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TRANSITION OF BUSINESS COMPANIES TO CIRCULAR ECONOMY IN SLOVAKIA*

Eva Hanuláková [1], Ferdinand Daňo [2], Marek Kukura [3]

[1,2,3] Department of Marketing, University of Economics in Bratislava, 852 35 Bratislava, Slovakia

E-mails: [1]eva.hanulakova@euba.sk; [2]ferdinand.dano@euba.sk; [3]marek.kukura@euba.sk

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Abstract. Integration of the circular economy system and its elements into business activities present new business opportunities. Despite the fact that circular economy represents a global trend, most industrial branches are based on the structure of a linear model. A system of circular economy has been gradually gaining ground in the business activities of companies functioning in Slovakia in different industries, including the clothing and textile industry. Transformation to the circular economy will be a necessity resulting from the legislative changes, as well as the pressure of public opinion. Our article focuses on this issue mentioned above. The main goal of the article is to explain the principles of the transition of companies operating in the textile and clothing industry from the linear to the circular economy and their potential for such a change and define the benefits of such a new business strategy for companies in Slovakia. In order for companies to be willing to switch to a circular economy, it is necessary to address the potential of the market and know the opinion of companies in the transition to a circular economy. To determine the market potential, we used ex ante forecasting using Holt's linear exponential smoothing, which showed us the growing trend of revenues in the textile industry, which can be an important factor for companies. In order for the transition to the circular economy to be successful, it is important to know the opinion of companies on the limitations and problems associated with the circular economy. To assess the opinions of companies, we worked with cluster analysis using the centroid method. The cluster analysis pointed to an implementation problem in almost 70% of the companies surveyed. Despite that all companies from the first cluster regard the circular economy as a new business model. However, it will be necessary to create adequate conditions for these companies to make the transition to the circular business models easier or possible. This primarily concerns adequate legislation and business operators' awareness of both positives and negatives connected with the transition to such a business model.

Keywords: circular economy; cicular business model; clothing and textile industry

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1. Introduction

Global climate change is one of the greatest economic and social problems in the foreseeable future (Adamisin et al., 2018). It requires the implementation of a full range of various solutions and new systems. One of them is the transition of national economies from a linear system of economy to a circular economy.

Transition to the circular economy is a social, political and economic phenomenon deserving deeper scientific research. It is a change which we can, by its extent and impact, compare to the Industrial Revolution. Circular economy represents a manual how to leave a zero, or at least a minimal ecological footprint in both personal and production consumption. In the model of a linear economy, it steps in applying the principle of "a circle", meaning repeated usage of a product or a material, its remake and recycling).

Slovak economy faces an important change. Transformation to the circular economy will be a necessity resulting from legislative changes, as well as the pressure of public opinion. Stakeholders will have to explain the necessity and usefulness of legislative changes and requirements. Implementation of new environmental goals or tightening the ones which already exist will have to be communicated towards the market and the public in a way to make them accepted and implemented.

Companies functioning in Slovakia are part of the European Union's single market and are therefore facing pressure from the European Commission. The Plastics Strategy will lead to the decrease of plastic waste and to the increase of recycling, as well as using recycled materials in production, which will have a huge impact on business (European Commission, 2018). Public pressure towards limiting disposable plastic products will mean a revolutionary change in gastronomy. It will create an opportunity for the use of new materials, but also new concepts of catering, and thus business.

Directive on the reduction of the impact of certain plastic products on the environment by the European Parliament and the Council of the European Union will bring new duties to producers in the form of special requirements on changes of packaging designs, particularly beverage bottles (European Commission, 2018). Producers will have to start to use recycled material in a larger scale and also change the system of closing so the cap would not be separated from the bottle.

An important precedent is the implementation of extended responsibility of producers for specific products such as wet wipes for personal hygiene and household cleaning and filters of tobacco products containing plastic. Extended producers' responsibility represents an economic instrument and a modern version of a principle "a polluter pays", the aim of which is to raise the circulation of products and materials (Ghisellini et al., 2016). Extended producers' responsibility is an instrument that closes the circle in the circular economy and that will gain importance and relevance.

One can state that nowadays the majority of industry is built on the structure of a linear model. The same applies to the textile and clothing industry. To make the textile industry circular, the whole infrastructure, including the supply chain, has to transform into circular. European Directive 2018/851 refers to the textile waste in relation to the end-of-waste status with regard to the period until 1.1.2025, by which conditions for textile waste will be created within separate collection of municipal waste by means of waste containers (waste containers will probably be set for dirty waste textile as it is called for downcycling). Current waste containers for textile are set for repeated usage, i.e. upcycling (The European Parliament and the Council of the European Union, 2018).

