ELIZABETA KOVAČ-STRIKO, D. Sc.
Fakultet prometnih znanosti
Zagreb, Vukelićeva 4
ESTERA RAKIĆ, B. Eng.
GORANKA ANDABAKA, B. Eng.
HP-Središte pošta
Zagreb

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APPLICATION OF PARETO'S METHOD IN ANALYSING POSTAL SERVICE QUALITY

ABSTRACT

The basic aim of control in postal traffic is to insure high--quality services for customers. The paper presents the analysis of quality control in collecting postal items, based on the data obtained during the control performed by the Internal Control Service in the postal centre for international traffic Zagreb. The paper also offers some measures for the improvement of the quality of services.

KEY WORDS

Pareto's diagram, statistical methods of quality control, postal centre, letters with special services

1.INTRODUCTION

The intention is to determine the most important factors which influence the quality of collecting postal items, and to identify those postal centres where the quality has been endangered to a greater extent.

In order to identify the factors that influence the quality of collecting postal items, statistical methods are used for their identification.

The application of statistical methods in quality determination started in 1920 in the USA, at the Bell Telephone Laboratories as part of technical control. In Europe, the first quality control standard using statistical methods was published in 1935 in Great Britain. In the field of services, the introduction of statistical methods in monitoring quality started a bit later.

Statistical quality control has advantages over the 100% control which is often not necessary nor suitable, although it is often used in postal traffic. The method of full quality control is time-consuming, requires a great number of employees, and has a great psychological disadvantage for the controller who does the job mechanically having to control a sample as big as possible and therefore inevitably making certain mistakes. Figure 1 presents the total costs of the statistical method of quality control (SMQC) and the method of 100% quality control in relation to the amount of controlled services.

In the control of services, statistical methods of quality control should be carried out with the aim of determining the condition of the process, setting of optimal tolerances, increase of quality control efficiency, obtaining of objective data about the quality and costs reduction.

If the variability of the process is low or negligible, the application of statistical methods of quality control is not always justified, but can be used as the initial check of the results with every new service or in some specific cases.

The costs of 100% control per product item as

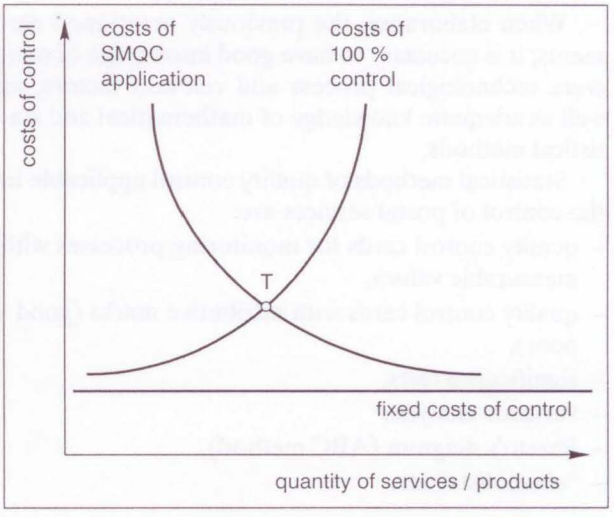

Figure 1 - Comparison of costs of SMQC and 100% quality control

function of the service quantity rise progressively. The costs of statistical methods of quality control as function of the service quantity fall progressively. The limit point T is the point at which it does not matter for the quantity of service which method of quality control is applied.

The functioning of the system is influenced by a significant number of interdependent factors which cannot be controlled. The only way of solving such complex problems is by application of statistical methods, which would process a certain condition and its flow, so that it refers only to direct indications or deviations. Using appropriate statistical methods it is possible to learn a lot from a relatively small number of data. Statistical approach to solving a problem eliminates also the subjective approach to solving a problem.

