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Design and Evaluation of a Blockchain-Based Smart Contract Model for Wellness Tourism Services

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Abstract: Spa services in wellness tourism often face challenges related to transparency, fragmented management, and limited automation. While blockchain and smart contracts have been proposed as potential solutions, existing studies remain largely conceptual and lack empirical evaluation. This study presents a blockchain-based smart contract model that integrates five key service domains: reservations, customer satisfaction, inventory management, scheduling, and financial transactions. A questionnaire was administered to 150 spa users over a three-month period, and the data were analyzed using linear regression, Pearson correlation, and ANOVA. The results indicate a strong positive correlation between reservation frequency and customer satisfaction ($r \approx 0.93$); however, this relationship is not statistically significant ($p > 0.05$). Therefore, the findings are exploratory rather than confirmatory. The proposed model remains simulated and has not yet been implemented in an operational environment. Nevertheless, it offers a data-driven and integrative approach that may inform future applications of blockchain-based smart contract models in wellness tourism services.

Keywords: Blockchain; Smart Contract; Wellness Tourism; Spa Service; Customer Satisfaction

1. Introduction

Wellness tourism continues to experience significant growth as public awareness of the importance of holistic health increases [1][2]. Spa services are a key component of this sector as they provide physical relaxation, emotional stability, and mental recovery [3]. However, the growth in demand has not been fully matched by an efficient, adaptive, and transparent service management system. The reservation process, customer feedback, inventory management, service scheduling, and financial transactions are still largely carried out manually and separately, and supported by a centralized system that is prone to inefficiency, data redundancy, and operational errors [4] [5].

These limitations have a direct impact on customer experience and reduce the accuracy of decision-making in service management [6]. Although a number of digital platforms have been introduced, most of them only target one or two functional aspects of the service without forming a comprehensive systemic integration [7]. Therefore, a technological approach that is able to unite the entire spa service process into one transparent and automated digital system is an urgent need.

Blockchain technology is present as one of the strategic solutions to these challenges [8][9]. With its decentralization features, data recording reliability, and security against manipulation, blockchain allows for the safe and open storage of service transactions [10]. When combined with smart contracts, which are digital contracts that run automatically based on programming logic, the potential for efficiency and accountability in spa service management increases significantly [11]. Smart contracts can be used to automate various service functions, such as reservation confirmation, payment validation, stock management, and customer feedback integration in one framework [12][13].

However, until now, there is no smart contract-based integrative model that is specifically designed and tested in the context of spa wellness services [14]. Most previous studies are still conceptual or limited to simulating single aspects of services without testing the inter-dimensional connectivity comprehensively and based on real data [15]. In addition, limitations in the evaluative aspect cause their contributions to remain largely theoretical and difficult to implement within complex service digitalization models.

To address these gaps, this study aims to develop and evaluate a blockchain-based smart contract model that covers five key dimensions of spa services: reservations and cancellations, customer satisfaction, inventory, scheduling, and finance [16]. Validation was conducted using a quantitative approach on data from 150 spa visitors over a period of three

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months. The methods used included linear regression, Pearson correlation, and ANOVA. Specifically, correlation analysis was used to measure the strength and direction of the relationship between operational variables, such as reservation frequency and customer satisfaction level.

As a conceptual reinforcement, this study is also equipped with a systematic literature review based on a Google Scholar search of 113 articles (2010–2024), which resulted in 25 relevant publications. The frequency of occurrence of keywords such as "customer reservations," which reached 10,100 results in the period 2020–2024, shows that the dimensions used in the model are very relevant and in line with global research trends. This model is simulative and has not been applied in an actual commercial environment, but it has the potential to be replicated in other fitness services such as yoga, meditation, or community health therapy. Thus, this study is expected to contribute to the development of a decentralized digital service system that is data-based and supports sustainable fitness tourism governance.

2. Literature Review

2.1. Wellness Tourism and Operational Complexity

Wellness tourism is increasingly recognized as one of the transformational sectors in the global travel industry [17]. The uniqueness of this sector lies in its ability to offer integrated services that emphasize the physical, emotional, social, and spiritual aspects of health in a holistic manner. Among the various forms of services available, spas stand out as one of the most prominent because they combine body therapy, hydrotherapy, and relaxation programs that are not only oriented towards recreation but also towards improving lifestyle and long-term well-being.

Despite significant growth in recent years, wellness spa services still face complex operational challenges. Studies have reported issues such as double bookings, inconsistent service, lack of transparent feedback systems, uncoordinated service schedules, and disparate and unconsolidated inventory management [18][19]. These issues are largely due to the centralized system architecture and manual coordination processes, which are not yet able to accommodate the dynamic expectations of modern customers who demand real-time services.