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2. Circular economy as a new economic system and business model

2.1. From the Linear to the Circular Economy

In the case of the circular economy, it is a change of the economy paradigm from the linear, typical for raw material extraction, production and consumption, to the circular one. The aim is to decrease the environmental impact of production and consumption. Circular economy has a potential to understand and implement fundamentally new models and facilitate reaching sustainability and welfare with minimal or no material, energy or environmental costs. Circular economy can present a solution how to reduce a negative impact of the "bussines-as-usual" economic system (Ghisellini et al., 2016; Andryeyeva et al., 2021).

The topic of circular economy is very up to date, but at the same time very young. It means that the volume of specialized literature of older date is rather limited. The database of scientific publications Web of Science lists only 30 published scientific articles on the topic of the circular economy in 2014, but in 2016 there were more than 100 of them (Kirchherr et al., 2017)

The concept of the circular economy appeared in the 70' of the 20th century for the first time (Ellen MacArthur Foundation, 2014). Several authors such as Andersen, Ghisellini and Su claim credit for the concept of the circular economy to authors Pearce and Turner (Andersen, 2007; Ghisellini et al., 2016; Pearce & Turner, 1989; Su et al., 2013).

The concept of the circular economy is based on several schools of economics and economic theories. The most commonly refferred source is the theory "cradle to cradle" by authors McDonough and Braungart (McDonough & Braungart, 2010). The second source is the theory Looped and Performance Economy by Walter Stahel and also the Industrial Ecology Theory (Preston, 2012; Prokopenko, 2011).

The best-known definition of the circular economy is the one by Ellen MacArthur Foundation that presented the circular economy as the industrial economy focused on regeneration and design (Ellen MacArthur Foundation, 2014; Geng & Doberstein, 2008).

The broader definition which describes the circular economy as a regenerative system in which the leakage of invested resources as well as waste, emissions and energy is minimized by slowing down, closing, and limiting material and energy cycles is very accurate. This might be achieved by a design aimed at long-term consumption, maintenance, reparation, repetitive usage, remaking, renovationg and recycling (Geissdorfer et al., 2017).

Circular economy moved away from the traditional economic model "take-make-dispose" and transformed into an economic model that is renewable. The aim is to maintain the greatest possible value of resources, products, parts and materials in order to create a system that would enable long lifespan, repeated usage, renovation, repeated production and recycling (Lehmann et al., 2014). Circular economy is often defined as a concept in which the waste does not exist.

Circular economy has a big potential in changing the models of consumption and production by implementing new business models and processes which have positive impact on the environment. Integration of the circular economy system into companies' activities represents benefits typical for new tendencies. They result in new business opportunities in the form of models based on decreasing production inputs as well as outputs, new technologies, innovations, changing attributes of products and their life cycle, repeated usage of virgin resources and materials or raising the level of recycling.

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Literature mentions many circular business models (Ellen MacArthur Foundation, 2014; Frankenberger et al., 2013; Joustra et al., 2013; Laubscher & Marinelli, 2014; Linder & Williander, 2015; Van Renswoude et al., 2015; Wirtz, 2011). A model CANVAS is considered to be the most comprehensive. It is comprised of nine pillars (elements) which create a base for this model: (1) customer segments, being served by a company, (2) creation of value for customers, (3) distribution and communication canals, used by a company to provide service for customers, communicate with them and sell products, (4) relations with customers, which a company creates and maintains with every market segment, (5) revenue flows resulting from price offerings to customers, (6) key resources as assets necessary for the provision and delivery of the above mentioned elements, (7) key activities, carried out for the purpose of the provision and delivery of the above mentioned elements, (8) key partnerships, which are the network of suppliers and partners who support the implementation of the circular business model by means of providing particular resources and carrying out particular activities, (9) structure of costs including all costs which resulted from the operation of the circular business model. (Osterwalder & Pigneur, 2010).

The each product goes through several stages of its life cycle – from the development to the market "death". From the point of view of circular economy, it is necessary to perceive the influence of a product's lifetime namely in the context of a product's life cycle. According to McDonough and Braungart it is crucial that materials are divided into two independently circulating circles (McDonough & Braungart, 2010). The first circle concerns a biological system comprised of products, which only contain substance that is possible to safely return to biosphere, e.g. making it into compost. Products such as food and beverages, fabric from natural fiber without harmful dye, products from wood etc. rank among them. These products are made from renewable biological materials which are not contaminated. Depending on the type of product, cascade usage prior to its processing into biosphere is possible. Within the second circle, synthetic substances are being handled with. Those should be put in products in a way that would enable to extract them as simple as possible and repeatedly use them after the product was used.

The aim of the model of desired circular behaviour is to act as a guide for designers to understand what the key user behaviours that help circular business models to function are and therefore design products, services and other systems with these in mind (Wastling et al., 2018). In the context of the circular economy, we talk about circular design of products. Circular design is complex; it is a conjunction of economic, environmental and social attributes. It is a part of a renewable design.

