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THE IMPLEMENTATION OF LOYALTY FORECAST MODEL IN IDENTIFYING KEY CLIENTS OF AN ENTERPRISE

Abstract

Managing product range by means of the, so called, portfolio methods¹ implementation is widely known in the theory of marketing and applied in many enterprises functioning practice. Much less attention, both in professional literature and in marketing practice, has been paid to clients' portfolio analysis, so far. However, in the conditions of growing competition, the issues of enterprise clients' portfolio management have become the tool which may exert an extensive influence on increasing both effectiveness and competitiveness of enterprises.

The hereby paper discusses the concept of clients' loyalty probability forecast model, which may be used in the process of establishing an optimum portfolio of clients by means of identifying and selecting key clients of an enterprise. The verification of suggested model correctness in the process of consumer loyalty establishment will be performed based on a selected Polish travel office operations.

Keywords: clients portfolio, key client, MLP neural network method, model of clients loyalty forecast, verification of clients loyalty forecast model accuracy based on empirical data from selected tourism organizer.

¹ The term 'portfolio methods' originates from financial analyses of portfolio securities owned by an enterprise, the main objective of which was to undertake allocation decisions and obtain a balanced set of assets. The first portfolio analyses were performed in the 60s of the 20th century.

Introduction²

The concept of relations marketing puts emphasis on activities focused on maintaining the existing clients. It is assumed that capturing new clients is an important task for a company, however, it is more important to keep the existing ones. Research indicates that company results depend on a limited number of relations, while winning new customers is much more expensive than activities aimed at keeping the loyal ones. Analyses of many enterprises resulted in the conclusion that increasing the level of maintained clients by 5% results in better profitability measured by net present value from 20 to 85%. (More in: Fonfara (2004), pp.104–105).

The selection of key clients is performed based on identification and selection matrix including two types of this value determinants, which define the relationship between a supplier and a client as well as a client and a supplier, namely:

- client's attractiveness factors resulting in an enterprise interest in an existing or potential client,
- relative power of an enterprise factors resulting in client's distinguishing a given supplier from competitive ones.

Both criteria are determined by many more detailed quantitative and qualitative factors, specific for a given enterprise, which should refer to long-term company goals. Proper weight should be assigned to particular partial factors. Client's attractiveness is decided by a set of determinants selected in adequate proportions, e.g.: scale of transactions, opportunities for development, financial stability, client's availability, the level of current relation development, matching strategic goals of a supplier and a client, client's flexibility towards new, emerging products, client's appreciation for supplier's offer, competition level, client's market position. In order to define factors which determine supplier's power client's point of view should be accepted as well as determinants according to which an enterprise may be evaluated by him/her. They may include as follows: price, service level, quality, reaction rate to the notification of needs,

 $^{^2}$ The article was written within the framework of a research project 2011/03/D/HS4/03420 entitled "Loyalty of travel agencies clients in Poland – determinants, models, research results" sponsored by the National Center of Science.

bonds and attitudes, technical innovations, product or service practical usefulness, long-term stability, trust and reliability.





Specifying client's attractiveness and supplier's relative power results in distinguishing four categories of an enterprise clients (Cheverton, 2001, pp. 206–209):

- "key clients" represent the category most desirable by enterprises, since they are the clients most satisfied with the existing cooperation. Key clients may also be taken advantage of in the role of lead users – as individuals frequently using company services who, in a survey, are capable of indicating areas requiring innovation or improvement and are helpful in establishing long-term relations with a client (See: Keiningham et al. (2009) and Reichheld (2006));
- "prospects potential key clients" i.e. a group of clients cooperation with whom stands the chance of becoming exemplary if only the company modifies its way of functioning. In this case the main objective is to find out what are the clients' expectations, reasons of their dissatisfaction, as well as company adjustment to meeting their needs. In order for the cooperation with the discussed group to be successful no savings

should be done regarding the provision of adequate resources and professional service. These clients with whom cooperation is not developing, or no changes are expected in this matter, should be excluded from the group of customers with future potential;

- "maintained clients" who, in many respects, constitute the most difficult category, since the decision about quitting any investments in them, as well as directing means and efforts elsewhere, i.e. where they are more necessary, turns out difficult, but indispensable;
- "occasional clients" customers served by an enterprise when such activity meets current objectives of the company. They are not offered any promises which the company will not be able to meet but, at the same time, these clients are not referred to as unnecessary. This category of clients constitutes an income source which allows for cooperation development with key clients and potential key clients.

