sustainability

MDPI

Article

Evaluation of Process Orientation Dimensions in the Apparel Industry

Andrea Dobrosavljević [1], Snežana Urošević [1], Milovan Vuković [1], Miroslav Talijan [2] and Dragan Marinković [3,*]

1 Technical Faculty in Bor, University of Belgrade, Vojske Jugoslavije 12, 19210 Bor, Serbia; an.dobrosavljevic@gmail.com (A.D.); surosevic@tfbor.bg.ac.rs (S.U.); mvukovic@tfbor.bg.ac.rs (M.V.)
2 Military Academy, University of Defence, Pavla Jurišića Šturma 33, 11000 Belgrade, Serbia; mtalijan@gmail.com
3 Faculty of Mechanical Engineering and Traffic Systems, TU Berlin, Str. d. 17. Juni 135, 10623 Berlin, Germany
* Correspondence: dragan.marinkovic@tu-berlin.de

Received: 8 April 2020; Accepted: 15 May 2020; Published: 19 May 2020

Abstract: The dimensions that influence the establishment of business process management (BPM) practices and the progression to higher levels of process maturity derive from exploring the dimensions of process orientation of organizations. Small and medium-sized clothing enterprises (SME's) are characterized by various specifics that can affect the degree of process orientation adoption and the pace of transition from lower to higher levels of process maturity. According to these specifics, the acceptance of the process approach may be differently affected. For the purpose of adequate evaluation and prioritization of the most influential dimensions, a new integrated multicriteria decision-making (MCDM) model that combines classical and fuzzy theory was developed. First, the full consistency method (FUCOM) method was applied, followed by the fuzzy pivot pairwise relative criteria importance assessment (fuzzy PIPRECIA) method to obtain more accurate criteria values. Prioritization of the most influential BPM dimension contributes to highlighting the area of business that needs to be primarily strengthened by appropriate actions for successful establishment of BPM in apparel industry SMEs. Within this research, the prioritized dimension refers to human resource management in accordance with the specific aspects of business within the apparel industry.

Keywords: business process orientation (BPO); business process management (BPM); FUCOM; fuzzy PIPRECIA; apparel industry; SMEs

1. Introduction

In the contemporary business environment, organizations are becoming aware of the need to implement adequately defined and controlled processes, which will contribute not only to acquiring the status of a process-mature organization, but also to improving the methods of management, development, and product quality [1]. Organizational orientation towards business processes and managing them ensures gaining knowledge about the possibilities of adopting best business practices and differentiating from the competition [2]. In the case of textile manufacturing organizations in countries such as Serbia, Bulgaria, and North Macedonia, several specific aspects make the whole approach to the implementation of business process management (BPM) relevant because it can contribute to the generation of new insights important for the improvement of business processes of these types of organizations. There were textile giants in these countries, in the past, that employed thousands of workers. The past and present picture of this sector is quite different. Today, there are mainly garment manufacturing small and medium-sized clothing enterprises (SMEs) [3].

The evaluation of the influence of different dimensions of process orientation is partly stimulated, among other specific aspects of the apparel industry, by the statement of author Chong [4], who stated that although process-oriented research is mainly focused on the operations of large organizations, this concept applies to the business of small and medium-sized enterprises (SMEs).

Consideration of the apparel industry SMEs' business appears through the literature precisely because of the particularities that accompany their business, among which the labor-intensive character and the dominant presence of the female workforce can be emphasized [5–7]. Besides, specific aspects of the apparel industry are highlighted in terms of constant model changes, short deadlines due to the change in fashion trends, and grading, which signifies the production of items by size. Then, there are the particularities of the textile material in terms of impermanence in shape, solidity, creasing, and pattern. All of these specific aspects make the production process complex [8]. The apparel industry is creative; however, design as a strategic resource is underutilized due to limited human and financial resources, as well as the informal process of developing and innovating apparel within SMEs [9,10]. The managerial role of the owner, as well as informality of interpersonal relationships and communication processes in SMEs, can, also, be added to this set of specific aspects [11]. The problems encountered by SMEs in the apparel industry in the surveyed countries are reflected in the lack of skilled personnel, batch size, type of assortment, production subcontracting or "lohn" production, cheap labor, and poor information, among others [12].

The fact is that in the modern business world, only those organizations that are ready to adapt quickly and effectively to generate new, more appropriate, and flexible concepts of business and development manage to survive [13,14]. In such organizations, the issue of adopting and implementing certain business practices based on strengthening certain elements or dimensions of process orientation arises.

2. Motivation and Research Aim

The business process consists of a set of activities performed in coordination with an organizational environment, with each element of the activity being subject to effective management [15]. BPM is implemented through the application of methods, techniques, and software for design, adoption, control, and analysis of operational processes that encompass people, organization, implementation, documentation, and other sources of information [16]. However, some authors have emphasized that in the SMEs sector there is a lack of understanding and interest for the proper implementation of BPM practice with respect to the principles of the concept [17,18]. Key elements in applying a BPM approach relate to a clear explanation of intentions to carry out this practice, the links between BPM and strategic programs that an organization develops, and the acquisition of process competencies, skills, and knowledge, among others [19]. An array of elements, such as structure, focus, measurement, responsibility, and consumer orientation, make up an integral part or basis of the business process orientation [20,21].

Various authors have researched the elements that influence the adoption of process orientation and BPM, and in the next section, this issue will be considered through a literature review. Considering the dimensions as important parts for understanding the overall picture of the establishment of BPM practices, the thought of the multidimensionality of this practice develops. Each of the elements can be categorized as an element of a particular process dimension. This statement was the driver of the research question within this paper. To what extent do each of the identified categories of process orientation adoption elements realistically contribute to the establishment of BPM practice and the progression towards a state of stability and high degree of process maturity within the SMEs of the apparel industry?

The aim of this paper was, therefore, reflected in the evaluation of the adopted process dimensions, while prioritizing the most influential one considering the apparel industry sector and its specific aspects. In this way we sought to identify which link in the business process management chain makes a more pronounced contribution to enhancing the process maturity of apparel industry SMEs,

in comparison to other links. The findings of such a nature, except the scientific contributions, can provide a practical contribution in terms of advising organizations in which direction they should focus their activities and in what areas they need to make improvements in order to achieve higher process maturity.

In the next section, a literature review of the study of the elements and characteristic dimensions of process orientation is presented, with an emphasis on the recognized importance of each. The application of different multicriteria decision-making methods in the textile and clothing industry is also highlighted in this section. The research part of the paper begins with a description of the methodological framework and structure of the research. The presented methodology, which includes the application of the FUCOM and fuzzy PIPRECIA methods as elements of an integrated multicriteria model, was implemented to evaluate the process orientation dimensions of the apparel industry organizations. Finally, in addition to concluding considerations, guidelines for further research in this area are provided.

3. Literature Review of Research on the Process Orientation Dimensions

BPM is driven by a few basic rules concerning the appropriate way of mapping and documenting process activities, a focus on consumers, and a reliance on systems and documentation procedures to maintain discipline, consistency, and repeatability of performance quality. Also, BPM is concerned with the measurement and processing activities and business process management with continuous optimization, as pointed out by [22]. According to this author, BPM represents the approach of cultural changes, and it is not only about the establishment of good systems and the right kind of structure. It should be inspired by the best practices to ensure the achievement of superior competitiveness. Within each of these rules, it is possible to notice the existence of dimensions that influence the establishment of BPM. Adoption of the process view may depend on elements such as alignment of the process with strategic goals, established culture, human resources, management style, application of methods, and development of information systems, according to authors [23]. Another author [24] highlighted the success factors of BPM. These are strategy alignment, level of IT investment, performance measurement, level of employee specialization, organizational change, the appointment of process owner, implementation of proposed changes, implementation of continuous improvement systems, process standardization, computerization, automation, training, and employee empowerment. These elements and factors are also considered in the literature as interconnected areas of BPM capability [25,26].

3.1. Significance of Process Orientation Dimensions for Establishment of BPM

An organization's strategic program can be more easily implemented by applying BPM practices [27]. There is an assumption within the literature that process activities support the organization's strategy [28,29]. The chosen strategy must rely on processes that are coordinated and designed to simplify its successful implementation [30]. Harmonization of operational and strategic priorities is the basis for gaining competitiveness, and involvement of top management is important to ensure that the right priorities are set [31,32].

The requirements of the business are expressed through a description of the business processes, which are related to the strategy, and the explanation of the organizational goals, which answers the questions "why" and "what" is being done. These requirements also motivate the definition of specific processes, that is, the answer to the question "how" [33]. BPM relies on documented procedures to ensure discipline, consistency, and repeatability of performance quality [22]. An organization that does not, in any way, define or document its processes, inevitably remains at the lowest level of process maturity [34].

Business process performance reflects in overall organizational performance [35,36]. BPM relies on the measurement of activities to evaluate the performance of each process, to set goals, and to deliver results at a level that reaches corporate goals [22]. Performance measurement and evaluation help to evaluate the effectiveness and efficiency of performance, as well as the performance potential of

different objects within an organization, so determining specific performance measures or performance indicators is essential [37,38]. Considering that consumer orientation is one of the core values that the BPM culture concept emphasizes, process performance measures based on consumer expectations are of great importance [11,39,40].