The core of the circular design is to correctly design a product or material so it would take different aspects and requirements in the account, such as e.g. durability, compatibility, modularity and functionality of designed products. Intelligent choice of materials, rational design and selection of adequate production processes significantly reduce negative impact of products on the environment, prevent waste production and economize on natural resources.

One possibility how to prolong the life cycle of a product which reflects the idea of the circular economy at the same time is the modular design of a product. Products with modular design not only follow customer's need and wishes and bring new solutions, but at the same time also mean easier development, bring lower production costs, eliminate spending unnecessary energy and economize raw materials. It is important to perceive the modular design as a business prospect in which the modularity is being used for offering adjusted products to big masses of consumers (Best, 2016).

A consumer as such plays an important role in the process of transition to the circular economy. A number of behavioural barriers are preventing the development of the circular economy but an appropriate behaviour change intervention could help to overcome them (Muranko et al., 2019). Several factors that affect consumer acceptance of circular economy-type product offerings have been identified, however these are yet to be fully tested in 'real-

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world' scenarios (Chamberlin & Boks, 2018). Supply of information will influence consumers who will have greater expectations from a product or a service in relation to the environment protection.

Previous studies confirmed that up to 30 % of consumers are willing to pay an extra charge for products with environmental labels compared to those without such labelling (Vaško, 2016).

In a future circular economy, new business models are needed that slow, close and narrow resource loops to address key resource and climate challenges. After a phase of excitement and inspiration, an operationalization phase needs to start to ensure the best possible implementation and transition towards a circular economy.

2.2. Integration of the circular economy in the clothing and textile industry

The textile/apparel industry is of great importance to the economy in terms of trade, employment, investment and revenue all over the world. This sector is however characterised by substantial losses, due to production excesses on the one hand, and the "throw away" culture on the other. This state of affairs suggests that textile recycling is needed (Filho et al, 2019). Textile and clothing industry uses enourmous number of resources and has a great impact on the environment, which is intensified by its growing tendency. Production of the clothing itself and the care of it uses great amount of soil, water, energy, chemicals and produces excessive amount of waste.

This growth is a consequence of the "fast fashion" trend. The term "fast fashion" was defined in the 90'of the previous century. Fast fashion is a contemporary term used by fashion retailers to express that designs move from catwalk quickly to capture current fashion trends. Fake world designer clothes are affordable for a consumer for low prices. From the total production of clothes sold by a year less than 1% is recycled. That equals loss of material in the amount of 90 billion euro, whereas up to 95% of clothes that are being thrown out can be recycled or upcycled. William McDonough and Michael Brangaurt see upcycling as the industrial revolution. According to their opinion, it is necessary to design products in a way that would make them being used in upcycling after the end of their first life cycle. They also stress the importance of the implementation of the given concept directly into production processes that would lead to sustainability and will contribute to the protection of the environment (McDonough & Braungart, 2010). Upcycling prevents the generation of excessive waste and has almost no impact on the environment.

Together with upcycling, it is neccessary to define another concept of recycling, i.e. downcycling. The majority of recycled industry materials loses its value or viability in the process of recycling. To be more specific, it means that such materials can be used in the degraded form afterwards for components and products whose usage differs from the original usage. The result of the process of recycling is the production of shorter textile fibers of lower quality in comparison with virgin fibers. In order to enhance the quality, recycled fibers have to be combined with the original fibers (Subramanian, 2018). The opposite of the 21st century phenomenon of fast fashion is the "slow fashion". Slow fashion is about design, production, consumption and better life. It combines thoughts on nature (regenerative cycles and evolution) and culture (about the value of traditions). Just as the more common time frame of fashion and trade slow fashion puts emphasis on the quality and design manufacture of clothing (Fletcher, 2008).

Textile and clothing industry creates a broad spectrum of new spheres of using textile materials. European industry maintains its position with higher added value in the supply chain. It most frequently concerns the fusion of knowledge, advanced technology skills and high specialization. In the clothing and textile industry in particular it means research and testing of the functionality of fibers, products and textile materials and a consequent use of these components in further production processing. It also includes design, efficient tailor-made production and fast supply of fashionable textiles with high level of sustainability.

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Companies have started to gradually aproach the solution of specific environmental and social challenges in the framework of their supply chains either on their own initiative or under the pressure of sector-wide organizations. First of all, these afforts cause the reduction of the impact of the current linear model of economy. In the new textile economy, which applies the principles of the circular model, clothes, textiles and fibres are being kept in the highest value during their usage and after it, they are being returned back into the circulation. They never end in the form of waste. The new model leads to better economic, environmental and social results.

The limits of the present linear model (take-make-waste) are extremly apparent when examining the textile and clothing industry. The transition to a circular economy requies significant changes in both production and consumption models (Koszewska, 2018).

