Likert scale instrument to measure respondents' perception of three main constructs consisting of the perception of innovation novelty as an exogenous variable, the impact of innovation as a mediator variable, and the sustainability of innovation as an endogenous variable. Data analysis was carried out through two systematic stages which included the evaluation of the measurement model (outer model) to ensure the validity of the convergence, the validity of the discriminant, and the reliability of the construct, as well as the evaluation of the structural model (inner model) to test the significance of direct and indirect influences and prove the role of the mediation of the impact of innovation in ensuring the sustainability of public sector innovation in the long term.

4. Results and Discussion

The evaluation of the research model is carried out in two different phases, called the Outer Model and the Inner Model.

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4.1. *Outdoor Models*

4.1.1. Convergent Validity (Convergent Validity)

(1).Load Factor Value

The results of the first stage of convergent validity in the study are in Table 1.

Table 1. External Loading Results

Indicators	Outer Loading Value	Remarks
Sustainable 1	0.852	Valid
Sustainable 2	0.837	Valid
Sustainable 3	0.898	Valid
Sustainable 4	0.754	Valid
Sustainable 5	0.786	Valid
Impact 1	0.833	Valid
Impact 2	0.885	Valid
Impact 3	0.792	Valid
Impact 4	0.848	Valid
Novelty 1	0.717	Valid
Novelty 2	0.744	Valid
Novelty 3	0.846	Valid
Novelty 4	0.796	Valid
Novelty 5	0.766	Valid
Novelty 6	0.778	Valid
Novelty 7	0.783	Valid
Novelty 8	0.764	Valid

The results of the outer loading test in this study show that all indicators used to measure the constructs in the Public Sector Innovation Sustainability Determination model have excellent validity, with an outer loading value above 0.7. Each construct, such as Innovation Sustainability, Innovation Impact, and Innovation Novelty Perception has valid and significant indicators to measure each dimension. External loading values ranging from 0.717 to 0.898 indicate that these indicators can describe a well-measured construct, so that this SEM-PLS model can be forwarded for further analysis.

(2).Average Variance Extracted (AVE)

The output of the estimated variance average extracted (AVE) can be seen in the Table below. A variable is said to be valid if it has an average variance extracted (AVE) value of > 0.5 (Hair, 2019).

Table 2. AVE Results

Variable	Average variance extracted (AVE)	Remarks
Innovation Impact (Y1)	0.706	Valid
Innovation Sustainability (Y2))	0.684	Valid
Perception of Innovation Novelty (X)	0.601	Valid

The results of the Average Variance Extracted (AVE) test in the table showed that all constructs in this study had good convergent validity, with an AVE value above the threshold of 0.5. AVE values for constructs such as Innovation Sustainability, Innovation Impact, and Innovation Novelty Perception show that the indicators of each construct can explain more than 50% of the variance in the construct. Thus, the model used in this study has a strong and valid basis for further analysis.

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4.1.2. Discriminatory Validity

Discriminant validity is used to ensure that the constructs or variables in the measurement model actually measure things that are different or do not overlap with each other. In other words, discriminative validity measures the extent to which different constructs in a measurement model can be distinguished from each other. Discriminant validity can be measured using one of three value criteria to be evaluated, namely cross loading value, HTMT and or Fornell-Larcker.

(1). Cross-loading

An indicator/statement is declared valid if the relationship of the indicator/statement with its construct/variable (cross loading value) is higher than its relationship with another construct. The following are the results of data processing using SmartPLS version 4 with the results of cross loading as shown in the table below.

