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Conceptual Model of Human Resource Management for the Efficient Management of a Circular Economy

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Abstract:

Purpose: *Employees of companies from the production and service industry can carry out a lot of work for sustainable growth and circular economy, especially in the processes of delivery, production, distribution, and after-sales service. The aim of the article is to conduct a pilot study covering the challenges in the aspect of waste management and human resources, and to develop a conceptual model of human resource management for efficient circular economy management in an enterprise.*
Design/Methodology/Approach: *The article presents the results of preliminary research conducted with the use of a questionnaire consisting of 25 questions and conducted on a group of 101 small and large enterprises from the manufacturing or service industry. The results were prepared using the analysis of correlations confirmed by the Cronbach's alpha reliability coefficient. The conceptual model was developed based on the results of preliminary research and literature analysis.*
Findings: *The conducted research shows that one of the key challenges related to waste management and the possibilities of circular economy implementation in a company is the knowledge and awareness of employees. There are also differences in key challenges between small and large enterprises in relation to human resources in the implementation of the circular economy.*
Practical Implications: *The developed conceptual model may constitute the company's health path at the stage of the implementation of the circular economy in production or service companies. The conclusions from the research indicate which areas and in what order should be emphasized in relation to human resource management.*
Originality/Value: *The developed conceptual model is one of the first holistic approaches covering both human resources, sustainability, circular economy and the logistic system of waste management in the enterprise.*

Keywords: *Circular Economy, Logistic System of Waste Management, Human Resources.*

JEL Classification: *M51, Q01.*

Paper type: *Research article.*

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1. Introduction

Waste management is still one of the top topics, considering the number of publications from the last 40 years (Campitelli *et al.*, 2020). Waste in the enterprise can be generated in each of the company's processes, starting from the delivery process, through the production process, assembly, and ending with the process of distribution and after-sales service. In addition to the main technological processes of enterprises, another area influencing the amount of waste generated into the environment is the construction of the product itself, the selection of appropriate raw materials and semi-finished products, and the choice of methods of joining individual elements of the final product. In the event of damage to the product, the design of the product has a key impact on the ability to separate its elements and the possibility of reusing individual parts (Geda *et al.*, 2020).

The above example confirms that activities favoring the circular economy can be effectively implemented already at the stage of a production company, striving to minimize the number of waste and the negative impact on the environment in the logistic waste management system. The logistic system of waste management (LSWM) consists of activities integrated in four subsystems, aimed at minimizing the negative impact on the environment in relation to waste. Among the following subsystems we can distinguish: the waste collection subsystem, the waste shipment subsystem, the waste recycling subsystem, and the information flow subsystem.

In LSWM, it is justified to use new technologies for the purpose of collecting, processing, and inferring from data (Sarc *et al.*, 2019). Such solutions are now increasingly used in enterprises, especially in decision support systems using big data analytics, Data Science, Machine Learning and Artificial Neural Network (Melakessou *et al.*, 2020). This article complements the theoretical approach under the title Human Resources responsibilities in Logistic System of Waste Management for sustainable growth and circular economy, in which the research issues and theoretical approach are characterized. In this article, based on preliminary research, a conceptual model of human resource management was developed in terms of the subsequent stages of the implementation of the circular economy in an enterprise.

The developed model relates to the scope of responsibilities of the company's employees to achieve the overarching goal of sustainable growth and circular economy in the context of the company's main processes: delivery, production, distribution, and after-sales service. The model is the result of the previous primary pilot studies conducted on a group of 101 entities from Poland conducted in the period from October to December 2020 using a survey questionnaire. The scope of the study covers waste management in the enterprise in all subsystems of the logistic waste management system, i.e., waste collections, waste transport, recycling from waste and information flow. The survey was attended by representatives of middle and senior management in the company, including departments responsible for environmental protection. The result of the research is the analysis of the correlation of variables indicating the areas of waste management. These results, in conjunction with the literature review, constitute the basis for the development of the conceptual model and the described discussion of the results.

