Proceedings of the 5th NA International Conference on Industrial Engineering and Operations Management
Detroit, Michigan, USA, August 10 - 14, 2020

Study on the effect of user-generated content in social media on the process of product development: How to make user-generated content into a new product concept

Mohamadreza Azar Nasrabadi
Mechanical department
École de technologie supérieure (ÉTS)
Montreal, Canada
mohamadreza.azar-nasrabadi.1@ens.etsmtl.ca

Yvan Beauregard
Mechanical department.
École de technologie supérieure (ÉTS)
Montreal, Canada
yvan.beauregard@etsmtl.ca

Abstract

Digital community platforms, full of user views and suggestions, are a potential resource for developing innovative and useful ideas to enhance innovation skills. firms need to monitor and interpret reviews online periodically to enhance their internal analyses and design activities. For the end, a framework is suggested applying a computer science approach to systematically analyze the content of online thoughts and feedback on specific objects, using a web lexicon set up for this purpose.

Key words—*Social Media, Data Analysis, User- Generated Content, Product Development, Content Analysis,*

1. INTRODUCTION

Social media is defined as a strong platform for having cooperative communications with companies. The way communication between businesses and customers is performed many changes (Dahan and Hauser 2002). It gives different opportunities to businesses such as continuing their interaction with customers in the virtual world and they can also use their customer's opinion in their activities (Bartl and Fuller 2012, Sawhney and Prandelli 2000). This virtual interaction helps businesses to improve the customer engagement and they can extent and find their potential customers (Chen et al.2009). It also gives an opportunity to customers to change their role from passive participants to active participants in the process of product development (Rathore et al.2016).

Today more than ever, customers have more inclinations to share their opinion in social media platforms than attending a group discussion or survey (Li et al.2014). So, the increasing rate of using social media brings different advantages. Through analyzing contents generated by users, businesses can get valuable information concerning their products and customer's insight so that they can improve their product features that lead them into flourishing (Allan 2005). Therefore, the product design process has been shifted from traditional methods to user-centered design method because of its more effective

design that will be created by integrating users' opinion [Helander and Khalid 2006). Chan and Ip in their studies have found that product features, customer needs and customer satisfaction are affected by such shift in the product development process. They also explain that product attributes have profound effect on customer opinion and past experience that affect buying behavior. it discussed that the achievement of any product heavily relies on how it is linked to user's emotions that has a direct relation with users' requirements and satisfaction levels. Customer needs and satisfaction have been indicated to produce value for business (Chan and Ip 2011). Diffusion of such positive data concerning a company or business among customers can help motivate a strong market demand (Seva et al.2007). As a result, it is proposed that businesses ought to integrate social media applications into their business operations in the competitive market landscape (Curan and Lennon 2011).

Early identification by customer input of new or attractive product prospects are considered the first and most significant factor in product creation or product improvement (Krippendorff 2011) .In addition, Early recognition of such benefits allows companies to create a better and personalized connection which cannot be easily traced by rival to the company's strategic place in the value chain (Park and Yoon 2005). Thus, in order to improve product design and development, engineers and managers need a comprehensive process for collecting and analyzing this information efficiently to understand customer thoughts and feelings about goods.

2. Background

2.1. Social media

As the customer needs becomes more essential and as customer satisfaction reduces, the potential for value creation increases (Yen et al.2007). As a result of this reason, businesses are moving from traditional form of media to social media, blogs, wikis and so on (Hutton and Fosdick 2011). This technology provides many interactive work chances for businesses in different ways. Businesses can have contact along the day with their customers that has a beneficial effect on their relationship (Abed et al.2015, Dwivedi et al.2015). Further, users of social media can search information in any subject and create many different ideas about a product or services. For example, 42 percent of people who have access to the internet use social media as a source to gather information about health issue in U.S. (P. Martı´nez et al.2015).

Social media is also a network tool to make a new communication, generate useful content about any subject, real-time feedback and online opinion (Rodriguez et al.2012). It gives an opportunity to social customer to gain a strong voice and believe that they communicate with the companies they prefer to buy from (Greenberg 2010). Social media is a reliable source about product and service that is created by users (Curran and Lennon 2011). In addition, it is a major contributing factor in influencing user's opinion, their decision purchasing behavior, awareness (Chang 2008).

