

Adaptive Dimensions of Customer Engagement Within Evolving Market Structures

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Abstract

Customer Engagement Value (CEV) has emerged as a significant construct for evaluating the multidimensional value generated through customer–firm interactions. Unlike traditional customer valuation approaches that primarily focus on transactional behaviors, CEV incorporates both transactional and non-transactional contributions made by customers. This study develops a comprehensive and realistic framework for understanding the dynamics of customer engagement through the integration of Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV). Existing studies have largely examined these dimensions independently or relied on conceptual and gamified approaches that insufficiently represent actual market interactions. To address these limitations, the present research proposes a non-linear model capable of capturing the interdependent relationships among CEV components. The elasticity parameters associated with each engagement component were determined through an online survey and incorporated into a System Dynamics (SD) framework to simulate customer engagement behavior over time. The findings indicate that both purchasing and non-purchasing engagement behaviors significantly contribute to overall customer value creation. The proposed framework provides a strategic tool for organizations seeking to improve long-term customer relationships and sustainable business performance. The study further recommends the application of the model using real-world organizational data to validate and enhance its practical effectiveness.

Keywords: Customer Engagement Value (CEV), Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), Customer Knowledge Value (CKV), System Dynamics (SD), Relationship Marketing.

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Citation: Beverland M. Adaptive Dimensions of Customer Engagement Within Evolving Market Structures. Asian Journal of Management Sciences. 2024, 11 No. 1: 103

Received: March 11, 2024; **Accepted:** March 29, 2024; **Published:** April 06, 2024

Introduction

Customer Engagement Value (CEV) has increasingly become a fundamental concept in relationship-oriented marketing due to its ability to evaluate the comprehensive value generated by customers within an organization. Unlike traditional customer valuation methods that primarily focus on purchasing behavior, CEV captures both transactional and non-transactional dimensions of customer interaction. In modern competitive markets, customers contribute value not only through direct purchases but also through referrals, social influence, knowledge sharing, and feedback participation. Consequently, firms are gradually shifting from purely revenue-based customer evaluation toward multidimensional engagement-based assessment frameworks.

CEV is composed of four principal components that collectively define the total value of a customer to a firm. These components include Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV). Together, these dimensions provide a comprehensive understanding of customer engagement behavior and its influence on organizational sustainability and growth.

Among these components, Customer Lifetime Value (CLV) remains the most widely recognized and extensively studied measurement. CLV focuses on the purchasing behavior of customers and estimates the expected financial contribution generated throughout the customer's relationship with a firm. Because of its direct relationship with profitability, CLV has become one of the most important indicators in direct marketing

and customer relationship management [1–5]. Organizations utilize CLV to identify profitable customers, allocate marketing resources effectively, and develop long-term retention strategies. However, despite its significance, CLV alone does not fully represent the actual value customers create for organizations.

The limitations of CLV have encouraged researchers to investigate non-transactional dimensions of customer behavior. These dimensions are represented through Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV). Unlike CLV, these components focus on customer activities that indirectly contribute to organizational performance and market expansion.

Customer Referral Value (CRV) evaluates the ability of customers to recommend products and services to others. Referral activities play a crucial role in reducing customer acquisition costs and increasing future revenues through positive recommendations and interpersonal communication [6]. Customers who actively refer brands to friends, relatives, or colleagues often become strategic assets for organizations because they facilitate organic growth and strengthen customer trust.

Customer Influencer Value (CIV), on the other hand, measures the influence customers exert within their social and professional networks. This influence is commonly expressed through Word of Mouth (WOM), online reviews, social media interactions, and digital advocacy [7]. In contemporary digital environments, customers significantly affect the purchasing decisions of prospective consumers through the information they share. Positive influence enhances brand reputation and customer confidence, while negative influence may damage organizational image and customer loyalty.

