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Agility of the Supply Chain

It's been almost 40 years since Keith Oliver of Booz-Allen-Hamilton first introduced and then developed the Supply Chain Management concept. Although the term appears even in an article from 1898. The supply chain represents a lot of companies linked to each other and which outline the flow of resources transformation into products and services. K. Oliver defined SCM as the process of planning, implementing and controlling operations in the supply chain. Supply chain management aims to increase the value of the product offered. A solution to this effect has been offered since 1985 by Michael Porter who defined the value chain and value system, needed to create a competitive advantage. Over time, other solutions have been identified to create the efficiency of the supply chain, many of them used today. One trend was, for example, the globalization of the supply chain. But lately some new trends are emerging.

Companies have multiple options for getting products to buyers. They can use indirect channels, or they can sell directly to customers via the Internet or a sales force. Since profit margins vary depending on which channels are used, the firm must decide on the optimal channel mix. Companies compete based on innovation, customer experience, quality, and cost. Time to market is critical because the window of opportunity can be small.

Supply chain performance is measured with efficiency-related metrics such as asset utilization, inventory days of supply, products costs, and total supply chain management costs. In this sense, the management of the company must know the firm's value system as well as suppliers, customers, and suppliers 'suppliers.

Today's supply chain is broad and continually evolving, which means that it must be agile to be effective. Consumers have multiple choices in how they purchase products and they expect high levels of customization. Also, supply chain sourcing has become very fluid. The ability to rapidly reconfigure your supply chain is essential to successful businesses. An agile supply chain can deliver on those expectations.

Machine learning is especially useful for large, dynamic data and it is applied in logistics technologies to enhance warehouse management

> „I made an interesting discovery: if the components were all manufactured by other companies, the system that retailed for $3,000 cost about $600 in parts."
> Michael Dell
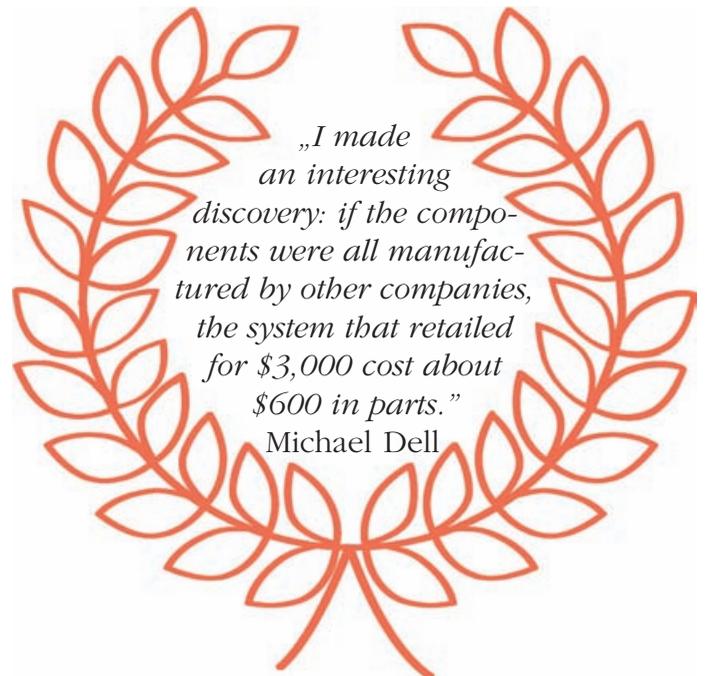
systems, supply chain visibility or supply chain planning. Advanced analytics provides the ability to extrapolate the current environment to make profitable decisions. Robots, drones or autonomous vehicles enable new business processes to reduce the time for inventory checks.

Supply chain risk is everywhere, and it is tough to prioritize. Consequently, companies need to start evaluating and confronting cyber risk at every level. A buyer may discover financial issues when increasingly late deliveries, inefficient alignment of supply and demand causing unnecessary inventory and production, capacity constraints and inadequate sources of funding.

An integrated supply chain is a process wherein every phase is streamlined and inseparable. A non-integrated supply chain is disconnected and functions in silos. Integrated supply chain allows a company to focus on assets that would allow reducing waste and costs. Increasing efficiency can save money through reduced warehouse space and lean supply chain for more profitable operations. The ability to be flexible and adapt to different situations is important in any competitive industry.

Many of the changes made in SCM have arisen from new theories applied in management, such as Resource-Based View (RBV), Agency Theory (AT), Just in Time (JiT), Theory of Constraints (ToC), Time Based Competition (TBC), etc. And innovation in management is a continuous process.

„If you can't describe what you are doing as a process, you don't know what you're doing."
Edwards Deming

Gheorghe Militaru
Deputy Chief Editor
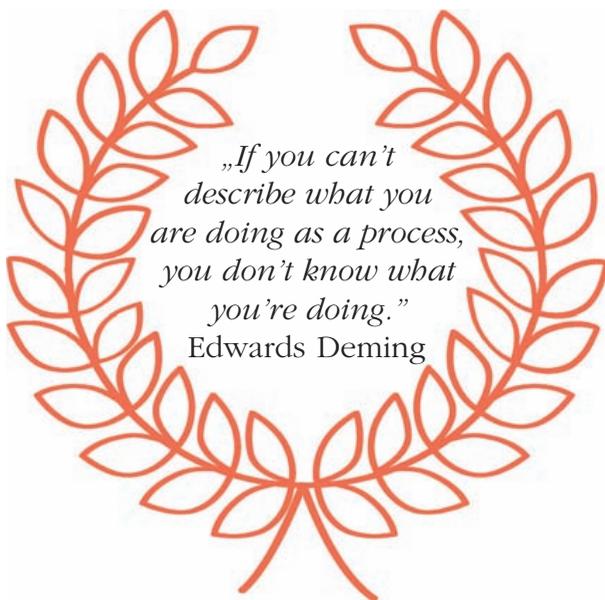
Modeling of the Intermodal Terminal

Sergiu Olteanu, Mihaela Popa, Ștefan Burciu, Florin Rusca

University POLITEHNICA of Bucharest

Abstract

Whereas most of the finished products are transported in containers which are the primary means facilitating intermodality, it is estimated that in XXI century, intermodal transport, along with technological improvements of the transhipment systems, will be the main international trade element, because is considered to be the most effective way of managing „door to door" international transport activity. The hubs of intermodal transport network are represented by intermodal terminals and by the efficiency of their operation largely depends the proper functioning of the entire intermodal chain. Transfer points are the most sensitive links in terms of efficiency and reported to the entire intermodal transport system generates the highest costs. In the intermodal terminals operating in the public system case, all transport demands to be treated are considered to have equal priority. Intermodal terminals activity privately operated can be modelled using the absolute priority treatment demand model. By serving prioritized entities with different characteristics the total duration of stationary system and implicitly stationing costs can be significantly influenced a total duration of stationary system and implicitly stationing costs.

Keywords: intermodal terminal, traffic flow, low priority demand, high priority demand, input stream, traffic entity

Introduction

Intermodal transport has emerged and developed from the need for rationalization of the used resources and from the need of improving the transport services quality, based on intense cooperation between all modes of transport. Through this cooperation, most of the advantages of

„If we are together nothing is impossible. If we are divided all will fail."
Winston Churchill

each transport mode used in the intermodal chain can be capitalized, registering beneficial influences on the supply chain costs and thus on the final price of goods in destination markets.

Due to free-market principles, existing competitive distribution and the current situation of freight transport activity, coordination between infrastructure managers and their carriers is fundamental. Intermodal freight coordination covers the transport modes, as well as interadministrative competences. The first issue has a technical component, being related to the development of various administrations in the regions and may refer to a logistics hub and to an area more or less extended. The second issue affects the regulatory competences of the transport services and requires increased cooperation, particularly in corridors with a higher potential for developing intermodality (Ciortan 2010).

For an adequate development of intermodal freight transport not only the existence of infrastructure for each of the competing modes is needed but also, this requires special features to these infrastructures and special platforms in which the

modal shift is achieved. Also, the development of intermodal freight transport requires specific services provided by the intermodal network operators and handling services of the loading units. Intermodal freight transport priorities are represented by the defining of the intermodal network linked to development needs, system structuring through supporting the creation of the links between modes and strengthening of certain key nodes, stimulating the emergence of new players and increasing the use of the existing equipment (Dragu, 2009).

The Modelling Framework

In most European countries, intermodal terminals differentiate between them depending on the infrastructure and superstructure owner on one hand and depending on the management and activity operation on the other. The owner owns both the land on which the terminal is built and the infrastructure and superstructure elements such as railway lines, cranes, forklifts etc. (Dewitt, Clinger, 2008).

The management of an intermodal terminal refers to daily activities organization and managing and can be done by the terminal owner or by companies specialized in the development of such activities. Intermodal terminals activity is based on the following principles (Tănăsuică, 2011):

- The principle of non-discriminatory access to terminals. Any operator is obliged to provide access to any customer at a reasonable price in response to a reasonable request.
- Rail Access to all licensed rail operators.
- Road access for all operators.
- Transparency in the capacity allocation and tariff setting.
- Grouping the various transports and market segments.

Input traffic flow entities treatment can be studied using mathematical models of mass serving theory or by numerical simulation. Both in the first and in the second case, the input traffic flow is characterized by the same specific characteristics that describe traffic flows. Input flows have consisted of network traffic flows at the nodes entrance which is considered to be serving stations. For these stations, characteristics such as the average serving intensity and the maximum number of traffic entities that are waiting to be served at one moment, are known.

Serving significant parameters are represented by the average time for an entity to cross through the system, the waiting average time in order to begin serving, the average length of the queue, average number of traffic entities that can be found in the system at one moment or the probability that a traffic entity to be refused to be served. These parameters can be analytically determined or by simulation and they largely depend by the characteristics of the input traffic flow, composed of the traffic flows from incident arcs which are associated to a particular network node (serving station).

The mathematical models that describe traffic entities serving differ depending on the characteristics and parameters of the input streams and serving stations. For the models identification a A / B / n: (m / d) (Lee, 1976), coding type is used where,

A – is the input stream characteristic (the probability density function of the intervals between the input traffic flow entities);

B – serving characteristics (the probability density function of the entities serving duration);

n – the number of identical serving stations working in parallel;

m – the maximum number of the places in the system;

D – serving discipline.

If the average intensity of the arrivals in the terminal, λ is smaller than the average serving intensity $n\mu$ then the demand average serving waiting time is non-existent and otherwise, if the average intensity of the arrivals in the terminal λ is higher than the serving intensity the waiting time becomes significant. In case the gap between the intensity of the arrival in the terminal and the serving intensity persists over time, queues will continuously grow. The parameters that describe waiting time systems refer to the average waiting time $\bar{t}_a$ to the average passing time of one traffic entity through the system $\bar{t}_s$, to the average number of the waiting requests $\bar{n}_a$, to the average number of the system requests.

In case of mixed input flows processing, consisting of various types of entities that differ depending on serving duration, depending on stationing cost, movement and
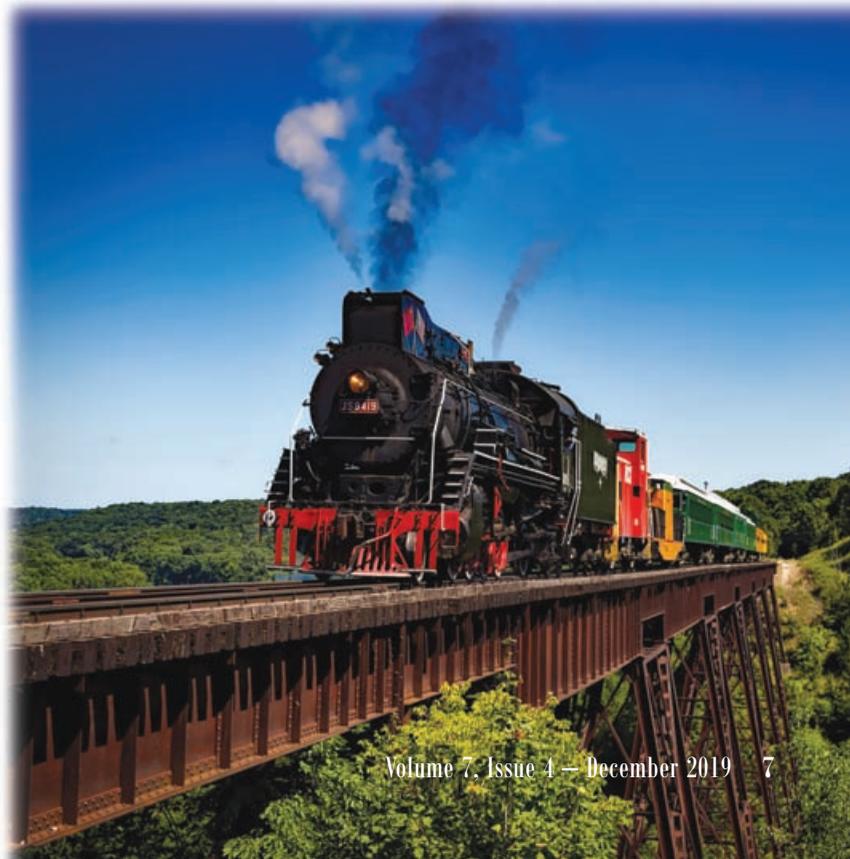
processing conditions or other characteristics, in order to increase the system efficiency it is advantageous to reduce serving waiting time and implicitly the passing time through the system of the demands whose stationing generates higher costs.

For priority demands treatment there are two possible ways. In the first mode, the demand for serving interruption is not allowed whatever priority has been assigned to it. In the second treatment mode, the demands which are considered to be prioritized, can not under any circumstances to be delayed so, either the serving station is reserved either the non-priority demands are removed with no restrictions from the serving station. In the first case it can be said that the demands have relative priority and in the case it can be said that the demands have absolute priority.

In the case of the intermodal terminals which are operated in the public system, all the demands to be treated are considered to have equal priority. Intermodal terminals activity which is privately operated

can be modelled using the absolute priority demands treatment model. For exemplification some assumptions will be made in order to simplify the results highlighting:

- Two intermodal terminals are considered, one which is public operated and one which is privately operated;
- Both terminals, the public and the private one, have the same technical equipment so effective serving times are identical in both cases;
- All the demands to be treated are identical relating to their size;
- There are two types of demands, with higher priority and with lower priority.

The average waiting of demand with lower priority, in an intermodal terminal which is privately operated, can be obtained using the following equation (Raicu, 2007):

$$\bar{t}_{inf} = \frac{1}{2(1-\rho)}(\rho \cdot \bar{t}_{sv.inf} + \bar{t}_{sup}) \cdot (1 + v_{sv}^2) \quad (1)$$

where:
- $\bar{t}_{inf}$ is the average waiting time of the lower priority demands;
- ρ is the system level of solicitation, $\rho < 1$;
- $\bar{t}_{sv.inf}$ represents the lower-priority demands average serving time;
- $\bar{t}_{sv.inf} = \bar{t}_{sv.sup}$ (equal demands relating to their size),
- $\bar{t}_{sup}$ is the average waiting time of the high-priority demands;
- v_{sv} is the variation coefficient of the serving durations and it can be defined as the ratio between standard deviation σ of serving durations and the average serving duration.

In the case of serving the demands with absolute priority, high-priority demands treatment does not depend on the number and serving duration of the lower priority

demands. For this reason, the average waiting time of the high priority demands for Poisson input streams can be calculated with the following equation:

$$\bar{t}_{sup} = \frac{1}{2(1-\rho)}\rho \cdot \bar{t}_{sv.sup} \cdot (1+v_{sv}^2) \tag{2}$$

Poisson incoming flows are characterized by the property of stationarity which means that the emergence of a number of favourable events (high priority requests) in a certain time does not depend on the position on the time axis but the size of this range. Another feature of Poisson input flow refers to that between the occurrence times of two successive positive events there is an order relation, the simultaneous occurrence of two or more favourable events is not possible.

$$\bar{t}_{inf} = \frac{1}{2(1-\rho)}(\rho \cdot \bar{t}_{sv.inf} + \bar{t}_{sup}) \cdot (1+v_{sv}^2) = \frac{\rho}{2(1-\rho)}(\bar{t}_{sv.inf} + \frac{\bar{t}_{sup}}{\rho}) \cdot (1+v_{sv}^2) \tag{3}$$

Using equation (2) $\dfrac{\bar{t}_{sup}}{\rho}$ can be calculated:

$$\frac{\bar{t}_{sup}}{\rho} = \frac{\frac{1}{2(1-\rho)}\rho \cdot \bar{t}_{sv.sup} \cdot (1+v_{sv}^2)}{\rho} = \frac{1}{2(1-\rho)}\bar{t}_{sv.sup} \cdot (1+v_{sv}^2) \tag{4}$$

Because the two types of demands are identical relating to their size we can say that serving time of the high-priority demands is equal to the serving time of the demands with lower priority $\bar{t}_{sv.inf} = \bar{t}_{sv.sup} = \bar{t}_{sv}$. Thus, equation (3) becomes:

$$\bar{t}_{inf} = \frac{\rho}{2(1-\rho)}\left[\bar{t}_{sv} + \frac{1}{2(1-\rho)}\bar{t}_{sv} \cdot (1+v_{sv}^2)\right] \cdot (1+v_{sv}^2) \tag{5}$$

$$\bar{t}_{inf} = \frac{\rho \cdot \bar{t}_{sv}}{2(1-\rho)} \cdot (1+v_{sv}^2) \cdot \left[1 + \frac{1}{2(1-\rho)} \cdot (1+v_{sv}^2)\right] \tag{6}$$

$$\bar{t}_{inf} = \bar{t}_{sup} \cdot \left[1 + \frac{1}{2(1-\rho)}\right] \tag{7}$$

The first two factors from the equation (6) represent the average waiting time of the demands with equal priority (none of the demands is prioritized). This treatment mode is typical to private system operated intermodal terminals. In this case, the demands with absolute priority can be considered to be demands with equal priority between them.

By priority serving of the traffic entities with different characteristics, the total stationing duration can be significantly influenced and implicitly the related costs. In the case of the same stationing cost for any entity but with different serving times, it is advantageous the serving priority to be in accordance with the serving durations order relation.

Results

For a better highlighting of the relation between the waiting time of a lower priority demand and the waiting time high priority demand, a graphical representation of the function $f(\rho) = t_a / \overline{t}_{sv}$ (Saaty, 1961), for $v_s = 1$ has been made (exponential distribution case).

From the graphical representation, it can be observed that for system levels of solicitation up to 40%, in the case of single channel serving type, the average waiting time of the lower priority demands is not much higher than the average waiting time of the high priority demands. For a level of system solicitation of 40%, the average waiting time of lower priority demands is nearly double to the average waiting time of the high priority demands, the waiting time of lower priority demands being approximately 80% higher.

Table 1 – *The t_a / t_{sv} values depending on the system solicitation*

ρ	$t_{a.sup} / t_{sv}$	$t_{a.inf} / t_{sv}$
0,20	0,25	0,41
0,30	0,43	0,73
0,40	0,67	1,22
0,50	1,00	2,00
0,60	1,50	3,38
0,70	2,33	6,22
0,80	4,00	14,00

For levels of system solicitation higher than 40%, the waiting times of lower priority demands increase significantly, forcing

the terminal manager which is privately operated to adopt investment measures in order to increase the capacity for maintaining a competitive level of quality service.
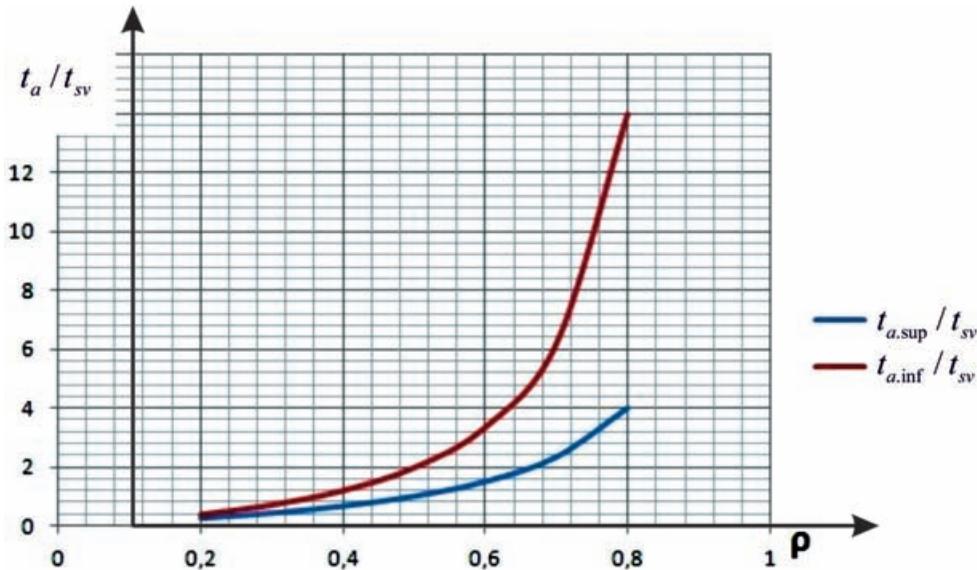
Figure 1 – *The t_a / t_{sv} dependence on the system solicitation*

Conclusions

The measures for increasing the capacity should materialize by purchasing high-performance lifting and handling equipment so that the average serving time to get lower. All these measures cause an increase in operating costs, maintenance and rent costs which, for levels of terminal solicitation that are not much higher than 40%, are felt in users charges. The main advantage of private intermodal terminals, in case its capabilities are consistent with the demand, consists of a high-quality level of service and lower costs.

Acknowledgement

REFERENCES

1. Ciortan, R. (2010) *Development of Containerization.* AGIR Publishing, Bucharest.
2. Dragu, V. (2009) *Transporturile intermodale, soluții eficiente pentru economisirea resurselor și limitarea efectelor externe negative.* (în English: Intermodal transport, efficient solutions for saving resources and limiting negative external effects). AGIR Bulletin no. 4.
3. Dewitt, W., Clinger, J.(2008) *Intermodal Freight Transportation.* [Online] Available from http://onlinepubs.trb.org/onlinepubs/millennium/00061.pdf. [Accessed: 10th Sept. 2017].
4. Lee, A.M. (1976) *Teoria asteptarii cu aplicatii.* (in English: Waiting theory with applications). Technical Publishing. Bucharest.
5. Raicu, S. (2007*) Sisteme de Transport.* (in English: Transportation systems) AGIR Publishing, Bucharest.
6. Saaty, T.L (1961) *Elements of Queueing Theory with Applications.* Mc. Graw Hill Publishing. New York.
7. Tănăsuică, M. (2011) *Transportul unităților de transport intermodal pe calea ferată,* (in English: Transport of intermodal transport units by rail). Rail Club Conferences. Bucharest.

„The most important single central fact about a free market is that no exchange takes place unless both parties benefit."
Milton Friedman

Using Technology Acceptance Model to Adopt Intelligent Banking

Mihaela-Rodica Ganciu (1), Andrei Niculescu (2)

(1) ENERGOMONTAJ S.A., Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania

Abstract

This paper analyses the impact constructs of the adoption of intelligent banking among Romanian consumers, the correlation between them and also, demographic factors will be taken into account (age and gender). The main basis for this study is the extended Technology Acceptance Model (TAM), mainly aimed at the study of information systems adoption. George, an application from Romanian Commercial Bank, the first smart banking, is a new highway to make banking: totally intelligent and digital. Based on empirical research, using a technology rating model was developed a modified TAM for consumer acceptance of Internet Banking. There are two important factors in TAM: Perceived Ease of Use (PEoU) and Perceived Usefulness (PU), which are of particular importance to the attitude towards the use of a new technology or information system through the behavioural intention to use. For the verification of variables' correlation, it was applied Structural Equations Model, adapting to the questioned sample. Results and conclusions are partly supported by the developed hypotheses, presented after the reliability test (calculating Cronbach's Alpha). The significant effect that influences the attitude toward using George is made up of behavioural intention to use, perceived usefulness and the perceived risk towards intelligent banking.

Keywords: online banking, George, intelligent banking, TAM Model, perceived usefulness

„For you to gain, those you deal with should gain as well."
Alan Greenspan

Introduction

100 years ago, in the aviation world, an important step was taken by the american Lawrence Sperry with an innovation called George: the first autopilot. Now George is the symbol of innovation and it's designed to be more than an Internet Banking, it is a
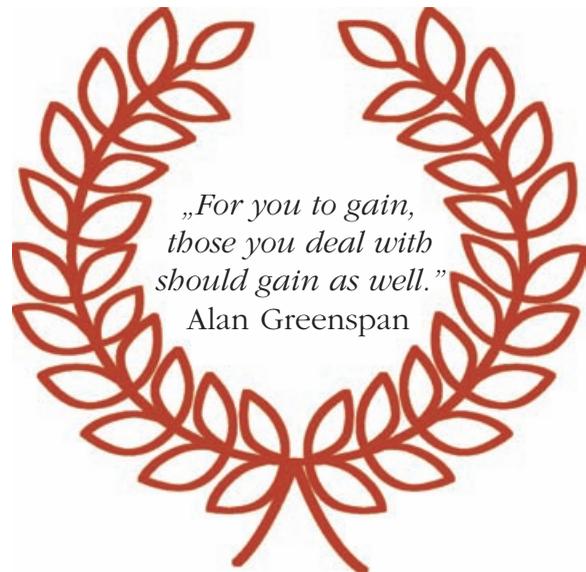
new way to interact with the remote bank. „Let George Do it!" soon became an expression that testifies to the confidence that technology can make your life easier. George is the first smart banking in Romania and is part of ERSTE's Internet Banking platform, being the largest Internet Banking platform in Europe with over 5 million users in 4 countries: Romania, Austria, Czech Republic and Slovakia.