A process-oriented organization tries to organize responsibilities as horizontally as possible, as opposed to the traditional vertical hierarchical structure [41]. The business processes of all partners in the network should be conceptually modeled, focusing on documenting the flow and structure of interorganizational process activities [42]. Communication in the service of process execution, as well as the application of adequate techniques, are integrated within the organizational structure [43].

In a process-oriented organization, human resources are the drivers that enable the execution of a process. Process quality depends on the competencies of the human resources that work on its realization [44,45]. The application of BPM has a significant impact on the people in the organization. Adopting a process orientation affects employees because they have to accept responsibility for the outcomes of their processes. Accordingly, employees get new and different roles [41], like the role of the process owner responsible for overseeing functioning and process performance; the match between organizational information, management systems, and process needs; and the quality of the measures used in the process to measure process performance [46]. Management should focus on educating employees about process implementation and the benefits of process-based performance management [47]. It is of great importance to train the employees and make them able to work in a changing business environment [48]. Process-mature organizations encourage their employees to be process-oriented, enabling them to participate actively in process definition and process improvement activities. Rewards and incentives for the efforts of the employees should exist. Employees in such an environment develop a belief in the process, and when errors occur, they are focused on improvements rather than the measures of punishment. The value and importance of good staff are recognizable in process-mature organizations, therefore the knowledge and skills of employees are nurtured because modern business operations and the presence of new technologies require the upgrading of specialized skills and knowledge of human resources [49,50].

Business processes are conducted in a group environment, where the effectiveness of their realization depends on elements such as communication, coordination, and cooperation [51]. Organizational culture plays a key role during any change initiative [52]. Research [53,54] has identified four distinctive values that define the concept of culture within business process management. These values include customer orientation, excellence, responsibility, and teamwork.

Market orientation enhances organizations' motivation to explore consumer and competitor reactions, as it is marked by the degree of information generated from the external environment. Then, it is used to share information with the external environment and to respond to consumer needs and demands [55,56]. The application of BPM practices provides the opportunity to gain a competitive advantage and secure the market position of the organization [57]. Besides, careful BPM can help clients gain extraordinary experience in consuming products and services marketed by an organization [58].

The desire to meet the requirements of both internal and all external stakeholders, including suppliers, lies in the core of the BPM [59]. The term "cross-organizational business processes" is referred to in the literature, with the notion that contemporary businesses meet the wave of cross-organizational BPM among partners [60,61]. This term refers to the process collaboration that exceeds the limits of the organization while maintaining the autonomy of the organization in terms of the freedom of modification of the internal operation to achieve organizational objectives while achieving the common partnership goals [62].

The application of information and communication technologies to support BPM in companies and administration is quite an important element. Adequate techniques and software tools to support activities from design to control, as well as analysis of operating business processes, are being put into practice to facilitate value creation [63]. Information technology typically provides automatic

support for business processes and inter-process connections [36]. Besides, they enable business process innovation in line with industry best practices and IT trends [64].

All of the business dimensions can reflect the state of the process orientation by how they perform. Using a holistic approach and evaluating each one of them might be beneficial. Some of the authors [65–68] highlighted some of these dimensions as factors of success or dimensions for analysis of process maturity within organizations operating in various industries. Authors [69] applied the fuzzy Delphi method to isolate dimensions by which BPM practice adoption can be assessed in a labor-intensive business environment, from a wider list of factors from the literature. The final list of dimensions consists of: (1) compliance of process and strategic goals; (2) process identification, documentation, and standardization; (3) performance measurement and business process improvement; (4) process structure; (5) human resource management; (6) process organizational culture; (7) focus on consumers and competitors; (8) supplier relations processes; and (9) process-based information systems development.

3.2. Application of Multicriteria Decision-Making Methods in Textile and Apparel Industries

Multicriteria decision-making methods [70,71] take into account expert evaluation of the criteria. Experts rank alternatives according to specified standards in the most objective way possible [72]. Each of the multicriteria methods has its advantages and disadvantages, as well as its application areas. In order to solve complex decision problems, a combination of several methods is also possible [73]. These methods have found application in the field of BPM through the evaluation and selection of business processes [74], evaluation of the most appropriate business process outsourcing decision [75], assessment of process factors when developing a methodology for analyzing business processes weaknesses and possible improvements [76], and BPM decision-making support [77], among others.

The analytic hierarchy process (AHP) method was applied to formulate a decision support system for determining the potential for clustering in the textile and clothing sectors [78]. The AHP method for calculation of weight coefficients of each criterion was applied to solve the problems of ranking and selection of suppliers within the textile industry in China and India, and then using the calculated weights, the ranking of suppliers was performed using the TOPSIS method [79]. Authors [80] grouped suppliers using the AHP method and cluster analysis. The AHP method was used to make a prototype selection of fashion items by [81]. Fuzzy AHP was used for the selection of adequate manufacturing technology for the textile laminating process [82].

In addition to the AHP method, which is present in a large number of papers related to the apparel and textile industries, the combination of PROMETHEE II and V methods has been applied in the development of a multicriteria optimization model for the optimal blending of cotton [83]. Ranking of workplaces according to the severity of working conditions in the textile industry was done by [84] by applying the ELECTRA method.

Some of the newer MCDM methods, such as the full consistency method (FUCOM) [85] and pivot pairwise relative criteria importance assessment (PIPRECIA) [86] might, as well as the ones previously mentioned, make their contribution to the research in the textile and apparel industry. The successful implementation of these methods is notable in the examples of sustainable supplier selection [87,88].

4. Methodology

Within the apparel industry in Serbia, Bulgaria, and North Macedonia, as well as in the other European countries, the most common business entities are small and medium-sized enterprises (SMEs). SMEs are interesting for research on BPM, and the sector within which they operate makes them even more interesting because business processes are creative and labor-intensive. The initial assumption of this research was that the establishment of BPM in apparel industry organizations can be considered by taking different process orientation dimensions into account. Each of these dimensions can have a different degree of contribution according to the conditions of business in a particular industry. With that in mind, this research attempted to evaluate and prioritize different process

orientation dimensions according to their influence on BPM establishment in the apparel industry based on experts' opinions, and to discuss the practical contribution of the prioritized dimensions to the establishment of efficient, effective, and continuous BPM in the apparel industry organizations. Figure 1 illustrates the proposed steps to conduct this research in order to fulfil the stated research aim.

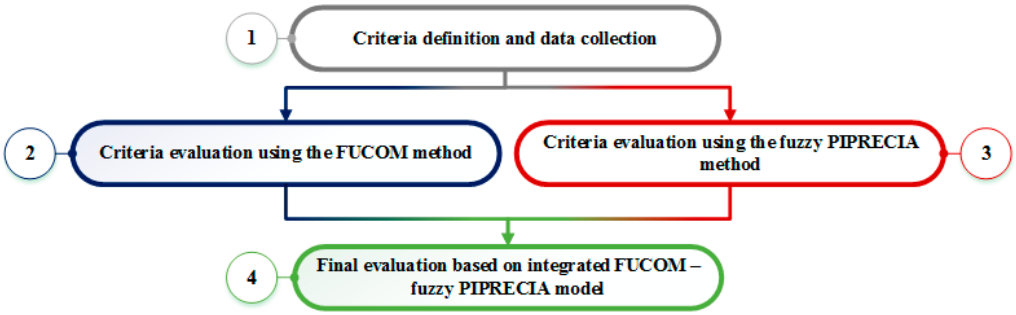

Figure 1. Proposed methodology for evaluation of process orientation dimensions' influence in the apparel industry using an integrated FUCOM–fuzzy PIPRECIA model.

The proposed research methodology for conducting an evaluation of process orientation dimensions in the apparel industry consisted of four major research phases, as presented in Figure 1. The initial phase of this research focused on criteria definition and data collection. Considering the dimensions that influence the establishment of BPM, described in detail within the literature review, nine criteria stood out. The optimal size of expert panel was investigated by [89], who came to the conclusion that final calculation scores are stable when more than 15 experts provide their estimations, and with 30 experts involved the stable mean can be reached. They further stated that having a large panel of experts is good, but expert panels of smaller sizes can, as well, provide a reliable evaluation of criteria. Within this research, a panel of 24 experts from apparel industry was formed. By contacting them, a database of criteria evaluations was collected. Collected data, in the form of expert evaluations, presented the input for the second and the third phase.

