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ANALYSIS AND RANKING OF FACTORS IMPACTING APPLICATION OF THE 6σ-METHODOLOGY IN SMALL PRODUCTION ORGANIZATIONS USING THE PRIOR FACTOR RANKING METHOD

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Original scientific paper

Ranking of factors that mostly influence the non-use of the 6σ-Methodology in small production organizations was conducted using the method of prior factor ranking. The method resulted in identifying factors which have a dominant impact in order to decrease it.

Key words*: six sigma, quality, business excellence, improvement, prior factor ranking*

Istraživanje i rangiranje utjecajnih faktora na primjenu 6σ metodologije u malim proizvodnim organizacijama metodom apriornog rangiranja faktora

Izvorni znanstveni članak

Metodom apriornog rangiranja faktora izvršeno je rangiranje faktora koji najviše utječu na neprimjenu 6σ metodologije u malim proizvodnim organizacijama. Na taj se način došlo do faktora koji imaju dominantan utjecaj s ciljem poduzimanja mjera smanjivanja njihovog utjecaja.

Ključne riječi*: šest sigma, kvaliteta, poslovna izvrsnost, poboljšavanje, apriorno rangiranje faktora*

1
Introduction
Uvod

How to reach better quality of products with as low costs as possible, is an issue raised by all organizations. One of the possible answers being increasingly adopted today is application of the 6σ-Methodology. This is a business methodology whose objective is to eliminate, almost completely, all defects in products, service and production process.

Statistically, 6σ means 3,4 defects per million opportunities (DMPO), where sigma means variation in relation to the process mean value.

The western world of business has been thrilled by the success of companies that have applied and started implementing the 6σ-Methodology in their business processes. Professional magazines provide education and references on the 6σ, presentations and seminars have been organized in grand castles and exotic places, 6σ academies have been established in almost every country of the West, experiences get exchanged among companies that have introduced the 6σ, sky-rocketing profits have been reported [4, 5] thanks to application of the 6σ-Methodology, etc. What is it all about? What is so "magical" in the 6σ-Methodology? Can it be applied in Croatia? [1, 2] The question is how much the 6σ-Methodology can help in improving the product and the system quality in small production organizations?

Why small production organizations?

Considering the Accounting Act of the Republic of Croatia, "Narodne novine" no. 146/2005, the majority of organizations in the Republic of Croatia fall into the category of small and medium sized organizations. According to details for 2005, provided by the Ministry of Economy, Labour and Entrepreneurship, small and mid-sized entrepreneurship covers:

- 99 % of registered business entities
- 55 % of total work force in the Republic of Croatia
- 44 % of total GDP
- 60 % of Croatian export.

The importance of small organizations in the economy of other countries as well is obvious. In early 2000, a British Government Agency's report showed that 99,8 % of business systems in Great Britain had been classified as small or mid-sized business systems with 56 % of total work force in the country [3]. According to the US Census Bureau, 98 % of organizations in the USA have about 20 employees. If we add that over 30 % of total sales in the USA has been realized through organizations of less than 100 employees, and considering the above stated details of small and mid-sized organizations in Croatia and Europe, economic justification of investigating possible applications of the 6σ-Methodology in small organizations has been confirmed.

Since all previous research results showed low level of 6σ-Methodology in small production organizations, we were interested in the reasons or the most influential factors of such non-application.

2
Brief description of the conducted research
Kratak opis provedenog istraživanja

The researched population included about 1700 organizations that, according to data provided by the Croatian Society for Quality in end 2007, had a quality management system complied with the ISO 9001 standards. The sample comprised 98 organizations, i.e. 5,76 % of the researched population. As per form and characteristics it can be classified as quota type, which means that the author has chosen respondents based on indicators of the population. The sample is "non-statistical", based on the researcher's assessment. It comprises respondents available during the research and who, according to the decision made by the researcher, were competent as regards the required answers. One of the criteria to selecting the sample was the knowledge of the business activity, with particular emphasize being given to mechanical and similar production and members of the Board known to the author himself. Business activities of the respondents (the organization) are different and have been classified according to international classification (European Accreditation Classification).

The research resulted in identification of influential factors that the most competent respondents within the sample stated as being the reason for non-introduction of the 6σ-Methodology. For the purposes of analyzing the factors ranking was conducted to get insight into the intensity of their acting. The selected method was the prior ranking method.

