

Sales effect of a software product series' length in Japan

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Abstract. *Previous studies have examined changes in software sales using the network effect theory framework based on hardware sales. This study aims to examine the effects of a software series' length on software sales. We also investigate the moderating effects of how a platform's life cycle influences the series' sales. We adopted the double-jeopardy theory and brand loyalty discussions for both products and corporations. To test our hypotheses, we analysed 11,863 video game software samples in the Japanese market, addressing the following research questions: How does the length of a software series influence sales in terms of both the product and the corporate brand? How is the influence of the software series' length on sales moderated by the stage of the platform's lifecycle? Our findings show that a longer software series led to higher software sales for both the specific series as well as other software released simultaneously by the company. Moreover, we found that the positive relationship between the video game series' length and sales of all the firm's software was stronger when the platform had matured. By examining firm behaviours, such as software series releases and their effects, we confirmed that software series' length is a core factor stimulating its sales and that of other series produced by a company. We also examined the impact of a platform's lifecycle on video game sales. Our study contributes to the field by extending the literature on the effect of brand loyalty and the double-jeopardy theory.*

Keywords: video game market, product series, product brand, loyalty, the double-jeopardy theory, corporate brand.

Please cite the article as follows: Seo, E. and Inoue, Y. (2023), "Sales effect of a software product series' length in Japan", *Management & Marketing*, Vol. 18, No. 3, pp. 251-269, DOI: 10.2478/mmcks-2023-0014.

Introduction

The dynamics of the platform-based video game industry were created through interactions between users and platforms (e.g., video game consoles) and their accompaniments (e.g., games) (Rietveld & Eggers, 2018). Video games now constitute a mature industry, with product designs representing well-established genres, and consumers and publishers increasingly seeking innovation in game conceptualisation (Marchand & Hennig-Thurau, 2013). However, industry attributes, such as short product lifecycles and difficulties in

predicting product acceptance, have created challenges for video game companies (De Vany, 2003). In this environment, video game companies tend to be conservative in their new product development decisions and limit themselves to incremental innovations (Tschang, 2007). To overcome the challenges posed by industry attributes, it has become more important for game companies to analyse existing resources and use them efficiently.

In the current competitive environment, a strong brand is an important part of the communication strategy of a video game company and an important resource that can be leveraged to achieve a sustainable competitive advantage (Kowalczyk & Pawlish, 2002; Marchand & Hennig-Thurau, 2013; Sevel et al., 2018). Generally, a video game company has both a corporate brand and product brands, and the two interact and extend the value of each brand, ultimately influencing customer product evaluations and buying behaviour (Kato, 2021; Kleinstein, 2005). Regarding video games, customer recognition of familiar brands (versus unfamiliar brands) often determines their buying behaviour (Butcher et al., 2017). As part of a common marketing strategy, video game companies create game series that trigger more convenience for their consumers. Such series can serve as brand extensions for the companies (e.g., Basuroy & Chatterjee, 2008; Hennig-Thurau et al., 2009). A brand extension, which lends an existing brand name to a new product, helps increase consumer interest in the newly launched product (Hennig-Thurau et al., 2009; Keller, 2003). Therefore, many game companies pursue brand extension strategies by launching new game sequels of prior video games. Game brands often include well-developed characters and stories in the series, enhancing the sequels' value and user perception of product quality (Marchand & Hennig-Thurau, 2013). Determining the impact of a game series' length on product sales can enable us to better understand the meaning of the game series as a corporate resource.

Studies on the dynamics of the video game industry have examined changes in software sales using the network effect theory framework based on hardware sales (Nair et al., 2004; Parker & Van Alstyne, 2005; Stremersch et al., 2007). However, the effects of software series length have been ignored as a potential cause of change in software sales. As releasing software sequels is a common strategy in the hit-orientated game industry, game users are susceptible to such stimuli from software publishers in making purchasing decisions (Kleinstein, 2005). Accordingly, we consider that the length of a software series could be an important factor in influencing software sales. Therefore, to fill this gap, this study analyses the effects of a video game software series' length on sales from the perspectives of product and corporate brand loyalty.

Furthermore, based on the diffusion of innovations literature (Rietveld & Eggers, 2018; Rogers, 2003), customer heterogeneity exists between different lifecycle stages and affects users' hardware buying behaviour. However, few studies have examined the effect of a platform's lifecycle on the relationship between software and hardware sales. According to platform lifecycle stages, game users choose a product based on different needs, which affect the performance of the game company. Thus, we consider certain game user behaviours and product and corporate brand perceptions that were not addressed in previous studies. Our study focuses on how heterogeneous consumer demands impact the effects of a series' length on its software sales based on the stage of the platform's lifecycle (Priem et al., 2013; Rietveld & Eggers, 2018).

This study aims to investigate the effects of software series length on the software sales of a company. Thus, we address the following research questions:

RQ 1: How does the length of a software series influence sales in terms of both the product and the corporate brand?

RQ 2: How is the influence of the software series' length on sales moderated by the stage of the platform's lifecycle?