George Go has four big advantages: it's INTELLIGENT (George remembers IBANs and transfers and also looks for intuitive transactions by name or a trader), PERSONAL (each client can customize it, from profile picture to new colours, wallpapers and special name for the account), SIMPLE (Client can make payments quickly and in one form, because George remembers the recipients of the transfers and completes everything automatically) and UNIC (Allows extra option activation and opening of new products from George Store). Through Romanians consumers, the most important construct of smart banking usage is security and privacy. The paper aims to answer the questions „What is the impact of the application among consumers? Is there any benefit for consumers in using this smart banking? Which factors are more influential in affecting the decision towards using online banking?"

Electronic banking is a kind of „umbrella" that roofs the whole process by which a consumer can make banking transactions through the internet, that doesn't have to visit the bank's headquarters. Most used electronic banking possibilities are internet banking, personal computer (PC Banking) or online banking (Georgescu-Golosoiu, 2003, p. 109). Better use of new Information Systems (IS) available on market is real defiance at the moment with which this sector is scrambling. Adapting to this change will allow costumers to solve all banking needs with minimal human intervention (Martins, 2014, p. 2). At the same time, Internet banking is much more advantageous to customers as regards the availability of any banking services, the timing and accuracy of the transaction, and their low cost (Irfan, 2013, p. 55). There are some benefits of using Internet banking for both banks and customers. Banks can benefit from much lower operating costs by providing Internet banking (Oruca, 2017, p. 232).

Consumers will benefit from the availability, convenience and speed of internet banking services (Xue, 2011, p. 293). The emergence of Internet banking systems has made many banks reorganize their IT strategies on the market and it's noteworthy that banks that don't have a favourable response to the emergence of Internet banking services have the chance to lose their customers and also the costs of Internet banking services are much lower than the cost of maintaining banking services involving presence in banks' branches (Dash, 2011, p.52). It is important for banks to

study how quickly different segments would like to adopt new technologies and innovations. That's why findings indicate that some segments need other useful information and targeting needs to be customized for each segment to ensure efficiency (Nerme *et al.*, 2013, p. 6). The user interface is an important part of each application, especially in the case of Internet Banking, where customers access online banking services from different locations (Eze, 2014, p. 13).

Technology Acceptance Model

Technology Acceptance Model (TAM) was a proposal from Fred Davis in the doctoral thesis in 1986, trying to bring arguments for usage of new technologies and for creating a relationship between attitudes, perceptions, intentions or behaviour. The most important factors in Davis's Technology Acceptance Model are perceived ease of use „how much a particular system is effortless" and perceived usefulness „how much a person believes that using a particular system leads to increased performance of his activities in an organizational context" (Davis, 1989, p. 320). The principal components of the perceived risk are the confidence and security, emerged as being the main problems that hamper the adoption of Internet Banking system. This construct also reflects the individual's subjective conviction in the negative consequences of a deliberate action because of the uncertainty that can have a negative influence on the system's intentions to use (Geetha, 2012, p.182).

TAM is tailored to IS (Information System) context and it was designed to predict information technology acceptance and usage (Venkatesh, 2003, p.428). Data were evaluated in two parts: first the demographic statistics, then was examined the fit of the research model, and the hypotheses were tested through SEM (structural equation model) (Liao, 2016, p.1449). Perceived ease of use has a significant effect on users attitudes but perceived usefulness was confirmed to be the most important factor affecting user acceptance (Ahmad, 2018, p. 26). Figure no. 1 indicates the proposed research model for the present paper.

Hence, hypotheses are developed as follows (Figure 1):

The perceived ease of use is the percentage in which a consumer thinks that using an application doesn't require physical or mental effort. It has been found that perceived ease of use has been used, influencing usefulness, attitude, intention and actual usage. Also, perceived ease of use both directly and indirectly influences the usage of the application (Gardner, 2004, p. 5).

H1: Perceived ease of use has a positive impact on attitude towards using smart banking application.

The evaluations of perceived usefulness that consumers can considerable supply would then derive from expectations. Perceived usefulness has been confirmed to be the most important factor affecting user acceptance (Yee-Loong Chong *et al.*, 2010, p. 271). Delivery speed, user enjoyment, perceived ease of use, reliability and were found to contribute to the perceived usefulness in many technology-based self-implemented systems (Liao, 2002, p. 284).

H2: Perceived usefulness positively influences the behavioural intention to use system.

H3: Perceived usefulness has a positive effect on the attitude towards using George.

H4: Perceived usefulness has a positive impact on the perceived ease of use of the system.

Attitude towards the use of a system is an important element of the Technology Acceptance Model because it considerably affects online banking in customers' future actions (Lee, 2011, p. 118). These findings show that users can have a positive attitude if they think using technology will increase performance and productivity.

H5: Attitude towards using system has a significant effect on the behavioural intention to use.

Behavioural intention is a method of measuring the power of the intent of a particular behaviour. It is stated that behavioural intention is a good predictor of the actual use of a technology that has received much support in previous studies. (Gardner, 2004, p. 6).

H6: Behavioral Intention toward using the system is positively correlated to the perceived ease of using it.

Security/Privacy Risk: Risk perceptions have been a very important feature that in-

fluences the adoption rate. Risk is defined as „uncertainty about what innovation provides" (Gerrard, 2003, p.19). This is also defined as a significant loss due to fraud or a hacker that discredits the security of an online banking client. Phishing is a new form of crime that phishers are trying to fraudulently acquire personal information such as usernames, passwords, and credit card details by masking as a trusted entity in electronic communication (Lee, 2009, p. 131).

H7: Security/privacy risk negatively influences attitudes towards the use of George (Lee, 2009, p. 134).
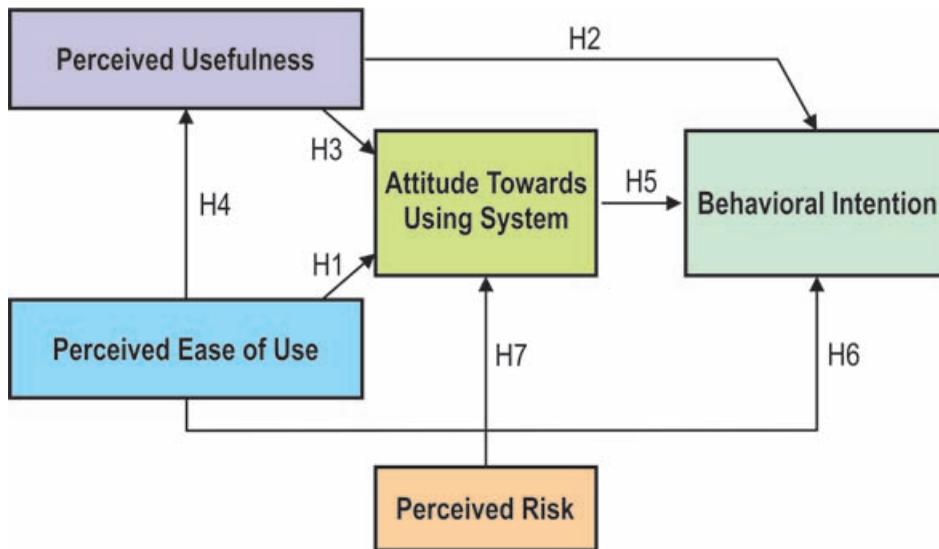
Figure 1 – *Proposed research model for George's usage*
(Source: adapted from Dash, 2011, p.54)

Methodology of Research

Through the methodological chapter, it was developed a model in the construction of an individual decision in the financial-banking sector, tested on a sample of respondents aged between 21 and 50 years. Collecting responses was realised in almost two months, using a survey with 18 questions, registering 130 respondents. The questionnaire applied to the determined sample aims to identify the specific aspects and factors that have a real impact on the use of George Go-smart banking. Also, it was designed to be short, with inquiring questions for obtaining relevant information, taking into account a number of five factors. Most of constructs were measured using the seven-point Likert scale, with „1" denoting the low end and „7" the high end.

Results and Discussion

Demographic statistics (Table 1) show young customers, 93% of respondents up to the age of forty years. Referring to gender, most of the questioned people are female (65%), while men are fewer respondents, more accurately 35%.

Table 1 – *Demographic profile of respondents*

	Attributes	Frequency	Percentage (%)
Gender	Female	85	65.4
	Male	45	34.6
Age	21-30 years	80	61.5
	31-40 years	42	32.3
	41-50 years	8	6.2

Bartlett's KMO test and Bartlett sphericity test are both multivariate normalization tests and sample sampling (matching variables for factor analysis).

Kaiser-Mayer-Olkin – measures whether the distribution of values is appropriate for performing factor analysis. The level from Table 2 is 0.802 (Sig =.000), which means good value.

Table 2 – *Kaiser-Meyer-Olkin and Bartlett's Test*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	1110.095
	Sig.	.000

The Bivariate Correlation or Pearson Correlation (Table 3) denotes a normal correlation between two variables (for example a high positive relationship exists between the behavioural intention to use and the attitude towards using George – r = .714, Sig = .000).

Table 3 – *Bivariate Correlation – Pearson Matrix*

		PEoU	PU	AU	BI	PR
PEoU	Pearson Correlation (r)	1	.335**	−.106	−.077	.289**
	Sig. (2-tailed)		.000	.199	.347	.000
PU	Pearson Correlation (r)	.335**	1	−.043	−.020	.033
	Sig. (2-tailed)	.000		.603	.811	.692
AU	Pearson Correlation (r)	−.106	−.043	1	.714**	.229**
	Sig. (2-tailed)	.199	.603		.000	.005
BI	Pearson Correlation (r)	−.077	−.020	.714**	1	−.116
	Sig. (2-tailed)	.347	.811	.000		.158
PR	Pearson Correlation (r)	.289**	.033	.229**	−.116	1
	Sig. (2-tailed)	.000	.692	.005	.158	

Alpha values were calculated to evaluate the internal reliability of scale consistency. According to Table 4, the Cronbach Alpha value is 0.860, indicating a good one. Furthermore, it indicates a high degree of internal coherence on the questioned sample.

Table 4 – *Chronbach's Alpha*

Cronbach's Alpha	N of Items
.860	18

After calculating the Multiple Regression Test in Table 5, the power of each predictive variable, suggesting the dominance of the largest ones, is the scale of Perceived Usefulness (t = 6.233, Sig = .000) and Behavioural Intention to use (t = 2.452, Sig = .145).

Table 5 – *Multiple regression coefficients*

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta (β)		
Attitude towards Using Gorge (Dependent variable)	.643	.756		.355	.252
Perceived Ease of Use	.546	.067	.043	.520	.301
Perceived Usefulness	.780	.055	.152	6.233	.000
Behavioral Intention	.692	.101	.104	2.452	.145
Perceived Risk	−.003	.080	−.003	−.022	.010
R = .805; R² = .630 (63%)					

As can be seen, the Linear Regression Coefficient from Table 5, R = 0.805, indicates that there is a strong correlation between dependent and independent variable. In terms of variability, the value amount of R^2 = 0.630 or 63% explains the variability within the population (this means that 63% population in the sample agree that on the correlation between the given variables).

Table 6 shows the frequency of the question, where 70 persons or (53.8%) of respondents use Internet banking for 1-2 years, 40 persons or (30.8%) use system for more than 3 years and 20 respondents or (15.4%) have been using internet banking for less than 1 year.

Table 6 – *Online use of internet banking by respondents*

How long time do you use internet banking from BCR?		Frequency	Percentage (%)
	For 1-2 years	70	53.8
	For more than 3 years	40	30.8
	Less than 1 year	20	15.4
	Total	130	100.0

Structural Equations Model was used in the presented study, adapting the Technology Acceptance Model to the questioned sample (Figure 2) and then validate/invalidate the hypotheses, discovered in SPSS AMOS, synthesized in Table 7.
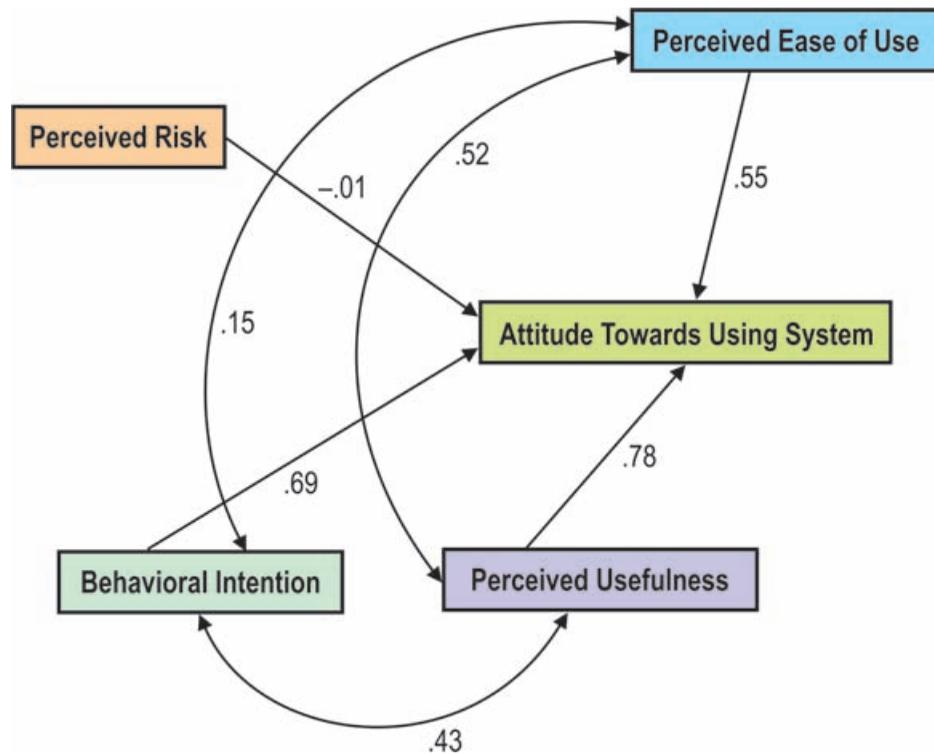
Figure 2 – *Model for George's adoption in Romania*

Table 7 – *Validation/Invalidation of Hypotheses*

Hypothesis	Coefficient β	Error	Validation / Invalidation of Hypothesis
H1: Perceived ease of use has a positive impact on attitude towards using smart banking.	.546	.067	VALIDATE
H2: Perceived usefulness positively influences the behavioural intention to use system.	.432	.147	VALIDATE
H3: Perceived usefulness has a positive effect on the attitude towards using George.	.780	.055	VALIDATE
H4: Perceived usefulness has a positive impact on the perceived ease of use of the system.	.520	.178	VALIDATE
H5: Attitude towards using system has a significant effect on the behavioural intention to use.	.690	.022	VALIDATE
H6: Behavioral Intention toward using the system is positively correlated to the perceived ease of using it.	.136	.128	VALIDATE
H7: Security/privacy risk negatively influences attitudes towards the use of George.	–.013	.080	VALIDATE

In this study, there are four independent variables, namely Perceived Ease of Use, Perceived Usefulness, Perceived Risk and Behavioral Intention to Use. The Attitude towards the Use of George will be the dependent variable. Perceived Usefulness (PU) and Perceived Ease of Use (PEoU) influence customer's attitude towards using

George, supporting Hypotheses 1, 2 and 4. Through the research, it was found that each client expectations regarding the accuracy, transactions speed and user-friendliness were the most important quality characteristics in the Perceived Usefulness of smart – banking system, this relationship also having the biggest Coefficient, supporting Hypothesis 3. Theses factors had positive path coefficients and Attitude towards Using George (AU) explain 54.1% of the variance in behavioural intention to use it (BI), which supports Hypothesis 5. Behavioural Intention to use is a measure of the power of the intent of a particular behaviour and the use of computers by people can be reasonably anticipated by their intentions, and that's why Hypothesis 6 is validated. The significant effect that influences the attitude toward the application's use is the Perceived Usefulness, Perceived Ease of Use and Behavioral Intention to use George. Perceived Risk is considered to be a significant factor in determining the Attitude of adopting the online banking system. Customers don't support internet technology for three reasons: service provider mistrust, system security and worrying about service reliability, validating Hypothesis 7.

Conclusions

The more a digital application has more options and features, the more likely it is for customers to change their banking service provider. At the same time, several Romanian consumers expressed the wish that they would like to interact with the bank outside of the program hours, after closing the Branches. The use of these systems depends mainly on perceived ease of use, not on services or on the trust of companies. In order to get consumers' acceptance, they need to feel safe when using Internet banking. The results of this study indicate that the technology acceptance model would need to lead at least to an increase in confidentiality and confidence in internet banking systems. The results of the tested hypotheses provide satisfactory support for the TAM model conceived by the analysis of the structural equation model.

Limitations. It is quite important that science and theories in the field be applied to situations in daily life and current technology, so older technology and internet banking models must be supervised and updated as technology changes. This study has been confronted with resource limitations, mainly of time, and can, therefore, be seen as a start and involvement in the subsequent research to be done. This paper is exploratory research aimed at identifying the adoption percentage of the Romanian Commercial Bank application – smart banking George. Research is relevant to understanding the experience of respondents in this respect but is still unrepresentative for all users of Internet banking solutions.

REFERENCES

1. Ahmad, M. (2018) *Review of the Technology Acceptance Model (TAM) in internet banking and mobile banking.* International Journal of Information Communication Technology and Digital Convergence. 3 (1). pp. 23-41.
2. Dash, M., Mohanty, A., Pattnaik, S., Mohapatra, R., Sahoo, D. (2011) *Using the TAM Model to Explain How Attitudes Determine Adoption of Internet Banking.* European Journal of Economics, Finance and Administrative Sciences. 36. pp. 50-59.
3. Davis, F. (1989) *Perceived usefulness, perceived ease of use, and user acceptance of information technology.* Management Information Systems Quarterly. 13(3). pp. 319-340.
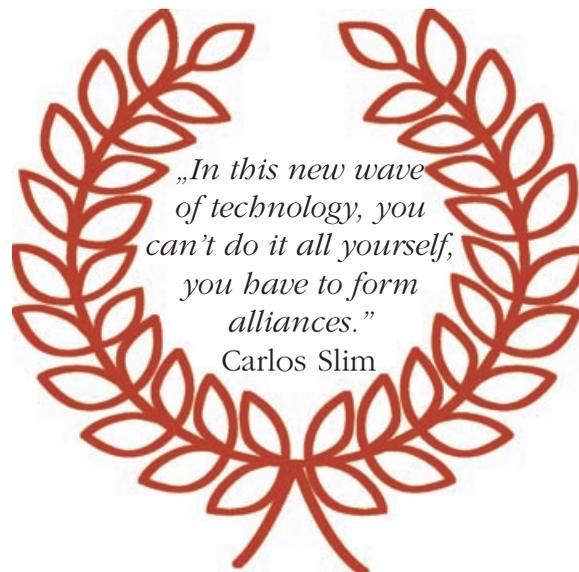4. Eze, M. (2014) *Internet Banking User Interface Design: A Comparative Trend Analysis of Nigeria Perspective.* International Journal of Computer Science and Telecommunications. *5(3)*. pp. 13-20.
5. Gardner, C., Amoroso, D. (2004) *Development of an instrument to measure the acceptance of internet technology by consumers.* Proceedings of the 37th Hawaii International Conference on System Sciences. California. January 2004. pp. 1-10.
6. Geetha, K. & Malarvizhi, V. (2012) *Assessment of a Modified Technology Acceptance Model among E-banking Customers in Coimbatore City.* International Journal of Innovation, Management and Technology. 3(2). pp. 181-187.
7. Georgescu-Golosoiu, L. (2003) *Means, modalities and payment instruments.* [Online]. Available from: http://www.bibliotecadigitala.ase.ro/biblioteca/carte2.asp?id=203&idb= [Accessed: June 2019]
8. Gerrard, P., Barton Cunningham, J. (2003) *The diffusion of Internet banking among Singapore consumers.* International Journal of Bank Marketing. 21(1). pp. 16-28.
9. Irfan, B., Madhavaiah, C., Ramakrishna, J.N. (2013) *Customer acceptance of internet banking services: A review of extensions and replications to technology adoption model (TAM).* Asia-pacific marketing review. 2(1). pp. 55-72.
10. Lee, K.-W.,Tsai, M.T., & Lanting, M. C. (2011) *From marketplace to marketspace: Investigating the consumer switch to online banking.* Electronic Commerce Research and Applications. 10(1). pp. 115-125.
11. Lee, M. C. (2009) *Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit.* Electronic Commerce Research and Applications. 8(3). pp. 130-141.
12. Liao, C., Huang, Y.-J., Tung-Heng, H. (2016) *Factors influencing Internet banking adoption*, Social behaviour and personality: an international journal, Scientific Journal Publishers. 44(9). pp. 1443-1455.
13. Liao, Z., & Cheung, M. T. (2002) *Internet-based e-banking and consumer attitudes: an empirical study.* Information& Management. 39(4). pp. 283-295.
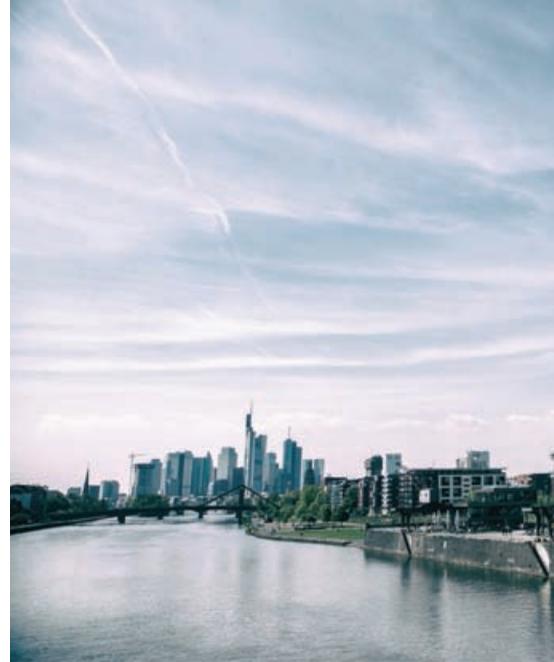
14. Martins, C., Oliveira, T., Popovic, A. (2014) *Understanding internet banking adoption: a unified theory of acceptance and use of technology and perceived risk application.* International Journal of Information Management. 34(1). pp. 1-13.

15. Nerme, P, Stenstrom, C., Darefelt, N., Soilen, K.S. (2013) *Usage of internet banking among different segments as an example of innovation-trust and information needs.* Journal of Internet Banking and Commerce. 18(2). pp. 1-7.

16. Oruca, O.E., Tatar, C. (2017) *An investigation of factors that affect internet banking usage based on structural equation model.* Computers in Human Behavior. 66(C). pp. 232-235.

17. Venkatesh, V., Morris, M.G., Gordon, D.B., Davis, F.D. (2003) *User acceptance of information technology: toward a unified view.* MIS Quarterly. 27(3). pp. 425-478.

18. Xue, M., Hitt, L.M., & Chen, P. (2011) *Determinants and Outcomes of Internet Banking Adoption,* Management Science. 57(2). pp. 291-307.

19. Yee-Loong Chong, A., Ooi, K.-B., Lin, B., Tan, B.-I. (2010) *Online banking adoption: an empirical analysis.* International Journal of Bank Marketing. 28(4). pp. 267-287.

„In this new wave of technology, you can't do it all yourself, you have to form alliances."
Carlos Slim

Distribution Capacity in the Supply Chain Management

Evgeniya Tonkova

University of Economics, Varna, Bulgaria

In the last century the focus in business has shifted from production to distribution. The economic and political crises set ordeals to the effectiveness of production and the implementation of products and services. The incompatibility between the production and distribution capacity is an issue of particular importance, especially for companies and organizations functioning in the sphere of services. The interrelation between capacities can be critical for companies and problematic for their contractors and clients. Managing the channels for implementation in modern conditions presupposes flexibility, dynamics and transparency. Using the marketing tools in managing capacities in conditions of multi-channel distribution is of exceptional importance for using the abilities of the production capacity and decreasing the cost of missed benefits for companies. Economies of scale in production and implementation are prerequisites for the development of companies' innovation activity and improving their overall competitive positions on the market or in particular market segments. Investments in distribution and maintaining relations with consumers are among the key factors for the success and sustainability of companies.

Keywords: distribution, capacity, multi-channel distribution, economies of scale, innovations

„It was our duty to expand. What we want to do, we can do and will do, together." Ingvar Kamprad

Introduction

Distribution as an element of the marketing mix takes part in forming providers' offers on the market. Both as a place and type of channels, objects and subjects of selling products and services, it influences companies' market performance and their financial results.

The market and political changes in the last couple of decades deepened the issues
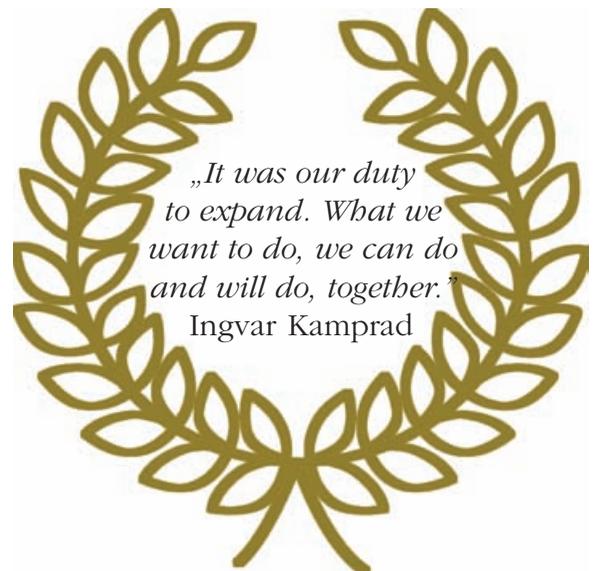
in respect to selling the produced quantities of goods and set up the question about how companies function in the sphere of production and distribution. The incompatibility of the production and distribution processes is not studied and analyzed enough yet from the point of view of direct and transfer effects on companies' business.