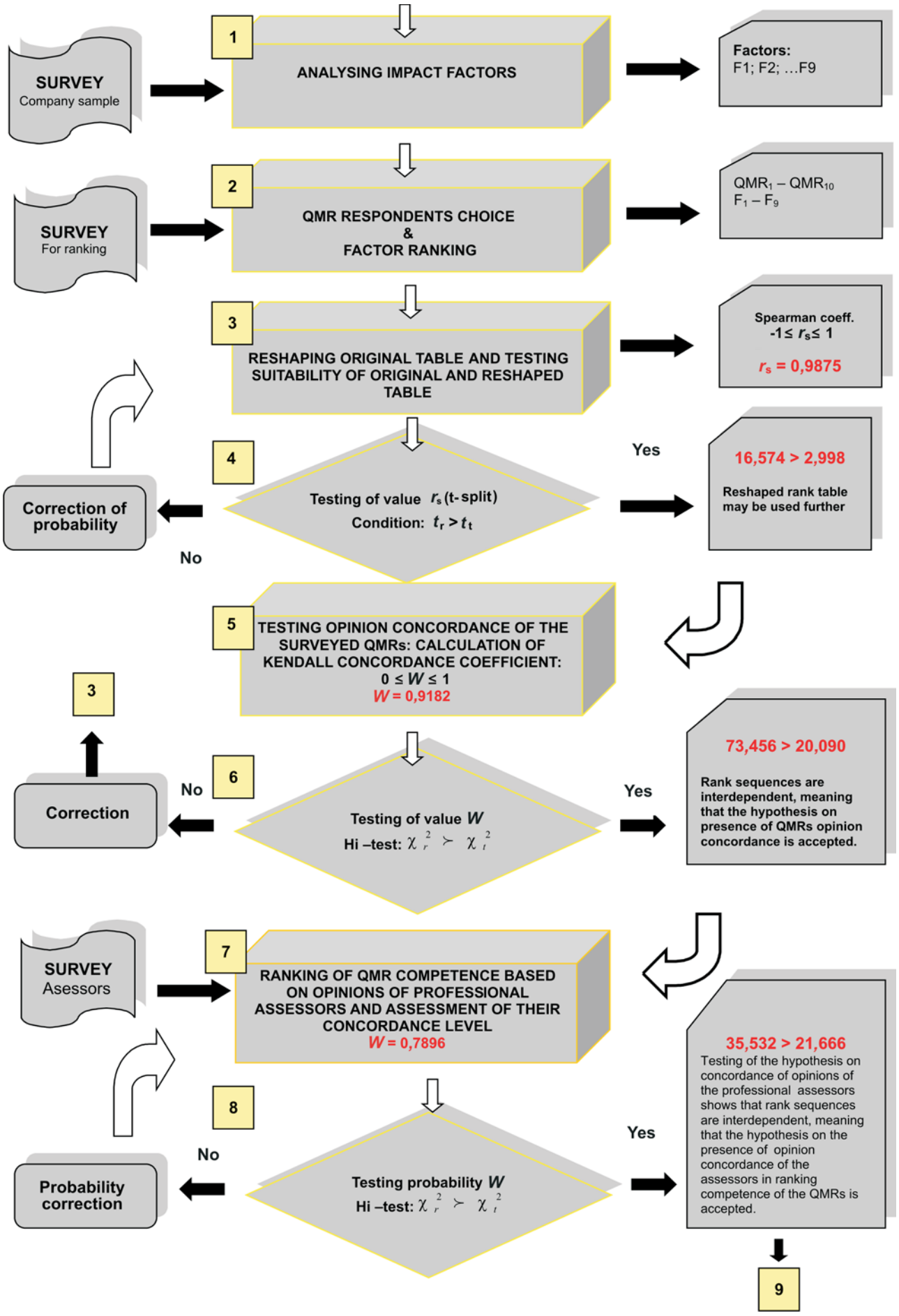

Figure 1 *Realizing the method of prior factor ranking*
Slika 1 *Realizacija metode apriornog rangiranja faktora*

