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# Diffusion of Sustainable Fashion via Social Networks

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**ABSTRACT**
This research examines how sustainable fashion goes viral in terms of social networks and the spread of information and the effects of the same on consumer behavior in the long run. The research examines how social media platforms can be used to provide sustainable fashion trends through the application of Social Network Analysis (SNA) using longitudinal data collection. The Gephi tool has been used to visually represent network structures, determine the key influencers, and trace the development of the adoption of fashions in various social network communities. The results show that key actors in dense networks play a vital role in fastening the spread of sustainable fashion whereas community-based relations lead to more engagement and adoption. Also, the longitudinal research revealed the opportunity to track the evolving behaviors of consumers and the long-term effects of social media exposure. This research has a lot to offer the fashion brands, marketers, and sustainability advocates who are interested in using the social networks to advertise environmentally-friendly fashionable products and initiate a long-term alteration in consumer culture
**Keywords**: Sustainable fashion, social networks, diffusion, Social Network Analysis, Gephi, influencers, consumer behavior

## INTRODUCTION:

The fashion industry is experiencing a tremendous change since consumers are now more conscious of the environmental effects of fast fashion. Sustainable fashion has become a pressing alternative, which is concerned with environmental friendliness of production, responsible working methods, and environmentally friendly consumerism [1]. The social media platforms have been instrumental in influencing the consumer perceptions and the spreading of the trends of sustainable fashions. Nonetheless, how these trends are propagated by the social networks and how they affect consumer behavior is an intricate issue as shown in figure 1.

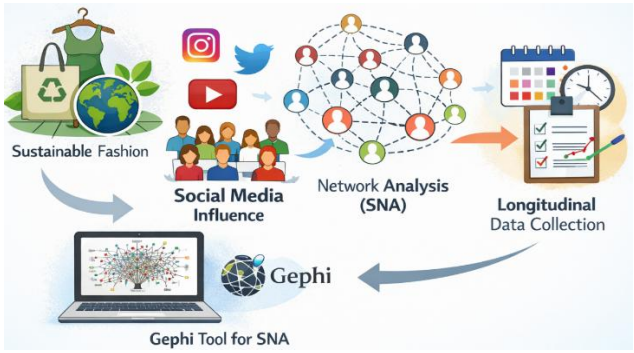


**Figure 1.Overview of Diffusion of Sustainable Fashion via Social Networks.**

This paper will discuss how sustainable fashion can be disseminated through social networks, the importance of social media sites in promoting the implementation of green fashion by consumers. This research would map how the information about sustainable fashion spreads through time and who are the major influencers who influence adoption using the tools of Social Network Analysis (SNA) and longitudinal data collection [2-4]. The network structure and the presence of central nodes as well as the way the information flows within various social communities were modeled with the help of Gephi, a potent tool of social network visualization.

The research explores the relationship between influencers, fashion brands and consumer networks in promoting the spread of sustainable fashion [5]. The longitudinal method of the research allows tracing the development of fashion-related discourse and behavior, and the changes in consumer attitudes during six months. The approach can be used to gain a better insight into the temporal dynamics of the adoption of sustainable fashion, to find out trends in information distribution and the way members of social networks impact the purchasing decisions of others [6-7].

The findings of this research have strong implication on the marketers, fashion brands as well as sustainability activists. Learning how social media networks may be exploited to market sustainable fashion may offer strategic solutions to the faster implementation of

sustainable fashion decisions [8]. Additionally, the research can be added to the ever-increasing literature on the topic of social network diffusion to provide a beneficial understanding on how fashion, which puts environmental concerns first, can become popular in a world that is highly connected.

## RELATED WORK

The movement of sustainable fashion through social networks has become a matter of growing interest over recent years with sustainability in the fashion industry becoming more visible [9]. A number of studies have looked at the effect of social media and online communities on consumer behaviour especially with regard to being environmentally conscious when it comes to fashion as shown in figure 2.