Another important dimension is Customer Knowledge Value (CKV), which captures the informational and innovative contributions customers provide to organizations. Customers often generate valuable feedback, product suggestions, and service improvement ideas that support innovation and organizational development. Firms increasingly recognize that customer knowledge contributes directly to product enhancement, operational efficiency, and long-term competitiveness. Consequently, organizations seek to integrate customer feedback mechanisms into their strategic decision-making processes.

The growing importance of customer engagement has motivated researchers and practitioners to develop models capable of capturing the interactions among these engagement dimensions. Existing studies have attempted to conceptualize how transactional and non-transactional behaviors collectively influence customer value creation. However, most previous models remain either theoretical in nature or heavily dependent on gamification concepts. Although gamification techniques improve customer participation and engagement through reward-based systems,

they often fail to represent realistic business environments and complex customer behaviors accurately. As a result, the practical applicability of many existing models remains limited [8].

To overcome these limitations, researchers have increasingly explored the application of System Dynamics (SD) as a methodological approach for analyzing customer engagement interactions. System Dynamics is particularly effective in studying complex systems characterized by non-linear relationships, feedback loops, and time-dependent interactions [9]. Through SD, organizations can understand how different engagement components evolve and influence one another over time.

System Dynamics models commonly utilize two major forms of representation: stock-and-flow diagrams and causal loop diagrams. Stock-and-flow diagrams focus on accumulations and movement within systems, while causal loop diagrams emphasize feedback relationships among variables. These relationships can be reinforcing or balancing. Reinforcing relationships occur when variables move in the same direction, leading to continuous growth or decline. In contrast, balancing relationships occur when changes in one variable counteract changes in another variable, contributing to system stability.

Within the context of CEV, several reinforcing and balancing relationships exist among CLV, CRV, CIV, and CKV. For example, customers with high CLV are generally more loyal and therefore more likely to participate in referral activities, resulting in higher CRV [10]. Similarly, influential customers who actively advocate for brands may contribute positively to customer acquisition and market visibility (Table 1). Conversely, the relationship between CLV and CKV may exhibit balancing characteristics because highly satisfied customers may provide less feedback compared to customers experiencing dissatisfaction or unmet expectations.

In addition to these dynamic relationships, customer engagement is influenced by multiple internal and external factors. These factors include personal characteristics, interpersonal interactions, behavioral attributes, attitudinal factors, network influence, firm-specific characteristics, and product-specific attributes [11]. The interaction among these variables further increases the complexity of measuring customer engagement comprehensively.

To capture these interactions effectively, this study proposes a non-linear framework for modeling Customer Engagement Value. The proposed framework integrates the principles of System Dynamics with multiplicative non-linear modeling techniques. The non-linear model allows the representation of interdependent relationships among engagement components and enables the estimation of elasticity parameters that determine the influence of each component on overall customer value [12].

The elasticity parameters utilized in this study are determined through an online survey designed to measure customer perceptions and engagement behaviors. These parameters are

Table 1: Classification of Variables Influencing Customer Engagement Value Components.

CEV Component	Major Variables	Classification Category	Expected Influence
Customer Lifetime Value (CLV)	Recency, Frequency, Monetary Value (RFM), Churn Probability, Cross-selling, Up-selling	Customer-Specific and Firm-Specific Characteristics	Positive influence on purchasing behavior and profitability
Customer Referral Value (CRV)	Referral Rate, Loyalty, Customer Satisfaction, Trust, Brand Advocacy	Interpersonal and Behavioral Characteristics	Enhances customer acquisition and future revenues
Customer Influencer Value (CIV)	Word of Mouth (WOM), Social Media Interaction, Network Size, Online Reviews	Network and Social Characteristics	Increases brand awareness and customer influence
Customer Knowledge Value (CKV)	Feedback Quality, Product Suggestions, Innovation Ideas, Complaint Handling	Knowledge and Attitudinal Characteristics	Supports product improvement and organizational innovation
Customer Engagement Value (CEV)	Combined effect of CLV, CRV, CIV, and CKV	Integrated Engagement Framework	Measures overall customer contribution to the firm

subsequently incorporated into a System Dynamics simulation model to examine the evolving interactions among CEV components over time. The proposed framework therefore provides a more realistic and comprehensive approach for evaluating customer engagement compared to existing theoretical and gamification-based models.