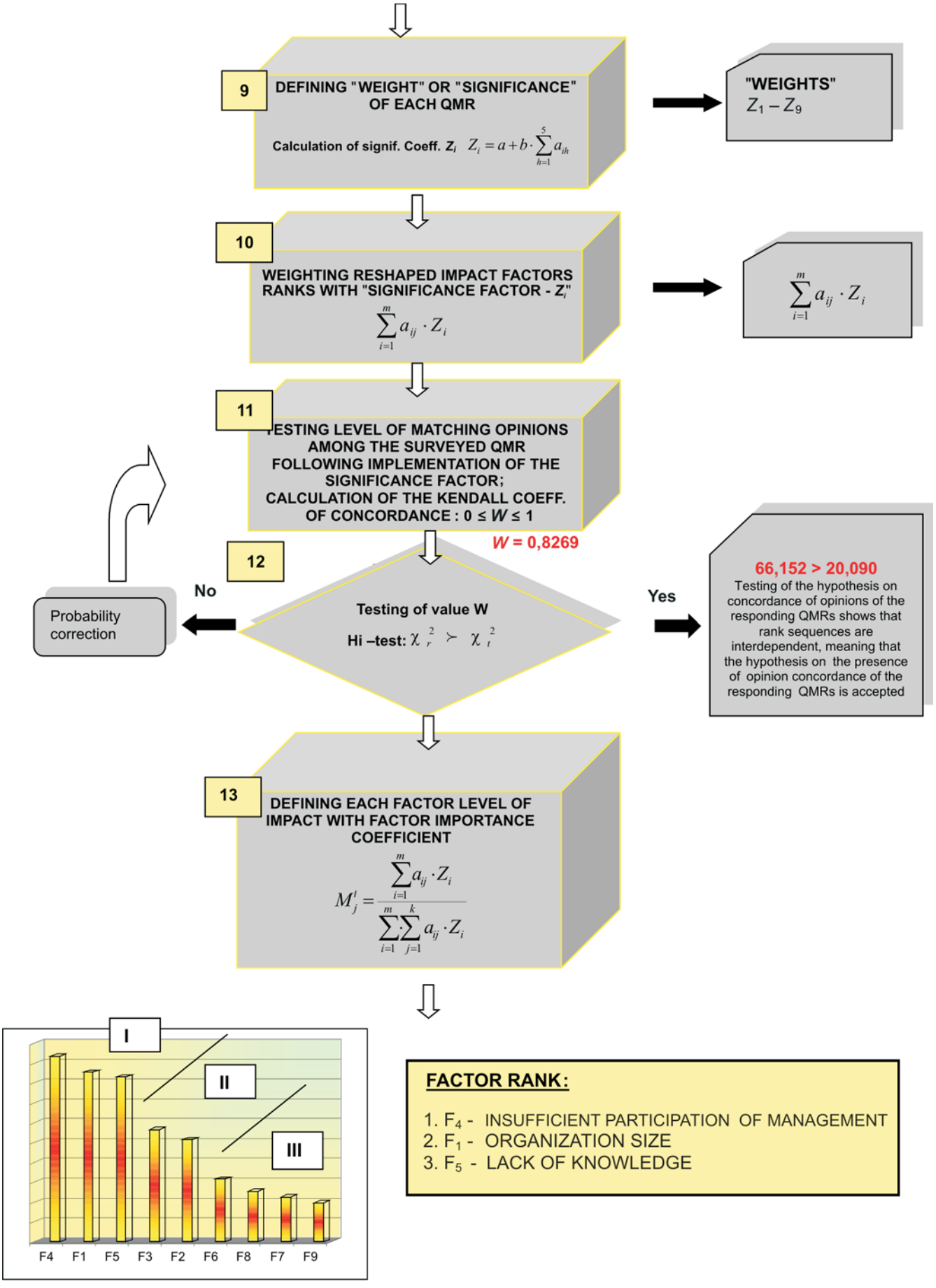

Figure 1 *Realizing the method of prior factor ranking (resumption)*
Slika 1 *Realizacija metode apriornog rangiranja faktora (nastavak)*

3
Ranking procedure
Postupak rangiranja

The procedure of ranking and analysis is shown in Fig. 1.

Ranking has been conducted by 10 selected QMRs (Quality management representative) in small production organizations. It is done by allocating ranks to each factor; rank 1 to the most influential one, rank 9 to the least influential one. Factors with equal influence are allocated the same rank. The respondents used the option of being allocated the same rank for different factors. Therefore it was necessary to reshape the ranks. Factors with the same rank receive a new rank, equal to the mean value of the position allocated among the factors.

Tab. 1 shows ranks the respondents allocated to individual factors (item 1), rank total

$$\sum_{i=1}^{m} a_{ij} \quad \text{(item 2)},$$

and $Q_i^{(1)}$ ranks allocated to factors based on total of the ranks (item 3).

Tab. 2 shows ranking and reshaping of the ranks for quality managers 1. The procedure is identical for other 9 respondents. The reshaped table including ranks of all respondents is shown in Tab. 3.

When multiple factors have the same variable rank value, we speak about linked ranks. Then, the value of the mean rank is added to them. The average rank is defined as the arithmetic mean of the ranks, which they would have were they not the linked ranks. The table below shows the same rank values by means of linked ranks.

3.1
Testing the suitability of the original and the reshaped table
Provjera adekvatnosti izvorne i preoblikovane tabele

Testing of suitability of the original and the reshaped table shall be made by the Spearman rank correlation coefficient.