The remainder of the paper is organized as follows. Section 2 reviewed short literature review. Section 3 explained the methodology and data collection procedures. Section 4 presented results, analysis, and findings. Section 5 discussed conceptual model and managerial implications. Section 6 concluded the research and presented the recommendations of how to proceed, in the future.

2. Literature Review

The reason for implementing a circular economy in an enterprise is either a voluntary willingness to change representatives of a given organization or a formal compulsion. Any legal acts and directives in force in the area of the company's operations, which force the implementation and implementation of specific changes in the field of environmental protection, can be compulsory. Another way to implement the circular economy may be the high awareness (Veleva *et al.,* 2017) of the management in the field of corporate social responsibility and the impact of implemented processes on the environment. If top urban managers are not committed to transition to a circular economy in waste management, either no significant progress will be achieved or other staff will not have enough motivation to work efficiently, although definite goals have been defined (Mahpour, 2018). The high awareness of employees, their knowledge, skills, and attitudes shape the company's organizational culture, thus having a direct impact on the employees it employs. Based on the company's philosophy and individual key criteria of enterprises, processes are organized inside each of them.

Moving towards a circular economy in cities requires an involvement of many sectors and stakeholders (Taelman *et al.,* 2018). Minimizing the amount of waste generated is also supported by the popularizing concepts such as: "zero waste" (Pietzsch *et al.,* 2017), "green production" (Tiwari *et al.,* 2018), "green product" (Sharma and Foropon, 2019; Song *et al.,* 2020), "green workplace behavior" (Francoeur *et al.,* 2019) or "green HRM" (Bombiak and Marciniuk-Kluska, 2018).

Nevertheless, the article emphasizes the important role of man and his impact on the creation of solutions and their implementation in the field of CE, waste management and minimizing the negative impact on the environment. Although CE business models have been developed over past decade (Salvador *et al.,* 2020), the area of research on the connection of human resources and enterprise processes in the context of CE is still not widely covered in the literature (Jabbour *et al.,* 2019; Esposito *et al.,* 2018), which has been described in more detail in theoretical terms in the article entitled Human Resources responsibilities in Logistic System of Waste Management for sustainable growth and circular economy.

3. Material, Methodology and Methods

The development of the conceptual model was preceded by preliminary studies. The research results were presented in three steps. Initially, we provide an analysis of the current challenges of enterprises in the context of the effectiveness and efficiency of waste management in the enterprise. In the second stage, the correlation of key areas of responsibility of the management and all employees at CE and LSGO in the enterprise

was analyzed. The research at this stage was preceded by an analysis of the reliability of Alpha Cronbach. The last, third stage is the development of a conceptual model covering human resource management for the efficient management of a circular economy in a company.

At the preliminary studies stage, in the period from October to December 2020, a survey was carried out on a group of n = 101 enterprises. Out of all questionnaires, 3 were rejected due to the type of organization (it was not a company, but a school and office). A total of 98 responses were included in the analyzes. Even though the conducted research is not representative for the studied population of enterprises, they allow for initial verification and extraction of data relating to waste management and the current state of implementation in the area of waste management. The selection of the research sample was random based on the snowball method. Nearly 50% of the respondents are people responsible for waste management in the enterprise, another 30% are people in managerial positions or business owners. The selection of the research sample is presented in Table 1.

Table 1. *The statistical sample specification*

Group description	Number of respondents	Percentage of the research sample
All respondents	98	100%
Size of a company		
1 - 9 employees	16	16,3%
10-49 employees	15	15,3%
50 - 99 employees	15	15,3%
100 - 499 employees	19	19,4%
500 - 999 employees	10	10,2%
1000 and more employees	23	23,5%
Type of a company		
Manufacturing	47	48%
Service, including trade	51	52%
Position of a respondent		
Owner	16	16,3%
Managers	14	14,3%
Environment protection expert	47	48%
Other position	21	21,4%

Source: *Own study.*

The research questionnaire was developed based on an earlier literature analysis. In closed questions concerning waste management, a scale from 1 to 7 was used. For the purposes of the analyzes, the data was transformed as follows: open-ended questions were separated from closed questions and answers were divided according to the type of enterprise. Questions regarding internal recycling of waste and the wider circular economy context also related to data analysis, employees' knowledge of how to handle waste, employee responsibility or information flow in the organization. The questionnaire also includes an open-ended question on the key challenges in minimizing the negative impact on the environment in the enterprise, especially in the aspect of waste management.

