

SELECTION OF A SUPPLIER OF THERMOPLASTIC INTERLINING BY NUMERICAL EVALUATION MATRIX*

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A b s t r a c t: In this paper the methodology for supplier selection of fusible interlining for men's shirts is presented. The first step of supplier selection starts with the identification of suppliers of support materials, evaluation of quality, and the evaluation of economic and commercial performance of potential suppliers by the following criteria: quality of fusible interlining, procurements cost, supplier operational capability, financial stability and additional services offered. Evaluation of suppliers is made by numerical evaluation of sub-criteria, and the final selection is made by summation of the “weight” of particular features.

Key words: supplier evaluation; quality; procurements cost; operational capability; financial stability; additional services

СЕЛЕКЦИЈА НА ДОБАВУВАЧ НА ТЕРМОПЛАСТИЧНА МЕГУПОСТАВА СО ПРИМЕНА НА МАТРИЦА ЗА НУМЕРИЧКА ЕВАЛУАЦИЈА

А п с т р а к т: Во трудот е претставена методологија за избор на добавувач на помошниот материјал термопластична меѓупостава за фиксирање на машка кошула. Процесот на селекција на добавувач започнува со идентификација на претпријатија кои работат како добавувачи на помошни материјали и испитување на квалитетот, а потоа се прави евалуација на економските и комерцијалните перформанси на идентификуваните добавувачи преку критериумите: квалитетот на термопластичната меѓупостава, трошоците за набавка, оперативната способност и финансиската стабилност на претпријатието и дополнителните технички услуги кои тоа ги нуди. Оценувањето и селекцијата на добавувачите се направени преку нумеричка евалуација на супкритериуми, а крајниот избор на добавувач е направен преку сумирање на „тежините“ за одделни карактеристики.

Клучни зборови: термопластична меѓупостава; евалуација; добавувач; квалитет

INTRODUCTION

Suppliers have a critical role in achieving quality objectives. It is clear that if the quality of the raw materials is low, a high quality finished product cannot be achieved. Therefore, companies pay great attention to the quality of the purchased materials by inspecting the materials for: spotting scraps, faults, operation performance, etc. [1]. Decisions made concerning the selection of a supplier are different from one enterprise to another. Companies that understand the supply management well, base the selection decision on the attributes of their needs. The

selection process includes strategy and development, assessment, long-term contacting and negotiation. Each selection decision has some degree of uniqueness, i.e. there is not only one way to evaluate and select suppliers. However, all selection decisions should follow a particular law of logic, from the identification that there is a need for selection to the extension of the contract with the selected supplier. Decisions on selection of suppliers are made by monitoring the lists created during the pre-classification phase of the supplier. These are complicated decisions because different criteria are taken

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into account. A significant number of quantitative and qualitative attributes of the supplier are examined, and the evaluation of suppliers is realized by using objective and subjective criteria [2]. In this paper a selection of a supplier of thermoplastic interlining casual men's shirt was made based on the previously set criteria. Companies, potential suppliers are evaluated through the quality of the products offered and their economic commercial performance.

EXPERIMENTAL SECTION

1. Defining needs and identification of potential suppliers of thermoplastic interlining

A large participation in the overall production of men's shirts is the creation of a casual men's shirt. The specification of the fabric for which we require a compatible thermoplastic interlining for fusing of the collar, under collar and cuffs of a men's shirt is given in Table 1. For fusing of the fabric, *we need white, woven, soft, lightweight, thermoplastic interlining, with cotton base and high density polyethylene coating.*

Table 1

Characteristics of the fabric used in tests

Composition	Weight g/m ²	Warp density cm ⁻¹	Weft density cm ⁻¹	Color
100% cotton	125	56	38	Blue

By contacting the managers of the clothing companies from the wider eastern region of the Republic of Macedonia, and by searching supply portals, three companies, potential suppliers of thermoplastic interlining, have been identified. Company

data is collected from web portals, their product catalogs and in direct contact with their managers. The first company is the company "Coats" from Bulgaria, which is part of the family of the group "Coats" with headquarters in England. The interlining assortment the company "Coats" is produced by manufacturers "Wendler" from Germany and "Permess" from Netherlands.