Businesses can create chances such as developing new markets, customer engagement, and creating ideas for customer behavior and trends (He and Yan 2014). They can also improve their strategies based on the user's information and diminish the product failure risk (Abamovici and Linder 2011, Decker and Trusov 2010). Barclays Bank, for example, has incorporated multiple social media applications to connect with clients, react interactively to their requirements and improve the overall business performance (Setia et al.2013). In today's competitive market environment, it is discussed that data performs as a principal source of competitive advantage.

To remain competitive, firms must always be aware of new, vital and beneficial data which are outside the companies and incorporate that information into their processes of value creation (Jansen et al.2005). There are two reasons to consider customer information as a competitive tool: first, an accurate understanding of customer expectations and behaviors allows firms to suggest products to their customers considered of supreme value (Garcia-Murillo and Annabi 2002). second, competitors will find it difficult to emulate, as potential customer knowledge is elusive (Salojarvi and Sainio 2006).

2.2. User-generated content

Contents generated by ordinary people in a valuable and engaging way on the web are defined UGC. The utilization of UGC has experienced a dramatic increase in recent years because of its reasonable price to obtain (John Krumm et al.2008). It is working like common word-of-mouth with exception of that it spreads contribution through an inline medium (Manap and Adzharudin 2013). Further, it is generated outside of the firm or business (Kaplan et al.2010, OECD 2007). It can be a positive or a negative statement that is shared by potential, genuine, or previous client about a yield or an organization which is accessible to host of individual and institutions by the means of the web.

2.3. Using UGC in identifying customer insight

In order to identify customer insight, a significant number of methods have been promoted by researchers that heavily rely on focus group and interview. Despite all of these struggles, researchers have dedicated sizeable chunk of their time to find a new source of customer insight to alter common methods. As an illustration, customers are asked to enter their requirements straight

by a web interface (Schaffhausen and Kowalewski 2015). social media provides an environment for customers to articulate their needs and also for businesses to figure out customer insight with the intent of translating them into attributes addressing those needs. This indirect customer- based approach often identifies customer needs leading to successful innovation (Timoshenko and Hauser 2017).

2.4. UGC in identifying product advantages and disadvantages point

Always businesses and marketers constantly gather product data in order to analyze product performance in the market because of its effects on creation of product marketing policy, decision taking on product quality control and enhancement of organizational efficiency (Liu et al.2019, He et al.2015, Zhan et al.2009, Chang et al.2018). In the past, the main source to collect information about a product or service as internal data gathered from expert and off-line customer survey (Liu et al.2019). With consideration of increasingly internet access and the improvement of social media based- internet platforms, customers can express their feelings and opinions regarding products and services (Zhang et al.2018, Li et al.2014, Gallaugher and Ransbotham 2010).

Social media brings with itself user generated online content giving new opportunity to product performance analysis. For example, obtaining internal information regarding rivals is difficult for businesses, UGC makes them access a huge amount of data about their competitors because of its comfortable accessibility in social media platforms. In fact, at the competitive market, analyzing competing products from the customer's review is more logical (Liu et al.2019). In the process of purchasing product, users often compare advantages and disadvantages of products among competitors with the intent of choosing proper one based on their understanding of different products (Li et al.2017, Jin et al.2016).

2.5. Social media and UGC in product development

Due to the people awareness about product, the design approach has been moved from firm-centered design to customer-centered design (Abramovici and Linder 2011). This transformation creates functional competitive advantages for businesses (Green et al.2001). Chan and Ip reported that due to the transition of product development process from traditional methods to customer-centered design through social media internet-based platforms, two areas in the product development process are affected: (1) product features and (2) customer need and satisfaction. There is a direct relationship between product features and customer experience that have effect on the customer purchasing behavior. Moreover, there is a relation between customer's feeling and product. In fact, customer's emotion is related to their satisfaction.

Based on the above reasons and the increasing in the rate of using social media as a platform to share opinion and thought about products, social media and social media mining are the cost-effective approach to do. Unlike the traditional methods such as group discussion and surveys to gather information and analyzing them, the contents generated by customers in social media platforms as a potential value to improve the product features is more beneficial than traditional approach. So, Business should incorporate social media in their product development process and marketing strategy, and they can use these platforms as a competitive advantage. Social media gives an opportunity to businesses to gain information about their product and customer's requirement in less time and more quality of information (Rathore et al.2016).