Table 3. Cross Loading Results

	Innovation Impact	Innovation Sustainability	Perception of Innovation Novelty	Remarks
Impact1	0.833	0.706	0.711	Valid
Impact2	0.885	0.643	0.732	Valid
Impact3	0.792	0.596	0.704	Valid
Impact4	0.848	0.782	0.741	Valid
Sustainaible 1	0.769	0.852	0.734	Valid
Sustainaible 2	0.729	0.837	0.662	Valid
Sustainaible 3	0.693	0.898	0.702	Valid
Sustainaible 4	0.559	0.754	0.681	Valid
Sustainaible 5	0.603	0.786	0.654	Valid
Novelty 1	0.564	0.63	0.717	Valid
Novelty 2	0.599	0.617	0.744	Valid
Novelty 3	0.804	0.804	0.846	Valid
Novelty 4	0.661	0.591	0.796	Valid
Novelty 5	0.643	0.515	0.766	Valid
Novelty 6	0.633	0.633	0.778	Valid
Novelty 7	0.661	0.615	0.783	Valid
Novelty 8	0.725	0.697	0.764	Valid

The results of the cross loading test showed that all indicators in this study had a higher loading on the relevant construct compared to other constructs, which indicates the validity and suitability of the indicators. For example, the indicator Sustainable 3 (0.898) shows the highest loading in the Innovation Sustainability construct, the Innovation Impact is Impact2 (0.885), and Novelty 3 is in the Perception Of Innovatioan Novelty (0.846). The loading value of each construct is much higher than the value of the other construct, which indicates that each indicator measures the construct in question well. Thus, the results of this test show that the model used in this study is valid and reliable, and the indicators are reliable to measure each construct in the Public Sector Innovation Sustainability Determinants model: Testing the Role of User Impact Mediation in the Dolan Banyumas Application

(2). Fornell-Larcker

The Fornell-Larcker assessment criterion states that the square root of an AVE construct must be greater than the correlation of that construct with other constructs. In practice, the results are presented in the form of a matrix in which the diagonal value (square root of the AVE) must be greater than the values below or beside it (correlation between constructs). If this criterion is met for all constructs, then the validity of the discriminant is considered good.

Table 4. Fornell Larcker Results

	Innovation Impact	Continuation of Innovation	Perception of Innovation Novelty
Innovation Impact (Impact)	**0.84**		
Continuation of Innovation (Sustainability)	0.816	**0.827**	

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Perception of Innovation Novelty (Novelty)	0.775	0.831	**0.86**

The results of the Fornell-Larcker test in the table show that all constructs in the model have good discrimination, because the root value of the Average Variance Extracted (AVE) on the diagonal is greater than the correlation value between the constructs that exist outside the diagonal. For example, the Impact of innovation is 0.84, which is greater than the value of the correlation between the Impact of Innovation and other constructs, Continuity of Innovation, Perception of Novelty, and others.

The same applies to other constructs such as Innovation Sustainability (0.827), and Novelty Perception (0.86). Thus, the results of this Fornell-Larcker test show that each construct in the model can be well distinguished from the others, supporting the validity of discrimination in the SEM-PLS model used.

4.1.3. Construction Reliability

Construct Reliability can be analyzed using one of these two methods, namely by analyzing Cronbach's Alpha or Composite Reliability values. These two methods are part of the process used to test the reliability value of indicators on a variable.

(1).Alpha Cronbach

Cronbach's Alpha scoring criteria use a value range from 0 to 1, where a ≥ value of 0.70 is considered acceptable for exploratory research, and a ≥ value of 0.80 is considered good for confirmatory research. Higher values indicate better internal consistency, but too high a value (> 0.95) may indicate redundancy between indicators

Table 7. Cronbach's Alpha Results

	Alpha Cronbach	Remarks
Innovation Impact	0.861	Reliable
Sustainability Innovation	0.883	Reliable
Perception of Innovation Novelty	0.905	Reliable

The results of the Cronbach's Alpha test shown in the table show that all constructs in this study model have excellent reliability, with Cronbach's Alpha values above 0.7, which is the general threshold for accepted reliability. Cronbach's Alpha values range from 0.861 for Innovation Impact, 0.883 Innovation Sustainability, to 0.905 Innovation Novelty Perception.