The second enterprise is "Elviet" from Štip. It is a trading company that works only with auxiliary materials for ready-made production. This is a Greek company founded in 2006 in Štip, the Republic of Macedonia. In regard to the thermoplastic interlining, the company "Elviet" has a direct cooperation with manufacturers of thermoplastic interlining from France and Spain. It has cooperated with the manufacturer "DHJ Internacional" from France since 2009, and since 2010 it has been cooperating with the manufacturer "Staflex" from Spain.

The company "Niko 2002" was founded in 2002 in Štip. This is a trading company that sells retail and wholesale of base and auxiliary materials for ready-made production. What is specific about this company is that it has not established cooperation with any manufacturer of thermoplastic interlining. Since there is no continuous cooperation with manufacturers of thermoplastic interlinings, the quantities they have from a particular manufacturer are available for a certain period. Therefore, in this case, the re-supply of thermoplastic interlining of a particular type may be a problem in the event deficiency in production. The manufacturer of the thermoplastic interlining is "Freudenberg" from Germany.

The specifications of the thermoplastic interlinings offered by the companies potential suppliers are given in Table 2.

Table 2

Specification of thermoplastic interlinings offered by identified potential suppliers

Supplier	"Coats" – Bulgaria	"Elviet" – Macedonia	"Niko2002" – Macedonia
Article	"Wendler" DV 31	"Staflex"	Freudenberg
Composition	Base: 100% cotton, woven; Coating: PE HD, microdots	Base: 100% cotton, woven; Coating: PE HD, microdots	Base: 100% cotton, woven; Coating: PE HD, microdots
Weight, g/m ²	100	110	80
Width, m	0.9	0.9	0.9
Touch	Very soft	Very soft	Very soft
Fusing conditions	$T = 160 - 165^{\circ}\text{C}$ $P = 2 - 3 \text{ bar}$ $t = 12 - 18 \text{ s}$	$T = 150 - 170^{\circ}\text{C}$ $P = 1.8 - 2.5 \text{ bar}$ $t = 12 - 17 \text{ s}$	$T = 143 - 166^{\circ}\text{C}$ $P = 0.8 - 3 \text{ bar}$ $t = 12 - 18 \text{ s}$
Care instructions	Washing $T = 95^{\circ}\text{C}$ Ironing: $T = \text{max. } 150^{\circ}\text{C}$	Washing $T = 95^{\circ}\text{C}$ Ironing: $T = \text{max. } 150^{\circ}\text{C}$	Washing $T = 95^{\circ}\text{C}$ Ironing: $T = \text{max. } 150^{\circ}\text{C}$
Density, cm ⁻¹	Warp 23, Weft 21	Warp 23, Weft 21	Warp 24, Weft 21

2. Criteria for evaluating the supplier

Evaluation of suppliers is obtained as a complex assessment based on several criteria. The quality of the product is always taken as one of the criteria. Other criteria that are evaluated are in fact the economic and commercial performance of the supplier. Accordingly, the evaluation of the supplier of thermoplastic interlining is made on the basis of the following criteria: quality of the thermoplastic interlining offered by the companies; procurement costs; operational capability of companies; financial stability of companies; additional services offered by companies. The data based on which the analysis of the companies was carried out according to the above criteria and their evaluation are obtained from experimental pre-production testing and in direct conversation with the companies' managers. Pre-production testing is essential for comparing the quality of different types of interlinings, i.e. interlinings from different suppliers.

