Digital marketing innovation: New business models for pharmaceutical and medical device product marketing

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Abstract

Background: Within the rapidly evolving healthcare landscape in Japan, digital marketing innovations are transforming pharmaceutical and medical device marketing. This study explores the emergence of new business models in the digital marketing, highlighting a transition from traditional methods to more dynamic, data-driven strategies.

Methods: InsighTCROSS® is a business model that qualitatively and quantitatively examines three steps based on stratified persona images: (1) verifying the effectiveness of product marketing promotions, (2) identifying competitors from the users' perspective, and (3) developing marketing strategies to counter competition. To demonstrate the effectiveness of this model, a case study was conducted focusing on the current anticoagulant drugs, including apixaban, dabigatran, edoxaban, rivaroxaban, and warfarin.

Results: Rivaroxaban, the only drug prescribed for the prevention of thrombus and embolism formation in patients with peripheral artery disease after lower limb revascularization, garnered the most interest from interventional cardiologists performing peripheral vascular interventions, as determined by InsighTCROSS® factor analysis, confirming that the manufacturer's marketing activities have effectively penetrated the market. A survey conducted between 20 September 2023 and 3 October 2023, among members of a cardiology website, identified edoxaban as the market leader with a 39.1% share, followed by apixaban (32.7%) and rivaroxaban (16.8%). The main competitor of edoxaban was warfarin, whereas that of rivaroxaban was apixaban. Decision tree analysis was conducted using InsighTCROSS®, highlighting the strengths and weaknesses of each anticoagulant, providing strategic approaches to exploit competitive weaknesses. For edoxaban, increased use was driven by elderly and poorly adherent patients; for apixaban, high-volume percutaneous coronary intervention centers; and for rivaroxaban, the influence of medical representative detailing. It is recommended to avoid markets where these drugs have a strong presence and to focus marketing activities on leveraging their specific strengths.

Conclusion: The findings suggest that digital marketing enhances product visibility and patient engagement, providing valuable insights into market behavior and consumer preferences.

Keywords

Digital marketing innovation, market-driven platform operation strategy, medical information support service

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Introduction

In Japan, among the industries under state intervention due to information asymmetry, the healthcare industry, known for its significant profitability, is heavily regulated. The Ministry of Health, Labour, and Welfare (MHLW) oversees this industry, which is dominated by companies

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specializing in pharmaceuticals and medical devices. According to MHLW data from January 2023, Japan has 181,138 medical facilities with over 300,000 affiliated physicians.[1,2] There are approximately 50,000 medical representatives (MRs) in the industry.[3] Given geographical constraints, the current number of MRs is insufficient for providing comprehensive information on pharmaceutical products to medical professionals nationwide.

Following the government's recommendation of generic drugs in 2000, major pharmaceutical companies have entered the generic drug market, actively increasing the number of MRs. However, physicians have limited time to meet MRs due to their daily practice, resulting in inefficient sales activities based on workforce tactics. The number of MRs continued to increase between 2000 (49,212) and 2010 (61,246). However, they failed to deliver adequate information on product safety and effectiveness in meetings that only lasted for a few minutes. Following its emergence in the 1990s, the Internet became a catalyst for resolving such challenges. The Internet provides consumers and companies with easy, low-cost access to all kinds of information worldwide. This has resulted in significant economic and social changes, with old industries declining and new ones emerging. Companies have found ways to address the issue of employing well-paid representatives who have failed to ensure that physicians are appropriately informed.[4] As such, new services have been developed to promote pharmaceutical and medical device safety and efficacy via the Internet, enabling physicians to obtain information 24 hours a day, 365 days a year. The companies that have developed such service platforms have created a business model that generates revenue by conveying information regarding pharmaceuticals and medical devices on the distributor's behalf. Through these platforms, physicians must register the personal information required, and sponsoring drug and medical device companies provide them with the necessary information. Since its development in the early 2000s, this business model has attracted significant attention.

