

# MASS CUSTOMIZATION AND CO-CREATION ON SOCIAL NETWORKS

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**Abstract:** *What customers are seeking now is customization, products made to order. In their desire to become customer driven, many companies have turned to new programs and processes to meet every customer's request. One of the emerging paradigms today are 'mass customization' and 'co-creation'. Mass customization is a production strategy focused on creation of products that are uniquely customized to the customers. To produce personalized products or services, and provide unique value to their customers, companies increasingly involve customers in product and service development – a process of co-creation. Information about mass customization and co-creation are present in industry and science, but valuable data could also be found on social networks. In this paper authors analysed the visibility and presence of mass customization and co-creation on social network Twitter, using data mining technique. Twitter is a global social media platform and it is nothing less than a goldmine when it comes to data and information. Nearly all tweets are public and easily extractable, which makes it easy to gather large amount of data from twitter for analysis. Data mining is used in order to extract data from Twitter, and analyzing it with the intention of finding trends and patterns.*

**Key Words:** *Mass customization, Co-creation, Social media, Social networks, Twitter, Data mining*

## 1. INTRODUCTION

In today's turbulent era, it is very difficult to achieve a competitive advantage on the market. Changes in business are everyday, technology becomes more advanced in a very short period of time, users have more knowledge about products and services than they ever had. Users are no longer passive receivers of information and today they are becoming more and more active in the process of creating products, starting from design to creation of promotional messages. In recent years, mass media has changed and adopted a new phenomenon called social media. The first part of this terminology, social, refers to the need of people to connect and communicate with other people and the second part refers to the media that people use to connect with other. Applying term social media means that people can use all available technologies effectively, interact and connect with other people, build relationships, trust, and

be there when people in these relationships are ready to buy the product offered by some company. The rise of interactive digital media has changed the model of communication between companies and customers.

Companies have to change own business strategy continuously, starting from the market research, over production strategy to the communication with customers. Mass customization is a production strategy focused on creation of products that are uniquely customized to the customers. To produce personalized products or services, and provide unique value to their customers, companies increasingly involve customers in product and service development – a process of co-creation.

## 2. THEORETICAL BACKGROUND

This part of the paper will cover theoretical fundamentals from the field of mass customization and co-creation, social media and data mining in social media.

### 2.1. Mass customization and co-creation

The market is constantly changing, the rules and conditions of business also, competition becomes very intense, and what customers want today are products and services made exclusively according to their wishes and requirements. So, the most important competitive advantage for every business has to be the diversification of products that adapt to specific customer needs. Customers become more self-aware and more demanding in their buying preferences and in the light of growing trends towards sustainable consumption mass customization becomes a strong drive for the implementation of sustainable products and services [1]. Focusing on the customer, however, is both an imperative and a potential curse and in order to meet all the requirements of customers, many companies implement different technologies and production strategies. Some authors claim that mass customization as a state-of-the-art production paradigm aims to produce individualized, highly variant products and services with nearly mass production costs [2]. On the other side, customers and their needs grow increasingly diverse, such an approach has become a surefire way to add unnecessary cost and complexity to operations. Available information technology and flexible work processes

permit companies to customize goods or services for individual customers in high volumes and at a relatively low cost, but many managers have discovered that mass customization, too, can produce unnecessary cost and complexity [3]. Probably, they have not yet found the appropriate kind of customization their customers would value before they plunged ahead with this new strategy. Mass customization cannot succeed without a marketing and sales teams that understand the demand for customized products. Companies must first identify opportunities for customization that create value for the customer and are supported by smooth, swift and inexpensive transactions for both consumers and producers and second achieve a manageable cost structure and cost level for producer even as manufacturing complexity increases [4]. Also, one research found that work-design practices that manage both the technical and the social dimensions for achieving organization success have significant impact on a company's ability to achieve mass customization [5].

