

**USER-GENERATED CONTENT AS CUSTOMER
CO-CREATION IN NEW PRODUCT DEVELOPMENT:
INSIGHTS FROM SOCIAL MEDIA ANALYSIS**

ASHISH KUMAR RATHORE



**DEPARTMENT OF MANAGEMENT STUDIES
INDIAN INSTITUTE OF TECHNOLOGY DELHI
OCTOBER 2018**

© Indian Institute of Technology Delhi (IITD), New Delhi, 2018

**USER-GENERATED CONTENT AS CUSTOMER
CO-CREATION IN NEW PRODUCT DEVELOPMENT:
INSIGHTS FROM SOCIAL MEDIA ANALYSIS**

by

ASHISH KUMAR RATHORE

Department of Management Studies

Submitted

in fulfillment of the requirements of the degree of Doctor of Philosophy

to the



INDIAN INSTITUTE OF TECHNOLOGY DELHI

OCTOBER 2018

CERTIFICATE

This is to certify that the thesis entitled ‘User-Generated Content as Customer Co-Creation in New Product Development: Insights from Social Media Analysis’ being submitted by ***Ashish Kumar Rathore*** to the Indian Institute of Technology Delhi for the award of the degree of **Doctor of Philosophy (Ph.D.)**, is a record of bona fide research work carried out by him. He has worked under my guidance and supervision and fulfilled the requirements for the submission of the thesis, which has attained the standard required for a Ph.D. degree of the Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

(Prof. P. Vigneswara Ilavarasan)

Research Supervisor

Associate Professor

Department of Management Studies

Indian Institute of Technology Delhi

ACKNOWLEDGEMENTS

I state my heartiest gratefulness to my thesis supervisor, **Prof. P. Vigneswara Ilavarasan**, whose incessant and unconditional support, and right direction has helped me on every stage of my PhD journey. I consider it as a privilege to accomplish my doctoral research under his supervision. Whenever I needed guidance for my research work, he has always assured his availability despite his busy schedules. Apart from research and professional guidance, by sharing his personal experiences, he has also helped me develop a positive attitude towards balancing personal life aspects including health. All the hurdles during my PhD journey were easily handled in a meaningful way with his support.

I am grateful to **Prof. M. P. Gupta**, the Chairperson of the ‘Student Research Committee’ for his valuable suggestions for my research work. I also sincerely thank **Prof. P. M. Pandey** and **Prof. J. Madaan**, members of the ‘Student Research Committee’, for their support during my research journey. The faculty members of the Institute have been very kind to extend their help whenever I approached them at various stages of my PhD, and I do hereby acknowledge all of them. I thank **Prof. Arpan Kumar Kar** for his valuable suggestions and concise comments on some of my research papers. **Prof. Sushil**, and **Prof. S. P. Singh** have extended their support in understanding the Post-PhD career and I thank them for their suggestions.

I cannot forget my fellow research colleagues including Dr. Abhishek Narain Singh, Dr. Amit Kumar Srivastava, Dr. Megha Gupta, Dr. Sudha Vemaraju, Dr. Dhanya Jyothimani, Ms. Akriti Jain, Ms. Anushruti Vagrani, Mr. Ravi Shankar Giri, Mr. Rohit Rathod, Mr. Ankit Goel who provided their personal support and valuable inputs throughout my research journey. I am also grateful to Mr. Aonghus McGovern who was very kind and supported me a lot on

the task of data collection and data analysis. I also thank the office staff of Department of Management Studies for their assistance and cooperation.

I owe a lot to my parents, who encouraged and helped me at every stage of my personal and academic life and longed to see this achievement come true. Above all, I owe it all to Almighty God for granting me the wisdom, health and strength to undertake this research task and enabling me to its completion.

New Delhi

(Ashish Kumar Rathore)

Abstract

The present thesis explores whether the user-generated content (UGC) can be used as customer co-creation in the product design and innovation. Social media offers an innovative approach for users to enhance their value and capability by interacting with businesses and others. Earlier research has explained the role of UGC as a type of customer-to-customer communication that enhances product promotion. Integrating social media with customer co-creation provides an efficient platform of user engagement for new product development with a natural extension of the co-creation process. As this area of research is relatively new, the extant literature on UGC as customer co-creation is limited.

