

Features of Postal Item and Their Impact on Transit Time Parameter

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Abstract

The paper is focused on relation between transit time of postal items and selected discriminant mail characteristics within their modes modelled by system of test postal items, namely end-to-end services for single piece priority mail. They are designed as sample of postal items proportionally to real mail flows and measured in context of their transit time. Each test item is defined by its set of characteristics and these are divided to certain modes to identify specific features of item. These discriminant mail characteristics (DMC) can have influence on technological processing of postal item and thus impact measured transit time parameter. The main objective of this paper is to research influence of concrete mode within particular DMC on transit time parameters following from modelling of test samples. Mentioned relation could vary with form of logistic network, capability of nodes processing items and systems of delivery. Analysis of potential dependences is based on data and indicators of period with usual and typical course of panelist behavior by sending and receiving items, thus without seasonable anomalies. The results should partially analyze consistency of measuring system, which reflects postal transport network efficiency. Naturally it could help to find relevant ways to improve accuracy and exploitation of measuring system within postal services quality management.

KEY WORDS: *transit time, discriminant mail characteristics, analysis of variance, relation, postal item, dependence*

1. Introduction

There are some possible specifics that can influence customer behavior to use postal service and on the other hand, they can be connected with some technological specifics related to processing and transportation of postal items. Some features of postal items could also be co-determining with regard on technological core processes of postal service. Exploring closer some of them, we focus on selling points and processes in connection with next selected mail characteristics.

In general, selling point represents where and how the product is sold, including distribution channels, distribution network accessibility, sales range, supply, and transportation. Postal operator's selling point can have several forms. As a traditional national postal operator's endpoint is, for example, considered a post office. The basic services provider usually has very dense network of selling points, which is given to the historical development, is very costly and its profitability, i.e. return of resources invested, is conditional on sufficient volume of operations realized in these endpoints.

There are also other types of postal network endpoints. That is in places, where the return on investment, due to low demand, would not be or currently is not sufficient and where it is desirable to maintain the service. National postal operator has several options to choose from. The first is to maintain post office in the existing establishment and at the same time utilize this facility's capacity to provide different and even non-postal services, so that their revenues reduce the cost of providing postal services. Another option for the national postal operator is to establish its selling point in a form of registry, mobile post office, or motorized delivering. Criteria, which are considered important for selling point assessment, are spatial availability, distance, physical barriers, and especially customer confidentiality.

Processes are also considered as one of the most useful elements. In case of provision of postal services, the customer participates only on the process of posting and delivery of the consignment. Postal chain - clearance, sorting, transport, and delivery of mail – consists of work activities represent a certain process. In general the processes include procedures, tasks, schedules, mechanisms, activities and routines through which the product or service is provided to the customer. Changing some process (for example to introduce automation) can contribute to improving the quality of services provided and thereby increasing customer satisfaction.

2. Selling Points

When deciding on a selling point, i.e. point of contact between dealer and customer, it is important to take into account many factors and only through their combination the possibility for success can be found.

In terms of the provision of postal services, the point of sale, or the endpoint of the postal network, is a place where a consignment enters into the postal system from customer's (submitter's) hands or leaves this system into customer's (addressee's) hands, who is the consignee.

A traditional endpoint of the basic services provider's network is a facility called post office. This method of finalization of the network is relatively expensive and its profitability, i.e. return of resources invested, is conditional on sufficient volume of operations realized in it.

Density of the network of post offices, although important criteria in terms of availability of postal services, depends to a large extent also on the standard of living, which is determined, among others, by the degree of motor vehicle equipment, possibility to use it daily, or level of public transport.

There are also other types of postal network endpoints. In places, where the return on investment, due to low demand, would not be or currently is not sufficient and where it is desirable to maintain the service, one of the following options can be chosen: existing facility will not be shut down establishing postal office through service of registry, introduce a mobile post office or motorized delivery (so-called mobile service site).

Relatively new mean of delivering postal consignments is represented by motorization of remote delivering, which in addition to saving and significantly lightening labor also means an important element of marketing character.

Choice and a layout of a place, where the postal operator provides services to the customer, is one of the most important factors deciding on whether the service will be available for the customer at all.

Spatial availability of postal network's endpoints is determined by many circumstances that as a whole stimulate customer's satisfaction or dissatisfaction and can influence his choice between basic services provider and other competitive operator. Therefore, the basic service provider should pay maximal attention to this matter, which is actually expected in its marketing strategic plans and in the end also realized.