Theoretical background and hypotheses

Video game market dynamics

The dynamics of the video game market have been explained in terms of the network effects of game platforms and changes in hardware sales (Clements & Ohashi, 2005; Corts & Lederman, 2009; Stremersch et al., 2007). Network effects occur when consumers benefit, either directly or indirectly, from more consumers purchasing the same product (Gretz et al., 2019). Indirect networks arise when consumer utility increases through wider network adoption, expanding the number of products in the network (Gretz et al., 2019). According to Katz and Shapiro (1994), direct network effects occur when the number of consumers in a network directly impacts their utility. Meanwhile, indirect network effects occur when there is interdependence in the demand for hardware and compatible software (Nair et al., 2004).

Indirect network effects have been used to explain typical relationships between hardware and software sales in two-sided markets (Gretz et al., 2019; Nair et al., 2004; Parker & Van Alstyne, 2005). Drawing on indirect network effects, industry research has demonstrated the influence of the supply of software on the demand for hardware (Stremersch et al., 2007). The amount of software available for a certain technology has a positive influence on the customer's utility of the entire hardware – software system. This is because the software can entice more customers to adopt new hardware, thereby increasing hardware sales and the base of installed hardware (Stremersch et al., 2007). Thus, the amount of installed hardware positively affects software companies' decisions regarding new software development.

Regarding software, the greater the number of consumers buying the hardware platform, the greater the market potential for compatible software products, and the greater the motivation for software companies to produce more compatible software titles (Corts & Lederman, 2009). For example, Corts and Lederman (2009) investigated the scope of indirect networks in the industry, finding that the supply of video games for a particular platform depends not only on the installed base of that platform but also that of competing platforms because the home video game market is no longer dominated by a single platform.

The diffusion of game systems has been analysed through the interaction between console adoption decisions and software supply decisions (Clements & Ohashi, 2005; Stremersch et al., 2007). Clements and Ohashi (2005) examined the importance of indirect network effects in the diffusion of game systems in the U.S. video game market from 1994 to 2002. They found that introductory pricing was a significant strategy at the beginning of the product cycle and effective later for expanding software sales. Furthermore, they found that market inertia only appears on the software side. This implies that software providers continue to search for the installed base of hardware users after hardware demand slows. Stremersch et al. (2007) suggested that weak indirect network effects impact diverse

markets. Drawing on empirical market evidence, they show that indirect network effects on hardware sales are less pervasive than previously predicted.

The effects of superstar game software and their product characteristics on software sales have also been examined as core factors influencing video game market dynamics (Binken & Stremersch, 2009). They reported that the introduction of a superstar title can increase console sales by an average of 14% over a 5-month period in the U.S. video game hardware market. One in every five buyers of a superstar software title purchases the hardware required.

Brand extensions of experiential products

A brand extension strategy is especially important for products where diffusion follows an exponential pattern of decay, such as movies, books, music, and games (Sood & Dreze, 2006). Big budgets are used to generate the highest profits as soon as new products are available to consumers (Hennig-Thurau et al., 2009; Seo & Takashima, 2017). As entertainment products, video games are experiential assets (Sood & Dreze, 2006) that consumers must play to know whether they like them (Marchand & Hennig-Thurau, 2013). Such entertainment product brands extend from popular parent brands, and the fitness between them has been investigated in terms of successful brand strategies (Butcher et al., 2017).

Branding is an integral part of a communication strategy for video games and an effective tool for delivering information to users (Marchand & Hennig-Thurau, 2013; Sood & Dreze, 2006). The video game software series acts as a brand extension and the prequel influences the value of the sequel (Butcher et al., 2017; Marchand & Hennig-Thurau, 2013). Most video game sequels have characteristics and stories that relate to their prequels (Marchand & Hennig-Thurau, 2013).

Game users recognise and prefer a video game's brand and expect to be reminded of the video game's characteristics in the sequels. With regard to psychological reactions of the customer sequels offer a familiar message. Butcher et al. (2017) examined gamers' perceptions of video game brand extensions using focus groups and interviews, finding that they retain deep and highly contextual information pertaining to game and extension characteristics. Therefore, a video game series, as an extended product brand, can have the same effect as brand loyalty on increasing sales.

Effects of brand loyalty

Double-jeopardy theory (Chaudhuri & Holbrook, 2001; Ehrenberg et al., 1990; McPhee, 1963) states that brands with smaller market shares are at a disadvantage compared to those with larger ones. Brands with a smaller market share have fewer buyers who purchase less frequently, while more popular brands with a larger market share have more buyers who purchase more often. Based on double-jeopardy theory, we expect that a brand with high purchasing loyalty will have a high market share because it drives a high level of purchasing behaviour among its consumers. This loyalty captures the willingness of the average consumer to repurchase the brand (Nyadzayo et al., 2020).

Customer loyalty leads to positive customer purchasing behaviours for three key reasons (Anisimova, 2007; Huber & Hermann, 2001). First, loyal consumers are prone to greater brand consumption, making additional purchases of related services and accessories, thereby contributing to better firm performance (Huber & Hermann, 2001).

Second, they are willing to pay more for that brand as they perceive it as having a unique value that cannot be replaced (Jacoby et al., 1978). Third, their repeated purchases elicit greater market share, ignoring contextual constraints (Assael, 1998). Upshaw (1995) asserted that loyal consumers are more likely to use the brand because of various emotional factors they associate with it, helping them distinguish the brand's image from others. Moreover, a high number of loyal consumers leads to lower service costs and price sensitivity, and positive word-of-mouth (WOM) generates further consumer loyalty (Anisimova, 2007).