Spearman rank correlation coefficient [6] tests the link level of sequence variables, i.e. variables presented by rank values. Spearman rank correlation coefficient can take up values of the closed interval, from minus one to plus one. The coefficient will take up the border value -1 if the sequence of the first variable modality is opposite to the sequence of the second variable modality. And vice versa, if the sequence of the first variable modality matches the sequence of the second variable modality, the coefficient will take up the border value +1. If there is no connection between the sequence of the first variable modality and the second variable modality, the rank correlation coefficient is zero.

$$r_s = 1 - \frac{6 \cdot \sum_{j=1}^{k} (Q_j^{(1)} - Q_j^{(2)})^2}{k(k^2-1)} \qquad -1 \le r_s \le 1$$

value $r_s = 0{,}9875$

The above values inserted into the formula to calculate the Spearman rank correlation coefficient r_s:

k - number of influencing factors (9)

$Q_j^{(1)}$ - ranks allocated to factors in the initial table (Tab. 1) according to the rank total

$Q_j^{(2)}$ - ranks allocated to factors in the reshaped table (Tab. 3) according to the rank total.

Testing of the statistical value r_s shall be conducted by hypothesis tests relating to the significance of linear correlation coefficient t_r. Statistical value of r_s is tested by the t-split whose values solve:

$$t_r = \frac{r_s}{\sqrt{\frac{1-r_s^2}{k-2}}}$$

where:

k - number of influencing factors (9)

r_s - Spearman rank correlation coefficient (0,9875).

If the solved value t_t is higher than the table value t_t, the correlation coefficient is significant. Since $t_r \succ t_t \Rightarrow 16{,}574 > 2{,}998$, the hypothesis test on the significance of the linear correlation coefficient has confirmed the single direction positive correlation. Value of the Spearman rank correlation coefficient $r_s = 0{,}9875$ is close to 1, indicating that the reshaped table equals the original one, and can be used in further analysis.

3.2
Testing level of matching opinions among the surveyed QMR
Provjera stupnja suglasnosti mišljenja anketiranih QMR-a

The level of matching opinions among the surveyed QMRs shall be tested by the Kendall coefficient of concordance. Kendall coefficient of concordance W is based on the fact that the level of concordance among rank sequences may be measured by deviations of certain rank totals from their respective arithmetic means. W cannot take up negative values, because total non-concordance may not exist among rank sequences. W assumes values from 0 to i +1 (0 no concordance to +1 full concordance). The Kendall coefficient of concordance [6] formula reads:

$$W = \frac{12\sum_{j=1}^{k} \Delta j^2}{m^2 \cdot k(k^2-1)} \qquad 0 \le W \le 1$$

Since in the analysis the ranks repeat, the Kendall coefficient of concordance formula is added a correction factor for the linked ranks T_i, and reads:

$$W = \frac{12\sum_{j=1}^{k} \Delta j^2}{m^2 \cdot k(k^2-1) - m\sum_{i=1}^{m} T_i} \qquad 0 \le W \le 1$$

where:

k - number of influencing factors (9)

m - number of QMRs (10)

$\sum_{j=1}^{k} \Delta_j^2 \Rightarrow$ total of deviation square values of all QMR rank totals

$\sum_{i=1}^{m} T_i \Rightarrow$ total of correction factors for linked ranks T_i=156.

Tab. 4 shows resulting values of the Kendall coefficient ($W = 0{,}91823$) by rank totals and Fig. 2 uses a Box-Whisker comparative diagram to show the impact factor and the allocated ranks.

Table 1 *Initial ranking of influential factors by quality managers*
Tablica 1 *Početno rangiranje utjecajnih faktora od strane menadžera kvalitete*

ITEM	QMR (i)	IMPACT FACTOR (j)								
		F1	F2	F3	F4	F5	F6	F7	F8	F9
1.	1	1	3	4	1	2	5	6	5	6
	2	1	4	5	2	3	9	8	6	7
	3	2	3	3	1	2	4	5	4	5
	4	1	4	3	2	1	5	7	6	7
	5	2	3	4	1	2	7	8	3	8
	6	3	4	5	2	1	6	7	8	9
	7	2	4	3	1	3	4	6	5	6
	8	3	4	4	2	1	4	6	5	7
	9	2	4	3	1	2	5	6	7	8
	10	1	3	2	1	1	4	5	4	5
2.	$\sum_{i=1}^{m} a_{ij}$	18	36	36	14	18	53	64	53	68
3.	$Q_j^{(1)}$	2,5	4,5	4,5	1	2,5	6,5	8	6,5	9

Table 2 *Reshaping of Tab. 1 into 3*
Tablica 2 *Postupak preoblikovanja tablice 1 u 3*

	FACTORS								
	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9
Initial ranking	1	3	4	1	2	5	6	5	6
Rank	1-2	4	5	1-2	3	6-7	8-9	6-7	8-9
Reshaped ranks	1,5	4	5	1,5	3	6,5	8,5	6,5	8,5

