Social Media Based, Data-mining Driven Social Network Analysis (SNA) of Printing Technologies in Fashion Industry

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Introduction and conceptual framework

Social media is increasingly recognized as a rich data resource through which savvy fashion brands gather market intelligence (Nash, 2019). Social media proliferation impacts academia and practice because these data provide contextual insight. However, as *big data*, this dynamic supply of online information with millions of social media messages derived from human activities is difficult to analyze using conventional methodologies (Tsou, 2015). This study demonstrates application of *data-mining* driven Social Network Analysis (SNA) to generate a model of four predominant printing terms: screen printing, heat transfer, sublimation, and digital printing. Grounded in Graph Theory (GT), data-mining driven SNA uses computational techniques to capture, analyze, and depict key indicators for a given phenomenon among large social media datasets (Zhao & Min, 2018). The current research is predicated on Freeman's (1978) seminal GT work which suggests that node centrality impacts can be evaluated through centrality indices (i.e. degree, betweenness, and closeness). Advances in big data analytics facilitate visualization and interpretation of social networks.

Methodology

As a subset of a long-term study tracking the development of digital printing technology, this study focuses specifically on four technology terms that emerged from earlier network analyses (Yu et al., 2020). *Crimson Hexagon* software was used to harvest data from Twitter for one year (January 2019-20). A total of 3,000 tweets were randomly selected based on the presence of one or more of the following hashtags: #screenprint, #heattransfer, #sublimation and #digitalprint. Using *Python*, a matrix was developed including the initial network nodes as well as *edges* between nodes which depict hashtag co-occurrence. A total of 3,742 nodes and 52, 802 edges were identified following noise removal. *Gephi* software was applied to cluster the nodes and generate the outcome network visualization.

Results and discussion

This study reveals the interrelated indicators among four predominant printing technology termsthrough the visual SNA network (Figure 1). Each printing technology represents the local

hub of its corresponding cluster. Screen printing (#screenprint), depicted as the blue community, indicates the highest degree & betweenness centrality and features #tshirt, #fashion, #clothing indicating the dominance of these apparel decoration techniques in fashion. The digital printing community identified by the color pink features a set of nodes related to Direct-to-Garment (DTG) printing which refers to digital printing directly to garments (e.g. #dtg, #dtgpint, #dtgprinter). The pink community reveals potential advantages of DTG over screen printing including: extensive color options, low minimum requirement and quick turnaround time (Figure). Further, the pink community features #smallbusiness, #kornit, and #bellacanvas which reflect dominant characteristics of the domain including business scale, leading digital printing equipment and preferred cotton t-shirts brands for DTG.

The unique features of sublimation and heat transfer technologies are presented in the yellow and green communities, respectively. Sublimation is a digital dye process (#dyesub, #dye) which is widely used for polyester fabric and hard surfaces (e.g. #swimwear, #banner, #mug). The hashtags #transferpaper and #heatpress reflect the logical bridge linking sublimation and heat transfer terms. The durability of heat transfer is not ideal, thus, it is widely used for event t-shirt printing (#event). The purple community which encompasses art and design related nodes, suggests the printing market draws on inspiration from street (#streetstyle) and pop culture (#popart). Notably, despite the general interconnectivity of these communities, each community suggests relatively independent structures which provide a means for deeper interpretation presented in this section.

Conclusion

The visual network demonstrates a blueprint for identifying and understanding unique printing technologies in the fashion industry and their dominant characteristics. The present study extends previous research through focus on information flows organized around different printing technologies. Overall, social media based, data-mining driven SNA provides fashion researchers with an innovative approach to inductively characterize the rapidly evolving printing market. Interpretation of the network findings suggest a number of practical directions for multiple stakeholders in the fashion industry and demonstrate the effectiveness of data mining within the fashion domain.

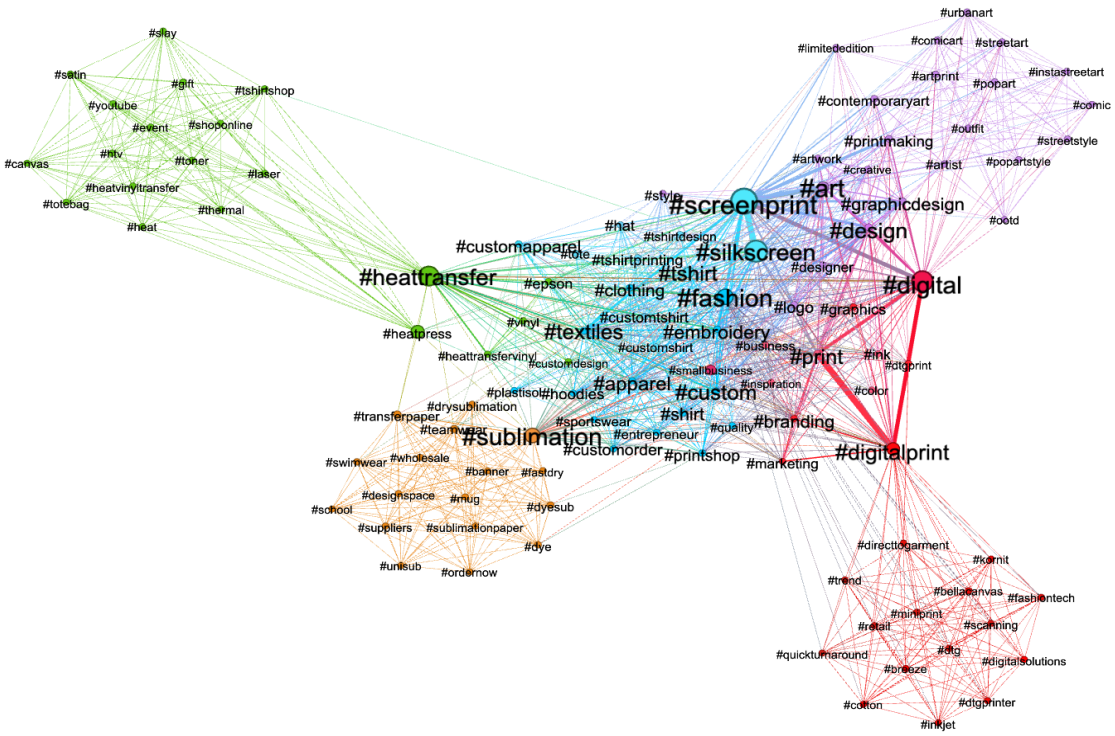

Figure 1. Multiple printing technologies visual network (112 Nodes, 1302 Edges, K-core>15)

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