2. CLASSIFICATION OF STATISTICAL METHODS FOR QUALITY CONTROL APPLICABLE IN POSTAL TRAFFIC

Statistical methods of quality control can be classified into four main groups. These are:
- data grouping method,
- control cards,
- plans of collection,
- special methods.

Application of statistical method of service quality control includes the following elements:
- defining of quantitative or qualitative characteristics of quality that has to be controlled,
- selection of adequate statistical method of quality control,
- determining of the sample size,
- determining of the control frequency.

When elaborating the previously mentioned elements, it is necessary to have good knowledge of concrete technological process and relevant factors, as well as adequate knowledge of mathematical and statistical methods.

Statistical methods of quality control applicable in the control of postal services are:
- quality control cards for monitoring processes with measurable values,
- quality control cards with attributive marks (good - poor),
- significance tests,
- variance analysis,
- Pareto's diagram (ABC method),
- "check-lists" etc.

3. PARETO'S DIAGRAM (ABC METHOD)

Pareto's diagram was named after the Italian economist and sociologist Vilfredo Pareto who is known for the application of mathematical methods in economic analyses. In the 19th century, V.Pareto noticed that 80% of Italian wealth is in the hands of 20% of population. Such relation proved true in many fields, e.g. 80% of a company's problems form 20% of the sample. Of course, the ratio is not always 80:20, but the principle is that the majority of questionable results in a process are due to only a few causes.

Pareto's diagram (ABC method) was used in the quality control of postal services (quality control of collecting postal items with special services).

This method is used when the causes of a certain phenomenon are not equally distributed from the aspect of influence, but a relatively small number of causes forms the majority of influences (20% of causes form 80% of influences). This means that the distribution of events lacks uniformity in relation to their effects.

This method enables isolation of the essential factors which influence the quality of those that influence the quality slightly (i.e. 20% of factors which form 80% of total errors).

The core of the method is that one should concentrate on the little, but the significant. In order to eliminate the most significant causes, errors need to be classified according to their "importance". This means that if e.g. waste material or complaints occurred over a certain period of time are grouped according to the number of cases or according to value in HRK (Croatian Kunas), very often only a few complaints represent the main problem.

4. APPLICATION OF PARETO'S ABC DIAGRAM IN CONTROLLING POSTAL SERVICES

Pareto's diagram is a very efficient method of considering irregularities in postal services. This will be shown on an example of data obtained during the control of postal items in postal centre for international traffic Zagreb [10]. The objective of the control is to determine the percentage of irregularities for:
- postage charging,
- designating of charged postage,
- addressing,
- equipping and closing of postal items,
- standardisation of postal items.

The sample used to carry out the control consisted of:
- letter items,
- letters with designated value,
- EMS items and
- postal items which are subject to customs inspection and control.

Control included:
- 20 postal centres (PC)
- 446 post offices (PO) (36%)

Table 1 - Statement about implementation of the price-list for letter items in international traffic per postal centres

Ord. No.	Postal centre	Sample (Number of postal items)	Correctly charged postage		Cause of incorrectly charged postage			
					Non-standardisation		Other reasons	
			Items	%	Items	%	Items	%
1	Bjelovar	119	83	70	28	23	8	7
2	Čakovec	103	70	68	32	31	1	1
3	Dubrovnik	151	55	37	55	36	41	27
4	Gospić	160	86	54	31	19	43	27
5	Karlovac	122	80	66	22	18	20	16
6	Koprivnica	59	40	68	16	27	13	5
7	Krapina	21	17	81	1	5	3	14
8	Osijek	143	80	56	48	34	15	10
9	Pazin	248	108	44	63	25	77	31
10	Požega	64	46	72	11	17	7	11
11	Rijeka	212	121	57	46	22	45	21
12	Sisak	169	103	61	11	6	55	33
13	Sl. Brod	135	66	49	50	37	19	14
14	Split	150	69	46	48	32	33	22
15	Šibenik	123	61	50	34	27	28	23
16	Varaždin	113	57	50	52	46	4	4
17	Virovitica	29	18	62	8	28	3	10
18	Vukovar	72	44	61	25	35	3	4
19	Zadar	268	119	44	121	46	28	10
20	Zagreb	1176	805	68	212	18	159	14
	Total:	3637	2128	59	914	25	605	16