This research builds upon prior studies that investigated Customer Engagement Value from theoretical and simulation perspectives [13–15]. However, unlike previous approaches, the present study integrates non-linear modeling with System Dynamics simulation to provide a practical and empirically driven framework for analyzing customer engagement behavior. By doing so, the study contributes to both academic literature and managerial practice through the development of a robust model capable of supporting strategic customer relationship management decisions.

The remainder of this paper is organized as follows. Section Two reviews the relevant literature and highlights the motivation behind the study. Section Three presents the proposed framework and methodological design. Section Four discusses the experimental findings and analysis. Section Five outlines the managerial implications of the proposed model. Finally, Section Six concludes the study, identifies its limitations, and proposes directions for future research [16].

Materials and Methods

The existing studies related to Customer Engagement Value (CEV), system dynamics, and gamification-based engagement frameworks. Previous researchers contributed to this field through two primary streams of research. The first stream focused on developing theoretical models that describe the dynamic relationships between firms and customers using system dynamics approaches. The second stream concentrated on practical gamification frameworks that apply gaming concepts and motivational techniques to enhance customer participation and engagement. Both categories of studies contributed significantly to the development of customer engagement theory; however, several limitations remain unresolved.

Researchers in customer engagement initially focused on understanding the drivers and determinants of customer participation in virtual environments. One notable study proposed a framework for examining customer engagement and its major influencing factors within virtual customer communities [17]. Their framework was validated using Partial Least Squares Structural Equation Modeling (PLS-SEM) and applied to real customers from the Dutch telecommunications industry. The study demonstrated the importance of cognitive, personal, hedonic, and social integrative benefits in enhancing customer engagement levels. Despite its contribution, the model lacked several potentially significant variables, particularly customer-specific characteristics. Furthermore, the applicability of the model remained limited because it was validated only within the telecom sector.

The role of System Dynamics (SD) in organizational decision-making has also attracted significant academic attention. Previous studies highlighted how system dynamics can generate managerial insights that support strategic decision-making processes. Building upon this perspective, researchers applied SD techniques within the telecommunications industry, specifically in mobile technology environments. Using a unique dataset related to mobile application purchases and customer engagement, the study revealed that customer disengagement exerts a stronger long-term influence on organizational outcomes than customer engagement itself. Although the findings were valuable, the model incorporated only limited dimensions of customer engagement, thereby restricting the generalizability of the results.

Another line of research explored the integration of system dynamics into the analysis and management of Small and Medium Enterprises (SMEs). These studies developed simulation-based frameworks to evaluate customer engagement and organizational adaptability within small businesses [18]. Their findings demonstrated that globalization pressures force SMEs to invest additional resources to improve market adaptability, enhance service capabilities, and strengthen competitive positioning. However, the proposed models focused mainly

on controllable internal variables while excluding important external factors such as government regulations, exchange rates, and economic fluctuations. Additionally, the limited number of interviews conducted reduced the representativeness of the empirical findings [19–20].

Researchers also investigated customer engagement through incentive-based and gamification-oriented approaches. One study developed a two-dimensional matrix model for analyzing customer engagement crowding effects under monetary incentive systems. Although the framework provided useful insights regarding motivational structures, it lacked sufficient complexity to accurately represent the multiple actors and relationships existing in real-life customer ecosystems.

Value co-creation also emerged as an important perspective in customer engagement literature. Scholars conceptualized customer engagement behavior as a co-creation process involving multiple stakeholders within service systems. Their framework was applied as a case study within public transportation service environments. The findings emphasized the importance of leveraging customer resources, encouraging stakeholder collaboration, and creating opportunities for value co-creation. Nevertheless, the model's findings were context-specific and lacked broader generalizability across industries.