(2).Composite Reliability

The Composite Reliability scoring criteria use a value range from 0 to 1, where a value of ≥ 0.70 is considered acceptable for exploratory research, a value of ≥ 0.80 is considered good for confirmatory research, and a value of ≥ 0.90 indicates excellent reliability. However, values that are too high (> 0.95) need to be watched out for because they can indicate semantic redundancy between indicators or that the indicators are too similar so as not to comprehensively capture the diversity of constructs. In the context of SEM-PLS, Composite Reliability is more recommended than Cronbach's Alpha because it does not assume tau-equivalence and provides a more liberal but more accurate estimate.

Table 8. Composite Reality Test Results

	Composite reliability (rho_a)	Composite reliability (rho_c)	Remarks
Innovation Impact	0.869	0.905	Reliable
Sustainability Innovation	0.888	0.915	Reliable
Perception of Innovation Novelty	0.911	0.923	Reliable

The results of the Composite Reliability test shown in the table show that all constructs in this research model have excellent reliability. The Composite Reliability values (rho_a and rho_c) for each construct are above the accepted threshold (0.7), which indicates high internal consistency. In addition, the Composite Reliability values (rho_a and rho_c) also show

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excellent numbers, with a range between 0.869 and 0.923, which supports that the constructs in this model have a high internal consistency. Thus, it can be concluded that the constructs in the SEM-PLS model are reliable and can be used for further analysis.

(3).Test Model Fit

The Standardized Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI) are the two main indicators for evaluating the suitability of the overall model (fit model) in the SEM-PLS analysis introduced by Henseler et al. (2014, 2016) in response to criticism that PLS-SEM does not have an adequate measure of goodness of fit. SRMR measures the average difference between the observed correlation matrix of the data and the correlation matrix predicted by the model, thus showing how well the estimated model represents the empirical data

Table 9. Suitable Models

	Saturated models	Forecasting Model
SRMR	0.082	0.082
NFI	0.705	0.705

The results of the Model Fit test shown in the table show that the SEM-PLS model used in this study has a good match. The SRMR (Standardized Root Mean Square Residue) value for the Saturated model is 0.082 and for the Estimated model is 0.082. Both of these values are below the accepted threshold, which is 0.08, which indicates that the model has a good fit with the data. In addition, the NFI (Normed Fit Index) value for the Saturated model is 0.705 and for the Estimated model is 0.705, which also indicates a fairly high value. An NFI value greater than 0.90 is considered excellent, but a value greater than 0.80 is still acceptable, so the model still meets the criteria adequate for model compatibility. Overall, these results show that the model in this study is in accordance with the analyzed data.

4.2. *Inner Model*

The inner model in PLS-SEM describes the relationships between latent variables and is evaluated to see the strength and significance of these relationships. The evaluation includes three main aspects: R Square, relationship significance (Hypothesis Testing) and F Square/Effect Size.

4.1.1. R Square (R^2)

The criteria for the R Square assessment vary depending on the context of the study and the complexity of the phenomenon being studied. In social and behavioral sciences, an R^2 value of ≥ 0.70 is considered substantial, an R^2 value ≥ 0.50 is considered moderate, and an R^2 value ≥ 0.25 is considered weak but still acceptable, following the guidelines set forth by Hair et al. (2019) and Chin (1998). However, Cohen (1988) gave slightly different criteria with values of 0.02 (small), 0.13 (medium), and 0.26 (large) for effect size in the context of behavioral research. It is important to understand that the interpretation of R^2 must be adapted to the discipline: in areas such as consumer behavior or technology acceptance, R^2 0.20 may already be considered good due to the complexity of human behavior, while in studies with more measurable variables such as financial performance, a higher R^2 standard may be expected.