The second phase relied on the application of the full consistency (FUCOM) method to calculate the weight coefficients of dimensions based on the evaluations of each expert. One of the new methods based on the principles of pairwise comparison and validation of results through deviation for maximum consistency is the full consistency method (FUCOM) [85]. The decisive advantages of applying the FUCOM method are the small number of pairwise comparisons of criteria ($n - 1$ comparisons only), the ability to validate results by determining deviations from the maximum consistency (DMC) of comparisons, and to appreciate the transitivity in pairwise comparisons of criteria. This is particularly true of the first and second steps of the FUCOM method, in which decision makers rank the criteria according to their personal preferences and make comparisons of pairs of ranking criteria. However, unlike other subjective models, FUCOM showed smaller deviations in the criteria weight values obtained relative to the optimal value [85,90–92]. In addition, the methodological procedure of the FUCOM method eliminates the problem of redundancy of comparison of criteria pairs, which exists in some subjective models for determining the weight coefficients of criteria. The assumption is that there are n evaluation criteria in the multi-criteria model denoted by wj, $j = 1, 2, \ldots, n$, and that their weight coefficients should be determined. Subjective weighting models based on pairwise comparisons require the decision maker to determine the degree of influence of the criterion i and on the criterion j [93].

The third phase used the fuzzy PIPRECIA and the inverse fuzzy PIPRECIA to calculate weight coefficients of the same dimensions using the fuzzy logic. The fuzzy logic in PIPRECIA method was introduced by [94]. Inclusion of fuzzy logic in decision-making increases the reliability of the decision by minimization of misjudgment possibility [95,96]. The main advantage of the PIPRECIA method is that it allows criteria evaluation without sorting by relevance [97].

Phases two and three provided the input for final evaluation. The main focus within the fourth phase was on the comparison and final calculation of weight coefficients of considered process orientation dimensions in the business environment of the apparel industry using an integrated FUCOM–fuzzy PIPRECIA model.

5. Evaluation of Process Orientation Dimensions Priority within the Apparel Industry

5.1. Criteria Definition and Data Collection

By reducing the initial list of 13 factors, through which it is possible to observe the level of process orientation of organizations in labor-intensive activities, a list of nine factors was obtained within the research [69]. As labor-intensive character appears to be one of the particularities within apparel industry organizations, along with the dominant participation of the female workforce, the creative character, and the need to acquire specific knowledge, the possibility of evaluating the influence of these dimensions in the apparel industry has been noticed. Table 1 presents the complete list of these dimensions, codified in order to be used in the integrated FUCOM–fuzzy PIPRECIA multicriteria decision-making model as criteria. A description of each dimension is, as well, provided.

Table 1. Codification of the criteria used in the questionnaire.

Code	Criteria	Description of the Criteria
C1	Compliance of process and strategic goals	Business processes support the strategy and are aligned and designed to simplify its execution.
C2	Process identification, documentation, and standardization	The well-defined and documented procedures ensure discipline, consistency, and repeatability of performance quality.
C3	Performance measurement and business process improvement	Measuring the performance of each individual process is important for goal setting, delivering excellent results, and continuity in improvements.
C4	Process structure	The process organizational structure integrates elements in the service of execution of business processes, with a horizontal organization of responsibilities.
C5	Human resources management	Adopting a process orientation affects employees because they have to accept responsibility for the outcomes of their processes.
C6	Process organizational culture	Organizational culture plays a key role in adopting values aligned with BPM practices.
C7	Focus on consumers and competitors	The possibility of achieving competitive advantage and securing the organization's market position arises under the influence of adequate BPM in relations with consumers and competitors.
C8	Supplier relations processes	Impact of managing cross-organizational business processes with suppliers.
C9	Process-based information systems development	Adequate techniques and software tools to support activities from design to control, as well as analysis of operating business processes are being put into practice to facilitate value creation.

Source: [22,30,41,43,53,54,57,62,63,69].

Experts evaluated defined criteria using a seven-point scale given in the questionnaire for experts' assessments. By comparing the criteria, experts measured their preferences using scores from 1 to 7, where 1 stood for an almost equal value of two compared criteria, 2 for slightly more significant criteria, 3 for moderately more significant criteria, 4 for more significant criteria, 5 for much more significant criteria, 6 for dominantly more significant criteria, and 7 for absolutely more significant criteria [97].

Objective evaluation of the criteria was carried out by 24 experts from Serbia, Bulgaria, and North Macedonia in the period from September to October 2019. Experts who evaluated the criteria gained practical experience by investigating organizations' aspirations to adopt business process management practices or by being responsible for process execution within the textile and apparel industry. This group included experts in managerial positions in the procurement, production, quality

control, and sales processes, as well as those engaged in educational and scientific research in the textile and apparel industries.

5.2. Criteria Evaluation Using the FUCOM Method

Table 2 shows the evaluation of the criteria by all decision makers, which is essentially the first and second step of the FUCOM method.

Table 2. The first two steps of the FUCOM method—ranking and rating.

DM1	C4	C5	C6	C2	C3	C7	C8	C1	C9
	1	1	1	1.5	1.5	1.5	1.8	1.8	1.8
DM2	C1	C5	C2	C8	C9	C7	C4	C3	C6
	1	1	1.5	1.5	1.5	1.8	1.8	1.8	2.7
DM3	C5	C9	C6	C3	C2	C4	C1	C7	C8
	1	1	1.5	1.5	1.8	1.8	2.7	4	5
DM4	C3	C2	C5	C9	C1	C7	C8	C6	C4
	1	1.5	1.5	1.5	1.8	2.7	2.7	4	4
DM5	C3	C9	C5	C2	C1	C4	C6	C7	C8
	1	1	1	1.5	1.8	1.8	1.8	2.7	2.7
				...					
DM20	C5	C9	C8	C6	C4	C1	C2	C3	C7
	1	1	1.5	1.5	1.5	1.5	1.8	1.8	1.8
DM21	C7	C8	C9	C6	C5	C4	C3	C2	C1
	1	1	1.5	1.5	1.5	1.5	1.8	1.8	1.8
DM22	C9	C7	C5	C3	C2	C1	C4	C6	C8
	1	1.5	1.5	1.5	1.5	1.8	1.8	1.8	2.7
DM23	C5	C7	C9	C1	C4	C6	C2	C3	C8
	1	1.5	1.5	1.5	1.5	1.8	1.8	1.8	2.7
DM24	C1	C3	C7	C9	C8	C6	C5	C4	C2
	1	1	1	1	1.5	1.5	1.5	1.5	1.5

The following is an example of a FUCOM method calculation for a third decision maker. As can be seen from Table 2, a ranking and rating was performed showing that the best criterion was C5 and the worst was C8. Based on the obtained criteria importance, the comparative values of the criteria importance for each decision-maker were calculated:

$$\varphi_{C_5/C_9} = 1/1 = 1,\ \varphi_{C_9/C_6} = 1.5/1 = 1.5,\ \varphi_{C_6/C_3} = 1.5/1.5 = 1,\ \varphi_{C_3/C_2} = 1.8/1.5 = 1.2,$$
$$\varphi_{C_2/C_4} = 1.8/1.8 = 1,\ \varphi_{\frac{C_4}{C_1}} = 2.7/1.8 = 1.5,\ \varphi_{\frac{C_1}{C_7}} = 4/2.7 = 1.48,\ \varphi_{\frac{C_7}{C_8}} = 5/4 = 1.25.$$

In the third step, the final values of the weighting coefficients of the evaluation criteria were calculated, which needed to satisfy two conditions:

(1) The final values of the weighting coefficients should satisfy the condition where:

$$w_5/w_9 = 1,\ w_9/w_6 = 1.5,\ w_6/w_3 = 1,\ w_3/w_2 = 1.2,\ w_2/w_4 = 1,\ w_4/w_1 = 1.5,$$
$$w_1/w_7 = 1.48,\ w_7/w_8 = 1.25.$$

(2) In addition to the defined relations, the final values of the weighting coefficients should satisfy the condition of mathematical transitivity:

$$\varphi_{C_5/C_6} = 1 \times 1.5 = 1.5,\ \varphi_{C_9/C_3} = 1.5 \times 1 = 1.5,\ \varphi_{C_6/C_2} = 1 \times 1.2 = 1.2,\ \varphi_{C_3/C_4} = 1.2 \times 1 = 1.2,$$
$$\varphi_{C_2/C_1} = 1 \times 1.5 = 1.5,\ \varphi_{C_4/C_7} = 1.5 \times 1.48 = 2.22,\ \varphi_{C_1/C_8} = 1.48 \times 1.25 = 1.85.$$

$$w_5/w_6 = 1.5,\ w_9/w_3 = 1.5,\ w_6/w_2 = 1.2,\ w_3/w_4 = 1.2,\ w_2/w_1 = 1.5,\ w_4/w_7 = 2.22,$$
$$w_1/w_8 = 1.85.$$

The final model for determining the final values of the weighting coefficients of the evaluation criteria can be defined by applying the model:

$$\min \chi$$
$$s.t. \begin{cases} \left|\frac{w_5}{w_9} - 1\right| = \chi,\ \left|\frac{w_9}{w_6} - 1.5\right| = \chi,\ \left|\frac{w_6}{w_3} - 1\right| = \chi,\ \left|\frac{w_3}{w_2} - 1.2\right| = \chi,\ \left|\frac{w_2}{w_4} - 1\right| = \chi, \\ \left|\frac{w_4}{w_1} - 1.5\right| = \chi,\ \left|\frac{w_1}{w_7} - 1.48\right| = \chi,\ \left|\frac{w_7}{w_8} - 1.25\right| = \chi, \\ \left|\frac{w_5}{w_6} - 1.5\right| = \chi,\ \left|\frac{w_9}{w_3} - 1.5\right| = \chi,\ \left|\frac{w_6}{w_2} - 1.2\right| = \chi,\ \left|\frac{w_3}{w_4} - 1.2\right| = \chi, \\ \left|\frac{w_2}{w_1} - 1.5\right| = \chi,\ \left|\frac{w_4}{w_7} - 2.22\right| = \chi,\ \left|\frac{w_1}{w_8} - 1.85\right| = \chi, \\ \sum_{j=1}^{9} w_j = 1,\ w_j \geq 0, \forall j \end{cases}$$

Criteria values according to the third decision maker were 0.70, 0.106, 0.127, 0.106, 0.190, 0.127, 0.047, 0.038, and 0.190.