The control of 3637 postal items with special services (R-registered, AR-registered with confirmation of delivery, Ž- express) provided data about the postage charging presented in Table 1:

Table 1 shows that:

- correct postage was charged for 2128 postal items, i.e. 59%,
- postage was incorrectly charged for 1519 postal items, i.e. 41%. Out of these:
  - for 914 postal items (25%) due to incorrect standardisation,
  - for 605 postal items (16%) due to incorrect calculation of postage.

Control of these postal items results in the data about incorrect standardisation according to the elements and types of postal items as presented in Table 2.

R, Op and D are designations for the following postal items:

R – registered postal items,

Op – regular letter items,

D –postcards.

Table 2 shows that incorrect standardisation is mainly due to:

- dimensions - 210 postal items or 18%,
- masses - 166 postal items or 15%,
- addresses - 525 postal items or 46%,
- adhesive stamps - 236 postal items or 21%.

When analysing the incorrectly charged postage, the following data were obtained about the incorrectly charged postage presented in Table 3 according to the frequency of error for every postal centre separately:

By applying the Pareto's method (ABC method) 14 postal centres (PC) may be identified making about 80% of the sample (postal items with incorrectly charged postage). Table 3 and Figure 2 show that these are postal centres: Dubrovnik, Pazin, Zadar, Split, S. Brod, Šibenik, Varaždin, Gospić, Osijek, Rijeka, Vukovar, Sisak, Virovitica and Karlovac.

Table 2 - Incorrect standardisation of postal items according to elements and centres

Ord. No.	Postal centre	Reason For Non-Standardisation											
		Dimensions			Mass			Address			Adhesive stamps (stamps)		
		R	Op	D	R	Op	D	R	Op	D	R	Op	D
1	Bjelovar	4	0	0	3	1	0	1	10	0	6	8	0
2	Čakovec	0	0	0	2	10	0	2	9	0	7	8	0
3	Dubrovnik	2	2	2	1	2	0	2	12	2	0	0	0
4	Gospić	1	3	5	0	1	0	5	14	5	0	1	0
5	Karlovac	0	2	0	0	1	0	0	21	0	0	0	0
6	Koprivnica	2	2	2	0	1	0	1	9	2	1	6	0
7	Krapina	1	0	0	1	0	0	0	0	0	0	0	0
8	Osijek	6	5	1	0	4	0	4	22	0	5	8	3
9	Pazin	1	1	32	0	1	0	3	25	3	0	0	0
10	Požega	0	0	0	0	0	0	2	8	0	0	4	0
11	Rijeka	2	5	3	2	5	0	3	15	18	0	2	1
12	Sisak	4	3	0	4	6	0	4	3	0	0	0	0
13	Sl. Brod	0	7	0	0	15	0	4	32	0	4	15	0
14	Split	4	3	0	4	6	0	4	3	0	0	0	0
15	Šibenik	0	7	0	0	15	0	4	32	0	4	15	0
16	Varaždin	1	0	0	1	10	0	8	23	0	13	21	0
17	Virovitica	0	1	0	0	1	0	0	3	0	2	2	0
18	Vukovar	4	3	0	0	2	0	3	8	0	5	11	0
19	Zadar	6	13	6	0	3	5	5	39	0	6	29	0
20	Zagreb	19	41	4	25	36	0	50	89	13	6	10	3
	Total:	57	98	55	41	120	5	105	377	43	59	140	37