The identification and selection of clients in order to group them by category does not always mean the resignation of one in favour of the other. What is does mean is planned allocation of resources. Time and energy saved, owing to the application of more efficient methods for serving both the maintained and occasional clients and revenues obtained as the result of cooperating with them, may in the future be invested in company development. In the process of key clients management an important role is played not only by these basket components which result in high profits, but also in managing this basket. Therefore proportions between long and short term financial inflows should be properly formed as well as between the resources invested and the return on investment. Correct assessment of investment dynamics and earning revenues from clients portfolio, as the result of key clients management, brings about numerous advantages for a company.

1. THE MODEL OF TRAVEL OFFICE CLIENTS LOYALTY FORECAST USING MLP NEURAL NETWORK

The process of maintaining clients starts mainly from the selection of proper ones, while the strategic component of loyalty programme construction is to define key clients to whom it will be addressed (more in: Berry, Linoff (2004)). When an enterprise has a data base at its disposal it may be used for

performing an in-depth segmentation and identification of possible subsegments (Kwiatek (2007), p. 132 and further).



Fig. 2. Assumptions of clients loyalty forecast model Source: authors' compilation.

Based on a given travel office clients' loyalty forecast model, the existing customers may be divided into groups representing different levels of risk of leaving, on the one hand, and different chances for making future purchase, on the other, as well as design and direct adequate marketing activities to these clients who will most probably return to a given travel office and will stay its regular clients for a long time.



Fig. 3. MLP neural network scheme

Source: authors' compilation based on: Bishop (1995) and Rossi, Conan-Guez (2008), [in:] Diday, Noirhome-Frature M. (ed.), pp. 373–391.

Based on historical data it is possible – by means of data analysis model – to construct a model for travel office clients' loyalty probability forecast. The process of travel office clients' loyalty probability forecast will be performed with usage of MLP neural network (see: Tadeusiewicz (1993), Bishop (1995),

and Ripley (1996)), which general scheme is presented at the picture below. Multi-layer MLP neural networks represent the development of classical perceptron concept (Rosenblatt (1958), pp. 386–408) and are composed of one input layer, one output layer and one or more hidden layers.

In the suggested model each client describing variable stands for one neuron of input layer. Output layer is represented by "loyalty level" variable understood as the probability of client's return after making the first purchase.

Input layer neuron values are presented as $X = [X_1, X_2, ..., X_L]$, hidden layer/layers neuron values as $Z = [Z_1, ..., Z_K]$ and output layer neuron values as $Y = [Y_1, Y_2, ..., Y_J]$

Hidden layer neurons represent *h* (.) activation function values of linear input layer neuron combination with wages $\{w_{kl}\}$, $1 \le k \le K$, $1 \le i \le L$ following (1). In (1) sigmoid function represents the activation function. It is also possible to use other functions (see e.g.: Walesiak, Gatnar (2004), however, this particular function was applied in Rossi and Connan-Guarez's proposal.

$$Z_{k} = \frac{1}{1 + e^{-\left(w_{k0} + \sum_{l=1}^{L} w_{kl} X_{l}\right)}} \quad (1)$$

Whereas output neuron values are calculated as values of SOFTMAX transformation (see e.g. Bishop [1995]) of hidden layer linear neurons combination with wages $\{\omega_{li}\}, 0 \le l \le L, 1 \le j \le J$ according to (2)

$$Y_{j} = \frac{e^{\omega_{j0} + \sum_{k=1}^{K} \omega_{jk} Z_{k}}}{\sum_{r=1}^{J} e^{\omega_{r0} + \sum_{k=1}^{K} \omega_{rk} Z_{k}}}$$
(2)