3. Material and Methods

Due to topicality of the circular economy and the forthcoming changes concerning its implementation in the textile and clothing sector, we have implemented broader research in order to ascertain the readiness of the entrepreneurs to move from a linear to the circular economy. However, due to need an innovative approach in the both mentioned sectors, we firstly focused on the potential of the producers surveyed with a view to introducing new circular business models into their business activities. We later extended the research into a qualitative research approach aimed at examining the core of the problem – circular business models in relation to the attitudes, motivation and expectations of the companies surveyed towards the anticipated changes (Daňo et al., 2020).

However, it is essential that companies operating in the textile and clothing industry gradually and systematically prepare for the changes brought about by legislation and for the trends that determine those changes. Subsequently, we comprehensively processed the results of our research to determine the readiness of entrepreneurs in both industries to transition from a linear to a circular economy.

The main goal of this article is to explain the principles of the transition of business companies operating in the textile and clothing industry from the linear to the circular economy and their potential for such a change and to define benefits of such a new business strategy for companies in Slovakia. For the purpose of reaching the stated main goals we determine several partial goals: (1) explain the starting points of the companies' transition from the linear economy to the circular economy; (2) find out what are the conditions of the Slovak companies transition from the model of linear to circular economy considering possible problems and barriers in the selected industry; (3) define the market's potential for circular products in the selected industry and (4) specify effects related to the implementation of circular business models in the business practice in the examined sectors.

We focused on the core of the circular economy and implementation of its principles in business models. We concentrated on products and services in compliance with the circular design and the newest trends with regard to changes in the life cycle of products and finding a competitive advantage. In the course of the following years, the transition to the circular economy will probably become a key question for the majority of industries. If we want to examine the implementation of principles of the circular economy at the micro-level, it will be neccessary to apply a sector-based approach as well. In our article, we focused on the principles of the circular economy from the point of view of the clothing and textile industry which are typical for turbulent reproductive process. For this purpose, we carried out a research, the goal of which was to find out what is the condition and the degree of applying the principles of circular economy in Slovak companies operating in the clothing and textile industry and assess their potential in relation to using such a model in their business activities. We were interested in the approach of the examined companies towards their product strategies, design and brand from the perspective of the circular economy. We also concentrated on the potential of the examined companies regarding the search for

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markets for such circular products and their ability to apply the strategy of differentiation with an aim of finding a new source of competetive advantage.

Information on the clothing and textile industry were obtained from data published by the Statistical Office of the Slovak Republic. Our definition of the clothing and textile industry was based on the statistical classification of economic activities SK NACE Rev. 2, which was released in the Decree of the Statistical Office of the Slovak Republic on June 18, 2007 under the number 306/2007 Coll.

To process the results, we used the relevant mathematical and statistical methods. By means of the analysis of time series we tried to find out what the expected development for the next 3 years is and whether an increasing or a decreasing trend will prevail. The ex ante prognosis is closely related to the companies' decision-making. The result is the monitoring of the development of the revenue on the basis of statistically available information for the period from 2008 to 2018, forecasting by means of the Holt's Exponential Smoothing, and setting a conclusion. The method of cluster analysis was used to determine the size of clusters, to find out how individual companies perceive the difficulty of the circular economy implementation and where do they see the main issues with implementing the circular economy in their business activities. A variable entering the model as individual companies was used as dependent and variables named as follows were put as independent: problems with implementation, high costs, incresed capacity requirements, lack of qualified employees and insufficient government support.

When carrying out time series analysis and using the Holt's exponential smoothing method, we applied the following method:

$$\widehat{\beta_{0,t}} = \alpha y_t + (1-\alpha)\left(\hat{\beta}_{0,t-1} + \hat{\beta}_{1,t-1}\right)$$
$$\widehat{\beta_{1,t}} = \beta\left(\hat{\beta}_{0,t} - \hat{\beta}_{0,t-1}\right) + (1-\beta)\hat{\beta}_{1,t-1} \quad (1)$$

$\widehat{\beta_{0,t}}$ - the linear trend level estimation at the end of the period t,

$\widehat{\beta_{1,t}}$ - the linear trend direction estimation at the end of the period t,

$\hat{\beta}_{0,t-1}$ - the linear trend level estimation at the end of the period t – 1 ,

$\hat{\beta}_{1,t-1}$ - the linear trend direction estimation at the end of the period t – 1

α, β - equalizing constants.

We carried out the cluster analysis applying the centroid-based clustering method as follows:

$$D\left(C_h, C_h^{'}\right) = d_{ij}^2(\bar{X}_{c_h}; \bar{X}_{c_h}{}^{'}) \quad (2)$$

$D\left(C_h, C_h^{'}\right)$ - distance between clusters,

d_{ij} - Euclidean distance,

$\bar{X}_{c_h}; \bar{X}_{c_h}{}^{'}$ - newly created cluster relaced by an average element,

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When applying mathematical and statistical methods, we relied on several literary resources [Bailey, 1994; Chatfield, 1984; Rublíková et al., 2003; Stankovičová & Vojtková, 2007).