Therefore, superior brand performance outcomes, such as greater market share and premium prices, can result from greater consumer loyalty, as determined by the perceived trust and affection elicited by the brand (Anisimova, 2007; Chaudhuri & Holbrook, 2001; Huber & Hermann, 2001). These brand loyalty effects would occur in cases where video game companies have strong corporate and product brands and extend the product brand to a series. In this study, we use these concepts to establish our hypotheses, explaining the diversity of the video game market.

Hypotheses

Software series are typically released continuously, interacting with the product's brand and customer brand loyalty. Generally, the software will have the same characters in all games in the series, and the story will continue as the series progresses (Marchand & Hennig-Thurau, 2013). By serialising video games, software manufacturers can attract users with high loyalty to their product brands. The instalments are released in response to user demand for the series. In this interdependent situation, the number of users with high brand loyalty to a specific video game series increases, stimulating purchasing loyalty and driving increased market share (Chaudhuri & Holbrook, 2001). For example, the longer the Super Mario series continues, the higher the sales volume of the game's newest instalment. Therefore, we hypothesise the following:

H1. The length of the software series positively affects its sales.

Video game companies often manage multiple product and corporate brands, generating synergistic effects across them. User loyalty for the software series brand could affect the purchasing behaviour of other software through the complicated processing of stimuli, which encompasses user understanding and affection for the brand. Individuals build specific categories by perceiving stimuli and understand stimuli by processing how new stimuli, such as brands, fit into existing categories (Chaudhuri & Holbrook, 2001; Sujan, 1985). Within particular product brand categories, the new stimulus is slotted into an existing category or forms a new one (Marchand & Hennig-Thurau, 2013; Sujan, 1985).

Video game companies use different promotional activities to launch new video games in the market (Rao et al., 2004) aimed at inspiring customers and stimulating their buying experience. Through such experiences, game users may accumulate knowledge and sentiments regarding product brands, which in turn could help develop specific knowledge and sentiments regarding the corporate brand. Thus, the product brand reminds consumers of the manufacturer (Hsieh et al., 2004; Johansson, 1993). Regarding video game series, sequels sustainably stimulate customer needs for the game, helping form loyal customer communities in which positive feelings are generated among users. Additionally, it creates

an attachment to the corporate brand identified with the game's software (Hsieh et al., 2004). Conversely, a poor experience negatively impacts the image of a brand (Souiden et al., 2006).

A corporate image represents the identity of a company, reflecting how a certain market segment perceives that company (Souiden et al., 2006). The corporate image acts as a summary or logical information in the consumer decision-making process (Erickson et al., 1984). Corporate information, as perceived by consumers, influences brand image by shaping consumer attitudes toward companies (Homer, 1990), or through creating greater trust that positively influences consumer preferences and product choices (Simmons & Lynch Jr., 1991). Corporate brands convey unique information to consumers and promote their intention to use product brands that express the characteristics and mission of the firms (Kato, 2021). Highly valued corporate brands reduce brand confusion and contribute to firms' performance by prompting additional purchases of services and accessories by loyal consumers (Anisimova, 2007; Huber & Hermann, 2001). That is, consumers who develop a positive attachment to the manufacturer through repeat purchases are encouraged to purchase other game software (Kato, 2021; Stokburger-Sauer, 2010). For example, the longer the Super Mario series continues, the more attached Super Mario fans become to the corporate Nintendo brand, and the more interested they are in purchasing other software released by the company. Thus, this framework creates the phenomenon where software game sales increase overall. To explore this phenomenon, we hypothesise the following:

H2. A long software series positively affects all other company software sales.

Recent research on platform dynamics has begun to consider that platform adapters at different stages are different, and such user heterogeneity could affect platform values (Priem et al., 2013; Rietveld & Eggers, 2018). For example, Rietveld and Eggers (2018) showed that despite an increase in the potential user pool as the platform evolves, video games launched later in the platform's life cycle realise lower sales than those launched earlier. This suggests that differences in preferences and behaviour between early and late adopters affect whether games succeed, and which types are most successful. Furthermore, the structure of a network (centrality of members and the number of roles of each member) and its conduct (e.g., opportunistic behaviour, reputation signaling, perceptions of trust) have a significant impact on the value of the network to users and network providers (Afuah, 2013). These viewpoints explain the effects of differences in platform stages.

There are three distinct characteristics of early and late adopters (Rietveld & Eggers, 2018): risk aversion, preference for novelty, and the search process. Compared to late adopters, early adopters prefer novelty products and reflect a lower risk avoidance as they search and choose products based on innovation. Contrastingly, late adopters generally reflect risk-avoidance characteristics, as they adopt a product in the later life cycle stage of the platform; they also have access to more information on the platform and its accompaniments (Rietveld & Eggers, 2018). Moreover, late adopters can rely on abundant external signals, such as familiar video game and company brands, for help with purchasing (Eggers et al., 2016).