3. Examination of the quality of the selected thermoplastic interlinings

The evaluation of the quality of the selected thermoplastic interlinings is done by examining the properties: the bonding strength before and after fusing, banding rigidity and dimensional stability of the laminate of the fabric with the thermoplastic interlining. The testing of the bond strength of the fixed textile material is done according to the standard ASTM D 2724 – (07)2015 [3]. The standard ISO 3759:2011 is applied to determine the dimensional changes in textile materials [4]. The method of this standard is intended to examine the dimensional stability of the fabric and the laminate, before washing and after washing. The standard BS 3356:1990 is applied to determine the banding rigidity of textile materials [5]. The selected fusing parameters are part of the factors intervals in the specifications of the individual thermoplastic interlinings given by the manufacturers, Table 3.

Table 3

Fusing parameters

Type of interlining	Weight, g/m ²	Fusing parameters		
		T, °C	P, bar	t, s
Freudenberg	80	160	2	15
Wendler DV 31	100	160	2	15
Staflex 3620	110	160	2	15

Legend: T – temperature; P – pressure; t – time

RESULTS AND DISCUSSION

1. Evaluation of companies potential suppliers

Through numerical evaluation, all sub-criteria of a particular criterion are analyzed individually and independently, i.e. isolated from other sub-criteria and are rated with a certain number of points from which the sum is ultimately calculated. The number of points by which the sub-criteria are evaluated ranges from 1 to n, where n is the number of potential suppliers that are compared according to the criterion. One point is assigned to the supplier for which the evaluator considers that it least meets the sub-criterion or does not meet it at all, and the highest number of points, or n points, is assigned to the supplier for which the evaluator considers that it most meets the sub-criterion. The points of the criterion are calculated as the sum of the points of the sub-criteria for each supplier respectively. Suppliers are ranked according to the criterion points. The values of the numerical evaluation of potential suppliers in relation to the sub-criteria of a particular criterion are entered into the matrix [6].

• Evaluation of companies according to the criterion "quality"

For the evaluation of companies according to the criterion "quality", a matrix has been created in which the values of the numerical evaluation for each quality sub-criterion are written. The quality of the offered thermoplastic interlinings as a criterion for the evaluation of companies, potential suppliers, is analyzed through: bonding strength before and after washing, dimensional stability and banding rigidity. The results of testing the bonding strength are given in Table 4.

Table 4

Bonding strength between the fabric and the thermoplastic interlinings (cN/cm)

Properties	Laminate		
	Freudenberg	Wendler	Staflex
Bonding strength before washing,	236.6	142.3	218.3
Bonding strength after washing	266.4	127.7	174.3

According to the results, the highest bonding strength has the laminate "Fabric/Freudenberg", then "Fabric/Staflex", while the weakest bonding strength has the laminate "Fabric/Wendler". The standards for testing bonding strength of the laminate do not indicate the minimum strength of bond. However, in the literature and in practical experience, it can be found that the bonding strength should be at least 10 N/5cm or 200 cN/cm [7]. If this value is taken into account, the laminates "Fabric/Freudenberg" and "Fabric/Staflex" generally have the required bonding strength. The laminate "Fabric/Wendler", in all cases, has a bonding strength weaker than the minimum.

The results of the banding rigidity test are given in Table 5. Samples cut in warp direction have greater banding rigidity than samples cut in weft direction. This is due to the higher density of the warp yarns in the structure of the thermoplastic interlining and the outer fabric. All the analyzed thermoplastic interlinings have a higher density by warp than by weft, and therefore this is a phenomenon found in all examined samples. It can be concluded that the application of interlining with an appropriate surface mass, can influence the banding rigidity of the laminate, and hence the aesthetic properties of the clothing. The data on the banding rigidity of the laminate can be used as a parameter in the process of selecting a thermoplastic interlining in relation to the aesthetic appearance of the clothes we want to achieve.