A combination of various text mining, sentiment analysis, and network analysis techniques is adopted to examine the datasets to gain insights into users' social media activities, influence, and sentiments. These methods are effective in identifying influential online users, and in understanding users' sentiments about specific product's aspects to discover potential issues or problems. RStudio and NodeXL are the analytical tools used for extracting, analyzing, and visualizing the data in this research.

Findings highlight how users actually relate and view their experiences with the new product and how impressions are constantly evolving. Ideation explores users' preferences in characterizing various product-related aspects about the same product brand and discussion of earlier existing products. Sentiment analysis highlights the collective emotional state of existing and potential users. It has been observed that 'anger' and 'anticipation' are two primary emotions users experience during pre-launch duration of the new product. With proper user engagement based on accurate sentiments, a new product can be converted into a successful product. This research suggests that users' emotions should be monitored to make the product more engaged. Community and influencer analysis obliges businesses (especially product manufacturers) to extend their information capabilities by improving the quality and timeliness for influence and attention. Influencer contents can serve as customer touch-points for commutative information.

This research provides an effective approach for identifying product-related aspects with links for both businesses and individual users. It provides communication quality for customer co-creation using information of user activities. For an in-depth understanding of product performance, a systematic approach can be developed in future work to characterize various product-related variables for a predictive optimization model for social network size.

सार

वर्तमान थीसिस यह पता लगाता है कि उपयोगकर्ता द्वारा जेनरेट की गई सामग्री (यूजीसी) को उत्पाद डिज़ाइन और नवाचार में ग्राहक सह-निर्माण के रूप में उपयोग किया जा सकता है या नहीं। सोशल मीडिया व्यवसायों और दूसरों के साथ बातचीत करके उपयोगकर्ताओं के लिए अपना मूल्य और क्षमता बढ़ाने के लिए एक अभिनव दृष्टिकोण प्रदान करता है। पहले के शोध ने यूजीसी की भूमिका को ग्राहक-से-ग्राहक संचार के रूप में समझाया है जो उत्पाद संवर्धन को बढ़ाता है। ग्राहक सह-निर्माण के साथ सोशल मीडिया को एकीकृत करना सह-निर्माण प्रक्रिया के प्राकृतिक विस्तार के साथ नए उत्पाद विकास के लिए उपयोगकर्ता सगाई का एक कुशल मंच प्रदान करता है। चूंकि शोध का यह क्षेत्र अपेक्षाकृत नया है, यूजीसी पर मौजूदा साहित्य ग्राहक सह-निर्माण के रूप में सीमित है।

उपयोगकर्ताओं के सोशल मीडिया गतिविधियों, प्रभाव और भावनाओं में अंतर्दृष्टि प्राप्त करने के लिए डेटासेट की जांच करने के लिए विभिन्न टेक्स्ट खनन, भावना विश्लेषण, और नेटवर्क विश्लेषण तकनीकों का संयोजन अपनाया जाता है। ये विधियां प्रभावशाली ऑनलाइन उपयोगकर्ताओं की पहचान करने और संभावित समस्याओं या समस्याओं को खोजने के लिए विशिष्ट उत्पाद के पहलुओं के बारे में उपयोगकर्ताओं की भावनाओं को समझने में प्रभावी हैं। RStudio और NodeXL विश्लेषणात्मक उपकरण हैं जो इस शोध में डेटा निकालने, विश्लेषण करने और विज़ुअलाइज़ करने के लिए उपयोग किए जाते हैं।