The goal of this paper is to describe current issues and ways of solving them in distribution and managing capacities, as well as to provoke marketer's thinking about ways of overcoming incompatibilities and reaching high economic activity.

Modern authors define a company's capacity as key business metrics (Ye *et al*., 2012) and it is viewed as a strategic competitive advantage (Shugan, 2002). It is interesting to know about the various aspects of studying the issue – from the point of view of competition and competitive conditions, as well as market performance.

In the business of a prevailing part of companies, incompatibility is registered between the production capacity and the capacity of their distribution. In conditions of crisis and the unfavourable ratio between supply and demand companies realize that their production capacity exceeds that of their distribution system. This incompatibility can be critical for companies in the field of services, as well as for those which offer fast-rotten products with a short demand cycle in conditions of possible copycats. For example, cinemas with a certain capacity for each show report capacity overload which can vary in large limits because of the specifics of demand for the product. Unsold cinema tickets for every show pile up in time as missed benefits for the company, which has failed to balance its production capacity with that of the distribution channels. Of course, this example is not the only one a researcher can give in defending the need for managing and balancing capacities. Similar issues are observed in companies in the tourism sector, transport, healthcare, education, culture, industry and so on. In practice, there is no business that is not affected by the issue of balancing the production and the distribution process.

Table1 – *Interrelation between production and distribution capacity*

The interrelation between production and distribution capacity	Specifics
Production capacity that is higher than the distribution one	It is characterized by functioning under the capacity abilities, low economic efficiency, problems in selling the produced quantities, missed benefits and others.
Distribution capacity that is higher than the production one	It is characterized by limited production which does not comply with the high capacity of distribution of the channels used by the company. The explanation for this could concern the use of old technologies, the high share of using manual labour, deliberately limiting the use of the production capacity for keeping up higher prices and others.
Complete compatibility between production and distribution process	In practice, a few companies keep up such balance. It is characterized by high efficiency and a possibility for precise planning of production and distribution.

While in producing products it is possible to balance these two variables by storing and keeping in time, in providing services it is practically impossible. Or, for example, if in a cinema seating 300 people the direct channel for distribution is average 210 tickets, this means that the remaining 90 seats do not have the chance to be sold because of capacity limitations of the single direct channel. They can be offered and bought, though through other additional channels. Using those could balance the two capacities and could lower the market risk with respect to selling them. J. Wirtz, P. Chew and Ch. Lovelock (2013) says that the issues about capacities in the sector of services are especially familiar to companies with fixed capacity, and they define four basic interrelations of consumer demand and capacity: excess demand, demand exceeds optimum capacity, demand and supply are well balanced and excess capacity. According to the authors, the capacity and demand should be managed.

Capacity of Distribution

The capacity of a distribution system shows the maximum volume and value of produced output which could be sold in certain conditions. On the lowest level, the capacity of the outlet is viewed. It depends not only on the standard resources but also on-demand, location, space, consumer profile, product line, space placement, use of space, promotion, offers and so on. On the next level comes the capacity of the intermediary. It is defined by the capacity of his outlets. On a higher level, one defines the capacity of the channel which results from the capacity of all intermediaries or the actual demand of end-users. The sum of the capacities of the separate channels defines the capacity of the company distribution system. The distribution capacity is not a stable value, in practice it can develop. Managing capacities in distribution enable the development in several directions depending on the conditions of the environment.

Table 2 – *Guidelines for enhancing the distribution capacity of products and services*

Guidelines for enhancing distribution capacity	Specifics
Enhancing the capacity of a single channel	This can be done through investment for enhancing the channel capacity, stimulating tools, searching for stimuli for even use of the channel capacity and others. Investments on the level of a single subject or a single commercial outlet are an opportunity for enhancing the capacity of a single channel.
Adding new channels of distribution	Designing multi-channel distribution structures has plenty of considerable advantages that contribute to enhancing the capacity of the distribution system as a whole. The two basic models of addition and competition are characterized by specifics which need to be studied and assessed beforehand as an opportunity to enhance the distribution capacity.
Enhancing individual capacities of separate channels in conditions of multi-channel distribution	It is done by looking for an opportunity to improve the capacities of separate channels through specific means and investments in capacity.
Selective enhancing of individual capacities for realization/selling	Enhancing the capacities of the company's most lucrative channels for distribution and those with the largest potential.
Enhancing the general capacity of the company's distribution system through better system management	Done through a higher level of coordination of distribution activities in separate channels and using the advantages of channel integration and specialization.
Using outside distribution systems	Done in conditions of large production capacity, high margins and opportunities for cross-selling with other products and services.
Using the potential of event distribution	Looking for opportunities to sell company products and services through events.

The above-mentioned seven variants for enhancing the distribution capacity of companies can find real-time application in their business. The judgment which of the variants to be applied can be done based on the current performance of the realization channels, the company resources and the expected benefits/costs from channel modifications.

Managing capacity in distribution

Managing the distribution system is an important part of business management. The economic crisis in the last decades put forward the issue concerning the market realization of products and services. The focus shifted from production to selling goods. The necessity for balancing the capacity of production with that of selling/distributing produced volumes is increasing. Balancing would contribute to achieving independence and smaller risks for companies.

Balancing capacities in the framework of managing company distribution is based on the following considerations: the lifecycle of company products, lifecycle of the company realization channels, segment specifics of the market, market potential,

opportunities for production and distribution economies of scale, efficiency and profitability, investments and return on them.

Table 3 – *Basic considerations in balancing capacities in business*

Considerations in balancing capacities in business	Specifics
The lifecycle of company products	In designing the expansion of a company's distribution capacity one needs to give a reason with the stages of product development and the forecast for the coming years. In support of this reason, an analysis of the sales structure in time can be applied with respect to products and market segments. The changes in volumes and the structure of demand are also reported when capacities are enhanced.
The lifecycle of the channels of company realization	Multi-channel distribution enables diversification of risks that refer to companies' market realization and reaching economic advantages that are based on channel addition, specialization and integration. Making an investment in increasing the capacity of a distribution channel can have a favourable effect on the remaining distribution channels. The channel lifecycle can be of utmost significance for investing in capacity.
Segment specifics of the market	Absorption of target segments, purchasing power, competitive conditions and the chance for consumer shifting between brands and channels of realization.
Market potential	The market potential is determinative in investing in increased capacities. The calculated value is taken into consideration in modifying distribution systems.
Opportunities for economies of scale in production and sales	Balancing the production and distribution capacity is exceptionally important for products and services with a high possibility for economies of scale. Each case can be particularly assessed and individually treated according to the particular estimates. It is exceptionally important for justifying the increase of the distribution potential in constant high production costs for making products and services.
Efficiency and profitability	The decisions for increasing the potential are justified with the chance to improve the efficiency and profitability of production and realization. In cases of increasing the potential of part of the realization channels, one chooses the channels that have the highest values of efficiency and profitability.
Investment and return on them	The opportunities for investment and project assessment and return on them.
Barriers for entry and exit of consumers in contract/subscription services	Assessing the possibility for user mobility from channel to channel and from brand to brand and so on.

Balancing the production and distribution capacity in the framework of capacity management is important both for companies and all non-profit organizations. Tracking production and sales in time and space, as well as the speed of processes, provide significant information which can be used for the goals of business and improving companies' market positions.
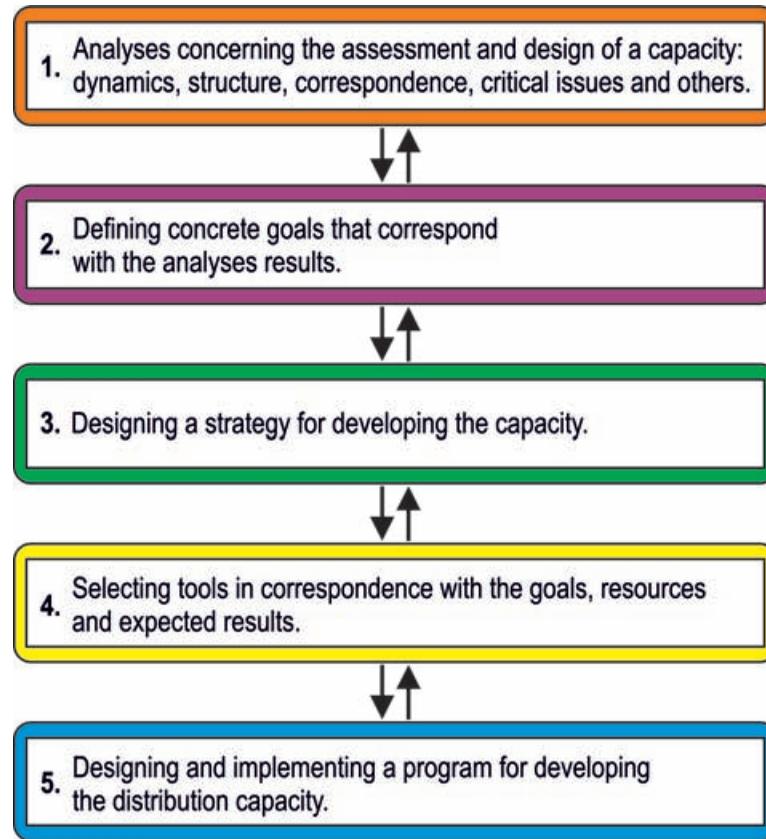
Table 4 – *Means in managing distribution capacities*

Tools in managing distribution capacities	Characteristics
Innovations	Innovations that can be both high-cost and low-cost. Investments with direct impact can be target oriented to increase production capacity. Other company innovations can have a favourable transfer effect on distribution.
Tools for stimulating sales	Used for balancing demand and supply, stimulating volumes and frequency, generating market interest in offered products and services and others.
Advertising tools	Applied in overcoming the imbalance in the form of cycles, seasonality and others. Advertising displays and dispensers have direct relation to distribution capacity. Their volume defines the distribution capacity on the level of commercial outlet.
Marketing investments	Investments in capacity need a precise forecast concerning demand on the market. The possibility of consumers shifting from one provider to another also needs to be taken into consideration. Since distribution relates to performing many functions, investments in capacity have to be balanced.
Training and motivation	Staff training for improving the carrying capacity of distribution outlets and contributing to larger volumes and bigger worth of sales. Staff motivation, if not corresponding with the distribution capacity, proves risky for the company – market, financial risk and so on. F. Kotler tells about the need for training and relevant motivation of the participants in the distribution channel.
CRM	Investing in capacity and company CRM has to be compatible. Otherwise, the company faces high market and financial risk.
Flexible marketing/flexible capacity management	Flexible marketing is a tool which can react immediately to a weak usage of the capacity through tools which can increase the capacity quickly and efficiently. Flexible management of capacities also includes outsourcing.
Information	Information is a tool that influences consumer decisions by having an impact on expectations, intentions, and circumstantial characteristics of purchase and so on. As a significant factor, it can influence distribution capacity and its use, in online distribution channels at that. It relates also to balance the production and distribution capacity.
Channel integration	Integration of channels can have a positive impact on the distribution capacity. The various forms of channel integration are oriented to achieving benefits.

The tools in managing distribution capacities can be used independently and in combination depending on particular conditions and the parameters of imbalance. They are a significant component in making decisions in capacity management. The process of managing capacity can be presented in five steps (Figure 1).

1. Analyses concerning the assessment and design of a capacity: dynamics, structure, correspondence, critical issues and others.

2. Defining concrete goals that correspond with the analyses results.

3. Designing a strategy for developing the capacity.

4. Selecting tools in correspondence with the goals, resources and expected results.

5. Designing and implementing a program for developing the distribution capacity.

Figure 1 – *The process of managing capacity*

Analyses are an important part in support of designing and modifying distribution capacities. The inclusion of key variables, comparison and marketing interpretation is important for defining the imbalance between a company production and distribution capacity. Studying structures, seasonality, cycles and so on is necessary in order to present a clear picture of using capacities in time and space. Important is also the speed of distribution processes that relate to efficiency and turnover. The second step is defining the goals of capacity development of company distribution. This suggests clear modification which is actually increasing, maintaining, decreasing or restructuring the distribution capacity. One needs to take into consideration both the analyses findings and the current and projected values of the production capacity.

Making strategies for developing capacity aims for presenting basic directions for increasing capacity, ways for improving its use and the opportunities for balancing it with production capacity. The variety of tools within capacity management presupposes arguments in choosing them. It has to contain both an assessment of the direct effect of using a particular tool and the

transfer effects on other activities, processes and results. It is necessary to keep up the balance between the various tools.

Designing and implementing a program for developing distribution capacity is a significant stage within which separate activities are harmonized in time and space. A significant element is balancing the material and non-material assets directed to developing the capacity and the human resources involved in distribution. Balancing resources and coordinating the activities is a prerequisite for achieving capacity goals and the company goals as a whole.
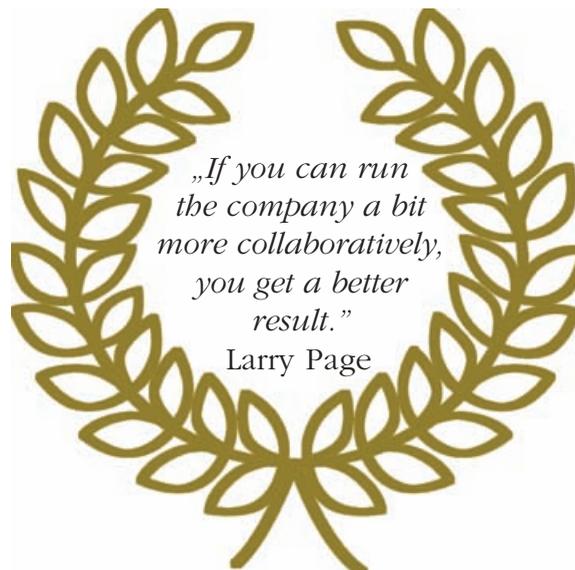
Conclusion

The design and management of distribution capacities are of particular importance that is especially necessary under the new economic and political conditions. The sensitive changes in demand, supply and prices influence the level of using the production and distribution capacity of companies, thus influencing the key values of efficiency and profitability. The inconsistency between production and distribution capacity of companies exposes them to high production and financial risk. Investing in capacities is preceded by a large-scope argumentation which needs to present the critical issues and the possibilities to solve those. Balancing and coordinating capacities in business is a prerequisite for achieving the company goals and taking benefits from the effects of increased production and sales. A favourable effect would be reported for consumers too – lower prices as a result of economies of scale, better service, more ergonomic environment for purchasing and consumption. The use of innovative technologies by business and households is a prerequisite both for using capacity management on behalf of small, medium and large companies and for binding it on behalf of business and end-users. This could make an impact for the benefit of more precise planning in time and space.
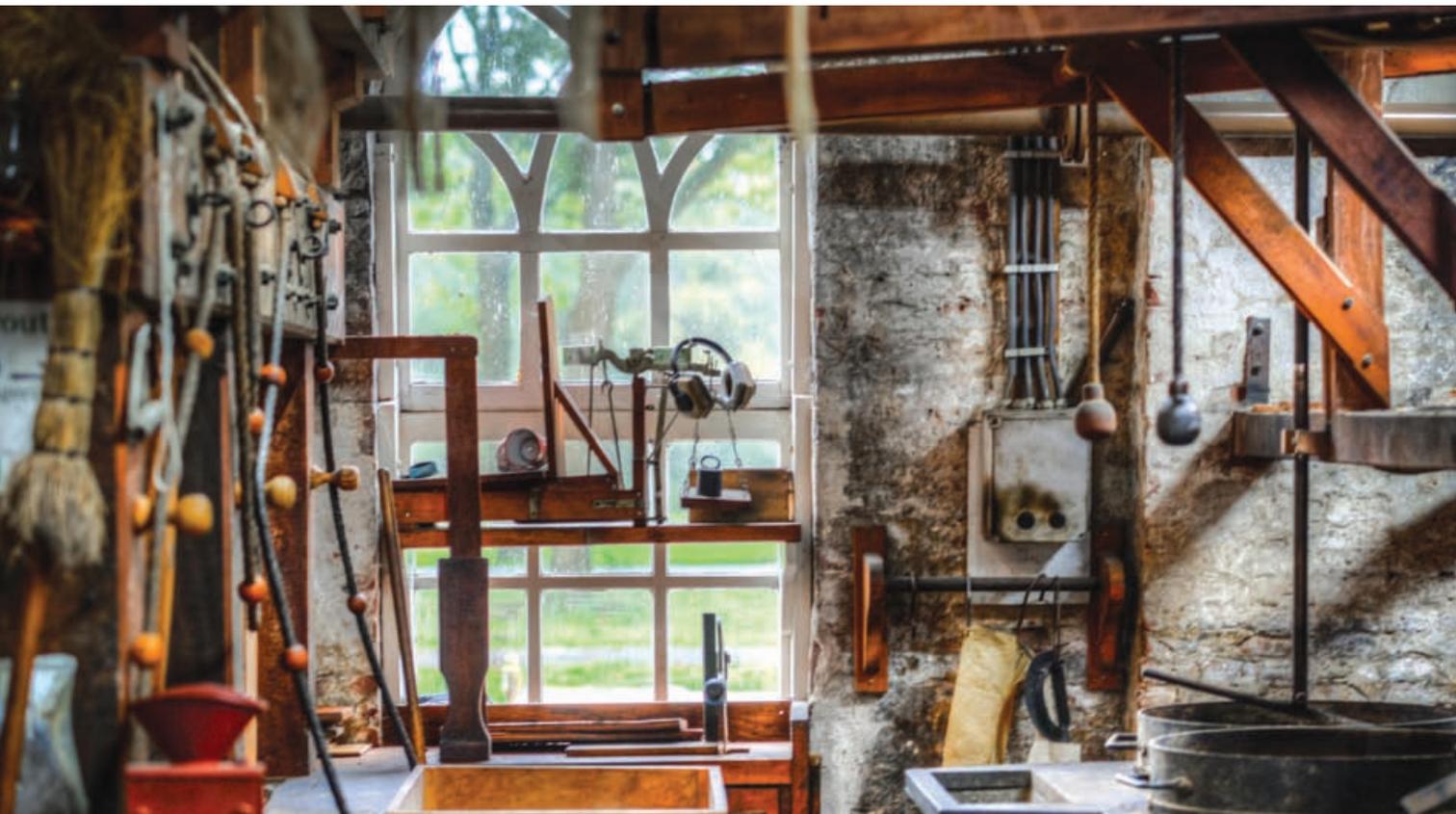
REFERENCES

1. Buyukkaramkli, N., Bertrand, J., Ooijen, H.(2013), *Periodic capacity management under a lead-time performance constraints*. OR Spectrum. p. 223. [Online]. Available from: http://download.springer.com [Accessed 1st June 2017].

2. Dibb, S., Simkin, L., Pride, W., Ferrel, O. (2012) *Marketing Concepts and Strategies*. 6th edition. Cengage Learning. ISBN 9781408064320. 2012. pp. 425-427

3. Homos, T. (1973) *Capacitatea de producție* (in English: *Production Capacity*). Tehnica Publishing House. Bucharest.

4. Kotler, F. (2005) *Управление на маркетинга: Структура на управлението на пазарното предлагане*. (in English: *Marketing Management: Structure of Market Supply Management*). Classics and Style. ISBN 954-9964-19-1. 2005. pp. 462-463

5. Lefter, V. (1985) *Capacitatea de producție* (in English: *Production Capacity*). Economica Review no. 42.

6. Plumb, I., Ionescu, S. (2004) *Reingineria serviciilor* (in English: *Service reengineering*). ASE Bucharest.

7. Schonberger, R. (1991) *Building a chain of customer*. Comunita Publishing House. Milan.

8. Shugan, S. (2002) *Service Marketing and Management: Capacity as a Strategic Marketing Variable* in B. Weitz, R. Wensley (ed) Handbook of Marketing. SAGE. ISBN 0 7619 5682 4. pp. 484-488.

9. Wirtz, J., Chew, P., Lovelock, Ch. (2013) *Essentials of Services Marketing*. 2nd Edition, Pearson, ISBN 978-9810686185. p. 266.

10. Ye, Q., Duenys, I., Kapuscinski, R. (2012). *Should Competing Firms Reveal Their Capacity?* Wiley Online Library. p.1. [Online]. Available from http://search.ebsco-host.com/ [Accessed 1st June2017].

„If you can run the company a bit more collaboratively, you get a better result."
Larry Page

Logistic Performance in Supply Chain Management

Bianca Guliman (1), Sorin Ionescu (2)

(1) Vodafone Group Technology, Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania

This paper presents a theoretical conceptual model for creating performance through logistics performance, customer satisfaction and financial performance for a whole supply chain. The problem for both practitioners and researchers is that supply chain performance is difficult to measure. This study incorporates an established measure of logistics performance as a surrogate for supply chain performance. Logistics is clearly a supply chain function in that it links manufacturers and customers although those customers may not be the ultimate customers in the supply chain. Furthermore, in the context of logistics performance, customer satisfaction is a key construct, as it provides marketers and business owners with a metric that they can use to manage and improve their businesses. The scope of this work is to evidence that a supply chain focus will enhance logistics performance, which will ultimately result in improved organizational performance.

Keywords: logistic performance, value, attributes of performance measurement, customer satisfaction

Introduction

In recent years, developments in the dynamic global economic environment have caused many businesses to modify their strategies in order to remain competitive. One of the most significant drivers of change in the business environment in the world today is globalization. A notable result of this phenomenon in business has been the opening up of new markets that were previously closed due to cost, regulations or indirect barriers such as the ability to tape labour and knowledge resources on a worldwide scale (Kraemer, 2002).

„*Our method was to develop integrated products, and that meant our process had to be integrated and collaborative.*"
Steve Jobs

Because of organizations' new requirements for better monitoring and controlling operational activities, more and more non-financial measures are integrated into performance measurement systems. Due to globalization and constantly changes, the usual objective of any business unit is to „create value and remove waste". How waste can be defined? Within this objective, waste is typically seen as „anything that does not add value". Logistics performance measurement system is a strategic objective that any firm should consider when discussing removing the waste and bringing value. Furthermore, the value is brought to and by end customer. Nowadays it is a sure thing that customer satisfaction has many aspects and is not just linked to the quality and the costs of the product. Given the many choices of product available to the customer, the advances in technologies described above have also increased customer's expectation of better product functionality and quality. The challenge now for business is to provide quality products, exceptional service, timeliness of delivery, and flexibility so as to respond to customer's desire for specific features but at the same time maintaining competitive advantage. In addition to all these challenges faced by businesses, operating in a global economy means providing services to customers from different societal and cultural backgrounds. This new business environment requires firms to be sensitive to these differences and to that extent, firms are also required to focus on the external environment in which they operate and the society in which the customer lives.

Logistics Performance in Literature

Theoretically, logistics performance can be regarded as a portion of the larger notion of the firm or organizational performance (Chow *et al*., 1994). For a long time, the measurement of logistics performance was evaluated through a few financial measures, such as profit, cost, return on the asset because logistics was regarded as a supporting activity and evaluated as a cost centre (Fawcett and Cooper, 1998). Nevertheless, with the dramatic changes in business environment, companies, especially in mature industries where products tend to be similar from a technical point of view, began to heavily turn to logistics to improve customer service, differentiate from their competitors and finally develop a key competency for the firm (Keebler & Plank, 2009). The old-fashioned logistics performance measuring methods that heavily focus on financial measures cannot meet its new role within an organization any longer.

Chow *et al*. (1994) categorized logistics performance measures into „hard" and „soft" class. „Hard" measures are those that can measure directly, such as return on as-

sets, order lead time. „Soft" measures refer to measures that are difficult to be measured directly, such as customer satisfaction. They claim that „hard" and „soft" measures have their own strengths and weaknesses. The first one treats quantitative measures such as order cycle time, fill rates and costs, while the second deals with qualitative measures like manager's perceptions of customer satisfaction and loyalty (Chow *et al*., 1994).

Quantitative measures are easily computable with some simple mathematical expressions while the qualitative ones require more sophisticated tools of measurement (e.g. regression analysis, fuzzy logic, Data Envelopment Analysis, etc.). Customer satisfaction is the new soft measure that has been widely discussed. How well logistics increases customer satisfaction is the information that managers desire to know after the role of logistics has been transferred from cost reduction to value-added for customers. However, measures that relate to customer satisfaction are hard to acquire in reality. So, in order to measure it, managers resort to measures that may affect customer satisfaction, such as logis-

tics quality, embodied by flexibility, reliability, responsiveness (Table 1).

In order to clearly understand how performance can be measured, the literature offers us the concept logistics performance measurement framework (LPMFs), categorized into five groups (Table 2): perspective-based performance frameworks; process-based performance frameworks; activity-based performance framework; financial-ratio frameworks; hybrid performance frameworks.

