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Strategic Optimization of Website Performance through AI, Multi-Channel Integration, And CRM: An Impact Analysis on Customer Conversion, Customer Loyalty, and Business Economic Performance at Pt. XYZ

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Abstract
The enhancement of customer conversion rate and the improvement of PT. XYZ's economic performance are critical for reinforcing the company's position in among digital marketplace. PT. XYZ faces substantial challenges in evaluating the effects of Customer Relationship Management implementation, AI-based website optimization, and multi-channel integration on customer satisfaction, engagement, and loyalty. This study aims to assess the influence and interrelation of CRM practices on customer conversion through customer satisfaction, determine the impact of AI-driven website optimization by analyzing engagement rates, also explores the role of multi-channel integration in fostering customer loyalty, considering customer retention metrics. The study also explores the role of multi-channel integration in fostering customer loyalty, considering customer retention metrics. Data was obtained by questionnaire from 100 active users of PT. XYZ Website. Statistical analyses, including tests for validity, reliability, normality, correlation, and paired t-tests, were employed to examine the relationships between variables. The results indicate that CRM implementation positively and significantly affects customer conversion in a linear manner, mediated by customer satisfaction. AI-based website optimization demonstrates a positive and significant nonlinear effect on economic performance, as reflected by engagement rates. Although the impact of multi-channel integration was not statistically significant. So, it is recommended that PT. XYZ pursue an integrated approach by combining CRM, AI-enhanced website optimization, and multi-channel strategies to improve customer conversion, loyalty, and overall economic performance. The insights derived from this study provide valuable guidance to improve the innovativenest and effectivenest digital marketing strategies.

Keywords: *Engagement rate, Customer Relationship Management, Customer loyalty, Customer conversion, Business performance, Digital marketing.*

I. Introduction

1.1.Background

As digital transformation accelerates, businesses are shifting from traditional offline operations to digital commerce or e-commerce. Kedah (2023) summarizes customer motivations for choosing e-commerce, including lower prices, ease and speed of transactions, and access to detailed product reviews.

PT. XYZ, a strategic marketing arm for its sister companies, spans seven product categories (furniture, children's toys, electronics, etc.) and sells via its website, Shopee, and Tokopedia. Now, PT XYZ displays over 930 items, with sales heavily dependent on its website. Engagement rate discrepancies are evident: the Krisbow 16-inch industrial fan has accumulated over 10,500 reviews on Shopee vs 1,337 on PT XYZ's site. As supported by Syahroni (2022), high ratings and positive reviews enhance buyer trust, while low ratings diminish purchase intent. Therefore, the lower engagement rate on PT XYZ's website is likely due to fewer reviews and interactions compared to competitive platforms.

In 2024, PT XYZ's website attracted 3.16 million visitors, resulting in 30,500 purchases. In comparison, one sister company's Shopee store reported over 947,500 followers and 13,700 products sold. Despite generating IDR 19.00 billion in revenue, PT XYZ still faces an annual churn rate of 18%. To improve user experience, PT XYZ implemented personalized content and augmented reality features in January 2023. Personalized content recommendations are based on users' browsing behavior, while AR enables virtual visualization of products in real spaces. As a result, CVR rose from 0.69% in August 2022 to 0.97% by 2024, and there was a 16% shift from offline to online transactions among a sample of over 2,000 visitors. While sales increased by IDR 43.7 billion and visitor counts grew by 19,150 over two years, the high churn rate remains a concern. Because of that optimization through CRM strategies is essential. Deepening CRM capabilities will enable PT XYZ to better segment its audience, personalize marketing campaigns, and improve engagement and conversion. Innovative digital marketing techniques can foster trust and loyalty. As such, this study explores the application of data analytics and CRM development to address low engagement and high churn at PT XYZ, ultimately aiming to enhance operational efficiency, customer experience, conversion rates, and market positioning.

1.2.Problem Formulation

Based on the previously discussed background, the following research problems are identified:

1. What is the impact and relationship of implementing Customer Relationship Management (CRM) on customer conversion, as further reviewed through customer satisfaction?
2. What is the impact and relationship of website optimization using AI on the business performance of PT XYZ, as further reviewed through engagement rate?
3. What is the impact and relationship of multi-channel integration on customer loyalty, as further reviewed through customer retention?

1.3.Research Objectives

In response to the identified problems and considering the current conditions, the objectives of this study are as follows:

1. To determine the impact and relationship of implementing Customer Relationship Management (CRM) on customer conversion, as further reviewed through customer satisfaction.
2. To determine the impact and relationship of website optimization using AI on the business performance of PT XYZ, as further reviewed through engagement rate.
3. To determine the impact and relationship of multi-channel integration on customer loyalty, as further reviewed through customer retention.

1.4.Hypothesis

Hypothesis 1: The Relationship Between the Implementation of Customer Relationship Management (CRM) and Customer Conversion Based on Customer Satisfaction

a. Null Hypothesis (H_0): The implementation of Customer Relationship Management (CRM) strategies does not have a significant and positive impact on customer conversion, as measured by customer satisfaction at PT XYZ.

b. Alternative Hypothesis (H_1): The implementation of Customer Relationship Management (CRM) strategies has a significant and positive impact on customer conversion, as measured by customer satisfaction at PT XYZ.

Hypothesis 2: The Relationship Between AI-Based Website Optimization and Business Economic Performance Based on Engagement Rate

a. Null Hypothesis (H_0): There is no significant and positive relationship between AI-based website optimization and the economic performance of PT XYZ, as measured by engagement rate.

b. Alternative Hypothesis (H_1): There is a significant and positive relationship between AI-based website optimization and the economic performance of PT XYZ, as measured by engagement rate.

Hypothesis 3: The Relationship Between Multi-Channel Integration and Customer Loyalty Based on Customer Retention

a. Null Hypothesis (H_0): The implementation of multi-channel integration does not have a significant and positive impact on customer loyalty, as indicated by customer retention at PT XYZ.
b. Alternative Hypothesis (H_1): The implementation of multi-channel integration has a significant and positive impact on customer loyalty, as indicated by customer retention at PT XYZ.