Gamification has increasingly been recognized as a strategic mechanism for strengthening customer engagement. Previous researchers explained gamification as the application of game design principles, motivational affordances, and reward structures within non-gaming business environments. Gamification frameworks were shown to improve customer participation, data collection, and behavioral interaction. However, many of these models were applied only within limited domains such as water management systems or online purchasing environments. Consequently, the applicability of these frameworks outside digital or highly specialized contexts remains uncertain.

Several studies further analyzed how gamification contributes to increasing customer hope, motivation, and digital purchasing behavior. Empirical investigations conducted using online customer communities such as Samsung Nation demonstrated that gamified environments could significantly improve engagement and customer participation. Despite these promising findings, the studies were heavily concentrated on online environments and did not adequately address offline or hybrid customer engagement contexts.

Beyond gamification and engagement behavior, some researchers developed simulation-based managerial frameworks designed to assist organizations in understanding the dynamic relationships among profitability, investment in employee competence, and customer relationship development [21]. These “management flight simulators” provided managers with practical tools for

analyzing long-term organizational performance and customer loyalty development. However, these models were highly sensitive to the quality and reliability of input data, which could substantially influence the validity of the simulation results.

Another stream of literature focused on Service-Dominant (S-D) Logic as a theoretical foundation for customer engagement. Researchers proposed strategic engagement frameworks integrating customer knowledge sharing, customer learning, and customer resource integration. Their work emphasized the theoretical and managerial implications of collaborative customer relationships. Nevertheless, these frameworks remained conceptual and failed to incorporate disengaged customers or negative engagement behaviors into the analysis.

In parallel with these developments, researchers introduced Artificial Neural Networks (ANN) into simulation modeling environments. ANN techniques were utilized as function approximation tools capable of learning complex relationships among system dynamics components. These relationships were represented through highly non-linear differential equations, enabling researchers to simulate sophisticated organizational systems with greater accuracy.

The present study builds upon previous research that proposed conceptual frameworks for Customer Engagement Value and system dynamics integration. However, unlike earlier studies, the current research aims to develop a practical and comprehensive CEV framework capable of representing real-world customer interactions more effectively. The proposed framework integrates a multiplicative non-linear model with System Dynamics simulation to capture the interdependencies among Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV). By incorporating elasticity parameters obtained through empirical survey analysis, the study attempts to overcome the limitations associated with purely theoretical and gamification-based approaches.

Proposed Framework

This section presents the proposed Customer Engagement Value (CEV) System Dynamics model. The framework integrates the relationships among CEV components using a multiplicative non-linear model. The proposed model depends on a set of elasticity parameters that determine the relative influence of each engagement component on the overall CEV structure.

The elasticity parameters are estimated through an online survey conducted to capture customer perceptions and behavioral interactions. These parameters are subsequently integrated into the System Dynamics model to simulate the dynamic interactions among the components of customer engagement over time. Figure 1 illustrates the implementation process of the proposed CEV System Dynamics framework and demonstrates how the non-linear relationships guide the simulation model [22].