The first stage presents the results of research on the challenges related to waste management in the context of human resources and the implementation of the circular economy. Then, the relationships between the various aspects in the context of the logistic system of waste management and human resources were analyzed. For this purpose, a correlation matrix was used. For these analyzes, the linear correlation coefficient is $p < 0.05$ and the Cronbach's alpha is 0.723.

4. Results

4.1 Stage I – Current Challenges of Enterprises in the Field of Human Resources and Waste Management

In the first stage, the analysis of the research results concerns the qualitative analysis of the answer to the question "What, in your opinion, is the key challenge in minimizing the negative impact on the environment in the enterprise, especially in the aspect of waste management?". Out of all responses, 86 of them were considered for further analysis. The answers to these questions were largely repeated in some areas, therefore all of them were finally classified in 11 areas presented in Table 2. The table includes both the division of challenges by companies from the manufacturing industry and trade services. The second division category is the division into small companies (employing up to 100 people n = 46) and large (employing more than 100 people n = 52).

Table 2. *The frequency of respondents indicating a specific waste management challenge*
in relation to the type of business activity conducted

Type of challenge	Total	Production companies	Service and trade companies	Small companies	Large companies
Knowledge and awareness of employees	27	9	18	12	15
Waste segregation	17	8	9	8	11
Minimizing the amount of waste generated	5	3	2	2	3
Recycling of waste and recycling	5	2	3	1	4
Reducing the use of plastic and associated waste	5	1	4	4	1
A small number of companies specializing in waste management	4	2	2	2	2
High waste management costs	3	1	2	2	1
Legal aspects and required documentation	2	1	1	0	2
Selection of appropriate waste containers	2	2	0	1	1
Packaging	4	2	2	3	1
Other challenges not classified above	12	6	6	6	6

Source: *Own study.*

The most frequently indicated category of challenges (30%) was the awareness and knowledge of employees. This category also included responses such as: "making people aware and showing them the seriousness of the matter", "informing and training employees". The second most frequently indicated answer was the category related to waste segregation. In this category, the results were often related to the lack of knowledge

among employees about how to separate their waste. The lack of this knowledge referred to both the basic classification of waste and the specialist classification related directly to the production process and the type of generated waste. This situation may apply, for example, to various types of metals that are segregated separately and not only by basic type of waste. Other respondents' answers were comparable to all other categories. Many of the declared responses were related to the employees' knowledge and awareness group. These include "prevention in the field of waste management", "coherence of the waste management policy between the supplier and the recipient" or "appropriate protection of hazardous waste".

When it comes to the respondents' answers due to the classification of the production or service-trade criterion, it can be noted that compared to production companies, in service and trade companies, the development of knowledge and awareness of employees is a much greater challenge. And from the analyzed data it can be concluded that small companies are better at building ecological awareness of their employees than large enterprises. The same applies to waste segregation.

Small enterprises are slightly better at this than large ones. For small companies, a greater challenge than for large ones is to reduce the use of plastic and related waste, and to select an equivalent and ecological packaging both at the stage of delivery and distribution. Another important challenge, much more often indicated in service and commercial companies, is the challenge of reducing the use of plastic and waste related to plastic packaging. In service and commercial companies, these wastes may concern, inter alia, stretch foil, which is required for securing the loading. Unpacking and re-packing can be associated with a large generation of this type of waste.

The conclusions from the analyzes are unambiguous. One of the key challenges related to waste management and the possibilities of circular economy implementations in a company is the knowledge and awareness of employees. These activities can be developed, inter alia, by ensuring employee development strategies, developing cross-cutting key requirements at workplaces in terms of environmental protection, waste management and the circular economy, and adjusting the type of training to the competency gaps of employees in the workplace. Conclusions from this stage of the research constitute a substantive contribution to stage III, i.e., the development of a conceptual model of human resource management for the efficient management of a circular economy in an enterprise.

