Customer Journey Pathway Analysis from the Perspective of Customer Engagement: A System Dynamics Approach

M. Kimura[a]

[a]*Faculty of Business and Informatics, Nagano University, Japan. E-mail: kimura@nagano.ac.jp*

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ABSTRACT

This study proposes a method for monitoring, quantifying, and evaluating the customer journey over time by aggregating the customer experience timeline. This method takes into account the customer experience before and after the purchase of a product or service and across multiple channels and numerous types of touchpoints, thereby expanding the scope of marketing research. By reviewing theoretical frameworks in marketing literatures, this study constructs a dynamic model for the approximate calculation of customer journey, considering the progression of customer's satisfaction and emotion levels towards the customer engagement through multiple touchpoints. The "Yokai Watch" video game software for children is selected as single case study, and model validity is evaluated using the time series data of accumulated game sales and total weekly ratings of animated TV program. By executing the Monte Carlo simulation using customer's satisfaction level and emotional level, the market size is estimated by the median values of total weekly ratings and accumulated game sales. The model and simulated results presented in this study show customer journey pathway analysis by setting different conversion rates to customer's satisfaction level and emotion level through dual touchpoints. These suggest the customer journey design towards customer engagement and the possibility of expansion for computer simulations.

1. INTRODUCTION

Attempts to create theories and models for customer experience (CX) management, the customer journey (CJ), and customer engagement (CE), which were developed in rapid succession after 2010, have predominantly taken a practical approach. This process has proven to be uncharted territory for marketing research, and an interdisciplinary approach is vital (Bleier *et al.*, 2018; Lemon & Verhoef, 2016). The full-scale commercialization of the Internet of Things (IoT) is expected in the 2020s, and information (e.g., attributes, locations, and relationships) will be constantly available through such technologies as radio-frequency identification, sensors, and two-dimensional barcodes, even for non-electronic items (Chen *et al.*, 2014; Gubbi *et al.*, 2013). In the retail industry, the introduction of the IoT is linked to stakeholder expansion, the development of omni-channel policies, and improvements in the scope and accuracy of big data analytics. Moreover, it has latent potential for achieving profound CE (Grewal *et al.*, 2017; Westerlund *et al.*, 2014).

This study attempts to broaden the field of marketing analysis by proposing and tracking a quantitative evaluation method for the CJ, which includes the entirety of the CX timeline and spans multiple channels and types of touchpoints before, during, and after the purchase of a product or service, from a CE perspective. First, this study summarizes the theoretical frameworks for CX, the CJ, and CE developed in prior research. Next, it constructs a dynamic model for the CJ that approaches CE using changes in customer satisfaction and emotion levels across multiple touchpoints. An example of the first-generation “Yokai Watch” children’s video game software is selected as the CJ case study, and the model’s validity is evaluated using changes in total sales over time. Based on the simulation results, this study examines the characteristics of the changes in satisfaction and emotion levels throughout the CJ and identifies the potential for CJ time-series analysis from a CE perspective.

This study makes the following contributions and offers the following new perspectives. First, it builds on the foundation of previous research on CX, the CJ, and CE, particularly that of Pansari and Kumar (2017), to construct a dynamic CJ model using a CE matrix with customer satisfaction and emotion levels as the two axes to divide users into four categories. This model is used to calculate estimates for the case study, and changes in customer satisfaction and emotion levels and product performance at additional touchpoints are evaluated. A sensitivity analysis is used to estimate the scope of changes in product performance based on changes in customer satisfaction and emotion levels. Finally, based on an examination of the simulation results, this study suggests the features of progression of satisfaction levels and emotion levels throughout the CJ.

2. RELATED PRIOR RESEARCH

Prior research fields related to this study include

multi-channel strategy, CX management, and CE marketing. Prior multi-channel strategy research considers the expansion of purchasing opportunities resulting from complementary actions and the mutual strengthening of channels (Neslin & Shankar, 2009; Thomas & Sullivan, 2005; Veen & Ossenbruggen, 2015). Among the definitions of CX, CJ, and CE in academic literature, this study particularly focuses on those used by Brodie *et al.* (2011), Norton and Pine II (2013), Lemon and Verhoef (2016), and Pansari and Kumar (2017) (see Table 1). Norton and Pine II (2013) define the CJ as "following the purchase of a product provided by a company, the learning by design related to this product which occurs through interactions with the company or the progression of unintended events," emphasizing development and refinement through repeated co-creation by companies and customers. Lemon and Verhoef (2016) propose a model of the CJ and CX process with CJ touchpoints categorized into four groups: brand-owned, partner-owned, customer-owned, and social. Only the touchpoints in each stage of the CX are under the company's control, and they emphasize that the CX is a bi-directional and dynamic flow extending from the pre-purchase period (including searches) to the purchase and post-purchase periods. Stein and Ramaseshan (2016) extract seven aspects of the CX (atmosphere, technology, communication, process, interactions between employees and customers, interactions between customers, and product interactions) and indicate that CX touchpoints are built from a combination of these aspects. Edelman and Singer (2015) of McKinsey & Company discuss the essential technologies for corporate CJ management and indicate the importance of smart products with continuous connection capabilities, journey analysis and management tools, and application linkage (marketing automation) application programming interfaces.