Through monitoring the conversation and interacting with users in these platform businesses can get more customer's insight helping them to reach new ideas. It also helps them to make a better decision in product design (Aral et al.2013). So, it enables businesses to investigate what features must be added to their next generation of their products. For example, with consideration that the 4th causes of death among hospitalized patients is Adverse Drug Reactions, social media gives an opportunity to pharmaceutical companies to monitor special drugs after they are placed on the market. In these platforms, people share more detailed and accurate information about ADRs (Adverse Drug Reactions) than a healthcare specialist (Herxheimer et al.2010). C.C. Freifeld and et al 2014, said that people in social media report their Adverse Drug three times more than reporting to FDA. Thus, these companies can gain more information concerning drugs and improve them. From the realistic point of view, social media allows businesses to develop and evaluate new products by collecting insight form customers (Rathore et al.2018).

3. Methodology

This research adopted the approach of Webster & Watson (2002) to update the previous studies on online reviews or user-generated content in social media platforms. The approach described in Webster & Watson (2002) emphasizes the concept-based way of carrying out the analysis, where the emphasis is on literature-implied concepts suggested by the author. This enables for the effective clustering of the plenty of research done in the field of analysis. Thus, generating a better review production. The approach proposes literary study, ended with a conceptual structure proposal that may assist in future academic research.

"online reviews", "product reviews", "online word-of-mouth", "online consumer reviews", are the keyword that have been applied for procurement of articles from different management journals and databases like "ABI informa proquest, "MIS

Quartely", EBSCOhost, internet research and IEEE intelligent system with including others. In addition to this assimilation of research articles making a total 16. The following table contains the details of the publications from which the literature was collected.

Table 1 - Sources of Research articles included in this study	
Decision Support System	3
International Journal of Information Management	2
Computer Industry, Global Journal of Flexible System Management, Technological Forecasting & Social Change, Engineering Management Journal, Sawtooth Software, International Journal of Research in Marketing, Electronic Commerce Research, The Computer Journal, Expert System with Application, Journal of Computer Information System, Journal of Information & Management	1

3.1. Conceptual structure

A programming framework was developed to automatically gather and evaluate feedback online, using a web lexicon. This approach synthesizes text and network research, collects unstructured text-based content into a structured database and improves the ability to understand online feedback about product innovation. This research also provides engineers and managers with as comprehensive method of analyzing data generated from social media, allowing for the assessment of consumer feedback related to product characteristics so that engineers and managers would take more steps to improve products (Lee et al.2017).

This involves four key steps: Crawling, pre-processing, review, and visualization. Usage of a list of target online chat sites generated by users, the crawling process requires a frequent and structured examination of the forums and UGC software for review and eventual use. The explored UGC includes relevant data and irrelevant data (e.g. user views shared in posts). The Pre-processing stage retrieves the raw UGC to strip out unnecessary data to resolve this, and then restructure and load relevant data into a database. The developed natural language processing and text mining technologies are utilized during the research stage to classify views and feedback relevant to product creativity. Finally, the visualization step resulted in the creation of images, diagrams to implement appropriate propagation of the collected data to interested organizations and practitioners. For a special case, we can choose a company that produce different types of products and use its database to demonstrate how to implement the proposed design framework and react to our study question. Thus, we will use the data from one of social media platforms the company uses.

Social media is defined as an online communication forum that allows users to express their views about products. A social media platform can be applied that the company utilizes (such as Twitter, Facebook, or Instagram) and then extract users' comments to perform the research. The following approach was discussed as a guideline for companies to make them aware of their customers' opinion.