The process of perceptron learning consists in such choice of $\{w_{kl}\}$ and $\{w_{lj}\}$ weights so that the difference between theoretical values (achieved from perceptron transformations with input data) and real values could be the smallest. This difference is expressed by means of a well known, from multiple regression analysis method, least square criterion.

$$Q(\mathbf{w}, \mathbf{\omega}) = \sum_{j=1}^{J} \sum_{i=1}^{N} \left(y_i - f_j(\mathbf{x}_i) \right)^2$$
(3)

where: N – number of observations, f(.) – superposition of (2) and (3) functions Therefore sequential minimization of $Q(w, \omega)$ function is the purpose of learning. It is performed by applying the generalized delta rule with minimization by means of the highest gradient drop method.

Starting with the same weights in subsequent r + 1 step of network learning the modification of synaptic weights for each layer is performed in the following way:

$$\omega_{jk}^{(r+1)} = \omega_{jk}^{(r)} - \eta \cdot \sum_{i=1}^{N} \frac{\partial Q_i(\mathbf{w}, \boldsymbol{\omega})}{\partial v_{jk}^{(r)}} + \lambda \cdot T(\mathbf{w}, \boldsymbol{\omega}) \quad (4)$$
$$w_{kl}^{(r+1)} = w_{kl}^{(r)} - \eta \cdot \sum_{i=1}^{N} \frac{\partial Q_i(\mathbf{w}, \boldsymbol{\omega})}{\partial w_{kl}^{(r)}} + \lambda \cdot T(\mathbf{w}, \boldsymbol{\omega}) \quad (5)$$

Where $\eta \in (0,1>$ means the coefficient of learning speed, λ – penalty coefficient and $T(w,\omega)$ – penalty function equal to

$$T(\mathbf{w}, \mathbf{\omega}) = \sum_{l=1}^{L} \sum_{k=1}^{K} w_{kl}^2 + \sum_{k=1}^{K} \sum_{j=1}^{J} \omega_{jk}^2 \quad (6)$$

or:

$$T(\mathbf{w}, \boldsymbol{\omega}) = \sum_{l=1}^{L} \sum_{k=1}^{K} \frac{w_{kl}^2}{1 + w_{kl}^2} + \sum_{k=1}^{K} \sum_{j=1}^{J} \frac{\omega_{jk}^2}{1 + \omega_{jk}^2}$$
(7)

Error backward propagation algorithm (generalized delta method) in this case operates following two steps:

- 1. Forward pass consists in calculating theoretical $\hat{f}_i(\mathbf{x}_i)$ values.
- 2. Backward pass $-\delta_{ji} = y_i \hat{f}_j(\mathbf{x}_i)$ error value is calculated, which allows for synoptic weight values modification, first output, next input values and on their basis synoptic weights of hidden layers are modified according to formulas (4) and (5).

When the learning process is over perception memorizes due weights for hidden layer (layers) and output layer which are applied in the prediction of variable values – the regress and, based on regression variable values.

2. THE VERIFICATION OF CLIENTS LOYALTY FORECAST MODEL CORRECTNESS FOR A SELECTED TOURISM ORGANIZER

For a selected tourism organizer³ a model was constructed to forecast which of its existing clients will repeat the purchase. The model will be applied soon after the first purchase, therefore its construction should be limited to data available after finalizing the first order. Network provided with such knowledge – based on historical data referring to clients of one of tourism organizers – may be used in calculating the probability of a specific client's return to a certain service provider.

We have historical data at our disposal, which refer to the purchase already made (value of the first purchase, number and category of offers purchased so far, last minute offers purchased, etc.), method and place of purchase (from the organizer, at an agent's office, in an online travel office), the form of payment (whether it was an instalment purchase), client's profile (age, sex, education, number of household members, income level) as well as client's activity before, during and after making the purchase (whether the client was contacting the travel office before or right after the purchase).