Table 5

Calculated a banding rigidity of the outer fabric and the three laminates

Sample	Fabric (A)	Staflex laminate (B)	Freudenberg laminate (C)	Wendler laminate (D)	
Weight, g/m ²	125	110+125	80+125	100+125	
Banding rigidity, cN cm	warp	1.06	14.58	6.12	10.55
	weft	0.94	9.76	5.57	8.29

From the testing of the dimensional stability, there is no dimensional changes in the examined samples after washing. From the results it can be concluded that the base fabric and the thermoplastic interlinings are dimensionally stable. If the two components in the laminate have a different shrinking ability, a dimensional change will occur under

the influence of the component that has a lower dimensional stability.

Evaluation of potential suppliers is shown in Table 6.

Table 6

Evaluation matrix of potential suppliers according to the criterion "quality"

Criterion with subcriteria	Potential supplier of thermoplastic interlining					
Quality	"Coats" ("Wendler")		"Elviet" ("Staflex")		"Niko 2002" ("Freudenberg")	
Bonding strength before washing	lowest	1	medium	2	highest	3
Bonding strength after washing	lowest	1	medium	2	highest	3
Dimensional stability	excellent	3	excellent	3	excellent	3
Banding rigidity	low	3	medium	3	high	3
Sum	8		10		12	

The banding rigidity of the collar and the cuffs of a men's shirt, as an aesthetic feature, depends on the type of shirt produced, but it mostly depends on the designer's idea of the product's appearance. In practice, the assessment of the banding rigidity of the fused parts of clothes is the result of an internal evaluation within the clothing company during product development. Based on this, when we evaluate the companies according to the sub-criterion "banding rigidity", although the values obtained from the banding rigidity test are different, all companies are rated with the highest number of points.

• *Analyzing and evaluating companies according to the criterion "costs"*

The procurement costs are composed of the price to be paid for the product and of the additional costs consisting of the costs of transport, customs and interest. Effective reduction of the procurement costs of raw materials can greatly contribute to increasing the economy in the production process. Procurement costs as a criterion for evaluating companies, potential suppliers, are analyzed through: product price, transport costs, payment method, discount opportunities.

For fusing a parts of casual men's shirt as cuffs, collar and undercollar, the average consumption of thermoplastic interlining of 0.9 m width is 0.1 m. For the evaluation of companies according to the criterion "costs", a matrix has been made in which the values of the numerical evaluation for each sub-criterion are entered. Evaluation of potential suppliers according to the criterion "costs" is shown in Table 7.

- *Analyzing and evaluating companies according to the criterion "operational capability"*

The operational capability of suppliers is defined by the ability to meet the demands of textile companies, then their efficiency, the way they work and their capacities. Operational capability as a criterion is analyzed through the following sub-criteria: number of employees in the company, assort-

ment of thermoplastic interlinings, mode of operation, time required for delivery (Table 8).

- *Analyzing and evaluating companies according to the criterion "financial stability"*

The supplier's good financial condition gives the clothing company confidence that the supplier company will operate while the cooperation agreement lasts. The profit and financial stability of the suppliers is linearly dependent on the number of associates and the sales made by the company.

The following sub-criteria were taken as indicators of the "financial stability" of companies - potential suppliers: number of realized cooperation agreements as a supplier, number of newly agreed cooperation agreements per year, quantity of thermoplastic interlining delivered annually and realized profit (Table 9)

Table 7

Evaluation matrix of potential suppliers according to the criterion "costs"

Criterion with subcriteria	Potential supplier of thermoplastic interlining					
	"Coats"	("Wendler")	"Elviet"	("Staflex")	"Niko 2002"	("Freudenberg")
Procurements cost						
Price / piece	10.1 denars	1	9.8 denars	2	6.2 denars	3
Transport	Included in the price	3	At the buyer's expense	1	At the buyer's expense	1
Method of payment	In cash/with invoice	3	In cash/with invoice	3	In cash/with invoice	3
Discount	2% in cash	3	No	1	By agreement	2
Sum		10		7		9

Table 8

Evaluation matrix of potential suppliers according to the criterion "operational capability"