Essential for the customer to get to the desired service is awareness of the location of a particular endpoint of the postal network. This customer's awareness can be based on previous knowledge, but in an unknown environment it is necessary to base it on generally understandable logic of location of postal facilities or navigate the customer to these facilities in urban areas using information system.

Distance that separates the customer from the postal network's endpoint is another important standard that can be used to assess service's spatial availability. With regard to the distance, it is always necessary to consider needs and possibilities of the potential customer. In principle, the aim should be to bring the service to the customer as much as possible while maintaining a reasonable level of efficiency.

Apart from the distance, the access to the service can be also prevented by physical barriers, which could be narrow entrances to buildings, stairways, no parking for vehicles, etc. This problem does not concern only physically handicapped people, but it is particularly relevant also for mass submitters with a large volume of posting. The aim of basic services provider is to eliminate preferably all physical barriers obstructing the customer an easy access to the postal service. Whereas special attention is being paid to among others and taking into account legal framework the access of disabled customers to postal services.

A relatively new element in the provision of services at post offices is the effort to maintain customer confidentiality, similarly as in banks, saving banks, and other places of mass serving to the customers.

Another very important factor in postal service availability is service's time mode, i.e. public hours. Even in this case applies, that if the postal service provider cannot adjust to current lifestyle and daily habits of the population, it cannot completely fulfill its function.

Overall, the endpoint's numerousness, location, and custom configuration of the interior is from the marketing point of view a very important element for overall assessment and comparison of the quality and availability of services. The general opinion on public service operator actually copies this assessment. Of this fact is aware even the postal service provider and in less than a decade of its existence has demonstrated in the real postal network today, how and in what environment it intends to provide its services to ensure customer satisfaction in the future. By that also responds to the growing competition in postal services because it knows that the customer in its selection will distinguish even these inalienable aspects of network configuration and equipment of every operator. [1]

3. Processes

Processes, through which the services are developed and delivered, are the main element of service marketing mix. The processes of providing services are affected especially by the inseparability of services from the customer and their perishability.

With regard to the process of providing postal services, it can be said that the greater part of the process of service provision is carried out without the customer's participation. Customer comes into contact with the postal operator's staff either at the input side, thus when posting the item (for example posting a parcel), or at the end, thus during the delivery (for example a delivery to the addressee only). It is obvious that there are very important technical prerequisites for a process of service provision itself (internal process), whereas for the initial and final stage of this process (external process) the important is the ability of contact staff to face the customer.

All the work activities represent a certain process. Process includes procedures, tasks, schedules, mechanisms, activities, and routines through which the product or service is provided to the customer. To define a process management as an independent activity is an essential prerequisite for improving the service quality. Changing some processes – such as to introduce an automated system for pension payments through a network of machines and associated chip cards - can contribute to improving the quality of services provided, and thereby increasing customer satisfaction. Step in the right direction, in this context, was to reorganize the way of providing the postal services by individual counters at the post office. A model of so-called associated counters was implemented, which, unlike

previous specialized counters, basically ensure provision of all kinds of services at every counter. This step coheres with, actually it preceded it, recognition of the importance of waiting times at the counters. This topic is in detail addressed by multi-server queuing theory. Arrivals of customers to the individual service lines are described by Poisson random process. This means that intervals between arrivals of customers have exponential distribution of probability. Because the time of the service has also exponential distribution of probability, we are talking of multi-server queuing model $M/M/n$, where n is the number of servers, first M characterizes arrivals of customers and the second M the service time. This labeling comes from Kendall's notation.

It does not matter if all the counters are permanently manned, however, their manning must be flexible in accordance with the number of customers awaiting service. Domestic and foreign experience shows that in principle, it is not possible to determine a waiting time limit at the post office. Indeed, this limit cannot be determined even by other subjects providing mass service to the customers. There is a principle though, that must apply to a post operator, and that is if the queues start forming at the post office, all the counters shall be manned.

One of the solutions to this problem are the above-mentioned associated counters that unlike the previous specialized counters basically eliminate the situation of a queue forming at one counter while other counters would be completely without customers' interest. When the process is defined as an independent element of marketing mix, only then we recognize its true significance in terms of service quality.

Regarding the productivity of provided postal services, this can be increased, firstly, by (already implemented) mechanization and automation, and secondly, by customer involvement in the production process, resulting in a reduction in cost and thus the price.