The success of the a video game is based on the quality of the user experience. That is, users discover whether the video game is right for them after playing it. This

fundamental characteristic of the experiential product means that there is a certain risk for consumers, which affects their buying choices (Marchand & Hennig-Thurau, 2013). Simultaneously, the length of a series may provide customers with a clue for evaluating the sequel (Sood & Dreze, 2006). Many game companies release sequels that have a strong user preference on the market. However, as late adopters may select software conservatively (Gretz et al., 2019), they may require more information to pacify perceived risk. Nonetheless, the product brand reputation and length of the series could help reduce these risks. Therefore, a user's sense of lower risk and greater trust in the product brand, based on the length of the series, could increase brand and attitude loyalty (Chaudhuri & Holbrook, 2001; Liang & Fu, 2021), which could accelerate software sales. Thus, we hypothesise the following:

H3. The impact of the length of the series on software sales is positively moderated by the mature stage of the platform's lifecycle.

A longer series ensures that users are exposed to information on the series, leading to users feeling more familiar with the product and the corporate brand. Perceived risks of product quality are reduced through familiarity with the corporate brand producing the series (Walsh et al., 2017). Hence, we expect that late adoption may reduce perceived risks based on corporate brand trust and stimulate other software purchases from the company. Therefore, we hypothesise the following:

H4. The impact of the length of the series on sales of all software from the company is positively moderated by the mature stage of the platform's lifecycle.

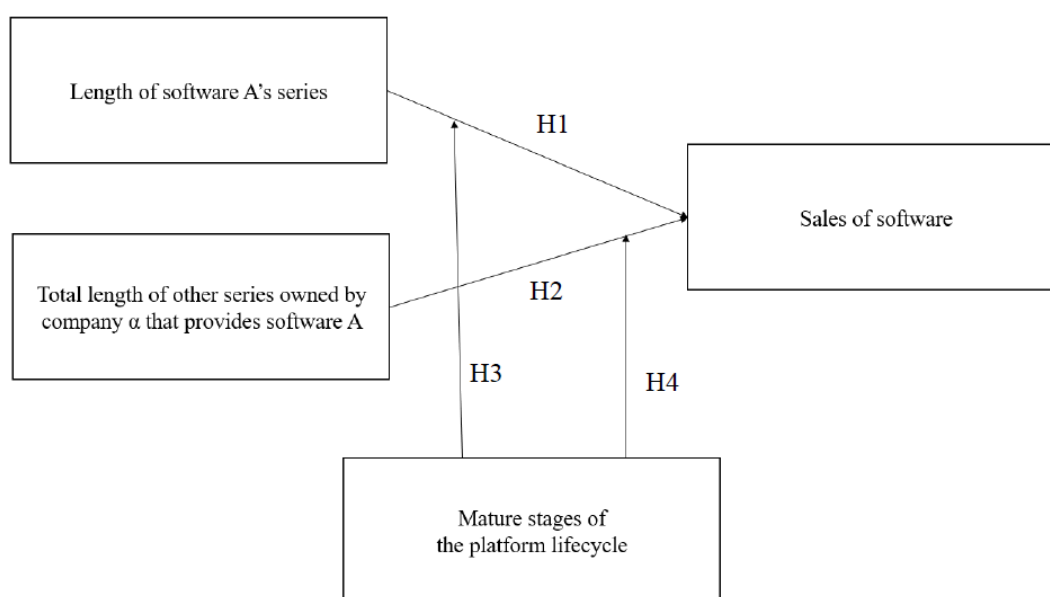


Figure 1. Structure of the hypothesis

Source: Authors' own research.

Methods

Sampling and dataset

To test our hypotheses, we conducted a statistical analysis using a video game software dataset from the Japanese video game market. The dataset was purchased from Famitsu Intelligence Strategic Marketing (f-ISM; <http://www.f-ism.net>) and provided by KADOKAWA ASCII Research Laboratories, Inc. The data included the title, platform, manufacturer name, price, release date, monthly sales, and genre of each game software. We collected all software samples released from April 1996 to March 2012 in the Japanese video game market. The starting point was based on the date f-ism began collecting sales data. The end point was set to avoid the influence of the smartphone game market's substantial growth. Our data comprise 11 game platforms shown in Table 1. We removed data from other platforms with smaller market shares to avoid any data bias caused by smaller markets on the platforms. Furthermore, due to the characteristics of the video game market, a small amount of software may be provided after the declining stage of the platform, which could create a numerical bias in the analysis (Inoue, 2019). Therefore, referring to the study by Inoue (2019), we removed software sold during the periods when the annual software distributed was <25% of the maximum value after its declining stage for each platform. Our final sample included 11,863 video games. As our dataset did not identify software series, we created a series database using the string information of software names, following Inoue's (2021) method.

Table 1. List of video game hardware analysed in this study

Hardware	Platform owner	Release date in Japan
Sega Saturn	Sega	Nov. 22, 1994
PlayStation	Sony	Dec. 3, 1994
Nintendo 64	Nintendo	Jun. 23, 1996
Dream Cast	Sega	Nov. 27, 1998
PlayStation 2	Sony	Mar. 4, 2000
Game Boy Advance	Nintendo	Mar. 21, 2001
Game Cube	Nintendo	Sep. 14, 2001
Nintendo DS	Nintendo	Dec. 2, 2004
PlayStation Portable	Sony	Dec. 12, 2004
PlayStation 3	Sony	Nov. 11, 2006
Wii	Nintendo	Dec. 2, 2006

Source: Authors' own research.