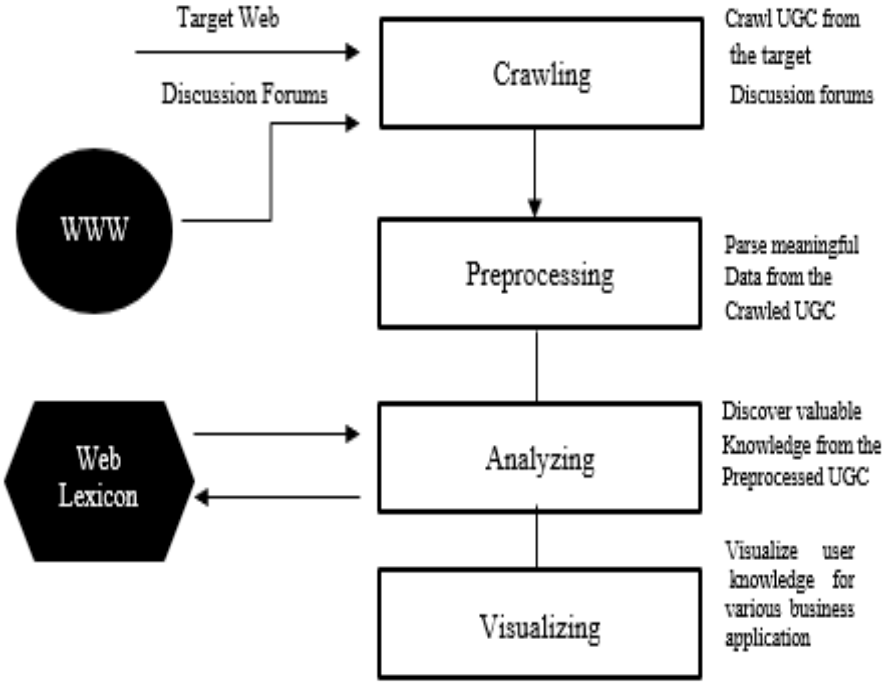

Fig 1: The Content Analysis Framework

3.1.1. Data

To analyze the data obtained, a content analyzer was developed to recognize consumer brand reactions and conducts co-occurrence research task in the processing of natural language. The content analyzer contains two main elements, namely a web lexicon consisting of domain terminologies, as well as text and data-network analysis. As the research advanced, an array of new and unique web language seemed to inhibit user feedback from comprehension. ''Internet Lingo'' (i.e., user-generated informal language in an internet discussion that includes informal grammar, symbols, slangs, etc.) allows the contextual creation and effect of specific online comments incomprehensible (Lee et al.2017).

This pattern is not new, but the power of web lingo cannot be ignored if engineering practitioners wish to explore consumer values effectively. In practical terms, accurate recognition and understanding of this lingo is critical. The lack of a coherent understanding of this lingo could impede the potential for gaining information about the business from these data. Therefore, a feedback framework was developed in this study to keep the web lexicon up to date (Lee et al.2017).

3.1.2. Analyzing text

Analysis of meaning considered a valuable method for the textual analysis of communication problems (Chiu et al.2012, Haavisto 2014, Hsieh and Shannon 2005), was applied in this study. It is an efficient method for analyzing material in terms of the definitions, contexts and expectations found in qualitative data (Franzosi 2004), and in studies in which quantitative analysis is emphasized (Berelson 1952). Additionally, as a measure of importance, we use the frequency of terms and phrases and can draw from the main online discussion forums some of the related comments concerning product features (Lee et al.2017).

3.1.3. Text-Network Analysis

We perform a text-network analysis to obtain a holistic view of the user's perceptions toward a product (Popping 2000). This analytical method focuses on the co-occurrence of key terms which appear as a network in a particular set of texts. Such words are usually the most used or picked in content analysis (Verd and Lozares 2014). Summary, the unique terms discovered, and the evaluation of the various brands found through the process have provided valuable knowledge of product design and created new insight for designers and manufactures alike (Lee et al.2017).