The calculation for the other decision makers was performed in an identical manner and the results are presented in Figure 2. After finding the mean of all values for each criterion, taking into account the values of all experts, the final values of the weights of the criteria for the FUCOM method were obtained.

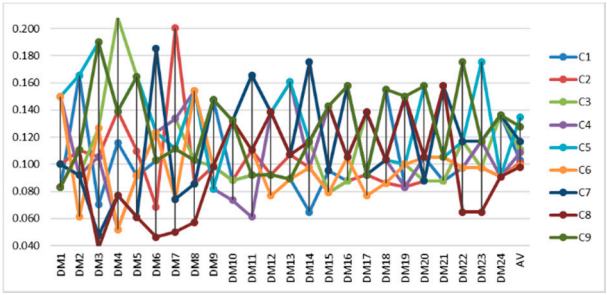

Figure 2. Criteria weights for each of the decision makers and final criteria values obtained by the FUCOM method.

The final values of the criteria obtained by the FUCOM method are indicated by AV, which stands for average value, in Figure 2. Using the FUCOM method calculation, the following values of the criteria were obtained: C1 = 0.103, C2 = 0.101, C3 = 0.111, C4 = 0.109, C5 = 0.135, C6 = 0.099, C7 = 0.117, C8 = 0.098, C9 = 0.128. The final values can be ranked from highest to lowest. At the same time, it was concluded that criteria C5, called human resource management, was the best-rated criteria by experts, while the lowest-rated and ninth-ranked criteria, C8, is called supplier relations processes.

5.3. Criteria Evaluation Using the Fuzzy PIPRECIA Method

The evaluation was performed using a linguistic scale that involves quantification into fuzzy triangular numbers. Table 3 shows the evaluation of the criteria for fuzzy PIPRECIA and inverse fuzzy PIPRECIA by the decision makers and the geometric mean (GM), based on which values were further calculated.

Table 3. Criteria evaluation by decision makers for fuzzy PIPRECIA and inverse fuzzy PIPRECIA method.

PIPR.		**C2**			**C3**		…		**C8**			**C9**	
DM1	1.100	1.150	1.200	1.000	1.000	1.000		0.500	0.667	1.000	1.000	1.000	1.000
DM2	0.500	0.667	1.000	0.500	0.667	1.000		1.100	1.150	1.200	1.000	1.000	1.000
DM3	1.100	1.150	1.200	1.100	1.150	1.200		0.500	0.667	1.000	1.500	1.750	1.800
DM4	1.100	1.150	1.200	1.100	1.150	1.200		1.000	1.000	1.000	1.200	1.300	1.350
DM5	1.100	1.150	1.200	1.100	1.150	1.200		1.000	1.000	1.000	1.300	1.450	1.500
			…				…			…			
DM20	0.500	0.667	1.000	1.000	1.000	1.000		1.100	1.150	1.200	1.100	1.150	1.200
DM21	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	1.000	0.500	0.667	1.000
DM22	1.100	1.150	1.200	1.000	1.000	1.000		0.400	0.500	0.667	1.300	1.450	1.500
DM23	0.500	0.667	1.000	1.000	1.000	1.000		0.400	0.500	0.667	1.200	1.300	1.350
DM24	0.500	0.667	1.000	1.100	1.150	1.200		0.500	0.667	1.000	1.100	1.150	1.200
GM	0.795	0.912	1.095	0.969	1.015	1.076		0.689	0.793	0.956	1.082	1.185	1.267
PIPR-I		C8			C7				C2			C1	
DM1	1.000	1.000	1.000	1.100	1.150	1.000		1.200	1.000	1.000	1.000	0.500	0.667
DM2	1.000	1.000	1.000	0.500	0.667	1.000		1.000	1.100	1.150	1.200	1.100	1.150
DM3	0.250	0.286	0.333	1.100	1.150	0.250		1.200	0.500	0.667	1.000	0.500	0.667
DM4	0.400	0.500	0.667	1.000	1.000	0.400		1.000	0.500	0.667	1.000	0.500	0.667
DM5	0.333	0.400	0.500	1.000	1.000	0.333		1.000	0.500	0.667	1.000	0.500	0.667
			…				…			…			
DM20	0.500	0.667	1.000	0.500	0.667	0.500		1.000	1.000	1.000	1.000	1.100	1.150
DM21	1.100	1.150	1.200	1.000	1.000	1.100		1.000	1.000	1.000	1.000	1.000	1.000
DM22	0.333	0.400	0.500	1.200	1.300	0.333		1.350	1.000	1.000	1.000	0.500	0.667
DM23	0.400	0.500	0.667	1.200	1.300	0.400		1.350	1.000	1.000	1.000	1.100	1.150
DM24	0.500	0.667	1.000	1.100	1.150	0.500		1.200	0.500	0.667	1.000	1.100	1.150
GM	0.511	0.598	0.732	0.929	1.013	0.511		1.122	0.765	0.862	1.018	0.735	0.863

Based on the evaluation of the criteria and the geometric mean, a matrix *sj* was formed. Following the rules of operations with fuzzy numbers, the k_j matrices were obtained as follows:

$$\overline{k_1} = (1.000, 1.000, 1.000),$$
$$\overline{k_2} = (2 - 1.058,\ 2 \quad -0.899,\ 2 - 0.795) = (0.942, 1.101, 1.205).$$

Fuzzy weights, denoted by q_j, were calculated in the following manner:

$$\overline{q_1} = (1.000, 1.000, 1.000),\ \overline{q_2} = \left(\frac{1.000}{1.205}, \frac{1.000}{1.101}, \frac{1.000}{0.942}\right) = (0.830, 0.908, 1.062).$$

The relative weight (w_j) of the criterion was then determined:

$$\overline{w_1} = \left(\tfrac{1.000}{11.086}, \tfrac{1.000}{6.910}, \tfrac{1.000}{5.377}\right) = (0.090, 0.145, 0.186)$$
$$\overline{w_2} = \left(\tfrac{0.830}{11.086}, \tfrac{0.908}{6.910}, \tfrac{1.062}{5.377}\right) = (0.075, 0.131, 0.197).$$

In order to determine the final weights of the criteria, the inverse methodology of fuzzy PIPRECIA method was applied. The following calculations refer to determination of coefficient k_j'; fuzzy weights for inverse fuzzy PIPRECIA, denoted by q_j'; and relative weights for the inverse fuzzy PIPRECIA, denoted by w_j'.

$$\overline{k_9'} = (1.000, 1.000, 1.000),$$
$$\overline{k_8'} = (2 - 0.861, \quad 2 - 0.720,\ 2 - 0.628) = (1.139, 1.280, 1.372)$$

$$\overline{q_9'} = (1.000, 1.000, 1.000),\ \overline{q_8'} = \left(\frac{1.000}{1.372}, \frac{1.000}{1.280}, \frac{1.000}{1.139}\right) = (0.729, 0.781, 0.878)$$

$$\overline{w_9'} = \left(\frac{1.000}{9.844}, \frac{1.000}{6.019}, \frac{1.000}{4.702}\right) = (0.102, 0.166, 0.213)$$

$$\overline{w_8'} = \left(\frac{0.729}{9.844}, \frac{0.781}{6.019}, \frac{0.878}{4.702}\right) = (0.074, 0.130, 0.187).$$

The complete calculation and results of the inverse fuzzy PIPRECIA method are presented in Table 4 and illustrated in Figure 3. The last column shows the deficient values of the relative weights of the criteria.

Table 4. Calculation and results of fuzzy PIPRECIA and inverse fuzzy PIPRECIA.