The logistics performance measurement framework is a combination of hierarchical and process-based structure. Figure 1 exemplifies the logistics performance measurement framework designed for measuring logistics operation in an oil company. In the framework, the enterprise strategy and objectives are at the top level. At the business unit level, four main business units: human resources, manufacturing, accounting, sales & marketing, plus external environment are identified to have impact on logistics operations. Logistics activities are categorized into four logistics processes: supplying, inbound logistics, warehousing and outbound logistics.
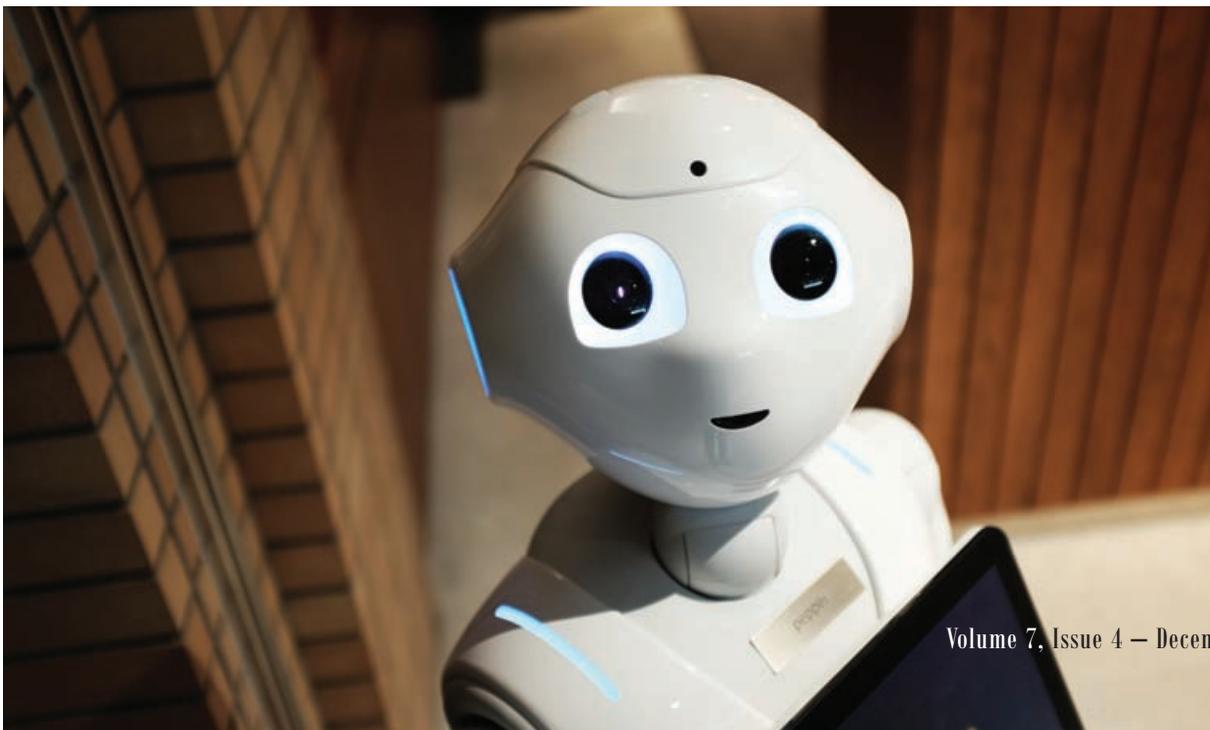
Table 1 – *Performance measurement dimensions*

Performance measurement dimension categories	Performance measurement dimensions	Papers
Attributes of performance measures	Efficiency, effectiveness, differentiation	• Griffis *et al.* (2004) • Neely (1995) • Bobbitt (2004) • Fugate *et al.* (2010)
Nature o performance measures	Financial and non-financial	• Brewer and Seph (2000) • Gunasekaran (2004) • Said *et al.* (2003) • Rafele (2004)
Decision-making levels	Strategic, tactical and operational level	• Gunasekaran *et al.* (1994) • Gunasekaran and Kobu (2007) • Rushton *et al.* (1994)
Components of performance measures	Asset management, cost, customer service, productivity and logistic quality, customer satisfaction	• Fawcett and Cooper (1998) • Chan and Qi (2003) [b] • Jothimani and Sarmah (2014) • Huo and Ji (2008) • Keebler and Plan (2009) • Franceschini and Rafele (2000) • Aguezzeoul (1994)
Bases of performance measures	"Hard"/quantitative/Direct VS "soft"/qualitative/Indirect	• Chow *et al.* (1994) • Staudt *et al.* (2015) • Gunasekaran *et al.* (2001)
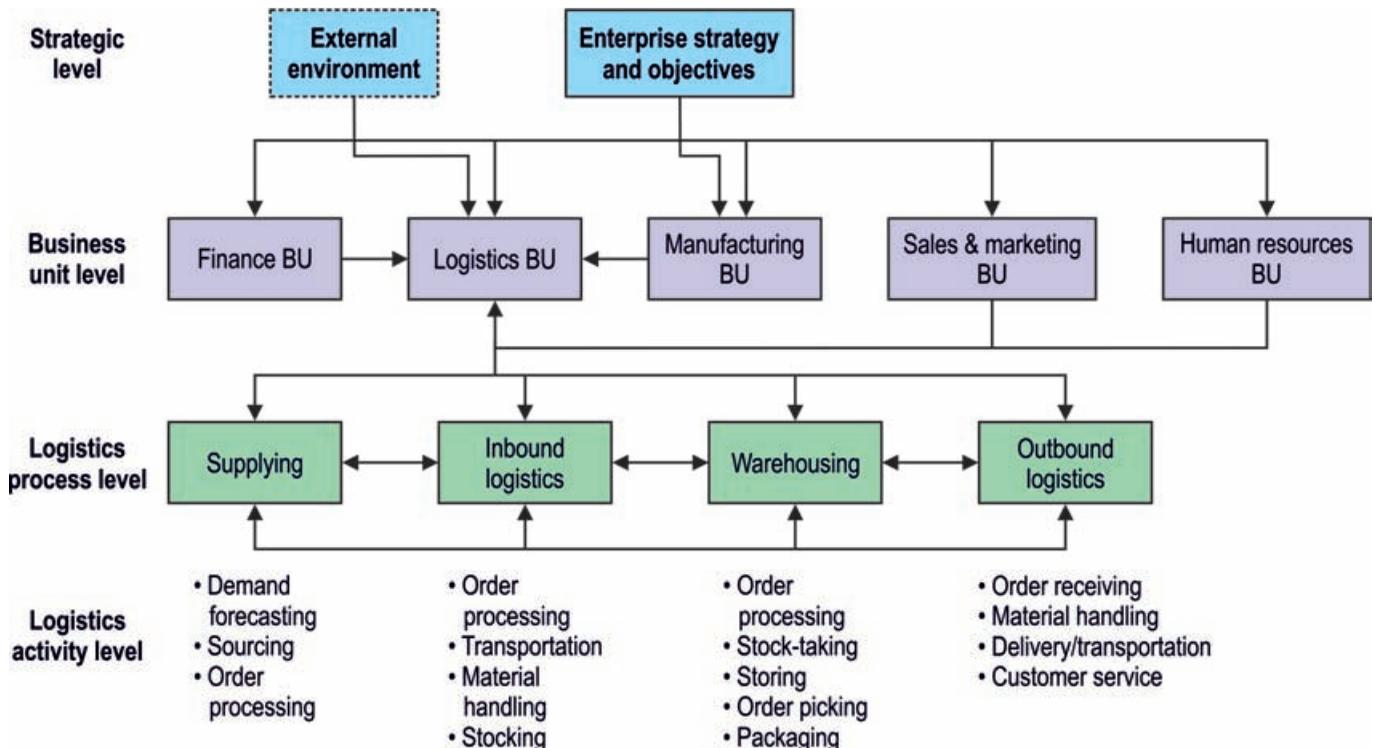
Figure 1 – *Logistics performance measurement framework*

The supplying process aims to source raw materials or other resources needed. Inbound logistics realizes the physical movement of raw materials or other resources from supplier's place to company's warehouse. And warehousing process is to maintain inventory and prepare finished product for outbound. Outbound logistics helps to physically move finished product from company's warehouse to customers' places. According the scope of four processes, logistics activities are clustered under each logistics process. The logistics processes' objectives are directly influenced by logistics objectives and indirectly by requirements from other business units. The objectives of each logistics process are then shared with logistics activities clustered in each process.

Table 2 – *Performance measurement framework*

Performance measurement framework category	Papers	Merits and demerits
Perspective-based	1) Balanced Score Card (BSC) (Brewer and Seph, 2000; Bhagwat and Sharma, 2007; Chia *et al.*, 2009; Najmi and Makui, 2012) 2) Four perspectives: manager employee, customer and society (Krauth *et al.*, 2005) 3) Integration of BSC and Performance Prism to envelope more stakeholders (Shaik and Abdul-Kader, 2013)	BSC model forces companies to pay their attentions on aspects that can improve the performance of the company (Bhagwat and Sharma, 2007). It communicates and links strategic objectives and measures (Kaplan, Norton, 1996). The demerits of BSC remain in the multi-objective and multi-criteria evaluation of the objects (Shaik and Abdul-Kader, 2013). It provides no theories about how to solve conflicts among perspectives.
Process-based	1) SCOR (Gunasekaran, 2001; Lai *et al.*, 2002; Jakhar and Barua, 2014; Jothimani and Sarmah, 2014; Chia *et al.*, 2009) 2) Logistics Processes (Garcia *et al.*, 2012; Chan and Qi [a], 2003; Chan and Qi [b], 2003; Kurien and Qureshi, 2011)	It encourages horizontal integration, but discourages the linkage between strategy and operation (vertical integration). Some frameworks employ hierarchical structure to reinforce vertical integration.
Activity-based	1) Logistics functions: transportation Mgmt, inventory Mgmt, order-customer Mgmt and demand coordination (Kayakutlut and Biiyiikzakan, 2006; Cooper *et al.*, 2012)	Easy to develop measures for individual logistics activities. But it encourages local optimization by neglecting the interdependence between logistics activities.
Financial ratio based	1) Economics value added (EVA) (Lambert and Pohlen, 2001) 2) Integration of ABC and EVA (Pohlen and Coleman, 2005)	These frameworks well connect financial with non-financial measures, so that managers have strong motivations to improve non-financial measures.

Research Hypotheses

Based on the research and also on the actual business environment we consider suitable to build up a logistics performance measurement model taking into consideration the following pillars: supply chain management strategy; logistics performance; marketing performance; customer value; financial performance.

The hypothesis that we want to test is structured in a graphical model (Figure 2):

H1: A supply chain management strategy is positively associated with logistics performance;

H2: A supply chain management strategy is positively associated with marketing performance;

H3: A supply chain management strategy is positively associated with financial performance;

H4: Logistics performance is positively associated with marketing performance customer satisfaction;

H5: Logistics performance is positively associated with financial performance;

H6: Marketing performance is positively associated with financial performance and customer satisfaction.
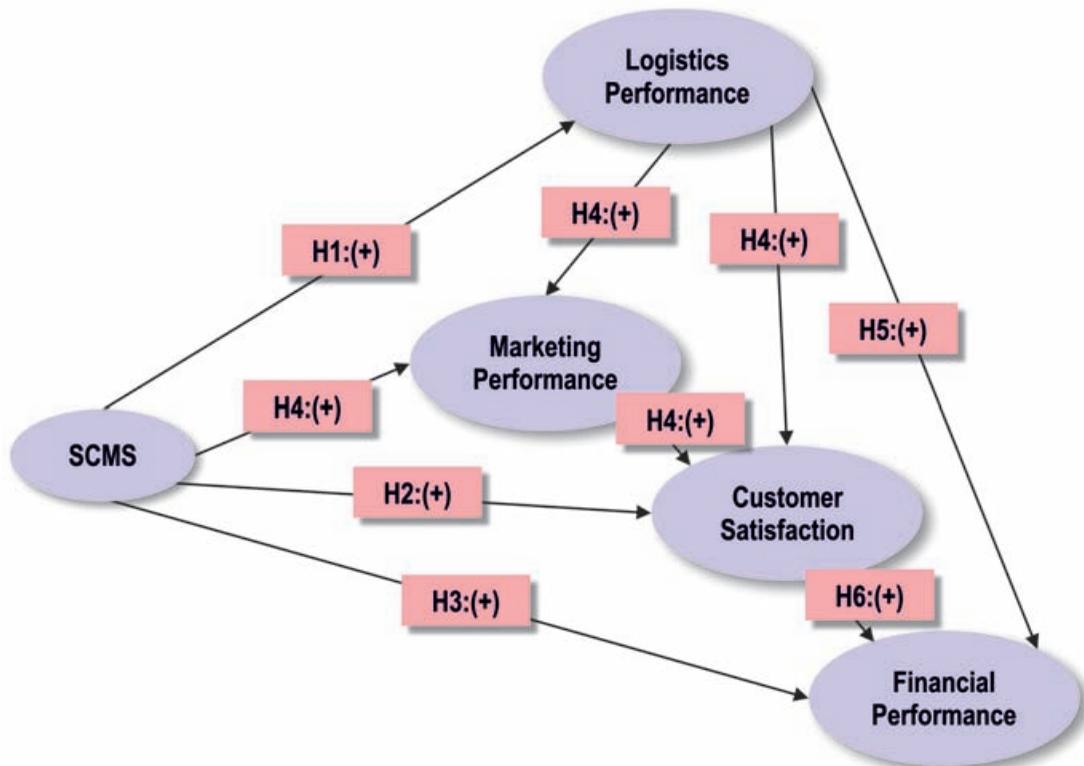
Figure 2 – *Logistics performance model with hypotheses*

Research Results

For testing our proposed model, we selected 15 oil companies from Romania and was applied to Logistic Managers and Business Performance Managers. The sample frame was constructed primarily to target relatively high-level managers such as logistic and business performance managers. These managers were targeted in the belief that, while they are intimately aware of the internal operational workings of their organizations, they are also well aware of

their organization's supply chain strategy and the performance of such supply chain functions as logistics. In total, 142 responded with completed instruments for a response rate of 9.7 per cent. Table 3 is showing the Measurement scales used.

Respondents were asked to indicate the importance of the listed issues and concerns to their organization's supply chain efforts. Logistics performance was measured using a 13-item scale developed by Bowersox *et al.* (2000). Respondents were asked to rate their organization's perform-

ance compared to that of their competitors on the performance metrics related to customer service, cost management, quality, productivity, and asset management performance metrics. The organizational performance was measured using two scales previously used and assessed by Green and Inman (2005). Respondents were asked to compare their organization's financial performance (four-item scale) and marketing performance (three-item scale) to the performance of competitors.

Table 3 – *Measurement scales*

Supply chain management strategy
Please indicate the importance of each of the following issues/concerns to your organization's supply chain management efforts (1 = low importance, 7 = high importance)

SCMS3	Searching for new ways to integrate SCM activities
SCMS4	Creating a greater level of trust throughout the supply chain
SCMS6	Establishing more frequent contact with supply chain members
SCMS9	Communicating customers' future strategic needs throughout the supply chain
SCMS10	Extending supply chains beyond your firm's customers/suppliers
SCMS11	Communicating your firm's future strategic needs to suppliers

Logistics performance
Please rate your company's performance in each of the following areas as compared to the performance of your competitors (1 = much worse than competition, 7 = much better than competition)

LOGPERF3	Delivery speed
LOGPERF5	Delivery dependability
LOGPERF6	Responsiveness
LOGPERF8	Delivery flexibility
LOGPERF10	Order fill capacity

Financial performance
Please rate your organization's performance in each of the following areas as compared to the industry average (1 = well below industry average, 7 = well above industry average)

FINPERF1	Average return on investment over the past three years
FINPERF2	Average profit over the past three years
FINPERF3	Profit growth over the past three years
FINPERF4	Average return on sales over the past three years

Marketing performance
Please rate your organization's performance in each of the following areas as compared to the industry average (1 = well below industry average, 7 = well above industry average)

MRKPERF1	Average market share growth over the past three years
MRKPERF2	Average sales volume growth over the past three years
MRKPERF3	Average sales (in dollars) growth over the past three years

Four of the study hypotheses are supported by the standardized estimates and associated t-values. Table 4 is showing the statistics and the correlations between indicators. The relationship between SCM Strategy and logistics performance (H1) is significant at the 0.05 level with an estimate of 0.23 and t-value of 2.52. The estimate of 0.21 for the relationship between supply chain management strategy and marketing performance (H2) is significant at the 0.05 level with a t-value of 2.34. The relationship between supply chain management strategy and financial performance (H3) is not significant with an estimate of 0.00 and t-value of 0.04. The relationship between logistics performance and marketing performance and customer satisfaction (H4) is significant at the 0.05 level with a standardized estimate of 0.69 and an associated t-value of 7.67. The relationship between logistics performance and financial performance (H5) is not significant with a standardized estimate of 0.18 and t-value of 2.02. The relationship between marketing performance and customer satisfaction and financial performance is significant at the 0.01 level with a standardized estimate of 0.74 and at-value of 7.87.
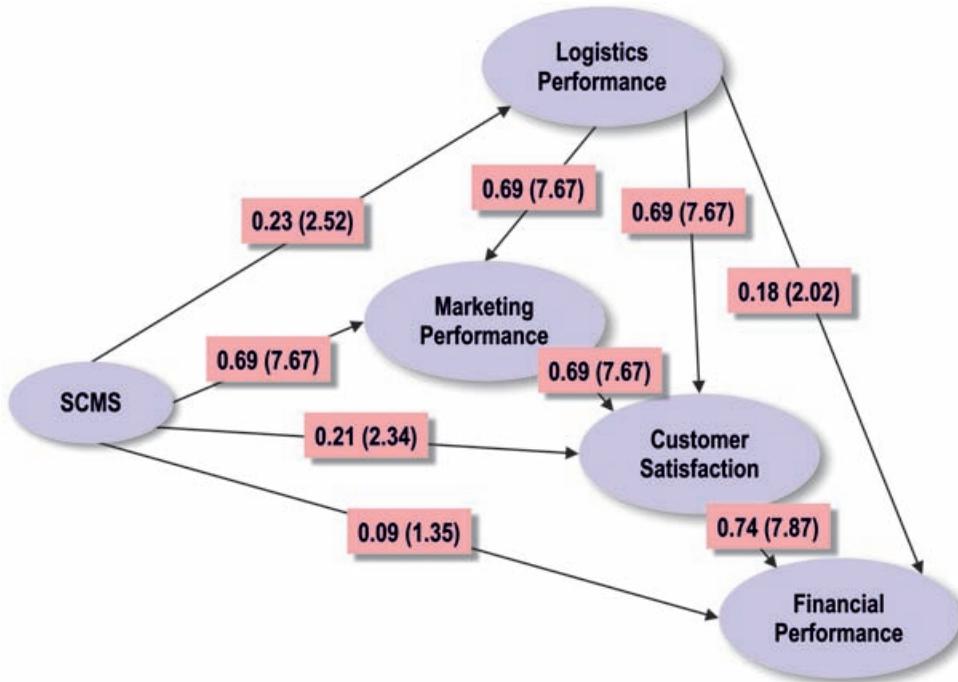
Conclusions

Logistics performance is positively impacted by supply chain management strategy and directly impacts customer satisfaction and marketing performance which, in turn, impacts financial performance. These results support the positive relationship between logistics performance and organizational performance within the oil sector. Figure 3 is graphically showing the study results.

Table 4 – *Descriptive statistics and correlations*

	Mean	SD			
A. Descriptive statistics (*n* = 142)					
Supply chain management strategy (SCMS)	4.91	1.18			
Logistics performance (LP)	5.42	.93			
Financial performance (FP)	4.63	1.22			
Marketing performance (MP)	4.55	1.30			
B. Correlation matrix (*n* = 142)	SCMS	LP	FP	MP	
SCMS	1.000				
LP	0.230*	1.000			
FP	0.193*	0.243*	1.000		
MP	0.248*	0.225*	0.706**	1.000	

Note: **Correlation is significant at the 0.01 level (two-tailed)

Successful adoption of a supply chain management strategy requires a supply chain focus and efforts by managers to strengthen linkages with both suppliers and customers.

These stronger relationships result in improved performance of supply chain-related functions, such as logistics, purchasing and selling. In this particular case, a supply chain focus resulted in improved

Figure 3 – *Logistics performance proposed model with standardized coefficients*

logistics performance, which in turn led to improved organizational performance and customer satisfaction.

Conclusions

The decision-makers from the oil industry should now consider the implications for the overall supply chain when making decisions related to their organization's purchasing, selling and logistics processes. Those processes are integrated and coordinated throughout the supply chain to better serve the ultimate customers. Logistics is clearly a function that it links company and customers although those customers may not be the ultimate customers in the supply chain. The logistics processes linking oil manufacturer and customers play an important role in supporting a supply chain management strategy.

REFERENCES

1. Bowersox, D.J., Closs, D.J., Stank, T.P. Keller, S.B. (2000) *„How supply chain competency leads to business success".* Supply Chain Management Review. Vol. 4 No. 4. pp. 70-8.
2. Bhagwat, R., Sharma, M.K. (2007) *Performance measurement of supply chain management: A balanced scorecard approach.* Computers & Industrial Engineering. 53. pp. 43-62.
3. Brewer, P.C., Speh, T.W. (2000) *Using the Balanced Scorecard to Measure Supply Chain Performance.* Journal of business logistic. 21(1). pp. 75-93.
4. Chan, F.T.S., Qi, H.J. (2003a) *Feasibility of performance measurement system for supply chain: a process-based approach and measures.* Integrated Manufacturing Systems. 14(3). pp. 179-190.
5. Chan, F.T.S., Qi, H.J. (2003b) *An innovative performance measurement method for supply chain management.* Supply Chain Management: An International Journal 2003. 8(3). pp. 209-223.
6. Chow, G., Heaver, T. & Henriksson, L. (1994) *Logistics Performance.* International Journal of Physical Distribution & Logistics Management. 24(1). pp. 17-28.
7. Cooper, O., Tadikamalla, P. and Shang, J. (2012) *Selection of a Third-Party Logistics Provider: Capturing the Interaction and Influence of Performance Metrics with the Analytical Network Process.* Journal of Multi-Criteria Decision Analysis. 19(3-4). pp. 115-128.
8. Fawcett, S.E. & Cooper, M.B. (1998) *Logistics Performance Measurement and Customer Success.* Industrial Marketing Management. 27. pp. 341-357.
9. Garcia, F.A., Marchetta, M.G., Camargo, M., Morel, L. Forradellas, R.Q. (2012) *A Framework for Measuring Logistics Performance in the Wine Industry. Intl. J. Production Economics.* 135. pp. 284-298.

10. Green, K.W., jr. Inman, R.A. (2005*) „Using a just-in-time selling strategy to strengthen supply chain linkages".* International Journal of Production Research. Vol. 43 No. 16. pp. 3437-53.

11. Gunasekaran, A. (2001) *Performance Measures and Metrics in a Supply Chain Environment.* Intl. J of Operations & Production Management. 21(1/2). pp. 71-87.

12. Jakhar, S.K., Barua, M.K. (2014) *An integrated model of supply chain performance evaluation and decision-making using structural equation modelling and fuzzy AHP.* Production Planning and Control. 25(11). pp. 938-957.

13. Jothimani, D., Sarmah, S.P. (2014) *Supply Chain Performance Measurement for Third Party* Logistics. Benchmarking: An International Journal. 21(6). pp. 944-963.

14. Kayakutlu, G., Biiyiikzkan, G. (2007) *Assessing Performance Factors for Logistics Companies.* Troyes. France: IEEE.

15. Keebler, J., Plank, R. (2009) *Logistics performance measurement in the supply chain: a benchmark.* Benchmarking: An International Journal. 16(6). pp. 785-798.

16. Kraemer, K.L. (2002) I*mpacts of Globalisation on E-Commerce Adoption and firm Performance.* A Cross Country Investigation.

17. Krauth E., Moonen H., Popova V. (2005) *Understanding Performance Measurement and Control in Third Party Logistics.* ECIS Proceedings. 157.

18. Lambert, D.M., Pohlen, T.L. (2001) *Supply Chain Metrics.* International Journal of Logistics Management. 12(1). p. 1.

19. Pohlen, T.L., Coleman, B.J. (2005) *Evaluating Internal Operations and Supply Chain Performance Using EVA and ABC.* Advanced Management Journal. 70(2). p. 45.

20. Shaik, M.N., Abdul-Kader, W. (2013) *Transportation in reverse logistics enterprise: a comprehensive performance measurement methodology.* Production Planning & Control. 24(6). pp. 495-510.

*„Coming together
is a beginning, staying
together is progress,
and working together
is success."*
Henry Ford

Skills for Virtual Communication

Elena Oliviana Epurescu

University POLITEHNICA of Bucharest, Romania

Abstract

The use of new information technologies is in line with the provisions of European Union force for the third millennium. The objectives are: describing and analyzing the main features of European projects in e-learning; specifying the benefits of the widespread use of new information technologies; identifying ways of capitalizing on the computer for each of the specialties; arguing why the computer use in the study for each subject and at any time of enrollment; listing some of the advantages of belonging to a virtual community; describing of virtual educational communities; enrolling in virtual educational communities; requesting for inclusion and participation in these communities active and sustained; looking for educational information on virtual support necessary to optimize the educational process, increasing the quality and timeliness of teaching performance; participating in forums on educational themes, making an exchange with other teachers in Europe; communicating in a virtual manner, in English effectively with teachers, pupils/students from other cultures; designing virtual learning units; designing and developing of content to participate in the European educational community pages.