4.2 Stage II – Statistical Analyzes Related to Human Resources and the Logistic System of Waste Management

The next stage of the research was to compare the answers from 18 questions made by means of the analysis of the median results (Table 3) and the correlation analysis (Tables 4 and 5). Table 4 presents the results of the analyzes from the questions in which the two-step criterion (Yes / No) was used, i.e., questions Q1-Q5. Table 5 presents the results of the analyzes from the questions in which the Likert scale (7 grades), i.e., questions Q6-Q18, was used for the assessment. The scale 1 meant a small degree of fulfillment of a given criterion or activities not implemented in the enterprise, while the score of 7 - the

highest and activities fully planned and implemented by the company. The answers were also accompanied by questions from the M1-M3 certificate.

The questions that have been assigned to the following abbreviations:

- Q1: Clearly defined method of handling various types of waste, which is described in the form of written documents, e.g., procedures or the Logistic Waste Management System.
- Q2: Growing amount of generated waste in 2017-2020.
- Q3: Knowledge of employees about the way of handling waste: segregation, transfer, handling of hazardous waste.
- Q4: Defining the method of waste shipment (assignment of means of transport and communication routes to transfer the waste from the place of its generation to the place of its storage).
- Q5: Appoint a waste manager in the company.
- Q6: Assessment of the main (production / service) process analysis in terms of the amount of consumption of raw materials, semi-finished products, and materials.
- Q7: Assessment of the scope of the company's analyzes of the amount and type of waste.
- Q8: Degree of informing employees about the way of handling waste, including minimizing the amount of waste and its impact on the environment.
- Q9: Relevance of the packaging criterion in cooperation with suppliers and recipients.
- Q10: Amount of waste recycled (either internally or by third parties).
- Q11: Percentage of waste recycled inside the company.
- Q12: Percentage of waste that is utilized.
- Q13: Percentage of segregated waste.
- Q14: Evaluation of the number of waste containers.
- Q15: Waste collection frequency assessment.
- Q16: Assessment of the proper functioning of the waste management system.
- Q17: The frequency of activities related to minimizing the amount of waste in the enterprise.
- Q18: Frequency of the analysis of the company's waste management data.

Data from the certificate:

- M1: Enterprise type
- M2: Company size
- M3: Location of the company.

From data in Table 3 it can be concluded that in most of the responses the results of the average assessments of respondents from small and large companies are comparable. Differences in responses that exceed 0.5 values apply to five of them: Q1 (absolute value of the difference in responses between respondents from small and large companies $z = 0.77$), Q2 ($z = 0.53$), Q7 (0.55), Q11 ($z = 0.63$) and Q16 ($z = 0.79$).

Therefore, it can be concluded that the way of dealing with waste is better characterized and described, for example, in the form of procedures in large companies than in small companies (Q1). In recent years, small companies have generated significantly more waste than large companies (Q2). In large enterprises, the quantity and type of waste are analyzed in more detail (Q7). In large companies, internal recycling is carried out to a greater extent, which is significantly closer to activities in the circular economy area, than to small enterprises (Q11). The manner and correctness of the functioning of the waste management system are assessed much higher in large enterprises than in small enterprises (Q16).

Table 3. *The average values of the responses and the value of the standard deviation with the division into small and large companies*