But customers are ready to pay extra costs and purchase more favorable products if they have a chance to co-create new product together with producer [6]. Then, customers create innovative products and realize value by collaborating with manufacturers and other consumers. Mass customization was enabled by several important concepts and technologies, including product family architecture, reconfigurable manufacturing systems, and delaying differentiation and in the most cases the role of the consumer is limited to choosing the module combinations [7]. A company that has one or a few customers can produce customization by collaborating with each one to produce exactly what, when, where and how an offering is delivered, but mass market companies have to take a scalable approach to involving customers in these processes [8]. The traditional system of company-centric value creation is becoming obsolete, so interaction as a basis for co-creation is now a necessity and co-creation experience of the consumer becomes the very basis of value [9]. It was also found that when customers are allowed to participate and are provided with more choices, it leads to a higher level of trust and any ignorance in this process may bring in negative effect of relational value on customer recommendation [10]. Social media can make economic-exchange relations more collaborative and social, but interestingly may also turn relations formerly based on social-exchange into "money markets" with strong competition among actors [11].

## 2.2. Social media

In recent years, mass media has changed and adopted a new phenomenon called social media. The first part of this terminology, social, refers to the need of people to connect and communicate with other people. And the second part of this term refers to the media that people use to connect with other people. The rise of interactive digital media has changed the model of communication between companies and customers. Customers increasingly use digital media not only to explore products and services, but to interact with the companies they buy from and also with other customers who can

have valuable and important insights into the product or service. The most popular and most widely used definition of social media is "group of Internet-based applications that build on the ideological and technological foundations of the Web 2.0 and that allow the creation and exchange of user-generated content" [12]. The main advantage of social media is the possibility of greater interaction and individualization. Social media humanize customer services, attract customers to the company and make the information more accessible. The availability of advanced analytics, inexpensive data storage, advanced search capabilities allows companies to offer non-generalized and truly customized offers to their customers. Digital marketing also helps in identifying trends and patterns of customer behavior and companies can use to attract customers on their websites. It is considered that one of the reasons why user-generated media is so popular is the fact that they are easy to use and controlled by users. Business executives, consultants, and decision makers alike all struggle with understanding and decrypting how to best make use of the various social media applications that are available in the marketplace [13]. The Internet has extended consumers' options for gathering product information from other consumers and provides the opportunity for consumers to offer their own consumption-related advice by engaging in electronic word-of-mouth (eWOM) [14]. Programmability, popularity, connectivity and datafication are the four elements of social media and most important in understanding how in a networked society social interaction is mediated by an intricate dynamic of mass media, social media platforms, and offline institutional processes [15]. Social commerce is a new phenomenon rooted in social media practice and further understanding of social commerce phenomenon is essential for companies to achieve their profitable marketing values in today's digital business environment [16].

The most popular social networks that companies use for B2C communication are: Facebook (social network), Twitter (microblogging applications), YouTube (video sharing tool), Pinterest and Instagram as photos sharing tools. In this paper, special emphasis will be on Twitter. Twitter is a social networking and microblogging service, enabling registered users to read and post short messages, so-called tweets. Twitter messages are limited to 280 characters and users are also able to upload photos or short videos. Tweets are posted to a publicly available profile or can be sent as direct messages to other users. Twitter is one of the most popular social networks worldwide. Part of the appeal is the ability of users to follow any other user with a public profile. In the second quarter of 2018, the micro-blogging service averaged at 335 million monthly active users (Source: The Statistics Portal - Statista). Twitter tracks phrases, words, and hashtags that are most often mentioned and posts them under the title of "trending topics" regularly [17]. The most important elements on Twitter are [18]:

1. Hashtag - allows to explicitly mark the topic of a tweet, start with character '#' and can be common word or concatenation of several words. Tweet can contain any number of hashtags and these hashtags can be placed at any position in the text.

2. User References - users are identified by their names prefixed with the character “@” Twitter users can make references to other users.