Table 1. Definitions of the CJ, CX, and CE Used in Prior Studies

Researchers	Terminology	Definition
Norton and Pine II (2013)	CJ	The sequence of events – whether designed or not – that customers go through to learn about, purchase, and interact with company offerings – including commodities, goods, services, or experiences.
Lemon and Verhoef (2016)	CJ	All processes that a customer goes through, across all stages and touchpoints, that make up the customer experience.
Lemon and Verhoef (2016)	CX	A multidimensional construct focusing on a customer's cognitive, emotional, behavioral, sensorial, and social responses to a firm's offerings during his or her entire purchase journey.
Brodie *et al*. (2011)	CE	A psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent or object (e.g., a brand) in focal service relationships.
Pansari and Kumar (2017)	CE	The mechanics of a customer's value addition to the firm, through either direct or indirect contributions.

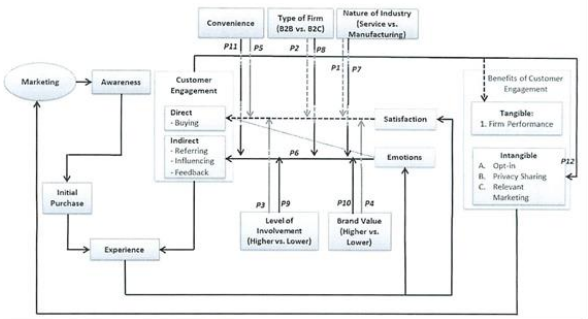

Figure 1. Theoretical framework for CE (Pansari & Kumar, 2017)

CE is common marketing terminology, and engagement has been discussed as a customer activity that targets a company (Brodie *et al*., 2011; Kumar *et al*., 2010; Vivek *et al.*, 2012). Brodie *et al*. (2011) suggest that CE is a psychological state in which a customer is motivated to participate in an activity with a company. Pansari and Kumar (2017) propose a theoretical framework for CE, including a detailed explanation of CE components, prerequisites (satisfaction and emotion), and results (both tangible and intangible) (see Fig. 1). They propose seven CE components (i.e., customer participation, CX, customer satisfaction, customer loyalty, customer confidence, customer responsibility, and customer brand value), stating that the two doctrines for CE theory are

customer satisfaction and emotion and that engagement occurs after a customer relationship built on trust and commitment is formed. In other words, engagement theory includes relationship marketing, and Brodie *et al*. (2011) stress that the CE process is theoretically positioned as the next stage after relationship formation. According to Pansari and Kumar (2017), CE is defined as "the mechanics of a customer's value addition to the firm, either through direct or/and indirect contribution." Within their conceptual framework, CE is composed of direct and indirect customer contributions. The impact of the customer's awareness of the product or service and the satisfaction gained from the CX of the initial product purchase are directly linked to CE through repeat purchasing (direct contribution), whereas the emotions recalled during the CX are indirectly linked to CE through browsing, influencing others, and providing company feedback (indirect contribution). As a result, direct and indirect customers engender both tangible (direct) and intangible (indirect) benefits for companies. Pansari and Kumar (2017) propose a CE matrix based on the conceptual framework described above (see Table 2). The axes of the CE matrix are satisfaction (S) and emotion (E), and customers are grouped into one of four quadrants: True Love (high S and E), Attraction (high S, low E), Passion (low S, high E), and Indifference (low S and E).

Figure 2. CE matrix (Pansari & Kumar, 2017)

The context of the prior studies related to CX, the CJ, and CE listed above can be organized as follows. The CX chain provided primarily by companies through multiple types of touchpoints is the CJ. CE, meanwhile, is formed by providing satisfaction and emotion to the customer and is linked to tangible (business performance) and intangible (relationship) benefits for the company. In the CE matrix presented by Pansari and Kumar (2017), a customer's status throughout the CJ can be classified into one of four categories: Indifference, Passion, Attraction, and True Love. The analytical framework that integrates these CX, CJ, and CE concepts can be regarded as a dynamic model that includes repeated instances of the CX chain and feedback, with the customer's life cycle in the time domain.

3. MODEL

3.1 Model Notation

Based upon the CE matrix by Pansari and Kumar (2017), the state of customers has been classified into four categories: Indifference, Passion, Attraction, and True Love. Assuming that customer's emotion and satisfaction levels improve and stagnate, the main CJ pathways in the four quadrants of the CE matrix are the E-S typed pathway, in which the customer's emotion level progresses before the customer's satisfaction level, and the S-E typed pathway, in which the customer's satisfaction level progresses before the customer's emotion level. For the E-S typed CJ pathway, emotion increases first, followed by satisfaction, and the customer state transitions from Indifference to Passion to True Love. In contrast, for the S-E typed CJ pathway, an increase in satisfaction is followed by an increase in emotion, and the customer state transitions from Indifference to Attraction to True Love. The E-S typed CJ pathway includes, for example, CE approaches such as offering free products or services or communicating via word of mouth, whereas the S-E typed CJ pathway includes the CE approaches such as prior product purchases or the use of paid services.