P.	sj			kj			qj			wj			DF
C1				1.000	1.000	1.000	1.000	1.000	1.000	0.090	0.145	0.186	0.143
C2	0.795	0.899	1.058	0.942	1.101	1.205	0.830	0.908	1.062	0.075	0.131	0.197	0.133
C3	0.930	0.996	1.084	0.916	1.004	1.070	0.776	0.904	1.159	0.070	0.131	0.216	0.135
C4	0.757	0.863	1.023	0.977	1.137	1.243	0.624	0.796	1.187	0.056	0.115	0.221	0.123
C5	1.041	1.086	1.125	0.875	0.914	0.959	0.650	0.870	1.356	0.059	0.126	0.252	0.136
C6	0.600	0.703	0.870	1.130	1.297	1.400	0.465	0.671	1.200	0.042	0.097	0.223	0.109
C7	0.879	0.969	1.089	0.911	1.031	1.121	0.414	0.651	1.317	0.037	0.094	0.245	0.110
C8	0.689	0.793	0.963	1.037	1.207	1.311	0.316	0.539	1.270	0.029	0.078	0.236	0.096
C9	0.953	1.055	1.172	0.828	0.945	1.047	0.302	0.570	1.535	0.027	0.083	0.285	0.107
SUM							5.377	6.910	11.086				
P-I	sj′			kj′			qj′			wj′			DF
C1	0.795	0.899	1.058	0.942	1.101	1.205	0.222	0.427	1.257	0.023	0.071	0.267	0.096
C2	0.730	0.835	1.006	0.994	1.165	1.270	0.267	0.470	1.185	0.027	0.078	0.252	0.099
C3	0.798	0.906	1.062	0.938	1.094	1.202	0.339	0.548	1.178	0.034	0.091	0.250	0.108
C4	0.681	0.763	0.889	1.111	1.237	1.319	0.408	0.599	1.104	0.041	0.100	0.235	0.112
C5	1.065	1.123	1.171	0.829	0.877	0.935	0.538	0.741	1.227	0.055	0.123	0.261	0.135
C6	0.619	0.765	1.019	0.981	1.235	1.381	0.503	0.650	1.017	0.051	0.108	0.216	0.117
C7	0.951	1.027	1.121	0.879	0.973	1.049	0.695	0.803	0.999	0.071	0.133	0.212	0.136
C8	0.628	0.720	0.861	1.139	1.280	1.372	0.729	0.781	0.878	0.074	0.130	0.187	0.130
C9				1.000	1.000	1.000	1.000	1.000	1.000	0.102	0.166	0.213	0.163
SUM							4.702	6.019	9.844				

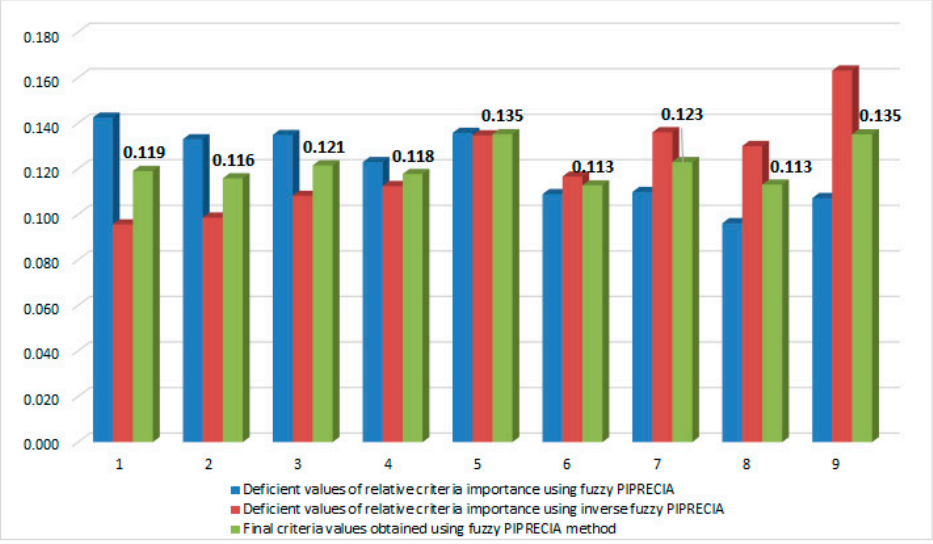

Figure 3. Final values of the criteria obtained using the fuzzy PIPRECIA method.

5.4. Final Evaluation Based on Integrated FUCOM–Fuzzy PIPRECIA Model

The integrated FUCOM–fuzzy PIPRECIA model enables the final evaluation of the process orientation dimensions of the clothing industry organizations. Figure 4 shows the values obtained by the FUCOM method marked by columns, the values obtained by the fuzzy PIPRECIA method marked

with the red line, and the final values, expressed as the mean of the FUCOM and fuzzy PIPRECIA criteria, indicated by the green line.

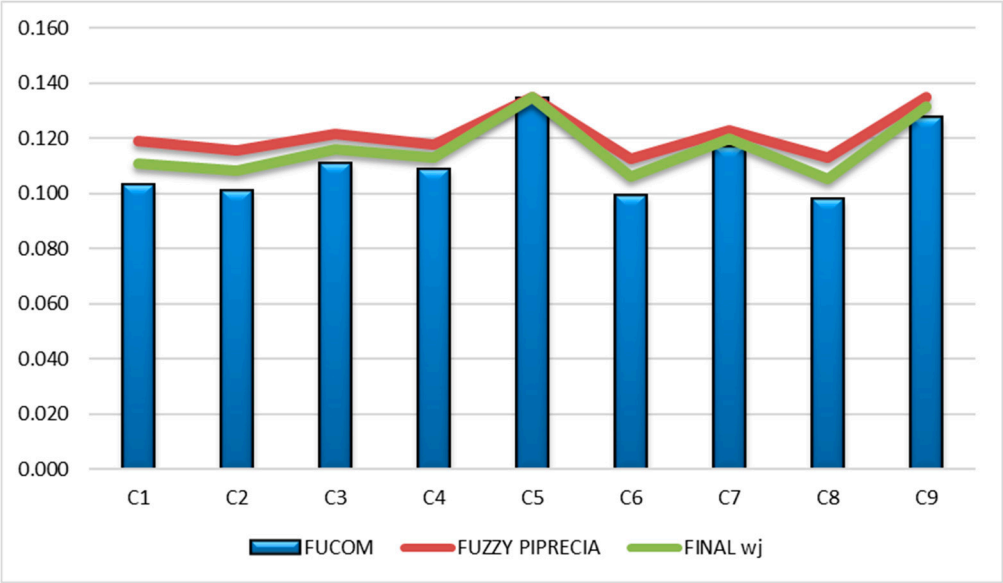

Figure 4. Final criteria values obtained using the integrated FUCOM–fuzzy PIPRECIA model.

Therefore, the best-ranked criteria was human resource management (0.135), followed by the process-based information systems development (0.131), followed by a focus on consumers and competitors (0.120). In fourth place was the criteria of performance measurement and business process improvement (0.116), fifth was the process structure (0.113), and sixth was the compliance of process and strategic goals (0.113). The lowest on the impact scale were process identification, documentation, and standardization (0.108), ranked seventh, followed by process organizational culture (0.106), eighth, and finally supplier relations processes (0.106), ninth. It should be emphasized that the criteria of process organizational culture and supplier relations processes share the same weight value, both in the result of the fuzzy PIPRECIA method and in the final result of the integrated multicriteria model.

6. Discussion

For SMEs in the apparel industry to adequately apply the principles of BPM and ensure growth and development based on the application of this practice, it is necessary to satisfy several elements of process orientation. Earlier research has noted the importance of each of the dimensions examined, but within this paper, the need to evaluate the strength of their individual impact on the adoption of process orientation and the establishment of BPM practice in SMEs in the apparel industry in Serbia, Bulgaria, and North Macedonia has been recognized.

The integrated FUCOM–fuzzy PIPRECIA model made it possible to evaluate and prioritize process orientation dimensions based on the evaluations of the 24 experts, taking into account the SMEs of the apparel industry and the specificities that occur in the businesses of these organizations. Ranking the criteria based on the final values of the weight coefficients of the implemented integrated multicriteria model provided the answer to the basic research question that motivated this research, which read: "To what extent do each of the identified categories of process orientation adoption elements realistically contribute to the establishment of BPM practices and the progression towards a state of stability and a high degree of process maturity within the SMEs of the apparel industry?"

The final values of the overall integrated model shown in Figure 4 indicate the most influential contribution of the human resource management element in comparison to the other eight considered elements. Routine tasks can be automated, however, within labor-intensive industries such as the apparel industry, which involves a large number of manual operations in the manufacturing processes,

especially of uniquely designed garments; human resources are required [24,98]. Managing them is also necessary.

Process-based information systems development follows the previous element in its potential impact. The apparel industry, as well as others in terms of business modernization, is accompanied by the automatization and implementation of information technology [61]. As [99] stated, manual cutting of materials is still present in the production of apparel because of lower production costs, however, this makes the production process labor-intensive and reduces productivity. The impact of this element is increasing due to the recognized need to use computer numerical control (CNC) machines in production with the implementation of specialized tailoring software.

The criterion of focus on consumers and competitors was third-ranked within the integrated FUCOM–fuzzy PIPRECIA model. A system that responds quickly and adequately to the needs and demands of consumers attracts a large number of consumers and ensures their loyalty while gaining a more favorable competitive position [100].

The dimensions related to performance measurement and business process improvement, process structure, compliance of process and strategy goals, and process identification, documentation, and standardization were ranked fourth to seventh. Measuring the performance of the creative processes within the apparel industry can be of great importance, as regularly measuring and setting improvement goals would ensure the delivery of added value to consumers. The lack of human and financial resources in the SMEs of the apparel industry is an obstacle to carrying out a large number of activities that strengthen the process orientation. A large number of activities within the work practices of these companies are performed by one person, and the responsibility for performing multiple processes and multiple process roles is also up to one person.