### 2.3. Data mining in social media

The use of social media generates a large amount of data and these data cover different topics such as sociology, business, psychology, entertainment, politics, news, events, etc. Such metadata includes: who is speaking and sharing, where they are located, to whom they are linked, how influential and active they are, what their previous activity patterns look like and what this suggests about their likely preferences and future activities [19]. As a main type of “big data,” social media is finding its many innovative uses, such as political campaigns, job applications, business promotion and networking, and customer services, and using and mining social media is reshaping business models, accelerating viral marketing, and enabling the rapid growth of various grassroots communities [20]. Social media data are vast, noisy, unstructured, and dynamic in nature. In order to overcome these challenges, data mining techniques are used by researchers to reveal insights into social media data that would not be possible otherwise. This helps to get a better understanding of the outlook of different people regarding a certain subject, locate groups of people among large communities of people, study changes in group with reference to time, or even suggest a certain product or task to ascertain person by using data mining in combination with social media [21]. Data mining in social media can expand researchers' capability of understanding new phenomena due to the use of social media and improve business intelligence to provide better services and develop innovative opportunities. This is multidisciplinary area where researchers of different backgrounds can make important contributions.

### 3. RESEARCH METHODOLOGY AND RESULTS

Data is collected via registered Twitter application which is used for authentication and communication with the Twitter as social network. This enables the user to gather the live tweets for certain hashtags, or to gather the tweets published by registered user. All data is collected and analyzed by using the Python language scripts from [22]. The data collection script uses Twitter Streaming API (Application Programming Interface). Tweets were collected daily in the period of one week, starting with 16.5.2018. and ending with 22.5.2018. Data was collected by certain hashtag words and by a keyword required by the data collection script. The collected data is stored in a JSON file (JavaScript Object Notation). Data analysis has been done by using scripts from [22] and the results of data analysis are hashtag frequency, mention frequency (user mentions), hashtag statistics and time series chart.

Tweets are collected using the hashtags:

#MassCustomization,  
#masscustom,  
#3dprinting,  
#AdditiveManufacturing,  
#productconfigurator,

#cocreation,  
#productcustomization.

Table 1. presents the date and the time period in which the tweets are collected and the number of collected tweets.

Table 1. *Number of collected tweets*

Date	Time period	Number of collected tweets
Wednesday 16.5.2018.	14:30 - 23:26	2268
Thursday 17.5.2018.	7:40 - 16:10	2206
Friday 18.5.2018.	12:56 - 00:49	2553
Saturday 19.5.2018.	8:00 - 16:54	1785
Sunday 20.5.2018.	7:36 - 18:14	1621
Monday 21.5.2018.	10:15 - 20:35 with break 12:54 - 14:20	2411
Tuesday 22.5.2018.	5:46 - 15:45	2193

Figures 1-7 present time series for collected tweets for seven dates respectively.