The dynamic model (hereafter, "the model") integrating the concepts of CX, CJ, and CE expresses the change in the number of customers over time using the customer satisfaction level, the customer emotion level, and the types of touchpoints per unit of time as explanatory variables. These explanatory variables are defined as described below using subscript ranges (synonymous with the vector name) and the elements in the subscript range in the format [subscript range] = [subscript elements]. No. of customers (t = time) = ΣCustomers([Satisfaction], [Emotion], [Touchpoints]).

[Satisfaction] = [Cold, Attraction, True Love]

[Emotion] = [Interest, Passion, Faith Love]

[Touchpoint] = [Touchpoint 1, Touchpoint 2, ... Touchpoint n]

The notation for [Satisfaction] and [Emotion] in the subscript range expresses the customer's satisfaction and emotional levels, which approach CE in three stages: [Cold], [Attraction], and [True Love] for satisfaction and [Interest], [Passion], and [Faith Love] for emotion. This measure must be adopted to prevent the reuse of the same name for subscript elements in multiple subscript ranges owing to the constraints of the modeling software environment. Thus, the customer's satisfaction level is defined as progressing from [Cold] to [Attraction] to [True Love], and the customer's emotion level is defined as progressing from [Interest] to [Passion] to [Faith Love]. Although this model calculates the progress or stagnation of [Satisfaction] and [Emotion] for a customer, it does not monitor reverse progression (deterioration).

However, it does take into account the number of customers who exit. Moreover, the model supports notation for up to N types of touchpoints. For example, the minimum case of the CJ pathways is configured by the two types of touchpoints: [Touchpoints] = [Touchpoint 1, Touchpoint 2].

3.2. Single Case Study for CJ Pathway Analysis

This study is aimed at the video game business toward children customers, in order to construct the model contains two types of touchpoints, which is the minimum configuration model of CJ. The two types of touchpoints for purchasing video game software are the package recognition at a real store, and the viewing of animated TV program titled with the same name of package. The first-generation of "Yokai Watch" video game software series for is selected as a case study for this model. Yokai Watch is a cross-media project developed by the game publisher LEVEL-5 Inc.; the manga series serialized in the "Gekkan Korokoro Comic" hobby magazine for boys for the six months before the video game's release (Nikaido, 2014). The first Yokai Watch game, titled "Yokai Watch," was released by LEVEL-5 for the Nintendo 3DS on July 11, 2013, and the animated TV program "Yokai Watch" began airing on TV Tokyo Channel 6 approximately six months later, on January 8, 2014, in the 7:00 p.m. slot. On January 11 of the same week, Bandai released the tie-in toy series "DX Yokai Watch," "Yokai Medal Series 1" (with 30 different toys in total), and "Yokai Daijiten Vol. 1," among other items. Plastic "Yokai Medals" are decorated with naturally-colored stickers on the front depicting the names and likenesses of yokai characters from the series, and QR codes are affixed to the back. If customers scan the QR codes on the front of the Yokai Medals at the Kobuta Bank in the game, they earn "Yokai Gasha Coins" that might be used to play the "Yokai Gasha" game and earn rare yokai or items. The Yokai Watch game shipped a total of 500,000 copies in the first month that the animated TV program was broadcast, and over 3 million Yokai Medals were sold. By April 22, over 1 million copies of the game had shipped, and as of June 30, over 32 million Yokai Medals had been sold (Hisamura, 2014). LEVEL-5 released the second game in the series, "Yokai Watch 2: Ganso/Honke," on July 14, 2014, and it sold over 1.3 million copies in the first week.

For the first-generation of "Yokai Watch" game software case, the CJ pathway analysis is as follows. Opportunities to recognize the original game software package and purchase the software in brick-and-mortar stores and opportunities to watch the animated TV series of the same title are touchpoints throughout the CJ. Based on these touchpoints, customers can be divided into two categories: game users and animated TV program viewers. Game users typically purchase only one copy of the software to play, and they may tire of it and exit the game user group. A new episode of the animated TV program airs every week, and although many viewers watch weekly, in some cases, they also stop and switch TV programs (exiting the viewers group). Within the S-E typed CJ pathway, the progression over time is Game Users[Cold] to Game Users[Attraction] to Game Users[True Love]. In contrast, the E-S typed CJ pathway progresses from Viewers[Interest] to Viewers[Passion] to Viewers[Faith Love]. In this case, there is a delay in the formation of the S-E typed CJ pathway and the E-S typed CJ pathway, and the difference of the time-series data of business performance between CJ pathways are shown as the pattern of weekly game sales of the first-generation of "Yokai Watch" (see Fig. 3).

3.3. Model Components

This study adopts system dynamics (SD) is to construct a model to analyze the CJ pathways in the case study described above. The SD method is a system modeling and simulation method proposed by Forrester (1961). Stock variables (accumulated variables), input and output flow variables that act on stock variables, and the feedback between other variables (i.e., circulation factors) are modeled graphically, and numerical time integration can be implemented seamlessly (Sterman, 2000). In this model, accumulated game sales correspond to direct contributions from customers, and weekly total viewership of the TV program corresponds to indirect contributions. The model structure is divided into the stock variables of Game Users, Potential Viewers, Viewers, and Accumulated Game Sales (see Fig. 4). Although the model supports notation for up to N types of touchpoints, the case study uses a minimal configuration with only two types of touchpoints: [Touchpoints] = [Animated Program, Video Game].