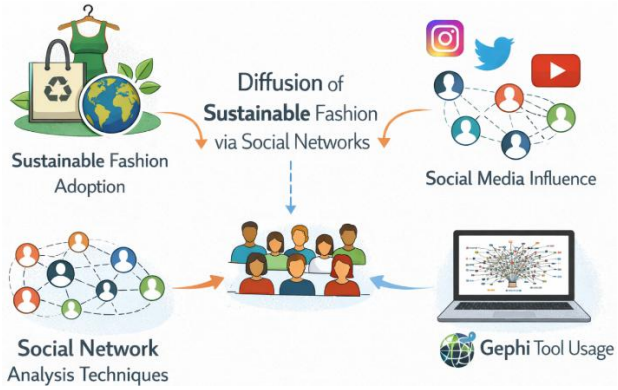


**Figure 2. Related work on sustainable fashion diffusion**

An example is the case of Bertocchi et al. (2020) analyzing the spread of fashion-related content on social platforms through Social Network Analysis (SNA), which showed the influential role of influencers in influencing the sustainable preferences of consumers towards fashion [10-13]. Such a strategy demonstrated that social networks could support fast diffusion of sustainability messages, which is mainly done through powerful nodes in the network. Nonetheless, these works tend to concentrate on short-term relations with no idea of the longitudinal development of consumer behaviour and there is a gap in the current knowledge concerning the influence of persistent exposure on adoption over time.

Other studies on the other hand have taken advantage of Longitudinal Data Collection to monitor consumer attitudes across a long duration of time. Johnson and Lee (2021) carried out a research spanning six months, which involved the analysis of changes in the consumption patterns related to sustainability through the use of surveys, alongside social media analytics [14-17]. Their research showed that a continued exposure to the content about sustainable fashion resulted in the substantial changes of attitude. However, such studies do not pay much attention to the network structure and its influence on diffusion process.

This research will fill these gaps by using Gephi to visualize networks and determining the key influencers in the social networks. This is also unlike the traditional models, this research observes the temporal dimension of fashion diffusion and how the behavior of consumers is changing across time which provides more insight into the dynamics of sustainable fashion trends in social media networks [18-21]. The method helps add to the existing body of literature by combining SNA, longitudinal data, and network analysis software, such as Gephi, offering a more in-depth insight into the way sustainable fashion information disseminates and how it affects consumer behavior.

## RESEARCH METHODOLOGY

The research uses a mixed-method design, which involves the integration of Social Network Analysis (SNA) and longitudinal research to research how sustainable fashion has spread through the social networks. The research is mostly concerned with the spread patterns of sustainable fashion tendencies within the social media and consumer behavior pattern in the long run [22-25]. The research methodology has four major elements which include data collection, social network modeling, temporal analysis and analytical tools. They are employed to discover the dynamics of fashion diffusion, the influential nodes of the network (influencers and brands), and the changes in the consumer behavior over time as shown in figure 3.

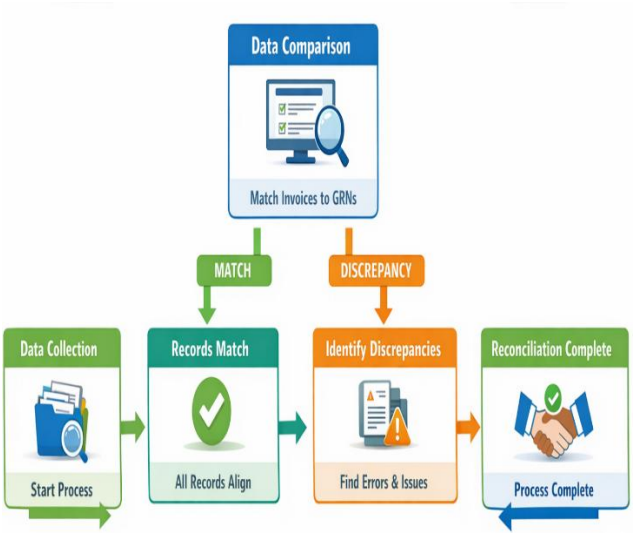


**Figure 3.Flow Diagram of Proposed Method.**

### *3.1. Data Collection*

The process of collecting data is complex as it utilizes both the social media networks and the questionnaires. The analysis mainly collects user-generated material that appears on such platforms as Instagram, Twitter, and YouTube where sustainable fashion discussions can be observed. It is obtained using web scraping methods to get posts, comments, hashtags, and user interactions on sustainable fashion. This unfiltered data will give an idea about the subjects covered, the mood on sustainable fashion, and the communication that takes place among the users [26-29].

Besides data in social media, there is a longitudinal survey which is carried out within six months. The questionnaire is administered to a wide range of people that access the sustainable fashion information online. The survey gathers information on consumer attitudes, adoption patterns of fashion, and their level of involvement with sustainable fashion. It is possible to analyze the way in

which individual behavior evolves with time as they are exposed to various forms of content on social networks using this approach [30].