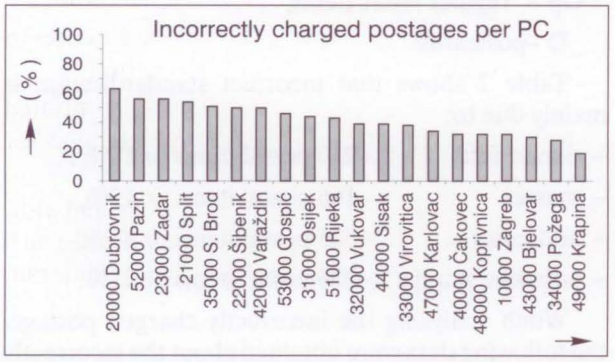

Figure 2 - Graphical presentation of incorrectly charged postage according to postal centres

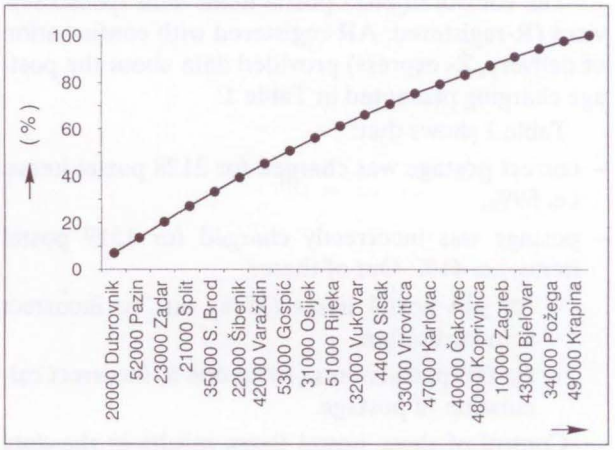

Figure 3 - Cumulative presentation of incorrectly charged postages per postal centres

Each column in the graph (Figure 2) represents one postal centre, and the ordinate represents frequency of error in percentages.

Figure 3 shows the cumulative percentage of the share of individual postal centres in the total sample of irregularities.

Analysing the data obtained by control of conclusions, from these conclusions data were obtained about the types and frequency of irregularities when

Table 3 - Presentation of the incorrectly charged postage per postal centres

Postal centre	Percentage of incorrectly charged postage within PC	Irregularities within the sample	Cumulative
20000 Dubrovnik	63	7.5%	7.5
52000 Pazin	56	6.7%	14.2
23000 Zadar	56	6.7%	20.9
21000 Split	54	6.4%	27.3
35000 S. Brod	51	6.1%	33.4
22000 Šibenik	50	5.98%	39.38
42000 Varaždin	50	5.98%	45.36
53000 Gospić	46	5.5%	50.86
31000 Osijek	44	5.3%	56.16
51000 Rijeka	43	5.1%	61.26
32000 Vukovar	39	4.6%	65.86
44000 Sisak	39	4.6%	70.46
33000 Virovitica	38	4.5%	74.96
47000 Karlovac	34	4.1%	79.06
40000 Čakovec	32	3.8%	82.86
48000 Koprivnica	32	3.8%	86.66
10000 Zagreb	32	3.8%	90.46
43000 Bjelovar	30	3.5%	93.96
34000 Požega	28	3.3%	97.26
49000 Krapina	19	2.2%	99.46

collecting postal items, that greatly endanger the quality of postal traffic. By means of analysis of irregularities, Pareto's method will make it possible to isolate those with frequency allowing for 80% of errors, thus isolating those irregularities that due to their frequency of occurrence endanger to a lesser extent the quality of postal traffic (according to Pareto's analysis 80:20).