II. Materials and Methods

This research employs a correlational quantitative research design. Quantitative research is characterized by its emphasis on primary data collection, causal relationships, hypothesis testing, and variable interdependence, all of which serve to examine, observe, and propose solutions to identified problems (Syahroni, M. I., 2022). The study will be conducted through three primary steps: first, questionare sample calculations using Slovin method; Second, administering an online questionnaire to users of PT. XYZ's e-commerce platform; Third, analyzing questionare datas through statistical tests using JASP software. The questionnaire will be distributed via G-Forms and is intended to examine the correlation between the studied variables and customer behavior as well as customer loyalty.

This study incorporates three categories of variables. The independent variables include: (1) the implementation of data-driven Customer Relationship Management, (2) multi-channel integration via email and social media platforms, and (3) the utilization of Artificial Intelligence to optimize search algorithms, personalize digital content, and deploy chatbot systems. The intervening variables, which mediate the relationship between input and outcome, comprise webpage engagement rate, customer satisfaction, and customer retention. Meanwhile, the dependent variables, representing the ultimate goals of the proposed strategy, are customer loyalty, customer conversion, and improved business economic performance.

A Likert scale is employed to quantify perceptions and attitudes toward each variable, with specific indicators developed as the basis for each questionnaire item. These indicators serve to ensure construct validity and alignment with the conceptual framework, as summarized in Appendix Table A.1. Furthermore, the data analysis incorporates several statistical tests to ensure the robustness of the findings. Validity testing was conducted using Pearson's correlation coefficient to examine the relationship between each item and its corresponding construct. Reliability testing was performed using Cronbach's Alpha to assess the internal consistency of the measurement instrument. Normality testing was carried out using the Kolmogorov–Smirnov test to evaluate whether the data were normally distributed. Lastly, correlation analysis was conducted using Pearson's correlation coefficient to determine the strength and direction of relationships among the variables under study. This study also employs a T-test as part of the hypothesis testing procedure, aiming to determine whether each independent variable has a partial influence on the dependent variable. A variable is considered significant if the p-value (Sig. T) < 0.05, and not significant if $p > 0.05$ (Widiyanti, 2020).

III. Results

3.1. Reliability Test

Respondents were selected based on behavioral relevance to PT XYZ's website, specifically those categorized as last 30 days users. To ensure valid exposure to the studied variables, only users with at least two interactions during this period were included. This criterion ensured the sample reflected active users capable of providing reliable insights on engagement, loyalty, and perceptions of PT XYZ's CRM strategies.

3.2. Respondent Data Distribution by Key Characteristics

The sample comprised 100 active PT XYZ customers who had interacted with the website at least twice within the last 30 days. Most respondents were female (59%) and interacted with the website 2–3 times during that period (57%). A majority had been customers for over six months (71%). In terms of transaction behavior, 69% placed fewer than one order per month, and 71% generated less than IDR 1 million in monthly revenue.

Table 3.2. Respondent Data Distribution (Personal Documents,2025)

Variable	Category/Range	Frequency (n)	Percentage (%)
Gender	Man	41	41
	Woman	59	59
Website Interaction Frequency (Last 30 Days)	2-3 times	57	57
	4-5 times	32	33
	>5 times	11	11
Costumer Status	New Customer (≤ 6 months)	29	29
	Old Customer (> 6 months)	71	71
Order amount (Permonth)	< 1 item	69	69
	1 – 3 items	17	17
	3 – 5 items	10	10
	> 5 items	4	4
Total Spending (Permonth, millions Rp)	< Rp 1 million	22	71
	Rp 1 – 5 million	7	23
	> 5 million	2	6

3.3.Reliability Test Results

Reliability testing using Cronbach's Alpha indicates that most variables exhibit good to excellent internal consistency (Alpha ≥ 0.7), confirming that the indicators reliably measure their intended constructs and are suitable for further analysis. However, the combined reliability score for the CRM variable was relatively low (Alpha = 0.58), likely due to the inclusion of multiple diverse sub-initiatives under a single construct. This suggests the need for separate reliability testing of each CRM sub-variable to obtain more accurate and representative measurements. See Table 3.3 for detailed reliability scores.

Table 3.3. Cronbach's Alpha Value for Each Variable (Personal Documents,2025)

Variable	Label	Cronbach's Alpha
X1	Data Basis Customer Relationship Management	0.519
X2	Multichannel Integration with Email and Social Media	0.576
X3	Technology Optimization with AI	0.569
Y1	Engagement Rate	0.515
Y2	Customer Satisfaction	0.75
Y3	Customer Retention	0.79
I1	Customer Loyalty	0.83
I2	Customer Conversion	0.76
I3	Economy Business Performance	0.73

Variable		XA - CRM DATA	YA - KONVERSI PELANGGAN	IA-COSTUMER SATISFACTION	XB- OPTIMALISASI DENGAN AI	YB - KINERJA EKONOMI BISNIS	IB - ENGAGEMENT RATE	XC - INTEGRASI MULTICHANNEL	YC - LOYALITAS PELANGGAN
1. XA - CRM DATA	Pearson's r	—							
	p-value	—							
2. YA - KONVERSI PELANGGAN	Pearson's r	0.779	—						
	p-value	< .001	—						
3. IA-COSTUMER SATISFACTION	Pearson's r	0.906	0.88	—					
	p-value	< .001	< .001	—					
4. XB- OPTIMALISASI DENGAN AI	Pearson's r	0.344	0.295	0.312	—				
	p-value	< .001	0.003	0.002	—				
5. YB - KINERJA EKONOMI BISNIS	Pearson's r	0.179	0.123	0.152	0.578	—			
	p-value	0.078	0.226	0.135	< .001	—			
6. IB - ENGAGEMENT RATE	Pearson's r	0.22	0.157	0.192	0.839	0.697	—		
	p-value	0.03	0.122	0.058	< .001	< .001	—		
7. XC - INTEGRASI MULTICHANNEL	Pearson's r	-0.13	-0.16	-0.146	-0.023	0.011	-0.033	—	
	p-value	0.201	0.115	0.153	0.823	0.918	0.744	—	
8. YC - LOYALITAS PELANGGAN	Pearson's r	0.26	0.291	0.199	0.238	0.18	0.167	-0.173	—
	p-value	0.01	0.004	0.05	0.018	0.076	0.101	0.089	—
9. IC-COSTUMER RETENTION	Pearson's r	0.329	0.311	0.311	0.348	0.238	0.253	-0.151	0.709
	p-value	< .001	0.002	0.002	< .001	0.018	0.012	0.139	< .001