Question no.	Average values for small companies	Average values for large companies	Average values for manufacturing companies	Average values for trade and service companies	Standard dev. For small companies	Standard dev. For large companies	Standard dev. For manufacturing companies	Standard dev. for trade and service companies
Q1	**2.59**	**3.37**	3.25	2.76	1.43	1.21	1.29	1.42
Q2	**2.10**	**1.56**	2.00	1.66	1.35	1.08	1.39	1.07
Q3	3.34	3.78	4.72	4.33	1.03	2.06	1.70	1.60
Q4	3.44	3.39	4.97	4.49	0.49	1.07	1.66	1.74
Q5	4.76	4.62	4.95	4.80	0.50	1.54	1.88	1.80
Q6	3.46	3.13	3.55	3.58	1.69	1.87	2.19	1.86
Q7	**4.23**	**4.78**	3.48	3.35	1.73	1.59	1.03	1.07
Q8	4.27	4.41	4.44	4.92	1.76	1.86	1.61	1.33
Q9	5.44	5.70	2.87	3.68	1.97	1.26	1.83	1.79
Q10	5.87	5.68	4.70	4.01	1.43	1.72	1.58	1.74
Q11	**5.19**	**5.82**	5.80	5.37	1.82	1.38	1.17	1.38
Q12	5.23	5.33	5.72	5.82	1.51	1.46	1.63	1.77
Q13	1.59	1.80	5.59	5.45	1.33	0.40	1.62	1.71
Q14	4.51	4.25	5.27	5.29	1.68	1.91	1.40	1.46
Q15	4.23	5.17	1.80	1.60	1.88	1.58	0.39	0.49
Q16	**3.57**	**4.37**	4.51	4.25	1.40	1.74	1.80	2.05
Q17	1.46	1.86	4.34	3.66	1.96	0.34	1.86	1.94
Q18	4.74	5.00	1.78	1.56	2.05	1.90	0.41	0.50

Source: *Own study.*

Table 4*. Analysis of the results of answers to questions with a two-point scale*

Question no.	Standard deviation	Q1	Q2	Q3	Q4	Q5	M1	M2	M3
Q1	1.38	1.00							
Q2	1.24	-0.24*	1.00						
Q3	1.05	0.28*	-0.09	1.00					
Q4	0.46	**0.54***	-0.27*	**0.37***	1.00				
Q5	0.47	**0.37***	-0.10	0.22*	**0.45***	1.00			
M1	0.50	-0.18	-0.14	-0.07	-0.22*	-0.23*	1.00		
M2	1.78	**0.39***	-0.24*	0.01	0.28*	**0.46***	-0.37*	1.00	
M3	1.56	0.09	0.06	-0.07	-0.06	-0.20*	0.29*	-0.02	100

Note: * Coefficients with an asterisk are significant from p <0.05.
Source: *Own study.*

Table 4 shows that there is a significant, moderate relationship between three variables: Q1-Q4 (0.54), Q4-Q5 (0.45) and M2-Q5 (0.46). Three of the studied relationships show a weak relationship. These include: Q3-Q4 (0.37), Q1-Q5 (0.37) and M2-Q1 (0.39). From the analysis, it can therefore be concluded that a clearly defined method of handling waste

(Q1) described in the form of documents contributes to the definition of the method of waste shipment (Q4) and the proper selection of means of transport and communication routes of waste. In turn, the appointment of a waste manager (Q5) in the company also influences the definition, systematization, and organization of the method of waste shipment. It can be concluded that the greater the number of employees in the enterprise (M2), the more often a person managing waste in the enterprise is appointed.

A weak but still existing relationship between the variables was observed between the employees' knowledge (Q3) about the way of handling waste and the definition of the way of shipment of waste. It can therefore be concluded that the greater the knowledge of employees in the field of ecological and circular economy activities, the better organized the processes related to waste and its transport. In turn, the designated person for waste management in the company significantly contributes to the development of documentation related to waste management, the circular economy, or the internal Logistics Waste Management System. It is also observed that the larger the company, the better-defined way of dealing with waste, more precisely developed procedures and method of dealing with waste, including the circular economy or the Logistics System of Waste Management.

In turn, from the analyzes in Table 4, we can distinguish as many as 19 correlations of variables with moderate dependence. The strongest correlation (0.67) is indicated between the variable Q6, related to the assessment of the main process analysis in terms of the number of raw materials, semi-finished products and materials consumption, and Q7 carried out in the enterprise with the analysis of the amount and type of waste. The more frequently the analyzes of the amount of consumption of raw materials, semi-finished products and materials are carried out in companies, the greater the level of informing employees about the way in which waste is dealt with (Q8) and minimizing the number of wastes that have a negative impact on the environment.