Game Users

Changes in the number of game users over time take into account progression over the subscript range [Satisfaction], that is, transitions of game user satisfaction levels from [Cold] to [Attraction] to [True Love], as well as the incidence of game user exits. The progression of game users across satisfaction levels is based on Video Game Conversion Rate[Satisfaction]. Using the [Satisfaction] subscript range, the number of game user exits is defined by the following formula: Game Users Exited[Satisfaction]=Game Users[Satisfaction]*Exit Rate of Game Users[Satisfaction]

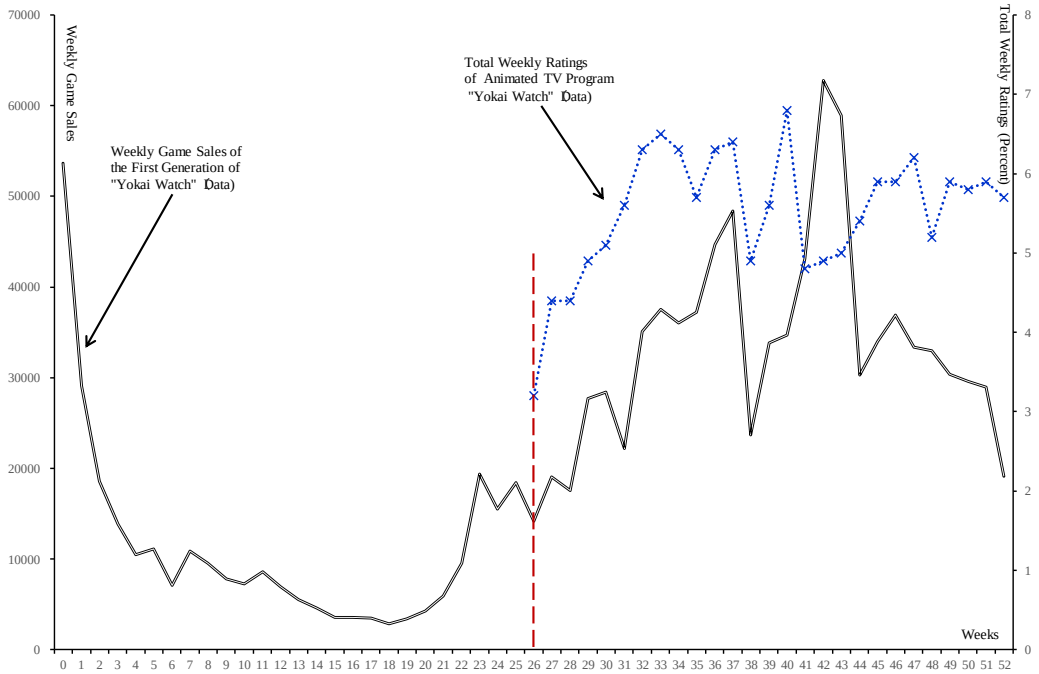

Figure 3. Time-series data of Yokai Watch case

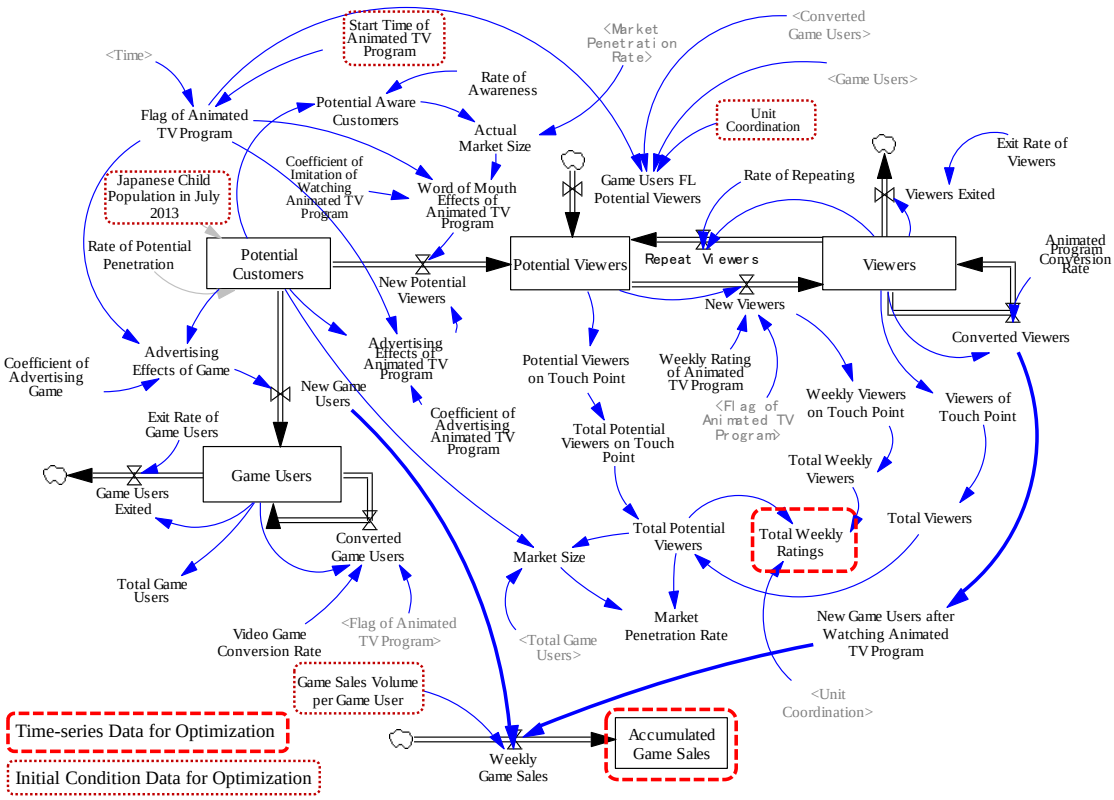

Figure 4. Model structure

To measure conversions from Potential Customers to Game Users[Cold], this study adopts a modified Bass model (Bass, 1969; Mahajan *et al.*, 1990) that includes only external effects (advertising effects). However, the Advertising coefficient changes intermittently before and after the animated TV program airs. Game Users[True Love] is assumed to coincide with the start of an animated program broadcast.

Potential Viewers

The change in the number of potential viewers over time can be calculated using both the [Emotion] and

[Touchpoint] variables in the subscript range. Here, the viewer's emotion level progresses from [Interest] to [Passion] to [Faith Love] with the addition of the [Animated Program] and [Video Game] touchpoints. The increase in Potential Viewers[Interest, Animated Program] from Potential Customers is calculated using the Bass model, which includes external (advertising effects) and internal effects (word of mouth effects). Coefficient of advertising anime TV and Coefficient of Imitation of Watching Anime TV change intermittently before and after the animated TV program broadcast. The increase in Game Users[True Love] is calculated as the increase in Potential Viewers[Interest, Video Game] who have reached the [Video Game] touchpoint. New Viewers is calculated as the product of Potential Viewers and Weekly Rating of Animated TV Program (the average value of each emotion level): Potential Viewers[Emotion, Touchpoint]*Weekly Rating of Animated TV Program[Emotion]*Flag of Animated TV Program[PreAiring]. The total of the subscript range can be calculated as the union of the SUM function and the operator "!" according to the following formula: Weekly Viewers on Touch Point[Touchpoint] = SUM(New Viewers[Emotion!, Touchpoint]). Similarly, Total Weekly Viewers are calculated by the following formula: Total Weekly Viewers = SUM(Weekly Viewers on Touch Point[Touchpoint!]). Total Weekly Ratings are calculated by the following formula: Total Weekly Ratings = ZIDZ(Total Weekly Viewers, Total Potential Viewers*Unit Coordination), and used for the calibration using time-series data.