Keywords: virtual communication, social networks, social media, Facebook

Introduction

The following represents a list of characteristics of this type of communication: it can help, but at the same time, distract people from more important things from the real-life; attracts youth into its traps, offering them an imaginary and virtual world; it is very time consuming as well for kids as for young people; generates addiction. It allows interaction with a very large number of imaginary, virtual friends;
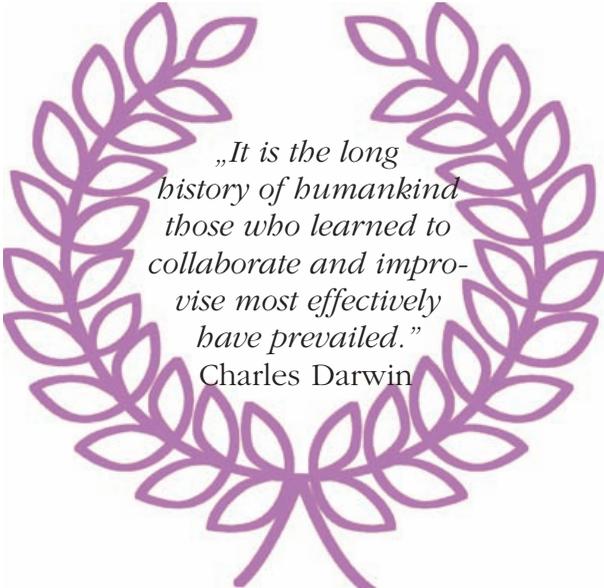
„It is the long history of humankind those who learned to collaborate and improvise most effectively have prevailed."
Charles Darwin

* Correspondence to: epurescuoliviana@yahoo.com

it has a universe totally different from the real world; it has no boundaries, blockages and offers a fake universe; it creates the premises of a communication with „virtual friends", as in the meantime, in the real life, the real friends are fewer and fewer and they even disappear; it affects inter-human relationships, from simple interactions to expressing feelings and emotions; it makes people colder and colder, less communicative, more introverted and their overall interactions very superficial; it generates discussions that only concentrate on the problems that need to be fixed; is a very short communication that actually adds a distance among the dialog partners; its components of communication do not act in interdependency; it might generate a misunderstood or distorted message; the nonverbal and paraverbal elements are not present; it entertains doubt, uncertainty regarding the „face" that is on the other side; from an emotional perspective, it lacks the depth of a thought, of an idea and so on; affective feelings are reduced and minimized by quitting the information given by the senses; it is a „refuge" for many teenagers and youth that leads to rejecting its fellows and even to avoid facing its own fears; it reduces the ability of a person to empathize with those surrounding them; the contact with reality is lost and this gives birth to drug or alcohol addiction.

A few benefits of virtual communication are that you can get a large number of friends, it doesn't depend on certain hours and it is useful just as an alternative.

Methodology of Research

The purpose of the research: identifying the level of knowledge, of use of the social networks. The objectives of the research:

O1. Establishing the level of self-evaluation in regard to knowing the use of a computer for daily activities.

O2. Identifying a specific social network.

O3. Defining the level of interaction in a social network.

O4. Establishing the level of addiction, the subjects' need to use social networks.

The hypotheses of the research:

H1. Knowing and using the computer leads to good usage of the applications that exist on the internet.

H2. The social networks are responsible for how people socialize to some extent.

H3. If we use the social networks on a daily basis leads to a higher addiction of them.

- **The target group.** The target group is represented by persons that are part of different professional social networks.

For the research part of the paper, I chose a sample of 57 persons from different activity fields.

- **Research methods.** The method chosen was the survey. The survey was built with the purpose of identifying the level of self-evaluation of the computer skills and social networks usage one has. The survey was made and managed with GoogleDocs.

Results and Discussions

The survey was applied and filled by a number of 57 persons, having the following personal traits: 79% female and 21% male, with ages from 20-60 years old, from one company. At the beginning of the questionnaire were gathered details about the use of a computer in daily life.

1. How often do you use the computer?
   Answers (Figure 1): many times a day: 53 (93%), once a day: 4 (7%), two times a week: 0 (0%), once a week: 0 (0%), never: 0 (0%).

2. Where do you use the computer?
   Answers: (Figure 2): at home: 14 (25%), at work: 5 (9%), permanently: 38 (67%).

3. Where do you have access to the internet?
   Answers (Figure 3): at home: 14 (25%), at work: 2 (4%), permanently: 41 (72%).

The majority of the persons use the computer frequently (93%), as well as home, as at work (47%), having access to the internet through cable or through mobile devices.

The following questions regard the basic skills of using the computer for making the documentation necessary for the daily routine. As we can see from the following answers, the interviewees have the basic skills for word processing and less for image editing.

4.1. My personal skills using computer software – a text editor (i.e. Word): Answers: very good 49 (86%), good 7 (12%), satisfying 1 (2%).

4.2. My personal skills using computer software – a spreadsheet program (i.e. Excel): Answers: very good 36 (63%), good 16 (28%), satisfying 5 (9%).
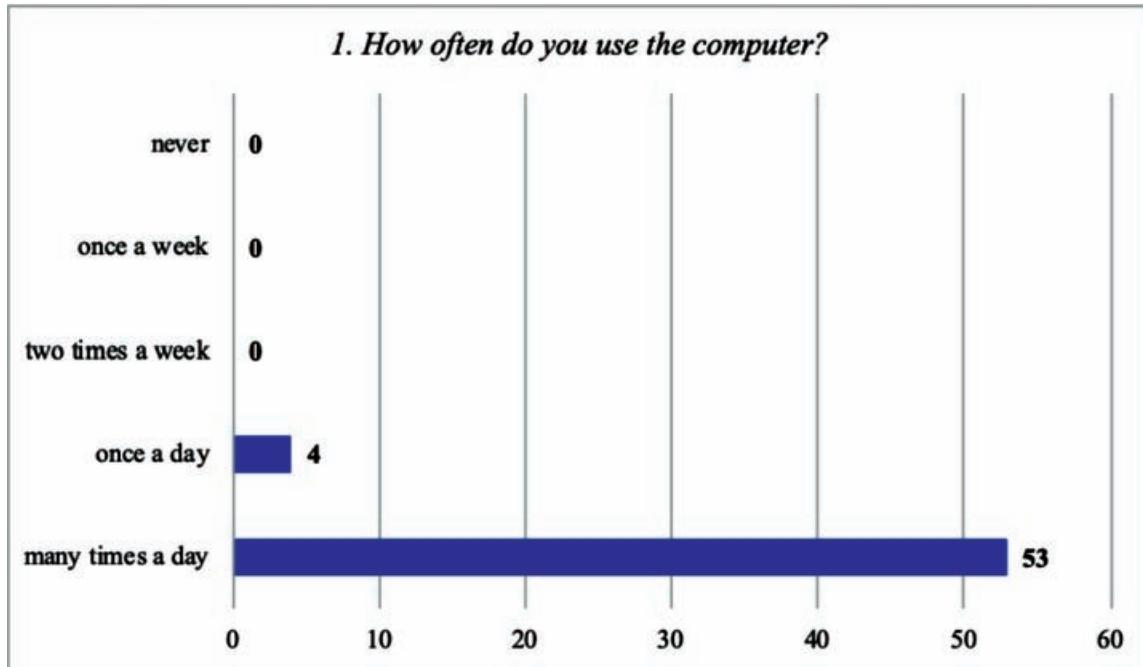
Figure 1 – *Frequency of using your computer*

Figure 2 – *The location of your computer*

4.3. My personal skills using computer software – a presentation designer (i.e. PowerPoint):
Answers: very good 31 (54%), good 19 (33%, satisfying 7 (12%).
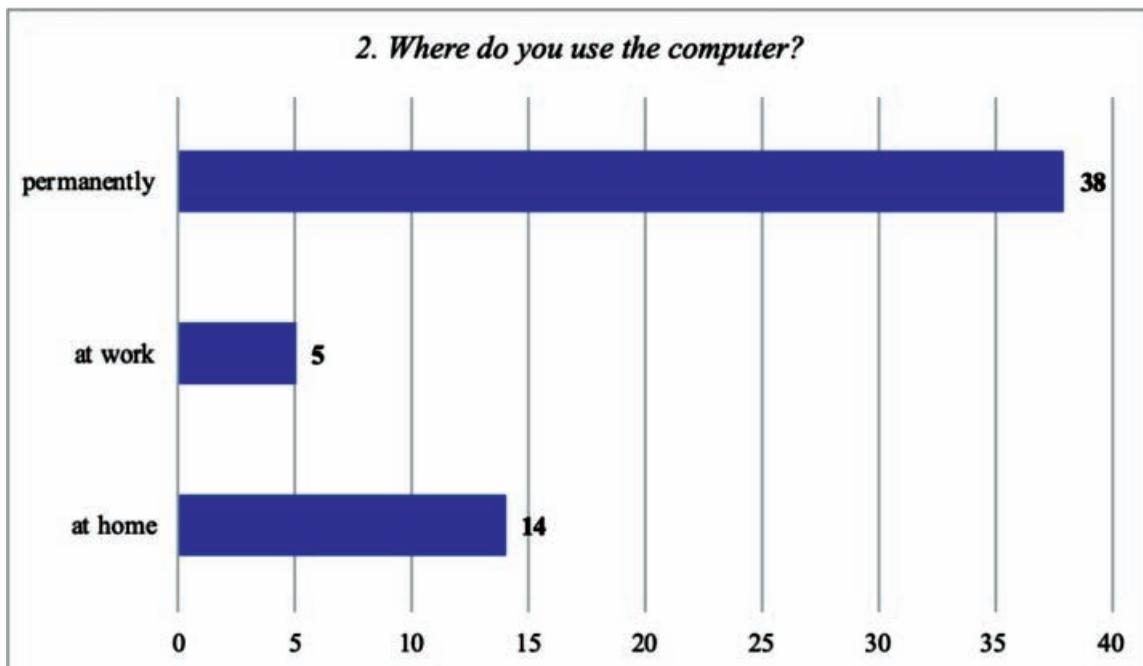
4.4. My personal skills using computer software – an image editor (i.e. Paint, Photoshop):
Answers: very good 12 (21%), good 19 (33%), satisfying 26 (46%).

Considering the multitude of application offered by social networks, the questionnaire also investigated the following skills of using web 2.0 apps:

5.1. Creating a simple site:
Answers: very frequently: 2 (4%), frequently: 3 (5%), sometimes: 9 (16%), rarely: 15 (26%), Never/I don't know/ I don't answer: 28 (49%).

5.2. Using visualization tools (mind maps, diagrams etc.):
Answers: very frequently: 6 (11%), frequently: 9 (16%), sometimes: 16 (28%), *rarely: 13 (23%), Never/I don't know/I don't answer: 13 (23%.)*

5.3. Using tools to create online surveys:
Answers: very frequently: 2 (4%), frequently: 8 (14%), sometimes: 10 (18%), rarely: 18 (32%), Never/I don't know/ I don't answer: 19 (33%).

5.4. Creating a wiki:
Answers: very frequently: 1 (2%), frequently: 1 (2%), sometimes: 6 (11%), rarely: 9 (16%), Never/I don't know/ I don't answer: 40 (70%).

Figure 3 – *Access to the internet*

5.5. Creating a blog:
Answers: very frequently: 3 (5%), frequently: 7 (12%), sometimes: 6 (11%), rarely: 17 (30%), Never/I don't know/ I don't answer: 24 (42%).

5.6. Using instant communication applications:
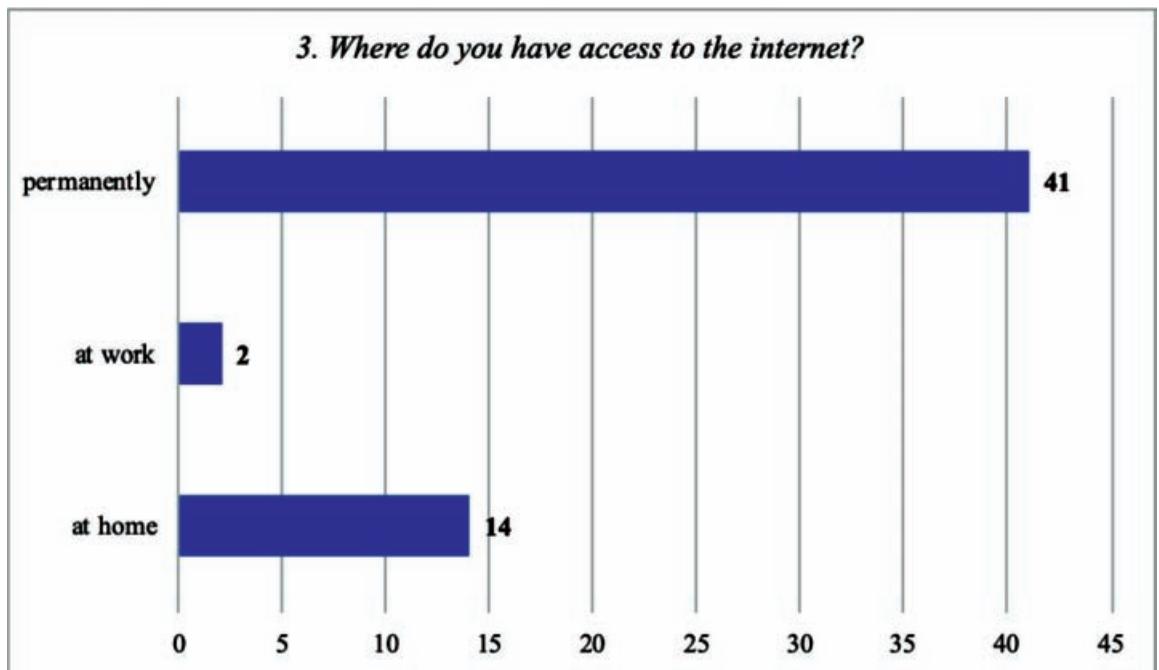Answers: very frequently: 5 (9%), frequently: 11 (19%), sometimes: 2 (4%), rarely: 17 (30%), Never/I don't know/ I don't answer: 22 (39%).

5.7. Posting audio/video materials on the web:

Answers: very frequently: 10 (18%), frequently: 16 (28%), sometimes: 9 (16%), rarely: 8 (14%), Never/I don't know/I don't answer: 14 (25%).

Summarizing and comparing the percentages for each application in part, just for the frequent/very frequent, we notice that the percentage of IT skills in using them is lower than the previous ones:

- creating a simple website: 9%
- using visualization tools (mind maps, diagrams etc.): 27%
- using tools to create online surveys: 18%
- creating a wiki: 4%
- creating a blog: 17%

- using instant communication applications: 28%
- posting audio/video materials on the web: 46%

Thus, we can shape a first conclusion: even though the computer is used daily, accessing the internet two times a day, on average, using the most common web 2.0 apps (except creating and editing blogs) is lacking.

The following questions investigates information regarding the way that the social networks are used.

6. Do you use social media in the current activity?

Answers (Figure 4): Yes: 51 (89%), No: 6 (11%).
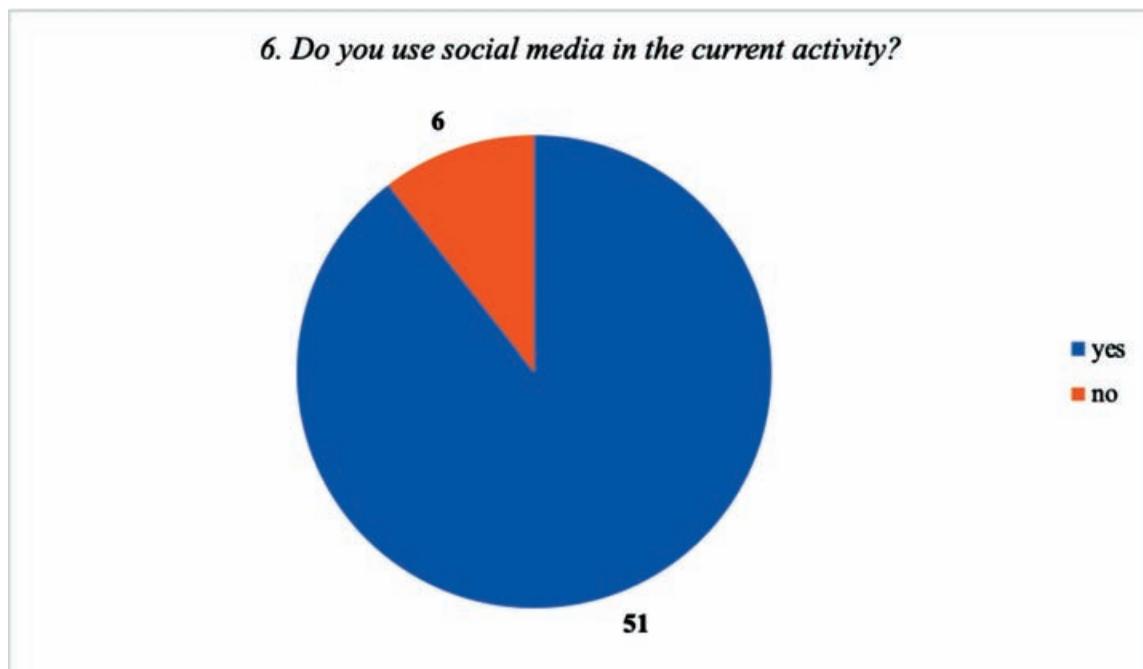
Figure 4 – *The current use of social media*

A significant percentage (89%) of the persons asked, state that they use social networks. The distribution of these answers per social network is the following:

7. If you are using social networks, what are the ones using?

Answers (Figure 5): facebook: 31 (54%), Hi5: 0 (0%), MySpace: 0 (0%), LinkedIn: 23 (40%), Xing: 1 (2%), Ning: 1 (2%), Neogen: 1 (2%), Other: 0 (0%).

7. If you are using social networks, what are the ones using

Figure 5 – *Social media used*

The following two questions had the purpose to identify 'needs' of socializing.

8. How often do you access this site? Answers (Figure 6): many times a day: 32 (56%), once a day: 20 (35%, 2-3 times a week: 2 (4%), once a week: 1 (2%), a few times a month: 2 (4%), once a month: 0 (0%), less than once a month: 0 (0%).
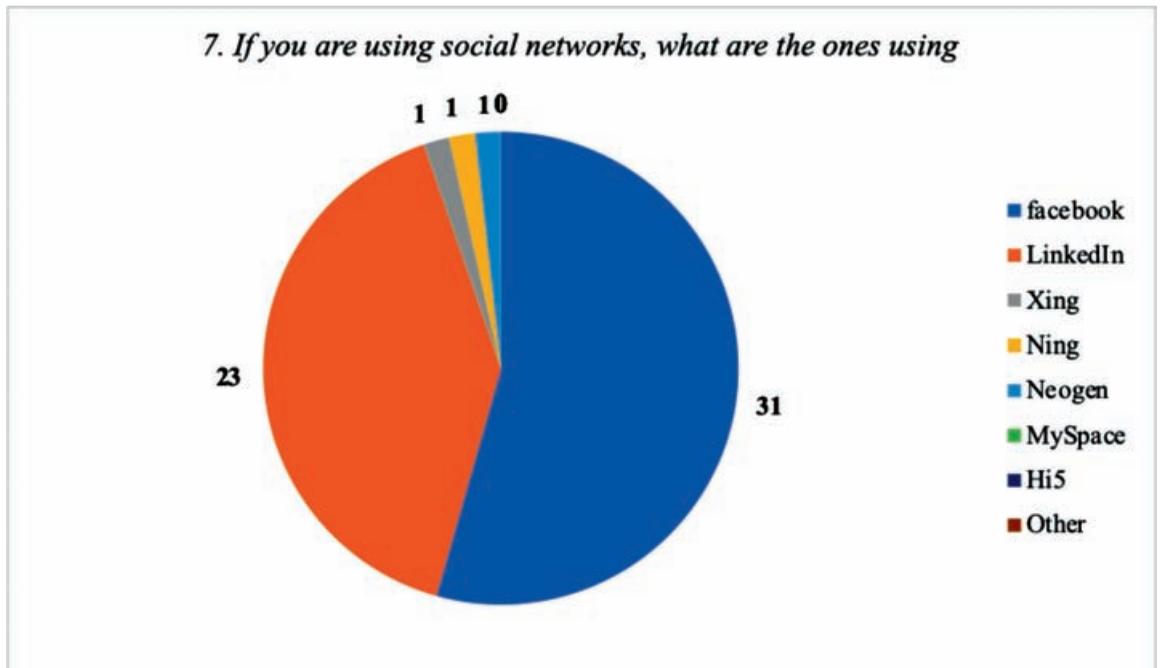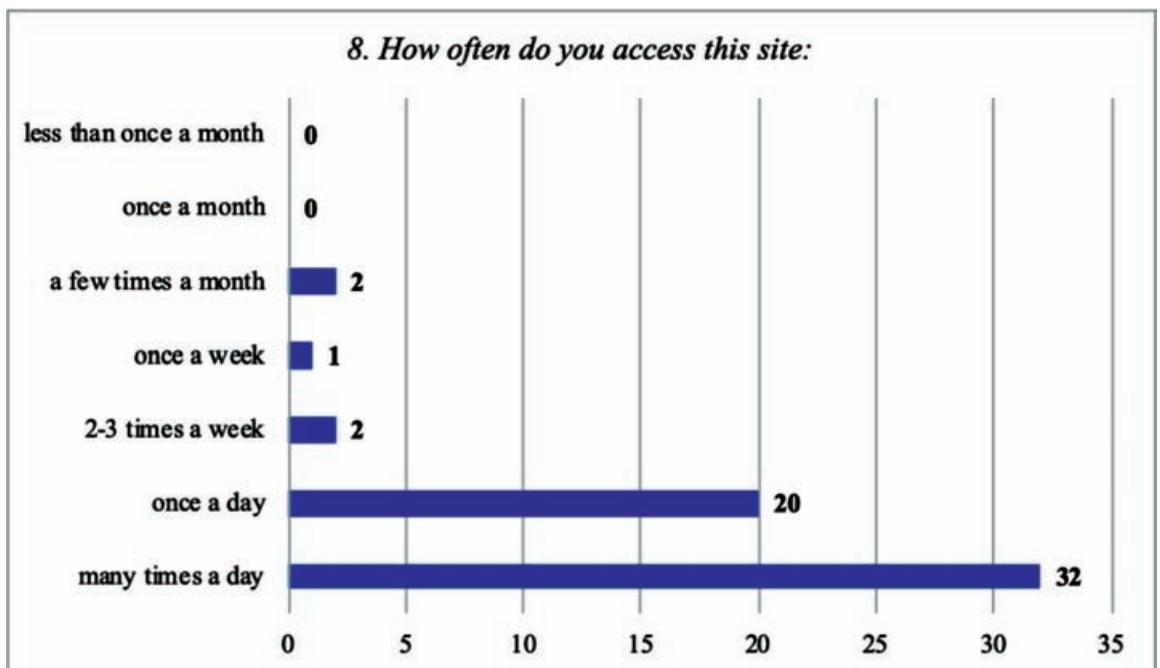

Figure 6 – *Frequency of use of sites*

9. How many hours do you spend, on average, on a social network:
Answers: less than an hour: 27 (47%), between 1 and 2 hours: 22 (39%), between 2 and 4 hours: 4 (7%), more than 4 hours: 4 (7%).

10. What were the reasons that determined you to create such account?
Answers (Figure 7): friends' influence: 2 (4%), the desire to meet new people: 10 (18%), to keep in touch with my friends: 15 (26%), to be in trends: 0 (0%), to promote certain events: 5 (9%), to find old friends: 9 (16%), to be informed: 16 (29%), other: 0 (0%.)

At the next question, a significant number of subject (58%) declare that the main reason for being part of a social network is just socializing, detrimental to other reasons. The freedom of expression is without risks and responsibilities, a thing assured by online anonymity. This aspect can damage the process of building a self-image, having, in the end, the potential to induce confusion in one's mind on his own self, including negative effects on his own self-worth.

11. What are the reasons for which you access the social network?
Answers: socializing: 33 (58%), games: 2 (4%), information about events: 8 (14%), to post photographs: 0 (0%), different applications: 3 (5%), information about new jobs: 8 (14%), other: 3 (5%).

Microblogging is a form of blogging, have a few defining traits: the possibility of editing and following the notes through technologies and different devices; building social networks.