Table 2 - Literary Contribution: Content Analysis framework

	Author	Title	Method	Result	Future Research
2015	Martinez et al.	Turning user-generated health-related content into actionable knowledge through text analytics services	Text Analysis	Propose a system that is able to process real-time health related user-generated content showing aggregated data about the different entities in several visualization timelines	Improving the quality of the spanishDrugEffectDB databse. Databse should be reviewed manually in order to remove false positives, which are generated by the automatic process used to build the database. Text classification methods should be applied to automatically filter ADR related post to improve the real time performance.
2019	Liu et al.	Assessing product competitive advantages from the perspective of customers by mining user-generated content on social media	Sentiment Analysis	Propose a novel method for analyzing competitive advantage (and disadvantages) of a target product relative	apply the method to other domains (e.g., Cellular phones) to validate its generalizability
2018	Rathore et al.	Social media Data Inputs in Product Design: Case of a Smartphone	Content analysis, Network Analysis	to get insights based on thematic pattern and topological metrics of social networks	a longitudinal research with suggested approach could be future work for many researchers in this research space
2020	Rathore & Ilavarasan	Pre-and-post-launch emotions in new product development: insight from twitter analytics of three products	Sentiment Analysis	emotions play an important role in identifying the subjective nature of product attributes	how different emotions affect user-product connections, which may determine future purchase behavior
2017	Bashir et al.	Use of social media applications for supporting new product development process in multinational corporations	Qualitative Approach (coding method for analyzing data)	A formal use of social media applications can enhance the external information sources for NPD in MNCs.	Use of social media in SMEs to explore the effect of a company's size. Explore the use of social media in NPD in other sectors such as electronic, textile, or other manufacturing areas
2017	Jeong et al.	Social media mining for product planning: A product opportunity mining approach based on topic modeling and sentiment analysis	Opportunity mining approach, Sentiment Analysis	A social media mining approach was proposed for identification of product development opportunities	the product opportunities for disruptive innovation can be captured

2017	Lee et al.	Understanding customer opinions from online discussion forums: A Design Science Framework	Text Analysis, Text-Network Analysis	A framework for systematic collection and analysis of online UGC has been presented	for future research an integrating process to incorporate different datasets could be developed
2017	Artem Timoshenko & John R.Hauser	Mining and Organizing user-generated content to identify attributes and attribute levels	Machine learning hybrid approach, conventional neural network	UGC can substitute for experiential interviews	
2011	Chan & lp	A dynamic decision support system to predict the value of customer for new product development	CPB model, NCLV estimation model	the system offers effective decision support by predicitng the customer switching probability and determining the NCLV for products	the system proposed in this study is not used to assess the individual impacts of the various influencing factors on product success or conduct a sensitivity analysis of product, customer, and marketing factors. However, it could certainly be extended in the future to these areas. future research could contact case studies in a range of different industries to test the systems' capability or make customizations if necessary
2010	Decker & Trusov	Estimating aggregate consumer preference from online product reviews	Econometric Analysis	the NBR approach can be a promising comprise between simplicity of application and the need of adequately heterogeneity	future research should be devoted to the development of powerful filters for detecting fake reviews and to the further automation of the time-consuming data pre-processing and attribute extraction steps
2018	Zhang et al.	Product innovation based on online review data mining: a case study of Huawei phones	Sentiment Analysis, Comparative Analysis	Found a strong correlation between the change in the degree of feature satisfaction and phone improvement	Choose other e-commerce platforms, such as tmall.com and jd.com, and further analysis sentiment polarities
2014	He & Yan	Mining blogs and forums to understand the use of social media in customer co-creation	Text Mining, Sentiment Analysis	customer co-creation is a growing trend	new assessment metrics will have to be developed to solve the issue of whether social media investments are paying off for companies
2009	Zhan et al.	Gather customer concerns from online product reviews- A text summarization approach	Text summarization approach	summarization of customer reviews presents a better structured and purified output compared to the source article	how to integrate the concerns in product reviews form different sources and written in different styles

2014	Li et al.	Creating social intelligence for product portfolio design	Knowledge analysis, Fitness analysis, Expertise analysis, Authority analysis, Influence analysis, sentiment analysis	The proposed framework can effectively produce the feature importance distribution and the inferred feature specification for enterprises to make decision for new product portfolio development	an extended work that conducts experiments over different social media and heterogeneous products
2016	He et al.	Actionable social media competitive analytics for understanding customer experience	Text Mining, Sentiment Analysis	The results of the case study show that the proposed framework and the methods applied in the case study are effective ways to perform social media competitive analyses	future research plan is to build a social media competitive intelligence monitoring and analytics system, which can be custo-mized to collect different types of data from social media
2015	He et al.	A novel social media competitive analytics framework with sentiment benchmarks	social media competitive analytics with sentiment benchmark	the proposed framework is feasible and may have wide applicability in business	for future research, the plan is to examine the relationship between social media mentions/sentiments and business performance.