निष्कर्ष बताते हैं कि उपयोगकर्ता वास्तव में नए उत्पादों के साथ अपने अनुभवों को कैसे देखते हैं और देखते हैं और इंप्रेशन लगातार कैसे विकसित होते हैं। विचार एक ही उत्पाद ब्रांड और पहले के मौजूदा उत्पादों की चर्चा के बारे में विभिन्न उत्पाद-संबंधी पहलुओं को दर्शाने में उपयोगकर्ताओं की प्राथमिकताओं की पड़ताल करता है। भावना विश्लेषण मौजूदा और संभावित उपयोगकर्ताओं की सामूहिक भावनात्मक स्थिति पर प्रकाश डाला गया है। यह देखा गया है कि 'क्रोध' और 'प्रत्याशा' दो प्राथमिक भावनाएं हैं जो उपयोगकर्ता नए उत्पाद की प्री-लॉन्च अवधि के दौरान अनुभव करते हैं। सटीक भावनाओं के आधार पर उचित उपयोगकर्ता सगाई के साथ, एक नया उत्पाद एक सफल उत्पाद में परिवर्तित किया जा सकता है। इस शोध से पता चलता है कि उत्पाद को अधिक व्यस्त बनाने के लिए उपयोगकर्ताओं की भावनाओं पर नज़र रखी जानी चाहिए। सामुदायिक और प्रभावक विश्लेषण व्यापार और विशेष रूप से उत्पाद निर्माताओं को प्रभाव और ध्यान के लिए गुणवत्ता और समयबद्धता में सुधार करके अपनी सूचना क्षमताओं का विस्तार करने के लिए बाध्य करता है। इन्फ्लूएंसर सामग्री कम्प्यूटेटिव जानकारी के लिए ग्राहक टच-पॉइंट के रूप में काम कर सकती है।

यह शोध दोनों व्यवसायों और व्यक्तिगत उपयोगकर्ताओं के लिए लिंक के साथ उत्पाद से संबंधित पहलुओं की पहचान के लिए एक प्रभावी दृष्टिकोण प्रदान करता है। यह उपयोगकर्ता गतिविधियों की जानकारी का उपयोग कर ग्राहक सह निर्माण के लिए संचार गुणवत्ता प्रदान करता है। उत्पाद प्रदर्शन की गहराई से समझने के लिए, सामाजिक नेटवर्क आकार के लिए भविष्यवाणी अनुकूलन मॉडल के लिए विभिन्न उत्पाद-संबंधित चरों को दर्शाने के लिए भविष्य में काम में एक व्यवस्थित दृष्टिकोण विकसित किया जा सकता है।

CONTENTS

<i>Certificate</i>	i
<i>Acknowledgements</i>	ii
<i>Abstract</i>	iv
<i>Contents</i>	vi
<i>List of Tables</i>	ix
<i>List of Figures</i>	x
<i>List of Abbreviations</i>	xiv
CHAPTER 1	1
INTRODUCTION	1
1.1 Thesis Structure	5
CHAPTER 2	7
LITERATURE REVIEW	7
2.1 Social Media	7
2.2 SM Platforms	10
2.2.1 Using SM for Business	12
2.3 New Product Development	14
2.3.1 Product Feature Selection.....	15
2.4 Importance of Customer in NPD	17
2.4.1 Customer Value	17
2.4.2 Self-Construal	18
2.5 Current Approaches to NPD.....	19
2.5.1 Co-Creation	19
2.6 SM in NPD	22
2.6.1 Use of SM for Customer Co-Creation	24
2.7 SM Analytics	27
2.7.1 SMA as a BI Practice	28

2.8	Gaps in Literature	29
CHAPTER 3		34
CASE STUDIES		34
3.1	Case Product 1: Domino's Exotic Italian Pizza.....	35
3.2	Case Product 2: Hyundai Creta	38
3.3	Case Product 3: Samsung Galaxy S6.....	41
CHAPTER 4		45
METHODOLOGY.....		45
4.1	Background.....	45
4.2	Data Collection and Analysis	48
4.2.1	Data Pre-Processing.....	49
4.2.2	Data Analysis.....	51
4.2.3	Data Visualization/Interpretation.....	60
CHAPTER 5		67
IDEATION		67
5.1	Domino's Exotic Italian Pizza.....	67
5.2	Hyundai Creta.....	83
5.3	Samsung Galaxy S6	95
5.4	Summary	108
CHAPTER 6		114
SENTIMENT ANALYSIS.....		114
6.1	Domino's Exotic Italian Pizza.....	114
6.2	Hyundai Creta.....	122
6.3	Samsung Galaxy S6	128
6.4	Summary	133
CHAPTER 7		137
COMMUNITY AND INFLUENCERS		137
7.1	Domino's Exotic Italian Pizza.....	138
7.1.1	Influencing Measures Based on Content Quality	138
7.1.2	Influencing Measures Based on Relationships.....	144
7.2	Hyundai Creta.....	150
7.2.1	Influencing Measures Based on Content Quality	150
7.2.2	Influencing Measures Based on Relationships.....	155