The model covering observations for 111 clients of an analyzed travel office included the following input layer variables referring to (see: Dudek, Michalska-Dudek (2011), pp. 25–28).

An order, namely:

1a. value of the first purchase – a variable measured in quotient scale,

- 1b. number of purchased products a variable measured in interval scale,
- 1c. category of purchased products a variable measured in ordinal scale,

1d. method of purchase – a variable measured in nominal scale,

1e. form of payment - a variable measured in nominal scale,

1f. whether it was an instalment purchase – a dummy variable.

A client, including:

2a. region of client's residence – a variable measured in nominal scale,

³ Tourism organizer (tour operator, producer of tourism service packages) deals in combining elements of a tourism product (originating from partial service providers, e.g. accommodation, food and catering, transport, insurance, tour guide services etc.) in a coherent package, as well as selling services directly to tourists, or by means of subsequent links in the distribution system.

Table 1

Historical data of the analyzed tourism organizer

	Historical data – variables of model input laver											Regressand			
	Da	ata abou		Ι	Data	a ab	out	a cl	ien	t	Data about client's	(output layer			
No				activity								L ovalty"			
	1a	1b	1c	1d	1e	1f	2a	2b	2c	2d	2e	2f	2g	3a	"Loyany
1	6490	5	5	3	2	1	15	1	60	0	4	2	1	1	0
2	6330	2	1	2	2	1	8	1	46	1	3	5	2	1	0
3	1980	4	5	3	3	1	9	3	25	0	3	2	3	1	0
4	8560	1	3	2	3	0	12	7	22	1	3	2	3	1	1
5	7940	5	5	3	2	1	15	4	37	0	1	4	3	1	0
6	8380	3	5	3	1	1	15	2	23	0	2	4	1	1	0
7	10000	5	4	1	3	1	15	7	3	0	4	2	1	0	0
8	6730	1	6	1	3	1	18	3	35	1	2	5	4	0	0
9	7700	2	6	1	1	1	9	6	56	0	4	2	4	1	0
10	6710	1	6	3	3	0	17	6	30	0	3	3	4	1	1
11	2960	2	3	1	3	1	4	6	18	1	3	3	1	0	0
12	4360	2	4	3	2	1	15	2	23	0	4	2	1	0	1
13	2390	1	7	1	2	1	17	7	44	0	2	5	2	0	0
14	8990	1	3	3	1	1	10	3	43	1	2	2	3	0	0
15	1460	1	5	3	2	0	5	7	10	1	3	3	2	0	1
16	7190	5	6	2	1	0	3	1	13	0	3	2	3	1	1
17	3440	2	3	1	1	0	15	3	17	1	3	3	1	0	1
18	9800	4	4	1	2	0	6	3	54	1	3	4	1	0	1
19	2810	1	6	1	3	1	15	2	65	1	1	2	3	0	0
20	6820	5	7	2	3	1	18	1	50	1	2	1	4	0	0
21	5780	5	7	3	2	1	1	1	64	1	1	5	2	0	0
22	5080	2	7	3	1	1	14	6	60	0	4	2	3	0	0
23	4640	4	2	1	1	1	1	5	14	0	4	2	2	1	0
24	6840	1	3	3	1	0	6	4	53	1	4	4	3	0	1
25	7040	5	2	3	1	0	4	7	51	0	2	1	4	1	1
26	1360	2	3	2	3	1	12	4	65	1	4	3	1	1	0
27	7360	4	2	3	2	1	18	3	14	0	2	1	3	0	0
28	8010	5	4	3	3	1	6	7	19	0	2	5	4	1	0
29	5390	3	1	3	1	1	6	7	22	1	3	4	2	0	0
30	5870	5	1	3	3	1	16	1	2	1	2	3	4	0	0
31	7680	2	3	3	3	1	8	6	53	1	4	1	2	0	0
32	1150	2	4	2	1	0	11	3	46	0	2	2	3	0	0
33	8870	1	1	2	2	1	6	4	29	1	1	1	1	0	0
34	4030	1	2	1	2	0	3	3	39	0	2	1	1	0	1