Viewers

The number of viewers is calculated as the cumulative sum of the additional new viewers, the repeat viewers, and the number of viewers exited. The change in the emotion level of viewers is based on Animated Program Conversion Rate[Emotion]. Using the [Emotion] and [Touchpoint] subscript ranges, Repeat Viewers is defined via the following formula: Repeat Viewers[Emotion, Touchpoint] = Viewers[Emotion, Touchpoint] * Rate of Repeating[Emotion].

Only when the emotion level of viewers at the animated program touchpoint progresses from [Passion] to [Faith Love] are viewers assumed to make a new video game purchase. At this point, the "Video Game" touchpoint is added. In this case, the following formulas are used:

Viewers[Passion, Animated Program] = INTEG(New Viewers[Passion, Animated Program]-Viewers Exited[Passion, Animated Program]+Converted Viewers[Passion, Animated Program]-Converted Viewers[Faith Love, Animated Program]-Repeat Viewers[Passion, Animated Program], 0)

Viewers[Faith Love, Video Game] = INTEG(New Viewers[Faith Love, Video Game]-Viewers Exited[Faith Love, Video Game]+Converted Viewers[Faith Love, Animated Program]+Converted Viewers[Faith Love, Video Game]-Repeat Viewers[Faith Love, Video Game], 0).

Accumulated Game Sales

Weekly game sales are calculated as the sum of the number of new game users who did not watch the animated program before purchasing the game and the number of new game users who did watch the animated program before purchasing the game multiplied by game sales volume per game user. Accumulated game sales are calculated as the accumulated sum of weekly game sales according to the following formula: Accumulated Game Sales = INTEG(Weekly Game Sales, 0).

3.4. Initial Value Settings

The initial value for potential viewers is set as the population of Japanese children (12 and under) in July 2013, and one is the initial number of game sales volume per game user. Aside from those shown in Table 2 (initial parameter values), the initial values are set as the optimal values from a calibration of the calculated values of accumulated game sales and total weekly rating using time series data and the application of the model (see Appendix). Time series data are taken from a video game database provided by Media Create Co., Ltd. and from ratings database provided by Video Research Ltd.

