

# Economic horizons



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## EDITORIAL

*Economic horizons*, as a scientific journal, published by the Faculty of Economics, University of Kragujevac, Serbia, publishes the results of theoretically, methodologically, and practically valuable researches within the relevant areas of economics, business administration and management. As in the previous thirteen years of its publication, the journal focuses on the creative conceptualization and management of increasingly complex and heterogeneous phenomena, issues, problems of economics and management. The journal enables the authors to publish their double-blind reviewed manuscripts containing the previously unpublished results of scientifically grounded, practically useful and socially responsible researches into the key economic and management areas. The journal is intended for the academic community, researchers, problem-solvers and decision-makers in macroeconomics, monetary and public finances, banking, financial markets, management, marketing, accounting, business finance, management information systems, and the other related areas that allow for the multi- and interdisciplinary researches.

The new editorial platform implies a continuous enhancement of the journal quality. In accordance with this, relevance, impact, originality and clarity are the decisively important criteria for selecting the papers to be published and their classifying. The journal will be published three times a year, in Serbian and English, in print and in electronic form.

Along with the editor-in-chief's Editorial, *Economic horizons*, Volume 14, Number 1 includes two original scientific papers, two review papers, two book reviews,

and an announcement of the international scientific conference.

The renouncement of a national currency hallmarked by unstable external and internal values can result in the reduction of a long-term inflation rate, and, on the other hand, can bring about a significant problem of the balance-of-payments adjustment. *Nenad Stanisic* empirically tests the relevant hypotheses concerning the repercussions of the monetary integration on the sample of 42 countries from different regions and of various development levels. The obtained results imply a conclusion that the monetary integration influences the inflation reduction in the group of developing countries; however, such integration does not have an influence on the realized economic growth rates. On the other hand, the results suggest that the monetary integration contributes to increasing the current account deficit of developing countries, rather than developed ones.

The focus on the customer represents one of the relevant features of service-oriented organizations, including banks. *Veljko Marinkovic* and *Vladimir Senic* deal with the methodological, methodic and applicative dimensions of the creative exploring of the service quality in corporate banking. Namely, they examine the attitudes of small and medium enterprises to different elements of the service quality offered by a banking institution. The three key elements of the service quality offered in corporate banking – respecting and understanding the client, professionalism, and an image – have been examined in 133 small and medium enterprises in Serbia by employing the questionnaire technique, the factor analysis and the ANOVA test. The results of the conducted study additionally confirm that the banks' marketing orientation in their everyday business

implies a particularly conceived, long-term, close cooperation with their clients.

In System Dynamics, as the structuralist-functionalist systems approach to management, the starting hypothesis is that the system's structure represents a key determinant of its behavior, while a scientifically based and practically useful prediction of the system's behavior can be provided through appropriately conceptualized, formulated, tested and implemented models. *Dejana Zlatanovic* addresses the relevant dimensions of the System Dynamics modeling process as well as models in managing the extremely complex problems of business economy. Besides, she particularly identifies the resulting shortcomings, and sets forth the qualitative and group modeling as possible suitable ways of enhancing the System Dynamics.

Through an appropriate redefining the concept of traditional supply chain management, the development of Information Communication Technologies together with the Internet environment enable the integration of the participants and the creative management of complex interfaces between organizations in the supply chain network. Starting from the hypothesis that the separate activities of the supply chain can be connected through an appropriate e-business model in an efficient, flexible, integrated, and coordinated system, *Dragana Rejman Petrovic, Igor Milanovic* and *Zoran Kalinic* firstly examine the key dimensions of the supply chain management in an e-environment. Relying on the insights obtained through research into the different architectures of an organization's internal business, business between the organizations, and technologies between the organizations, a suitable generic model of supply chain architecture has been developed.

The current issue of the journal contains the two following book reviews: *Cimoli, M., Dosi, D., & Stiglitz, J. (Eds.). (2009). Industrial Policy and Development: The Political Economy of Capabilities Accumulation.* New York, NY: Oxford University Press, written by *Vladimir Micic*, and *Gordon, R. (Ed.). (2010). Taxation in Developing Countries: Six Case Studies and Policy Implications.* New York, NY: Columbia University Press, written by *Stevan Lukovic*.