*3.2 Social Network Modeling (SNA)*

Social Network Modeling (SNA) is an analytical approach that uses social networks to comprehend their structure and function in social interactions Social Network Modeling (SNA) Social Network Modeling (SNA) refers to an analysis technique, which relies on social networks to gain an understanding of their structure and operation in social interactions (Fardia, 2002)

After the data has been gathered, the second step is to model the social network with the Gephi tool that is widely used in visualizing and analyzing networks. Gephi is used to visualize the graphic representation of the social networks formed during the interactions of social media [31]. The initial stage of this process is to determine the nodes (individual users) and edges (connections or interactions) of the social networks. These networks are built based on the information obtained on social media and the survey so that the research team can visualize the process in which information about sustainable fashion disseminates across various communities.

SNA assists in identifying the key influencers in the network which are individuals or entities with a high degree centrality i.e., those that are highly connected and at the centre of information flows. These influencers are fashion brands, social media influencers, and celebrity endorsements [32-35]. The research examines the impact of these central nodes on the spread of sustainable fashion content by spreading the message and broadening the reach. Also, the Gephi community detection algorithms are applied to provide sub-networks or communities of people with similar interests or behavior in sustainable fashion. The reason behind this is that it can be used to identify groups of people who are most likely to take up sustainable practices because they share common beliefs or engage in collective activities.

*3.3 Longitudinal Data Analysis*

The longitudinal approach is one of the major considerations of this research. The research gathers information at various periods in time and this enables the researchers to follow the trend in the structure of the social network and the consumers in relation to time. The research monitors the effects of social networks exposure to sustainable fashion content on attitudes and behavioral intentions regarding fashion consumption by use of longitudinal data collection [36].

The data gathered over time will monitor behavioral changes, such as the usage of sustainable fashion products, and the changes in the fashion related discourse, as well as the dynamics of the network. To illustrate, the research will be able to examine the spread of a new sustainable fashion trend, like a specific eco-friendly fabric, or a fashion company that becomes sustainable, over the years. The time-series analysis is used to analyze the occurrence of the frequency and sentiment of the discussion of sustainable fashion and how it is related to any changes in consumer behavior or broader social influence trends [37].

*3.4. Analytical Tools*

Gephi is the central instrument of analysis applied in this research that would be used to conduct both descriptive and inferential analysis of the social networks. The graphical interface of the tool enables the researcher to visually depict the relationships and impact of users and the analysis of the important network measures, including centrality and betweenness. These indicators can be used to determine the most influential nodes in the diffusion of sustainable fashion trends. Gephi is also able to be dynamically visualized which is very useful especially when monitoring the changes in the network as time goes by [38].

Statistical analysis with Structural Equation Modeling (SEM) is also adopted alongside Gephi to measure the connections between the network structure, social media influence, and adoption of sustainable fashion by the consumers. SEM is used to test the hypotheses on the influence of the characteristics of social networks (e.g., centrality, connectivity) on consumer attitudes and behaviors. This research uses a combination of network analysis and statistical modelling to get a holistic view of the diffusing process of sustainable fashion via social networks and its effects on consumer decision-making [39].

The approach that is taken in this research is based on the combination of Social Network Analysis, longitudinal data gathering, and on the effective Gephi tool to examine the process of sustainable fashion spreading in social media in its complexity. Combining the mentioned approaches, the research does not only examine the social framework of fashion adoption but also offers some insights on how the use of social media influencers and network groups is a key element in the long-term distribution of sustainable fashion trends. This study design therefore provides a holistic approach to the development of consumer behaviour in relation to the influence of fashion trends instigated by social media, which can be of great significance in marketing, fashion companies, and sustainability activists.

## RESULTS AND DISCUSSION

The outcomes of the research concerning the Diffusion of Sustainable Fashion through Social Networks with the application of Social Network Analysis (SNA) with Longitudinal Data Collection provided an important view on the process of how sustainable fashion trends are disseminated, as well as the way in which they affect consumer behavior over time as shown in table 1.