This complexity not only impacts the internal efficiency of service providers but also directly affects the level of customer satisfaction, user retention, and the image of professionalism of spa service providers. With the increasing demand for fast, personalized, and traceable services, digital integration has become a strategic imperative. This condition opens up opportunities for the use of decentralized technologies to develop a more responsive, transparent, and fully automated service model.

Unlike existing blockchain-based tourism models that primarily focus on isolated functions such as reservation systems, digital identity, or payment validation, most prior studies do not provide an integrated operational model that simultaneously links reservations, customer satisfaction, inventory management, scheduling, and financial transactions within a single smart contract architecture [20]. Furthermore, previous approaches are largely conceptual or simulation-based without empirical validation using real user data. This limitation results in a lack of evidence regarding how operational variables interact and influence service effectiveness in real wellness tourism contexts. Therefore, existing models are inadequate in capturing the multidimensional and data-driven nature of spa service operations. This study addresses these gaps by proposing and statistically evaluating an integrated blockchain-based smart contract model using empirical data from 150 spa visitors, thereby offering a validated and replicable operational model specifically designed for wellness tourism services.

2.2. Blockchain and the Shift Toward Decentralized Tourism Services

Blockchain technology presents a paradigm shift from a centralized system to a decentralized system, which allows direct interaction between users (peer-to-peer) and immutable transaction recording [16] [21]. In the context of tourism, this technology is starting to be widely considered because of its ability to improve traceability, accountability, and trust in various transaction flows, both between service providers, tourists, and third-party partners.

In the wellness services sector, blockchain offers great potential for secure customer data management, real-time reservation validation, and automation of cross-provider service processes without relying on a central authority [22]. These features are essential in ensuring the reliability of complex service systems involving many actors, such as spa services, health therapies, and other supporting services.

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However, until now, most blockchain applications in the tourism sector have remained limited to conceptual models or pilot projects, and only a small number of studies have systematically examined their actual impact on service performance or customer experience in real operational settings. This shows that the adoption of this technology is still in its early stages and requires the development of more structured models and quantitative evaluations based on field data in order to be widely applied in the wellness tourism industry.

2.3. Blockchain Environment and Smart Contract Logic

The proposed model is designed within a simulated blockchain environment that represents a permissioned (private) blockchain architecture. This approach allows controlled testing of smart contract logic without real-world deployment risks.

The system architecture consists of three main layers: data input (user transactions and questionnaire data), smart contract processing (automated validation and rule execution), and output (immutable transaction records and service evaluations).

At a conceptual level, smart contract logic follows an input–process–output structure. User-generated data such as reservations, feedback, and service usage act as inputs. These inputs are processed by predefined smart contract rules to evaluate service conditions, trigger automated actions, and generate outputs such as service evaluation scores and operational records.

It should be emphasized that the proposed model has not yet been implemented in a real operational spa environment and remains a simulated and evaluative model.

2.5. Smart Contracts: Enablers of Automation and Trust

Smart contracts are blockchain-based scripts that can be executed automatically when certain conditions are met [23]. In the context of wellness tourism, smart contracts have the potential to automate a variety of critical tasks, such as scheduling service appointments, allocating staff and resources, validating payments, recording customer feedback, and distributing loyalty points. Their deterministic and manipulation-resistant nature makes smart contracts the foundation for a reliable and intervention-free service system, thus minimizing the occurrence of disputes or misuse of information.

Several studies have highlighted the theoretical potential of smart contracts in the healthcare and supply chain sectors [24]. However, their practical application in tourism services, especially in spa operations, is still very limited. Although smart contracts are generally defined as digital agreements that run automatically based on pre-programmed rules, most research in the tourism sector has not gone beyond the conceptual stage. Therefore, the study of the operational impact of smart contracts in real service scenarios, especially through structured evaluation, is still a gap in the current literature.

2.6. Modelling and Evaluating Service Variables Using Statistical Analysis

To design a technically and operationally effective smart contract model, a deep understanding of the relationships between core service variables such as reservations, cancellations, customer satisfaction, inventory, scheduling, and financial transactions is required. Although statistical methods such as linear regression, Pearson correlation, and ANOVA are widely used in data-driven service studies, their integration in evaluating blockchain-based systems is still limited. Most studies only discuss conceptual aspects without empirical testing between service variables. Therefore, this study comprehensively applies the three methods to test the effectiveness of a smart contract-based spa service system and address the methodological gaps in the literature.