Table 3 *Reshaped original table of ranked impact factors per individual QMRs*
Tablica 3 *Preoblikovana izvorna tablica rangiranih faktora utjecaja po pojedinim QMR-ima*

ITEM	QMR (i)	IMPACT FACTOR (j)									T_i
		F1	F2	F3	F4	F5	F6	F7	F8	F9	
1.	1	1,5	4	5	1,5	3	6,5	8,5	6,5	8,5	18
	2	1	4	5	2	3	9	8	6	7	0
	3	2,5	4,5	4,5	1	2,5	6,5	8,5	6,5	8,5	24
	4	1,5	5	4	3	1,5	6	8,5	7	8,5	12
	5	2,5	4,5	6	1	2,5	7	8,5	4,5	8,5	18
	6	3	4	5	2	1	6	7	8	9	0
	7	2	5,5	3,5	1	3,5	5,5	8,5	7	8,5	18
	8	3	5	5	2	1	5	8	7	9	24
	9	2,5	5	4	1	2,5	6	7	8	9	6
	10	2	5	4	2	2	6,5	8,5	6,5	8,5	36
2.	$\sum_{i=1}^{m} a_{ij}$	21,5	46,5	46	16,5	22,5	64	81	67	85	
3.	$Q_j^{(2)}$	2	5	4	1	3	6	8	7	9	

Table 4 *Testing of respondents' concordance by the Kendall's coefficient*
Tablica 4 *Provjera stupnja suglasnosti anketiranih preko Kendallovog koeficijenta*

Variable	Friedman ANOVA and Kendall Coeff. of Concordance ANOVA Chi Sqr. (N = 10, df = 8) = 73,45826 p = ,00000 Coeff. of Concordance = ,91823 Aver. rank r = ,90914			
	Average Rank	Sum of Ranks	Mean	Std.Dev.
F1	2,150000	21,50000	2,150000	0,668747
F2	4,650000	46,50000	4,650000	0,529675
F3	4,600000	46,00000	4,600000	0,737865
F4	1,650000	16,50000	1,650000	0,668747
F5	2,250000	22,50000	2,250000	0,857969
F6	6,400000	64,00000	6,400000	1,074968
F7	8,100000	81,00000	8,100000	0,614636
F8	6,700000	67,00000	6,700000	1,005540
F9	8,500000	85,00000	8,500000	0,577350

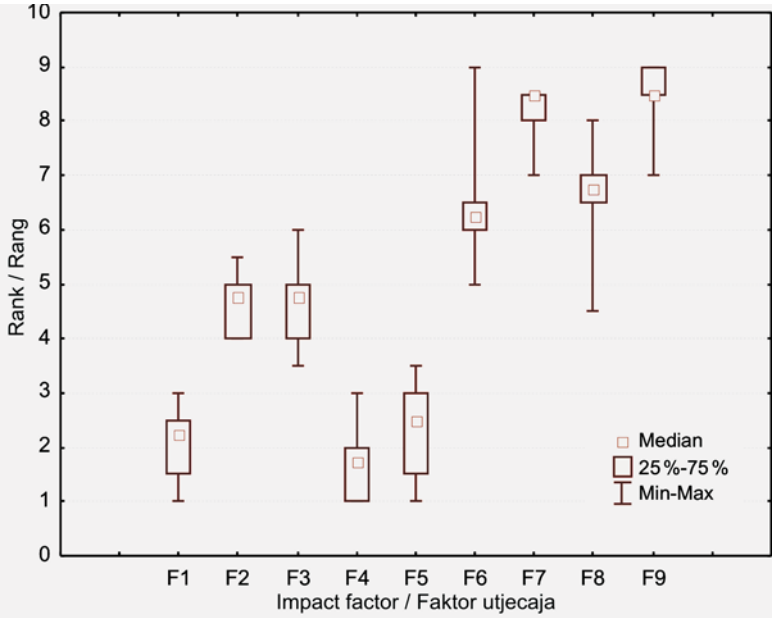

Figure 2 *Comparative Box-Whisker diagram following data from Tab. 4*
Slika 2 *Usporedni Box- Whisker dijagram prema podacima iz tablice 4*

Table 5 *QMR's competences ranked by professional assessors*
Tablica 5 *Rangirane kompetencije pojedinih QMR-a od strane stručnih ocjenjivača*

ITEM	ASSESSOR (*h*)	QMR (*i*)									
		1	2	3	4	5	6	7	8	9	10
1.	1	4	3	9	1	10	5	2	8	6	7
	2	2	1	8	5	9	4	6	7	10	3
	3	1	3	7	4	10	5	6	8	9	2
	4	3	2	6	4	9	5	7	8	10	1
	5	3	2	8	5	7	4	6	10	9	1
5.	Z_i	1,94	2	1,22	1,77	1	1,65	1,54	1,13	1,04	1,91

For the purposes of testing the value of the Kendall coefficient of concordance *W*, a Hi-square test shall be applied with the following indicator [6]:

$$\chi_r^2 = m \cdot (k-1) \cdot W \qquad \chi_r^2 > \chi_t^2$$

where
m - number of QMRs (10)
k - number of influencing factors (9)
W - Kendall coefficient of concordance (0,9182).