Criterion with subcriteria	Potential supplier of thermoplastic interlining					
	"Coats"	("Wendler")	"Elviet"	("Staflex")	"Niko 2002"	("Freudenberg")
Operational capability						
Number of employee	70 (seventy)	3	6 (six)	1	28 (twenty eight)	2
Assortment	Wide	3	Medium	2	Small	1
Method of operation	Stock/Order/Prediction of the buyer needs	3	Order	1	Stock/ Order	2
Delivery time	Stock: 2–3 days	2	There is no stock	1	Stock: 1 day	3
	Order: 1–2 weeks	3	Order: 1–2 weeks	3	Order: 2–3 weeks	2
Sum		14		8		10

Table 9

Evaluation matrix of potential suppliers according to the criterion "financial stability"

Criterion with sub-criteria	Potential supplier of thermoplastic interlining					
	"Coats" ("Wendler")	"Elviet" ("Staflex")	"Niko 2002" ("Freudenberg")			
Number of contract	1500	3	400	1	500	2
Number of new contract/year	100	3	60–70	1	70–80	2
Shipping (m/year)	1.5 million	3	30 thousand	1	60 thousand	2
Profit (eur/year)	10 million	3	20 thousand	1	500 thousand	2
Sum		12		4		8

- *Analyzing and evaluating companies according to the criterion "additional services"*

Additional technical services offered by companies as suppliers are considered to belong under the criterion "additional services". Suppliers from the textile industry that work for some time with some product need to know the quality of the product, and, in the event of some unwanted situations in the production process, they should help the manufacturer to remove them and advise them how to avoid these in the future.

The company "Coats" from Bulgaria has distributed managers in respective regions (countries) who once a week or once in two weeks visit clothing companies in the region. They talk with production technicians about the problems that arise during the fixing process and the production process and give different advice on how to solve them. The manager of "Coats" for Macedonia visits all the clothing companies that cooperate with the company "Coats" every week.

The company "Elviet" does not offer any additional technical services, except the supply with auxiliary material.

Table 10

Evaluation matrix of potential suppliers according to the criterion "additional services"

Criterion	Potential supplier of thermoplastic interlining		
	"Coats" ("Wendler")	"Elviet" ("Staflex")	"Niko 2002" ("Freudenberg")
Participates in the production process	yes 3	no 1	no 1
Sum	3	1	1

The company "Niko 2002" deals only with sales, it does not offer any other services that would be helpful to the clothing company in the production process.

Based on the above explained, the company "Coats" was rated with the highest number of points 3, while the other two companies were rated with 1 point. In fact, these are the points according to which the companies were ranked according to the criterion "additional services" (Table 10).

2. Supplier selection

The final ranking of companies is done by comparing their total "weights". The total "weight" of a company is calculated as the sum of the multiplication product of the "weight of the criterion" and "weight coefficients of the company for each criterion". The allocation of "weight coefficients to the criteria" in order to determine the "weight of the criteria" is based on the experience and expertise of the evaluator. In the process of evaluation, it is desirable that a larger number of persons take part in order to make the evaluation more objective.

The "criterion weight" is calculated for each criterion according to which the evaluation of the companies is made, which are: quality, costs, operational capability, financial stability, and additional services.

A comparison of the criteria in pairs has been made. The criteria of each pair are given a "weight coefficient" 1 or 0, based on the significance of the evaluation criterion according to the evaluator, Table 11. The "weight coefficient" 1 is given to the criterion that is considered to be of greater significance for the evaluation of potential suppliers, and "weight coefficient" 0 is given to the criterion which the evaluator considers to have less significance for the evaluation.

