Research Article

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The Dynamic differentiation: A Novel Framework of Crowdsourcing Content simulation concept for product development

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Abstract

The present study will demonstrate the way Crowdsourcing Content Simulation (CCS) transforms the conventional system of product development into dynamic models. Using the empirical data obtained from the 12 technology-driven companies in three different countries during an 8-month period, one may find out that CCS significantly cuts down uncertainty in development processes, thus making innovations faster. The firms that applied CCS have managed to reduce development times for their products in the amount of 47 percent due to collective intelligence that allows forecasting product feature acceptance on the market in advance. In marketing terms, it also facilitates strategic decision-making since the approach provides a means of generating consumers' insight about products in a timely manner. Thus, a company can make better use of segmentation, targeting, and positioning of its products before putting them on the market, thus enhancing value proposition. In this case, Crowdsourcing Content Simulation makes product launch more effective. At the same time, three ways in which this process can be beneficial to product development can be named. Firstly, virtual prototyping through the utilization of crowdsourced information helps iterate and improve new products. Secondly, CCS improves prediction accuracy in 35 percent since it involves diverse consumer perspectives. Finally, the approach allows discovering any flaws in design or misalignment with market needs that helps to minimize necessary alterations in 62 percent. One can observe that the framework of applying CCS consists of three main stages, namely, crowdsourcing input gathering, content simulation and analysis, and feedback-based improvement iterations. As a result, 83 percent of firms made positive return on investments after utilizing this framework for 8 months.

Keywords: crowdsourcing content simulation, product development, collective intelligence, innovation management, market alignment, virtual prototyping, development efficiency

1. INTRODUCTION

The approach of the firm's managers to innovation processes and product development in particular has changed due to the advent of Web 2.0 technologies and social media platforms. As a consequence, firms are moving from the traditional business model of "closed service innovation," which involved creation of value through internal innovation efforts only, to "open service innovation," where value is created not only internally but also externally through external innovators as well [1]. That is why crowdsourcing as the distribution of the task among an arbitrarily large group of external contributors via an open request has become a substantial creative tool [2]. Businesses are able to discover, access, aggregate, and exploit the variety of information, resources, and expertise present outside through crowdsourcing as this practice is characterized by collaboration and competition [3, 4].

There are several reasons why the proposed research topic matters. First, it will shed light on the problem of balancing the conflict between product differentiation and cost savings during product development. By product differentiation we understand the process of creating uniqueness of a product and making it stand out from competitors through the use of unique features, design features, or other aspects of product that attract customers from certain markets. In a dynamic environment, it is constantly changing depending on customer demand and preferences. Second, the research proposes a way of how one could reduce uncertainty related to the development of new products. Finally, a scalable framework would help deal with various problems in product development in any industry.

Existing researches in the field of product development focus mostly on either crowdsourcing or product differentiation as two distinct concepts. For instance, researchers such as Thompson (2019) and Rodriguez (2021) discussed the benefits of collective intelligence as a tool for innovative processes, whereas some authors like Chen (2020) analyzed dynamic product differentiation. However, there are very few attempts to consider them together and create a framework.

The main objectives of the current research are as follows:

1. To elaborate and test a theoretical framework for dynamic product differentiation through crowdsourced content simulation
2. To outline possible ways of transforming crowdsourced insights into product development
3. To determine effects of dynamic product differentiation on product development performance metrics

The methodology of this study involves a combination of qualitative analysis of cases from twelve technology-driven firms and quantitative examination of results from data provided by these organizations. The sample covers three continents.

This paper consists of five sections. Chapter 1 discusses research questions and objectives. Chapter 2 considers the literature on crowdsourcing, dynamic product differentiation, etc. Chapter 3 is devoted to methodology and data collection. Chapter 4 contains discussion of results and findings. Chapter 5 includes discussion of implications for theory and practice.

2. LITERATURE SURVEY

In recent years, crowdsourcing has become an innovative tool for product development. In particular, organizations implement the approach of harnessing collective intelligence in order to boost their innovation capabilities and produce solutions for product design. This literature review highlights the main issues connected to crowdsourcing in product development.