*Verica Babic*, the president of the Program Committee of an international scientific conference: *Contemporary Issues in Economics, Business and Management - EBM 2012*, announces the second Conference that will be organized by the Faculty of Economics, University of Kragujevac, on December 13-14, 2012. As a scientific forum for exchanging ideas, insights, knowledge, and experiences concerning the relevant issues, problems and problem situations of contemporary economics, business and management, the Conference is intended for the domestic and international, academic and professional public.

On behalf of the Editorial Board and my own behalf, I would like to thank, first of all, the authors of the papers published in this issue. At the same time, we owe special gratitude to the reviewers for their efforts and constructive comments and guidelines for authors of the submitted manuscripts. Also, we would like to thank the distinguished representatives of the international academic community, who – accepting membership in the International Editorial Board of *Economic horizons* – contribute to the prestige of the journal and the Faculty of Economics, University of Kragujevac, as its publisher.

Editor-in-Chief  
Slavica P. Petrovic

*Slavica P. Petrovic* is a professor at the Faculty of Economics, University of Kragujevac, Serbia. She received her Ph.D. in Business Economics and Management, from the Faculty of Economics, University of Belgrade, Serbia. The key areas of her scientific interests and research are systems thinking, organizational cybernetics, systems methodologies for structuring the management problem situations, soft and critical management science.

*Original scientific paper*

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## EFFECTS OF INTERNATIONAL MONETARY INTEGRATION ON INFLATION, ECONOMIC GROWTH AND CURRENT ACCOUNT

Nenad Stanisic\*

There are various benefits which countries could derive from the renouncement of a national currency hallmarked by unstable external and internal values. The most evident one is the reduction of a long-term inflation rate. The objective of this paper is to test the hypothesis of the positive influence which monetary integration exerts on monetary stability and economic growth. On the other hand, monetary integration can also cause certain economic problems to countries' economies, such as the one of the balance-of-payments adjustment. Hence this paper surveys its influence on the current account balance of national economies. The hypotheses are tested empirically by examining the sample of 42 countries from different regions and of different development levels. The results suggest that the monetary integration influences the inflation reduction in developing countries, but not the achieved economic growth rates. At the same time, the results indicate that monetary integration contributes to an increase in the current account deficit of developing countries, but not of developed ones.

**Keywords:** international monetary integration, economic growth, inflation, current account

JEL Classification: F15, F31, F41, E31

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### INTRODUCTION

Reducing the number of national currencies, as one of the features of the world economy, can be interpreted as a logical consequence of the growing integration of the international commodity and financial markets. In terms of a fierce currency competition, a number of weak national currencies were suppressed by the world's major currencies. Simultaneously to this, the so-called dollarization process, the growing integration of the economies of the European Union,

led to the establishment of a monetary union and – the creation of the regional currency – euro. The practice of the renunciation of a national currency is presently the most common in Europe, among the former and current transition countries, either outside or within the European Union.

The distinction between the creation of the monetary union and dollarization can be observed from many different aspects. However, what they have in common is a loss of their national monetary sovereignty and, thus, inability to conduct the national monetary - and exchange rate policies.

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To achieve an economic and productivity growth is the final goal an economic policy aims for, so the benefits

of monetary integration can also be seen as monetary integration's contribution to accomplishing these goals.

Monetary integration can directly be conducive to increasing the competition and investment. The benefits monetary integration brings arise from the macroeconomic stabilization and elimination of a foreign exchange risk between the members of the monetary integration. Through the effects of monetary integration, macroeconomic stabilization affects the reduction of the inflation rate, the reduction of the real interest rate and the strengthening of the budgetary discipline. The elimination of a currency risk and, therefore, currency conversion fees and a simpler price comparison lead to increased international trade and investments within the single currency area.