Table 11

Comparison of evaluation criteria of potential suppliers

No	Combination	Criteria				
		I Quality	II Cost	III Operational capability	IV Financial stability	V Additional services
1	I:II	1	0			
2	I:III	1		0		
3	I:IV	1			0	
4	I:V	1				0
5	II:III		1	0		
6	II:IV		1		0	
7	II:V		1			0
8	III:IV			1	0	
9	III:V			1		0
10	IV:V				1	0
Sum		4	3	2	1	0

The number of comparisons between the criteria is calculated according to the following equation [1]:

$$\frac{n(n-1)}{2} = \frac{5 \cdot (5-1)}{2} = \frac{20}{2} = 10 \dots, \quad (1)$$

where: *n* is the number of criteria that are taken into account for the evaluation of companies.

The "weight coefficients" given to each criterion in comparison with the others are added and then the sum (Σ) is divided by the total number of comparisons made, equation (2). The calculated value is the "weight of the criterion".

$$W_c = \frac{\sum C_{W_c}}{n} \quad (2)$$

The calculated values for the "weight of the criteria" (*W*) are:

$$W_c \text{ (quality)} = 4/10 = 0.4$$

$$W_c \text{ (financial stability)} = 1/10 = 0.1$$

$$W_c \text{ (procurement cost)} = 3/10 = 0.3$$

$$W_c \text{ (additional services)} = 0/10 = 0$$

$$W_c \text{ (operational capability)} = 2/10 = 0.2.$$

The next step is to calculate the total "company weight". In order to determine the "weight coefficients of a company" for each criterion, companies are compared in pairs in relation to each individual criterion. The determination of the "weight coefficients of a company" for each

criterion is based on the previously made ranking of potential suppliers through the numerical evaluation of the sub-criteria. The company, from one pair, which is ranked at a higher level, receives a "weight coefficient" 1, and the second company from the pair is given a "weight coefficient" 0, Table 12 [8, 9].

Table 12

Comparison of potential suppliers according to the evaluation criteria

Criteria	Potential supplier					
	A : B		B : C		A : C	
Quality	0	1	0	1	0	1
Cost	1	0	0	1	1	0
Operational skills	1	0	0	1	1	0
Financial stability	1	0	0	1	1	0
Additional services	1	0	1	0	1	0

Legend: A – Company "Coats", B – Company "Elviet", C – Company "Niko 2002"

In relation to the "additional services" criterion, the company "Elviet" and the company "Niko 2002" do not provide any additional technical services. When comparing these two companies by the criterion "additional services", Table 12 shows a "weight ratio" 1 given to the company "Elviet" and 0 to the company "Niko 2002"

because the responsiveness and access to customers by the General Manager and the employees in "Elviet" are at a higher level.

After calculating the "weight of the criteria" and after determining the "weight coefficients of the companies", for each criterion the total "weight" of potential suppliers is calculated. The calculations for the total "weight" of potential suppliers are given in Table 13.

Table 13

Calculation of the total "weight" of potential suppliers

Criterion	A	B	C
Quality	$0 \times 0.4 = 0$	$1 \times 0.4 = 0.4$	$2 \times 0.4 = 0.8$
Procurement cost	$2 \times 0.3 = 0.6$	$0 \times 0.3 = 0$	$1 \times 0.3 = 0.3$
Operational skills	$2 \times 0.2 = 0.4$	$0 \times 0.2 = 0$	$1 \times 0.2 = 0.2$
Financial stability	$2 \times 0.1 = 0.2$	$0 \times 0.1 = 0$	$1 \times 0.1 = 0.1$
Additional services	$2 \times 0 = 0$	$1 \times 0 = 0$	$0 \times 0 = 0$
Total weight	1.2	0.4	1.4

Legend: A – Company "Coats", B – Company "Elviet", C – Company "Niko 2002"

The total "weight" of the companies is the criterion according to which the companies are ranked and on the basis of which the final selection of the company with which cooperation will be established as a supplier of thermoplastic interlining for partial fixation of a men's shirt. The company "Niko 2002" from Štip has the largest "weight" and is ranked number 1.

1. Company "Niko 2002" from Štip.
2. Company "Coats" from Bulgaria.
3. Company "Elviet" from Štip.

For a simpler explanation of the impact of the criteria in the overall "weight" of a company, that is, in the final decision on the choice of the supplier of thermoplastic interlining, the distribution of the criteria in the total "weight" of each company are graphically presented in Figure 1.