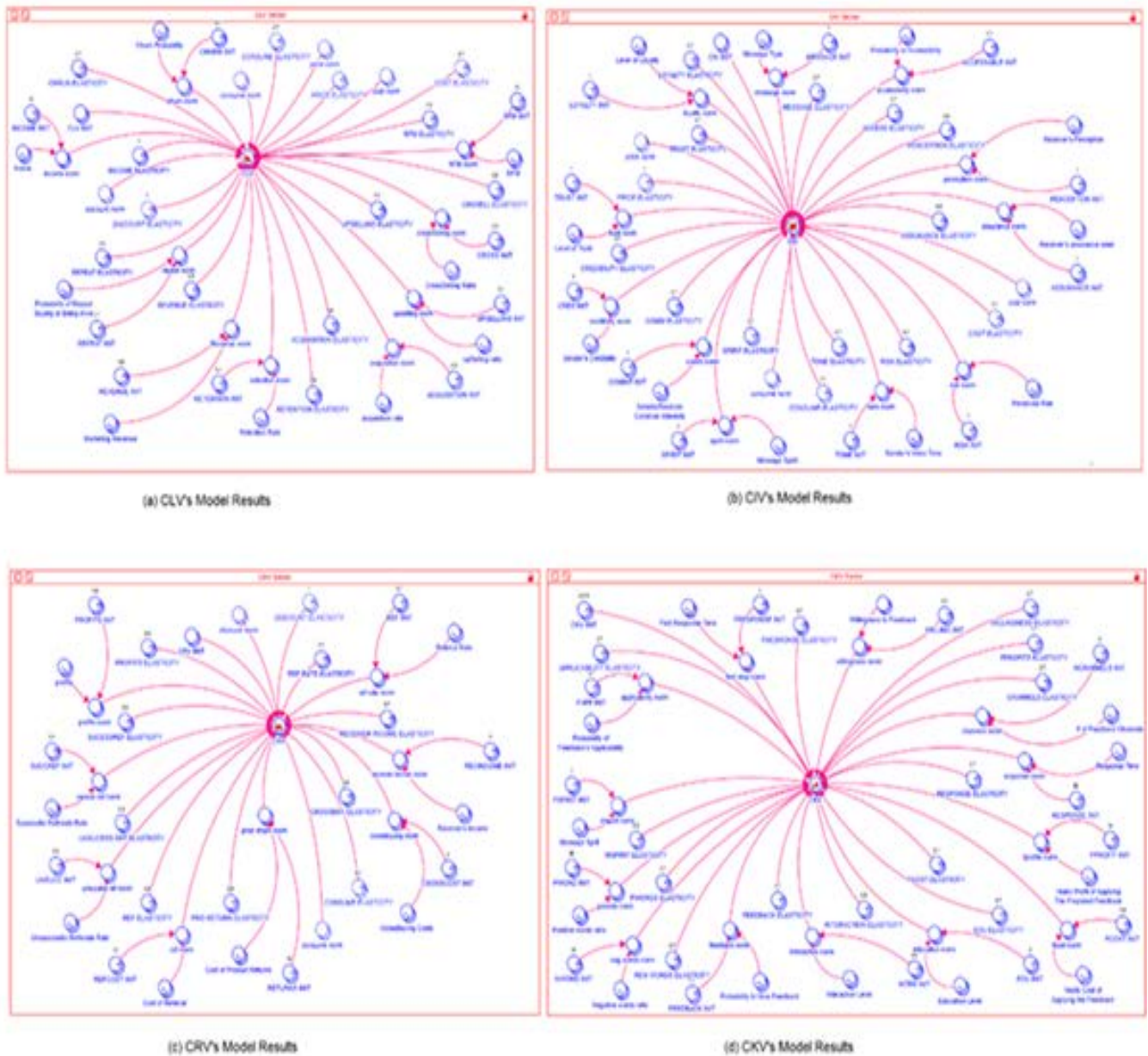


Figure 1 CEV's components SD results.

CEV's Non-Linear Model

This subsection introduces the proposed non-linear model for Customer Engagement Value based on the multiplicative non-linear modeling approach previously introduced in system dynamics literature. The proposed framework adopts the multiplicative method derived from power-law and log-linear modeling structures, where the influence of independent variables is represented through power functions of normalized inputs.

The proposed CEV model integrates four major components:

- Customer Lifetime Value (CLV)
- Customer Referral Value (CRV)

- Customer Influencer Value (CIV)
- Customer Knowledge Value (CKV)

The elasticity coefficient associated with each variable determines the degree of influence exerted by that component on the overall Customer Engagement Value. These elasticity values differ across engagement dimensions, reflecting the varying significance of each component within the engagement framework (Table 2).