Table 10. R Square Test Results

	R-Square	R-square adjustable	Categories
Innovation Impact	0.739	0.735	Substantial
Continuation of Innovation (Sustainability)	0.736	0.721	Substantial

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The results of the R-square test shown in the table show the model's ability to explain the variation in the dependent variables tested. For Innovation Impact, the R-square value is 0.739, its means that this model can explain 73.9% variation in Innovation Impact, and this is categorized as moderate. As for the Continuation of Innovation, the R-square value is 0.73, indicates that 73% of the variation in the Continuity of Innovation can be explained by the model, and this is categorized as Moderate. Overall, the model shows that the variables in the model can explain most of the variation in the model

4.2.2 *f Square (f2)*

f Square (f^2) or effect size is a measure to evaluate the substantive impact of a particular exogenous variable on an endogenous variable in a SEM-PLS structural model by measuring the change in the value of R^2 when the exogenous variable is removed from the model

Table 11. f Square Test Results

	Innovation Impact	Sustainability Innovation	Perception of Innovation Novelty
Innovation Impact		0.15	
Sustainability Innovation			
Perception of Innovation Novelty	2,838	0,237	

The explanation is as follows:

(a). The Effect of Innovation Impact on Innovation Sustainability is 0.147, so the effect of Innovation Impact on Sustainability is considered Moderate
(b). The effect of the Perception of Novelty on the Impact of Innovation is 2.838, so the influence of the Perception of Innovation on the Impact of Innovation is considered Strong.
(c). The effect of the Perception of Innovation Novelty on Innovation Sustainability is 0.237, so the effect of Innovation Novelty Perception on Innovation Sustainability is considered Strong.

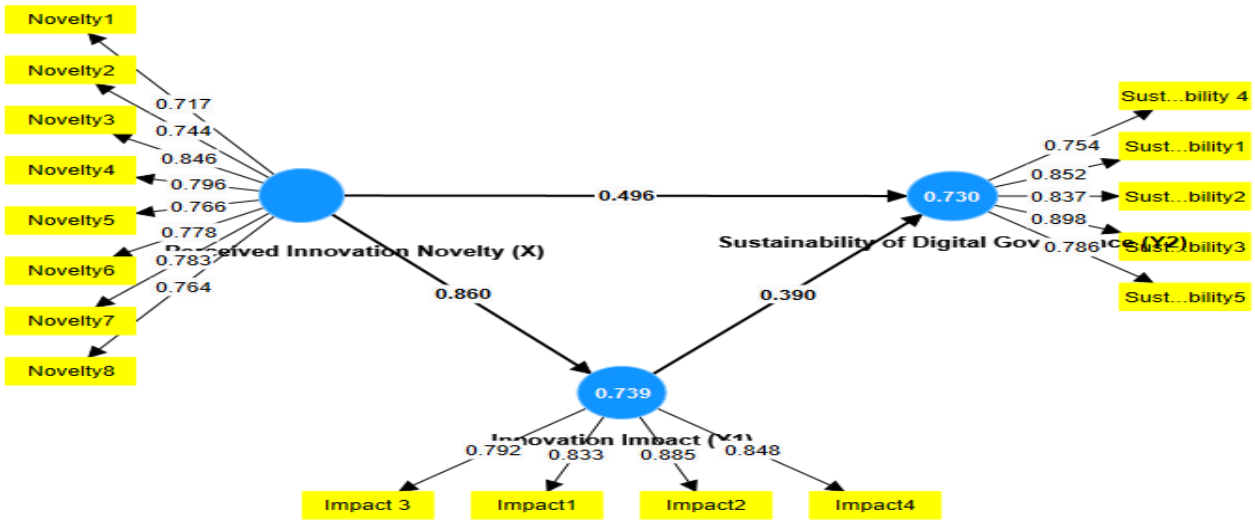

Figure 3. Inner and Outer Models Test Results

4.2.3 *Significance (Hypothesis Testing)*

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Relationship significance tests in PLS-SEM were performed to determine whether relationships between latent variables in the model could be considered statistically significant. This process uses the bootstrapping technique, where the data is resampled to calculate the path coefficient and its standard error. The result is in the form of t-statistic or p-value. A relationship is considered significant if the p-value is smaller than the predetermined significance level (in this study a significance of 0.05). Significant path coefficients indicate that the relationship between independent and latent dependent variables has strong statistical support, so the proposed hypothesis is acceptable. The following are the results of bootstrapping of direct effect and indirect effect research models.