2.7. Research Gap

Although blockchain and smart contract technologies have gained significant attention in tourism and service management studies, few studies have explored their application in the context of wellness tourism services. Existing research often focuses on isolated service functions such as reservation systems, digital identity verification, and payment mechanisms without addressing the integration of multiple operational domains into a unified service model. Furthermore, many of these studies are conceptual or prototype-based, with limited empirical validation using real-world data, especially in wellness tourism contexts

While several conceptual models have been proposed, limited research has examined how key operational variables such as reservations, customer

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satisfaction, inventory management, scheduling, and financial transactions interact within a blockchain-based smart contract model. The lack of statistical validation further limits the practical applicability of these models.

To fill this gap, this study proposes a data-driven blockchain-based smart contract model that integrates five core service domains and empirically evaluates the relationships between them using real user data from spa service users. The novelty of this study lies in its empirical approach, offering a conceptually integrated model tailored to wellness tourism services, which addresses both the technical and operational gaps in current literature. By directly evaluating the interaction of operational variables, this study aligns its research objectives with the identified gap and contributes to the development of an effective blockchain-based solution for wellness tourism.

2.8. Contribution of This Study

This study designs and evaluates a smart contract-based spa wellness service model to improve transparency, efficiency, and decentralization in wellness tourism operations. The model integrates five key service indicators, namely reservations, customer satisfaction, inventory management, scheduling, and finances, into a blockchain-based automated digital system. Unlike previous studies that are conceptual in nature, the model is empirically validated using survey data from 150 spa visitors over a period of three months, analyzed using linear regression, Pearson correlation, and ANOVA. The results show significant relationships between variables, particularly between the number of reservations and customer satisfaction. The proposed model offers a replicable, data-driven approach to support the reliability and automation of wellness tourism services.

3. Methods/Algorithm/Material

3.1 Model Design and Architecture

This smart contract model covers five operational domains of spa services: booking, customer satisfaction, inventory management, scheduling, and financial transactions, as illustrated in Fig. 1.

1. Data Structuring
   A total of 25 service indicators collected from the field survey were mapped into five operational domains: booking, customer satisfaction, procurement and inventory, scheduling, and finance. These indicators were selected to represent key operational aspects of digital spa service management.
2. Smart Contract Execution
   Each domain has a dedicated smart contract that automatically evaluates data and executes digital actions when certain parameters are met.
3. Immutable Recording
   Smart contract evaluation results and actions are permanently recorded on the blockchain to ensure transparency, audit trails, and real-time access.
4. Simulation and Verification
   Before being deployed, each smart contract is tested with simulated data to ensure its logic and flow meet system requirements.
5. Statistical Validation
   After the data were processed, the output was evaluated using linear regression, correlation analysis, and ANOVA because all three were considered appropriate and reliable for assessing the relationship between variables in the service system.

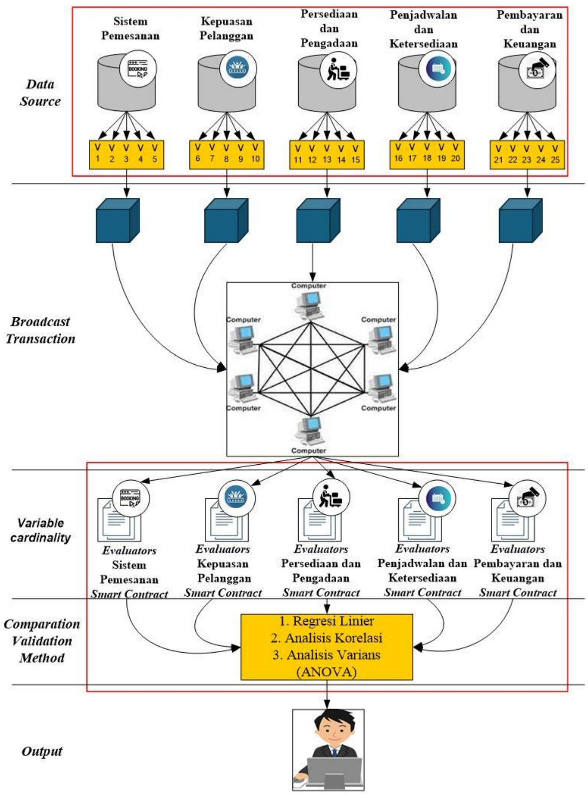

Figure 1. Spa Wellness Smart Contract Decentralization and Transparency Model

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3.2 Data Collection

This study adopts a structured narrative literature review approach. Relevant studies were identified through Google Scholar and Scopus databases, covering publications from 2010 to 2024. Selection criteria included peer-reviewed journal articles focusing on blockchain technology, smart contracts, and their applications in tourism, healthcare, or service systems. From an initial pool of 113 articles, 25 studies were selected based on relevance, methodological rigor, and contribution to service automation or decentralized system design. Recent literature indicates a growing academic interest in digital reservation systems, customer satisfaction analytics, and blockchain-based service automation in tourism and wellness-related domains. This strategy ensures that the variables in the model are not only theoretical, but also reflect the dynamics of scientific literature that has developed over more than a decade, as in Table 1.