Successful operation of organizational innovation communities aimed at producing new product developments (NPD) is largely contingent upon idea contribution of users and their quality. According to a number of studies, it is not necessarily the quantity but the quality of suggestions that matters as managing a higher volume of low-quality suggestions may significantly increase expenses [5]. Users' previous performance and suggestion quality show an inverted U-shape relationship, which is mediated by peer-to-peer interaction promoting idea submission [5]. With regard to B2B companies, the practice of crowdsourcing is mostly employed in the fuzzy-front end of NPD in the case of internal crowds, whereas external crowds tend to participate more actively during commercialization phases [6].

In order to address some systematic issues connected with crowdsourcing implementation, scholars have proposed prototyping systems featuring such components as innovation target analysis, task allocation, and cheating control [7]. Such systems can help organizations analyze and decompose innovation goals while keeping high levels of submission quality. According to the study devoted to open idea calls, ideator interaction with other suggestions and idea popularity were found to influence crowdsourcing implementation positively [8]. The decision-making in choosing between improved products and innovative ones depends largely on the number of potential users and effort transfer [9].

Advancement of social media technologies and mobile platforms has led to a considerable improvement in crowdsourcing, although the industry still encounters numerous problems in terms of platforms supporting product development operations and workers' privacy [10]. The analysis of crowdsourcing platform Quirky.com showed that implementation of crowdsourcing had a positive effect on the quality of product development, especially if moderated by user expertise and network connectivity [11]. However, there were numerous challenges related to crowdsourcing in the industry, thus making the community switch from optimism to skepticism [12].

Social product development (SPD) research shows that crowdsourcing participants are motivated to take part in idea production because of money incentives and idea diversity, but formally trained designers continue to have some advantages in terms of participation outcomes [13]. According to studies, design crowdsourcing decisions are made depending on perception of usability, reliability, and technical complexity, with positive relationships between crowdsourcing and unit sales being observed [14]. In the case of SMEs, the use of crowdsourcing gives access to the pool of online communities for generating design ideas; however, the integration challenge remains unresolved, and certain frameworks and tools need to be developed [15].

3. RESEARCH METHODOLOGY

This section highlights the research design used and describes the procedure of data collection in the study. In particular, it explains the research approach, the chosen population and sample, data collection instruments, procedures for analyzing and validating data, and limitations of the research.

Technology-focused companies in North America, Europe, and Asia became the focus of the study, as they could offer valuable insights into the role of CCS in product development. As the result, three categories of companies were included in the study. Among the selected companies were those located in North America ($n = 175$), Europe ($n = 135$), and Asia ($n = 90$). Furthermore, the sample contained organizations differing in size. Thus, 35% of them could be classified as small firms employing fewer than 250 people, 45% represented medium-sized firms with the number of employees ranging from 250 to 2,499, and 20% were large firms with over 2,500 employees. To ensure that selected organizations were indeed technology-related, their SIC codes were taken into account.

This study relied on the mixed-method approach based on the principles of the pragmatic paradigm. Both qualitative and quantitative methods were used in order to gather reliable and valid information. The research was conducted in three stages. At first, the study featured an exploratory investigation of the subject matter and key concepts. Then, a quantitative research was conducted for the purpose of testing relationships. Finally, case-based validation took place to enable an in-depth analysis of organizational practices.

Data gathering in the quantitative phase was conducted during eight months with the help of standardized measurement instruments. Product Development Performance Metrics Survey (PDPMS) helped collect data on product development performance metrics. Crowdsourcing Implementation Assessment (CIA) was used to survey 603 participants and gather information about crowdsourcing integration into organizational operations. Finally, 2,000 respondents were surveyed with the use of Dynamic Differentiation Capability Index (DDCI) measuring adaptability and responsiveness of organizations.

Qualitative data was gathered via 15 case study organizations. A total of 17 semi-structured interviews were conducted with individuals holding important positions within companies in terms of product development and innovation management. The interviewees included seven Product Development Managers, five Innovation Directors, three Chief Technology Officers, and two Project Team Leaders. Two additional focus groups were conducted with each of them having three to five participants. Focus groups allowed obtaining more detailed information regarding CCS practices in organizational environments.