The Japanese web-based medical information support service industry is dominated by market leader m3 with over 300,000 members,[5] followed by CareNet with over 220,000 members,[6] Nikkei Medical with over 200,000 members, and MedPeer with over 160,000 members.[7,8] In principle, these platforms provide medical news and information to physicians free of charge. They generate revenue by distributing and posting advertisement information leading to promoting the sponsoring company's pharmaceutical and medical devices. These platforms award points to members who read or watch the sponsored programs. These points can be exchanged for other points (e.g. Amazon). Hence, some members are said to visit the site to gain points. However, the key performance indicator (KPI) for sponsors' programs and article advertisements is the number of clicks. Sponsors are aware of the high level of viewing and browsing through the points-based system and have developed information websites to differentiate their content. However, creating content to continually attract physicians is challenging due to the strict regulation of promotional activities in Japan's healthcare industry.

Developing a business model to address industry challenges

In the current environment where web marketing KPI is based on the number of clicks, increasing this number is essential regardless of what physicians are interested in and to what extent they view it. Advertising and promotional activities are useful during a new product's introduction and growth stage. Priority is given to making the name of a drug or medical device known to many in the medical community, regardless of whether it involves clicks for points or sales. However, once industry awareness has been obtained and a product has reached the recognition growth stage, it is necessary to shift to promotional activities aimed at real users. When a product shifts from growth to maturity, budgets are drastically reduced and limited resources are invested in promotional activities. Therefore, from the growth to the maturity stage of a competitive market product, the KPI for web-based information service must shift from quantity (number of clicks) to quality (impressions). As such, this article proposes the "Market-driven Platform Operation Strategy (MPOS)" concept. Based on this concept, the objectives and platforms used for web marketing change with each product life cycle (Figure 1).

The increasing number of online platforms for disseminating medical information and the widespread adoption of these services by healthcare professionals highlight the evolving landscape of medical communication. Despite the number of users and the frequency of platform visits, there is a lack of in-depth analysis on how effectively these platforms convey critical information about pharmaceutical products' positioning and efficacy to physicians. Additionally, while the stringent regulations governing pharmaceutical promotions are well-documented, more research is needed to understand how these regulations affect the quality and reliability of the information provided through these online platforms. Furthermore, comparative studies evaluating the performance, user satisfaction, and outcomes associated with different medical information service platforms are noticeably scarce.