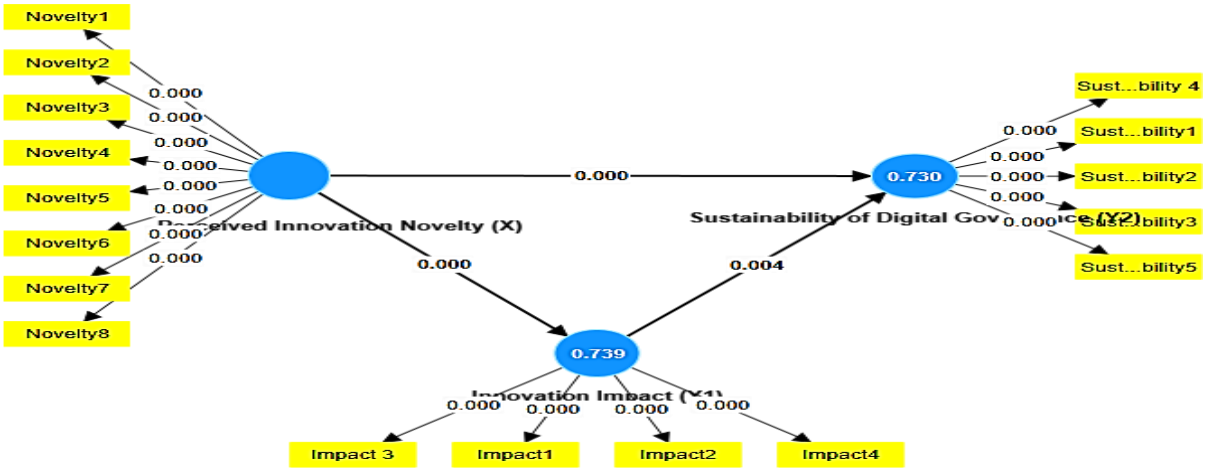

Figure 4. Hypothesis Testing Results

Table 12. Direct Hypothesis

Hypothesis	Hypothesis Statement	Analysis Results (P-Value)	Conclusion
H1	The perception of Innovation Novelty (X) has a positive effect on the Impact of Innovation (Y1).	0,000	Accepted
H2	The Impact of Innovation (Y1) has a positive effect on the Sustainability of Innovation (Y2).	0,009	Accepted
H3	The perception of Innovation Novelty (X) has a positive effect on Innovation Sustainability (Y2).	0,001	Accepted

The three direct influence hypotheses were declared Accepted because the p-value generated through the bootstrapping technique was smaller than the specified significance level, which was 0.05. This suggests that there is strong statistical support for the relationship.

Table 13. Indirect/Mediation

Hypothesis	Hypothesis Statement	Conclusion
H4	Innovation Impact (Y1) significantly mediates the relationship between Innovation Novelty (X) and Innovation Sustainability (Y2).	Accepted

(1). Based on the bootstrapping chart showing the significance of the X to Y1 path (0.000) and the Y1 to Y2 path (0.009), H4 is Accepted. This shows that the role of Innovation Impact (Y1) has proven to be significant in mediating the relationship between the perception of novelty and the sustainability of digital governance in the Dolan Banyumas application.

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(2). Predictive Power: The model has strong accuracy, where independent variables are able to explain 73.9% variation in Innovation Impact (Substantive Category) and 73% variation in Innovation Sustainability (Moderate Category).
(3). Practical Relevance (f^2): Perception of Novelty has a huge impact on Innovation Impact with an f^2 value of 2.838.