The criterion of process organizational culture is estimated to have a lower contribution and was, accordingly, ranked eighth. The value of the weight coefficient was the same for the dimension relating to processes in supplier relations, which was ranked ninth, out of the nine evaluated criteria. Therefore, it is noted that this criterion has the weakest impact compared to the previously discussed ones on the establishment of BPM practices in apparel SMEs.

7. Conclusions

BPM is a comprehensive approach, dependent on strategic and operational elements, the use of modern techniques and tools, the involvement of human resources, and a horizontal focus that enables the delivery of added value to end consumers [22].

The textile and apparel industries in Serbia, Bulgaria, and North Macedonia represent a fruitful area of research, taking into account the past and the present picture of business within these industries in these areas. Based on the review of available research regarding the application of multicriteria methods in the textile, but especially the apparel industry, no research has been observed focusing on the ranking of process orientation dimensions; that is, elements that influence the higher level of establishment of BPM practices within apparel industry SMEs. The considered elements have implications for establishing BPM practice within different areas, however, the conducted research provides an opportunity to see the impact of different process dimensions in accordance with the specificities of this sector.

A new integrated FUCOM–fuzzy PIPRECIA model has been developed in order to achieve the research objective related to the evaluation of adopted process orientation dimensions, prioritizing the most influential ones in accordance with the research problem. Through various phases within this model, the calculation of the weight coefficients of each of the considered process orientation dimensions was performed based on the responses of 24 experts.

The final values of the integrated model highlighted the human resource management (HRM) element as the most influential link in the chain of influence on the establishment of BPM practice in apparel industry SMEs in Serbia, Bulgaria, and North Macedonia. Clearly, in the labor-intensive sector with a majority share of female workers, this element is recognized as the most influential. In terms of

impact, this element is accompanied by process-based information systems development and a focus on consumers and competitors. Other dimensions provide a weaker contribution to the establishment of BPM practice and the adoption of process orientation, while the weakest contribution was attributed to the dimension of supplier relations processes. Although the impacts of all the dimensions considered are different according to the sector and size of the organizations, each of them has an impact, and none of the dimensions were excluded by this research.

To properly manage business processes and build a mature organization, all the elements need to be considered. For SMEs within the apparel industry to achieve this, they need to focus their initial steps on human resource management activities, then the development of process-based information systems, in line with the rankings obtained from the implementation of the integrated FUCOM–fuzzy PIPRECIA model.

The practical significance of conducted prioritization within this research is reflected in highlighting the importance and priority of particular dimensions according to the specific aspects of business in that domain. Decision makers in the domain can use these results to develop a process-based development strategy.

Based on this result, there is a need for further research within the HRM dimension to provide a more comprehensive understanding of the activities that need to be undertaken for this dimension to have its full impact on the establishment of BPM practices in the apparel industry SMEs.

Future research will be devoted to a deeper understanding of the problem by applying calculated weights of process orientation dimensions in future evaluations to generate solutions for improvements. An evaluation of the attitudes of managers and employees regarding the adoption of BPM practices, considering the role of process owners within the creative processes of the apparel industry, will also be done. Particular attention will be paid to assessing the degree of process maturity within small and medium-sized enterprises in the apparel industry based on the evaluations of managers and employees.

Author Contributions: Conceptualization, A.D. and S.U.; methodology, A.D. and D.M; validation, S.U. and M.T.; formal analysis, D.M.; investigation, A.D.; writing—original draft preparation, A.D.; writing—review and editing, M.V. and M.T.; supervision, S.U. All authors have read and agreed to the published version of the manuscript.

Funding: We acknowledge support by the German Research Foundation and the Open Access Publication Fund of TU Berlin.

Acknowledgments: The authors wish to acknowledge the support received from German Research Foundation and the TU Berlin.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Meidan, A.; García-García, J.A.; Escalona, M.J.; Ramos, I. A survey on business processes management suites. *Comput. Stand. Interfaces* **2017**, *51*, 71–86. [CrossRef]
2. Škrinjar, R.; Vukšić, V.; Štemberger, M. Adoption of Business Process Orientation Practices: Slovenian and Croatian Survey. *Bus. Syst. Res.* **2010**, *1*, 5–19. [CrossRef]
3. Stojanović, Đ.; Bašić, A. Extended Supply Chain and Small and Medum Retail Enterprises in Serbian Garment Industry. *Fibres Text. East. Eur.* **2013**, *21*, 13–17.
4. Chong, S. Business process management for SMEs: An exploratory study of implementation factors for the Australian wine industry. *J. Inf. Syst. Small Bus.* **2007**, *1*, 41–58.
5. Dimitrijević, D.; Spaić, O.; Urošević, S.; Adamović, Ž.; Đurić, Ž. Korelacija specifičnih performansi MSP odevne industrije država u razvoju i implementacija IKT tehnologija. *Tekst. Ind.* **2018**, *66*, 42–54.
6. Moniz, A.B.; Paulos, M.R. The globalization in the clothing sector and its implications for work organisation: A view from the Portuguese case. In Proceedings of the International Sociological Association First ISA Forum of Sociology, Barcelona, Spain, 5–8 September 2008; pp. 1–16. Available online: https://www.researchgate.net/publication/23646278_The_globalisation_in_the_clothing_sector_and_its_implications_for_work_organisation_a_view_from_the_Portuguese_case (accessed on 17 May 2020).

7. Bair, J.; Gereffi, G. Local Clusters in Global Chains: The Causes and Consequences of Export Dynamism in Torreon's Blue Jeans Industry. *World Dev.* **2001**, *29*, 1885–1903. [CrossRef]
8. Urošević, S.; Dobrosavljević, A. Conditions of Development of Small and Medium Enterprises in Clothing Industry. In *How to Prevent SMEs Failure (Actions Based on Comparative Analysis in Višegrad Countries and Serbia)*; Technical Faculty in Bor: Bor, Serbia, 2019; pp. 583–627.
9. Lan, T. Development Countermeasure of Clothing Creativity and Brand Construction from the Perspective of Cultural and Creative Industries. *Argos* **2019**, *36*, 72.
10. Ceptureanu, S.I.; Ceptureanu, E.G.; Melinte, C.S.; Borisov, D. Capabilities of SMEs in Romanian clothing industry. *Ind. Text.* **2016**, *67*, 265–269.
11. Dobrosavljević, A.; Urošević, S. Evaluation of orientation on performances and process improvements in manufacturing organizations. *Tehnika* **2019**, *74*, 287–294. [CrossRef]
12. Dimitrijević, D.; Milenković, L.; Antić, S.; Ilić, A.; Krstić, D. Uticaj primene CAD sistema u malim preduzećima odevne industrije zemalja u razvoju. *Tekst. Ind.* **2015**, *63*, 23–29.
13. Sorak, M.; Urošević, S.; Dragić, M.; Sorak, L. Improvement methodology of important clothing characteristics, by applying quality tools. *Ind. Text.* **2015**, *66*, 283–288.
14. Dimitrijević, D.; Adamović, Ž.; Đurić, Ž. Proces generisanja modela MSP—Implementacija efikasnih istraživačkih metoda - 1. deo. *Tekst. Ind.* **2018**, *66*, 85–95.
15. Lemańska-Majdzik, A.; Okręglicka, M. Identification of Business Processes in an Enterprise Management. *Procedia Econ. Financ.* **2015**, *27*, 394–403. [CrossRef]
16. Pyon, C.U.; Woo, J.Y.; Park, S.C. Service improvement by business process management using customer complaints in financial service industry. *Expert Syst. Appl.* **2011**, *38*, 3267–3279. [CrossRef]
17. Hewitt, S. Business excellence: Does it work for small companies? *Tqm Mag.* **1997**, *9*, 76–82. [CrossRef]
18. Rolinek, L.; Plevny, M.; Kubecova, J.; Kopta, D.; Rost, M.; Vrchota, J.; Marikova, M. Level of Process Management Implementation in SMEs and Some Related Implications. *Transform. Bus. Econ.* **2015**, *14*, 360–377.
19. Pritchard, J.; Armistead, C. Business process management – lessons from European business. *Bus. Process Manag. J.* **1999**, *5*, 10–35. [CrossRef]
20. Reijers, H.A. Implementing BPM systems: The role of process orientation. *Bus. Process Manag. J.* **2006**, *12*, 389–409. [CrossRef]
21. Vom Brocke, J.; Rosemann, M. *Handbook on Business Process Management*, 2nd ed.; Springer: Berlin, Germany, 2015.
22. Zairi, M. Business process management: A boundaryless approach to modern competitiveness. *Bus. Process Manag. J.* **1997**, *3*, 64–80. [CrossRef]
23. De Bruin, T.; Rosemann, M. Towards a Business Process Management Maturity Model. In Proceedings of the 13th European Conference on Information Systems, Information Systems in a Rapidly Changing Economy, Regensburg, Germany, 26–28 May 2005; Verlag and the London School of Economics: London, UK, 2005; pp. 521–532.
24. Trkman, P. The critical success factors of business process management. *Int. J. Inf. Manag.* **2010**, *30*, 125–134. [CrossRef]
25. Niehaves, B.; Plattfaut, R.; Becker, J. Business process management capabilities in local governments: A multi-method study. *Gov. Inf. Q.* **2013**, *30*, 217–225. [CrossRef]
26. Plesa, S.; Prostean, G. Business Process Management for Model Based Design Automotive Projects. *Procedia Soc. Behav. Sci.* **2018**, *238*, 313–322. [CrossRef]
27. Macedo de Morais, R.; Kazan, S.; Inês Dallavalle de Pádua, S.; Lucirton Costa, A. An analysis of BPM lifecycles: From a literature review to a framework proposal. *Bus. Process Manag. J.* **2014**, *20*, 412–432. [CrossRef]
28. Huff, A.S.; Reger, R.K. A Review of Strategic Process Research. *J. Manag.* **1987**, *13*, 211–236. [CrossRef]
29. Tallon, P.P. A Process-Oriented Perspective on the Alignment of Information Technology and Business Strategy. *J. Manag. Inf. Syst.* **2007**, *24*, 227–268. [CrossRef]
30. Neely, A.D.; Adams, C.; Kennerley, M. *The Performance Prism: The Scorecard for Measuring and Managing Business Success*; Prentice Hall, Financial Times: London, UK, 2002.
31. Carpinetti, L.C.R.; Buosi, T.; Gerólamo, M.C. Quality management and improvement: A framework and a business-process reference model. *Bus. Process Manag. J.* **2003**, *9*, 543–554. [CrossRef]