To address these identified gaps, InsighTCROSS® was developed as a support service for web marketing in the pharmaceutical and medical industries. This service is suitable for a product life cycle's growth to maturity stages according to MPOS. Therefore, the present study demonstrates its application in the Japanese cardiology pharmaceutical product market.
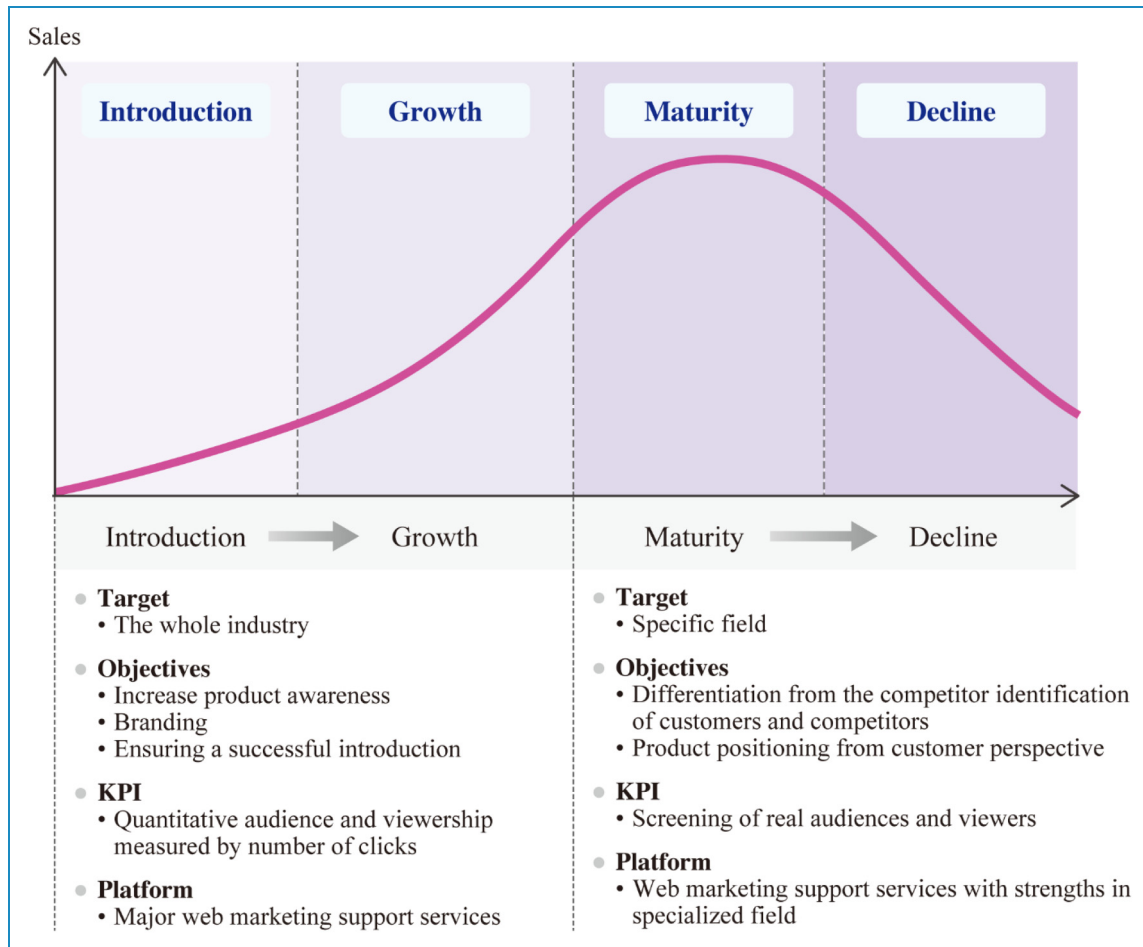
Figure 1. Market-driven platform operation strategy (MPOS). MPOS's concept involves using different web marketing platforms according to the product life cycle. During the introduction and growth phases, platforms that reach a broad audience are adopted to increase product awareness. Conversely, as the market transitions from the growth phase to the maturity phase, the user base becomes established, and the objective shifts from awareness to action. Therefore, it is desirable to conduct promotional activities using more specialized platforms. KPI: key performance indicator.

Methods

Model development and real-world application

Cardiology news site TCROSS NEWS divided InsighTCROSS®'s contents into 16 categories. This site surveys member access patterns and have continued delivering required information for physicians and medical professionals in the field of cardiology since 2020. Browsing logs were quantified and factor analysis was performed to identify insights based on member behaviors while stratifying members into five categories: (C1) percutaneous coronary intervention (PCI) cardiologists, (C2) general cardiologists, (C3) early adaptors, (C4) endovascular therapy (EVT) cardiologists, and (C5) ischemic heart disease (IHD) cardiologists.

Accounting for the largest proportion (24.8%), C1 showed a great interest in information on intravascular imaging, IHD, complex PCI, coronary flow reserve ratio, and acute coronary syndrome/chronic coronary syndrome. Based on these traits, the study defined C1 as "PCI cardiologists," a demographic interested in mastering the PCI technique. C2 was defined as "general cardiologists" (22.0%) due to their interest in research articles on cardiovascular disease, including hypertension, heart failure, arrhythmia, and structural heart disease. The third category was "early adaptors" (18.8%) due to their ability to seek information on domestic and international conference news and guidelines as quickly as possible. C4 was defined as "EVT cardiologists" (10.9%) based on seeking new information on peripheral vascular treatment and reacting to noncardiac information. Finally, C5, defined as "IHD cardiologists" (5.6%), was selected as an evolution of the "PCI cardiologist" due to their similar characteristics, including complex PCI. This group read or viewed international facility information and management-related articles and videos more frequently than the other groups. Table 1 shows that

these five strata accounted for 81.9% of the total, indicating a small number of other categories (18.1%).