12. Do you use microblogging/chat on this site?
Answers: yes: 25 (44%), no: 32 (56%.)

13. Do you use microblogging outside of social media? If yes, which one?
Answers (Figure 8): twitter: 23 (40%), cirip: 1 (2%, identi.ca: 0 (0%), tumblr: 0 (0%), Pownce: 0 (0%), Jaiku: 1 (2%), Hidu: 0 (0%), Frazr: 0 (0%), other: 32 (56%).
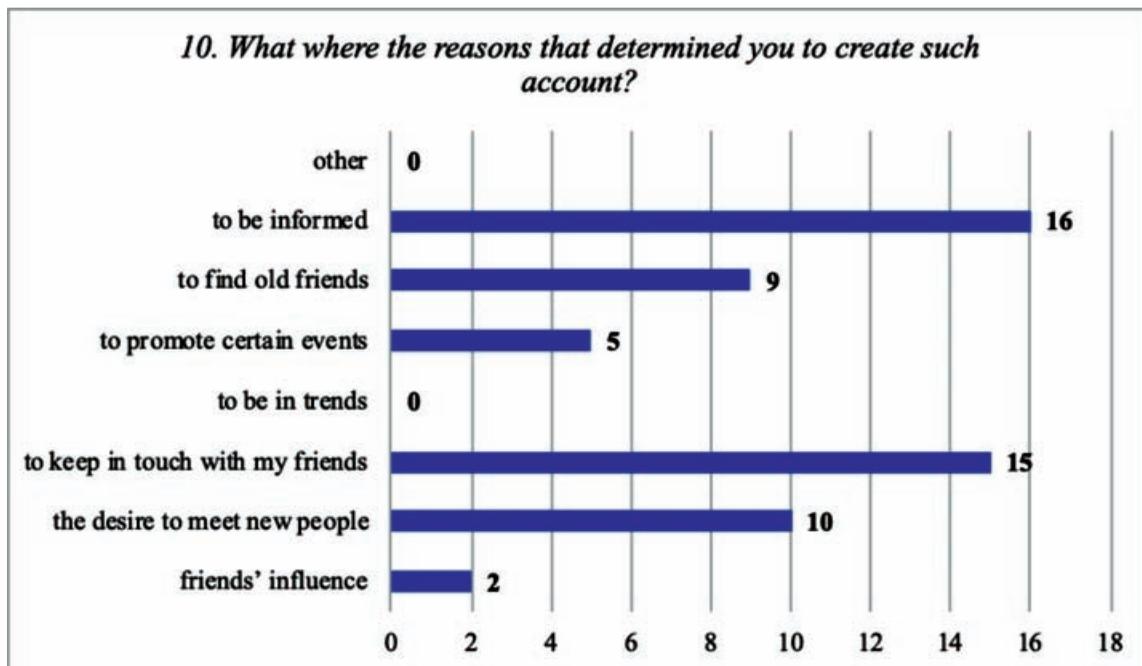
Figure 7 – *Reason for creating an account*
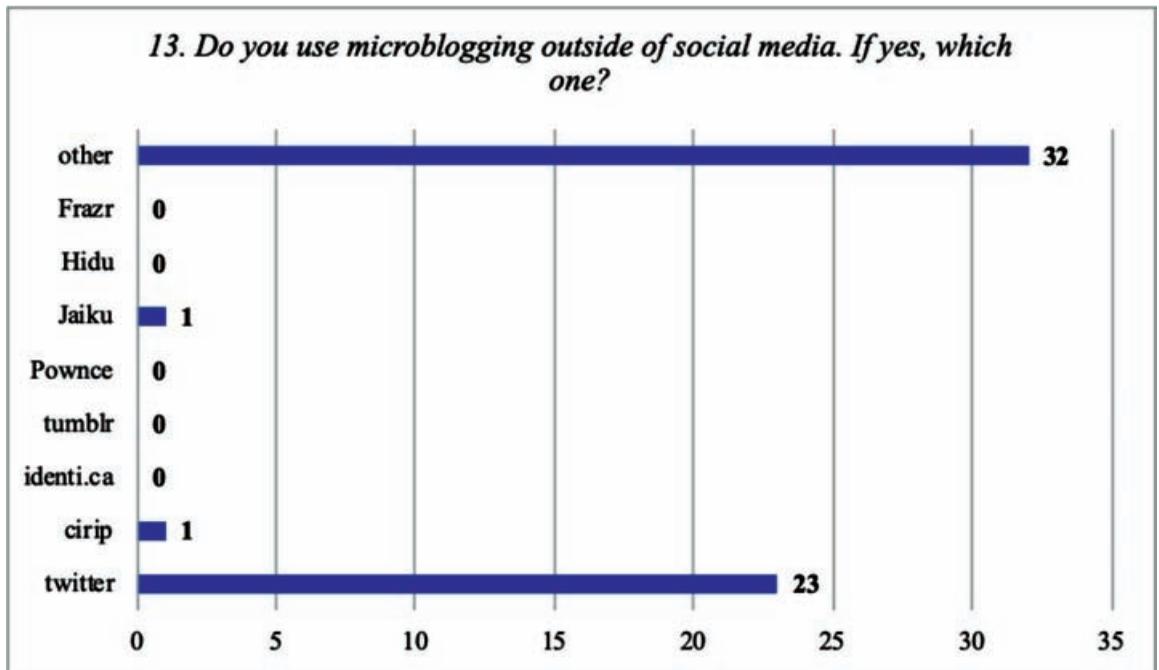
Figure 8 – *Using of microblogs*

At this question, as subjects answered (at the open-ended question from the ending of the questionnaire), there is no negative answer. They chose *other.* A significant percentage (56%) don't use microblogging, but use social networks.

From this, we can conclude that: using social networks not only for discussions but also for informing, access to different applications offered by those.

Conclusions

Social networks have advantages, but also disadvantages.

- **Advantages:** friends in a short time, socializing, online games, accessing jobs through the connections created, diversity etc.

- **Disadvantages:** psychological addiction that these sites create and the fact that they don't help youth to develop communication skills with other persons; the source of the information is not always declared, who is the provider and if the information data will be used in other purposes; lack of clear regulations opens the gate for strong abuses on private data or even secret data of the users.

The virtual space is not dangerous, and it doesn't have to be avoided. If you use the computer, the TV and the internet just as information and communication mean they are beneficial, yet their usage should be limited. Still, virtual communication can't offer one thing: direct interaction with one another.

REFERENCES

1. Andrieș, L. (2002) *The internet – psychological aspects*, Psihologia Magazine. 6/2001. Bucharest.
2. Barglow, R. (1994) *The Crisis of the Self in the age of information.* Sage Publishing House London.
3. Blanchard, A. (1998) *Virtual Communities and Social Capital.* Social Science Computer Review. 16(3).
4. Drăgănescu, M. (2002) *Broadband Internet and the Knowledge Society*, Studies in Informatics and Control. Vol.11. No.3. Sept.
5. Gavreliuc, A. (2006) *From interpersonal relations to social communication.* Polirom Publishing House. Iași.
6. Howard, J. (2000) *Social Psychology of Identities.* Annual Reviews Sociology, 26(1).
7. Lonsway, B. (2002) *Testing the Space of the Virtual.* Convergence. 8(3).
8. Lundmark, Vicki (1998) *Internet Paradox – A Social Technology That Reduces Social Involvement and Psychological Well-Being?* American Psychologist vol.53. no. 9.
9. Maltz, M. (2002) *The magic of personal image.* Curtea Veche Publishing. Bucharest.
10. Schneider, S., Foot, K. (2004) *The web as an object study.* New Media Society. 6(1).

„When you go to war, you need to have bullets at the right place at the right time. In other words, superior logistics.”
Tom Peters
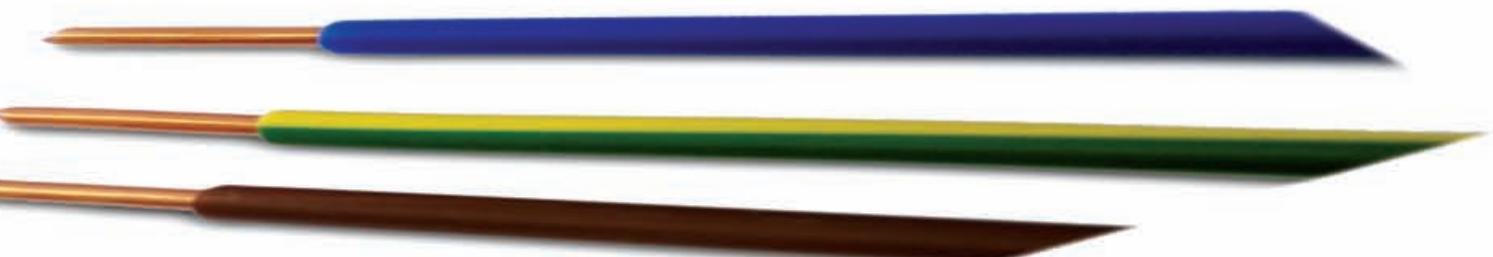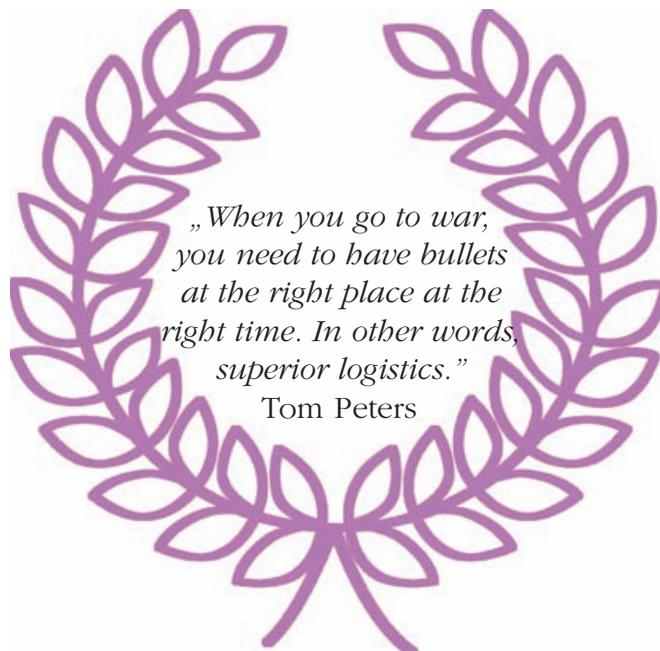
The Emotional Relationship Between Company and Client

Mariana-Simona Gheorghe

Radiocomunicatii, Bucharest Romania

Through the implementation of Customer Relationship Management (CRM) systems, multinationals today manage to control globally the quality of customer experience. The fluidity of information flowing within organizations through CRM systems brings businesses very close to the customers. Nowadays, customer satisfaction is less important for businesses than client-company emotional bonding. Customers, today, are seeking for emotional positive experiences, not only to buy something. In order to improve the relationships with today's customers, businesses need to diversify their marketing methods. Exploring the business-client emotional link is a marketing technique currently used to reach customers with messages that matter to them. Current CRM systems have not yet developed the capability of identifying, storing and using psychometric data, relying so far on storing and using demographic information. The paper proposes an informatics model for improving the client-company relationship, based on the emotional marketing approach through specific marketing processes. The utility, architecture, how to use, implement and test the IT model to improve the client- company relationship are presented. The proposed IT model can be implemented independently as a marketing tool or integrated as a marketing model in the CRM system. The proposed IT system is designed to collect and use relevant customer information, supporting companies that do not have marketing budgets in offering personalized experiences that form long-term business-client relationships.

Keywords: CRM systems, company-client relationships, emotional marketing, psychometric information, marketing processes

„You must never try to make all the money that's in a deal. Let the other fellow make some money too."
J. Paul Getty

* Correspondence to: simona.gheorghe10@gmail.com
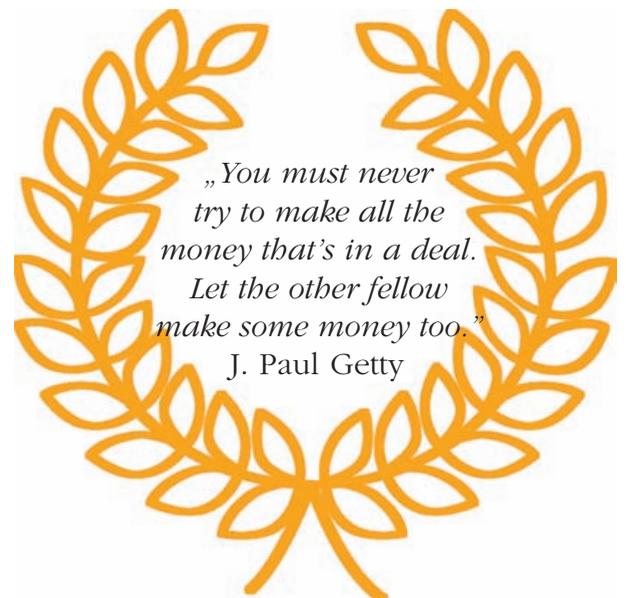
Introduction

In order to build an emotional relationship between the company and the customer, each interaction is stored and used to provide personalized experiences through customer relationship management systems. The management of the data that is available online today empowers brands in offering the experiences to customers that matter to them for real and this has an important contribution to building strong long-term emotional connections. Because customers are motivated in multiple ways, brands need to put people in the spotlight and use ethically available data to gain insight into customer motivation. Once the emotional triggers of these motivations identified, they can then be integrated into the marketing management process, customizing each customer experience.

The present research is specifically proposing an informatics tool for helping businesses either they have a budget for marketing or not, to dig deeper into customer's behaviour and use this data to improve the entire marketing process. And this is done by installing and using a simple informatics tool, by anyone with a minimum of business soft skills and problem-solving thinking, no need for hiring or outsourcing.

Study research conducted by Nielsen Neuroscience in 2015 across hundreds of brands from dozens of categories proves that it is possible to measure and target the emotions that drive customers' behaviour. According to this study, „emotional motivators" provide a better customers loyalty and future value to a business than any other metric, like brand awareness or customer satisfaction, which conducted to the conclusion that it can be an important new

source of growth and profitability for businesses. (Study, 2015)

Also, in eight years of anthropological and social science research, the above-mentioned study assembled a list with more than three hundred emotional motivators. Among the most important of these, it is the desire to „stand out from the crowd, the wish to „have confidence in the future, and to „enjoy a sense of well-being". When the brand succeeds to stand up in front of their clients with emotional motivators that resonate with their desires, the clients are emotionally connected.

The same study states that customers become more valuable at each step of an „emotional connection pathway" as they step from (1) „unconnected" to (2) „highly satisfied" to (3) „perceiving brand differentiation" to (4) being fully connected. This predictable pathway should be exploited by companies and used as a tool for marketing next investments and for revealing the wrong ones. Apparently, on average, fully connected customers have 52% more value than those who are highly satisfied (Study, 2015).

Another research on the new science of customer emotions conducted in 2015, has managed to show that emotions are central to advertising. They play an essential role in the relationship people have with brands, driving the conscious and nonconscious decisions people take. According to the study, recent advances in neuroscience are making possible to show how emotions affect people's decisions by measuring facial reactions, heart rate, temperature, posture, etc. The findings from this study of one hundred ads across 25 brands in the consumer goods industry show that ads with a lift in sales of 23% had above-average scores on a neuroscience-based test. (Magids, *et al.*, 2015)

Research Methods

The research held with respect to this paper was relevant in the field of customer relationship management informatics systems, with application to a start-up in the field of software development. Numerous previous academic researches were held regarding the role of customer relationship management information systems in developing company-client relationships. The particularity of this research is the purpose of improving business-client relationships by using an IT system based on innovative marketing processes. Also, it is an informational system design to be used especially by small businesses, that do not benefit from an expensive marketing budget.

As such, the present exploratory research for understanding the context, the motivations and reasons had the form of new research on an existing research topic. Hence, the research had a bibliographic nature at the beginning, in order to uncover trends, gain insights into the problem, to develop ideas and hypotheses, learn about theories in marketing field. In addition to the bibliographic research, in order to attain the objectives of the research and to develop ideas, qualitative research was held, by using semi-structured techniques like individual interviews, participation and observations.

In order to dive deeper into the problem, the methods of data applications took the form of a case study research process, using instruments for analyzing the data like business analyze, SWOT analysis, macro-environment analysis and micro-environment analysis, business process design and management, market analysis and software tools like Aris Express and Microsoft Office Project.

From an ethical perspective, these research findings are tapping into the understanding of the customer's needs and improving the company-clients relationship by collecting and analyzing customer data. Most customers agree that their data is

tric data and emotional factors in the marketing-management process.

Current CRM systems have not yet developed the capability of identifying, storing and using psychometric data. Therefore, this research proposes an informatics model for improving the client-company relationship. The model is based on the emotional marketing approach through specific innovative processes and the use of psychometric information in the marketing-management process.

In order to meet de needs of small businesses or start-ups, who lack a budget for marketing and customer relationship improvement, the present research proposes a new model that can be integrated as an independent informatics system for improving the relationship with the clients. And this is done by installing and using a simple informatics tool, by anyone with a minimum of business soft skills and problem-solving thinking, no need for hiring or outsourcing.

Depending on the company's objectives, the model can be entirely implemented, operationalizing the process for improving the client-company relationship. Containing a set of detailed marketing processes, any of the sub-processes described by the model can be implemented independently of each other.

Because the process-based approach allows the organization to have good control over the relationships and interdependencies between system processes, the overall performance of the organization can be improved. That is why the customer- relationships- improvement model was thought of as a marketing process that supports the improvement of business-to-customer relationships, containing several specific sub-processes.

collected and analyzed, of course for serving their own interest, of leading them to the specific products and services they need, and avoiding the ones they do not need or care for. But customers of today like to be informed of this and they are protected in this matter by the new General Data Protection Regulation.

Model for Improving Relationship

Modern organizations harness every interaction with the customer, collecting detailed demographic information in the customer relationship management system, in order to meet customer requirements.

In order to know better today's customers with increased education level and accelerated technology access, organizations need to conduct a qualitative market analysis to understand and meet their expectations. But in a competitive market, demographic data is insufficient to identify customer needs and expectations, and it is necessary to identify and exploit psychome-

The company where the model is implemented is in line with the applicable laws in Romania for small and medium enterprises, being a micro-enterprise with up to nine employees and a net annual turnover of fewer than two million Euros. That is one of the reasons why it was chosen as a good SMM candidate for the independent implementation of the model for improving the client-company relationship presented in this research.

The vision and at the same time, the mission of the selected SME is to provide customers with the software they need, combining software programming with web-design in order to give to the user an unprecedented experience. Following analyzes of the selected SME, SWOT analysis, analysis of macro-environment and micro- environment, the present research highlights marketing methods to achieve the medium-term strategic goal (2019-2021), respectively to reach 1000 monthly paid users for one of their products. The first business advice the selected SME received from the present research is the implementation of the model for improving client-company relationships. (The Romanian Parliament, 2004)

The first step in implementing the model was to determine the most suitable manner to install it. Because there was not a CRM system implemented within the selected SME, the model has been installed independently. The access to the model was accomplished by following the steps outlined in Figure 1.
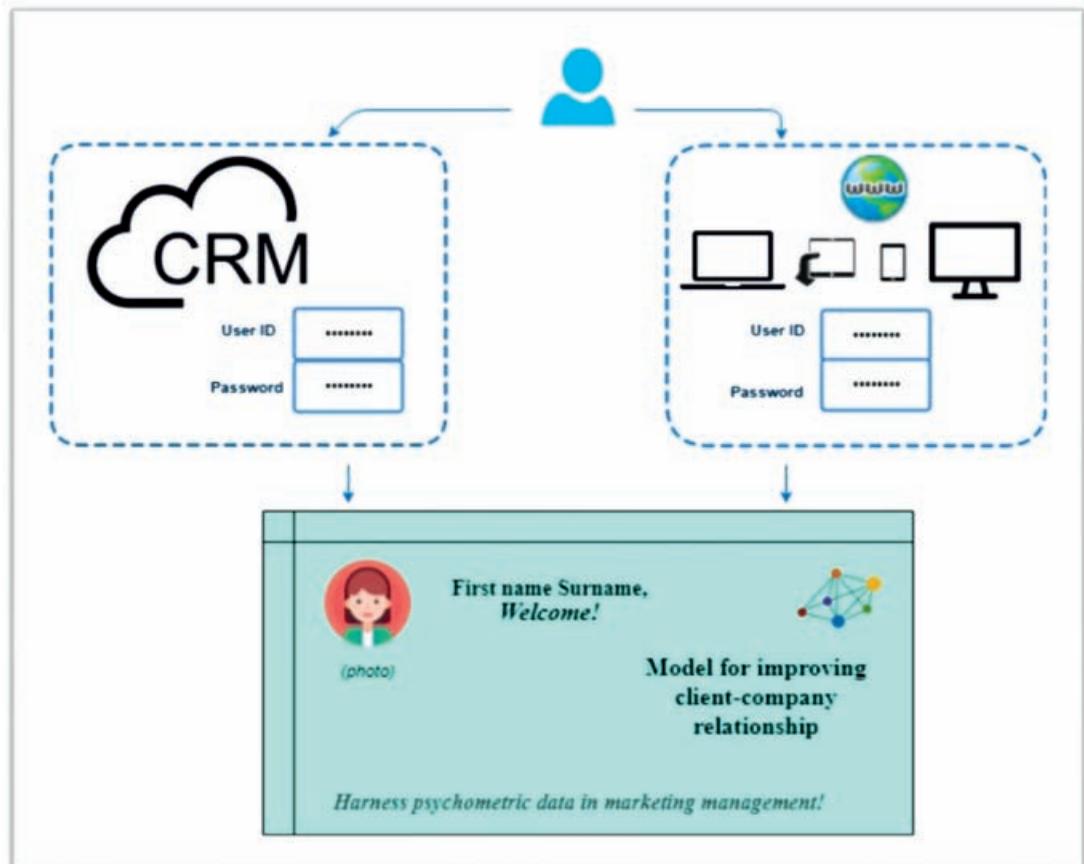
Figure 1 – *Access model*

In the process selection page, the user opens the window where he must choose one of the three process containing boxes. The processes are arranged like the three secondary objectives of the main objective of the model: harnessing psychometric data in the marketing-management process.

As the implementation of the model in the selected SME attempted to test the whole model for improving the business-to-customer relationship, the research has implemented the customer-company relationship improvement process illustrated in Figure 2. This was done by choosing first the processes (Figure 3) and in the next step choosing a specific file from that process (Figure 4).

At this stage of the research, every process contains three specific business pro-

cess management files: the process flow diagram, the process detail, an operational procedure. But after the first case-study, with an SME from software development field, the model has been improved and will be updated every time the experience will teach the best lessons.

In addition to the IT model for improving business and customer relationships, this research has revealed a way of working in the entrepreneurial spirit of doctoral studies in order to improve the results for businesses owned by small and medium-sized firms in Romania. Thus, in the next phase, the study will continue to be applied by opening an SME in the field of business consultancy applied to market, for improving the company-client relationships in Romania.

Strategic decision to improve company-client relationships

Assignment of the implementation team/ granting responsibilities & resources

The process of collecting and using psychometric data in marketing-management

The process of measuring attitudes through the theory of planned behaviour

The process of emotional targeting in marketing-management

Adjustment of marketing-management process

Monitoring implemented measures and measuring the impact on company-client relationships

Figure 2 – *Diagram of the customer-company relationship*

The implementation of the model for improving the customer-company relationship has the next steps:

1. The operationalization of the process was accomplished according to an implementation plan elaborated in Microsoft Project; a strong software tool used in project management.

2. Establishing the way of installing the model for improving the customer-company relationship – independently by a CRM system, because the selected SME was not using any CRM system.

3. An account has been created, with a confidential user and a password was assigned.

4. Access has been made to the model.

5. Responsibility for implementing the model for research purposes was assumed.

6. The operationalizing of the marketing-management process has been an adjustment of the existing marketing process in the firm. Thus, the other sub-processes have been operationalized to improve the firm-client relationship. The elements of the marketing-management process have been updated after the other processes have been carried out, as the testing has highlighted the need to optimize the succession of sub-processes in the process for improving the customer-company relationships, illustrated in Figure 3.
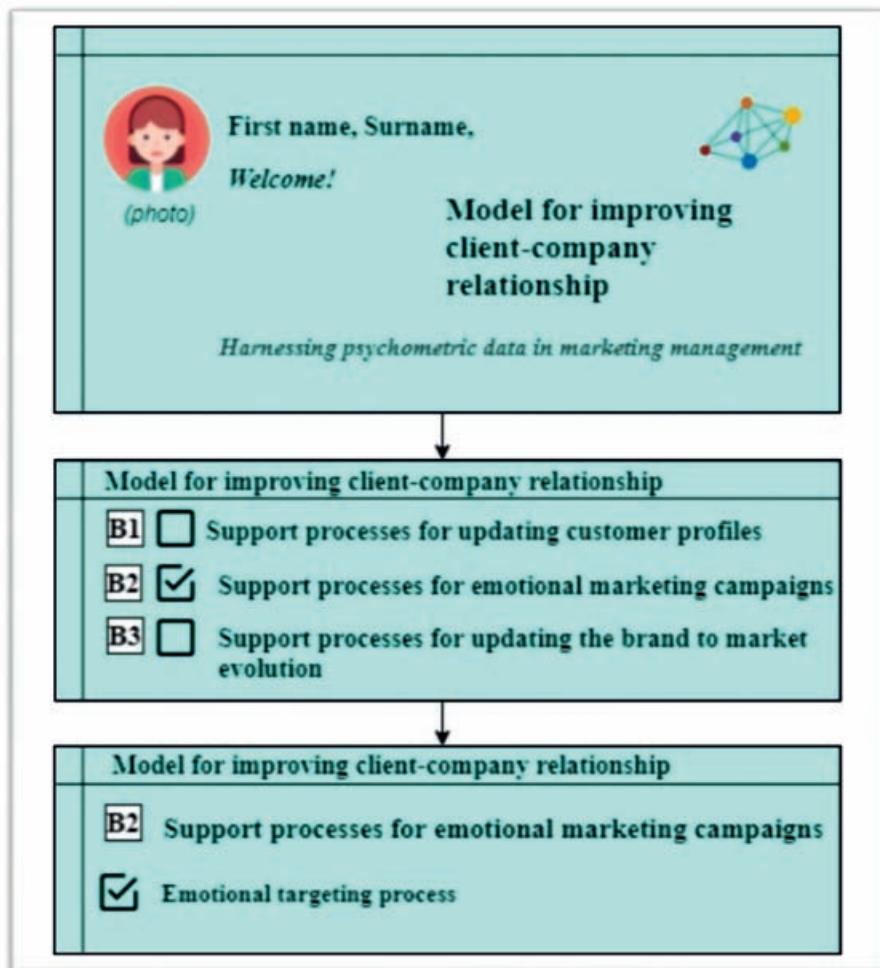
Figure 3 – *Process selection*

7. The process of collecting and using psychometric data was thus operationalized. Within this process, only some of the activities that were considered useful to the selected SME were implemented.
8. The process of measuring attitudes using the theory of planned behaviour was operationalized.
9. The emotional targeting process was operationalized.
10. In the next step, the marketing-management process was adjusted for the selected SME.