Additionally, Q8 is positively influenced by the role of packaging in cooperation with suppliers and recipients (Q9), which also translates into a positive assessment of the correct functioning of the waste management system (Q16). The analyzes show that Q16 is also influenced by the matching of waste containers (Q14) and the assessment of the frequency of waste collection (Q15), but also the frequency of analyzes of the amount and type of waste (Q7), the flow of information between employees about waste (Q8) or amounts of waste recycled (in general) (Q11) within the circular economy. It can also be concluded that the amount of waste influencing the recycling of waste (Q11) is positively influenced by the role of packaging and its selection in the delivery and distribution process (Q9) and the value of waste that is subject to internal recycling (Q10).

Activities in internal circulation of waste are related to the amount of segregated waste (Q13), and then to the amount of waste subjected to disposal (Q12). Optimally conducted analyzes of the amount and type of waste (Q7) are better met in the case of enterprises where, in the opinion of the respondents, frequent activities related to the minimization of waste (Q17) are adopted and data analyzes in this area are often performed (Q18). The number and type of waste containers are better suited (Q14) in enterprises where the information flow process between employees is better organized (Q8), which translates

into an increase in the number of segregated waste (Q13). It is concluded that the frequency of analyzes on waste management (Q18) translates into activities aimed at minimizing the amount of waste in the enterprise (Q17). It is worth noting that neither the type, nor the number, nor the location of the enterprise has a significant influence on the analyzed variables. Mutual dependencies are also presented in Table 5.

Table 5. *Analysis of the results of answers to questions with a seven-point scale*

Question no.	Standard deviation	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	M1	M2	M3
Q6	1.66	1.00															
Q7	1.72	**0.67***	1.00														
Q8	1.84	**0.56***	**0.56***	1.00													
Q9	2.02	**0.48***	0.39*	**0.43***	1.00												
Q10	1.49	0.36*	0.21*	0.30*	0.39*	1.00											
Q11	1.85	0.19	0.19	0.16	**0.46***	**0.43***	1.00										
Q12	1.70	0.20	0.25*	0.20*	0.27*	0.16	0.07	1.00									
Q13	1.30	0.33*	**0.40***	0.30*	0.25*	**0.42***	0.11	**0.40***	1.00								
Q14	1.70	0.39*	0.39*	**0.44***	0.23*	0.21*	0.09	0.27*	**0.49***	1.00							
Q15	1.66	0.27*	0.29*	0.23*	0.25*	0.20	-0.08	0.12	0.20	0.36*	1.00						
Q16	1.43	0.51*	**0.43***	**0.43***	0.35*	**0.44***	0.12	0.38*	**0.53***	**0.55***	0.34*	1.00					
Q17	1.94	0.39*	**0.41***	0.37*	0.34*	0.26*	0.21*	0.17	0.26*	0.15	-0.01	0.22*	1.00				
Q18	1.93	0.36*	**0.45***	0.35*	0.38*	0.16	0.20*	0.11	0.21*	0.23*	0.32*	0.19	**0.52***	1.00			
M1	0.50	-0.12	-0.14	-0.04	0.01	0.16	0.22*	-0.20*	-0.17	0.03	-0.04	0.01	-0.07	-0.18	1.00		
M2	1.78	0.17	0.32*	0.13	0.16	-0.17	-0.18	0.06	0.04	-0.07	0.25*	-0.04	0.03	0.29*	-0.37*	1.00	
M3	1.56	-0.05	-0.05	0.08	-0.14	-0.04	-0.11	-0.03	-0.12	-0.05	0.11	0.02	-0.05	-0.15	0.29*	-0.02	1.00

Note: ** Coefficients with an asterisk are significant from p <0.05.*
Source: *Own study.*