Figure 3.4. SPSS Simulation Results: Validity Test

3.4.Validity Test Results

Validity testing was conducted using JASP as an alternative to SPSS. Pearson's was employed to assess the strength and direction of linear relationships between numerical variables, ranging from –1 (perfect negative correlation) to +1 (perfect positive correlation). An r of 0 indicates no linear relationship. The closer the value is to ±1, the stronger the linear association between the two variables. The corresponding p-value indicates the statistical significance of the observed correlations, testing the null hypothesis (H_0) that no correlation exists. A p-value > 0.05 implies insufficient evidence to reject H_0, while $p < 0.05$ indicates a statistically significant correlation. Based on the results presented in the table above (see Figure 3.4), most relationships between variables X, Y, and Z within Parameters A and B show positive Pearson's r values with highly significant p-values (< 0.001), suggesting strong and statistically significant linear associations.

In contrast, relationships within Parameter C (Multichannel Integration, Customer Loyalty, and Retention) display weaker and sometimes negative correlations. For instance, Yc to Xc yields r = –0.173, p = 0.089, and Ic to Xc yields r = –0.151, p = 0.139—both statistically non-significant. However, Ic to Yc maintains a strong positive correlation (r = 0.709, p < 0.001). These findings suggest that Yc (Customer Loyalty) and Ic (Customer Retention) have limited statistical significance in relation to Xc (Multichannel Integration via email and social media).

3.5.Normality Test Results

One Sample T-Test

	Z	p
XA - CRM DATA	40.305	< .001
YA - KONVERSI PELANGGAN	35.052	< .001
IA-COSTUMER SATISFACTION	39.851	< .001
XB- OPTIMALISASI DENGAN AI	31.003	< .001
YB - KINERJA EKONOMI BISNIS	36.568	< .001
IB - ENGAGEMENT RATE	31.719	< .001
XC - INTEGRASI MULTICHANNEL	38.425	< .001
YC - LOYALITAS PELANGGAN	37.780	< .001

Note. For the Z-test, the alternative hypothesis specifies that the mean is different from 0.
Note. Z test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

	W	p
XA - CRM DATA	0.910	< .001
YA - KONVERSI PELANGGAN	0.924	< .001
IA-COSTUMER SATISFACTION	0.919	< .001
XB- OPTIMALISASI DENGAN AI	0.963	0.007
YB - KINERJA EKONOMI BISNIS	0.911	< .001
IB - ENGAGEMENT RATE	0.917	< .001
XC - INTEGRASI MULTICHANNEL	0.743	< .001
YC - LOYALITAS PELANGGAN	0.901	< .001

Note. Significant results suggest a deviation from normality.

	Mean	SD	SE	Coefficient of variation
XA - CRM DATA	4.071	0.585	0.059	0.144
YA - KONVERSI PELANGGAN	3.541	0.573	0.058	0.162
IA-COSTUMER SATISFACTION	4.026	0.607	0.061	0.151
XB- OPTIMALISASI DENGAN AI	3.132	0.442	0.045	0.141
YB - KINERJA EKONOMI BISNIS	3.694	0.616	0.062	0.167
IB - ENGAGEMENT RATE	3.204	0.507	0.051	0.158
XC - INTEGRASI MULTICHANNEL	3.882	0.502	0.051	0.129
YC - LOYALITAS PELANGGAN	3.816	0.510	0.051	0.134

Figure 3.5. (Left) One Sample T-Test & Shapiro Wilk Test of Normality (Right) Mean, SD, SE, and Coefficient of Variation Results on Each Variable (Personal Documents,2025)

Normality was assessed using both Z-test and Shapiro–Wilk test on 100 observations per variable. A standard normally distributed variable typically yields a Z-value < 3. However, the observed Z-values across all variables ranged between 30 and 41, indicating significant deviation from normality. Shapiro–Wilk test further supported this finding, where W-values closer to 1 typically suggest normal distribution. In this case, all variables except Xb showed p-values < 0.001, indicating statistically significant deviations from normal distribution (see Figure 3.5). Standard Error (SE) values were consistently around 0.05, reflecting the estimated distance of the sample means from the population means. The Coefficient of Variation (CV) ranged from 12–17%, suggesting high internal consistency and relatively low variability across the dataset.

3.6.Descriptive Statistical Analysis Test

3.6.1. Descriptive Statistical Analysis Test: CRM Data, Customer Conversion, and Customer Satisfaction

Figure 3.6. JASP Simulations on CRM Data, Customer Conversion, and Customer Satisfaction

Descriptive Statistics

	XA - CRM DATA	YA - KONVERSI PELANGGAN	IA-COSTUMER SATISFACTION
Mode	4.750[a]	3.500[a]	4.500[a]
Median	4.125	3.500	4.000
Mean	4.071	3.541	4.026
Std. Deviation	0.585	0.573	0.607
Skewness	−0.844	−0.330	−0.559
Std. Error of Skewness	0.244	0.244	0.244
Shapiro-Wilk	0.910	0.924	0.919
P-value of Shapiro-Wilk	< .001	< .001	< .001
Minimum	2.000	2.000	2.000
Maximum	4.750	4.500	5.000
25th percentile	3.750	3.000	3.500
50th percentile	4.125	3.500	4.000
75th percentile	4.500	4.000	4.500

[a] The mode is computed assuming that variables are discreet.