Discussion

Customer Relationship Management systems solve the problem of storing customer information from the analogue system (agenda, mobile phone, laptop memory, etc.) in a centralized informatics system, thus accessible to many users at a single click. By implementing a CRM system, companies have the advantage of eliminating the risk of losing customer information through human errors or staff leaving (Ward, 2018).

Current CRM systems have not yet developed the capability to identify, store, and use psychometric data, relying so far on storing demographic information. That is the reason why this research proposes a model for improving the client-company relationship based on addressing emotional marketing through specific innovative processes and the use of psychometric information.
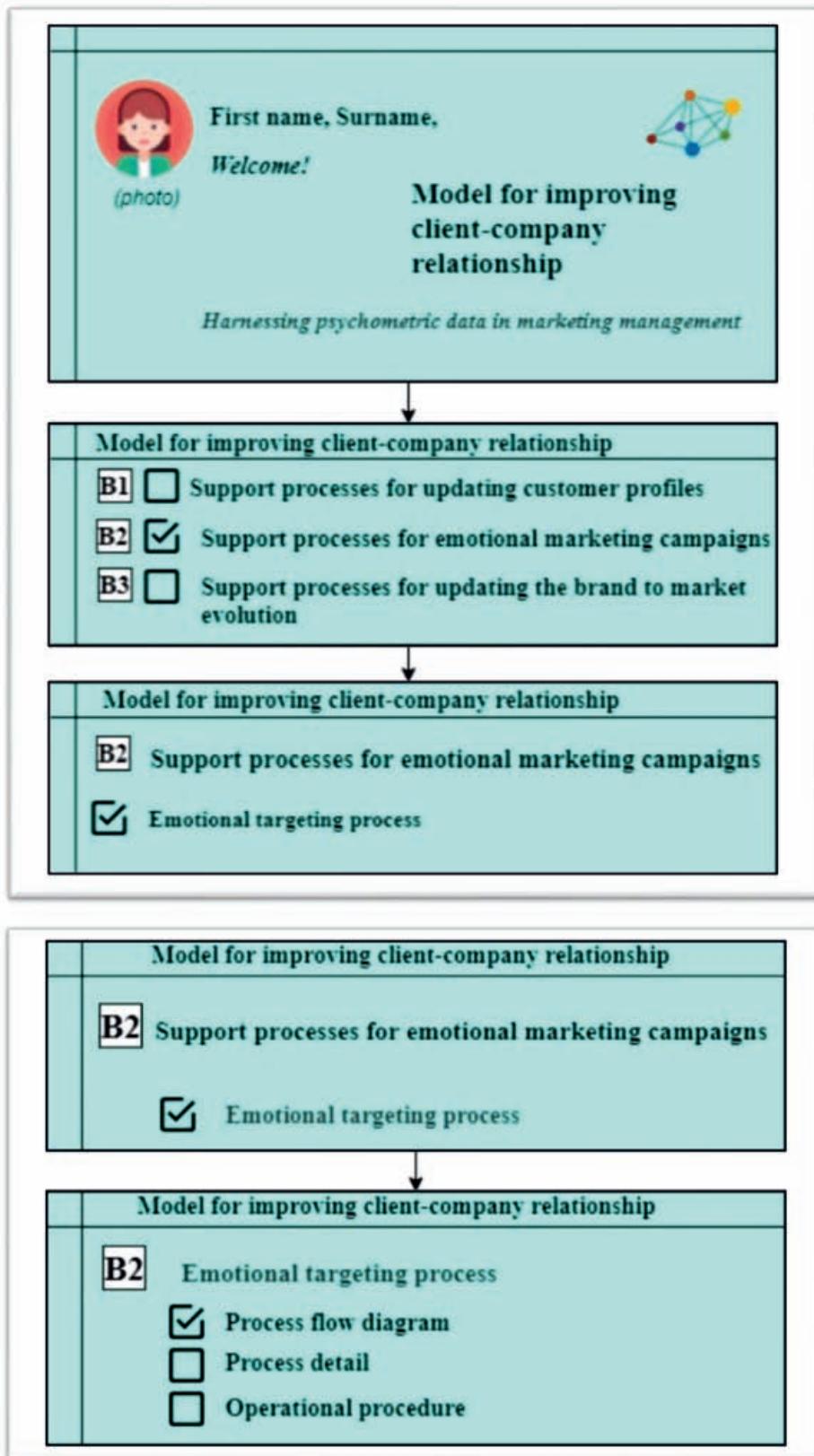
Figure 4 – *Choosing the file*

The marketing approach that relies on business-client emotional bonding reaches people interested in messages that make a difference to them, helping businesses improving sales and generally results.

The paper proposes an IT model for improving the client-company relationships based on the emotional marketing approach, through a specific informatics model of marketing processes that are accessible to any kind of business. Brands need to put people in the centre of their attention and use ethically available data to gain insight into customer motivation because customers are being motivated in multiple ways. Once the emotional triggers of these motivations are identified, they can then be integrated into the marketing management process, customizing each customer experience in order to have fully connected clients. The present research is proposing an informatics tool for helping businesses either they have a budget for marketing or not, to dig deeper into customer's behaviour and using this data to improve the entire marketing process and thus business results.

Conclusions

The present research is revealing how customer satisfaction is less important for businesses than client-company emotional bonding. According to multiple studies analyzed, customers of today are seeking for emotional positive experiences, not only to buy something. Starting from describing the architecture of a conceptual model for an improved customer relationship management system, this research proposes a new model that can be added as an informatics tool to improve the firm-client relationship, either there is an existing CRM system or not, as an independent model for tackle emotional marketing processes.
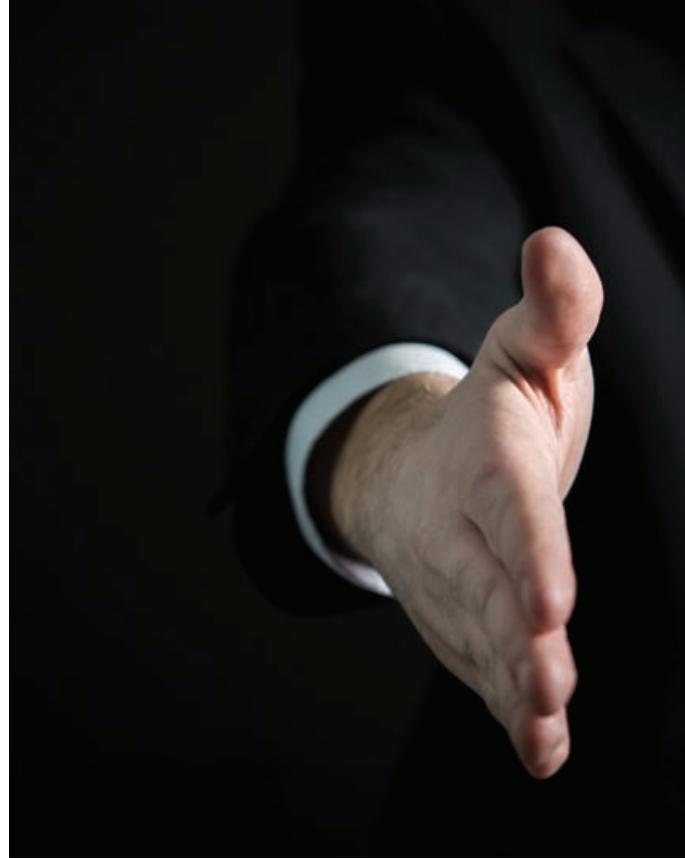
The model is addressing emotional marketing and the use of psychometric information based on innovative marketing processes. The model is designed to support small businesses at the start of the road for customer relationship improvement, even if they have no budget for marketing. The research gives the architecture of the model, the utility and the way of its use, by implementing a set of detailed marketing processes ready for operationalization. Any of the processes described can be made fully operational independently of each other, depending on management decisions and company objectives. Up to date, CRM systems have relied on the storage of demographic information and have not yet developed the capability of identifying, storing and using psychometric data.

In order to understand the context in which the proposed model is implemented, an SME in the field of software development is co-opted into the research. In order to test the model, a company analysis was

software development field selected as part of the implementation of the model, the process revealed other methods to support the organization's mission. This business advice was presented to the company's management and some of the recommendations and have been taken into considerations and included in the company's strategy. This research also represents a case study, trying to demonstrate the possibility of optimizing processes within an information technology SME, improving the company-client relationship, increasing the customer portfolio and increasing turnover by implementing a new model to improve the client-company relationships.

Moreover, in addition to the IT model for improving business and customer relationships, this research has revealed a way of working in the entrepreneurial spirit of doctoral studies in order to improve the results for businesses owned by small and medium-sized companies in Romania. For this reason, the model presented in this research will be implemented in the next phase after opening an SME for business consultancy applied to the market for improving the company-client relationships in Romania.

carried out in the first stage. This analysis includes the organization chart and staff, field of activity, location, history, mission-vision, company processes, turnover, participants analysis, macro-environment and micro-environment analysis, SWOT analysis and more business analysis tools.

Following the implementation of the model, the analysis made on the SME from

REFERENCES

1. Gassmann, O., Frankenberger, K. Csik, M. (2015) *The Business Model Navigator, 55 Models That Will Revolutionize Your Business.* pp. 4-400. FT Press

2. Kotler, P. (2014) *On marketing, how to create, win, and dominate.* The Free Press.

3. Magids, S., Alan, Z., Leemon, D. (2015) *The new science of customer emotions.* Harvard Business Review. November.

4. Mucchielli, A. (1991) *Rôles et communications dans les organizations* (in English: *Roles and Communications in the Organizations*). pp. 2-137. Esf Editeur.

5. Parr Rud, O. (2009) *Business Intelligence Success Factors: Tools for Aligning Your Business in the Global Economy.* pp. 3-283. John Wiley & Sons.

6. Romanian Parliament, (2004) *LEGE nr. 346 privind stimularea înființării și dezvoltării întreprinderilor mici și mijlocii* (in English: *LAW no. 346 on the stimulation of the establishment and development of small and medium-sized enterprises*). Buletinul Oficial 14 July.
7. Salesforce, (2018) *A Beginner's Guide to CRM Systems.* Salesforce.
8. Schermerhorn, J.R., Hunt, J.G., Osborn, R.N. (2002) *Organisational behaviour.* John Wiley & Sons.
9. Seddon, D. (2003) *Managing the security of data flow in CRM systems.* Search Enterprise Desktop. March.
10. Study, N.N. (2015). We're Ruled by Our Emotions, and So Are the Ads We Watch. Nielsen Neuroscience.
11. Ward, S., (2018a). What Is CRM and Is Your CRM Doing What It Needs to Do? Small Business, 29 April.
12. Ward, S., (2018b). What to look for in a CRM System for Small Business. The Balance Small Business.

„All we are doing is looking at the time line, from the moment the customer gives us an order to the point when we collect the cash."
Taiichi Ohno

The Main IoT Application

Ramona-Alexandra Neghină (1), Valentin-Andrei Mănescu (1), Gheorghe Militaru (2)

(1) WEBECOM, Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania

Abstract

The research aim is to analyze the evolution of the main IoT applications in the business environment in areas such as retail, medical, smart home, smart city, agriculture, logistics and automotive. The areas of application presented have been structured into two main categories, IoT applied to community-based services (agriculture, medical, smart city, smart homes) and IoT for service-oriented solutions (retail, logistics, automotive) as many academic studies have identified the potential for improving businesses by using IoT in these areas of activity. At the same time, the research identified the main development trends in the IoT fields of application. To analyze these trends, we identified the scientific articles in various scientific databases and used the Google search engine and Google News database to analyze the potential growth of these areas of application. The implementation of IoT solutions provides a new perspective for business owners, both to generate higher revenues and to facilitate efforts in order to meet customer needs. IoT technologies will change how end-users interact with objects around them, aggregate customer behaviour information, and improve business performance by using data volumes generated by devices using IoT technology.

Keywords: IoT applications domains, IoT digital resources, IoT online visibility, IoT industries, IoT market trends, scientific IoT resources

„The line between disorder and order lies in logistics."
Sun Tzu

Introduction

The term „Internet of Things" – IoT or the internet of the future is an umbrella term covering different characteristics, such as internet expansion, deployment of integrated
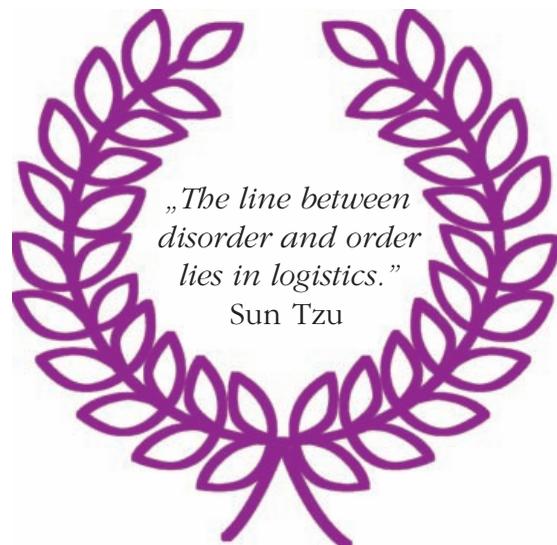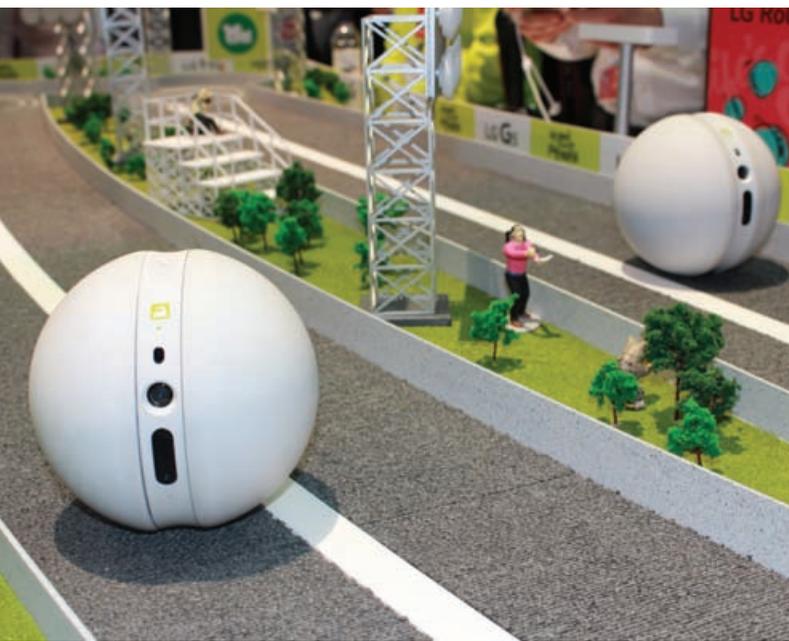
distribution devices, the transmission of information (Miorandi *et al*., 2012). However, there is still no common definition of the concept. Application scenarios and business opportunities offered by IoT interconnected devices and services are continually developing (Bassi *et al*., 2013).

The Internet of Things (IoT) encompasses billions of objects that can identify, communicate, and share information, all of which are interconnected through a public or private Internet Protocol (IP)-based networks. These interconnected objects collect, analyze and use data consistently to initiate actions, providing huge volumes of information for planning, management and decision making. The goal of IoT is to allow objects to be connected anytime, anywhere, with anyone using any network or service (Patel & Patel, 2016).

In the business environment, IoT technologies aim at detecting and quickly analyzing thousands of parameters of products and services, taking measures automatically before the good functioning of products or services is affected. IoT assumes the col-

lection and analysis of huge amounts of structured and unstructured data from various internal and external sources in order to gain a competitive advantage by offering improved products, services and business processes. Undoubtedly, IoT technologies have a major impact on the business environment, with companies already using IoT solutions to create new business models, improve their processes, reduce costs, risks, and generate added value (Rayes, Salam, 2019).

The main objectives are (1) to identify the interest of each IoT applicability domain identified, (2) to identify the scientific researches on IoT applicability domain and (3) to identify the total visibility of IoT activity domains by using tools such as Google Search, Google News database and scientific data bases.

Application Areas of IoT

The potential applications of IoT are numerous and diverse, penetrating in almost every area of everyday life of individuals, but also in the business world and society as a whole. Due to their wide applicability, IoT systems can be integrated into industries such as transport, construction, smart cities, lifestyles, retail, agriculture, industry, supply chain, energy, industry, user interaction, culture and tourism, environment (Shah, Yaqoob, 2016).

Users can improve some aspects of their lives because of the ease of adoption of various IOT technologies. IoT has a significant impact on domestic life, especially for smart homes, intelligent cars, and more. In the business sector, IoT has made significant progress in manufacturing and industrial services by streamlining production operations and improving product quality.

According to the Strategic Research

Agenda of the Internet of Things, 6 new areas of IoT implementation have been identified: smart energy, smart housing, smart health, intelligent buildings, intelligent transport and smart cities. According to the survey conducted by the IoT Strategic Research Agenda, in 2010, 65 application scenarios of IoT technologies were identified, scenarios divided into 14 main areas: transport, smart housing, smart cities, lifestyle, retail, agriculture, intelligent factories, distribution chain, medicine, emergency situations, user interaction, culture and tourism, energy and the environment (Shah, Yaqoob, 2016). Figure 1 presents the estimates regarding the popularity of applicability areas of IoT technologies until 2020 (Shah, Yaqoob, 2016).
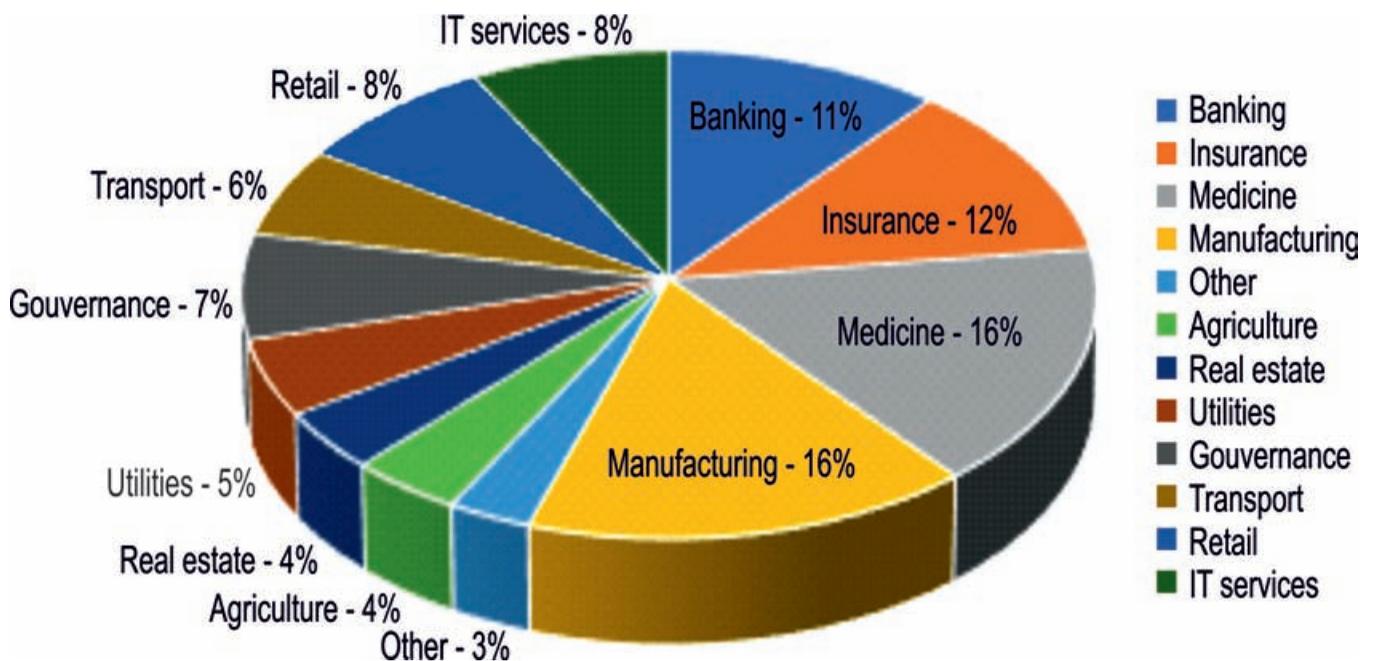
Figure 1 – *IoT application domain forecasting by 2020*
(Source: Shah, Yaqoob 2016)

- **Smart City** is the application of IoT in a complex urban environment, being a topic debated by many researchers because it responds to the efforts of national governments to adopt IT & C solutions for the management of public affairs, thus realizing the concept of Smart City. Although there is no formal and widely accepted definition of the Smart City concept, the ultimate goal is to make better use of public resources, increase the quality of services provided to citizens, while reducing the operational costs of public administration. IoT can bring a number of benefits to managing and optimizing traditional public services such as transport, parking, street lighting, surveillance and maintenance of public areas, cultural heritage conservation, garbage collection, sanitation of hospitals and schools. In addition, the availability of different types of data collected can also be exploited to increase the transparency of government actions towards citizens (Zanella *et al.*, 2014).

Table 1 – *IoT application domains*

Domain	Description	Applicability
Society	Activities related to the improvement and development of society	Smart Cities, Smart Agriculture, Smart Homes, Telecommunications, Defense, Energy, Medical Technology, Smart Buildings
Environment	Activities related to the protection, monitoring and development of all-natural resources	Smart Environment, Smart Metering, Smart Water Recycling, Natural Disaster Alert Systems
Industry	Activities related to the financial, commercial and transactions between companies, organizations and other entities	Retail, Logistics, Distribution Chain Management, Automotive, Industrial Process Control, Aviation and Aerospace

(Source: Shah, Yaqoob, 2016)

- **Medical** – IoT technologies have a huge potential to generate many medical applications, such as remote monitoring of vital functions, health programs, chronic illness, and the care of the elderly. The boundaries between traditional healthcare systems and home-based health welfare have been greatly reduced. The future of healthcare goes hand in hand with IoT technology to monitor patients at home, but also in their everyday life to collect and transmit data about vital parameters, physical activity, information that can be continuously analyzed by intelligent systems that can alert doctors when additional checks are required. The healthcare industry is becoming more patient-oriented than ever, looking for ways to keep in touch with patients, which can be facilitated through IoT (European Commission, 2017). Health-based IoT services are expected to reduce costs and contribute to raising the quality of life. Real-time updated healthcare networks can support patients with chronic diseases, diagnose certain conditions, monitor patients in real-time and contribute to the rapid intervention of doctors in emergencies (Lee, Ouyang, 2014).

- **Smart Homes** – another area of application of IoT technologies is housing, commonly known as Smart Homes. Home automation technology is another example of IoT application. A user can control the use of water, the toaster, the air conditioner, the TV, the washing

machine and many other appliances through a smart mobile phone. Information on house temperature, noise level, oxygen level can help users optimize living conditions (Suresh *et al*., 2014). According to Bhat *et al*. (2017), Smart home systems are divided into hardware equipment and user interface. A Smart Home has a local network of devices used in everyday life and aims to improve daily life and activities of the household members. Although apparently the devices communicate with each other, in reality, all devices communicate via the central controller, which, with triggering and other programs, modifies the status of other devices.

- **Retail** – IoT stimulates innovation and new opportunities by bringing each object, consumer and activity into the digital domain. Traders are trying to reach consumers in new ways, one of the most revolutionary being the use of IoT technology (Sorescu *et al*., 2011). Traders have the opportunity to digitize every process, product or service, even human resources. With the proliferation of

IoT devices along with software platforms, the adoption of common standards will increase the rapid growth of the adoption of IoT technologies in the retail field. Traders can experiment with new ways of using IoT technology to increase productivity, offer new solutions, services, reshape user experiences, enter new markets created by digital ecosystems. IoT strategies offer traders new opportunities in three critical areas: customer experiences, supply chain, channels and revenue streams (Kanchan, 2016). In retail, interconnected IoT devices radically transform consumer experiences. The huge volumes of data provided by IoT devices will be used by companies to improve their operations, to better serve and meet customer needs and to create completely new ways of doing business in the retail field. IoT technologies lead to innovation and new opportunities by bringing every object, consumer and activity in the digital domain. At the same time, IoT technologies will drive companies to change, through the digitization of every process, product, service and even human resource. Already, merchants are experimenting with new ways of using IoT technologies to deliver new services, reshape consumer experiences and enter new markets by creating digital ecosystems.

- **Logistics** – due to the increased competition in logistics and the numerous challenges, the focus is on customers and on meeting their needs in an efficient and speedy manner. The success of a logistics company consists of the efficient management of stocks and storage, the automation of internal and business processes, the rapid delivery, the assurance of the proper storage. IoT is

revolutionizing the field of logistics through the efficient use of technology. Offering many advantages and opportunities, IoT-based solutions can be widely implemented in logistics by using technologies such as RFID, predictive maintenance, smart lockers, drones and autonomous vehicles (Maltseva, 2019).