The above mentioned does not close the list of possible positive effects of monetary integration on a national economy. It can be expanded through support to the development of the financial sector, as well as

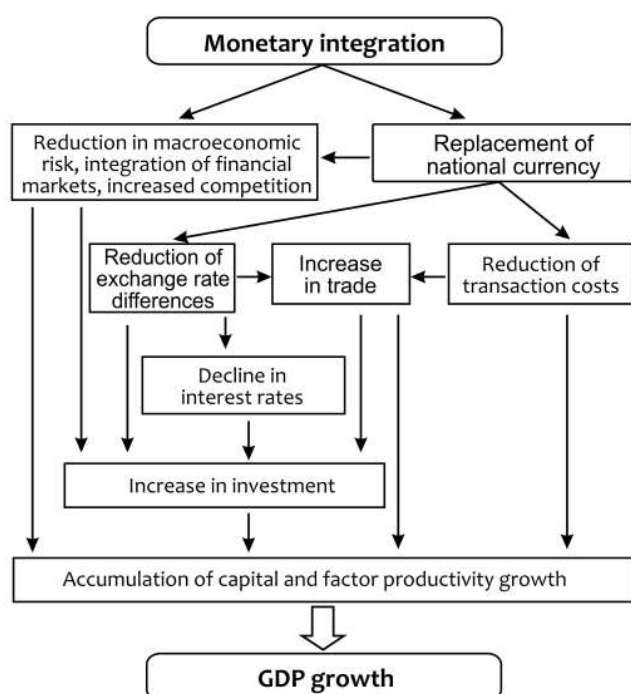
through the advantage of the international use of the monetary union's common currency, realized only if the particular currency takes a significant place on the global financial market.

Beside all the benefits, the replacement of the national currency with foreign or regional money also brings certain costs to the particular country. First of all, the country loses an important mechanism of adaptation in case of balance-of-payments disturbances within the currency area – a possibility to change the exchange rate (Mundell, 1961). Through renouncing the national currency, a possibility to conduct an independent monetary policy also goes astray as there is a risk that the common monetary policy (in the event of a monetary union) or a foreign monetary policy (in the event of dollarization) will not suit the interests of the respective country at that particular moment. Both potential problems could have an effect upon an increase in inflation or causing barriers to economic growth.

The ultimate effect of monetary integration on inflation and economic growth depends on the extent of opposition between positive and negative influences. The objective of this paper is to empirically confirm the fundamental research hypothesis:

1. Monetary integration leads to the reduction of a long-term inflation rate;
2. Monetary integration leads to increasing a long-term economic growth rate;
3. Monetary integration leads to an increase in the current account deficit.

The paper consists of three sections, followed by the conclusion. The first section comprises the review of the main conclusions of previous researches dealing with the same set of issues. The subsequent section includes the description of the applied research methods, as well as data to be used within the research. The section presenting the project results is divided into three subsections due to the subject of the research resp. the fact that the paper surveys the impact of monetary integration on three macroeconomic variables: economic growth, the inflation rate and the balance-of-payments current account. The main



**Figure 1** Effects of monetary integration (Stanišić, 2010)

results and limitations of the study are presented in the Conclusion.

## REVIEW OF PREVIOUS RESEARCH

Accepting a foreign or the regional currency represents an extreme form of exchange rate fixing within the given group of countries. Therefore, the question of macroeconomic effects of monetary integration is related (but not equal) to the question of the fixed exchange rate effects.

In order to draw a comparison between different exchange rate regimes due to their impact on inflation and economic growth, in the first place it is necessary to properly classify the countries according to the exchange rate regime they are applying. Namely, one country's monetary policy is often opposite to the official exchange rate regime. For instance, many developing countries which, after having faced the currency crises in the 1990's, moved to the floating exchange rate, still conduct the monetary policy which often pursues the goal of the long-term exchange rate stabilization. In literature, such an attitude of monetary authorities, which is not completely consistent with the officially accepted floating exchange rate regime, is called «Fear of Floating» (Bayoumi & Eichengreen, 1994). On the other hand, despite the official application of the floating exchange rate regime, in some developing countries the external value of the currency persistently goes down, which is the consequence of frequent devaluations. Nevertheless, changes in the exchange rate can also be minor in the event of applying the fully floating rate of exchange, as is often the case with developed economies during the expansion of the world economy. All this indicates a gap that could be found between the official (*de jure*) and the real (*de facto*) exchange rate regimes.