Table 1. Example of Frequency Distribution of Wellness Tourism Service Variables Based on Literature (2010–2024)

No.	Variable Code	Variable Description	2010–2014	2015–2019	2020–2024
Ordering System					
1	V1	Customer reservation	444	2.280	10.100
2	V3	Automatic notifications to customers	212	572	1.170
Customer satisfaction					
3	V6	Collecting customer feedback	1.570	6.320	16.500
4	V8	Responding to negative feedback	252	731	1.310
Inventory and Procurement					
5	V11	Monitor product and raw material stock	1.920	5.570	10.100
Scheduling and Availability					
6	V16	Determine staff schedules according to customer requests	3.240	7.910	12.900
Payments and Finance					
7	V21	Payment via various methods	16.700	16.900	17.500

3.3 Data Processing and Statistical Evaluation

3.3.1 Data Processing

The data processing process in this study was carried out in stages and systematically to ensure the validity of the developed model. Data were collected through a structured questionnaire with a 7-point Likert scale, which was distributed to 150 spa visitors for three months. A total of 25 indicators in the questionnaire were compiled based on a systematic literature review of 113 articles from Google Scholar, covering five main domains of spa services: reservations, customer satisfaction, inventory and procurement, scheduling, and financial transactions. After the data was collected, data cleaning was carried out to remove incomplete or inconsistent responses. The next stage was the reliability test using Cronbach's Alpha, which showed that all domains had adequate internal consistency. Data that passed the reliability test were then normalized and tabulated into a matrix format, with each row representing one respondent and each column representing one indicator. This dataset was then used as the basis for evaluating the logic of the smart contract and statistical analysis using linear regression, Pearson correlation, and ANOVA as shown in Fig. 2.

Figure 2. Data Processing

3.3.2 Statistical Evaluation

To evaluate the relationship between variables and the operational effectiveness of the smart contract model, this study applies three main statistical techniques: linear regression, Pearson correlation, and ANOVA. All three were chosen because they are suitable for analysing multivariate relationships in perception-based service data. Linear regression is specifically used to identify predictive relationships between independent variables and dependent

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variables in a spa service system. The general form of the regression equation is:

$$\boldsymbol{Y = a + bX + e} \qquad (1)$$

where:

$\boldsymbol{y}$ is the dependent variable (which is predicted), $\boldsymbol{X}$ is an independent variable (which influences), $\boldsymbol{a}$ is a constant or intercept value, $\boldsymbol{b}$ It is the regression coefficient that shows the level of influence of X on Y, $\boldsymbol{e}$ is the error term or residual error in the prediction.

This model allows researchers to quantitatively measure how changes in independent variables, such as the number of reservations or inventory availability, can affect dependent variables such as customer satisfaction or scheduling efficiency. In addition to linear regression, Pearson correlation analysis is used to determine the strength and direction of the relationship between pairs of variables. The formula for the correlation coefficient is stated as follows:

$$\boldsymbol{r} = \frac{\boldsymbol{n}(\sum \boldsymbol{xy})\ (\sum \boldsymbol{x})\ (\sum \boldsymbol{y})}{\sqrt{[\boldsymbol{n}\sum \boldsymbol{x}^2\ \ (\sum \boldsymbol{x})^2]\ [\boldsymbol{n}\sum \boldsymbol{y}^2\ \ (\sum \boldsymbol{y})^2\ ]}} \qquad (2)$$

The r value ranges from −1 to +1, where values close to −1 indicate a strong negative relationship, values close to +1 indicate a strong positive relationship, and values close to 0 indicate no linear relationship.

Analysis of variance (ANOVA) is applied to test for significant differences between means of groups of respondents, particularly in metrics such as satisfaction or financial transactions. Between-group variability is calculated through:

$$\boldsymbol{SSB} = \sum_{j=1}^{k} \boldsymbol{n_j}\ (\boldsymbol{\bar{X}_j} - \boldsymbol{\bar{X}}\ )^2 \qquad (3)$$

$$\boldsymbol{SSW} = \sum_{j=1}^{k} \boldsymbol{n_j}\ (\boldsymbol{\bar{X}_j}\ \boldsymbol{\bar{X}})^2 \qquad (4)$$

$$\boldsymbol{MSB} = \frac{\boldsymbol{SSB}}{\boldsymbol{df_{beteen}}} \qquad (5)$$

$$\boldsymbol{MSW} = \frac{\boldsymbol{SSW}}{\boldsymbol{df_{within}}} \qquad (6)$$

$$\boldsymbol{F} = \frac{\boldsymbol{MSB}}{\boldsymbol{MSW}} \qquad (7)$$

3.3.3 Summary of Statistical

Table 2 below presents a summary of the results of the main statistical tests used in this study to evaluate the effectiveness of the smart contract model. Each technique is analyzed based on relevant variables, key statistical values, and significance levels that support the empirical validity of the model.