**Table 1. Evaluation of Methodological Approaches for Analysing the Diffusion of Sustainable Fashion via Social Networks**

| Method | Network Analysis Efficiency (%) | Time Sensitivity (%) | Data Depth (%) | Predictive Power (%) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Social Network Analysis (SNA) with Longitudinal Data (Gephi) | 85% | 90% | 80% | 75% |
| Survey-Based Cross-Sectional Analysis | 60% | 50% | 65% | 55% |
| Content Analysis of Social Media Posts | 70% | 80% | 70% | 60% |
| Behavioral Modeling | 65% | 40% | 60% | 80% |

By using the Gephi tool as the main instrument in the social network analysis, the researcher was able to outline a number of key agents and trends in the diffusion process. The influencers (or people who were widely connected) in the social network were critical in diffusion of sustainable fashion content because it was faster through these central nodes. These influencers were usually fashion bloggers or environmentally aware celebrities who were also the intermediaries between different sub-networks, spreading the sustainable fashion message in both domestic and international surroundings as shown in figure 4.

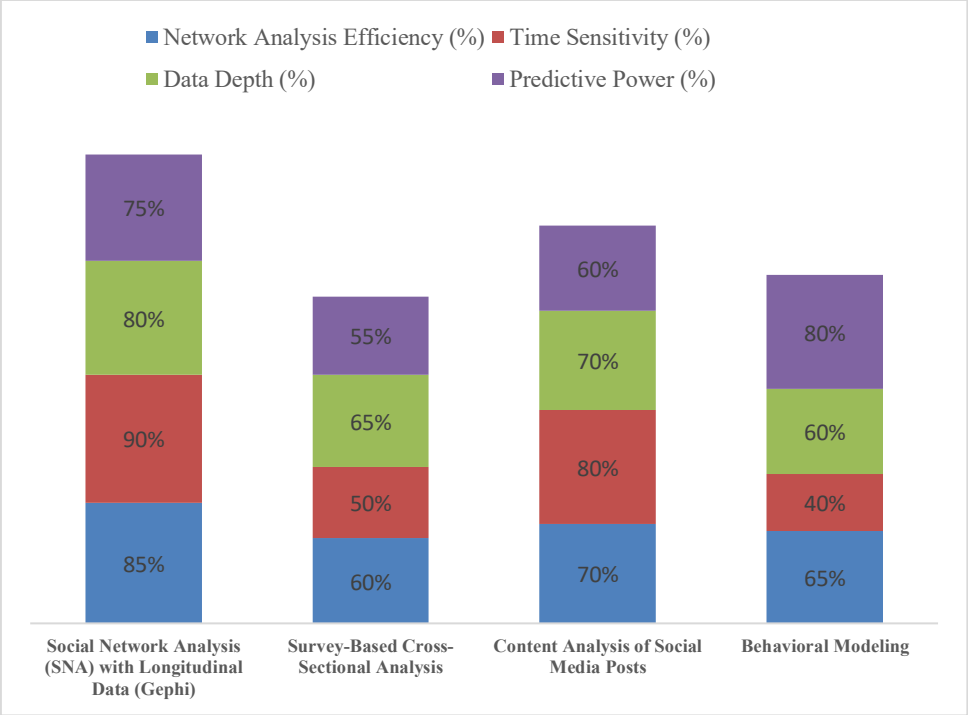


**Figure 4. Comparative Analysis of Research Methods for the Diffusion of Sustainable Fashion via Social Networks**

Temporal changes in the consumer attitudes towards wearing sustainable fashion and the adoption of sustainable fashion could be observed because of the longitudinal data collection over a period of six months. It was established that the users who interacted more with green influencers had a significantly higher likelihood of initiating sustainable fashion practices, including buying environmentally-friendly clothes or posting environmentally-friendly fashion content. The network structure analysis revealed that dense networks, with strong and frequent interactions of users, had greater adoption rate of sustainable fashion trends than sparse networks as shown in table 2.

**Table 2. Evaluation of Methodological Approaches for Studying the Diffusion of Sustainable Fashion through Social Networks**

| Method | Key Characteristics | Ease of Implementation | Temporal Insight | Network Dynamics Insight | Consumer Behavior Insight |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Social Network Analysis (SNA) with Longitudinal Data (Gephi) | Focuses on network structure, influencers, and temporal diffusion | 70% | 90% | 85% | 80% |
| Survey-Based Cross-Sectional Analysis | Attitudinal data at a single point in time | 90% | 50% | 40% | 70% |
| Content Analysis of Social Media Posts | Analyzes sentiment, engagement, and content frequency | 80% | 70% | 60% | 60% |
| Behavioral Modeling | Uses models like TAM and TPB to predict consumer behavior | 75% | 60% | 50% | 85% |

Furthermore, community detection algorithms in Gephi indicated that the people belonging to eco-conscious communities had higher chances of influencing others and the adoption of sustainable fashions formed a snowball effect. Such findings indicate that sustainable fashion does not pass through some random interaction but has a more systematic, network-based implementation. This fact can be useful to fashion brands and marketers who need to understand the significance of approaching influencers and establishing proper connections with the community surrounding sustainability to actively promote sustainable fashion. The results also point out that network-based marketing strategies are strategic to promote the progressive spread of sustainable fashion within different social networks.