InsighTCROSS® is a novel business model that qualitatively and quantitatively examines stratified persona images in three steps: (1) verifying product marketing promotion effectiveness, (2) identifying competitors from the consumers' perspective, and (3) developing marketing strategies to counter competition.

To demonstrate its usefulness, we present a series of InsighTCROSS® activities using direct oral anticoagulants (DOACs) as an example. The DOAC market was chosen for this study because it has reached maturity after a growth phase, 10 years following the introduction of the first DOAC in 2013. According to MPOS, InsighTCROSS® may be a suitable model for analyzing a pharmaceutical market transitioning from the growth to maturity phases. As of February 2024, only four DOACs are available in Japan, namely, apixaban, rivaroxaban, edoxaban, and dabigatran, which are used as alternative treatments to warfarin. Warfarin has been used over the past 40 years as a treatment for the prevention of cardiogenic stroke in patients with atrial fibrillation. All DOACs have been approved for stroke prevention in patients with nonvalvular atrial fibrillation, although each DOAC has other additional indications beyond stroke prevention.[9]

Step 1: Verifying product marketing promotion effectiveness

TCROSS NEWS reported an original project, "Event Suppression with Anticoagulation Therapy after Lower Limb Revascularization," between 22 August and 5 September 2022. Their nonsponsored article describes a series of clinical studies of rivaroxaban. The project resulted in an additional indication for preventing events after revascularization for lower limb occlusive atherosclerosis disease, and the article explains how the indication was reached. Stratifying the viewers of this article using InsighTCROSS® makes it possible to verify whether the company's promotional activities are reaching its target audience.

Step 2: Identifying competition from the consumers' perspective

The next step using InsighTCROSS® was surveying the site's members using the TCROSS NEWS survey system. The survey included approximately 3800 members who consented to receive the TCROSS NEWS e-newsletter over 14 days. It investigated internal factors such as the underlying disease and background of the patients treated by the respondents. The survey also included external factors such as the hospital situation; the sales, marketing activities, and market share of the pharmaceutical companies; and the respondents' attributes. Apixaban, rivaroxaban, and edoxaban were divided into higher-use and lower-use groups based on the respondents' usage to examine the use of competing drugs from their perspectives. The study performed logistic regression analysis, taking the internal and external factors as variables.

Step 3: Marketing strategy development

The final step of InsighTCROSS® was to develop a competition strategy. The current study conducted a decision tree analysis for the three DOACs with high and low use. We included the internal and external factors and respondents' attributes as variables.

Statistical analysis

Demographic data were summarized using descriptive statistics. A five-point scale was used to determine the selection frequency of drugs according to each patient background factor, and the proportion of drugs selected for patients with each factor was examined. Regarding each drug, the selection percentage obtained for each factor was summed up and the market share was estimated from the average value of the calculated selection rates. The proportion of anticoagulants selected for each patient's background factor was calculated and expressed as the frequency of selection for each drug. The study participants were divided into <10% (lower-use) and ≥10% (higher-use) groups based on the proportion of each anticoagulant selected. A logistic regression analysis was performed using the forced entry method, which allowed us to identify the factors influencing the selection of each drug by analyzing the relationship between the dependent (selection group) and independent (17 questions derived from selection criteria based on patient background and other factors) variables. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to determine the strength and significance of these associations, with the significance level set at <5%. In addition to logistic regression, a decision tree analysis was conducted to explore the factors influencing drug selection. Decision tree analysis is a nonparametric method that splits the dataset into branches based on certain decision rules derived from the independent variables, which helps identify the most important factors and their interactions that influence the selection of anticoagulant drug. The dependent variable was the selection group (<10% or ≥10%), and the independent ones were the same 17 questions used in the logistic regression. SPSS version 28.0 was used for all statistical analyses.