Processes may depend on the target market segment, on offering location, on customer's requirements. For example, a certain group of customers would prefer an alternative to the physical handling of letter mail. There is a possibility to through portals (situated at the post office) provide the customer with an alternative in the form of electronic mail.

The correct process selection may therefore be a source of a competitive advantage for a service provider. Marketing and operations are to be managed so as to achieve the synergy effect.

In the end, it should be mentioned that for the service provider an effectively operating system of complaints handling is also crucial. This system should include these steps:

- critical points monitoring and complaints prevention,
- customers' problems handling, especially in the areas of direct contact with the customer,
- fast problems solution,
- transfer of the powers necessary to resolve the complaints to the staff coming into direct contact with the customer,
- learn from past experience with critical points and complaints solution and base on them plans for dealing with complaints.

The above-mentioned principles generally apply to the whole service sector. The aim of complaint procedure is to verify, whether postal contract was or was not adequately fulfilled or to find out whether there is any damage.[1]

4. Items Features and Relation to Transit Time Parameter

Focus of this paper is to reflect possible relation between transit time of postal items and selected DMC within their modes modelled by system of test postal items. Each test item is defined by its set of characteristics and these are divided to certain modes to identify specific features of item. These DMC can have influence on technological processing of postal item and thus impact measured transit time parameter. The main objective of this paper is to research influence of concrete mode within particular DMC on transit time parameters following from modelling of test samples. Mentioned relation could vary with form of logistic network, capability of nodes processing items and systems of delivery. Analysis of potential dependences is based on data and indicators of period with usual and typical course of panelists behavior by sending and receiving items, thus without seasonable anomalies.

At first there has been set null hypothesis that all selections come from the same basic population of data. Main analytic tool is analysis of variance. The basis for input data is created by modelled values of percentage parameter of items delivered in one day after the day of its posting. It means, that their transit time is just one day. They are called on-time items. These parameters are defined for disjunctive set of specific relations between locality of posting and delivery. We can distinguish urban and rural localities and the term "stratum" is this concrete determined relation. Ratio of on-time items for particular strata creates enter data basis. Stratum can be considered as one element of DMC set, but the main task is to reveal some potential influence of post technological specific reflected by DMC elements on transit time parameters, more precisely on-time items ratio. DMC elements with technological features represent specification of addressing method DMC_{12} – thus specific modes "printed" (printed address on item envelope) or "written" (hand written address on item envelope) and also specific way of posting DMC_{34} – specific modes "box" (item posted by letter box) or "post" (item posted at the counter in post office).

To explore under-mentioned dependence, there was ANOVA (Analysis of Variance) method used. This method contains some assumptions and formulations. At first we work on the null hypothesis H_0 (1), that all samples originate from the same basic population. In our case, the samples are on-time parameter stratum (ST_i with index i) values y_{ij} belonging to specific modes (index j) in population of DMC technological elements (DMC_{12} addressing and DMC_{34} posting methods), see Table 1. All these data come from modelling of transit time measuring with test items from one

representative month of 2018 year. This null hypothesis is verified by F -statistics of ANOVA coefficient with form (2). Key components of this statistics are total sum of squares S_y (3), between-group sum of squares $S_{y,m}$ due to treatment (4) and within-group sum of squares $S_{y,v}$ due to error (5), n is total number of observations, n_i is total the number of observations in each group j and k is total number of populations, \bar{y} is the mean of the full sample, μ is the mean of basic population.[2]

$$H_0: \mu_1 = \mu_2 = \dots = \mu_k, H_1: \mu_i \neq \mu_j \text{ for some } i, j = 1, \dots, k, i \neq j \quad (1)$$

$$F = \frac{\frac{S_{y,m}}{k-1}}{\frac{S_{y,v}}{n-k}} \quad (2)$$

$$S_y = \sum_i \sum_j (y_{ij}^2 - \bar{y})^2 = \sum_i \sum_j y_{ij}^2 - \frac{1}{n} (\sum_i \sum_j y_{ij})^2 \quad (3)$$

$$S_{y,m} = \sum_i n_i (\bar{y}_i - \bar{y})^2 = \sum_i n_i \bar{y}_i^2 - \frac{1}{n} (\sum_i \sum_j y_{ij})^2 \quad (4)$$

