The Usage of Social Media Text Data for the Demand Forecasting in the Fashion Industry

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Abstract The fashion industry faces different challenges in the field of demand forecasting. Factors such as long delivery times in contrast to short selling periods requires precise demand figures in order to place accurate production plans. This paper presents firstly the idiosyncrasies of the fashion industry and shows current fashion forecasting approaches. Then, the idea of applying social media text data within the demand forecasting process is presented by showing works of integrating user generated content in different application fields. Following the research question on the predictive value of social media text data for the fashion industry, the research objective and the methodology are formulated in a last step.

Keywords Demand forecasting · Apparel industry · Social media · Communities

Introduction and Problem Description

The apparel industry often deals with stock out or overstocked inventories which result into high losses for companies. Especially, this industry is characterized through high impulse purchases and, most buying decisions are made at the POS. Therefore, the availability of a product is highly crucial for the companies' success (Nenni et al. 2013). While companies require accurate information about future demands, mostly this information is not present, since the demand is influenced by

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variant factors such as changing weather conditions, competition, holidays as well as the general economic situation (Thomassey 2010). In addition, fashion trends are very short and approximately 95 % of fashion items of a collection will be replaced in the following season. Consequently, companies face a lack of historical sales data for future items (Thomassey 2014). Volatile consumer demands and high product varieties in color and sizes are additional idiosyncrasies (Christopher et al. 2004).

While most production plants are located in Asian countries such as China, Bangladesh or Taiwan, the target region for these products are european countries (Mostard et al. 2011). Due to this fact time- to- market has been compared to the short selling period of a fashion product for a long time. Therefore, production of successful products is rarely possible (Fissahn 2001). In order to be time efficient companies also fly the products to Europe, which is however, related to high costs (Hoyndorff et al. 2010). Consequently, accurate forecasts are crucial since production decisions are often due before exact demand figures are known. Due to the described factors and the lack of historical data, traditional forecasting methods are difficult to be applied and therefore, new approaches have to be considered.

Fashion Sales Forecasting and the Predictive Power of Online Chatter

For forecasting of sales data statistical techniques such as exponential smoothing, ARIMA, Box and Jenkins model, regression models or Holt Winters model are often applied. However, due to the idiosyncrasies of the fashion industry and requirement of historical data these methods can be hardly adopted by apparel companies (Thomassey 2014). Nevertheless, a large number of commercial software often applies these techniques for their predictions (Jain 2007), although most sales experts use these forecasts only as a baseline for their own estimations (Thomassey 2014). Recently, advanced forecasting methods such as extreme learning machine (ELM) algorithms have been introduced (Sun et al. 2008). Wong and Guo (2010) base their model on the ELM and propose a hybrid intelligent model for mid-term forecasts for fashion retailer. In the work of Au et al. (2008) evolutionary neural networks (ENN) show promising results especially in the case of noisy data. Other authors use further soft computing techniques such as fuzzy logic (Thomassey 2010). These works focus on the application of different techniques. In contrast, Mostard et al. (2011) show a different approach by considering pre-order demand information.

The present paper addresses the described challenges by integrating customers' opinions in the forecasting process. With the rise of the Web 2.0 and the emerging social media applications the ordinary user obtained a new role: He is an active and producing entity and not purely consuming. For this role literature introduced the term producer (Bruns 2006). Especially fashion is a widely discussed topic in the

communities and many fashion blogs publish different fashion related topics. Kaplan and Haenlein (2010) define Social Media as group of Internet-based applications *that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content*. Various authors have examined the relationship from online chatter to real world outcomes and the predictive power of such user generated content. For instance, Asur and Huberman (2010) focused on movie box-office revenues and Twitter data and showed a strong correlation between the online data and the real future rank of a movie. Dhar and Chang (2009) suggest that user generated content is a good indicator for future sales of online music sales. However, they emphasize the consideration of also other influencing factors. Further research focuses on exploring sentiments from Twitter data and examining potential correlations to the value of the Dow Jones Industrial Average (Bollen et al. 2011). Likewise Twitter posts were used to investigate the platforms role in predicting the outcome of future elections (Tumasjan et al. 2010).

A further research stream is the usage of search keywords for prediction. Google Flu trends estimates influenza distributions based on search keywords related to the topic influenza (Google 2014). Goel et al. (2010) focus on entertainment goods and assume that consumers interested in a specific movie or game might also search for it. They conclude that search-based predictions are domain specific and other domains should be considered in further research. This paper intent to integrate both described research streams.