All independent variables within the model undergo normalization to ensure dimensional consistency and comparability among variables. The normalization process also facilitates the integration of variables measured using different scales and units.

Table 2: Summary of Previous Studies Related to Customer Engagement Value.

Author(s)	Research Focus	Methodology	Key Findings	Major Limitations
Kumar et al. (2010)	Customer Engagement Value Framework	Conceptual Model	Introduced comprehensive CEV dimensions	Mostly theoretical framework
Verhoef et al. (2010)	Customer Engagement Management	Customer Management Analysis	Highlighted engagement as strategic value	Limited empirical validation
Brodie et al. (2011)	Customer Engagement Theory	Conceptual Review	Defined engagement dimensions	Lack of simulation-based analysis
Hamari et al. (2014)	Gamification and Engagement	Literature Review	Gamification improves engagement participation	Limited real-world applicability
So et al. (2016)	Customer Engagement and Loyalty	Empirical Survey	Engagement positively affects loyalty	Industry-specific findings
Pansari and Kumar (2017)	Engagement Antecedents and Consequences	Theoretical Framework	Identified drivers of engagement behavior	Limited dynamic modeling
Harrigan et al. (2017)	Social Media Customer Engagement	Social Media Analysis	Social interactions strengthen engagement	Focused mainly on digital environments
Islam and Rahman (2017)	Online Brand Communities	Structural Equation Modeling	Online communities influence engagement	Limited generalizability
Rosado-Pinto et al. (2020)	Brand Authenticity and Engagement	Empirical Analysis	Authenticity enhances engagement and loyalty	Limited cross-sector analysis
Present Study	System Dynamics-Based CEV Framework	Non-linear Modeling and Simulation	Integrated transactional and non-transactional engagement dimensions	Requires validation using real-world datasets

The effect of Customer Lifetime Value (CLV) on CEV is determined analytically or through tabular estimation techniques. CLV itself depends on several independent factors including churn probability, recency, frequency, monetary value (RFM), cross-selling opportunities, up-selling effectiveness, customer characteristics, exchange characteristics, and firm-specific variables.

Similarly, Customer Referral Value (CRV) is modeled as a function of referral rate and associated customer interaction variables. The elasticity parameters corresponding to CRV determine the extent to which referral behaviors contribute to the overall customer engagement structure.

Customer Influencer Value (CIV) is represented through variables associated with network influence, average receiver propensity to consume, online interaction intensity, and social communication effectiveness. The non-linear structure enables the model to capture the indirect and dynamic influence customers exert through digital and interpersonal networks.

Finally, Customer Knowledge Value (CKV) is modeled through variables related to customer feedback, innovative idea generation, product improvement suggestions, and organizational learning contributions. CKV reflects the strategic importance of customer knowledge in supporting innovation and enhancing organizational adaptability.

System Dynamics Model of CEV

The proposed System Dynamics model represents a comprehensive framework that integrates all four dimensions of Customer Engagement Value. The primary inputs to the SD model are the non-linear relationships formulated in the previous

subsection along with the elasticity parameters obtained from the survey analysis.

Within the proposed framework, Customer Engagement Value acts as the main dependent variable influenced collectively by CLV, CRV, CIV, and CKV. The interactions among these components are represented through reinforcing and balancing feedback loops that capture the dynamic nature of customer engagement behavior.

Customer Lifetime Value depends on multiple operational and behavioral variables such as churn probability, recency, frequency, monetary contribution, cross-selling behavior, and up-selling activities. These factors are categorized into customer-specific characteristics, exchange characteristics, and firm-specific variables.

The proposed model further demonstrates how changes in one engagement component dynamically influence other components over time. For instance, an increase in customer loyalty may strengthen referral behavior and social influence simultaneously, thereby increasing overall engagement value. Conversely, disengagement behaviors may negatively affect customer retention, referrals, and organizational reputation.