Discussion

(1).Model Evaluation Procedure (SEM-PLS)

The evaluation is carried out in two main stages:

(a). Outer Model (Measurement): The research instrument is declared valid and reliable. External loading values (0.717–0.898) and AVE (>0.5) meet the convergence validity requirements. The validity of the discriminant is met through the Cross Loading and Fornell-Larcker criteria. Reliability is excellent with Cronbach's Alpha and Composite Reliability values >0.86.
(b). Inner Model (Structural): The model has strong predictive power with an R2 value of 0.739 for Innovation Impact (Substantial) and 0.73 for Innovation Sustainability (Moderate). Effect size (f2) shows that Perception of Novelty has a very large impact (2.838) on Innovation Impact.

(2).Perception of Innovation Novelty (X) as the Main Determinant

The results of the hypothesis test showed that the perception of innovation novelty had a positive and significant effect on the sustainability of innovation (p=0.001). These findings confirm the Innovation Diffusion Theory that novelty attributes such as ease of access and unique features are able to increase early adoption as well as long-term use interest (Rogers, 2003). Digital innovations such as the Dolan Banyumas application that bring significant changes have been proven to be able to increase public efficiency and trust (Mergel et al., 2019; Wirtz et al., 2019).

(3).The Role of User Impact Mediation (Y1)

The impact of innovation has been shown to significantly mediate the relationship between innovation novelty and innovation sustainability. Technological novelty does not automatically guarantee sustainability if it does not produce real benefits for users (p=0.000). Innovation must create public value through problem solving and meeting community needs (Moore, 2020; Criado & Gil-Garcia, 2019). This shows a causal mechanism: new innovations create positive impacts, and it is these impacts that ensure the sustainability of services.

(4).Sustainability of Innovation in Digital Governance (Y2)

The variables of perception of novelty and the impact of innovation are able to explain 73% of variations in innovation sustainability. In digital governance, long-term success depends on the organization's ability to adapt and integrate user participation into service systems (Meijer & Bolívar, 2021). The sustainability of the Dolan Banyumas application is the result of the interaction between the sophistication of government technology and the positive user experience.

(5).Policy Implications

(a). Theoretical: Expanding the public sector innovation literature by shifting the focus from internal organizational factors to the perspective of user experience as a determinant of success.
(b). Practical: Local governments must ensure that digital innovation is user-centric, not just replacing technology. Periodic evaluations are needed to maintain the relevance of innovation to the needs of a dynamic society.

5. Conclusion

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This study analyzes the sustainability of Dolan Banyumas application innovation using the SEM-PLS method with the following main findings:

(1). The Effect of Novelty on Impact: The perception of innovation novelty (new features and ease of access) has been shown to significantly increase the impact or benefits felt by users, in accordance with the theory of innovation diffusion (Rogers, 2003).
(2). Impact on Sustainability: The impact of innovation has a positive effect on sustainability. This confirms that the sustainability of services depends on the creation of real public value for society (Moore, 2020).
(3). Direct Relationship of Novelty and Sustainability: The novelty of innovation directly encourages people's interest in continuing to use services because of their better effectiveness than the old system.
(4). The Role of Impact Mediation: The impact of innovation is a crucial mediator; This means that the novelty of technology does not guarantee sustainability if it is not able to provide real benefits that are directly felt by users.

Overall, the model has high predictive power (R2 Innovation Impact = 0.739; Innovation Sustainability = 0.73). This proves that the perception of novelty that is converted into a positive impact on users is the main determinant of the sustainability of digital governance innovation in local governments.

6. Suggestions

Research Recommendations

(1). Focus on Real Benefits: Local governments should prioritize creating real impact for communities, not just adopting new technologies, to ensure the long-term sustainability of innovation.
(2). User-Centric Orientation: App development like Dolan Banyumas needs to emphasize the *user experience aspect* so that the service is more responsive, accessible, and relevant to the needs of the public to increase adoption rates.
(3). Periodic Evaluation: There is a need for regular audits and evaluations through satisfaction surveys and feedback mechanisms to ensure that innovation remains adaptive to technological developments and community needs.
(4). Future Research Development: Future studies are suggested to expand the model with new variables (such as quality of service, public trust, and institutional factors) and use a larger sample for more accurate generalizations of results

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