Calculating value χ_r^2 is compared to the value stated in the split table χ_t^2 at the selected level of significance and definite degrees of freedom.

For degree of freedom $f = k - 1 = 9 - 1 = 8$ and probability 0,01, the critical value of the Hi-square χ_t^2 test is 20,090. Since $\chi_r^2 > \chi_t^2 \Rightarrow 73{,}456 > 20{,}090$, testing of the hypothesis on concordance of opinions of the responding QMRs shows that rank sequences are interdependent, meaning that the hypothesis on the presence of opinion concordance of the responding QMRs is accepted.

3.3
Ranking of certain QMR competence
Rangiranje kompetentnosti pojedinog QMR-a

Certain QMRs vary by their level of education, work experience, personality features, diligence, inventiveness, creativity, etc., which results in different "meaning" of the QMR and different "severity" of grades given by the QMRs to certain factors of influence. Therefore, five professional assessors, who know all 10 QMRs very well, performed ranking of their competence (Tab. 5). The most competent QMR was given rank 1, and the QMR with the lowest competences was given rank 10.

3.4
Testing professional assessors' opinions level of concordance
Provjera stupnja suglasnosti mišljenja stručnih ocjenjivača

Level of professional assessors' concordance of opinions shall be tested by the Kendall coefficient of concordance:

$$W = \frac{12\sum_{i=1}^{m} \Delta i^2}{h^2 \cdot m\left(m^2-1\right)} = 0{,}7896 \qquad 0 \le W \le 1$$

where:
m - number of QMRs (10)
h - number of assessors (5)

$\sum_{j=1}^{k} \Delta i^2 \Rightarrow$ total of square deviation for all rank totals of all assessors.

For the purposes of testing the value of the Kendall coefficient of concordance *W*, a Hi-square test shall be applied with the following indicator:

$$\chi_r^2 = h \cdot (m-1) \cdot W = 35{,}532$$

Table 6 *Re-shaped impact factor ranks weighted with significance of each QMR*
Tablica 6 *Preoblikovani rangovi faktora utjecaja ponderirani značajem pojedinog QMR-a*

ITEM	QMRs (*i*)	IMPACT FACTOR (*j*)								
		F1	F2	F3	F4	F5	F6	F7	F8	F9
1.	1	2,91	7,76	9,7	2,91	5,82	12,61	16,49	12,61	16,49
	2	2	8	10	4	6	18	16	12	14
	3	3,05	5,49	5,49	1,22	3,05	7,93	10,37	7,93	10,37
	4	2,65	8,85	7,08	5,31	2,65	10,62	15,04	12,39	15,04
	5	2,5	4,5	6	1	2,5	7	8,5	4,5	8,5
	6	4,95	6,6	8,25	3,3	1,65	9,9	11,55	13,2	14,85
	7	3,08	8,47	5,39	1,54	5,39	8,47	13,09	10,78	13,09
	8	3,39	5,65	5,65	2,26	1,13	5,65	9,04	7,91	10,17
	9	2,6	5,2	4,16	1,04	2,6	6,24	7,28	8,32	9,36
	10	3,82	9,55	7,64	3,82	3,82	12,41	16,23	12,41	16,23

where:
h - number of assessors (5)
m - number of QMRs (10)
W - Kendall coefficient of concordance (0,7896).

For degree of freedom $f = 9$ and probability 0,01, the critical value χ_t^2 is 21,666. Since $\chi_r^2 > \chi_t^2 \Rightarrow$ 35,532 > 21,666, testing of the hypothesis on concordance of opinions of the professional assessors shows that rank sequences are interdependent, meaning that the hypothesis on the presence of opinion concordance of the assessors in ranking competence of the QMRs is accepted.

3.5
Defining "severity" or "significance" of each QMR using Z_i
Određivanje "težine" ili "značaja" svakog QMR-a pomoću Z_i

QMR with the lowest rank total (QMR 2. with rank total of 11), is allocated the highest severity Z_2=2, and QMR with the highest rank total (QMR 5. with rank total of 45) is allocated the lowest severity Z_5=1. For all other QMRs the severity is solved by applying the following formula:

$$Z_i = a + b\sum_{h=1}^{5} a_{ih}$$

a and *b* are solved by equations with two unknowns, which have values of the highest and the lowest Z_i, and values of the lowest and the highest total of ranks:

$$2 = a + b \cdot 11$$
$$1 = a + b \cdot 45$$

Solving these equations gives: $b = -0{,}029$; $a = 2{,}319$.
Values Z_i to be calculated are listed in Tab. 5.