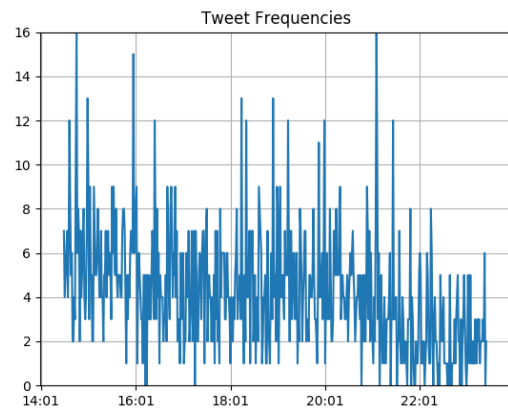


Fig. 1. *Twitter time series for 16.5.2018.*

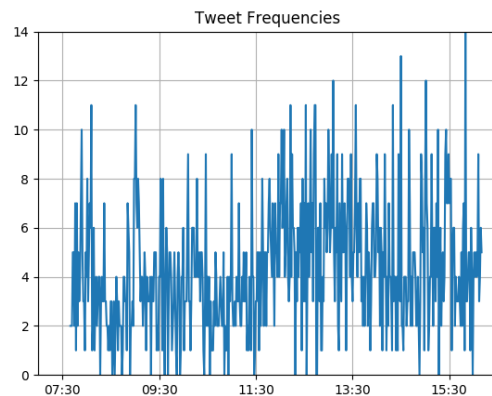


Fig. 2. *Twitter time series for 17.5.2018.*

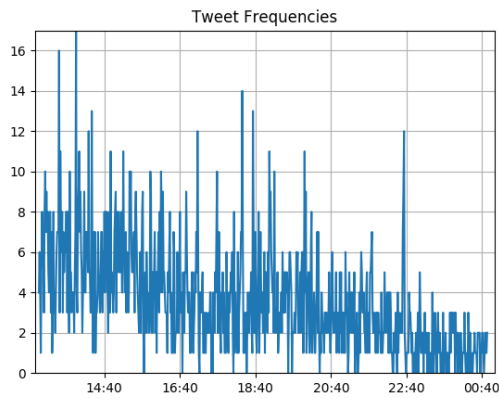


Fig. 3. Twitter time series for 18.5.2018.

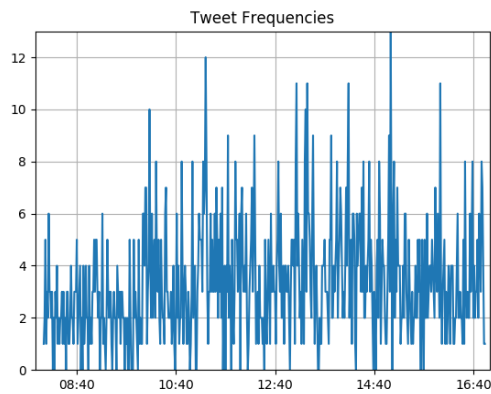


Fig. 4. Twitter time series for 19.5.2018.

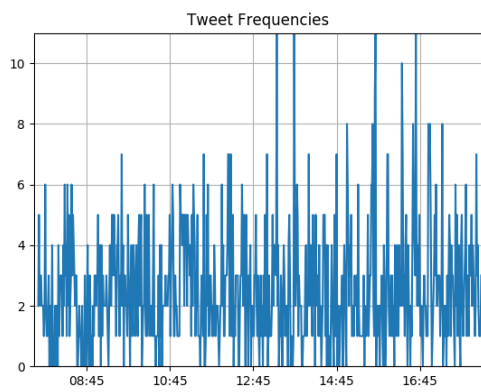


Fig. 5. Twitter time series for 20.5.2018.

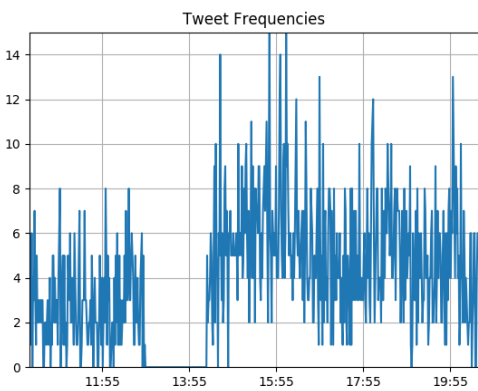


Fig. 6. Twitter time series for 21.5.2018.

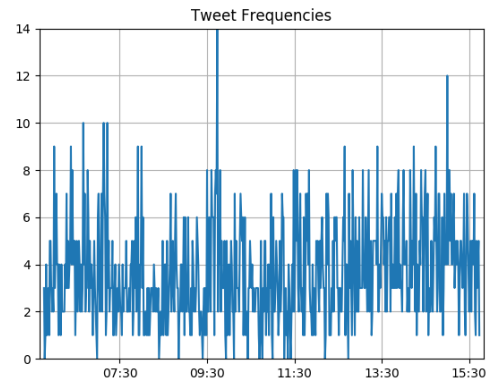


Fig. 7. Twitter time series for 22.5.2018.

Tweet hashtag frequencies for the seven dates are presented in the Table 2.