By integrating multiplicative non-linear equations with System Dynamics simulation, the proposed framework provides a realistic representation of customer engagement processes. Unlike previous conceptual and gamification-based models, the present framework offers a more comprehensive and empirically grounded approach capable of supporting strategic customer relationship management and long-term organizational decision-making.

Results

The experimental findings of the proposed Customer Engagement Value (CEV) framework. The section begins by discussing the online survey utilized to estimate the elasticity parameters of the non-linear CEV model. Subsequently, the implementation and outcomes of the proposed System Dynamics (SD) model are presented and analyzed.

Online Survey

To estimate the elasticity parameters associated with the proposed non-linear model, an online survey was conducted using a structured questionnaire. The survey consisted of 73 questions designed to evaluate the significance of the variables influencing the four major components of Customer Engagement Value, namely Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV).

The questionnaire was developed in two languages, English and Arabic, to improve accessibility and participation across different respondent groups. The survey was distributed electronically over a period of approximately fourteen days using the Survey.com platform. A total of 1000 respondents participated in the survey, reflecting a satisfactory sample size for statistical interpretation and parameter estimation [23].

Among the total respondents, approximately 84% completed the Arabic version of the questionnaire, while 16% responded using the English version. This distribution indicates a stronger participation rate among Arabic-speaking respondents. The demographic diversity of participants contributed to obtaining broader perspectives regarding customer engagement behavior and value perception.

Each survey question utilized a five-point discrete Likert scale ranging from 1 to 5. The selected value represented the perceived importance of a specific factor in influencing its corresponding CEV component. A value of "1" indicated minimal or no significance, whereas a value of "5" represented a highly significant contribution to customer engagement value.

The collected responses were subsequently mapped into discretized elasticity fraction values. This mapping process transformed qualitative customer perceptions into quantitative elasticity parameters suitable for integration within the non-linear model. By discretizing the elasticity values, the framework effectively simplified the representation of potentially infinite elasticity possibilities into a manageable finite structure.

The online nature of the survey offered several methodological advantages. First, the survey process was highly automated, reducing administrative complexity and improving data collection efficiency. Second, the online approach minimized time and operational costs compared to traditional survey methods. Third,

electronic distribution facilitated broader geographic reach and increased respondent accessibility [24].

The estimated elasticity parameters obtained from the survey served as the primary inputs for constructing and executing the proposed System Dynamics simulation model.

CEV's System Dynamics Model

The proposed Customer Engagement Value System Dynamics model was implemented using Stella Professional Software Version 2.2.1. The simulation framework was driven by the multiplicative non-linear equations formulated in the previous section. The primary objective of the simulation was to examine the dynamic interactions among the four CEV components over time and evaluate their collective impact on overall customer engagement value.

The simulation model was executed using a dataset of 1000 randomly generated customers following a normal distribution pattern [25]. The generated dataset enabled the analysis of customer engagement dynamics under varying behavioral conditions and interaction patterns.

The simulation results demonstrated that the proposed framework successfully captured the dynamic and interdependent relationships among CLV, CRV, CIV, and CKV. Each component exhibited distinct behavioral patterns over the simulation period while simultaneously influencing the overall Customer Engagement Value.

The results further revealed that Customer Lifetime Value (CLV) remained the strongest contributor to overall CEV due to its direct association with purchasing behavior and profitability generation. However, the simulation also confirmed that non-purchasing components, namely CRV, CIV, and CKV, exerted substantial influence on the comprehensive value of customers within organizations.

The simulation was conducted over a 24-month period for randomly selected customer profiles. Each month was represented as a separate observation point within the generated trend analysis. The resulting trends illustrated the fluctuations and interactions among the engagement components over time. In several cases, increases in referral activities and customer influence contributed significantly to the growth of overall engagement value, even when purchasing behavior remained relatively stable.