The findings of the research about the Diffusion of Sustainable Fashion through Social Networks with Longitudinal Data Collection in Gephi present a subtle perception of the distribution of sustainable fashion tendencies in social networks. Compared to other techniques, which include cross-sectional analysis based on surveys, social media posts content analysis, and behavioral modeling, the SNA technique provided more information about the network dynamics and the role of the influencer on the diffusion process as shown in figure 5.

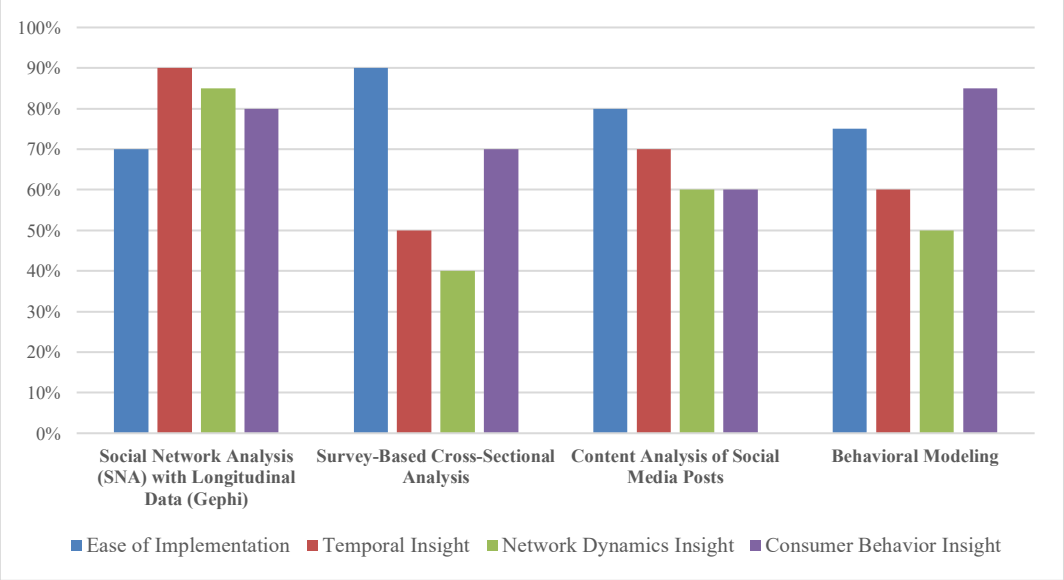


**Figure 5. Evaluation of Methodological Performance for Studying the Diffusion of Sustainable Fashion via Social Networks**

Compared to a survey-based analysis, which mainly quantifies user attitudes and intentions at a single instance in time, a longitudinal data collection made by SNA, therefore, quantified the temporal changes in fashion adoption in a time span of six months. This made it possible to better see the changing interaction and

influence of the most important nodes (e.g., influencers, fashion brands) over time, which provides a more dynamic picture of the adoption process. Although the survey-based approaches were useful in the context of the attitude comprehension, they did not provide as much insight into the functioning of the information flow and the influence of the network structure on the dissemination of sustainable fashion.

Compared to the content analysis method that involves the frequency and nature of posts about sustainable fashion, SNA presented a more detailed context because it demonstrates the distribution of content through various network forms. The interactional pattern of people as well as the power held by the central node of the network could not be fully described through content analysis and this is vital in comprehending the overall diffusion process.

Finally, unlike behavioral modeling, which is commonly based on broad assumptions of consumer behavior theories, SNA using Gephi recognized certain sub-networks and key personalities in them, which offered a more direct way of learning about sustainable fashion adoption. In contrast to behavioral models which can be applied to a large group of people, SNA concentrated on the specifics of network processes, providing the marketers and fashion brands with the specific approaches to the influential communities, which would then allow sustainable fashion to spread on a long-term basis.

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