Ethical considerations

To ensure confidentiality, this study conducted an anonymous survey and statistically processed the data obtained.

Table 1. Five strata based upon the result generated by factor analysis.

Categories	Belief	Interests	Proportions
PCI cardiologists	• Cardiologists interested in pursuing PCI techniques	• Ischemic heart disease • Complex PCI • Fractional flow reserve-guided PCI • Intravascular ultrasound imaging • Acute coronary syndrome	24.8%
General cardiologists	• Medical doctors specialized in all aspects of cardiology	• Heart failure • Atrial fibrillation • Arrhythmia • Hypertension • Structure heart disease	22.0%
Early adaptors	• Cardiologists who are up to date with the latest information	• Medical conferences • Guidelines	18.8%
EVT cardiologists	• Cardiologists specialized in peripheral vascular disease	• Endovascular intervention	10.9%
IHD cardiologists	• Cardiologists interested in improving the quality of care and in the training of future generations	• Catheter laboratories in foreign countries • Domestic and international guidelines • Complex PCI	5.6%

EVT: endovascular therapy cardiologist; IHD: ischemic heart disease cardiologist; PCI: percutaneous coronary interventional cardiologist.

Table 2. Proportion of viewers by factor types.

Categories	Sample	Proportion
PCI cardiologists	46	20.6%
General cardiologists	15	6.7%
Early adaptors	55	24.7%
EVT cardiologists	80	35.9%
IHD cardiologists	27	12.1%
Total	223	100.0%

EVT: endovascular therapy cardiologist; IHD: ischemic heart disease cardiologist; PCI: percutaneous coronary interventional cardiologist.

The responses were not used for any purpose other than this survey, and no third party gained access to the data provided. Participants were informed that their responses would not affect their institutional affiliation. Submitting the web-based questionnaire responses was considered as providing informed consent. The consent process was explained on the survey form and was conducted in accordance with the TCROSS Co., Ltd Ethics Committee requirements. All authors had access to information that could identify individual participants during or after data collection. These terms and conditions were included in the survey form in accordance with the Ethics Committee's instruction. This study complied with the principles and requirements of the Declaration of Helsinki and was conducted following the approval of the Ethics Committee on 23 August 2023 (approval number 2023004).

Results

Outcome of verifying product marketing promotion effectiveness

Of the 223 physician members who viewed this article, EVT cardiologists accounted for 35.9% (Table 2). Therefore, the delivered article regarding rivaroxaban's additional indications interested EVT cardiologists and reached the target audience. Comparing the average for each persona type indicated that EVT cardiologists exhibited the most extended viewing times (Table 3). The study drew a Kaplan–Meier curve according to viewing time to find that EVT cardiologists viewed this article for the most extended period. The total viewing rate was confirmed to be over 60% (Figure 2). The finding suggests that EVT cardiologists routinely consider using rivaroxaban for patients after lower limb revascularization.

The results indicate that the marketing activities for rivaroxaban are recognized by the target market of

Table 3. Viewer data analysis of anticoagulation for event prevention after lower limb revascularization.

| Categories | Mean Estimate | Standard error | 95% Confidence interval | | p Value |
			Lower	Upper	
PCI cardiologists	164.696	14.756	135.773	193.618	0.045
General cardiologists	117	21.384	75.088	158.912	
Early adaptors	171.055	12.328	146.892	195.217	
EVT cardiologists	183.1	10.186	163.135	203.065	
IHD cardiologists	165.074	17.18	131.401	198.747	