Association Matrix

Correlation

	XA - CRM DATA	YA - KONVERSI PELANGGAN	IA-COSTUMER SATISFACTION
XA - CRM DATA	1.000	0.779	0.906
YA - KONVERSI PELANGGAN	0.779	1.000	0.880
IA-COSTUMER SATISFACTION	0.906	0.880	1.000

Descriptive Statistic Analysis Test

Descriptive analysis of CRM data (Xa), customer conversion (Ya), and customer satisfaction (Ia) indicates relatively high central tendencies, with means of 4.125 (Xa) and 4.00 (Ia). The standard deviations across these variables range between 0.5 and 0.6, corresponding to approximately 12.5% of the total scale range, suggesting a moderate spread around the mean. All three variables exhibit negative skewness values between –0.330 and –0.844, indicating left-skewed distributions with extended tails on the lower end. These values suggest asymmetrical distributions, deviating significantly from normality. The Standard Error of Skewness (SES), as shown in the graph above, quantifies the uncertainty associated with these skewness estimates.

Additionally, the association matrix reveals strong inter-variable relationships among Xa, Ya and Ia, with correlation coefficients approaching +1, suggesting robust linear associations. Figure 3.7 illustrates the distribution patterns among CRM data (Xa), customer satisfaction (Ia), and customer conversion (Ya).

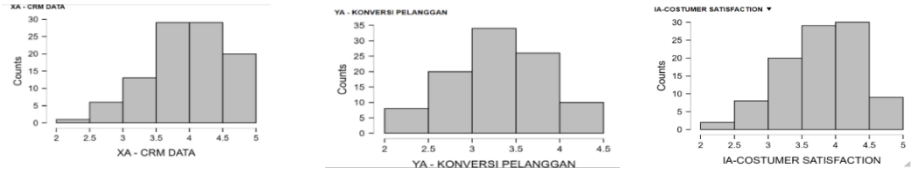

Figure 3.7. (From Left to Right) Distribution patterns of CRM Data; Customer Conversion; Customer Satisfaction

3.6.2. Descriptive Statistical Analysis Test: AI-Based Website Optimization, Business Performance, and Engagement Rate

Descriptive Statistics

	XB- OPTIMALISASI DENGAN AI	YB - KINERJA EKONOMI BISNIS	IB - ENGAGEMENT RATE
Mode	3.000*	3.500*	3.000*
Median	3.063	3.500	3.000
Mean	3.132	3.694	3.204
Std. Deviation	0.442	0.616	0.507
Variance	0.196	0.380	0.257
Skewness	0.646	−0.478	0.013
Std. Error of Skewness	0.244	0.244	0.244
Shapiro-Wilk	0.963	0.911	0.917
P-value of Shapiro-Wilk	0.007	< .001	< .001
Minimum	2.083	2.000	2.000
Maximum	4.333	5.000	4.500
25th percentile	2.833	3.500	3.000
50th percentile	3.063	3.500	3.000
75th percentile	3.333	4.000	3.500

* The mode is computed assuming that variables are discreet

Association Matrix

Correlation

	XB- OPTIMALISASI DENGAN AI	YB - KINERJA EKONOMI BISNIS	IB - ENGAGEMENT RATE
XB- OPTIMALISASI DENGAN AI	1.000	0.578	0.839
YB - KINERJA EKONOMI BISNIS	0.578	1.000	0.697
IB - ENGAGEMENT RATE	0.839	0.697	1.000

Figure 3.8. JASP Simulations on AI Optimilization, Economic Business Performance, and Engagement Rate Descriptive Statistic Analysis Test

The relationship between AI-driven website optimization (Xb), business performance (Yb), and engagement rate (Ib) displays lower modal values compared to the previous parameters, with the mode for all three variables centered around 3 Variance, representing the average squared deviation from the mean, indicates low data dispersion across all three variables. The relatively small variances suggest high data homogeneity and a distribution considered statistically normal.

Skewness values show that Xb exhibits mild positive skewness (0.646), indicating a right-tailed distribution. In contrast, Yb (−0.478) and Ib (0.013) fall within the range of −0.5 to +0.5, reflecting near-symmetric distributions. The association matrix (see Figure 3.9) confirms moderately strong correlations among Xb, Yb, and Ib, suggesting consistent inter-variable alignment.

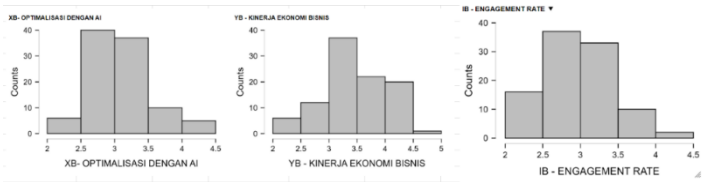

Figure 3.9. (From Left to Right) Patterns of CRM Data; Customer Conversion; Customer Satisfaction

3.6.3. Descriptive Statistical Analysis Test

Descriptive Statistics

	XC - INTEGRASI MULTICHANNEL	YC - LOYALITAS PELANGGAN	IC-COSTUMER RETENTION
Mode	3.750[a]	3.500[a]	3.500[a]
Median	3.875	4.000	4.000
Mean	3.882	3.816	3.827
Std. Deviation	0.502	0.510	0.460
Variance	0.252	0.260	0.212
Skewness	-3.514	-0.339	0.346
Std. Error of Skewness	0.244	0.244	0.244
Shapiro-Wilk	0.743	0.901	0.881
P-value of Shapiro-Wilk	< .001	< .001	< .001
Minimum	0.388	2.000	3.000
Maximum	4.875	5.000	5.000
25th percentile	3.750	3.500	3.500
50th percentile	3.875	4.000	4.000
75th percentile	4.125	4.000	4.000