35	7340	2	7	3	1	1	1	1	61	0	3	1	4	1	0
36	6590	2	4	1	3	1	6	6	22	1	4	5	2	0	1
37	8260	4	5	3	1	0	17	5	57	0	2	5	1	1	1
38	7620	2	6	3	3	1	12	2	36	1	2	2	1	0	0
39	9020	2	3	1	2	1	15	7	4	1	3	5	1	0	1
40	7770	4	6	2	3	1	10	3	0	1	4	3	1	1	0
41	6450	2	2	1	2	0	11	1	14	0	4	5	4	0	1
42	1630	2	2	3	2	1	9	2	63	1	1	2	4	0	0
43	5140	2	6	2	1	0	2	6	11	1	4	2	3	1	1
44	4300	1	7	1	3	0	9	5	49	1	3	5	3	0	1
45	7010	2	5	2	3	0	17	7	51	0	3	3	1	1	1
46	8500	4	6	1	3	1	2	4	44	0	4	4	3	1	0
47	9810	4	3	3	1	1	14	5	16	0	2	2	3	0	0
48	2320	2	6	1	1	0	8	5	18	0	1	3	1	1	1
49	5700	1	7	2	2	0	14	6	10	1	2	4	2	1	1
50	7320	4	7	3	2	1	5	3	33	1	1	5	2	0	0
51	3320	1	1	1	2	0	15	3	25	1	1	4	2	0	1
52	3850	3	4	3	2	0	7	3	0	0	4	1	2	0	1
53	7150	3	4	3	2	0	10	6	13	0	1	5	4	0	1
54	4130	2	5	1	3	1	14	4	44	0	1	3	1	1	0
55	2730	5	5	3	1	1	14	3	14	1	3	5	1	0	0
56	7280	4	6	3	2	1	16	3	16	0	1	1	3	1	1
57	3330	2	6	1	2	1	10	1	58	0	1	4	1	1	0
58	6500	4	3	3	1	0	18	1	19	1	1	3	1	0	0
59	4320	4	2	1	3	0	16	6	10	1	3	2	3	1	1
60	3260	1	5	3	1	1	5	7	21	1	1	5	2	0	0
61	9900	5	6	2	1	1	14	7	2	1	3	2	1	1	0
62	6790	2	4	1	1	0	14	7	63	1	3	4	1	1	1
63	4350	2	3	2	1	1	14	6	58	1	1	3	2	1	0
64	8540	5	5	2	3	1	8	4	53	0	4	1	4	1	0
65	9290	3	6	1	3	0	14	5	61	0	3	5	1	0	1
66	6000	2	3	3	2	0	9	4	43	1	4	2	2	1	1
67	7920	4	3	3	3	1	7	5	59	0	3	4	1	1	0
68	9300	1	3	2	2	1	7	2	9	0	4	2	1	1	0
69	2860	3	1	1	3	0	14	3	20	0	1	1	4	0	1
70	8000	1	7	3	3	0	7	5	45	1	1	2	2	1	1
71	9270	2	1	2	1	0	16	6	58	1	1	1	3	0	1
72	6290	4	1	3	2	1	8	1	2	0	4	3	4	0	0
73	3240	1	7	1	3	0	12	2	25	0	4	1	2	1	1
74	1450	2	2	3	2	1	5	5	56	1	2	4	3	1	0
75	5860	5	4	2	2	0	4	2	41	1	4	5	1	0	1
76	3090	3	2	1	1	1	11	1	27	1	4	1	2	0	0