Table 2. Statistical Evaluation Summary

Statistical Techniques	Tested Variable Pairs	Statistical Values	Significance Value	Information
Pearson Correlation	Reservation ↔ Customer satisfaction	r = 0,93	p = 0.505	Positive relationships are very strong
Linear Regression	Reservation ↔ Customer satisfaction	R^2 = 0,859	p = 0.505	Significant predictive model
ANOVA	Reservation ↔ Customer satisfaction	F = 0.447	p = 0.505	Differences between groups are significant

3.4 Respondent Profile and Research Location

The study involved 150 respondents who were spa service users in Batu City, East Java, Indonesia. Data collection was conducted over a three-month period. Respondents consisted of 62% female and 38% male participants. The dominant age group was 26–35 years (41%), followed by 36–45 years (29%), 18–25 years (18%), and above 45 years (12%). Most respondents reported visiting spa services at least once per month. This demographic profile reflects active wellness tourism consumers and provides a relevant empirical basis for evaluating the proposed smart contract model.

The questionnaire was designed using a 7-point Likert scale and comprised 25 indicators derived from prior literature on service quality, blockchain-based automation, and wellness tourism operations. Indicator selection was guided by relevance to

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operational domains and feasibility for smart contract logic.

This study is simulative and empirically evaluative in nature. While the smart contract model has not been implemented in a real operational blockchain environment, empirical user data were used to statistically evaluate relationships between service variables.

4. Results and Discussion

The empirical evaluation in this study primarily focuses on the relationship between reservation frequency and customer satisfaction. Other service domains, such as inventory management, scheduling, and financial transactions, are conceptually modeled but not fully tested using independent empirical datasets.

The Pearson correlation analysis indicates a strong positive linear relationship between reservation frequency and customer satisfaction ($r \approx 0.93$). Linear regression results further show a high coefficient of determination ($R^2 \approx 0.86$), suggesting a substantial proportion of shared variance between the two variables.

However, although the correlation coefficient suggests a very strong positive association, the corresponding p-value ($p = 0.505$) exceeds the 0.05 significance threshold. This indicates that the observed relationship is not statistically significant. Therefore, the results should be interpreted as exploratory evidence of a potential association rather than definitive proof of effectiveness.

These findings are consistent with prior studies that highlight the potential role of digital reservation systems in shaping perceived service quality. However, unlike some previous studies that suggest causal effectiveness, this study adopts a more cautious interpretation by identifying exploratory relationships that warrant further empirical investigation.

Several limitations should be acknowledged. First, the sample size is relatively limited and geographically constrained. Second, external factors such as service quality, staff professionalism, and facility conditions were not included in the analysis and may influence customer satisfaction.

4.1 Relationship Between Reservations and Customer Satisfaction

Initial analysis shows a positive relationship between the number of reservations and customer satisfaction levels; for example, the satisfaction score increased from 69.31 at 71 reservations to 88.54 at 91 reservations. This trend indicates that increasing reservations can strengthen customers' positive perceptions of the service. The data also includes a customer category variable (0/1), which is useful for service segmentation in smart contracts. The service evaluation scores developed from the combination of reservation and satisfaction data have the potential to be integrated into smart contract logic to support data-driven personalization and incentives, as shown in Table 4.

Table 3. Sample Dataset R_{11}: Relationship Between Number of Reservations, Customer Satisfaction, Category, and Service Evaluation Score

Reservation	Customer satisfaction	Customer Categories	Service Evaluation Score
71	69,31	1	37,13
34	45,64	0	19,53
91	88,54	0	44,86
80	72,30	0	41,70
40	52,12	0	30,59

4.2 Statistical Analysis: Linear Regression, Correlation, and ANOVA

The model was tested using three primary statistical methods. The linear regression between the number of reservations and customer satisfaction yielded a slope of 0.995 and an intercept of 0.323, with a Pearson correlation coefficient of 0.927, indicating a very strong positive linear relationship. However, the ANOVA test for this relationship yielded an F-value of 0.447 and a p-value of 0.505, making it statistically insignificant at the 0.05 level of significance. This indicates that although the linear relationship is strong, there is no significant difference across customer group categories on this variable. The full results for the various combinations of variables tested are presented in Table 4.