[a] The mode is computed assuming that variables are discreet

Association Matrix

Correlation

	XC - INTEGRASI MULTICHANNEL	YC - LOYALITAS PELANGGAN	IC-COSTUMER RETENTION
XC - INTEGRASI MULTICHANNEL	1.000	0.470	0.528
YC - LOYALITAS PELANGGAN	0.470	1.000	0.709
IC-COSTUMER RETENTION	0.528	0.709	1.000

Figure 3.10. JASP Simulations on Multichannel Integration, Customer Loyalty, and Customer Retention Descriptive Statistic Analysis Test

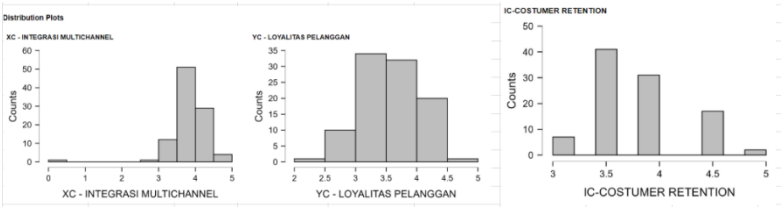

Figure 3.11 (From Left to Right) Distribution patterns of Multichannel Integration; Customer Loyalty; Customer Retention

Data generated via JASP software indicates a markedly non-normal distribution for the Xc variable (Multichannel Integration), with a skewness value of −3.514. This substantial left-skewness contributes to weaker correlations within the association matrix, particularly between Xc and Yc (r = 0.470) and Xc and Ic (r = 0.528). The distribution patterns for Xc, Yc (Customer Loyalty), and Ic (Customer Retention) are illustrated in the graph above (Gambar 4.3.2).

3.7.Correlation Analysis

3.7.1. Correlation Analysis on Parameter A:

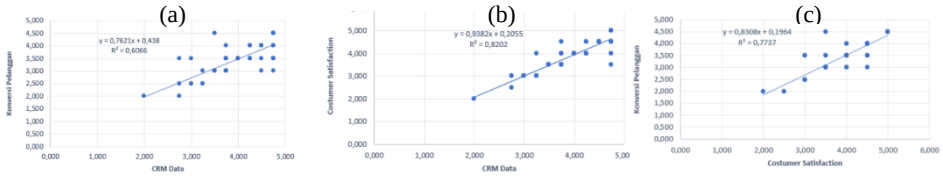

Figure 3.12 Correlation Analysis between (a) CRM data towards Customer Conversion; (b) CRM Data towards Customer Satisfaction; (c) Customer Satisfaction towards Customer Conversion

Correlation analysis was conducted to examine the relationships between variables X and Y, Y and Z, as well as X and Z. Linear regression was employed to assess whether changes in one variable correspond to proportional changes in another along a straight-line pattern. A positive R^2 value close to 1 indicates a strong direct relationship, while lower values suggest weaker or inverse associations. As shown in the three graphs above, CRM data, customer conversion, and customer satisfaction exhibit strong positive linear correlations, with R^2 values ranging from 0.60 to 0.90.

3.7.2. Correlation Analysis on Parameter B: AI Optimlization, Economical Business Performance, Engagement Rate

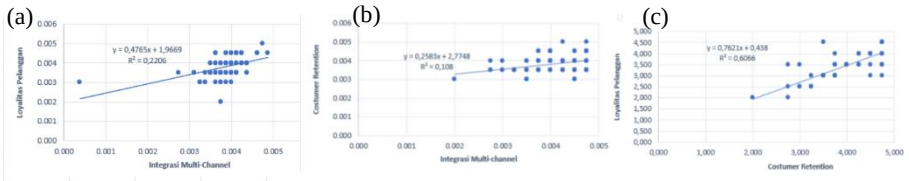

Figure 3.13. Correlation Analysis between (a) AI Optimilization towards Economical Business Performance; (b) AI Optimilization towards Engagement Rate; (c) Engagement Rate towards Economical Business Performance

The correlation analysis of Parameter B—comprising website optimization using AI, business performance, and engagement rate—indicates weak linear relationships between both AI-driven optimization and engagement rate with business performance, as reflected by R^2 values ranging from 0.3 to 0.4. Conversely, a stronger correlation is observed between AI optimization and engagement rate, with an R^2 value of approximately 0.7, suggesting a substantial positive association.

3.7.3. Correlation Analysis on Parameter C: Customer Loyalty, Multichannel Integration, and Customer Relations

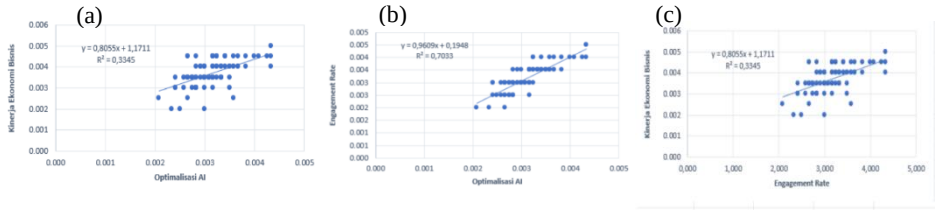

Figure 3.14. Correlation Analysis between (a) Multi-channel Integration towards Customer Loyalty; (b) Multichannel Integration towards Customer Retention; (c) Customer Retention towards Customer Loyalty

The analysis conducted on the relationship between customer retention, customer loyalty, and multichannel integration reveals that multichannel integration exhibits a weak correlation with both customer retention and loyalty, as evidenced by low R^2 values. In contrast, customer retention demonstrates a moderately strong relationship with customer loyalty, with an R^2 value of 0.6066, indicating a substantial degree of linear association between the two variables.