Variables

Dependent variables

Corresponding to our hypotheses, the dependent variable $v_i^{D,Sales}$ represents the sales of software game i . For this variable, we calculated the sum value of the sales volume for one year from the release date of software i . We selected a year to control the influence of the

release date and seasonal sales. Additionally, because the distribution of video game software sales is similar to a log-normal distribution (Inoue & Tsujimoto, 2018), we used the natural logarithm of this variable in the regression analysis.

Explanatory variables

Corresponding to our hypotheses, we set three explanatory variables. First, for H1, we set the variable for the length of the software series of game i as $v_i^{E,Ser,A}$. We calculated this variable as the number of games that included the same series of game i before game i was released. If game i did not have an existing series, it was regarded as starting a new series, and this variable's value was set as one. Corresponding to the dependent variable, the value of the natural logarithm of this variable was used in the regression analysis.

Second, for H2, we set the variable for the length of other software series provided by the firm producing i as $v_i^{E,Ser,B}$. We calculated this variable as the total number of software series from the firm producing game i . Here, because we considered series that went unused for a long time as unlikely contributors to recent software purchases, we used series within five years of the game's release date i for the calculation of this variable. Similar to $v_i^{E,Ser,A}$, if game i 's company did not have any existing series, the value of this variable was set as one. Corresponding to the dependent variable, because the value of the natural logarithm was used in the regression analysis, the value of one was the minimum within the possible values.

Third, for H3 and H4, we set the variable for the mature stage of the platform lifecycle, referring to methods from previous studies (Inoue, 2019; Polli & Cook, 1969); we calculated this as follows. First, for each platform f at period w (a moving window of 12 months), the share of game software sold was calculated as follows: $S_{f,w} (= N_{f,w}/N_w)$. N_w is the number of pieces of software sold. Second, the annual variation in the share of game software sold was calculated as follows: $\Delta S_{f,w} (= S_{f,w} - S_{f,w-12})$. Third, the values of $\Delta S_{f,w}$ were calculated for all cases of w and f . Fourth, the standard deviation σ for the collection of $\Delta S_{f,w}$ values was calculated, and the lifecycle stage in period w on platform f was classified as stage one (introduction, $S_{f,w} < 0.05 \times \max \{S_{f,w}\}$), two (growth, $0.5\sigma < \Delta S_{f,w}$), three (maturity, $-0.5\sigma \leq \Delta S_{f,w} \leq 0.5\sigma$), or four (decline, $\Delta S_{f,w} < -0.5\sigma$). Referring to the calculation results of the lifecycle stages, if the stage of range w , which started from the software's release date i , was stage three, the value of this variable $v_i^{E,Mature}$ was set as one; otherwise, zero.

Control variables

In our analysis, we controlled for other variables that could influence software sales.

First, we set a variable of software price, $v_i^{C,Price}$, and set the price of game i in Japanese Yen. The video game market has the peculiarity that higher prices are often connected to higher software sales, as higher priced software tends to have higher quality (Inoue & Tsujimoto, 2018).

Second, we set dummy variables for each hardware as $v_i^{C,Hard,h} (h \in H)$, where H is the video game hardware set. These controls not only influence the characteristics of each hardware platform but also the video game market status across the time series.

Third, we set dummy variables for video game software categories as $v_i^{C,Genre,g}$ ($g \in G$), where G is the set of genres. Video game software sales are largely influenced by software genre (Inoue & Tsujimoto, 2018), and some have multiple genres as the characteristics of the dataset. To control this, we set a variable that represented the number of genres as $v_i^{C,GenreNum}$.

We set dummy variables for the seasonality of the release date. Particularly, we controlled for the influence of the year-end shopping season. Software released in November and December can have disproportionately higher sales due to the influence of year-end shopping (Inoue & Tsujimoto, 2018). Thus, we set dummy variables for November and December for the software release date i as $v_i^{C,Month,Nov}$ and $v_i^{C,Month,Dec}$.

Empirical specifications

The full model of the regression analysis is as follows. We adopted a natural logarithm for the dependent variable to be approaching normal distribution. Therefore, we also applied a natural logarithm to the explanatory and control variables (excluding dummy variables) to correspond to the calculation of the dependent variable.

$$\begin{aligned} \ln v_i^{D,Sales} = & (\beta_1 + \beta_2 v_i^{E,Mature}) \ln v_i^{E,Ser,A} + (\beta_3 + \beta_4 v_i^{E,Mature}) \ln v_i^{E,Ser,B} \\ & + \beta_5 v_i^{E,Mature} + \beta_6 \ln v_i^{C,Price} + \sum_{h \in H} \beta_h^a v_i^{C,Hard,h} \\ & + \sum_{g \in G} \beta_g^b v_i^{C,Genre,g} + \beta_7 \ln v_i^{C,GenreNum} + \beta_8 v_i^{C,Month,Nov}, \\ & + \beta_9 v_i^{C,Month,Dec} + \zeta_i + C. \end{aligned} \quad (1)$$

Where β is the coefficient of each variable, ζ_i is an error term, and C is a constant. In the analysis, the standards for the dummy variable groups $v_i^{C,Hard,PlayStation}$ and $v_i^{C,Genre,Other}$ were removed. The analytical model was calculated through multiple regression analysis using the least squares method. Table 2 shows the correlation matrix of the variables. As shown, the correlations among the variables are not high (maximum absolute correlation value of 0.36). Additionally, in the calculation results of the variance inflation factors (VIF), we confirmed that there is no multicollinearity (mean VIF = 2.05, maximum VIF <10). We also applied the Breusch–Pagan test and confirmed that the model had heteroskedasticity. To address this issue, we calculated Newey–West estimated standard errors and applied them to the results.