Table 4. Linear Regression, Correlation Analysis, and ANOVA Test Results

Variables/methods	Linear Regression	Correlation Analysis	Analysis of Variance (ANOVA)
R_{11}	Slope: 0.995 Intercept: 0.323	Correlation coefficient: 0.927	F-Statistics: 0.447 P-Value: 0.505
R_{12}	Slope: 1.010	Correlation	F-Statistics: 1.452

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	Intercept: -0.990	coefficient: 0.954	P-Value: 0.996
R_{22}	Slope: 0.690 Intercept: -2.635	Correlation coefficient: 0.962	F-Statistics: 0.447 P-Value: 0.504
R_{13}	Slope: 0.825 Intercept: -1.434	Correlation coefficient: 0.816	F-Statistics: 0.108 P-Value: 0.743
R_{23}	Slope: 0.836, Intercept: -0.262	Correlation coefficient: 0.897	F-Statistics: 2.206 P-Value: 0.142
R_{33}	Slope: 0.743 Intercept: 0.347	Correlation coefficient: 0.909	F-Statistics: 0.023 P-Value: 0.878
R_{14}	Slope: 0.506, Intercept: 0.126	Correlation coefficient: 0.9540	F-Statistics: 0.683 P-Value: 0.092
R_{24}	Slope: 0.652, Intercept: -1.010	Correlation coefficient: 0.9308	F-Statistics: 1.7436 P-Value: 0.283
R_{34}	Slope: 0.607, Intercept: -1.867	Correlation coefficient: 0.121	F-Statistics: 1.686 P-Value: 0.198
R_{44}	Slope: 0.807, Intercept: 0.102	Correlation coefficient: 0.121	F-Statistics: 1.686 P-Value: 0.198

Table 5. Definition of Variable Relationship Codes

Code	Variable Relationship Description
R_{11}	Reservation frequency ↔ Customer satisfaction
R_{12}	Reservation frequency ↔ Service evaluation score
R_{13}	Reservation frequency ↔ Customer category
R_{14}	Reservation frequency ↔ Financial transaction value
R_{22}	Customer satisfaction ↔ Service evaluation score
R_{23}	Customer satisfaction ↔ Scheduling efficiency
R_{24}	Customer satisfaction ↔ Inventory availability
R_{33}	Scheduling efficiency ↔ Inventory availability
R_{34}	Scheduling efficiency ↔ Financial performance
R_{44}	Financial transaction ↔ Service evaluation score

The variable relationship codes (Rxx) represent pairwise statistical tests between key operational dimensions of the smart contract model.

4.3 Further Interpretation and Potential Implementation

Interpretation of the results shows that increasing the number of reservations has the potential to directly contribute to increasing customer satisfaction. Although this relationship is quite strong statistically, there is still a possibility that other factors, such as service quality, staff experience, or facility comfort, also affect customer satisfaction, but have not been covered in this study. Therefore, further research is needed to explore these additional variables. Although this smart contract model has not been tested in a real implementation, simulation results and statistical validation show that the integration of smart contracts in the reservation system can improve service efficiency through process automation, immutable records, and faster system response to customer requests. In other words, this system has strong potential to be adopted in digital-based wellness tourism service practices.

4.4 Literature Support and Theoretical Validation

The results of this analysis are supported by a literature review that shows similar scientific trends, especially in the domain of blockchain-based services and digital reservation systems. Based on a Google Scholar search, terms such as "customer reservation" and "customer satisfaction" show a high occurrence rate in the scientific literature for the period 2020–2024, indicating increasing academic attention to technology integration in optimizing tourism services. Previous research shows that the effectiveness of digital ordering systems has a strong relationship with perceptions of service quality as well as levels of customer loyalty. Studies by Zhang et al. (2022) and Kumar & Lee (2021) also show that digital reservation efficiency correlates with perceived service quality and customer loyalty. Therefore, the variables used in this study are not only in line with current scientific trends but also have a valid theoretical basis in the context of digital-based wellness tourism services.

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4.5 Visualization of Results

All test results involving linear regression, Pearson correlation, and ANOVA are visualized in Fig. 3, which presents the relationship between the number of reservations, customer satisfaction level, and customer category in a graphical and structured manner.