3.8. Paired T-Test

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
XA - CRM DATA	-	XB- OPTIMALISASI DENGAN AI	15.496	97	< .001
XA - CRM DATA	-	XC - INTEGRASI MULTICHANNEL	2.972	97	0.004
XB- OPTIMALISASI DENGAN AI	-	XC - INTEGRASI MULTICHANNEL	−13.747	97	< .001
YA - KONVERSI PELANGGAN	-	YB - KINERJA EKONOMI BISNIS	−1.923	97	0.057
YB - KINERJA EKONOMI BISNIS	-	YC - LOYALITAS PELANGGAN	−1.671	97	0.098
YA - KONVERSI PELANGGAN	-	YC - LOYALITAS PELANGGAN	−4.218	97	< .001
IA-COSTUMER SATISFACTION	-	IB - ENGAGEMENT RATE	11.427	97	< .001
IA-COSTUMER SATISFACTION	-	IC-COSTUMER RETENTION	3.092	97	0.003
IB - ENGAGEMENT RATE	-	IC-COSTUMER RETENTION	−10.403	97	< .001

Note. Student's t-test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
XA - CRM DATA	-	XB- OPTIMALISASI DENGAN AI	0.972	0.035
XA - CRM DATA	-	XC - INTEGRASI MULTICHANNEL	0.833	< .001
XB- OPTIMALISASI DENGAN AI	-	XC - INTEGRASI MULTICHANNEL	0.877	< .001
YA - KONVERSI PELANGGAN	-	YB - KINERJA EKONOMI BISNIS	0.952	0.001
YB - KINERJA EKONOMI BISNIS	-	YC - LOYALITAS PELANGGAN	0.953	0.002
YA - KONVERSI PELANGGAN	-	YC - LOYALITAS PELANGGAN	0.941	< .001
IA-COSTUMER SATISFACTION	-	IB - ENGAGEMENT RATE	0.943	< .001
IA-COSTUMER SATISFACTION	-	IC-COSTUMER RETENTION	0.933	< .001
IB - ENGAGEMENT RATE	-	IC-COSTUMER RETENTION	0.933	< .001

Note. Significant results suggest a deviation from normality.

Figure 3.15. Paired T-Test and Test and Normality Results for Each Correlated Variable

The paired-sample T-Test was conducted to assess the mean differences between paired variables and to evaluate the closeness of relationships among variables X, Y, and Z. A p-value greater than 0.05 indicates that the difference is not statistically significant at the 5% level. The results (see Gambar 5.2.3) reveal significant differences in several variable pairs: CRM Data vs. Website Optimization with AI (t = 15.496), Website Optimization with AI vs. Multichannel Integration (t = -13.747), Customer Satisfaction vs. Engagement Rate (t = 11.427), and Engagement Rate vs. Customer Retention (t = -10.043). Negative t-values indicate that the second measure yields higher values than the first.

Given the non-normality of the data, as established in earlier normality tests, the non-parametric Wilcoxon signed-rank test was employed as a more robust alternative. The resulting p-values, ranging from <0.001 to 0.035, confirm statistically significant differences between most variable pairs, notably between Xa and Xb. The W-statistic values approaching 1 suggest directional consistency—for instance, the majority of Xa values are greater than Xb.

IV. Discussion

4.1.Reliability Test

The questionnaire was distributed to 100 customers of PT XYZ and comprised 28 items designed to capture data across multiple research variables. A reliability test was conducted to assess the internal consistency of the instrument using Cronbach's Alpha. The resulting alpha coefficients ranged from 0.515 to 0.830, indicating moderate to high reliability. Variables X1, X2, and X3—representing CRM data, multi-channel integration (e.g., email and social media), and AI-based website optimization—exhibited values near the lower threshold. This is attributed to the broad scope of these constructs, which require multiple items to

comprehensively capture their dimensions, thereby affecting the average consistency reflected in the Cronbach's Alpha values.

4.2.Validity Test

The validity test aimed to verify the theoretical relationships proposed in the study through responses from the same 100 participants. Pearson's correlation analysis revealed strong and statistically significant relationships among CRM data, customer conversion, and customer satisfaction. Correlation coefficients approached +1 with p-values below 0.05, confirming positive associations. This suggests that enhancements in CRM data management contribute directly to increased customer conversion rates and satisfaction levels at PT XYZ. These findings align with prior research, such as Zahida et al. (2023), which reported a significant positive effect of CRM on customer satisfaction in Mixue consumers, with a path coefficient of 0.680 and an R^2 of 46.3%.

Richards and Jones (2017), as cited in Plauti (2025), emphasize that accurate CRM data significantly enables personalized customer interactions, which in turn foster enhanced customer satisfaction and loyalty. Empirical data show that 91% of consumers are more likely to purchase from brands offering relevant recommendations. Furthermore, the activation of personalization features increases customer retention, with 44% of customers indicating a likelihood of repurchasing due to positive personalized experiences.

An effectively implemented CRM system allows organizations to deeply understand customer needs and behavior by leveraging data collection and analytical processes. Satisfied customers often translate into repeat purchasers and brand advocates, enhancing customer lifetime value (CLV) and business profitability. CRM systems also assist in customer segmentation and targeted marketing, while integrated data facilitate the formulation of relevant marketing strategies. Moreover, proactive responses to customer concerns can reduce churn rates, thereby contributing to revenue stability and long-term business sustainability.

However, as Nguyen and Mutum (2012) argue, CRM implementation must be tailored to the specific operational characteristics of individual firms. Inadequate customization may hinder both system effectiveness and efficiency. Payne and Frow (2015) further highlight the challenges in integrating CRM with other enterprise systems such as ERP, financial systems, and inventory management platforms. Data misalignment among systems can result in fragmented customer information, which impairs timely and informed decision-making. Almotairi (2018) notes that employee resistance, lack of adequate training, and unclear performance indicators also constrain CRM adoption.

Statistical analyses indicate that CRM implementation at PT XYZ has had a significant and positive impact on customer satisfaction and conversion. Pearson correlation coefficients demonstrate strong positive relationships between CRM data, customer satisfaction, and conversion rates, with p-values below 0.05, affirming statistical significance.