Table 2. Correlation matrix

ID	Type	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	D	Software sales	1.00	0.23	0.30	0.01	0.22	0.03	0.06	0.02	0.03	0.01	-0.02	-0.04	0.00	-0.02	-0.01	0.21	0.12	-0.06	0.07	-0.11	-0.14	0.10	0.02	0.05
2	E	Length of series		1.00	0.24	0.04	-0.21	0.07	0.05	-0.01	0.06	0.08	-0.08	-0.04	0.03	-0.03	0.06	0.03	0.11	-0.17	0.01	-0.02	0.00	0.01	0.03	0.03
3	E	Length of other series			1.00	0.08	0.07	0.08	0.09	0.00	0.08	0.13	-0.14	-0.05	0.00	0.09	0.05	0.05	0.23	-0.08	-0.02	-0.05	-0.07	0.10	-0.01	0.02
4	E	Mature stage				1.00	0.07	-0.16	0.18	0.20	0.09	0.18	-0.06	0.10	0.12	-0.11	0.14	0.01	0.06	0.04	-0.03	-0.02	-0.02	0.03	0.03	-0.01
5	E	Price					1.00	0.13	0.16	0.21	0.09	0.03	0.10	0.02	-0.06	-0.24	-0.07	0.10	0.08	0.11	0.12	-0.11	-0.15	0.09	0.00	0.00
6	C	Hard.: PlayStation 2						1.00	-0.12	-0.07	-0.08	-0.11	-0.11	-0.11	-0.14	-0.23	-0.19	-0.02	0.00	0.00	-0.02	-0.07	-0.03	0.06	-0.01	-0.03
7	C	Hard.: PlayStation 3							1.00	-0.03	-0.03	-0.04	-0.06	-0.04	-0.06	-0.09	-0.07	0.00	0.14	-0.03	-0.06	-0.04	-0.05	0.01	0.04	-0.02
8	C	Hard.: Nintendo 64								1.00	-0.02	-0.02	-0.03	-0.03	-0.03	-0.05	-0.04	-0.02	0.06	-0.05	-0.03	-0.01	0.01	-0.03	0.00	0.03
9	C	Hard.: Game Cube									1.00	-0.03	-0.04	-0.03	-0.04	-0.06	-0.05	0.00	0.11	-0.02	-0.03	-0.01	-0.01	0.06	0.01	0.01
10	C	Hard.: Wii										1.00	-0.05	-0.04	-0.05	-0.08	-0.06	-0.04	0.11	-0.03	-0.05	-0.01	0.00	0.02	0.02	0.05
11	C	Hard.: Sega Saturn											1.00	-0.05	-0.07	-0.10	-0.09	-0.02	-0.03	-0.03	0.04	0.04	-0.01	-0.06	-0.01	0.00
12	C	Hard.: Dream Cast												1.00	-0.05	-0.08	-0.07	-0.01	-0.02	0.02	0.00	0.02	0.01	-0.02	0.00	0.00
13	C	Hard.: Game Boy Advance													1.00	-0.10	-0.09	0.07	0.03	-0.02	0.01	0.01	0.02	0.07	-0.02	0.04
14	C	Hard.: DS														1.00	-0.14	0.01	-0.13	0.01	-0.03	0.04	0.03	0.02	0.00	0.00
15	C	Hard.: PlayStation Portable															1.00	0.04	-0.04	0.11	-0.02	-0.04	-0.04	0.01	0.00	-0.02
16	C	Genre: RPG																1.00	-0.19	-0.15	0.06	-0.06	-0.10	0.36	0.00	0.00

17	C	Genre: Action	1.0 0	0.2 4	0.3 2	0.1 1	0.2 3	0.1 4	0.0 1	0.0 2
18	C	Genre: Adventure	1.0 0	0.1 5	0.0 7	0.1 1	0.2 1	0.0 3	0.0 4	0.0 4
19	C	Genre: Simulation		1.0 0	0.0 7	0.1 2	0.2 3	0.0 2	0.0 3	0.0 3
20	C	Genre: Puzzle			1.0 0	0.0 5	0.0 2	0.0 1	0.0 0	0.0 0
21	C	Genre: Party				1.0 0	0.0 4	0.0 1	0.0 5	0.0 5
22	C	Genre number					1.0 0	0.0 1	0.0 2	0.0 2
23	C	Month: Nov.						1.0 0	0.1 3	0.0 3
24	C	Month: Dec.							1.0 0	0.0 0

Note: Under Type, D = independent variable; E = explanatory variables; C = control variables.

Source: Authors' own research.