7.3	Samsung Galaxy S6	161
7.3.1	Influencing Measures Based on Content Quality	161
7.3.2	Influencing Measures Based on Relationships.....	166
7.4	Summary	171
CHAPTER 8		175
DISCUSSION, IMPLICATIONS & FUTURE DIRECTIONS		175
8.1	Limitations & Future Directions.....	183

LIST OF TABLES

Table 1 Diverse Nature of the Usage of Traditional Media and Social Media in Businesses	8
Table 2 Various Data Analysis Techniques.....	46
Table 3 Tweet Datasets with Time Periods for All Three Case Products	50
Table 4 Details of Network Metrics	63
Table 5 Comparative findings of ideation theme for Domino's Exotic Italian Pizza	82
Table 6 Comparative findings of ideation theme for Hyundai Creta	95
Table 7 Comparative findings of ideation theme for Samsung Galaxy S6	107
Table 8 Top influencers based on degree centrality for Domino's pizza.....	144
Table 9 Top influencers based on betweenness centrality for Domino's pizza	145
Table 10 User ranks based on closeness centrality for Domino's pizza	146
Table 11 Comparison of various graph metrics of pre- and post-launch durations of Domino's pizza	147
Table 12 Community-wise pre-launch and post-launch influencers of Domino's pizza...	149
Table 13 Characteristics of largest community in network of Domino's pizza	150
Table 14 Top influencers based on degree centrality for Hyundai Creta.....	155
Table 15 Top influencers based on betweenness centrality for Hyundai Creta.....	156
Table 16 User ranks based on closeness centrality for Hyundai Creta	156
Table 17 Comparison of various graph metrics of pre and post-launch durations for Hyundai Creta	157
Table 18 Community-wise pre-launch and post-launch influencers for Hyundai Creta...	159
Table 19 Characteristics of largest community in network of Hyundai Creta	160
Table 20 Top influencers based on degree centrality for Samsung Galaxy S6	166
Table 21 Top influencers based on betweenness centrality for Samsung Galaxy S6	166
Table 22 User ranks based on closeness centrality for Samsung Galaxy S6.....	167
Table 23 Comparison of various graph metrics of pre and post-launch durations for Samsung Galaxy S6.....	168
Table 24 Community-wise pre-launch and post-launch influencers for Samsung Galaxy S6	169
Table 25 Characteristics of largest community in network of Samsung Galaxy S6.....	170

LIST OF FIGURES

Figure 1. Social media users. Adapted from Statista (2017).	9
Figure 2. Social network user penetration worldwide. Adapted from eMarketer (2013).	9
Figure 3. Two approaches to driving value through design (adapted from Noble & Kumar, 2008).....	15
Figure 4. A framework for user's motivation factors and co-creation phases.....	21
Figure 5. Roadmap for UGC as co-creation using in new product development.	29
Figure 6. Growth rate of Domino's in market share among its competitors (source: Jubilant Food Works, 2016).....	36
Figure 7. Hyundai market share percentage over the years (source: Business Standard, 2014).....	39
Figure 8. Samsung market share among its competitors (source: IDC Worldwide, 2016).	42
Figure 9. Data mining process for social media content.	48
Figure 10. An example of Fruchterman–Reingold layout grouping in social network.....	62
Figure 11. Methodological approaches.....	66
Figure 12. Word cloud in pre-launch for Domino's Exotic Italian Pizza.....	68
Figure 13. Frequency distribution in pre-launch for Domino's Exotic Italian Pizza.	69
Figure 14. Word clustering in pre-launch for Domino's Exotic Italian Pizza.	70
Figure 15. Word association in pre-launch for Domino's Exotic Italian Pizza.	70
Figure 16. Word leveling in pre-launch for Domino's Exotic Italian Pizza.....	72
Figure 17. Word leveling with weights in pre-launch for Domino's Exotic Italian Pizza. .	73
Figure 18. Word network clustering with weights in pre-launch for Domino's Exotic Italian Pizza.....	74
Figure 19. Word cloud in post-launch for Domino's Exotic Italian Pizza.	76
Figure 20. Word frequency distribution in post-launch for Domino's Exotic Italian Pizza.	76
Figure 21. Word clustering in post-launch for Domino's Exotic Italian Pizza.....	77
Figure 22. Word association in post-launch for Domino's Exotic Italian Pizza.....	78
Figure 23. Word leveling in post-launch for Domino's Exotic Italian Pizza.	79
Figure 24. Word leveling with weights in post-launch for Domino's Exotic Italian Pizza.	80
Figure 25. Word network clustering in post-launch for Domino's Exotic Italian Pizza.	81
Figure 26. Word cloud in pre-launch for Hyundai Creta.....	83
Figure 27. Word frequency distribution in pre-launch for Hyundai Creta.	84
Figure 28. Word clustering in pre-launch for Hyundai Creta.	85