For reasons of easier understanding we have designated the irregularities that were determined by the control as A, B, C, etc. as follows:

A – Irregular packaging and closing,

B – Designating of the paid postage by stamps, adhesive stamps, postage meters , franking machines or combinations,

C – Designation of paid postage based on the agreement or in cash, and designating of official postal items,

D – Imprint of the postal stamp,

E – Designating as printed matter,

F – Sticking the adhesive stamp with the register number of the postal item and stickers denoting special postal service,

G – Marking of mass on the postal item,

H – Entering the document number by the sender on the addressing side below the sender's address,

I – Non-compliance with the conditions for collecting letter items in international traffic,

J – Collection of letter items which are subject to customs and foreign currency control,

K – Postal item closed, and marked as printed matter (imprime), and postage charged for printed matter,

L – Postal item with advertisement collected without charging as stated in the price-list art. 1.7.13. of the price-list for services in international traffic,

M – Addressing of postal items,

N – Incorrect definition of postal item standardisation.

The obtained data about the irregularities in percentage per PC have been included in Table 4.

Since we are in this case interested in irregularities at the Hrvatska Pošta (Croatian Post) and not individual postal centres, the obtained data about the irregularities are presented in Table 5 and graphically in Figures 4 and 5.

Table 4 - Irregularities in collecting postal items

Postal centres	Types of irregularities													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
44000 Sisak	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33000 Virovitica	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34000 Požega	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49000 Krapina	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43000 Bjelovar	0	0.236	0	0	0	0	0	0	0	0	0	0	0	0
40000 Čakovec	0	0.236	0	0	0	0	0	0	0	0	0	0	0	0
53000 Gospić	0.236	0.472	0	0	0	0.236	0	0	0	0.472	0	0	0	0
20000 Dubrovnik	0.236	0.236	0	0	0.236	0	0	0	0	0	0.472	0	0	0
47000 Karlovac	0	0.472	0.472	0	0	0.236	0.472	0.24	0	0	0	0	0.236	0
48000 Koprivnica	0	1.179	0.236	0.472	0	0.236	0.943	0	0	0	0	0.236	2.123	2.83
31000 Osijek	0	2.123	0	0	0	0	0	0	0	0.707	0	0	0	0
52000 Pazin	0.707	0.943	0.236	0	0	0.943	2.123	0	0	0.707	0	0	0.943	1.415
51000 Rijeka	0	1.887	0.236	0.236	0.236	1.179	1.179	0	0	0.707	0	0	0.472	0.472
35000 S. Brod	0.707	2.358	0.472	0.472	0.236	0.708	0.236	0	0.236	0.236	0	0	0.708	1.651
21000 Split	0	3.538	1.179	0.472	0	0.472	0.472	0	0.236	1.651	0	0	0.236	0
22000 Šibenik	0.236	0	0.236	0	0	0	0	0	0	0.236	0.236	0	0.236	0
42000 Varaždin	0	0.943	0	0	0	0	0.236	0	0	0	0	0	0	0
32000 Vukovar	0	0.236	0	0	0	0	0	0	0	0.472	0	0	0	0
23000 Zadar	0	0	0.236	0.472	0	0.472	0	0	0	0	0	0	0	0
10000 Zagreb	8.019	6.132	2.594	4.245	1.415	10.61	4.481	1.18	2.123	2.123	1.179	0.943	2.123	1.415
Total:	10.14	20.99	5.896	6.367	2.123	15.09	10.14	1.42	2.595	7.311	1.887	1.179	7.077	7.783

Table 5 - Frequency of irregularities per types

Irregularities	Percentage	Cumulative
B	21	21
F	15.09	36.09
A	10.14	46.23
G	9.67	55.9
N	7.78	63.68
J	7.31	70.99
M	7.08	78.07
D	6.37	84.44
C	5.89	90.33
I	2.6	92.93
E	2.12	95.05
K	1.89	96.94
H	1.41	98.35
L	1.18	99.53

Each column in Figure 4 represents one of the irregularities in collecting postal items, and the ordinate represents the frequency of irregularities in percentages. Figure 5 represents the cumulative image of the percentage of share of irregularities in the collection in the total sample.