Results

Table 3 presents the results of our multiregression analysis. Model 1 is the base model and only includes the control variables; Model 2-a includes $\ln v_i^{E,Ser,A}$ (length of series); Model 2-b includes $\ln v_i^{E,Ser,B}$ (length of other series); Model 2-c includes both $\ln v_i^{E,Ser,A}$ and $\ln v_i^{E,Ser,B}$; and Model 3 is the full model. As shown in the results of Models 2-a, 2-b, and 2-c, $\ln v_i^{E,Ser,A}$ and $\ln v_i^{E,Ser,B}$ do not have a significant influence on each other (i.e., there is no positive or negative change or disappearance of significance by inserting another variable). Additionally, as shown in Models 2-c and 3, the addition of $v_i^{E,Mature}$ does not significantly influence either $\ln v_i^{E,Ser,A}$ or $\ln v_i^{E,Ser,B}$. Therefore, we only discuss in detail the results of Model 3 here.

First, the length of the software series significantly and positively influences software sales ($p < 0.01$). Therefore, H1 is supported. Second, the total length of other software series from the same firm significantly and positively influences software sales ($p < 0.01$). Thus, H2 is also supported. Third, the interaction term between the length of the software series and the dummy variable of the mature stage of the platform does not show statistical significance. Therefore, H3 is not supported. Fourth, the interaction term between the total length of other software series from the same firm and the dummy variable of the mature stage of the platform significantly and positively influences software sales ($p < 0.01$). Therefore, H4 is also supported. Overall, H1, H2, and H4 were all statistically supported.

The results indicate the importance of software series for sales. As shown in the difference in the coefficient values of determination between Models 1 and 2-a/2-b, a game's software sales are largely influenced by both its series length and the length of other series from the firm ($\Delta R\text{-squared} = 0.064$ and 0.063 , respectively). Additionally, because the difference in $\Delta R\text{-squared}$ between Models 2-c and 2-a/2-b is 0.043 (as rounded) for both, these can be regarded as complementary, even though they are not totally separated. Therefore, the development of multiple software series simultaneously is important for a firm to achieve larger software sales overall. Although the influence of the series' interaction terms with the mature stage is not large in comparison with these fundamental series effects, the results indicate that the influence of other series is notable, especially on software sales at the mature lifecycle stage of the platform.

Table 3. Regression analysis results

	Model 1			Model 2-a			Model 2-b			Model 2-c			Model 3		
	β	S.E.	p value	β	S.E.	p value	β	S.E.	p value	β	S.E.	p value	β	S.E.	p value
Length of series				0.34	0.01	0.00				0.29	0.01	0.00	0.29	0.02	0.00
Length of series $\times$ Mature stage													0.01	0.03	0.81
Length of other series							0.24	0.01	0.00	0.20	0.01	0.00	0.19	0.01	0.00
Length of other series $\times$ Mature stage													0.06	0.02	0.00
Mature stage													-0.29	0.09	0.00
Price	0.86	0.07	0.00	1.23	0.07	0.00	0.77	0.07	0.00	1.10	0.07	0.00	1.10	0.07	0.00
Hard.: PlayStation 2	-0.01	0.05	0.81	-0.23	0.05	0.00	-0.28	0.05	0.00	-0.41	0.05	0.00	-0.40	0.05	0.00
Hard.: PlayStation 3	0.03	0.08	0.68	-0.26	0.08	0.00	-0.28	0.08	0.00	-0.47	0.08	0.00	-0.46	0.08	0.00
Hard.: Nintendo 64	-0.03	0.13	0.79	-0.22	0.13	0.08	-0.17	0.13	0.19	-0.30	0.12	0.01	-0.26	0.13	0.04
Hard.: Game Cube	-0.03	0.12	0.79	-0.39	0.12	0.00	-0.40	0.12	0.00	-0.64	0.12	0.00	-0.64	0.12	0.00
Hard.: Wii	0.00	0.11	0.98	-0.30	0.11	0.01	-0.48	0.11	0.00	-0.65	0.11	0.00	-0.65	0.11	0.00
Hard.: Sega Saturn	-0.21	0.08	0.01	-0.23	0.08	0.00	-0.16	0.07	0.03	-0.19	0.07	0.01	-0.19	0.07	0.01
Hard.: Dream Cast	-0.31	0.08	0.00	-0.36	0.08	0.00	-0.41	0.08	0.00	-0.44	0.08	0.00	-0.42	0.08	0.00
Hard.: Game Boy Advance	-0.07	0.10	0.51	-0.19	0.10	0.05	-0.41	0.09	0.00	-0.46	0.09	0.00	-0.45	0.10	0.00
Hard.: DS	0.20	0.06	0.00	0.17	0.06	0.01	-0.17	0.07	0.02	-0.14	0.07	0.04	-0.13	0.07	0.06
Hard.: PlayStation Portable	-0.01	0.06	0.87	-0.21	0.06	0.00	-0.32	0.06	0.00	-0.44	0.06	0.00	-0.42	0.06	0.00
Genre: RPG	1.26	0.08	0.00	1.18	0.08	0.00	1.14	0.08	0.00	1.09	0.08	0.00	1.09	0.08	0.00
Genre: Action	0.62	0.07	0.00	0.54	0.07	0.00	0.38	0.08	0.00	0.35	0.07	0.00	0.35	0.07	0.00
Genre: Adventure	0.11	0.07	0.16	0.24	0.07	0.00	0.13	0.08	0.09	0.23	0.07	0.00	0.24	0.07	0.00
Genre: Simulation	0.48	0.07	0.00	0.38	0.07	0.00	0.35	0.08	0.00	0.29	0.07	0.00	0.29	0.07	0.00
Genre: Puzzle	-0.48	0.11	0.00	-0.44	0.11	0.00	-0.54	0.11	0.00	-0.49	0.11	0.00	-0.49	0.11	0.00
Genre: Party	-0.24	0.09	0.01	-0.24	0.09	0.01	-0.29	0.09	0.00	-0.28	0.09	0.00	-0.28	0.09	0.00
Genre number	-0.43	0.13	0.00	-0.39	0.12	0.00	-0.34	0.13	0.01	-0.32	0.13	0.01	-0.33	0.12	0.01
Month: Nov.	0.13	0.07	0.04	0.09	0.06	0.14	0.15	0.06	0.02	0.11	0.06	0.06	0.12	0.06	0.06
Month: Dec.	0.26	0.06	0.00	0.22	0.05	0.00	0.25	0.06	0.00	0.22	0.05	0.00	0.22	0.05	0.00
Constant	1.80	0.61	0.00	-1.67	0.65	0.01	1.91	0.62	0.00	-1.02	0.65	0.12	-1.00	0.65	0.12
Adjusted R-squared	0.124			0.188			0.187			0.231			0.231		
Δ R-squared				0.064			0.063			0.107			0.107		