Figure 1 shows that in the total "weight" of the company "Niko 2002", which is also our choice for the supplier of thermoplastic interlining, the quality of the offered interlining has the biggest participation, 57.14%. In the total weight of this company the criterion "costs" has a participation of 21.43%, the criterion operational capability 14.29%, and the criterion of financial stability 7.14%.

The "Coats" company has a greater weight in the "costs", "operational capability", and "financial stability" criteria compared to the company "Niko 2002", but in the criterion "quality" it has no weight, i.e. the value for the weight of the quality is 0. The total "weight" of the company "Elviet" is formed only from the quality of the thermoplastic interlining offered by this company.

From the above explanation, it is clear that for the selection of a supplier of thermoplastic interlining, as well as of some other auxiliary material, the most important criterion to be satisfied is the quality. However, we should not rely solely on quality, since the quality only is not sufficient in choosing a supplier of thermoplastic interlining, as is shown by the results of the analysis of the company "Elviet".

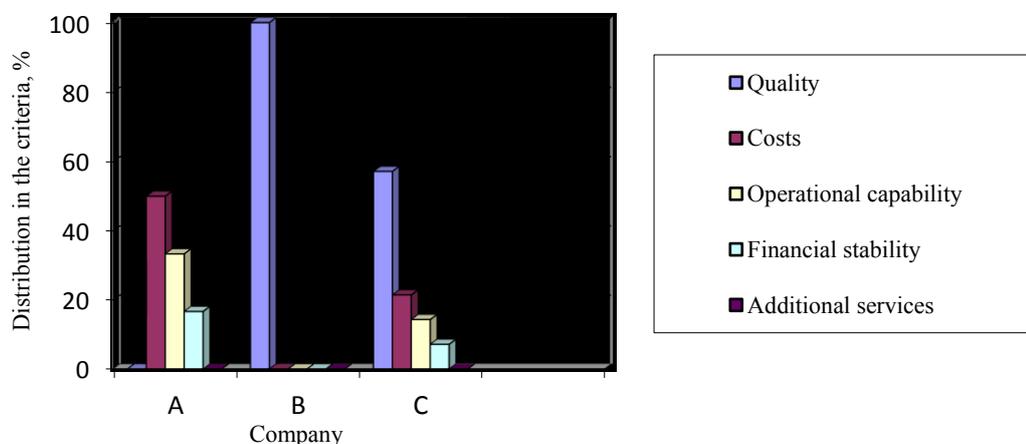


Fig. 1 Distribution of the criteria in the total "weight" of companies
A – Company "Coats", Bulgaria, B – Company "Elviet", Štip, C – Company "Niko 2002", Štip

It should be noted that the standards for testing the bonding strength and the quality standards of ready-made clothing products do not give the value of the minimum bonding strength. The value of the minimum bonding strength of 200 cN/cm resulted from industrial practice. Accordingly, the minimum bonding strength, in most cases, for respective types of clothing will be defined by the clothing manufacturer in the product development process. In this sense, if the bonding strength is not discussed in terms of the mentioned minimum bonding strength, the supplier "Coats", as it shows by far the best assessment for economic commercial performance, would certainly be the first choice for a supplier.

CONCLUSION

The selection process and the decision which supplier to choose for auxiliary materials in the fashion industry, such as production of clothing, is a rather complex process. In conditions of high competition in this sector, the inclusion of engineering and scientific methods is of great help in forming a comprehensive assessment of the quality of suppliers. From the evaluation of potential suppliers on the basis of the defined criteria, it can be concluded that quality is the criterion that usually has the largest participation in reaching the final decision on the choice of the supplier.

Nevertheless, in order to select an appropriate supplier, other criteria must be taken into account in order to obtain a complex assessment based on multiple criteria.

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