The optimal values of the initial parameters are calculated using a revised Powell algorithm implemented in Vensim Professional 7.3, an SD tool developed by Ventana Systems. The modified Powell algorithm is a conjugate orientation method, which uses the squared error between the calculated value of the time integration interval and the data value as the payoff to perform fast iterative calculation avoiding gradient calculation.

Table 2. Initial Values for Case Study

	Case
Japanese Child Population in July 2013 {Week*Person}	1.6308e+07
Start Time of Animated TV Program	26
Program Start Time {Week}	0
Program End Time {Week}	76
Time Step	0.0625
Unit Coordination {1/Week}	1
Game Sales Volume per Game User {Copy*Person}	1

4. RESULTS

4.1. Validity of Estimations

The simulations are executed using time step 0.0625 and Euler numerical integration. This study uses the results of estimations that obtained optimal values of 100% for

each subscript element of Rate of Repeating[Emotion] of Viewers (see Figure 5). The mean absolute percentage error (MAPE) of Accumulated Game Sales and Total Weekly Ratings is approximately 10%, which is interpreted as indicating high accuracy (Lewis, 1982, p. 40). The mean squared error (MSE) covariance for both variables approached one, and the calculated values closely approximated the average values of the time series data and overall trends, with no systematic error (Sterman, 2000, p. 877). However, the difference between the calculated and data values for the largest Accumulated Game Sales interval (in Week 76) is close to 300,000. This result is likely due to the model's failure to take into account the initial game's sales decrease due to the release of the second game in Week 52 (July 9, 2014). The optimized initial value of Weekly Rating of Animated TV Program[Passion] was set at 22%, and that of Weekly Rating of Animated TV Program [Faith Love] was set at 7%. Because these cohorts are also considered video game users once a certain emotion level is reached, reaching that emotional level could lead to a decrease in potential program viewing time. Customers who purchased video games after watching the animated program accounted for approximately 64% of Accumulated Game Sales.

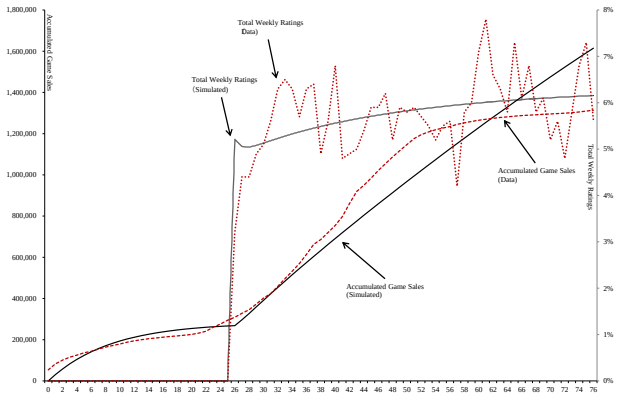

Figure 5. Graph of Simulated Results and Data

Table 3. Estimation Results for Case Study

Payoff Value	- 30.7512
Coefficient of Determination of Accumulated Game Sales (R^2)	0.946477
MAPE of Accumulated Game Sales	12.17 %
Accumulated Game Sales MSE Deviations (U^m)	0.0069
Accumulated Game Sales MSE Variance (U^s)	0.043
Accumulated Game Sales MSE Covariation (U^c)	0.9501
Accumulated Game Sales {Copy*Week}	1,615,113
Coefficient of Determination of Total Weekly Ratings (R^2)	0.9494
MAPE of Total Weekly Ratings	7.33 %
Total Weekly Ratings MSE Deviation (U^m)	0.0001
Total Weekly Ratings MSE Variance (U^s)	0.0143
Total Weekly Ratings MSE Covariation (U^c)	0.9856
Total Number of Potential Viewers {Person*Week}	7,493,724
Accumulated Game Users [Cold] Share	24.71 %
Share of Accumulated Game Users [Attraction]	36.63 %
Share of Accumulated Game Users [True Love]	38.66 %
Share of Number of Game Users after Watching Animated Program	63.67 %
Share of Number of Game Users before Watching Animated Program	36.33 %

The changes in Game Users[Satisfaction] and Viewers[Emotion, Touchpoint] over time are illustrated in Fig. 6. The Viewers[Interest, Animated Program] uses only Touchpoint[Animated Program]; the emotion level is the change in the minimum number of viewers over time, which is largest after the start of broadcast. Game Users[Passion] represents the change over time in customers who follow the CJ pathway to the [Animated Program] touchpoint after their satisfaction levels reach the [True Love] level. Additionally, the Viewers[Faith Love, Video Game] represents the change in the number of customers reaching CE through the progression of both their emotion and satisfaction levels over time, following the [Video Game] and [Animated Program] touchpoints. Game Users[True Love] peaked at approximately 96,000 in Week 42, after the release of the game. Viewers[Passion, Animated Program], which uses only the [Animated Program] touchpoint, stabilized after Week 58, after the release of the game (and 32 weeks after the animated program began airing), reaching 79,000 per week. Viewers[Faith Love, Video Game] increased by approximately 15,000 each week starting in the fifth week after the animated TV program began airing.