IoT Application Domains Forecasting

Regarding IoT trends, Scully (2018) analyzed the growth trends of the IoT domains based on 1,600 officially declared IoT projects worldwide as mentioned in

Figure 2. The developed IoT trends are Smart City (367 projects), followed by the industrial domain (265) and the projects related to connected IoT buildings (193). Most of these projects were implemented in America (45%), followed by Europe (35%) and Asia (16%). There are big differences when looking at the individual segments and regions of the IoT. Most Smart City projects are in Europe (45%), while America, especially North America, is a major player in the medical (55%) and automotive (54%) sectors. The Asia/Pacific region is particularly strong in the field of smart agriculture projects (31%).
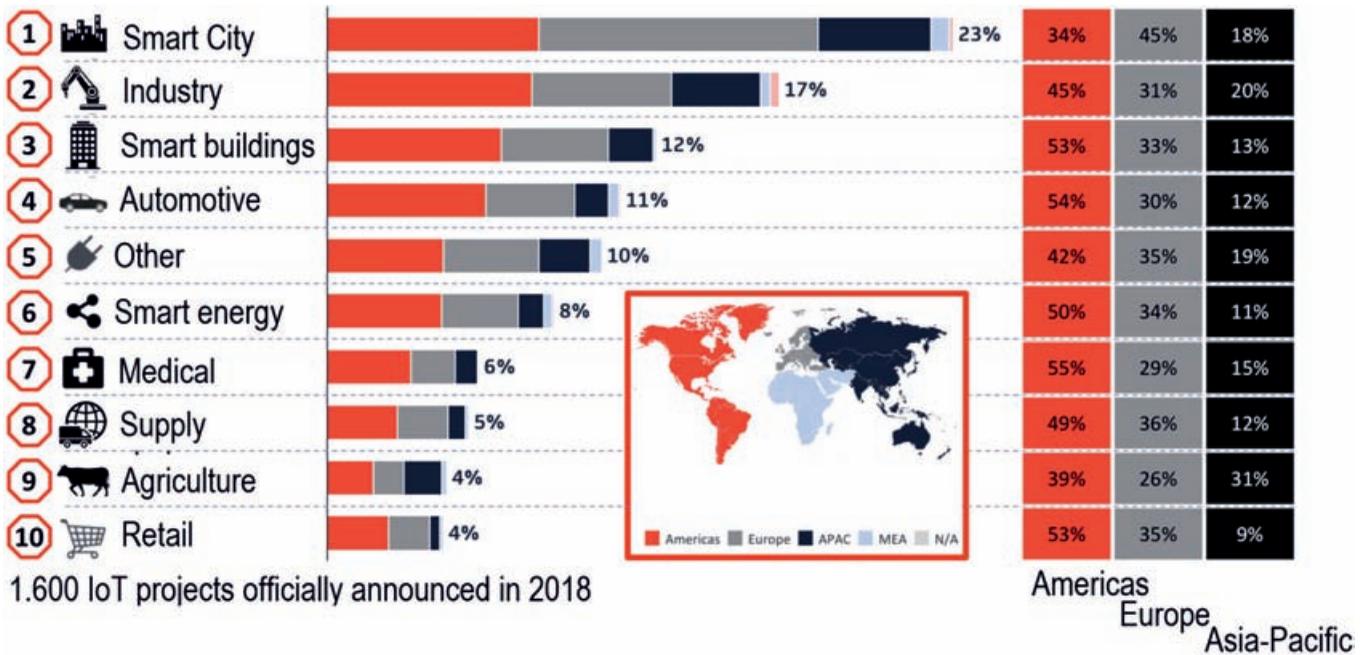
Figure 2 – *Trends evolution of IoT application domains in 2018*
(Source: Scully, 2018)

The scientific literature has a real interest for the applicability of IoT technologies in different fields such as smart city, smart homes, retail, agriculture, medical, logistics, automotive industry.

Table 2 shows the search results from different academic databases for scientific articles on the applicability of IoT in var-

ious fields, for the period 2015-2019. Most of the scientific articles listed on Google Scholar have been produced in the medical field for IoT technologies.

In the Jstore database, IoT applied in Smart City obtained 2,652 results on scientific articles made by researchers. Also, for the applicability of IoT in Smart City, Sci-

ence Direct recorded 2,712 results on scientific articles. The IoT applied in the medical field registered a total of 8,375 results for scientific articles. Retail IoT has the least results in scientific research, which may indicate significant development potential for future research into IoT applicability in this area.

Table 2 – *Application of IoT (2015-2019)*

| IoT application domain	Scientific articles in Google Scholar	Jstore	Science Direct	Elsevier	Total
Medical	17.700	1.535	903	8.375	28.513
Smart Homes	16.900	4.301	2.720	3.162	27.083
Smart City	17.300	2.652	2.712	2.495	25.159
Agriculture	16.600	1.398	1.190	2.162	21.350
Logistics	16.300	459	1.213	478	18.450
Automotive	15.400	197	884	698	17.179
Retail	14.400	578	730	453	16.161

(Source: Author's research)

Figure 3 presents the estimates regarding the evolution of the number of IoT and non-IoT devices in the 2015-2025 range globally. Non-IoT devices include all mobile phones, tablets, computers, laptops. IoT includes both connected B2B devices and those for personal use. The data is expressed in billions of devices connected to the IoT technological infrastructure. The number of connected devices currently exceeds 8.3 billion worldwide. Between 2018-2025, the number of IoT devices will increase by an estimated 10% annually. Global growth is mainly driven by IoT devices – both on the consumer side (for example, Smart Home) and on the enterprise/B2B side. The number of active IoT devices is expected to grow to approximately $ 10 billion by 2020 and $ 22 billion by 2025. This number of IoT devices includes all active connections and does not consider devices that were purchased in the past, but are no longer used (Lueth, 2018).

According to Forrester's research, businesses will drive growth in IoT adoption in 2019. IoT clearly offers huge business benefits. Production is a clear leader in the implementation of IoT. Here, throughout 2019, companies will increasingly see the value of connected equipment, able to report every detail of its operating parameters and efficiency to other connected smart devices. Predictive maintenance has been promised for some time but is currently only performed by the largest players who have invested huge amounts in IoT in recent years. With a growing understanding of utility, the implementation of IoT solutions will begin to be implemented in smaller organizations as well (Marr, 2019).

Figure 4 presents the forecast of the global IoT market from 2017-2025 showing a total growth of 39%. The market is defined as the end user's total expenses for IoT solutions.

ion.

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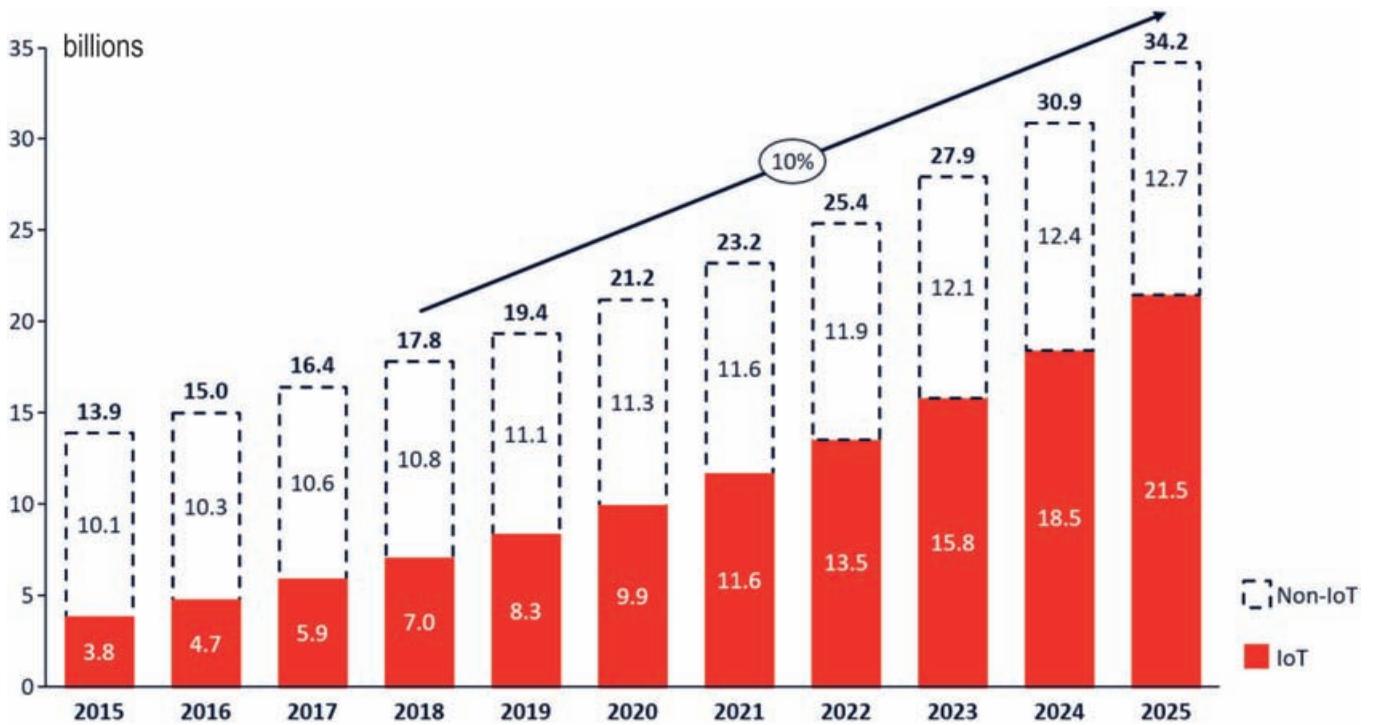
Figure 3 – *Estimates of the number of IoT and non-IoT devices*
(Source: Lueth, 2018)
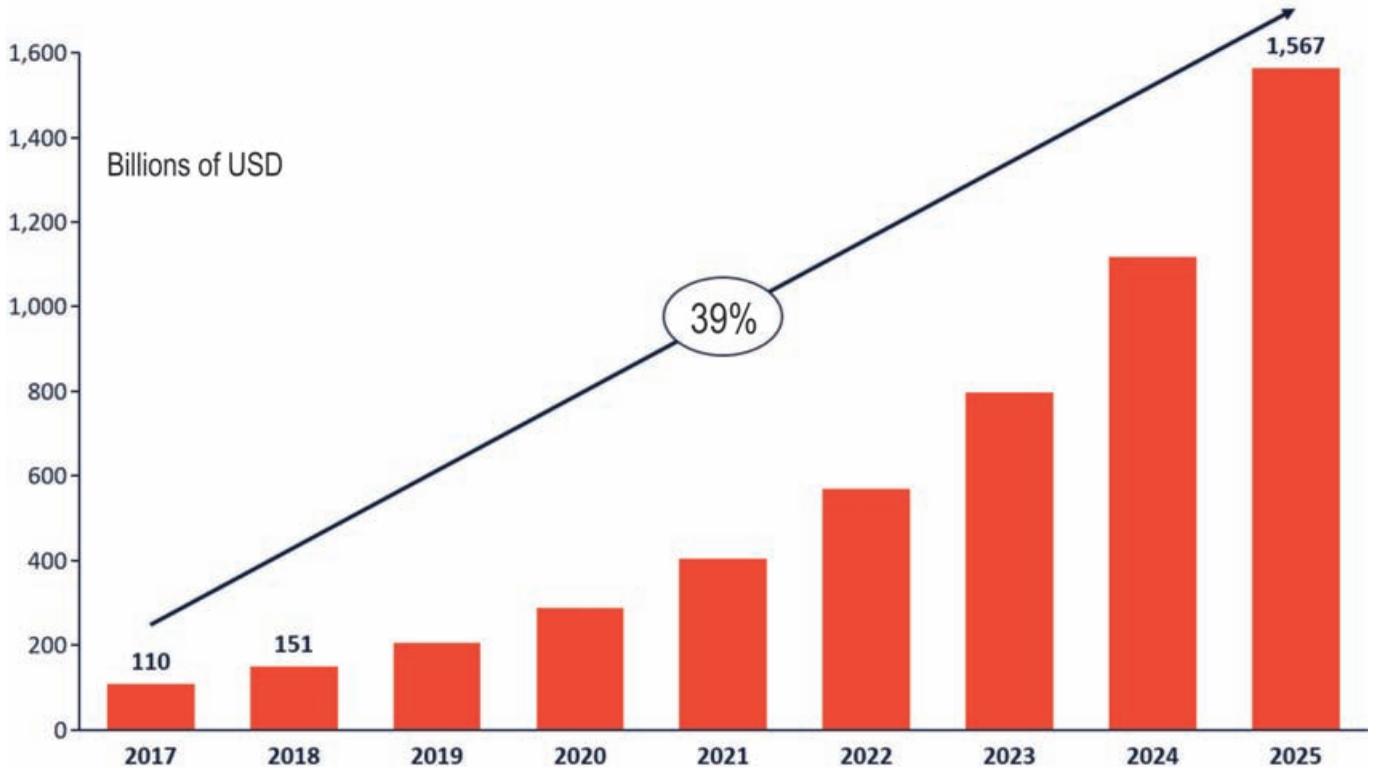
Figure 4 – *Estimates of the global IoT market*
(Source: Lueth, 2018)

Discussion and Conclusions

As a result of the research, we have identified the interested in each sector of the IoT industry analyzed. Thus, using public resources, the interest expressed for a particular applicability domain of IoT, the observations and the results obtained for each particular applicability domain were analyzed.

From a scientific point of view, it can be observed that IoT technologies are the most analyzed in the medical field, smart homes and smart city.

The field of agriculture is only 2 percent lower, on the last places being IoT systems in Logistics, Automotive and Retail for academic databases researches. The total number of scientific articles identified and the market share of each IoT applicability domain included in the study are presented in Table 3.

Table 3 – *Popularity of IoT application domains in academic databases 2015-2019*

IoT application domain	Total of academic database articles	Percentage
Medical	28.513	18,53%
Smart Homes	27.083	17,60%
Smart City	25.159	16,35%
Agriculture	21.350	13,87%
Logistics	18.450	11,99%
Automotive	17.179	11,16%
Retail	16.161	10,50%
Total	153.895	100%

(Source: Author's own research)

From the point of view of visibility in Google, we could observe slightly greater differences, so we can notice a difference of approach that is not similarly distributed on each domain, compared to the scientific environment. Thus, the most popular domain is one of Smart Homes.

In the area of results in the field of IoT Medical there are many resources, but not so much Google News. On the 3rd place in the Google search engine results was the Automotive IoT industry, but on the 2nd place with a share of over 30% in Google News results. The least search results regarding the IoT domain can be seen in the part of Smart City, Logistics and Agriculture.

By an average of the percentages was obtained from the visibility in the scientific environment, in the results of Google searches and the results of Google News it can be observed in Table 5 that most resources are in the field of Smart Homes, Medical and Automotive. At the opposite end, IoT systems in Retail, Smart City, Agriculture and Logistics are not so popular, so there are not so many published resources.

Table 4 – *Popularity of IoT application domains in Google search and Google News*

IoT application domain	Google Search Results	Percentage	Google News	Percentage
Medical	223.000.000	28,29%	1.460.000	6,51%
Smart Homes	300.000.000	38,05%	8450000	37,70%
Smart City	45.700.000	5,80%	2.360.000	10,53%
Agriculture	20.200.000	2,56%	150.000	0,67%
Logistics	30.600.000	3,88%	186.000	0,83%
Automotive	8.990.0000	11,40%	6.760.000	30,16%
Retail	79.000.000	10,02%	3.050.000	13,61%
Total	788.400.000	100,00%	22.416.000	100,00%

(Source: Author's own research)

Table 5 – *Percentage of use IoT*

IoT application domain	Scientific Percentage	Google Search Result Percentage	Google News Results	
Medical	18,53%	28,29%	6,51%	17,78%
Smart Homes	17,60%	38,05%	37,70%	31,12%
Smart City	16,35%	5,80%	10,53%	10,89%
Agriculture	13,87%	2,56%	0,67%	5,70%
Logistics	11,99%	3,88%	0,83%	5,57%
Automotive	11,16%	11,40%	30,16%	17,57%
Retail	10,50%	10,02%	13,61%	11,38%
Total	100,00%	100,00%	100,00%	100,00%

(Source: Author's own research)

Given these results, it can be observed that IoT systems that are related to individuals are more popular than those that help an organization or a community. This popularity can denote the fact that many more people are popularizing and studying these technologies that involve the individual directly. On the other hand, it can be estimated that the complex technologies that affect a community or an industrial consumer are not so popular by the access to free information, because they include many confidential details, which distributed in mass can affect a business model.
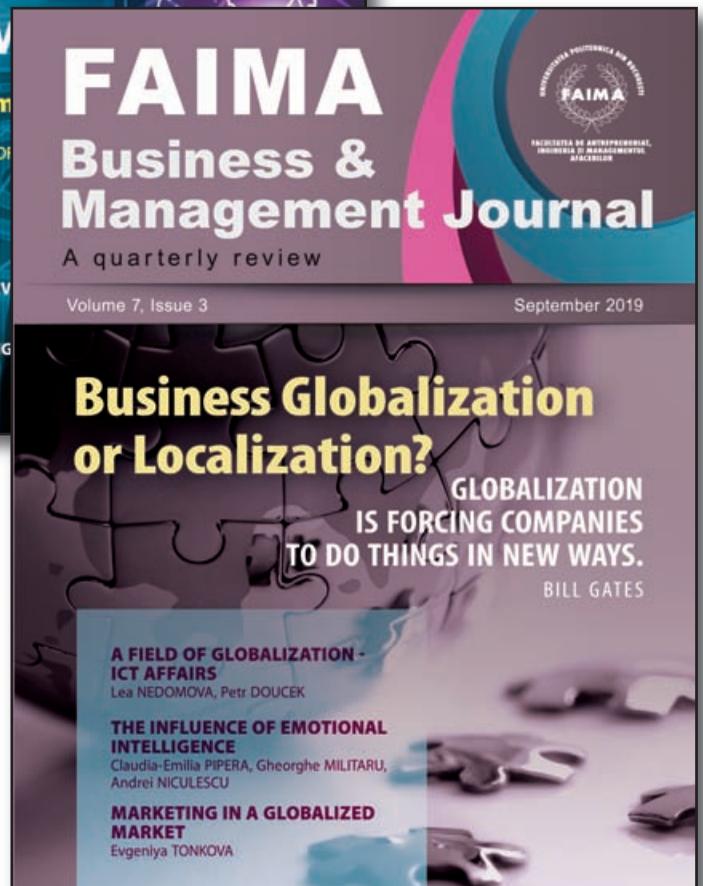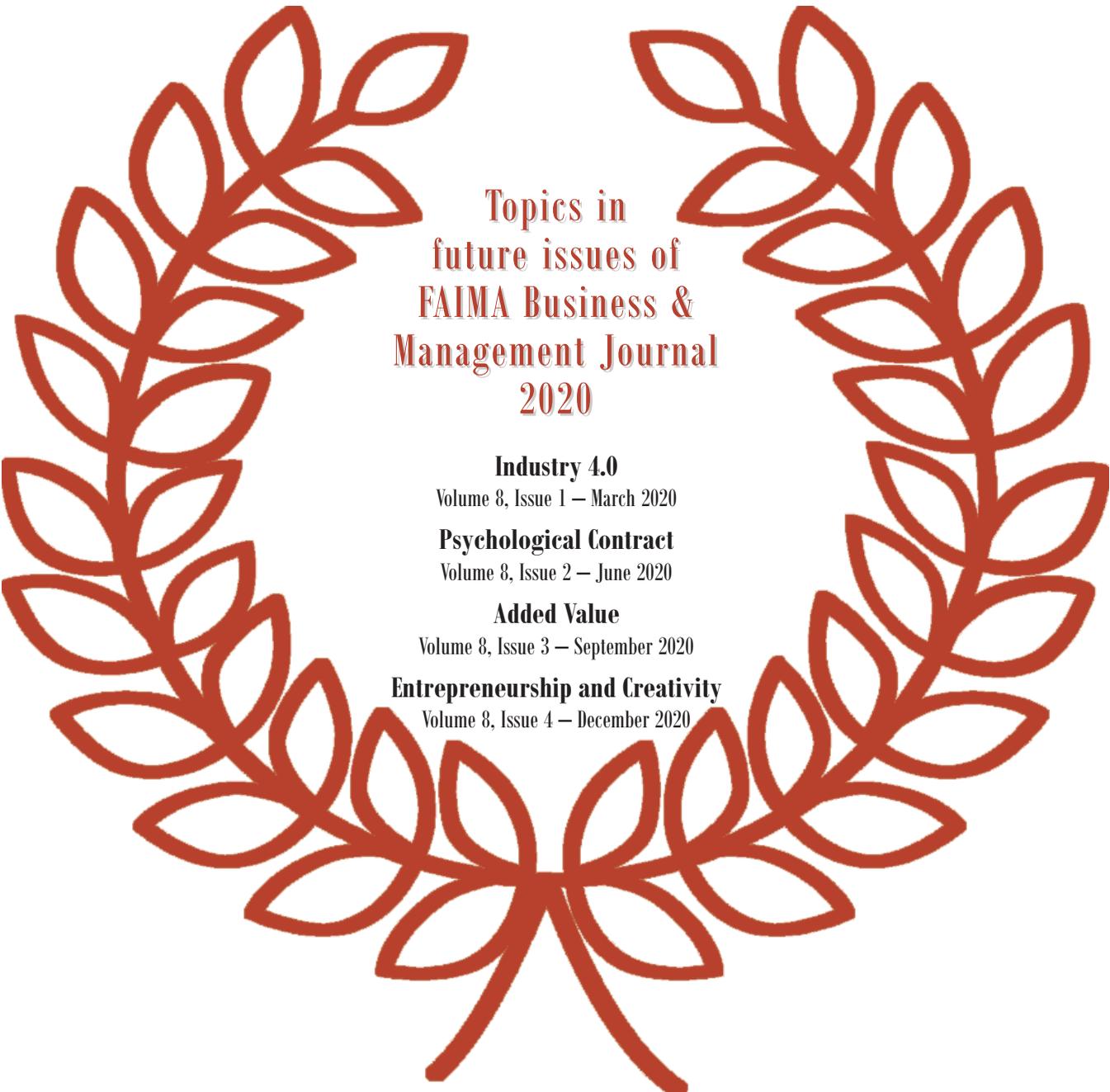
REFERENCES

1. Bassi, A., Bauer, M., Fiedler, M., Kramp, T., van Kranenburg, R., Lange, S. & Meissner, S. (Eds.). (2013) *Enabling Things to Talk Designing: IoT solutions with the IoT Architectural Reference Model*. Berlin, Germany: Springer.

2. Bhat, O., Bhat, S., & Gokhale, P. (2017) *Implementation of IoT in Smart Homes*. International Journal of Advanced Research in Computer and Communication Engineering. *6*(12) – December. 149-154.

3. European Commission. (2010) *Vision and Challenges for Realising the Internet of Things*. Brussels: Cluster of European Research Projects on the Internet of Things.

4. Kanchan, P. (2016) *Retail Adoption of Internet of Things: Applying TAM model*. International Conference on Computing, Analytics and Security Trends (pp. 404-409). Pune: CAST.

5. Lee, B.M., & Ouyang, J. (2014) *Intelligent Healthcare Service by using Collaborations between IoT Personal Health Devices*. International Journal of Bio-Science and Bio-Technology, 6(1), 155-164.

6. Lueth, L.K. (2018) *State of the IoT 2018: Number of IoT devices now at 7B – Market accelerating*. [Online]. Available from: https://iot-analytics.com/state-of-the-iot-update-q1-q2-2018-number-of-iot-devices-now-7b/ Accesses: June 2019].

7. Maltseva, D. (2019) *The top six IoT applications in logistics IoT and blockchain tech are revolutionizing the logistics industry.* [Online]. Available from: https://channels.thein-novationenterprise.com/articles/how-the-internet-of-things-will-revolutionize-the-logistics-industry [Accesed June 2019].

8. Marr, B. (2019) *5 Internet Of Things Trends Everyone Should Know About.* [Online]. Available from: https://www.forbes.com/sites/bernardmarr/2019/02/04/5-internet-of-things-trends-everyone-should-know-about/#6440c5a24b1f. [Accesed June 2019].

9. Miorandi, D., Sicari, S., De Pellegrini, F., & Chlamtac, I. (2012) *Internet of things: Vision, applications and research challenges.* Ad Hoc Networks. 10(7). 1497-1516.

10. Patel, K.K., & Patel, S.M. (2016) *Internet of Things-IOT: Definition, Characteristics, Architecture, Enabling Technologies, Application & Future Challenges.* International Journal of Engineering Science and Computing. 6(5). 6122-6131.

11. Rayes, A., & Salam, S. (2019) *Internet of Things (IoT) Overview.* In Internet of Things From Hype to Reality – The Road to Digitization (pp. 1-34). Cham: Springer.

12. Scully, P. (2018) *The Top 10 IoT Segments in 2018 – based on 1,600 real IoT projects.* [Online]. Available at: https://iot-analytics.com/top-10-iot-segments-2018-real-iot-projects/ [Accessed June 2019].

13. Shah, S.H., & Yaqoob, I. (2016) *A Survey: Internet of Things (IOT) Technologies, Applications and Challenges.* 4th IEEE International Conference on Smart Energy Grid Engineering (pp. 381-385). Oshawa: IEEE.

14. Sorescu, A., Frambach, R., Singh, J., & Rangaswamy, A. (2011) *Innovations in Retail Business Models.* Journal of Retailing, 1, 3-16.

15. Suresh, P., Vijay, D., Parthasarathy, V., & Aswathy, R. (2014) *A state of the art review on the Internet of Things (IoT) history, technology and fields of deployment.* International Conference on Science Engineering and Management Research (pp. 1-8). Chennai: IEEE.

16. Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014) *Internet of Things for Smart Cities.* IEEE Internet of Things Journal. 1(1). 22-32.

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Henry Ford

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