4. Conclusion

Social media performs a key role in the process of product development. This study emphasizes the essential role of social media and User-generated content in helping firms to develop new product development process. There are many various ways for firms to use social media data and turn it into knowledge in order to improve quality. We have attempted to review the literature in the areas of social media and product development. We find that businesses should take into account social media platforms and their data to make profit from information created by users or customers. using social media data in product development process requires companies have data-conscious workers and relevant data skills, find the best way to interpret data and the most appropriate application for it, have the right atmosphere for collaboration, and find the value of new product development concept. Companies must also dedicate more attention to various aspects of data in social media platforms and grasp all the theoretical principles to be applying them successfully in action.

5. Reference

A.A. Taleizadeh, R. Sadeghi, Pricing strategies in the competitive reverse supply chains with traditional and e-channels: a game theoretic approach [J], *International Journal of Production Economics* 215 (2018) 48–60.

Abed, S., Dwivedi, Y.K. and Williams, M.D. (2015a) "Social Media as a Bridge to E-commerce Adoption in SMEs: A Systematic Literature Review," *The Marketing Review*, Vol. 15 No. 1, pp. 39-57

Abramovici, M., & Lindner, A. (2011). Providing product use knowledge for the design of improved product generations. *CIRP Annals-Manufacturing Technology*, 60(1), 211–214.

A. Herxheimer, M.R. Crombag, T.L. Alves, Direct Patient Reporting of Adverse Drug Reactions. A Twelve-Country Survey & Literature Review, Health Action International (HAI), Europe, 2010 (Paper Series Reference 01-2010/01).

Allan, B. (2005), "Social enterprise: through the eyes of the consumer", *Social Enterprise Journal*, Vol. 1 No. 1, pp. 57-77.

Aral, S., Dellarocas, C., & Godes, D. (2013). Introduction to the special issue—Social media and business transformation: A framework for research. Information Systems Research, 24(1), 3–13

Artem Timoshenko and John R.Hauser,2017,mining and organizing user-generated content to identify attributes 10 | Page and attribute levels

Bartl, M., Fuller, J., Muhlbacher, H. and Ernst, H. (2012), "A Manager's Perspective on Virtual Customer Integration for New Product Development", *Journal of Product Innovation Management*, Vol. 29 No. 6, pp. 1031-1046.

Berelson, B. (1952). Content analysis in communication research. Glencoe, IL: Free Press.

C.C. Freifeld, J.S. Brownstein, C.M. Menone, W. Bao, R. Filice, T. Kass-Hout, N. Dasgupta, Digital drug safety surveillance: monitoring pharmaceutical products in twitter, Drug Saf. 37 (5) (2014) 343–350.

Chan, S.L. and Ip, W.H. (2011), "A dynamic decision support system to predict the value of customer for new product development", *Decision Support Systems*, Vol. 52 No. 1, pp. 178–188

Chang, C.C. (2008), "Factors influencing visual comfort appreciation of the product form of digit

Chen, L., Goes, P., Marsden, J.R..and Zhang, Z. (2009), "Design and use of preference markets for evaluation of early stage technologies", *Journal of Management Information Systems*, Vol. 26 No. 3, pp. 45-70

Chiu, M.-H. P., & Wu, C.-C. (2012). Integrated ACE model for consumer health information needs: A content analysis of questions in Yahoo! answers. Proceedings of the American Society for Information Science and Technology, 49(1), 1–10. doi:10.1002/meet.14504901093

Curran, J. and Lennon, R. (2011), "Participating in the Conversation: Exploring adoption of online Social Media", *Academy of Marketing Studies Journal,* Vol. 15 No. 1, pp. 21-38

Dahan, E., and Hauser, J.R. (2002), *"The Virtual Customer". Journal of Product Innovation Management*, Vol. 19 No. 5, pp. 332-353. https://doi.org/10.1016/j.dss.2019.113079

Decker, R., & Trusov, M. (2010). Estimating aggregate consumer preferences from online product reviews. *International Journal of Research in Marketing*, 27(4), 293–307

Dwivedi, YK, Kapoor, KK and Chen, H. (2015) "Social Media Marketing and Advertising", forthcoming in *The Marketing Review*, 15 (3), pp…