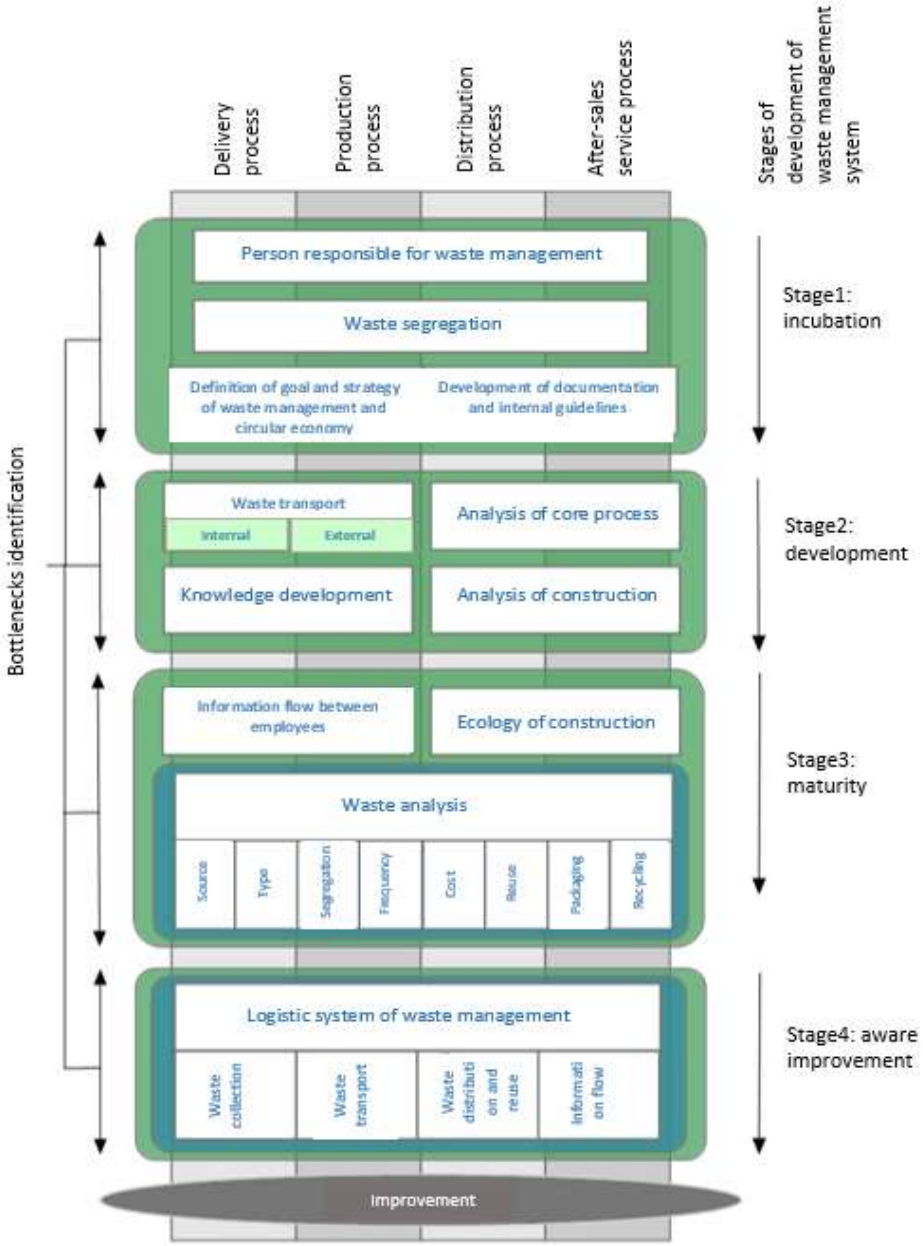
There are several important variables that influence each other the most when it comes to the number of related correlations. They include, among others analysis of the amount and type of waste, affecting the assessment of the main process in terms of the amount of waste and the frequency of analyzing data and minimizing waste, as well as segregation and assessment of LSWM. The assessment of the LSWM, in turn, depends on the flow of information, the circular economy and internal recycling, or the overall assessment of activities related to waste segregation. The flow of information contributes to better waste management, e.g., in the selection of the number and type of waste containers, the way of handling waste, or activities in the field of analysis of the amount and type of waste, which affects the LSWM assessment within the company.