$$S_{y,v} = S_y - S_{y,m} \quad (5)$$

Table 1

Parameter values

| Stratum i | ST_1 | ST_2 | ST_3 | ST_4 | ST_5 | ST_6 | ST_7 | ST_8 | ST_9 | ST_{10} |
|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|
| y_{i1} - printed | 0,943 | 0,955 | 0,933 | 0,977 | 0,947 | 0,897 | 0,960 | 0,911 | 0,949 | 0,952 |
| y_{i2} - written | 0,943 | 0,966 | 0,942 | 0,885 | 0,941 | 0,943 | 0,917 | 0,949 | 0,938 | 0,942 |
| Stratum i | ST_1 | ST_2 | ST_3 | ST_4 | ST_5 | ST_6 | ST_7 | ST_8 | ST_9 | ST_{10} |
| y_{i3} - box | 0,945 | 0,929 | 0,925 | 0,920 | 0,949 | 0,938 | 0,980 | 0,944 | 0,929 | 0,942 |
| y_{i4} - post | 0,942 | 0,970 | 0,941 | 0,917 | 0,943 | 0,921 | 0,928 | 0,932 | 0,945 | 0,947 |

Critical value of test F is compared to table critical value $F_\alpha(k-1, n-k)$. Test statistics $F(DMC_{12})$ for addressing method has value 0,312, table value delimiting critical range is 4,414. Thus we can accept null hypothesis, that related factor DMC_{12} does not impact transit time parameter – items with printed or written address are delivered equally from the time (or speed) viewpoint. This is confirmed also by P value 0,583 – to acceptance alternative hypothesis, this P value would have to be lower than 0,05 in accordance to set confidence level.

Test statistics $F(DMC_{34})$ for way of posting has value 0,044, table value delimiting critical range is 4,414. Thus we can accept null hypothesis, that related factor DMC_{34} does not impact transit time parameter – items posted by letter box or in post office are delivered equally from the time (or speed) viewpoint. This is confirmed also by P value 0,837 – to acceptance alternative hypothesis, this P value would have to be lower than 0,05 in accordance to set confidence level.