Table 5 and Figures 3 and 4 show that 7 out of 14 most significant irregularities, which account for 80%

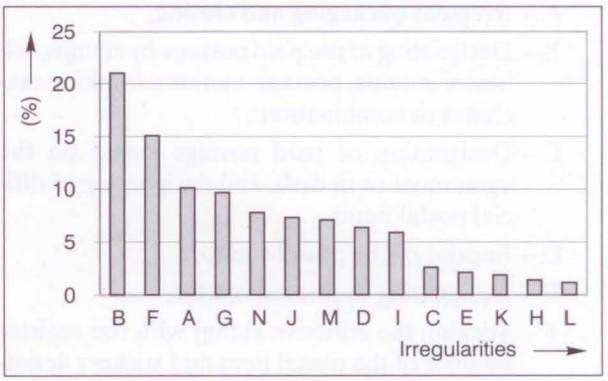

Figure 4: Graphical presentation of irregularities in receiving postal items

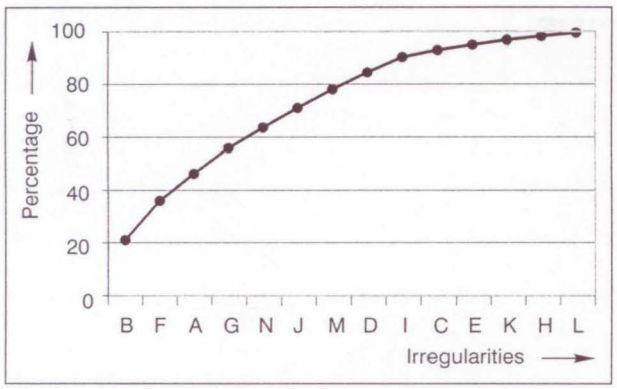

Figure 5 - Cumulative presentation of irregularities in collecting postal items

of irregularities when collecting postal items, include the following:

- Designating of the paid postage by stamps, adhesive stamps, postage meters , franking machines or combinations,
- Sticking the adhesive stamp with the register number of the postal item and stickers denoting special postal service,
- Incorrect packaging and closing,
- Designating mass on the postal item,
- Incorrect definition of postal item standardisation,
- Collection of postal items that are subject to customs control and foreign currency control,
- Addressing of postal items.

4. CONCLUSION

Using Pareto's diagram we have determined the critical postal centres regarding incorrectly charged postage and critical irregularities while collecting the postal items, in order to carry out certain measures to increase the quality of service.

By the control of postage charging in case of postal items requiring special services, it can be concluded that:

- in 14 out of 20 postal centres about 80 % postal items have been incorrectly charged,
- out of these 14 postal centres, there are 7 postal centres which have in the conclusion 50% and more incorrectly charged postages.

By comparing the data about the types of irregularities when receiving postal items, the following results were obtained:

- 7 out of 14 irregularities account for 90 % of total irregularities in receiving postal items.

In order to improve the above mentioned results, the following measures need to be undertaken:

- postal centres need to carry out educational, control and other measures in order to qualify the employees for correct charging of postages as well as for correct collection of postal items,
- the post traffic sector and the marketing sector and the public relations sector need to:
  1. create a standard letter envelope,
  2. define together with postal centres the suitability of picture postcards and letters which are being sold,
  3. agree with the authorised dealer the detailed application of the price-list,
  4. adequately inform the users about the dealers and the application of the price-list,
- postal centres need to continue to carry out intense control of postage charging, and therefore they need to organise daily control of charging at post offices, and once monthly at postal centres.

SAŽETAK

PRIMJENA PARETOVE METODE U ANALIZI KVALITETE POŠTANSKIH USLUGA

Osnovni zadatak kontrole u poštanskom prometu je osiguranje kvalitete usluga korisnicima.

U radu je prikazana analiza kontrole kvalitete prijema pismovnih pošiljaka, a na temelju podataka dobivenih prilikom kontrole od strane Službe unutarnje kontrole u poštanskom središtu za međunarodni promet Zagreb. Navedene su neke mjere za poboljšanje kvalitete usluga.

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