77	8390	4	1	1	3	0	6	1	9	0	4	2	4	0	1
78	6970	5	2	3	3	0	12	2	32	0	1	2	2	0	1
79	8220	5	4	3	2	0	5	6	51	0	3	2	1	1	1
80	4530	5	2	2	3	0	10	7	64	1	1	5	3	1	1
81	7990	4	2	1	1	0	15	6	4	1	1	5	2	0	1
82	5800	3	3	3	3	1	17	4	62	1	4	4	4	1	0
83	2620	5	1	2	1	0	12	6	7	0	1	1	1	0	1
84	9890	2	2	1	1	0	18	3	8	1	2	4	2	1	1
85	1730	2	5	3	2	1	6	4	5	1	2	5	2	1	0
86	1970	4	3	2	1	0	18	4	44	1	4	5	1	0	0
87	9550	5	2	1	1	0	16	6	59	0	4	4	4	1	1
88	8180	2	6	2	3	1	14	3	64	0	1	4	4	0	0
89	4880	3	2	3	3	0	12	6	2	1	3	3	2	0	1
90	9430	3	4	3	1	1	14	6	47	0	1	5	2	0	0
91	9710	3	7	2	2	1	11	5	45	1	2	5	4	0	0
92	2350	5	6	2	1	1	11	3	41	1	2	2	3	0	0
93	6470	4	5	1	2	1	9	1	54	0	1	2	3	1	0
94	5420	2	3	3	3	1	10	6	35	0	2	1	3	1	1
95	1330	1	5	1	1	1	1	7	61	1	4	1	2	0	0
96	1390	5	1	3	1	0	12	7	38	0	3	1	1	0	1
97	4630	2	7	1	3	1	18	1	64	1	4	4	1	1	0
98	5560	5	2	1	1	0	7	7	5	1	3	2	4	1	1
99	7540	5	5	2	2	0	5	6	5	1	4	5	3	1	1
100	6800	4	2	1	2	1	5	3	0	0	3	1	2	1	0
101	6630	1	1	2	3	0	8	7	55	1	1	4	2	1	1
102	6560	4	1	2	3	0	3	4	2	0	1	5	2	1	1
103	8150	2	5	2	2	1	5	1	5	1	4	1	3	1	0
104	3170	2	6	3	3	1	8	6	29	1	1	2	2	0	1
105	3630	4	7	3	2	1	14	6	31	1	1	2	1	0	1
106	1550	5	6	3	3	1	12	2	30	1	2	1	1	0	0
107	4730	1	3	1	2	0	13	5	54	1	3	5	4	1	1
108	8630	4	7	2	2	0	15	2	6	0	3	1	4	0	1
109	5090	2	7	1	1	1	7	5	19	0	4	4	3	1	0
110	3500	1	1	2	2	0	3	5	27	1	3	1	2	0	1
111	4150	5	5	3	3	1	7	6	36	1	2	3	1	1	0

Source: Authors' compilation.

2b. location size of client's residence – a variable measured in ordinal scale,

2c. client's age – a variable measured in interval scale,

2d. client's sex – a dummy variable,

2.e client's education - a variable measured in ordinal scale,

2f. number of household members - a variable measured in interval scale,

2.g income category – a variable measured in ordinal scale.

client's activity:

3a. information whether a client was contacting the supplier before or just after the purchase -a dummy variable.

Regressand variable (output layer variable) will be represented by "loyalty" variable. For historical data this variable will take 0 value if a client did not make next purchase and one if he did, while for new clients it will be a <0,1>interval variable, understood as the probability of a new client return after making the first purchase.

The table 1 presents input layer variables in a model covering 111 cases of an analyzed travel agency clients.

In order to verify model correctness retrograde cross-validation technique will be applied. For 20 randomly selected cases, out of 111 analyzed, and referring to a given tour-operator clients whose decision about making or not another purchase was known in the analyzed travel office, a dummy variable referring to this decision⁴ was compared with theoretical values of "loyalty" output layer variable in a model. Table 2 presents adequate variable values.