EVT: endovascular therapy cardiologist; IHD: ischemic heart disease cardiologist; PCI: percutaneous coronary interventional cardiologist.
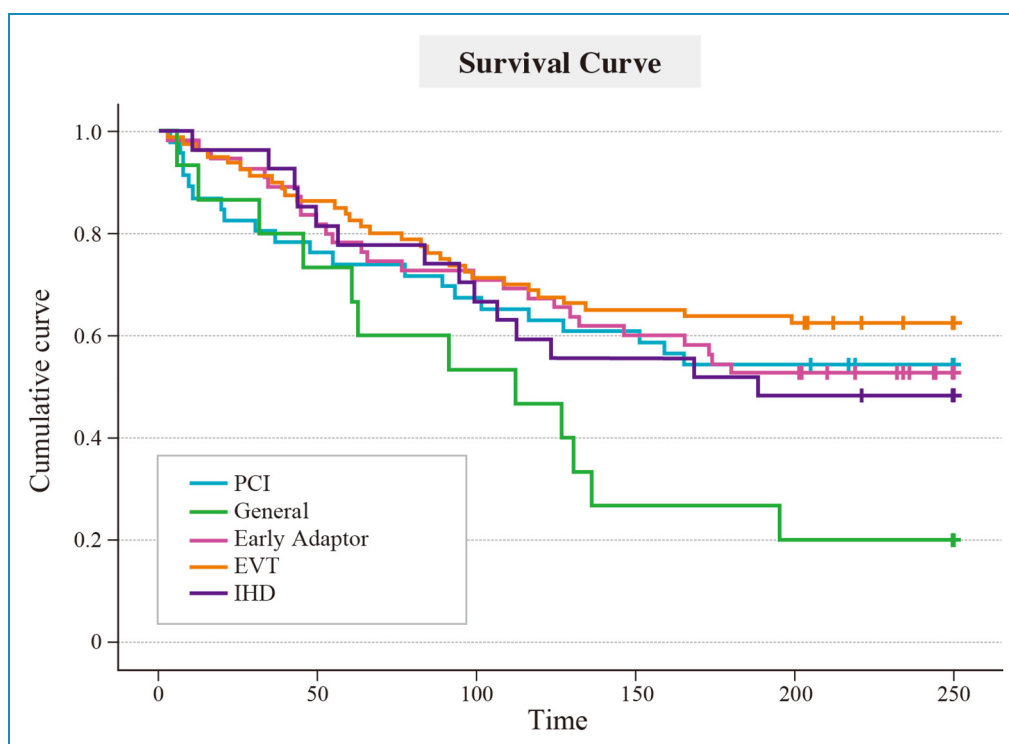
Figure 2. Article reviews by factor types. The Kaplan−Meier curve demonstrated that EVT cardiologists had longer viewing times compared to other groups, indicating their heightened interest in the articles they viewed. This suggests that the marketing strategies employed by the manufacturer of rivaroxaban have been effective. Consequently, informed decisions can now be made to transition into new markets. EVT: endovascular therapy cardiologist; IHD: ischemic heart disease cardiologist; PCI: percutaneous coronary interventional cardiologist.

cardiologists. Given that maximum benefits have been achieved in this target market, it is preferable to enter other markets rather than continuing to invest limited resources into the same market segment. Step 2 using InsighTCROSS® identified competitor markets from user perspectives and the strategies of other companies within the same market.

Outcomes identifying competition from the consumers' perspective

This study included medical professional members who had consented to receive the TCROSS NEWS e-newsletter from 20 September to 3 October 2023. The current market share was generated by InsighTCROSS® based on the survey

results of 172 respondents. The DOAC with the highest proportion of market share was edoxaban (39.1%), followed by apixaban (32.7%) and rivaroxaban (16.8%). Warfarin, a traditionally used anticoagulant, was fourth (8.5%). Based on the survey results, edoxaban was identified as the market leader, with the challengers being apixaban and rivaroxaban and warfarin representing the market niche. The study estimated the competition for each drug in the market.