Furthermore, the results demonstrated the strategic importance of Customer Influencer Value (CIV) and Customer Referral Value (CRV) in expanding customer acquisition opportunities through positive Word of Mouth (WOM) and network-based interactions. Similarly, Customer Knowledge Value (CKV) contributed to organizational innovation and service improvement through customer feedback and idea generation.

The findings therefore validate the significance of incorporating both transactional and non-transactional customer behaviors within comprehensive customer valuation frameworks [26–29]. The proposed model successfully illustrates that customer value extends beyond direct purchases and includes several indirect contributions capable of enhancing long-term organizational sustainability and competitiveness.

Overall, the System Dynamics simulation confirmed the effectiveness of the proposed framework in modeling the complexity and non-linearity associated with customer engagement behavior.

Managerial Implications

The proposed Customer Engagement Value framework offers several important managerial implications for organizations and decision-makers. One of the primary contributions of the framework is its ability to provide managers with a comprehensive understanding of the most influential factors affecting customer engagement. By integrating transactional and non-transactional dimensions within a unified model, organizations can obtain a broader perspective regarding customer value creation processes.

Another significant implication is the framework's ability to represent complex cause-and-effect relationships among engagement variables. Through the integration of System Dynamics modeling, managers can better understand how variations in customer behavior influence long-term organizational performance and customer relationship sustainability.

The proposed model also assists managers in identifying the relative significance of each factor contributing to purchasing and non-purchasing customer engagement behaviors. This understanding supports more informed strategic decision-making regarding customer retention, referral programs, social influence management, and knowledge-sharing initiatives.

In addition, the framework confirms the critical importance of Customer Lifetime Value (CLV) as a major determinant of customer engagement levels. However, the model simultaneously emphasizes that non-purchasing dimensions such as Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV) also contribute substantially to organizational growth and competitive advantage.

Consequently, organizations are encouraged to adopt holistic customer relationship management strategies that extend beyond direct sales and incorporate broader customer participation and engagement activities.

Limitations and Future Research Directions

Despite the contributions of the proposed framework, several limitations should be acknowledged. One major limitation relates to the selection of variables included within the model.

The framework primarily focuses on internal organizational and customer-related factors while excluding several important external variables such as economic conditions, government regulations, competitive intensity, and technological changes. These external factors may significantly influence customer engagement behavior and organizational performance.

Another limitation is associated with the use of simulated data rather than real-world organizational datasets. Although the randomly generated data enabled the examination of system behavior under controlled conditions, the practical effectiveness and robustness of the proposed framework require validation using real-life customer engagement data.

Future research may therefore focus on integrating additional external variables into the proposed model to improve its comprehensiveness and predictive capabilities. Moreover, applying the framework to real-world business environments across different industries would provide stronger empirical validation and enhance the generalizability of the findings.

Further studies may also explore the application of optimization techniques and machine learning algorithms to estimate elasticity parameters more accurately. In addition, advanced methods such as the Delphi technique may be utilized to improve parameter estimation through expert consensus and iterative evaluation processes. Future developments in Customer Engagement Value modeling are expected to contribute significantly to the advancement of relationship-oriented marketing and strategic customer management practices.

Conclusion

Customer Engagement Value (CEV) is an important concept for measuring the overall value of customers within a firm through both purchasing and non-purchasing behaviors. Previous studies mainly relied on theoretical or gamification-based models, which limited their practical applicability in real business environments.

This study proposed a comprehensive System Dynamics framework to model the relationships among the major components of CEV, namely Customer Lifetime Value (CLV), Customer Referral Value (CRV), Customer Influencer Value (CIV), and Customer Knowledge Value (CKV). A multiplicative non-linear model was developed to capture the complex interactions among these components, while elasticity parameters were estimated through an online survey. The proposed framework was implemented using Stella Professional software and tested on randomly generated data for 1000 customers. The findings confirmed that both purchasing and non-purchasing customer behaviors significantly influence Customer Engagement Value. The study therefore provides a practical and dynamic framework that can support organizations in understanding customer engagement and improving long-term relationship management strategies.

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