4. Results and discussion

In practice, the circular economy is still far from being implemented in industrial companies in general and in small and medium enterprises in particular. It is for such companies where it can represent an important contribution in the form of innovations. Innovation is a key factor for small and medium businesses to remain successful. Innovation is undoubtedly a key to ensure the sustainability of the entrepreneurial activity. The introduction of new and innovative processes in the company will result in improved products and services (Linder & Williander, 2015; Prokopenko, et al. 2014).

There is still no universally accepted definition what small and medium enterprises are. The most common criteria are the financial criteria of turnover, sales or assets and a number of employees. While the limits of the financial criteria are still being changed because of its adaptation to economic development, the number of employees is more stable during the period of time and so more suitable for statistical analysis of the small and medium enterprises development.

We regard in further analysis the SMEs by number of employees as provided by the Statistical Office of Slovakia. Small enterprises are considered as enterprises with the number of employees within the range 0 to 49; medium enterprises within the range of employees 50 to 250 and large enterprises have 250 employees or more (Láziková et al., 2018).

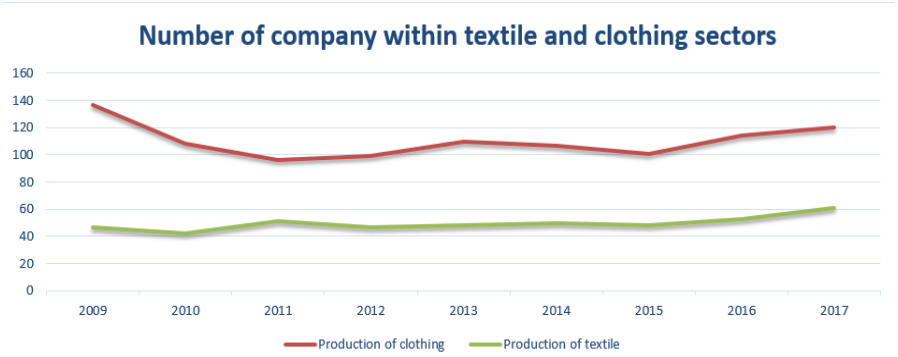

Figure 1. Number of companies in the individual sector of the textile industry in the period from 2009 to 2017

Source: Own processing from datacube

We can see in Figure 1, is that the production of clothing reached the maximum number in the year 2009 and because of the financial crisis, the number of companies fiercely fell down. Since 2015, the number of companies had been growing and reached the number 120 in 2017. The production of textile recorded stable progress.

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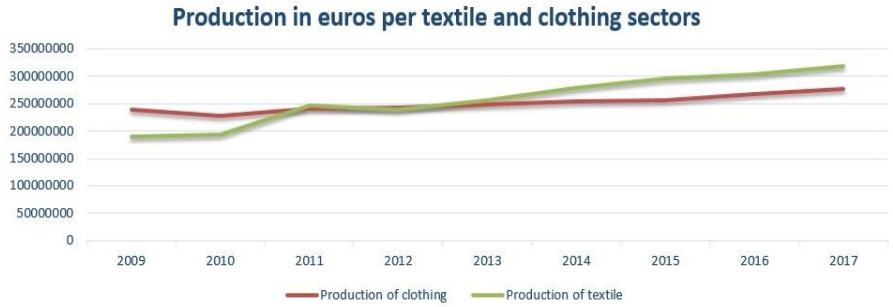

Figure 2. Production in the sector of the textile industry in euros in the period from 2009 to 2017

Source: Own processing from datacube

Production of textile had growing tendency in the whole reference period, whereby production of clothing fluctuated around 250 000 000 euros (Figure 2).

Figure 3. Average nominal monthly wage in the textile industry in euro in the period from 2008 to 2018

Source: Own processing from datacube

Average nominal monthly wage had stable variability of value in time in the reference period; we can also see a growing trend of our time series (Figure 3).

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4.1. Time series analysis using the Holt's exponential smoothing model

4.1.1. Analysis of development of revenue

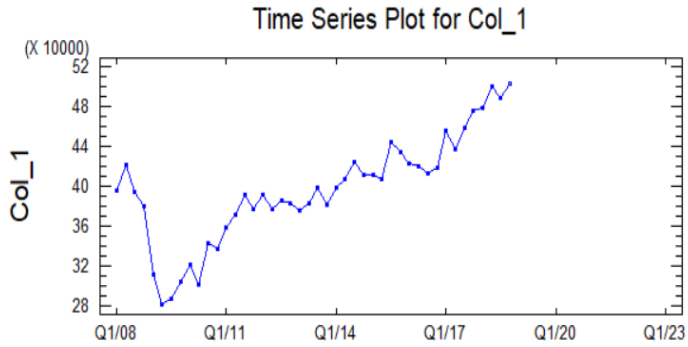

Figure 4. Time series of the development of revenue from Q1/2008 to Q4/2018

Source: Own processing

On the line charts, we can see a growing trend from the third quarter of 2009, whereby the alternation of the decrease and increase predicated the inherence of seasonality. Time series had stable variability of value, so we could assume that this concerns the additive model, in which case variability does not increase with time (Figure 4).