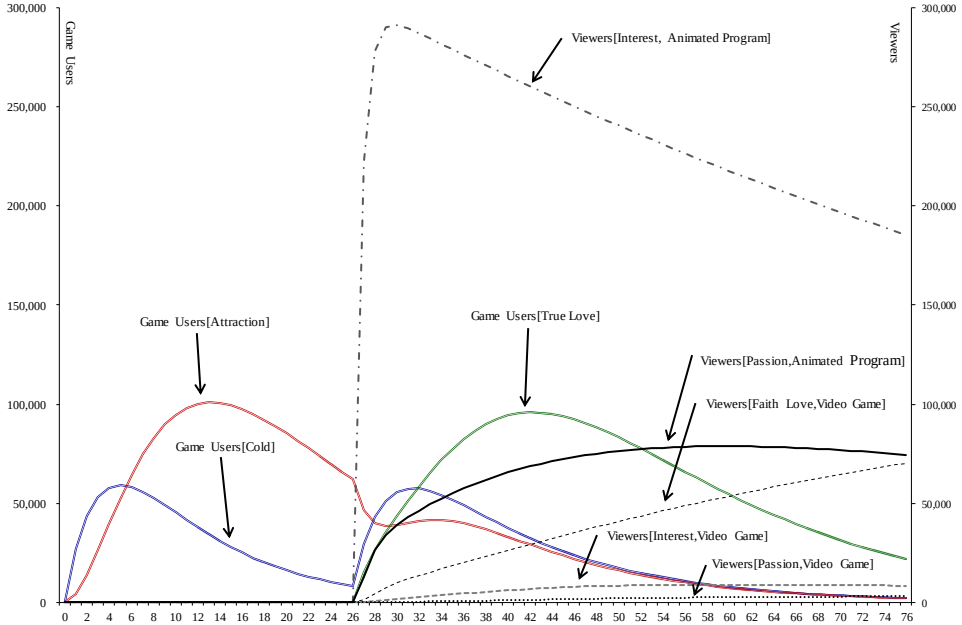

Figure 6. Graph of Game Users and Viewers

4.2. Sensitivity Analysis

A Monte Carlo simulation in which the Video Game Conversion Rate[Attraction] and [True Love] and Animated Program Conversion Rate[Passion] and [Faith Love], which measure the probability of transitioning between customer satisfaction and emotion levels via touchpoints, were varied over a uniform distribution (ranging from 0.1 to 0.6) was performed 1,500 times. Confidence intervals (50%, 75%, 95%, 100%) for Total Weekly Ratings and Accumulated Game Sales obtained from the simulation results are shown in time-series graphs (Fig. 7 & 8). The red lines show the averages of these confidence intervals. Basic statistics for the sensitivity analyses are shown in Table 4. The simulation results demonstrate that when the probability of transitioning between customer satisfaction or emotion levels via touchpoints reaches an upper limit of 60%, there is a 50% chance that Accumulated Game Sales will reach 2.42 million (the life cycle) and that Total Weekly Ratings will reach 6.89% over the 75-week period. The market scale estimated by this sensitivity analysis is a Total Weekly Ratings of 9.17%, Game Purchasers after Weekly Viewing of 48,609, and Accumulated Game Sales of 3.738 million.

Table 4. Sensitivity Analysis Results

	Total Weekly Ratings {%}	Accumulated Game Sales {Copy*Week}
Minimum	5.62	994,635
Maximum	9.17	3,738,280
Average	6.95	2,418,950
Median	6.89	2,414,710
Standard Deviation	0.71	627,675
Confidence Interval		
50%	6.89	2,416,180
75%	7.38	2,919,100
95%	8.32	3,439,620
100%	9.17	3,738,280