Franzosi, R. (2004). Content analysis. In M. S. Lewis-Beck, A. Bryman, & T. F. Liao (Eds.), *The SAGE encyclopedia of social science research methods*. Thousand Oaks, CA: Sage

García-Murillo, M., Annabi, H., 2002. Customer knowledge management. J. Oper. Res. Soc. 53, 875– 884, *journal of the operational research society.*

Greenberg, P., 2010. The impact of CRM 2.0 on customer insight. J. Bus. Ind. Mark. 25 (6), 410–419. *Journal of Business and Industrial marketing*

Green, P. E., Krieger, A. M. and Wind, Y. (2001), "Thirty years of conjoint analysis: Reflections and prospects", Interfaces, Vol. 31 No. 3, pp. 56-73. *Informs Journals on Applied Analytics*

H. Zhang, H. Rao, J. Feng, Product innovation based on online review data mining: a case study of Huawei phones [J], *Electronic Commerce Research* 18 (1) (2018) 3–22

Haavisto, P. (2014). Observing discussion forums and product innovation—A way to create consumer value? Case heartrate monitors. Tec novation, 34, 215–222. doi:10.1016/j. technovation.2013.12.001, *Decision Support System.*

He, W., & Yan, G. (2014). Mining blogs and forums to understand the use of social media in customer co-creation. *The Computer Journal*, 58(9), 1909–1920

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research, 15(9), 1277–1288. doi:10.1177/1049732305276687

H.L. Chang, Y.C. Chou, D.Y. Wu, S.C. Wu, Will firm's marketing efforts on owned social media payoff? A quasi-experimental analysis of tourism products [J], Decision

Helander, M.G., Khalid, H.M., 2006. Affective and pleasurable design. In: Salvendy, G. (Ed.), *Handbook of Human Factors and Ergonomics*, third ed. John Wiley & Sons, Inc., Hoboken, NJ, pp. 543–572

Hutton, G. and Fosdick, M. (2011), "The Globalization of SM, Consumer Relationships with Brand Evolve in the Digital Age", *Journal of Advertising Research*, Vol. 51 No. 4, pp. 564-570.

J. Gallaugher, S. Ransbotham, Social media and customer dialog management at Starbucks [J], MIS Quarterly Executive 9 (4) (2010). *Journal of Association for Information System*

J. Jin, P. Ji, R. Gu, Identifying comparative customer requirements from product online reviews for competitor analysis [J], *Engineering Applications of Artificial Intelligence* 49 (2016) 61–73

J. Zhan, H.T. Loh, Y. Liu, Gather customer concerns from online product reviews–a text summarization approach [J], *Expert Systems with Applications* 36 (2) (2009) 2107–2115

Jansen, J.J.P., Van den Bosch, F.A.J., Volberda, H.W., 2005. Managing potential and realized absorptive capacity: how do organizational antecedents' matter? Acad. Manag. J. 48 (6), 999–1015. *Academy of management Journal*

John Krumm, Nigel Davies, Chandra Narayanaswami, October-December 2008/*user- generated content*/published by the IEEE CS/1536- 1268/08.

Kaplan, Andreas M. and Michael Haelein (2010), users of the world, unite! The challenges and opportunities of social media, business Horizons, 53, 59-68.

KhairulHilmi A Manap, Nor Azura Adzharudin, 2013, the WEI *international academic conference proceedings*, Istanbul, Turkey.

Krippendorff, K., 2011. Principles of design and a trajectory of artificiality. J. Prod. Innov. Manag. 28 (3), 411–418. *Journal of Product Innovation Management*

Li, Y.M., Chen, H.M., Liou, J.H. and Lin, L.F. (2014), "Creating social intelligence for product portfolio design", *Decision Support Systems*, Vol. 66, pp. 123-134.

Lee, J. Y.-H., et al. (2017). "Understanding Customer Opinions from Online Discussion Forums: A Design Science Framework." *Engineering Management Journal* 29(4): 235-243.

N.S. Davcik, P. Sharma, Marketing resources, performance, and competitive ad- vantage: a review and future research directions [J], *Journal of Business Research* 69 (12) (2016) 5547–5552.

OECD (2007), participative web and user- generated content: web, wikis, and social networking. Paris: organization for economic co-operation and development.