If it is accepted that the 0,5 value of "loyalty" variable divides clients into two classes: 0 - a client who did not return after the first purchase and 1 - a client who did return after the first purchase, then there is only one position for which the result of model prediction is different from real value. Such situation occurs when a client with the variable level of *loyalty* $\cong 0,75$ was indicated by the model as the client who did not return after making the original purchase (Client 6). However, none of clients characterized by the model variable level of <0,5 returned to the company after making the first purchase.

⁴ Where "1" means that a given client returned to an organizer in order to make another purchase, while "0" means that a client did not make the second purchase in the analyzed travel office.

Table 2

	Theoretical values from the	Real values
No.	model	
1	0,084919	0
2	0,084919	0
3	0,084968	0
4	0,7488	1
5	0,085243	0
6	0,748799	0
7	0,7488	1
8	0,086503	0
9	0,084919	0
10	0,748424	1
11	0,085727	0
12	0,748335	1
13	0,084919	0
14	0,084919	0
15	0,748504	1
16	0,748751	1
17	0,748772	1
18	0,084919	0
19	0,084919	0
20	0,084919	0

Theoretical values and real values of "loyalty" variable

Source: Authors' compilation based on calculations made applying net package of R environment.

Conclusions

In times of current global crisis, growing competition, as well as increasing and changing clients' expectations, tourism enterprises are forced to search for new, more effective methods of entering into, maintaining and strengthening their contacts with clients. Client focus as the philosophy of functioning becomes more and more important. It leads to correcting the strategy of tourism sector companies and focusing mainly on obtaining proper satisfaction level and loyalty of a client. Tourism sector companies change the way of perception in their relations with clients. Focus shifts from transaction towards partnership and the aim of such movement is to establish long lasting relations with clients. New areas of activities become noticed and, apart from winning clients, attention is also directed towards establishing and maintaining lasting contacts with them.

Due to the fact that in the times of economic downturn among promotional activities the most efficient are these focused on a certain effect and measurable at the same time, therefore it is clients' loyalty establishing which should grow in importance also at tourism services market.

From the perspective of an enterprise functioning, repetitive purchase usually requires lower service costs, establishing contacts, sales and marketing which are depreciated in a long run. Positive correlation of clients maintaining indicator should also be emphasized as well as income earned by enterprises.

If it is supplemented by the fact that winning a new client may costs event five times more than maintaining the existing one, clients' loyalty should be considered one of the more important indicators for the evaluation of enterprises functioning at tourism market, while the application of loyalty programs as fully recommended.

It is possible to divide clients into groups characterized by a different level of leaving threat, on the one hand, and different probability of making further purchase on the other, after using information obtained from the model forecasting clients' loyalty towards a given travel agent ("perspective" group – loyal clients and "non-perspective" group – disloyal ones), design and apply adequate marketing activities for these potential clients who will probably remain long-term clients, and additionally, it is also possible to indicate certain events which will precede leaving, or influence keeping a client.

Different activities should be undertaken with reference to both groups of clients distinguished by the model, by travel office managers. Clients classified as "disloyal" may become the target of pre-emptive measures, while the perspective ones may become the recipients of new product offers – cross-selling, or offers for extending the existing cooperation – up-selling.

An adequately designed loyalty programme allows to identify and encourage the most valuable clients to participate in it and, at the same time, helps to save financial resources by an enterprise as the result of "encouraging" less valuable clients. Additionally the loyalty model may also indicate some events which precede client's leaving or influence keeping the particular client.

The presented model may become a useful tool not only for big and wealthy tourism organizers, but also for intermediaries and agents functioning in tourism sector who would be able to reach loyalty programmes participants in a targeted manner and minimize losses resulting from sending special offers (treatment, privileges) to unprofitable and not prospectively attractive clients.

Among open issues, next step further research topics following should be distinguished:

- opportunities for extending the hereby model so that it does not only forecast the probability of client's return after the first purchase, but also has the potential of indicating client's return probability after each *n*-th ($n \ge 1$) purchase,
- information about which input variables (data referring to an order, clients' profiles or their activities) influence loyalty level the most,
- possibilities for indicating certain events which precede client's leaving or influence keeping the client.

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