Based on logistic regression analysis, the higher-use group of edoxaban had an OR of 2.42 for patients with adherence problems compared with the lower-use group ([95% CI 1.013–5.791], p = 0.047). Meanwhile, the higher-use group of apixaban had an OR of 1.87 compared with the lower-use group for patients with a clearly expected lifestyle ([95% CI 1.060–3.314], p = 0.031). The higher-use group of rivaroxaban an OR of 1.812 ([95% CI 1.072–3.061], p = 0.026) for information provided by the MR than the lower-use group. In other words, the findings suggest that respondents used different DOACs with clear criteria when selecting each drug.

Based on the above, the competitors and their marketing strategies for each drug can be understood. The market leader edoxaban's competitors were not apixaban or rivaroxaban but warfarin. Hence, warfarin is still the market choice due to cardiologists' familiarity with it, since it has been in the market for more than 40 years. In other words, the strategy for edoxaban should be to take the market share of warfarin to expand the DOAC market.

Outcomes identifying marketing strategy development

The final stage of InsighTCROSS® developed this strategy for adoption by the pharmaceutical companies of each drug. Similar to the results of logistic regression analysis,

edoxaban was used in 91.4% of patients where adherence was an issue, that is, physicians exhibiting a high use of the drug (≥10%) for patients at risk, such as older adults or patients with dementia as shown in Figure 3.

From another perspective, a large proportion of respondents with a high rate of using apixaban (84.6%) worked in facilities with more than 200 PCI cases per year. Furthermore, respondents who used rivaroxaban at a rate of more than 10% were shown to reach a usage rate of 64% through medical representative's sales activities. When the real competitor of the market leader (edoxaban) was defined as warfarin, the study analyzed the characteristics of cardiologists with a high usage of warfarin. The results confirmed that the higher-use group of warfarin had a higher mean age than the lower-use group (43.5 vs 49.6 years; p = 0.056) compared with other drugs. This indicates that older respondents accustomed to using warfarin have not been able to switch to DOACs. Therefore, edoxaban's strategy must be to strengthen its detailed activities to promote the convenience and benefit of DOACs to cardiologists in older age groups. Presenting evidence from clinical studies showing the drug's efficacy in older adults is also essential. Moreover, the company's strategy should involve promoting the fact that once-daily prescriptions are safer and easier to use than warfarin for elderly and underweight patients who often forget to take their medication.[10]

Furthermore, market challengers apixaban and rivaroxaban companies can pose strategies to maintain their respective areas of competence. Given that the former has a high usage rate in institutions with more than 200 PCI cases per year, the latter can identify and exploit the needs of cardiologists at those institutions. Rivaroxaban has increased sales performance by strengthening the detailing by MRs. As such, apixaban's strategy of strengthening MRs' detailing at hospitals other than those conducting more than 200
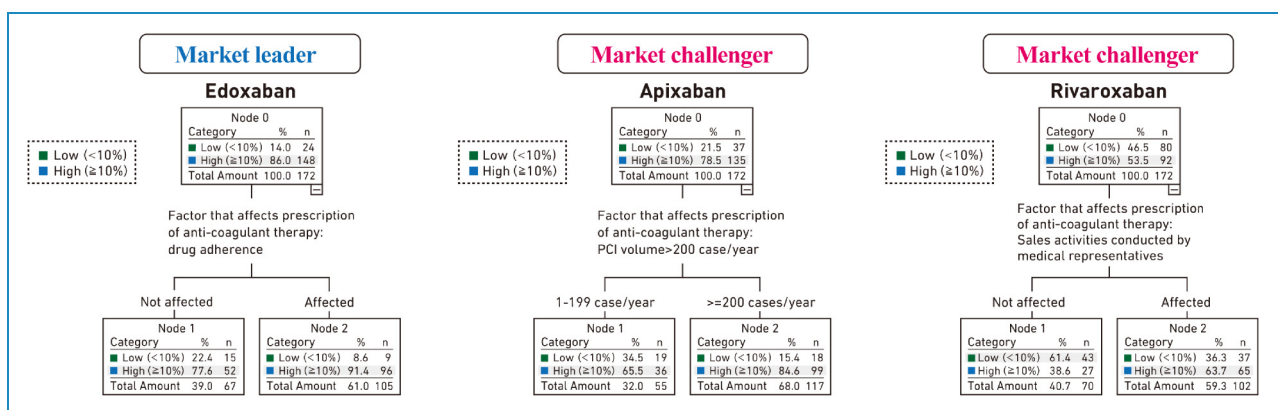