In parallel, optimization of AI-driven tools is shown to positively affect business performance through increased engagement rates. The Pearson correlation coefficients among these variables range from 0.578 to 0.839, all with p-values < 0.01, indicating strong and statistically significant relationships. Specifically, the correlation between engagement rate and business performance is $r = 0.697$ ($p < 0.01$), validating engagement as a reliable indicator of economic performance.

On a global scale, AI has become integral to business operations. McKinsey (2025) reports that 72% of firms have incorporated AI into at least one business function, with 50% employing it across two or more. Approximately 60% utilize AI to enhance customer experiences, while over half deploy AI for operational efficiency, analytics, and customer engagement functionalities such as chatbots (AI Hub, 2024). PT XYZ's AI-enhanced performance aligns with broader industry trends. For instance, Fachrizal (2024) observed that AI investments in the healthcare sector since 2016 generated IDR 8.3 trillion in revenue and IDR 18.2 trillion in added value. Kilay and Radianto (2023) confirmed a statistically significant and linear relationship between engagement rate and firm value, indicating that a 1% increase in engagement can elevate firm value

by 0.45%. Furthermore, mediation analysis shows that engagement rate significantly mediates the relationship between social media input intensity and firm valuation (Sobel test = 2.15, $p < 0.05$).

Conversely, Pearson bivariate analysis of PT XYZ's multi-channel integration via email and social media reveals weak, non-significant, and negative correlations with customer loyalty, ranging from $r = 0.151$ to 0.173 ($p > 0.05$). This implies that current multi-channel strategies are ineffective and potentially detrimental to customer loyalty. In contrast, the relationship between customer retention and loyalty is robust and statistically significant ($r = 0.709$, $p < 0.05$), reaffirming the centrality of retention strategies.

These findings are supported by prior research. Yunita et al. (2022) found a weak, non-significant negative correlation between email/social media integration and loyalty ($r = -0.162$, $p = 0.067$). Conversely, Fajar and Nugroho (2023) demonstrated that well-managed social media marketing significantly enhances loyalty, with a regression coefficient of 0.354 ($p < 0.01$) and an R-squared value of 0.42, indicating that 42% of loyalty variance is attributable to effective digital marketing. Similarly, Wibisono and Endarti (2024) reported a strong, positive correlation between retention and loyalty ($r = 0.712$, $p = 0.000$), highlighting the strategic importance of retention in loyalty development.

In practice, although multi-channel systems possess considerable potential for enhancing retention and loyalty, current implementation at PT XYZ remains suboptimal. Key barriers include impersonal promotional content and lack of compelling incentives. Growleady (2024) underscores the necessity of leveraging marketing automation, data analytics, and A/B testing to tailor messaging and optimize multichannel campaign efficacy.

Moreover, PT XYZ's review and feedback systems remain underdeveloped, leading to fragmented customer journeys and diminished satisfaction. Enhancing integration across communication platforms is imperative. Adopting cloud-based contact center technology would enable comprehensive data synchronization and cohesive customer interactions. Mapping the customer journey using behavioral analytics across digital touchpoints would further improve engagement. Strategically, implementing measurable loyalty programs can mitigate churn and reinforce customer commitment. Additionally, ongoing performance evaluation of each communication channel, coupled with data-driven budget reallocation, is essential to ensure optimal resource utilization and marketing efficiency (Growleady, 2024).

4.3.Normality Test

In the present study, normality assessments were conducted on responses from 100 participants who rated constructs such as multichannel integration effectiveness, customer retention, and customer loyalty using a five-point Likert scale. The Z-tests yielded values ranging from 31.220 to 39.870 across all variables, with associated p-values below 0.001. These results indicate statistically significant deviations from normality, as Z-scores exceeding ±3 are conventionally interpreted as evidence against the null hypothesis at a 5% significance level ($\alpha = 0.05$).

Complementary Shapiro–Wilk tests returned W-values between 0.971 and 0.989, which, despite their proximity to unity, were accompanied by p-values < 0.001. This further substantiates the rejection of the null hypothesis of normality, reinforcing the inference that the distribution of observed responses deviates from the Gaussian model. Such distributional irregularities are characteristic of ordinal data obtained via Likert-type instruments, a pattern well-documented in psychometric literature. Norman (2010) attributes this to respondents' propensity to avoid negative anchors and concentrate their selections around the mid-to-upper spectrum (e.g., 3–5), often resulting in positively skewed distributions. This behavioral tendency, frequently referred to as leniency bias or accommodation bias, is particularly prevalent in consumer satisfaction and marketing research.

Descriptive statistical analysis further revealed that the standard errors (SE) of the observed variables ranged between 0.452 and 0.615, indicating moderate dispersion of sample means relative to the population parameters. This level of variability is considered typical within the context of digital service assessments, where consumer evaluations may differ considerably across demographic and psychographic segments. Coefficients of variation (CV), calculated to range between 0.129 and 0.167, denote acceptable levels of

relative dispersion. For instance, the customer loyalty variable demonstrated a mean of 4.01 with a standard deviation of 0.56, yielding a CV of 0.1396. According to the classification proposed by Everitt (2006), a CV below 0.20 signifies satisfactory inter-respondent consistency for perception-based metrics.

4.4.Descriptive Statistical Analysis Test

A comprehensive descriptive statistical analysis was conducted for each research variable to explore customer perceptions and behavioral trends related to PT XYZ's CRM and AI-driven digital strategies. Parameter A, which comprises CRM data, customer conversion, and customer satisfaction, reflects a generally positive customer experience. For both CRM data (Xa) and customer satisfaction (Ia), the most frequent responses were 5 and 4, indicating high levels of satisfaction and engagement. These findings are further substantiated by median values approximating 4.125 and 4, respectively. The distribution of responses is notably left-skewed, with skewness values of −0.844 for Xa and −0.559 for Ia, implying that the data are concentrated on the higher end of the scale. These characteristics support Norman's (2010) theory of leniency bias, where respondents tend to provide favorable evaluations. Additionally, the standard error of skewness, calculated at 0.244, confirms the reliability of the skewness values, as shown by z-scores of 3.46 and 2.29 ($|z| > 1.96$), indicating that the skewness observed is statistically significant.