Table 2. Tweet hashtag frequencies

Wednesday 16.5.2018.	3dprinting: 950 iot: 156 ai: 141 additivemanufacturing: 109 robotics: 99 drones: 92 blockchain: 91 emergingtechnologies: 85 future: 70 tech: 67 3dprinted: 64 innovation: 61 machinelearning: 60 cybersecurity: 59 logistics: 59 dataanalytics: 58 ar: 57 vr: 53 technology: 52 manufacturing: 52
Thursday 17.5.2018.	3dprinting: 1180 manufacturing: 284 industry40: 255 iot: 119 ai: 111 3dthursday: 91 additivemanufacturing: 60 blockchain: 57 cybersecurity: 54 technology: 51 3dprinted: 48 digitaltransformation: 46 robotics: 44 3dprint: 42 3dprinter: 39 it: 39 innovation: 39 bigdata: 37
Friday 18.5.2018.	3dprinting: 879 industry40: 154 manufacturing: 109 iot: 91 ai: 80

	additivemanufacturing: 74 3dprinted: 71 smartcity: 58 bigdata: 57 socialmedia: 56 smarthome: 55 futureofwork: 55 digital: 54 technology: 53 cloud: 47 3dprinter: 38 innovation: 37 emergingtech: 36 climateaction: 36
Saturday 19.5.2018.	3dprinting: 462 industry40: 88 ai: 87, iot: 86 manufacturing: 52 bigdata: 50 3dprinted: 40 cloud: 38 technology: 35 emergingtechnologies: 34 blockchain: 33 tech: 2, robotics: 28 3dprint: 27 cybersecurity: 27 additivemanufacturing: 26 emergingtech: 25
Sunday 20.5.2018.	3dprinting: 639 ai: 138 industry40: 96 3dprinted: 88 emergingtechnologies: 86 robotics: 69 emergingtech: 64 healthcare: 63 wireless: 59 biotech: 59 iot: 50 disrupt: 49 manufacturing: 44 3dprint: 43 tech: 42 machinelearning: 40
Monday 21.5.2018.	3dprinting: 799 ico: 589 tokens: 580 3dprints: 579 manufacturing: 112 industry40: 89 3dprinted: 83 iot: 82, technologies: 73 ai: 66 smartcity: 47 blockchain: 41 drones: 41 additivemanufacturing: 40 3dprint: 34, scifi: 34 3dprinter: 33 toydesign: 33
Tuesday 22.5.2018.	3dprinting: 840 ico: 322, 3dprints: 312

	tokens: 311 manufacturing: 114 additivemanufacturing: 92 industry40: 80 ai: 77, iot: 71 healthcare: 75 technologies: 67 aerospace: 63 drones: 47 3dprint: 46 3d: 45, 3dprinted: 39 emergingtechnologies: 31 infographic: 31 robotics: 31
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The research is done in seven days including working days and weekend, and has shown that people definitely talk about Mass Customization on the Twitter. But, unlike the previous similar research on the topic connecting with industry 4.0 [23], the number of tweets in a similar period of time is 4 times lower in Mass Customization. This is expected because mass customization is too narrow as a topic. Observing the frequency of the tweets during the data collection period, the highest number of tweets per hour is 17. On weekend the number of tweets is lower by 30% approximately. On working days the number of tweets is more or less the similar. Areas in which the mass customization topics are mentioned cover manufacturing, healthcare, robotics, biotech and aerospace. The most frequently mentioned words related to this topic are 3D Printing, Additive manufacturing, Industry 4.0 and Internet of Things. 3D printing excels other hashtags by 5 to 10 times per collection period. In the research a geolocation tweets map was also generated for every day, but since very small number of tweets included this data, the generated maps were empty and this analysis is omitted.

#### 4. CONCLUSION

Information about mass customization and co-creation are present in industry and science, but valuable data could also be found on social networks. The aim of this paper was primarily to show whether the topic of Mass Customization is popular on Twitter, how often people talk about it and what topics are related. Given the fact that the total number of monthly active Twitter users is about 335 million, on the one side and importance of social media in creating of customer behavior on the other side, this can be used as a powerful tool for promotion of mass customization concept and its benefit. This is just first step in this "research journey" through social media. Future research will oriented toward detailed analyse of tweet content. Also, Facebook will be included using the same methodology.

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