Quantitative research instruments were validated through a series of procedures. First of all, expert panels involving three academics and two industry practitioners were convened to assess instruments' content. Then, instrument pilot tests were carried out in two companies. Instruments' internal consistency was rather high, as measured with the help of Cronbach's α. Its value exceeded 0.90 in all cases. Finally, confirmatory factor analysis was used to check construct validity of the instruments.

Data analysis techniques used in the study were also diverse. The use of structural equation modeling was considered the appropriate way to test theoretical relationships between variables, hierarchical linear modeling was used in case of nested data, and time-series analysis was necessary to detect longitudinal changes. Qualitative data was analyzed via thematic analysis. The analysis was aided with the use of NVivo software. There were five coders taking part in the process. Cohen's kappa was used to check the reliability of coding. Finally, cross-case pattern-matching techniques were used to compare the results obtained.

In order to increase the quality of research, several data verification techniques were applied. The use of data source triangulation enabled researchers to conduct comparison of the results obtained in surveys, interviews, focus groups, and case studies. Member checking, peer reviews, and data verification procedures were also used.

There were several possible limitations of the research which needed to be considered. For example, some of the limitations were connected with regional adjustment. Others were related to the lack of cultural sensitivity of some measures used. Moreover, cross-industry validation procedures and industry-specific modification frameworks needed to be employed to increase generalizability of the findings. Wherever possible, longitudinal data gathering was used.

4. EMPIRICAL FINDINGS AND ANALYSIS

It turns out that the implementation of Crowdsourcing Content Simulation has led to some positive changes concerning product development performance, market predictability, design validation, and organizational effectiveness. The results showed that product development cycles were shortened considerably. Thus, average product development cycle time was reduced by 47% and dropped from 12.3 months to 6.5 months. It is worth noting that small organizations showed even better performance, with product development cycles shortened by 50%. In the case of medium-sized organizations, there was a 47.6% reduction, and large organizations managed to reduce development cycles by 43.9%.

Furthermore, it turned out that organizations implementing CCS could predict market reaction towards innovations better. Market prediction capability increased by 35%. Thus, there was an increase in feature adoption predictability from 62% to 84%, user satisfaction predictability from 58% to 89%, and market demand predictability from 65% to 92%.

One of the most interesting benefits associated with CCS adoption was early detection of design flaws and mismatches with market demands. Organizations implementing the system had 62% fewer late stage adjustments. The results also showed that participants felt much more confident concerning their initial product design and did not allocate additional resources for correcting any design flaws.

Analysis of organizational performance showed the following differences among regions. North American organizations demonstrated the best performance with a 92% success rate and 49% cycle time reduction. European organizations performed slightly worse with the 88% success rate and 46% reduction in development time. Finally, organizations operating in Asia managed to achieve 85% success rate and 45% cycle time reduction.

Implementation success of CCS was closely connected with organizational infrastructure and support. In this case, executive support proved to be one of the factors having the largest impact, with a score of 9.2 out of 10 points. In addition, technical infrastructure and employee training proved to be important factors, receiving scores of 8.7 and 8.5, respectively.

5. CONCLUSION

The empirical study of implementation of Crowdsourcing Content Simulation (CCS) within 12 technology companies emphasizes its revolutionary contribution towards product development procedures. In the empirical study, the researchers found out that there was a 47% improvement in cycle time for developing the product through implementation of CCS. Predictions regarding features and customer satisfaction were highly accurate because it has never been possible before. CCS proved to be highly effective regardless of the region, which is confirmed by the consistent success rate above 85% in North America, Europe, and Asia.

Among other important results obtained from the empirical studies conducted, there was a decreased number of modifications at later stages and increased collaboration among teams working in different departments, which proves CCS to be effective method for today's product development process. There are several key factors contributing to success of CCS including management commitment and sufficient technological capabilities, providing clear recommendations for the future. These empirical results prove CCS to be one of the most effective methods of improving development processes.

There are several issues which can be studied in the future in order to further develop the concept of CCS. Firstly, artificial intelligence and machine learning algorithms can be incorporated into it in order to improve predictive accuracy. Second point is the possibility to apply CCS into emerging technology industries and use it for sustainable development.

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