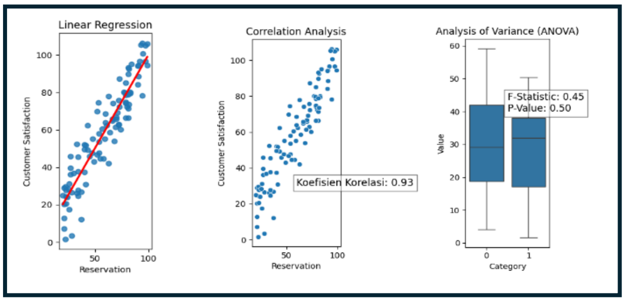

Figure 3. Visualization Results of Testing Graphs with Methods: Linear Regression, Correlation Analysis, and ANOVA Method

5. Conclusion

This study proposes and evaluates a blockchain-based smart contract model for spa wellness tourism services within a simulated environment. The proposed model conceptually integrates five core service dimensions, namely reservations, customer satisfaction, inventory and procurement, scheduling, and financial transactions, into a decentralized digital system designed to support service automation and transparency.

The results indicate a strong positive relationship between reservation frequency and customer satisfaction; however, this relationship is not statistically significant. Therefore, the findings should be interpreted as preliminary and exploratory rather than confirmatory evidence of effectiveness. These results suggest that integrated smart contract models have potential applicability in supporting wellness tourism service management, particularly in structuring operational data and enabling automation logic.

Although the model has not yet been implemented in a real operational environment, simulation results and quantitative analysis using linear regression, Pearson correlation, and ANOVA provide initial insights into its potential utility. Nevertheless, the study is subject to limitations related to sample size, simulation-based evaluation, and the exclusion of additional service quality factors.

Future research should focus on real-world implementation, larger and more diverse samples, and the inclusion of additional variables such as service quality, staff performance, and facility conditions. Such efforts are necessary to strengthen empirical robustness and further assess the practical value of blockchain-based smart contract models in wellness tourism services.

Conflicts of Interest

The authors declare no conflict of interest. All authors confirm that they have no personal, financial, or professional affiliations that could be perceived as influencing the objectivity, interpretation, or presentation of the research findings. Any potential sources of bias have been carefully considered to ensure the integrity and independence of the study.

Author Contributions

Author 1: In my capacity as a writer and manager of field data collecting, local stakeholder interviews, and local wisdom ideas for smart tourism. Ensuring the correctness and consistency of research results is a responsibility that goes beyond writing reports, interpreting data, and responding to criticism from other writers and journal reviewers.

Author 2: strengthen core research concepts by establishing a theoretical model, synthesizing the literature, and providing analytical contributions to the interpretation of data. Strengthen the literature review in this research by detailing key concepts, identifying existing knowledge gaps, and linking relevant findings from prior studies to the proposed research model.

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References

[1] D. R. Malra, "Blockchain and Tourism," *J. Interdiscipl. Cycle Res.*, vol. XII, no. VIII, pp. 732–747, 2020.

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[2] S. Jatmika, S. Patmanthara, A. P. Wibawa, and F. Kurniawan, "Cognition-Based Document Matching Within the Chatbot Modeling Framework," *J. Appl. Data Sci.*, vol. 5, no. 2, pp. 613–627, 2024, doi: 10.47738/jads.v5i2.209.

[3] S. Jatmika, S. Patmanthara, A. P. Wibawa, and F. Kurniawan, "The Model Of Local Wisdom For Smart Wellness Tourism With Optimization Multilayer," *J. Theor. Appl. Inf. Technol.*, vol. 102, no. 2, pp. 640–652, 2024.

[4] H. Permatasari, E. Purwanto, and T. Triyono, "Enhancing Customer Experience and Satisfaction through Mobile-Based Salon and Spa Reservations on Android Platforms," *IJEEIT Int. J. Electr. Eng. Inf. Technol.*, vol. 7, no. 1, pp. 12–21, 2024, doi: 10.29138/ijeeit.v7i1.2621.

[5] S. Estévez, G. Feijoo, and M. T. Moreira, "Environmental synergies in decentralized wastewater treatment at a hotel resort," *J. Environ. Manage.*, vol. 317, no. January, 2022, doi: 10.1016/j.jenvman.2022.115392.

[6] A. P. Lopes and N. Rodríguez-López, "Application of a Decision-Making Tool for Ranking Wellness Tourism Destinations," *Sustain.*, vol. 14, no. 23, pp. 1–19, 2022, doi: 10.3390/su142315498.

[7] J. Koskinen and S. Westerstrand, "Systemic Power of the Digital Platforms Versus Human Lifeworld Systemic Power of the D i g i t a l Platforms Versus H u m a n," no. January, 2025.

[8] W. K. A. Tan and B. Sundarakani, "Assessing Blockchain Technology application for freight booking business: a case study from Technology Acceptance Model perspective," *J. Glob. Oper. Strateg. Sourc.*, vol. 14, no. 1, pp. 202–223, 2021, doi: 10.1108/JGOSS-04-2020-0018.