3.6
Weighting of pre-shaped influence factor ranks with the "significance" of each QMR
Ponderiranje preoblikovanih rangova faktora utjecaja "značajem" pojedinog QMR-a

By weighting of pre-shaped influence factor ranks with the "significance" of each QMR, ranks are allocated certain "weight" (severity) and statistically more relevant information. Each weighted rank is multiplied by individual QMR coefficient of importance (Tab. 6). The resulting rank value is subtotaled at the level of influence factors (Tab. 7).

Since the Spearman coefficient of correlation has proved adequate sequence of ranks in the original table (Tab. 1) and the re-shaped table (Tab. 3), it is to conclude that the table of influence factors re-shaped ranks weighted with the significance of the QMR equals the original table (Tab. 1) and may be used in further work.

3.7
Testing the level of opinions concordance of the responding QMRs following ntroduction of the significance factor Z_i
Provjera stupnja suglasnosti mišljenja anketiranih QMR-a nakon uvođenja faktora značajnosti Z_i

Level of opinion concordance of the responding QMRs shall be tested with Kendall coefficient of concordance, whose formula also considers coefficients of significance in addition to the correction factors related to ranks:

$$W = \frac{12 \cdot k \cdot \sum_{j=1}^{k} \Delta j^{'2}}{\left[m(k^3 - k) - \sum_{i=1}^{m} T_i\right]\left(\sum_{i=1}^{m} Z_i\right)^2}$$

where:
k - number if impact factors (9)
m - number of QMRs (10)

$\sum_{j=1}^{k} \Delta j^{'2} \Rightarrow$ deviation square total of the total weighted ranks of all QMRs

$\sum_{i=1}^{m} T_i \Rightarrow$ total of correction factors for linked ranks

$\sum_{i=1}^{m} Z_i \Rightarrow$ total of th QMRs significance coefficient.

Kendall coefficient of concordance *W*=0,8269.

The result is shown in Tab. 7, and Fig. 3 shows a comparative Box-Whisker diagram based on the table data.

For the purposes of checking the statistical value of Kendall coefficient of concordance *W*, the Chi-square test will be applied, with the following indicator:

$$\chi_r^2 = h \cdot (k-1) \cdot W = 66{,}152$$

where:
h - number of assessors (5)
k - number of impact factors (9)
W - Kendall coefficient of concordance (0,8269).

Table 7 *Testing the level of opinions concordance of the respondents, following introduction of the significance factor*
Tablica 7 *Provjera stupnja suglasnosti anketiranih nakon uvođenja faktora značajnosti*

Variable	Friedman ANOVA and Kendall Coeff. of Concordance ANOVA Chi Sqr. (N = 10, df = 8) = 66,152 p = ,00000 Coeff. of Concordance = ,8269			
	Average Rank	Sum of Ranks	Mean	Std.Dev.
F1	3,09500	30,95000	3,09500	0,822344
F2	7,00700	70,07000	7,00700	1,745331
F3	6,93600	69,36000	6,93600	1,943303
F4	2,64000	26,40000	2,64000	1,471953
F5	3,46100	34,61000	3,46100	1,734169
F6	9,88300	98,83000	9,88300	3,735172
F7	12,35900	123,59000	12,35900	3,485578
F8	10,20500	102,05000	10,20500	2,876840
F9	12,81000	128,10000	12,81000	2,967783

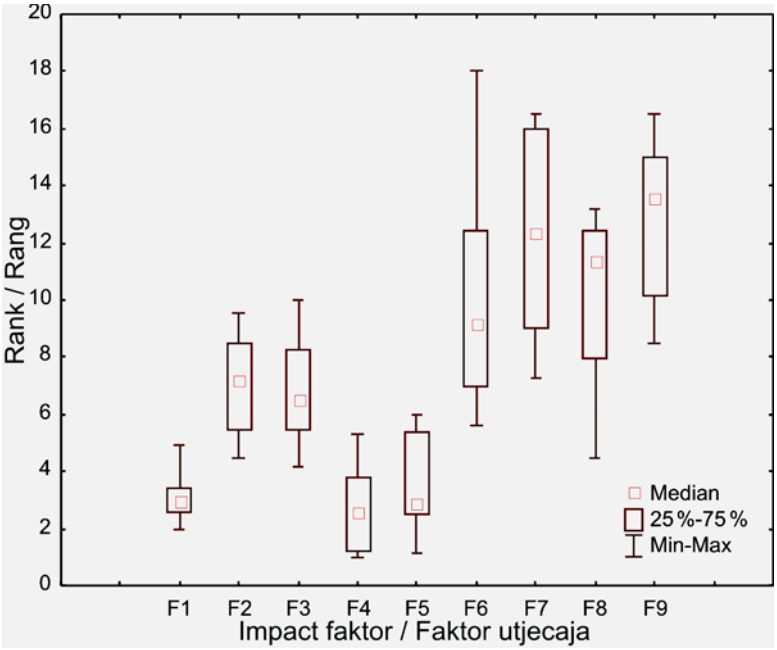

Figure 3 *Comparative Box-Whisker diagram based on the Tab. 7 data*
Slika 3 *Usporedni Box-Whisker dijagram prema podacima iz tablice 7*