Figure 29. Word association in pre-launch for Hyundai Creta.	86
Figure 30. Word leveling with weights in pre-launch for Hyundai Creta.	87
Figure 31. Word network clustering in pre-launch for Hyundai Creta.	88
Figure 32. Word cloud in post-launch for Hyundai Creta.	90
Figure 33. Word frequency distribution in post-launch for Hyundai Creta.....	90
Figure 34. Word clustering in post-launch for Hyundai Creta.	91
Figure 35. Word association in post-launch for Hyundai Creta.....	92
Figure 36. Word leveling with weights in post-launch for Hyundai Creta.....	93
Figure 37. Word network clustering in post-launch for Hyundai Creta.....	94
Figure 38. Word cloud in pre-launch for Samsung Galaxy S6.	96
Figure 39. Word frequency distribution in pre-launch for Samsung Galaxy S6.	97
Figure 40. Word clustering in pre-launch for Samsung Galaxy S6.	97
Figure 41. Word association in pre-launch for Samsung Galaxy S6.	98
Figure 42. Word leveling with weights in pre-launch for Samsung Galaxy S6.	99
Figure 43. Word network clustering in pre-launch for Samsung Galaxy S6.....	100
Figure 44. Word cloud in post-launch for Samsung Galaxy S6.	102
Figure 45. Word frequency distribution in post-launch for Samsung Galaxy S6.....	102
Figure 46. Word clustering in post-launch for Samsung Galaxy S6.....	103
Figure 47. Word association in post-launch for Samsung Galaxy S6.	104
Figure 48. Word leveling with weights in post-launch for Samsung Galaxy S6.....	105
Figure 49. Word network clustering in post-launch for Samsung Galaxy S6.	106
Figure 50. Sentiment polarity in pre-launch for Domino's Exotic Italian Pizza.	115
Figure 51. Emotion classification in pre-launch for Domino's Exotic Italian Pizza.	116
Figure 52. Word categorization based on emotion scores in pre-launch for Domino's Exotic Italian Pizza.	117
Figure 53. Sentiment polarity in post-launch for Domino's Exotic Italian Pizza.....	118
Figure 54. Emotion classification in post-launch for Domino's Exotic Italian Pizza.....	119
Figure 55. Word categorization based on emotion scores in post-launch for Domino's Exotic Italian Pizza.....	120
Figure 56. Time series analysis for sentiment polarity.....	121
Figure 57. Time series analysis of emotions.....	122
Figure 58. Emotion classification in pre-launch for Hyundai Creta.	123
Figure 59. Word categorization based on emotion scores in pre-launch for Hyundai Creta.	124