[9] M. A. Ferrag and L. Shu, "The Performance Evaluation of Blockchain-Based Security and Privacy Systems for the Internet of Things: A Tutorial," *IEEE Internet Things J.*, vol. 8, no. 24, pp. 17236–17260, 2021, doi: 10.1109/JIOT.2021.3078072.

[10] H. T. Abderahman Rejeb, John G. Keogh, "The Impact of Blockchain on Medical Tourism," *Angew. Chemie Int. Ed. 6(11), 951–952.*, vol. 3, no. 1, pp. 10–27, 2018, [Online]. Available: https://medium.com/@arifwicaksanaa/pengertian-use-case-a7e576e1b6bf

[11] T. Sultana, A. Almogren, M. Akbar, M. Zuair, I. Ullah, and N. Javaid, "Data sharing system integrating access control mechanism using blockchain-based smart contracts for IoT devices," *Appl. Sci.*, vol. 10, no. 2, 2020, doi: 10.3390/app10020488.

[12] B. O'Rourke, W. Oortwijn, and T. Schuller, "The new definition of health technology assessment: A milestone in international collaboration," *Int. J. Technol. Assess. Health Care*, vol. 36, no. 3, pp. 187–190, 2020, doi: 10.1017/S0266462320000215.

[13] I. Tyan, A. Guevara-Plaza, and M. I. Yagüe, "The benefits of blockchain technology for medical tourism," *Sustain.*, vol. 13, no. 22, 2021, doi: 10.3390/su132212448.

[14] A. G. Gad, D. T. Mosa, L. Abualigah, and A. A. Abohany, "Emerging Trends in Blockchain Technology and Applications: A Review and Outlook," *J. King Saud Univ. - Comput. Inf. Sci.*, vol. 34, no. 9, pp. 6719–6742, 2022, doi: 10.1016/j.jksuci.2022.03.007.

[15] W. Viriyasitavat, L. Da Xu, and Z. Bi, "Specification Patterns of Service-Based Applications Using Blockchain Technology," *IEEE Trans. Comput. Soc. Syst.*, vol. 7, no. 4, pp. 886–896, 2020, doi: 10.1109/TCSS.2020.2999574.

[16] D. Yaga, P. Mell, N. Roby, and K. Scarfone, "Blockchain Technology Overview," in *Blockchain Technology Overview*, 2019, pp. 7–10. doi: 10.6028/NIST.IR.8202.

[17] M. T. Cuomo, D. Tortora, P. Foroudi, A. Giordano, G. Festa, and G. Metallo, "Digital transformation and tourist experience co-design: Big social data for planning cultural tourism," *Technol. Forecast. Soc. Change*, vol. 162, no. June 2020, p. 120345, 2021, doi: 10.1016/j.techfore.2020.120345.

[18] M. Smith and M. Wallace, "An analysis of key issues in spa management: viewpoints from international industry professionals," *Int. J. Spa Wellness*, vol. 2, no. 3, pp. 119–134, 2019, doi: 10.1080/24721735.2020.1819706.

[19] F. Almrdof and A. Attia, "The Effect of Inventory Management Practices on Productivity-Palarch's," *J. Archaeol. Egypt/Egyptology*, vol. 18, no. 15, pp. 256–265, 2021, [Online]. Available:

International Journal of Electrical and Intelligent Engineering

https://archives.palarch.nl/index.php/jae/article/view/8332/7777

[20] S. van Erp, "Smart contracts," *Harmon. Digit. Contract Law Impact EU Dir. 2019/770 2019/771 Regul. Online Platforms*, vol. 23, no. 1, pp. 739–749, 2023, doi: 10.5553/oenf/157012472018026004005.

[21] F. Lumineau, W. Wang, and O. Schilke, "Organization Science Blockchain Governance — A New Way of Organizing Collaborations ? Blockchain Governance — A New Way of Organizing Collaborations ?," *Organ. Sci.*, vol. 32, no. 2, pp. 500–521, 2021.

[22] I. A. Omar, H. R. Hasan, R. Jayaraman, K. Salah, and M. Omar, "Implementing decentralized auctions using blockchain smart contracts," *Technol. Forecast. Soc. Change*, vol. 168, no. March, p. 120786, 2021, doi: 10.1016/j.techfore.2021.120786.

[23] W. Zou *et al.*, "Smart Contract Development: Challenges and Opportunities," *IEEE Trans. Softw. Eng.*, vol. 47, no. 10, pp. 2084–2106, 2021, doi: 10.1109/TSE.2019.2942301.

[24] S. E. Chang, Y. C. Chen, and M. F. Lu, "Supply chain re-engineering using blockchain technology: A case of smart contract based tracking process," *Technol. Forecast. Soc. Change*, vol. 144, no. March, pp. 1–11, 2019, doi: 10.1016/j.techfore.2019.03.015.