Figure 3. Decision tree determining DOAC prescription. Through decision tree analysis, the strengths of each drug were identified, enabling competitors to build their marketing strategies based on these strengths. Edoxaban, due to its once-daily low-dose prescription for the elderly, has a high prescription rate among patients with poor adherence. Apixaban shows a high prescription rate in hospitals with a high number of PCI procedures, while rivaroxaban's prescriptions are influenced by medical representative detailing. DOAC: direct oral anticoagulant; PCI: percutaneous coronary intervention.

PCIs per year is considered effective. In hospitals with high PCI case volumes, product choices will vary according to hospital circumstances. In contrast, the performance of individual MRs is relatively more effective in hospitals with low PCI case volumes. The clearer the user's thinking on drug choice, the clearer the strategy the company should take.

Discussion

InsighTCROSS® is a novel business model that supports the digital marketing activities of products related to pharmaceutical and medical device companies. It is a web marketing support service used during the growth and maturity stages based on MPOS. InsighTCROSS® identifies product positioning from the user's perspective. Simultaneously, it evaluates the marketing activities implemented by pharmaceutical and medical device companies to develop marketing strategies based on the positioning of other companies' products. The novelty of this model's stratified analysis method has been proven as a patent in Japan (No. 7418877). Several studies adopting methodology of this business model have been accepted in peer-reviewed journals, confirming its validity.[11–13] InsighTCROSS® uses machine learning algorithms, which have recently started to be utilized in the medical field. The objective is to enable devices to learn from past experiences and implement appropriate diagnoses and treatments. This methodology has the potential to displace work previously carried out by humans through accurate diagnosis and treatment.[14–18]

We have made further advancements to InsighTCROSS®. The latest model can successfully measure the probability that an individual is interested in or has used a particular product. Furthermore, InsighTCROSS® has a wide range of applications and is a valuable marketing business model. This study's findings can provide suggestions for marketing in healthcare organizations and reducing government healthcare costs. We plan to continue using InsighTCROSS® to conduct research on solving social problems in the future.

Limitations

The study conducted to verify the effectiveness of InsighTCROSS® has several limitations. First, the survey data collected from members of a cardiology website may not fully represent the entire market, limiting the generalizability of the findings. Second, the study results were based on an online survey rather than from real-world clinical practice. Third, the sample size of 172 participants is relatively small; hence, further studies with larger sample sizes may be required before definitive conclusions can be drawn. Finally, the questionnaires used in the survey were not validated through prior research. They were developed collaboratively with the authors including an experienced cardiologist. This lack of validation may affect the reliability and generalizability of the findings.

Conclusions

Despite the above limitations, the study indicates that InsighTCROSS® can be used to determine the strategies implemented by individual companies qualitatively and quantitatively. This methodology can segment individual drugs based on users' perspectives, enabling the formulation of repeatable strategies instead of relying on intuition and experience. InsighTCROSS® will be an effective tool for decision making in marketing strategies regarding leading pharmaceuticals and medical devices through the growth to maturity stages. This model has already been introduced in a Japanese commercial journal.[19] This research article introduces the effectiveness of the methodology to the international professional community. In the future, accumulating additional experience and data will allow for the application of InsighTCROSS® to other areas with greater certainty and accuracy.

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