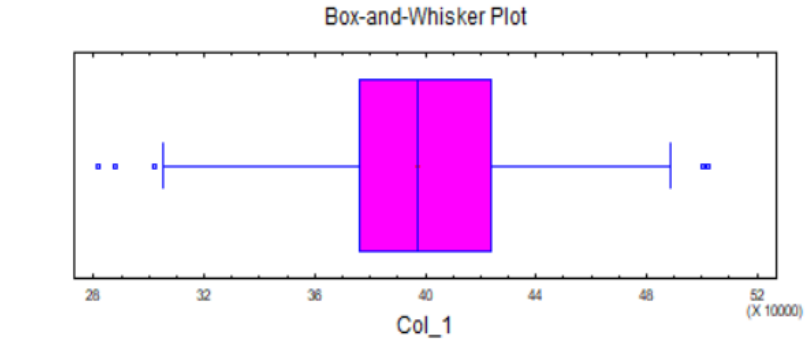

Figure 5. Box and Whisker Plot

Source: Own processing

Box-and-Whisker Plot indicate that time series have moderately left skewed the distribution and the negative kurtosis. In our time series, we have also recorded an extreme value (Figure 5).

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4.1.2. Verification of seasonality in times series

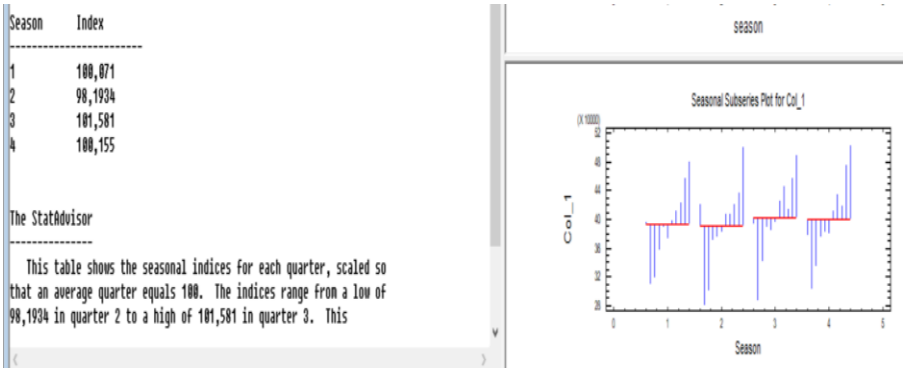

Figure 6. Seasonal indices and Subseries Plot

Source: Own processing

From the first line charts we predicted the inherence of seasonality. Seasonal indices and Seasonal Subseries Plot confirmed our prediction that in time series the seasonality in the second and third quarter of the years is moderate (Figure 6).

4.1.3. Choosing the correct model

Models

(A) Holt's linear exp. smoothing with alpha = 0,9939 and beta = 0,0387
Seasonal adjustment: Additive
(B) Linear trend = -475338,0 + 3427,39 t
(C) Quadratic trend = 5,79565E6 + -45976,5 t + 97,0606 t^2
(D) Simple exponential smoothing with alpha = 0,9939
(E) Brown's linear exp. smoothing with alpha = 0,9939

Estimation Period

Model	RMSE	MAE	MAPE	ME	MPE
(A)	21548,5	15130,7	3,96052	146,0	-0,151641
(B)	31607,5	21970,0	5,8823	-3,17496E-11	-0,696209
(C)	28520,6	20498,5	5,65786	-1,18532E-9	-0,617787
(D)	20417,4	15312,3	3,97892	2406,86	0,392319
(E)	29160,2	23924,9	6,18238	1194,3	0,301135

Model	RMSE	RUNS	RUNM	AUTO	MEAN	VAR
(A)	21548,5	OK	OK	OK	OK	OK
(B)	31607,5	*	**	***	OK	***
(C)	28520,6	OK	*	***	OK	***
(D)	20417,4	OK	OK	OK	OK	OK
(E)	29160,2	OK	OK	OK	OK	OK

Figure 7. Comparing applicability of various models

Source: Own processing

We choose the predictive model on the base of the lowest value of the mean absolute percentage error. In our case it is Holt's linear exponential smoothing. Real value differs from the predictive value average by 3.96 percent.

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$$E(\varepsilon_t) = 0$$

$$D(\varepsilon_t) = \sigma_\varepsilon^2$$

$$\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$$

$$cov(\varepsilon_t, \varepsilon_{t+k}) = cov(\varepsilon_t, \varepsilon_{t-k}) = 0$$

Figure 8. Conditions of residues

Source: Own processing

We have to verify the conditions of residues before a prediction. In the Comparison of model we have tests RUNS, RUNM, AUTO, MEAN, VAR which verify all conditions of residues. In our chosen model Holt's linear exponential smoothing, all tests are OK on our significance level α=0.05. We can therefore say that all residues conditions are carried out (Figure 8).