Research Objective

The objective of the research is to examine the applicability of the integration of data, which is published online by ordinary user in the fashion demand forecasting process. At the one hand social media applications have to be focused in order to analyze their relation to fashion products and to be able to identify factors, which are identifiers for future trends. On the other hand sales data of fashion companies should be examined. In addition, the current handling of fashion companies with social media applications and content will be examined. After analyzing these different aspects and finding out effects and relationships between them, then a solution on how these data might be integrated in the demand forecasting process for fashion products will be derived.

Research Methodology

Following the research question on the predictive value of social media text data for the fashion industry several perspectives have to be considered. A corpus has to be generated from different social media applications, which will be done by the mean

of web mining methods. For the preprocessing step of the text, different text mining methods have to be applied. In a following step, sentiment analysis and opinion mining methods will serve for analysis purposes. These results will be the basis for examining correlations to real sales data. A case study approach will serve as the main method for a requirement analysis based on fashion companies for an adequate integration of social media data in real life demand forecasting processes. After reviewing the literature regarding fashion forecasting as well as the existing theories on the impact of social media on real world outcomes the different cases will be selected. Expert interviews and online questionnaires will serve for the data collection and be the ground for analysis purposes.

References

Asur S, Huberman BA (2010) Predicting the future with social media. In: IEEE/WIC/ACM international conference on web intelligence and intelligent agent technology, vol 1, pp 492–499

Au KF, Choi TM, Yu Y (2008) Fashion retail forecasting by evolutionary neural networks. Int J Prod Econ 114:615–630

Bollen J, Maoa H, Zengb X (2011) Twitter mood predicts the stock market. J Comput Sci 2:2–8

Bruns A (2006) Towards produsage: futures for user-led content production. In: Sudweeks F, Hrachovec H, Ess C (eds) Cultural attitudes towards communication and technology 2006, 28 June–1 July. Tartu, Estonia

Christopher M, Lowson R, Peck H (2004) Creating agile supply chains in the fashion industry. Int J Retail Distrib Manage 32(8):367–376

Dhar V, & Chang EA (2009) Does chatter matter? The impact of user-generated content on music sales. J Interact Mark 23(4):300–307. http://linkinghub.elsevier.com/retrieve/pii/S1094996809000723

Fissahn J (2001) Marktorientierte Beschaffung in der Bekleidungsindustrie. Dissertation, Münster University

Goel S, Hofman JM, Lahaie S, Pennock DM, Watts DJ (2010) What can search predict. Working paper

Google (2014) Google Trends. http://www.google.org/flutrends/about/how.html. Accessed 10 Mar 2014

Hoyndorff K, Hülsmann S, Spee D, ten Hompel M (2010) Fashion logistics. Grundlagen über Prozesse und IT entlang der Supply Chain, Munich, Huss-Verlag GmbH

Jain CL (2007) Benchmarking forecasting software and systems. J Bus Forecast Methods Syst 26 (4):30–33

Kaplan AM, Haenlein M (2010) Users of the world, unite! the challenges and opportunities of social media. Bus Horiz 53:59–68

Mostard J, Teunter R, de Koster R (2011) Forecasting demand for single period products: a case study in the apparel industry. Eur J Oper Res 211:139–147

Nenni ME, Giustiniano L, Pirolo L (2013) Demand forecasting in the fashion industry: a review. Int J Eng Bus Manage 5(37):1–6

Sun ZL, Choi TM, Au KF, Yu Y (2008) Sales forecasting using extreme learning machine with applications in fashion retailing. Decis Support Syst 46(1):411–419

Thomassey S (2010) Sales forecasting in clothing industry: the key success factor of the supply chain management. Int J Prod Econ 128(2):470–483

Thomassey S (2014) Sales forecasting in apparel and fashion industry: a review. In: Choi TM, Hui CL, Yu Y (eds) Intelligent fashion forecasting systems. Springer, Berlin

Tumasjan A, Sprenger TO, Sandner FG, Welpe IM (2010) Predicting elections with twitter: what 140 characters reveal about political sentiment. In: Proceedings of the fourth international AAAI conference on weblogs and social media, pp 178–185

Wong W, Guo ZX (2010) A hybrid intelligent model for medium-term sales forecasting in fashion retail supply chains using extreme learning machine and harmony search algorithm. Int J Prod Econ 128(2):614–624