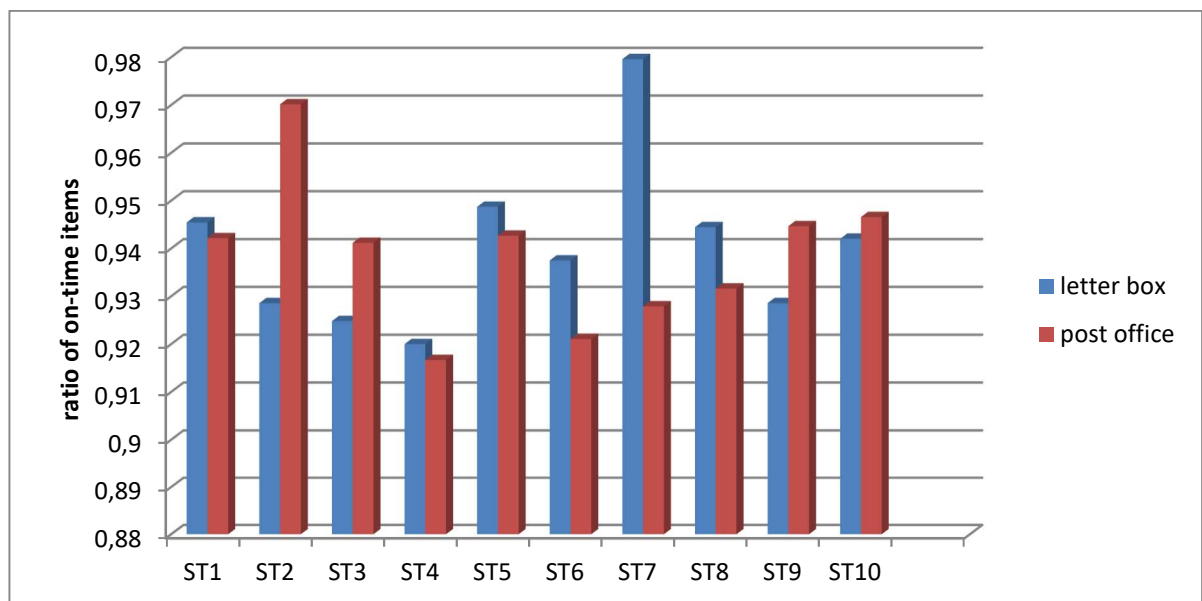


Fig.1 Ratio of on-time items by addressing method

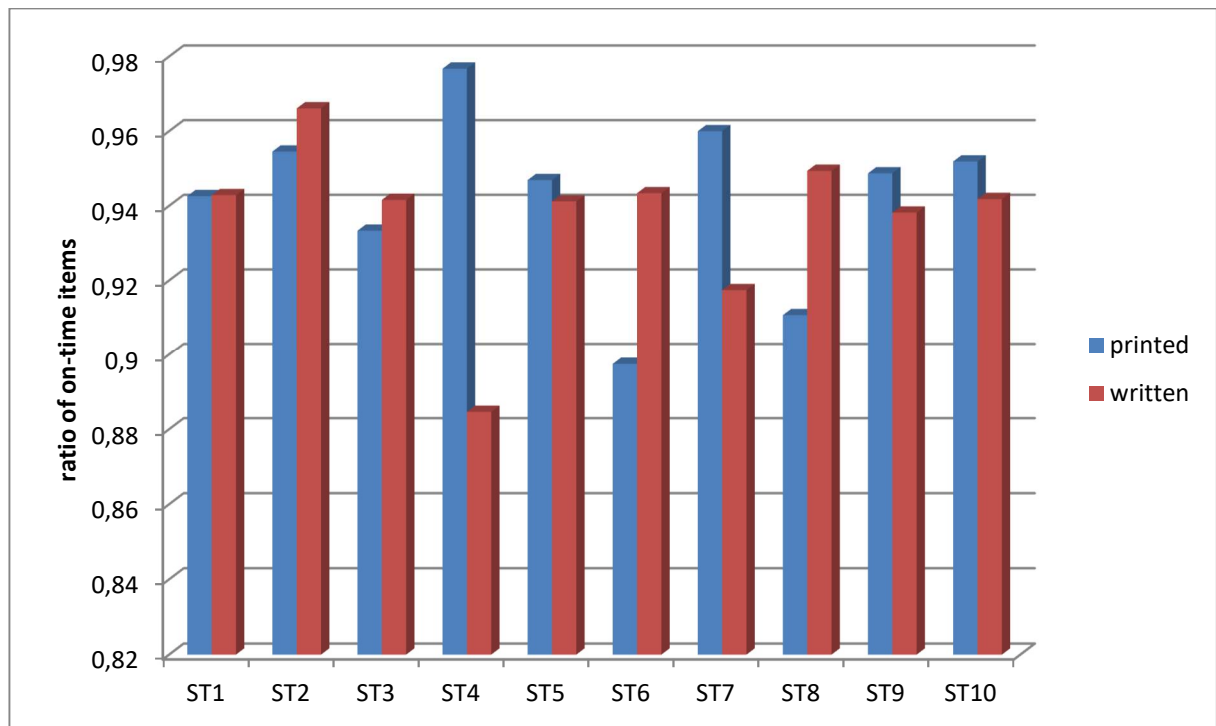


Fig.2 Ratio of on-time items by way of posting

3. Conclusions

The results of analysis based on variance parameters do not confirm influence of related selected item features on transit time parameter. There were selected mail characteristics of addressing method in connection with technological processing of postal items and the way of posting related to postal selling endpoints network, simply created by post offices or by letter boxes for ordinary letters in basic postal service.

Density of the network of post offices, although important criteria in terms of availability of postal services, depends to a large extent also on the standard of living, which is determined, among others, by the degree of motor vehicle equipment, possibility to use it daily, or level of public transport. Spatial availability of postal network's endpoints is determined by many circumstances that as a whole stimulate customer's satisfaction or dissatisfaction and can influence his choice between basic services provider and other competitive operator. Essential for the customer to get to the desired service is awareness of the location of a particular endpoint of the postal network. Distance that separates the customer from the postal network's endpoint is another important standard that can be used to assess service's spatial availability. With regard to the process of providing postal services, it can be said that the greater part of the process of service provision is carried out without the customer's participation. Customer comes into contact with the postal operator's staff either at the input side, thus when posting the item (for example posting a parcel), or at the end, thus during the delivery (for example a delivery to the addressee only). It is obvious that there are very important technical prerequisites for a process of service provision itself (internal process), whereas for the initial and final stage of this process (external process) the important is the ability of contact staff to face the customer.

It is obvious, that both aspects participate by certain way in internal technological processes and provision of postal service, but the rate of their significance and possibility to influence transit time or delivery parameters can be various. Partial results of concrete focus of this paper make effort to point out this problem, in compliance with fact, that factor of delivery time (or "speed" of postal service) has bigger and bigger role for customer.

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