32. Lawler, E.E. Total Quality Management and employee involvement: Are they compatible? *AMP* **1994**, *8*, 68–76. [CrossRef]
33. Kazhamiakin, R.; Pistore, M.; Roveri, M. A Framework for Integrating Business Processes and Business Requirements. In Proceedings of the Eighth IEEE International Enterprise Distributed Object Computing Conference, Monterey, CA, USA, 24 September 2004; IEEE: Piscataway, NJ, USA, 2004; pp. 9–20.
34. Vlahović, N.; Milanović, L.; Škrinjar, R. Turning Points in Business Process Orientation Maturity Model: An East European Survey. *WSEAS Trans. Bus. Econ.* **2010**, *7*, 22–32.
35. Lockamy, A.; McCormack, K. The development of a supply chain management process maturity model using the concepts of business process orientation. *Supply Chain Manag.* **2004**, *9*, 272–278. [CrossRef]
36. Elbashir, M.Z.; Collier, P.A.; Davern, M.J. Measuring the effects of business intelligence systems: The relationship between business process and organizational performance. *Int. J. Account. Inf. Syst.* **2008**, *9*, 135–153. [CrossRef]
37. Zamecnik, R.; Rajnoha, R. Business Process Performance Measurement Under Conditions of Business Practice. *Procedia Econ. Financ.* **2015**, *26*, 742–749. [CrossRef]
38. Van Looy, A.; Shafagatova, A. Business process performance measurement: A structured literature review of indicators, measures and metrics. *Springer Plus* **2016**, *5*, 1797. [CrossRef] [PubMed]
39. Schmiedel, T.; vom Brocke, J.; Recker, J. Culture in Business Process Management: How Cultural Values Determine BPM Success. In *Handbook on Business Process Management 2*; vom Brocke, J., Rosemann, M., Eds.; Springer: Berlin/Heidelberg, Germany, 2015; pp. 649–663.
40. Trkman, P.; Mertens, W.; Viaene, S.; Gemmel, P. From business process management to customer process management. *Bus. Process Manag. J.* **2015**, *21*, 250–266. [CrossRef]
41. Willaert, P.; Van den Bergh, J.; Willems, J.; Deschoolmeester, D. The Process-Oriented Organisation: A Holistic View Developing a Framework for Business Process Orientation Maturity. In *Business Process Management*; Alonso, G., Dadam, P., Rosemann, M., Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2007; Volume 4714, pp. 1–15.
42. Albani, A.; Dietz, J.L.G. Current trends in modeling inter-organizational cooperation. *J. Enterp. Inf. Manag.* **2009**, *22*, 275–297. [CrossRef]
43. Kwak, Y.H.; Ibbs, C.W. Project Management Process Maturity (PM)2 Model. *J. Manag. Eng.* **2002**, *18*, 150–155. [CrossRef]
44. Vanhaverbeke, W.; Torremans, H. Organizational structure in process-based organizations. *Knowl. Process Manag.* **1999**, *6*, 41–52. [CrossRef]
45. Heravizadeh, M.; Mendling, J.; Rosemann, M. Dimensions of Business Processes Quality (QoBP). In *Business Process Management Workshops*; Ardagna, D., Mecella, M., Yang, J., Eds.; Lecture Notes in Business Information Processing; Springer: Berlin, Heidelberg, 2009; Volume 17, pp. 80–91.
46. Hammer, M. The Process Audit. *Harv. Bus. Rev.* **2007**, *85*, 1–16.
47. Fleacă, E.; Fleacă, B. The Business Process Management Map – an Effective Means for Managing the Enterprise Value Chain. *Procedia Technol.* **2016**, *22*, 954–960. [CrossRef]
48. Krysińska, J.; Janaszkiewicz, P.; Prys, M.; Różewski, P. Knowledge Resources Development Process in Business Process Outsourcing (BPO) Organizations. *Procedia Comput. Sci.* **2018**, *126*, 1145–1153. [CrossRef]
49. Paulk, M.C. Practices of High Maturity Organizations. In Proceedings of the 11th Software Engineering Process Group (SEPG) Conference, Atlanta, GA, USA, 23 February 1999; Software Engineering Institute: Pittsburgh, PA, USA, 1999; pp. 8–11.
50. Cuevas, G.; Calvo-Manzano, J.A.; García, I. Some Key Topics to be Considered in Software Process Improvement. In *Computer Systems and Software Engineering: Concepts, Methodologies, Tools, and Applications*; IGI Global: Hershey, PA, USA, 2018; pp. 134–160.
51. Haake, J.M.; Wang, W. Flexible support for business processes: Extending cooperative hypermedia with process support. *Inf. Softw. Technol.* **1999**, *41*, 355–366. [CrossRef]
52. Škerlavaj, M.; Štemberger, M.I.; Škrinjar, R.; Dimovski, V. Organizational learning culture—The missing link between business process change and organizational performance. *Int. J. Prod. Econ.* **2007**, *106*, 346–367. [CrossRef]
53. Schmiedel, T.; vom Brocke, J.; Recker, J. Which cultural values matter to business process management? Results from a global Delphi study. *Bus. Process Manag. J.* **2013**, *19*, 292–317. [CrossRef]