For degree of freedom $f = 8$ and probability 0,01, the critical value of the hi-square test χ_t^2 is 20,090. Since $\chi_r^2 > \chi_t^2 \Rightarrow$ 66,152 > 20,090, and for the case when the different "significance" of each QMR was considered, testing of the hypothesis on concordance of opinions of the responding QMRs shows that rank sequences are interdependent, meaning that the hypothesis on the presence of opinion concordance of the assessors in ranking competence of the QMRs is accepted.

3.8
Defining each factor impact level
Određivanje stupnja utjecaja svakog faktora

The level of each factor impact on a certain phenomenon is defined by considering the significance coefficient of the impact factor:

$$M_j' = \frac{\sum_{i=1}^{m} a_{ij} Z_i}{\sum_{i=1}^{m}\sum_{j=1}^{k} a_{ij} Z_i}$$

Fig. 4 shows the prior rank diagram of factors influencing non-application of the 6σ methodology.

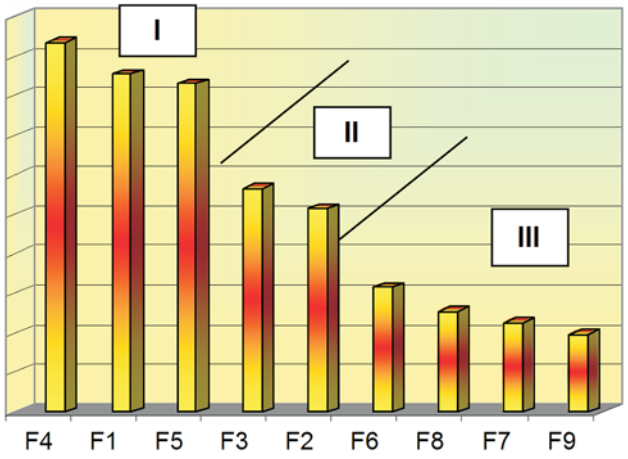

Figure 4 *Prior rank diagram of factors influencing non-application of the 6σ methodology in improvement procedures*
Slika 4 *Apriorni dijagram rangova utjecajnih faktora na neprimjenu 6σ programa u postupcima poboljšavanja*

When analyzing the diagram in Fig. 4, the factors may be divided into three groups:

- The most influential factors F_4, F_1 and F_5 in Group I
- The medium influential factors F_3 and F_2 in Group II
- The least influential factors F_6, F_8, F_7 and F_9 in Group III.

4 Conclusion Zaključak

It is to conclude that the most influential factors to non-application of the 6σ programme are:

1. F_4 - INSUFFICIENT PARTICIPATION OF TOP MANAGEMENT
2. F_1 - SIZE OF THE ORGANIZATION
3. F_5 - LACK OF KNOWLEDGE.

Without more vigorous participation of top management in procedures of improving, and subsequently in the 6σ programme, it is hard to expect any significant success. This was recognized by the assessors. Their competence is undisputable, which has been confirmed by the competent experts. Full devotion of top management in small organizations is crucial for the success of the 6σ methodology. This devotion should not be only declarative, but should be acknowledged in all business and decision-making segments. It should also be confirmed day by day. Participation of the top management in the 6σ programme also means participation of all employees in the organization. This is best illustrated by the example of GE headed by Jack Welch, who has achieved spectacular results in application of the 6σ programme. Despite several comments on the methodology of work Jack Welch managed to implement the 6σ concept in the way that he involved each employee and each member of the top management in the programme. Jack Welch fought fiercely against any bureaucracy and required from his associates to descend to the level of other workers and to solve problem in collaboration with them.

The factor of the size of organization has huge impact on application of the 6σ programme. Small production organizations experience troubles in its implementation. They simply do not have enough funds to apply such improvement procedures. Apart from that, small organizations have limited human resources who cannot be sent to training lasting several weeks, and are difficult to separate from day-to-day tasks to be engaged in projects. Besides these specific features, small organizations are characterized by other specific features.

Tailored model of the 6σ programme application for small organizations considers the stated factors and proposes practical activities relating to their impact is defined, too.

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