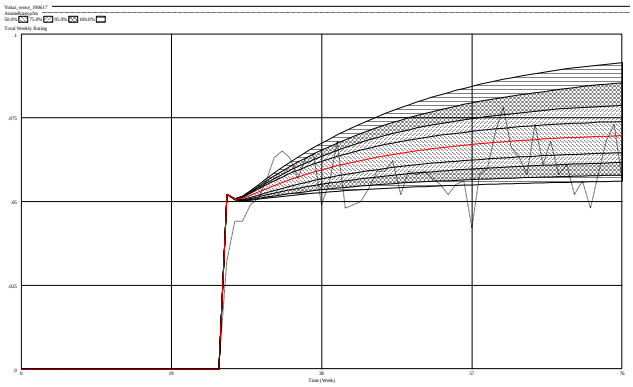

Figure 7. Total Weekly Ratings Sensitivity

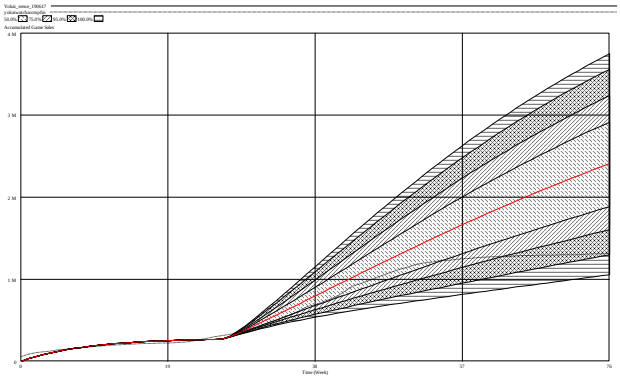

Figure 8. Accumulated Game Sales Sensitivity

5. DISCUSSION

5.1. Features of the Progression of Satisfaction and Emotion Levels

The model used in this study established a CE mechanism via CJs spanning two types of touchpoints, as follows. First, the customer satisfaction level progressed through potentially becoming aware of the video game at a touchpoint (physical store) and through playing with its features and functions. On and after Week 26, when the consumer video game was released, the consumer emotion level could progress through advertising and word of mouth from viewers and through weekly viewing of the TV animated program, which became the next touchpoint; consumers could then reach the point of purchasing the video game software. The simulation results demonstrate that the contribution from product performance due to the progression of the customer satisfaction level through the initial touchpoint was not as great as the (direct) contribution from the progression of the consumer emotion level through the next touchpoint. The customer satisfaction level conversion rate (video game conversion rate) did not differ by level; instead, it remained at (0.3) from [Cold] to [Attraction] and from [Attraction] to [True Love]. This result indicates that CE is a precondition of the satisfaction level that changes homogenously or linearly with consumer's game play. In contrast, the customer emotion level conversion rate (animated program conversion rate) from [Passion] to [True Love] (0.3) is double that from [Interest] to [Passion] This result may be due to a reluctance to reach a passionate emotional level, the prerequisite for CE, or due to heterogeneous or nonlinear progression. If this linear progression of customer satisfaction levels and nonlinear progression of customer emotion levels is not unique but instead occurs more generally, then this finding validates the indirect design of CJs that create different degrees (probabilities) of transitions between satisfaction and emotion levels and further suggests the potential for an index of CE marketing. That is, in the design phase of CJ using the model presented in this study, the conversion rates at each touch point (video game conversion rate[satisfaction] and animated program conversion rate[emotion]) are set as the scenario variables, the business performances (accumulated game gales and total weekly ratings) can be tracked and simulated.

5.2. Limitations and Issues

The limitations of and issues with this study are as follows. As this study attempts to conduct a time-series analysis of the CJ from the perspective of CE, the model is constructed based on two types of CJ pathways (the E-S pathway and the S-E pathway). Thus, the touchpoints are viewed as an additional prerequisite to CE (satisfaction and emotion). However, they may be differently interpreted as a simple expansion in the number of publications (an expansion of advertising effects via mass media) or as an increase in potential viewer awareness. The model and case study presented in this study do not take into account repeat purchases by the same consumer via increases in satisfaction levels. Even though in the Yokai Watch case, the second generation and the later version of the game software are also sold, and the majority of consumers of the first generation would repeatedly purchase. However, current model cannot track the CJ pathways for version-up software and/ or services. In general, initial purchases are an initial-stage phenomenon in the customer life cycle; repeat and "returning" purchases in subsequent stages require further analysis (Bleier *et al*., 2018). It is possible to expand the model to include three or more touchpoints, but the model would have to take into account the interactions between multiple types of touchpoints and would therefore become extremely structurally complex. This could be a limitation of the SD approach for using this model. One possible solution would be to create a hybrid model combining SD and an agent model. An expansion of the model that takes into account the limitations and problems of this study are topics for future research.

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Appendix: Parameter Optimal Value Overview

Rate of Potential Penetration {Dmnl}	0.5
Rate of Awareness {1/Week}	0.1
Coefficient of Advertising Animated TV Program[PreAiring] {1/Week}	0.1111
Coefficient of Advertising Animated TV Program[OnAiring] {1/Week}	0.01
Coefficient of Imitation of Watching Animated TV Program[PreAiring] {Dmnl}	0.01
Coefficient of Imitation of Watching Animated TV Program[OnAiring] {Dmnl}	0.0105
Weekly Rating of Animated TV Program [Interest] {1/Week}	0.0521
Weekly Rating of Animated TV Program [Passion] {1/Week}	0.22
Weekly Rating of Animated TV Program [Faith Love] {1/Week}	0.0718
Coefficient of Advertising Game[PreAiring] {1/Week}	0.004
Coefficient of Advertising Game[OnAiring] {1/Week}	0.0701
Video Game Conversion Rate [Cold] {1/Week}	0(*)
Video Game Conversion Rate [Attraction] {1/Week}	0.3
Video Game Conversion Rate [True Love] {1/Week}	0.3
Exit Rate of Game Users[Cold] {1/Week}	0.01
Exit Rate of Game Users[Attraction] {1/Week}	0.1
Exit Rate of Game Users[True Love] {1/Week}	0.09
Animated Program Conversion Rate [Interest] {1/Week}	0(*)
Animated Program Conversion Rate [Passion] {1/Week}	0.1497
Animated Program Conversion Rate [Faith Love] {1/Week}	0.3

Rate of Repeating[Interest] {1/Week}	1
Rate of Repeating[Passion] {1/Week}	1
Rate of Repeating[Faith Love] {1/Week}	1
Exit Rate of Viewers[Interest] {1/Week}	0.1
Exit Rate of Viewers[Passion] {1/Week}	0.1
Exit Rate of Viewers[Faith Love] {1/Week}	0.1

(*)Set as dummy values for the definition formulas, including the subscript domain