54. Schmiedel, T.; vom Brocke, J.; Recker, J. Development and validation of an instrument to measure organizational cultures' support of Business Process Management. *Inf. Manag.* **2014**, *51*, 43–56. [CrossRef]
55. Qi, L.; Wang, K.; Wang, X.; Zhang, F. Research on the relationship among market orientation, customer relationship management, customer knowledge management and business performance. *Manag. Sci. Eng.* **2008**, *2*, 31–37.
56. Dong, X.; Zhang, Z.; Hinsch, C.A.; Zou, S. Reconceptualizing the elements of market orientation: A process-based view. *Ind. Mark. Manag.* **2016**, *56*, 130–142. [CrossRef]
57. Matei, G. SOA and BPM, a Partnership for Successful Organizations. *Inform. Econ.* **2011**, *15*, 39–54.
58. Viaene, S.; Van den Bergh, J.; Schröder-Pander, F.; Mertens, W. BPM—Quo Vadis? *BPTrends* **2010**. Available online: https://www.bptrends.com/bpt/wp-content/publicationfiles/TWO%2009-14-10-BPM-Quo%20Vadis-van%20den%20Berghet%20al1.pdf (accessed on 17 May 2020).
59. Burlton, R. BPM Critical Success Factors Lessons Learned from Successful BPM Organizations. *BPTrends* **2011**. Available online: https://www.bptrends.com/publicationfiles/10-04-2011-ART-BPM%20Critical%20Success%20Factors-Burlton.pdf (accessed on 17 May 2020).
60. Norta, A.; Grefen, P.; Narendra, N.C. A reference architecture for managing dynamic inter-organizational business processes. *Data Knowl. Eng.* **2014**, *91*, 52–89. [CrossRef]
61. Hoyer, V. Modeling Collaborative e-Business Processes in SME environments. *J. Inf. Sci. Technol.* **2008**, *5*, 46–63.
62. Yongchareon, S.; Liu, C.; Zhao, X. An Artifact-Centric View-Based Approach to Modeling Inter-organizational Business Processes. In *Web Information System Engineering—WISE 2011*; Bouguettaya, A., Hauswirth, M., Liu, L., Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2011; Volume 6997, pp. 273–281.
63. Houy, C.; Fettke, P.; Loos, P.; van der Aalst, W.M.P.; Krogstie, J. BPM-in-the-Large—Towards a Higher Level of Abstraction in Business Process Management. In *E-Government, E-Services and Global Processes*; Janssen, M., Lamersdorf, W., Pries-Heje, J., Rosemann, M., Eds.; IFIP Advances in Information and Communication Technology; Springer: Berlin/Heidelberg, Germany, 2010; Volume 334, pp. 233–244.
64. Rahimi, F.; Møller, C.; Hvam, L. Business process management and IT management: The missing integration. *Int. J. Inf. Manag.* **2016**, *36*, 142–154. [CrossRef]
65. Škrinjar, R.; Trkman, P. Increasing process orientation with business process management: Critical practices'. *Int. J. Inf. Manag.* **2013**, *33*, 48–60. [CrossRef]
66. McCormack, K. Business Process Orientation: Do You Have It? *Qual. Prog.* **2001**, *34*, 51–58.
67. Bosilj Vukšić, V.; Hernaus, T.; Kovačić, A. *Upravljanje Poslovnim Procesima—Organizacijski i Informacijski Aspekti*; Školska knjiga: Zagreb, Croatia, 2008.
68. Milanović Glavan, L. Upravljanje procesima u poduzećima Republike Hrvatske. *Zbornik radova—Sarajevo Business and Economics Review (SBER)* **2011**, *31*, 105–125.
69. Dobrosavljević, A.; Urošević, S. Separation of factors important for the adoption of business process management practices in labor-intensive activities. *Tehnika* **2019**, *74*, 861–867. [CrossRef]
70. Pamučar, D.; Božanić, D.; Lukovac, V.; Komazec, N. Normalized weighted geometric bonferroni mean operator of interval rough numbers–application in interval rough dematel-copras model. *Facta Univ. Ser. Mech. Eng.* **2018**, *16*, 171–191. [CrossRef]
71. Petrović, G.; Mihajlović, J.; Ćojbašić, Ž.; Madić, M.; Marinković, D. Comparison of three fuzzy MCDM methods for solving the supplier selection problem. *Facta Univ. Ser. Mech. Eng.* **2019**, *17*, 455–469.
72. Morente-Molinera, J.A.; Wu, X.; Morfeq, A.; Al-Hmouz, R.; Herrera-Viedma, E. A novel multi-criteria group decision-making method for heterogeneous and dynamic contexts using multi-granular fuzzy linguistic modelling and consensus measures. *Inf. Fusion* **2020**, *53*, 240–250. [CrossRef]
73. Lee, H.-C.; Chang, C.-T. Comparative analysis of MCDM methods for ranking renewable energy sources in Taiwan. *Renew. Sustain. Energy Rev.* **2018**, *92*, 883–896. [CrossRef]
74. Cho, C.; Lee, S. A study on process evaluation and selection model for business process management. *Expert Syst. Appl.* **2011**, *38*, 6339–6350. [CrossRef]
75. Perçin, S. Fuzzy multi-criteria risk-benefit analysis of business process outsourcing (BPO). *Inf. Manag. Comput. Secur.* **2008**, *16*, 213–234. [CrossRef]
76. Coskun, S.; Basligil, H.; Baracli, H. A weakness determination and analysis model for business process improvement. *Bus. Process Manag. J.* **2008**, *14*, 243–261. [CrossRef]

77. Campos, A.C.S.M.; de Almeida, A.T. Using multiple criteria decision analysis for supporting decisions of Business Process Management. In Proceedings of the 2010 IEEE International Conference on Industrial Engineering and Engineering Management, Macao, China, 7–10 December 2010; IEEE: Piscataway, NJ, USA, 2010; pp. 52–56.
78. Aluftekin, N.; Tas, A.; Yuksel, O.; Cakar, G.E.; Bayraktar, F. Assessment of cluster potential and decision making criteria in the textile and apparel sector using the Analytic Hierarchy Process (AHP). *Afr. J. Bus. Manag.* **2011**, *5*, 9125–9136.
79. Sasi, J.C.; Digalwar, A.K. Application of AHP and TOPSIS Method for Supplier Selection between India & China in Textile Industry. *Int. Res. J. Eng. Technol.* **2015**, *2*, 1730–1738.
80. Stojanov, T.; Ding, X. Supplier Selection for Mixed-Model Production: A Case Study from the Apparel Industry. *Fibres Text. East. Eur.* **2015**, *23*, 8–12.
81. Moretti, I.C.; Braghini Junior, A.; Colmenero, J.C. Using the analytic hierarchy process for selecting prototypes in the development process of fashion garment products. *Acta Sci. Technol.* **2017**, *39*, 367. [CrossRef]
82. Mastrocinque, E.; Coronado Mondragon, A.E.; Hogg, P.J. Manufacturing technology selection in the supply chain context by means of fuzzy AHP: A case in the high performance textile industry. *ARPN J. Eng. Appl. Sci.* **2016**, *11*, 240–246.
83. Chakraborty, S.; Ramakrishnan, K.R.; Mitra, A. A multi-criteria decision support model for optimal cotton fibre blending. *J. Text. Inst.* **2018**, *109*, 1482–1492. [CrossRef]
84. Urošević, S.; Radosavljević, D.; Stefanović, V.; Đorđević, D.; Kokeza, G. Multicriteria ranking of a job positions by ELECTRA methods in order to improve the analysis and conditions at work in companies in the textile industry. *Ind. Text.* **2017**, *68*, 388–395. [CrossRef]
85. Pamučar, D.; Stević, Ž.; Sremac, S. A New Model for Determining Weight Coefficients of Criteria in MCDM Models: Full Consistency Method (FUCOM). *Symmetry* **2018**, *10*, 393. [CrossRef]
86. Stanujkić, D.; Zavadskas, E.K.; Karabašević, D.; Smarandache, F.; Turskis, Z. The Use of Pivot Pairwise Relative Criteria Importance Assessment Method for Determining the Weights of Criteria. *Rom. J. Econ. Forecast.* **2017**, *20*, 116–133.
87. Durmić, E. The evaluation of the criteria for sustainable supplier selection by using the FUCOM method. *Oper. Res. Eng. Sci. Theory Appl.* **2019**, *2*, 91–107. [CrossRef]
88. You, S.Y.; Zhang, L.J.; Xu, X.G.; Liu, H.C. A New Integrated Multi-Criteria Decision Making Multi-Objective Programming Model for Sustainable Supplier Selection and Order Allocation. *Symmetry* **2020**, *12*, 302. [CrossRef]
89. Campagne, C.S.; Roche, P.; Gosselin, F.; Tschanz, L.; Tatoni, T. Expert-based ecosystem services capacity matrices: Dealing with scoring variability. *Ecol. Indic.* **2017**, *79*, 63–72. [CrossRef]
90. Nenadić, D. Ranking dangerous sections of the road using MCDM model. *Decis. Mak. Appl. Manag. Eng.* **2019**, *2*, 115–131. [CrossRef]
91. Puška, A.; Stojanović, I.; Maksimović, A. Evaluation of sustainable rural tourism potential in Brcko district of Bosnia and Herzegovina using multi-criteria analysis. *Oper. Res. Eng. Sci. Theory Appl.* **2019**, *2*, 40–54. [CrossRef]
92. Fazlollahtabar, H.; Smailbašić, A.; Stević, Ž. FUCOM method in group decision-making: Selection of forklift in a warehouse. *Decis. Mak. Appl. Manag. Eng.* **2019**, *2*, 49–65. [CrossRef]
93. Stević, Ž.; Durmić, E.; Gajić, M.; Pamučar, D.; Puška, A. A Novel Multi-Criteria Decision-Making Model: Interval Rough SAW Method for Sustainable Supplier Selection. *Information* **2019**, *10*, 292. [CrossRef]
94. Stević, Ž.; Stjepanović, Ž.; Božičković, Z.; Das, D.; Stanujkić, D. Assessment of Conditions for Implementing Information Technology in a Warehouse System: A Novel Fuzzy PIPRECIA Method. *Symmetry* **2018**, *10*, 586. [CrossRef]
95. Albu, A.; Precup, R.E.; Teban, T.A. Results and challenges of artificial neural networks used for decision-making and control in medical applications. *Facta Univ. Ser. Mech. Eng.* **2019**, *17*, 285–308. [CrossRef]
96. Popović, G.; Đorđević, B.; Milanović, D. Multiple Criteria Approach in the Mining Method Selection. *Industrija* **2019**, *47*, 47–62. [CrossRef]
97. Vesković, S.; Milinković, S.; Abramović, B.; Ljubaj, I. Determining criteria significance in selecting reach stackers by applying the fuzzy PIPRECIA method. *Oper. Res. Eng. Sci. Theory Appl.* **2020**, *3*, 72–88. [CrossRef]

98. Güner, M.G.; Ünal, C. Line Balancing in the Apparel Industry Using Simulation Techniques. *Fibres Text. East. Eur.* **2008**, *16*, 75–78.
99. Nemeša, I. Automatizovani sistemi za krojenje tekstilnih materijala. *Tekst. Ind.* **2017**, *65*, 24–31.
100. De Toni, A.; Meneghetti, A. The production planning process for a network of firms in the textile-apparel industry. *Int. J. Prod. Econ.* **2000**, *65*, 17–32. [CrossRef]