4.1.4. Prediction of the revenue for years Q1/2019 - Q4/2021

After verifying the condition of residues we can use Holt's linear exponential smoothing, in which, due to distortion results, we use the data without seasonal factor for prediction.

Period	Forecast	Lower 95,0% Limit	Upper 95,0% Limit
Q1/19	506072,0	466310,0	545835,0
Q2/19	511344,0	422867,0	599822,0
Q3/19	514596,0	366855,0	662338,0
Q4/19	518453,0	302434,0	734472,0
Q1/20	522991,0	230717,0	815265,0
Q2/20	528263,0	152507,0	904019,0
Q3/20	531515,0	65622,4	997408,0
Q4/20	535372,0	-26855,2	1,0976E6
Q1/21	539910,0	-124476,0	1,2043E6
Q2/21	545182,0	-226873,0	1,31724E6
Q3/21	548434,0	-336533,0	1,4334E6
Q4/21	552290,0	-450598,0	1,55518E6

Figure 9. Prediction for years Q1/2019 – Q4/21

Source: Own processing

In the future, the prediction will have a growing tendency, what is a positive factor for investments in the textile industry. In reality, this result can obviously be different because of I_t, what we call an error or an irregular component (Figure 9).

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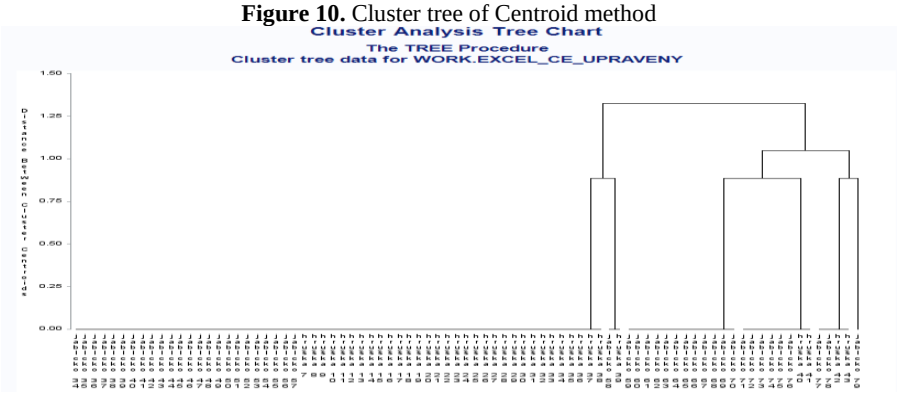
4.2. Cluster analysis

Individual companies answered the question about a problem of the entry in the Circular Economy. If they answered "yes", the answer was linked to "1", and if "no", to "0". To create clusters, we used hierarchical procedure. We chose the centroid method, using which we obtained the subsequent cluster tree (dendrogram). (Figure 10)

Figure 10. Cluster tree of Centroid method



Source: Own processing

It is important to find number of significant clusters. One of the reliable criteria is the greatest standard deviation of cluster variables RSQ and the smallest semi-partial coefficient of determination of SPRSQ. In our case, RSQ have value 0.963 and SPRSQ 0.0369. We apply both variables to the vertical axis and the number of clusters to the horizontal. In the chart, we must find a significant offset. In the Figure 11, we see significant offset on the level 5, so we set model to 5 clusters.

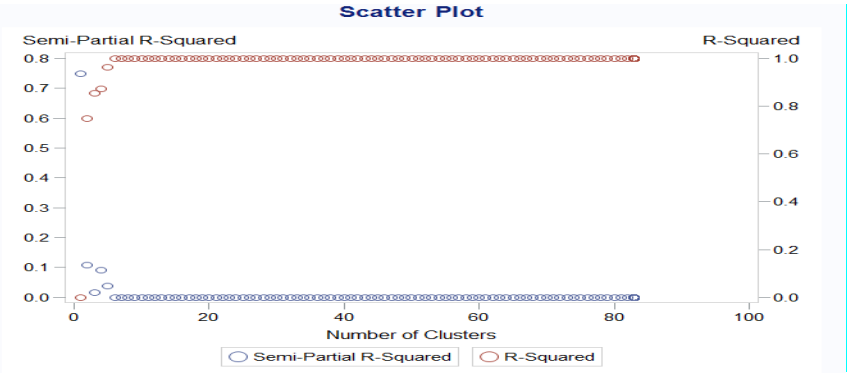


Figure 11. Scatter Plot

Source: Own processing

The absolute frequency in clusters is as follows: CLUSTER 1 = 58, CLUSTER 2 = 12, CLUSTER 3 = 8, CLUSTER 4 = 4 and in CLUSTER 5 we only have 1 observation. We modify number of clusters to number 4, but still, the system created a cluster with 1 observation. We choose the absolute number of cluster on the number 3. After modyfying the absolute frequency in clusters, CLUSTER 1 = 58, CLUSTER 2 = 20 and CLUSTER 3 = 5.