Source: Authors' own research.

Discussion

Interpretation of the results

In this study, we investigated whether the length of a software series influenced software sales, hypothesising that product brand loyalty extended to the corporate brand, which also promotes the sales of corporate brand products. Our results indicate that a strong brand is an important part of video game market dynamics, which agrees with previous findings (Gretz et al., 2019; Sevel et al., 2018). Moreover, our results show that software series length influences sales, tending to be stronger in the mature stages of the lifecycle of the platform. This finding supports the argument that the distinct characteristics between adapters, according to a platform's lifecycle, should be considered as a core factor explaining the video game market's dynamics (Rietveld & Eggers, 2018).

Theoretical implications

Our study makes the following theoretical contributions to the video game field and platform diversity.

First, by examining firm behaviours, such as releasing software series, and their effects, we confirmed that the length of the software series is a core factor stimulating its sales and that of other series produced by the company. The development of a software series is a process that expands the product brand, and a successful series increases the number of users and their loyalty. Preference for and loyalty to the corporate brand based on loyalty to a specific product also prompts an increase in sales of other software from the firm. This is explained using brand loyalty research and double-jeopardy theory regarding the dynamics of the software market. Hence, we have contributed by extending the effect of brand loyalty and double-jeopardy theory, along with previous studies on platform dynamics.

Second, we included an examination of the impact of the lifecycle of a platform on video game sales. Despite the heterogeneous nature of consumers in each lifecycle stage, few studies have considered the effects of a platform's lifecycle stage on all game sales (Gretz et al., 2019; Rietveld & Eggers, 2018). We found that in the mature stages of the platform's lifecycle, software series' length is strongly associated with all the company's software sales. This is because, in general, later adopters seek outside information and engage in buying behaviour based on corporate brand appraisal and value as they consider buying other software. Our results support those of previous studies on the effects of the special characteristics of adopter segments.

Practical implications

Our results have practical implications for product development and branding strategies. One key implication is that it is as important for firms to develop various series and product brands as it is to lengthen and strengthen those that are considered their main products. That is, the development of a new series and brand is as important as extending an existing series. The direct and indirect effects of the length of the series can contribute complementarily to product sales. Therefore, the parallel implementation of these actions is justified. Furthermore, because there is no assurance that the current major series and product brands will retain their values permanently, such parallel implementation becomes a means of risk management. This is similar to seeking innovation ambidexterity, which allows firms to act in an exploitative and exploratory way to achieve both incremental and

radical innovations (Inoue, 2021). In summary, our efforts here emphasise the importance of pursuing the development of various series simultaneously.

Our results also provide practical implications for firms producing creative products that can have sequels, such as books and movies. Valued product brands become an important resource because they can be extended to sequels and associated with a corporate brand. Therefore, firms that make creative experiential products should pursue product brand extension by developing a popular parent product brand. Then, firms should induce interest in the company's other products by simultaneously presenting the popular product brand and corporate brand with the new product, thereby making users associate the two brand types.

Conclusion

This is the first study to empirically demonstrate the effects of software series' length on sales in the video game market. The value and evaluation of the sequel in experiential goods, such as movies, have been previously studied (e.g., Marchand & Hennig-Thurau, 2013; Sood & Dreze, 2006).

This study has several limitations. First, we did not address the content of the series in our analysis; therefore, there is scope for additional analysis. For example, which characteristics of a series contribute to more sales? Conversely, which characteristics are not related to sales? Future studies could implement a more in-depth analysis of the effects of series content on sales.

Second, we assumed that the length of any series in the firm's product portfolio relates to its corporate brand strength. Similar to the first limitation, the related strength between the series and the corporate brand could differ according to the series content. Although the firm has many lengthy series, certain series may not contribute to strengthening its corporate brand, whereas others do. Future studies could further analyse the relationship between series content and corporate brands.

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