5. Conceptual Model and Discussion

5.1 Stage III - Conceptual Model of Human Resource Management for the Efficient Management of a Circular Economy in a Company

The main goal of the research is to develop a model describing the responsibility and direction of activities undertaken by people for the needs of the circular economy and waste management as part of the logistic waste management system. From stage I and II of the research, as well as from the literature review, conclusions can be drawn that allow for the development of the model presented in Figure 1.

Figure 1. *Conceptual model of human resources management considering the development phases of the implementation of the circular economy in the enterprise*



Source: *Own study.*

There are 4 phases of circular economy implementation: incubation, development, maturity, and conscious improvement. In the first phase, man carries out the simplest and poorest activities related to waste management. Most often, in the first phase, there is no one more person responsible for waste management and all activities are divided

among many employees. Segregation is disorganized but conducted. In terms of segregation, in this phase there is also no organized, single place for storing waste in the company and determining the optimal ways of transporting waste and the frequency of its collection. The incubation phase is the definition of guidelines, documentation, and the goal and strategy of waste management in the company.

In the LSWM development phase, the key activity is the analysis of the main (production or service) process, incl. in terms of waste, including the amount and type of waste, the place and causes of its formation, the method of collecting and transporting waste. Employees acquire new knowledge about waste management in the enterprise and pay attention to the non-ecological aspects of product design. The next, third stage of maturity allows employees to determine which aspects of the product and its packaging can be improved and how to combine its individual elements in the product so that its individual elements can be separated and reused at the disposal stage. The selection of raw materials and materials is also important here, which will allow to reduce the number of disposed waste and increase recycling also in a closed cycle.

The maturity phase is characterized by a continuous and ongoing waste analysis, also in the context of a proportional increase or decrease in relation to the amount of products produced or distributed. At this stage, inter alia, improvements in the field of waste compacting devices, e.g., stationary press with a tipper. The last phase of conscious improvement is the logical organization and management of the entire waste management system, also considering and paying attention to the procedures and processes related to the strategic and operational provision of training and information flow. Here, there is also standardization of the selection of containers and containers, reduction of the number of waste transport and improvement of the system, marking of places and stations for the production and collection of waste. The process of transporting waste is also being improved on the premises of the company, including by using the queuing system.

Thanks to the standardization of the containers, it is possible to simultaneously transport several fractions of waste to the waste collection point on the premises of the enterprise. Such activities have a positive effect on savings, time to implement the waste management process and waste transport. They also reduce the involvement of employees in waste management processes, thanks to which they spend more time on work at the workplace, and there is also a reduction in operations performed with waste.

Psychological capital is more involved in behavior responsible for the environment in the workplace (Afshar Jahanshahi *et al.*, 2021). Therefore, the literature proposes three indicators to assess these human resources professional qualification level (PQL), multidisciplinary level (ML) and leadership education level (LLE) (Marino *et al.*, 2018).

6. Conclusion

This paper contributes a significant contribution of work, which is not currently underlined in the literature (Jabbour *et al.*, 2019), which is the impact and importance of

the human factor, knowledge, competences, and attitudes of employees on the process of organizing and managing waste management in an enterprise.

Optimization in the field of waste management results in savings for the company and the environment in terms of the amount of waste (Campitelli and Schebeck, 2020). A well-organized logistic system of waste management also means a lower amount of manual work for employees and an increased automation of the process. A thorough internal audit also allows you to properly position waste containers, thanks to which the storage space is released and contributes to easier and faster waste collection. Thickened material in the form of waste reduces the frequency of its collection and improves ergonomics of work by easier emptying of containers, e.g., with the help of a tipper.

Based on preliminary research, it is possible to notice and divide the activities influencing LSWM into the phases of enterprise development, and in them define the responsibility of people in terms of minimizing the negative impact on the environment.

From the conducted analyzes and secondary sources, it can be concluded that the key challenges of companies in the field of waste management and factors correlated with a positive assessment and improvement of the Waste Management System. Further research work should be continued on a larger research sample and with a larger territorial range.

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