Figure 60. Emotion classification in post-launch for Hyundai Creta.....	125
Figure 61. Word categorization based on emotion scores in post-launch for Hyundai Creta.	126
Figure 62. Time series analysis for sentiment polarity.....	127
Figure 63. Time series analysis of emotions.....	127
Figure 64. Emotion classification in pre-launch for Hyundai Creta.	128
Figure 65. Word categorization based on emotion scores in pre-launch for Hyundai Creta.	129
Figure 66. Emotion classification in post-launch for Samsung Galaxy S6.	130
Figure 67. Word categorization based on emotion scores in post-launch for Samsung Galaxy S6.....	131
Figure 68. Time series analysis for sentiment polarity.....	132
Figure 69. Time series analysis of emotions.....	133
Figure 70. Tweet counts per user in pre-launch duration for Domino's Exotic Italian Pizza.	138
Figure 71. Tweet counts per user in post-launch duration for Domino's Exotic Italian Pizza.	138
Figure 72. Retweet counts per user in pre-launch duration for Domino's Exotic Italian Pizza.....	139
Figure 73. Retweet counts per user in post-launch duration for Domino's Exotic Italian Pizza.....	139
Figure 74. Reply counts per user in pre-launch duration for Domino's Exotic Italian Pizza.	140
Figure 75. Reply counts per user in post-launch duration for Domino's Exotic Italian Pizza.	141
Figure 76. URL counts in pre-launch duration for Dominos Exotic Italian Pizza.....	141
Figure 77. URL counts in post-launch duration for Domino's Exotic Italian Pizza.....	142
Figure 78. Comparative analysis of all three influential measures in pre-launch.	142
Figure 79. Comparative analysis of all three influential measures in post-launch.	143
Figure 80. Ratio of retweets to tweets per user in pre-launch duration for Dominos Exotic Italian Pizza.....	143
Figure 81. Ratio of retweets to tweets per user in post-launch duration for Domino's Exotic Italian Pizza.....	144
Figure 82. Various communities in pre-launch duration.	148
Figure 83. Various communities in post-launch duration.....	148
Figure 84. Tweet counts per user in pre-launch duration for Hyundai Creta.	150

Figure 85. Tweet counts per user in post-launch duration for Hyundai Creta.....	151
Figure 86. Retweet counts per user in post-launch duration for Hyundai Creta.....	152
Figure 87. Retweet counts per user in post-launch duration for Hyundai Creta.....	152
Figure 88. Reply counts per user in pre-launch duration for Hyundai Creta.....	152
Figure 89. Reply counts per user in post-launch duration for Hyundai Creta.	153
Figure 90. URL counts in pre-launch duration for Hyundai Creta.	153
Figure 91. URL counts in post-launch duration for Hyundai Creta.....	154
Figure 92. Various communities in pre-launch duration.	158
Figure 93. Various communities in post-launch duration.....	159
Figure 94. Tweet counts per user in pre-launch duration for Samsung Galaxy S6.....	161
Figure 95. Tweet counts per user in post-launch duration for Samsung Galaxy S6.	162
Figure 96. Retweet counts per user in pre-launch duration for Samsung Galaxy S6.....	162
Figure 97. Retweet counts per user in post-launch duration for Samsung Galaxy S6.	163
Figure 98. Reply counts per user in pre-launch duration for Samsung Galaxy S6.....	163
Figure 99. Reply counts per user in post-launch duration for Samsung Galaxy S6.	164
Figure 100. URL counts in pre-launch duration for Samsung Galaxy S6.....	164
Figure 101. URL counts in post-launch duration for Samsung Galaxy S6.	165
Figure 102. Various communities in pre-launch duration.	169
Figure 103. Various communities in post-launch duration.....	169

LIST OF ABBREVIATIONS

API	Application Programming Interface
BI	Business Intelligence
CSV	Comma-Separated Values
EDCOW	Event Detection with Clustering of Wavelet-Based Signals
EM-LDA	Expectation Maximization
FR	Fruchterman–Reingold
HMIL	Hyundai Motor India Limited
IDC	International Data Corporation
KL	Kullback-Leibler
LARA	Latent Aspect Rating Analysis
LDA	Latent Dirichlet Allocation
NLP	Natural Language Processing,
NPD	New Product Development
ODT	Optimal Distinctiveness Theory
PMI-IR	Pointwise Mutual Information-Information Retrieval
RNR	Reviews and Rating
SM	Social Media
SMA	Social Media Analytics
SUV	Sport-Utility Vehicle
SVM	Support Vector Machine
TPB	Theory of Planned Behaviour
UGC	User-Generated Content
URL	Uniform Resource Locator