P. Martı´nez, et al., Turning user generated health- related content into actionable knowledge through text analytics services, *Computer Industry* (2015), http://dx.doi.org/10.1016/j.compind.2015.10.006

Park, H., & Yoon, J. (2015). A chance discovery- based approach for new product–service system (PSS) concepts. *Service Business*, 9, 115–135.

Popping, R. (2000). Computer-assisted text analysis. London, UK: Sage

Rathore, A., Ilavarasan, P. & Dwivedi, Y. (2016). Social media content and product co-creation: an emerging paradigm. *Journal of Enterprise Information Management*, 29(1), 7-18.

Rathore, A., et al. (2018). "Social Media Data Inputs in Product Design: Case of a Smartphone." *Global Journal of Flexible Systems Management* 19(3): 255-272.

Rodriguez, M., Peterson, R.M. and Krishnan, V. (2012), "Social media's influence on business- to business sales performance", *Journal of Personal Selling & Sales Management*, Vol. 32 No. 3, pp. 365-378.

Salojärvi, H., Sainio, L.-M., 2006. Applying absorptive capacity construct to customer-related knowledge processing. *Proceedings of the ICEP and eBRFConference.* Global Venture Lab, Tampere, Finland

Sawhney, M. and Prandelli, E. (2000), "Communities of Creation: Managing Distributed Innovation in Turbulent Markets", *California Management Review*, Vol. 42 No. 4, pp. 24-54.

Setia, P., Venkatesh, V., Joglekar, S., 2013. Leveraging digital technologies: how information quality leads to localized capabilities and customer service performance. MIS Q. 37 (2), 565–590.

Seva, R.R., Duh, H.B.L., Helander, M.G., 2007. The marketing implications of affective product design. *Appl. Ergon.* 38 (6), 723–731.

Schaffhausen CR, Kowalewski TM (2015). Large- scale Needfinding methods of increasing user- generated needs from large populations. *Journal of Mechanical Design*. 137(7):071403.

Van Kleef, E., van Trijp, H. C., & Luning, P. (2005). Consumer research in the early stages of new product development: A critical review of methods and techniques. *Food Quality and Preference*, 16, 181–201.

Verd, J. M., & Lozares, C. (2014). Reconstructring social networks through text analysis: From text networks to narrative actor networks. In S. Dominguez & B. Hollstein (Eds.), Mixed methods social networks research: Design and application. New York, NY: Cambridge University Press

W. He, X. Tian, Y. Chen, D. Chong, Actionable social media competitive analytics for understanding customer experiences [J], *Journal of Computer Information Systems* 56 (2) (2016) 145–155.

W. He, H. Wu, G. Yan, V. Akula, J. Shen, A novel social media competitive analytics framework with sentiment benchmarks [J], *Information & Management* 52 (7) (2015) 801–812.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS quarterly*, 26(2), xiii-xxiii.

Yao Liu, Cuiqing Jiang, Huimin Zhao, 2019, Assessing product competitive advantages from the perspective of customers by mining user-generated content on social media, *Decision Support System*

Yen, T.-M., Chung, Y.-C., & Tsai, C.-H. (2007). Business opportunity algorithm for ISO 9001: 2000 Customer satisfaction management structure. *Research Journal of Business Management*, 1, 1–10.

Y. Li, B. Jia, Y. Guo, X. Chen, Mining user reviews for mobile app comparisons [J], Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 1 (3) (2017) 75

Y.M. Li, H.M. Chen, J.H. Liou, L.F. Lin, Creating social intelligence for product portfolio design [J], *Decision Support Systems* 66 (2014) 123–134.

6. Biographies

Yvan Beauregard is a professor in Mechanical Engineering Department at the *École de technologie supérieure (ÉTS)* University, Montreal, Canada. He earned B.S. in Engineering from Ecole Polytechnique university, Montreal, Master in MBA from McGill university, Montreal and Ph.D. in MBA from University of Concordia, Montreal. He has published journal and papers. His research interests include Aerospace, Information and Communications technologies, Health. In addition, his research areas consist of Project, Operation, Quality management and Product development and also Lean engineering.

Mohamadreza Azar Nasrabadi is a Master student in Project Management at the *École de technologie supérieure (ÉTS)* University, Montreal, Canada. He earned B.S. in Business Administration from Azad University, Tehran, Iran.