The customer conversion variable, while still left-skewed (−0.330), demonstrates a more balanced distribution across values 3 and 4. This suggests that while customer engagement is positive, it is more moderate in terms of actual conversion behavior. Complementing these findings, AnswerConnect (2023) reported that the average customer satisfaction score in the sector reached 80%, a 3% increase from the previous year. Based on this benchmark, PT XYZ's CRM implementation appears effective in aligning with industry standards.

Parameter B focuses on AI-enhanced digital strategies, including search algorithm optimization, content personalization, chatbot integration, business performance, and engagement rate. As illustrated in **Figure 4.3.2,** these components have not yet yielded a strong perceptual impact among users. Most variables exhibit a mode and median of 3, particularly for AI-based website optimization and engagement rate, reflecting a neutral perception. Qualitative insights from customer feedback indicate that current recommendations and content delivery lack personalization and relevance to individual preferences and needs. Many users engage in transactions only when necessary and are generally disinclined to browse further, limiting exposure to the platform's full offerings. While promotional strategies and pricing are considered adequate, they have yet to differentiate PT XYZ meaningfully from competitors. The skewness for variable Xb (AI-based optimization) is notably negative, indicating a clustering of higher-end scores despite an overall neutral median. This highlights a potential polarization in user experience and reinforces the need for more precise personalization to ensure consistent satisfaction across user segments.

The analysis was extended to include multichannel integration (via social media and email), customer retention, and customer loyalty. These dimensions demonstrated relatively favorable responses, with mode and median values between 3.5 and 3.75. However, skewness values ranging from +0.346 to −3.514 suggest substantial asymmetry in the distribution. Particularly, the extreme negative skewness is attributed to recurring anomalies observed during data collection. These irregularities, depicted in **Figure 4.3.3** (Distribution Plot), contributed to a heavily right-tailed distribution, indicating a dominant cluster of high responses with occasional outliers on the lower end.

Despite these anomalies, the overall alignment between multichannel engagement, customer loyalty, and retention appears statistically and conceptually coherent. These variables warrant deeper correlation analysis in subsequent sections, as they hold potential strategic value for customer lifecycle management in the digital commerce context.

5.1.5 Correlation Analysis

Correlation analysis was performed among the X, Y, and intervening variables for each parameter to assess the linearity of relationships. Based on the available data, the relationships between CRM data and customer conversion, CRM data and customer satisfaction, as well as customer satisfaction and customer conversion, all exhibit strong positive linear correlations. The corresponding coefficients of determination (R^2) are 0.6066, 0.8202, and 0.7737, respectively. These R^2 values, all approaching 1, indicate that linear regression

models effectively represent these variable relationships. The results suggest that improved performance in Customer Relationship Management (CRM) at PT XYZ leads to a proportional increase in both customer satisfaction and conversion rates. Furthermore, higher satisfaction levels also directly correlate with increased customer conversion.

In contrast, the relationships among AI-based website optimization, engagement rate, and business performance reveal weaker linear associations. As shown in the three scatterplots in **Figure 4.4.2**, the R^2 values for the relationship between AI optimization and business performance, as well as between engagement rate and business performance, are both relatively low at 0.3345. These results suggest that linear models may not sufficiently capture the nature of these relationships. The wide spread of the data also supports this conclusion. Nonetheless, it remains evident that enhanced AI performance has the potential to positively impact business outcomes.

On the other hand, the relationship between AI optimization and engagement rate yielded a more substantial R^2 value of 0.7033. This implies that improving website personalization can significantly increase customer engagement, time spent on the platform, and the likelihood of return visits to PT XYZ's website.

A similar pattern is observed for Parameter C. The relationships between multichannel integration (via email and social media) and both customer loyalty and retention demonstrate low linearity, with R^2 values far from 1 and low gradients of 0.4765 and 0.2583, respectively. These gradients suggest that although PT XYZ has implemented multichannel strategies their perceived impact remains limited. Customers do not yet associate these efforts with a compelling advantage over competitors or sufficient motivation to recommend the platform to others. As depicted in **Figure 4.4.3**, multichannel integration is still not viewed as a fully mature marketing strategy, nor is it perceived as offering superior value compared to alternative platforms, despite its modest positive influence.

5.1.6 Paired-Sample T-Test

A paired-sample t-test was conducted to determine whether customer perceptions across Parameters A, B, and C are statistically distinct. The results confirm that the constructs represented by each parameter are perceived differently by respondents, indicating that the questionnaire items were well-differentiated. A value of $0<t<10 < t < 10<t<1$ would imply overlapping definitions; however, this was not observed. Additionally, the p-values obtained were consistently below 0.005, supporting the conclusion that the distinctions between parameters are statistically significant and that the questionnaire design effectively avoids redundant or overlapping constructs.

V. Conclusion

A strategic analysis was conducted to evaluate the influence of AI-driven website optimization, multi-channel integration, and Customer Relationship Management (CRM) on customer conversion, loyalty, and business performance at PT XYZ. A questionnaire was distributed to 100 active website users, and variable relationships were assessed through validity, reliability, normality, correlation, and paired sample t-tests. Results confirmed the questionnaire's validity for further empirical analysis. CRM exhibited a strong, positive linear influence on customer conversion, mediated through customer satisfaction. AI-based website optimization demonstrated a significant, non-linear positive impact on business performance, mediated by engagement rate. Although multi-channel integration showed limited statistical significance, it maintained a positive linear association with customer loyalty, as supported by its linkage to customer retention.

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Authors Short Biography

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