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Summary Statistics
Results
The MEANS Procedure

CLUSTER	N Obs	Variable	Mean	Std Dev	Minimum	Maximum	N
1	58	Problems with implementation	1.0000000	0	1.0000000	1.0000000	58
		High costs	1.0000000	0	1.0000000	1.0000000	58
		Increased capacity requirements	1.0000000	0	1.0000000	1.0000000	58
		Lack of qualified employees	1.0000000	0	1.0000000	1.0000000	58
		Insufficient government support	0.9655172	0.1840592	0	1.0000000	58
2	20	Problems with implementation	1.0000000	0	1.0000000	1.0000000	20
		High costs	1.0000000	0	1.0000000	1.0000000	20
		Increased capacity requirements	0.6000000	0.5026247	0	1.0000000	20
		Lack of qualified employees	0	0	0	0	20
		Insufficient government support	0	0	0	0	20
3	5	Problems with implementation	0	0	0	0	5
		High costs	0.8000000	0.4472136	0	1.0000000	5
		Increased capacity requirements	0	0	0	0	5
		Lack of qualified employees	0	0	0	0	5
		Insufficient government support	0	0	0	0	5

Figure 12. Summary of Statistics of various Clusters

Source: Own processing

CLUSTER 1 – Significant problems with the implementation of the circular economy. We can see that in cluster 1, companies have had a problem in almost all aspects of the implementation. Majority of companies in this cluster already have the circular economy or have been considering the circular economy so they are aware of the problems that may arise in implementing it or have already experienced it.

CLUSTER 2 – Moderate problems with the implementation the circular economy. Companies in the second cluster do not see a problem with the implementation of the circular economy in that many aspects. All companies in cluster coincide with problems of deployment and high costs, most of them with the increased capacity requirements. In this cluster, only companies that consider the circular economy and are already having some information on problems or risks are included. However, as we can see, they mainly underestimate the lack of qualified staff and the lack of state support. On the one hand, these firms can be better prepared, and on the other hand, there is a need for better information on the circular economy implementation.

CLUSTER 3 – Minor problems with the implementation of the circular economy:
Companies in the third cluster see that the problem of the circular economy implentation mainly resides in high cost. In this cluster, there are companies that do not consider the implementation of the circular economy. We can state that companies have insufficient information on the circular economy (Figure 12).

Conclusions

As we can see, there is an assumption of a growing tendency regarding the development of revenues in the clothing and textile industry, what is a positive indicator for companies to invest into new technologies.

Transition to the circular economy is, however, a difficult process, requiring overcoming several difficulties. Despite that all companies from the first cluster regard the circular economy as a new business model. However, it will be necessary to create adequate conditions for these companies to make the transition to the circular business models easier or possible. This primarily concerns adequate legislation and business operators' awareness of both positives and negatives connected with the transition to such a business model. A significant effect particularly for companies which consider implementing the circular economy could be brought in the form of the government support by applying different motivational and economic instruments. Their implementation could first of all eliminate the fear of high costs connected with the implementation of the circular economy elements into companies' business activities. Consumers'awareness of circular products, their quality and design

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in particular will be an equally important instrument for suporting the transition of business operators to the circular business model. We consider it an opportunity for establishing a new consumer segment with a potential to grow, i.e. a new business opportunity.

Retail trade has played a significant role in the whole contractor's process. Retailers have to take the initiative and the responsibility for social and environmental costs of clothes and textiles. It is inevitable that companies begin to perceive this fact as the market opportunity and competitive advantage and will react on consumers' increasing demand for responsible, sustainable and transparent clothes.

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Eva HANULÁKOVÁ is the head of the Department of Marketing at the Faculty of Commerce, University of Economics in Bratislava, Slovakia. In her scientific outputs, she specializes in business, modern marketing approaches and consulting with regard to circular economics, electromobility and other current topics of the sustainability.
ORCID ID:0000-0003-2659-2481

Ferdinand DAŇO is the rector of the University of Economics in Bratislava, a member of the Department of Marketing at the Faculty of Commerce. In his scientific outputs, he primarily focuses on the possibilities of applying modern marketing approaches and consulting in business and trade with regard to current trends in sustainability, such as circular economy, electromobility and other social issues.
ORCID ID: 0000-0002-7756-781X

Marek KUKURA is the PhD. student at the Department of Marketing at the Faculty of Commerce, University of Economics in Bratislava Bratislava, Slovakia. In his scientific outputs he specializes mainly in the use of social marketing in the context of solving social problems, as well as other current topics of sustainability.
ORCID ID: 0000-0003-0249-1758