The above mentioned inconsistencies between the official exchange rate regime and the actual monetary policy make every research of economic performances based on *de jure* regimes unreliable. Therefore, contemporary literature contains many attempts to provide a classification of countries according to the regime they conduct, based on observations of exchange rate movements over a longer time period

(Ghosh et al., 1995; Levy-Yeyati & Sturzenegger, 2003; Rogoff et al., 2004). Since 1990, within its reports, the IMF has also been publishing, the classification of countries according to the *de facto* exchange rate regime, placing them into one of the following eight categories: regimes without a specific national currency, currency board arrangements, conventional (adjustable) fixed arrangements, target zones, crawling pegs, crawling bands, the managed floating exchange rate and the freely floating exchange rate.

The classifications made by several authors, as the result of observing the long-time series of the exchange rate behavior of a large number of currencies, are frequently used in research projects, to name some: : Ghosh, et al. (1995, 1998), Rogoff, et al (2004) or Levy -Yeyati, & Sturzenegger (2005).

The first group of authors made a comparison between the official regimes of 147 countries with the exchange-rate movements of their currencies over a period of several decades. Only those countries whose exchange rate behavior is in accordance with the official regime entered the classification of the so-called «consensus pattern», where the countries are sorted out due to the classification of all regimes into three groups: the fixed, floating and intermediate exchange rates.

Unlike this classification, Rogoff, et al (2002) put the countries into one of five categories of so-called «natural scheme»: fixed, limited flexibility, managed floating, freely floating and freely falling exchange rate behaviour (the last one includes countries in which the annual inflation rate exceeds 40%).

The number of countries according to the De Facto Exchange Rate Regime within the official IMF's classification (De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework) is accounted for in Table 1.

Empirical studies almost always confirm the positive effect of the fixed exchange rate (and monetary integration) on monetary stability (IMF, 1997; Edwards, & Magendzo, 2002; Edwards, & Magendzo, 2006; Meller, & Nautz, 2009). The IMF's study (1997), conducted on a sample of 145 countries sorted out in three groups due to the officially applied exchange rate (the fixed, intermediate and floating exchange rates) and whose

**Table 1** The number of countries according to the De Facto Exchange Rate Regime applied in 2009.

Exchange rate regime	Number of countries
Without national currency	10
Currency board arrangements	13
Conventional fixed rate	68
Target zones	3
Crawling pegs	8
Crawling bands	2
Managed floating exchange rate	44
Freely floating exchange rate	40*
In total	188

Note: The EMU member states are, each, separately classified under the group of countries with the freely floating exchange rate.

Source: De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework, IMF, Washington DC, 2010

economic features were observed during a thirty-year time period, indicates the following:

1. The inflation rate was the lowest in the group of countries with the fixed exchange rate, only to be followed by countries with the intermediate exchange rate, and finally those with the floating exchange rate.
2. Countries with the fixed exchange rate regime whose currency's parity frequently changed had higher inflation rates than those where the currency parity less often changed.
3. The growth of money supply is lower in countries with the fixed exchange rate than in those with the floating exchange rate.

The conclusions made are valid regardless of trade openness or of the level of country's development.

Also, the studies based on the previously described «consensus classification» of countries due to the *de facto* exchange rate regime have proven significant advantages of the fixed exchange rate in the sense of its contribution to monetary stability. The results of one

of the studies (Ghosh, Gulde, & Wolf, 2002) are shown in Table 2.

**Table 2** Inflation under different exchange rate regimes, time period 1970–1999.

	Average annual inflation	Median inflation
De jure classification		
Fixed exchange rate	13,3	8,0
Intermediate regimes	22,0	9,6
Floating exchange rate	24,3	9,0
De facto classification		
Fixed exchange rate	9,4	6,9
Intermediate regimes	30,2	11,4
Floating exchange rate	58,8	21,7

Source: Ghosh, A., Gulde, A., & Wolf, H. (2002).

The results indicate that, within fixed regimes, the rates of inflation are lower than in the case of other exchange rate regimes, no matter which classification is used: either *de jure* or *de facto*, and regardless of observing either the average inflation or the median value.

The advantage of the fixed exchange rate over the floating one in terms of achieving monetary stability has, as well, been proven by complex econometric studies in which many other variables that, beside the exchange rate regime, influence the inflation rate, were controlled, such as: money supply growth, the real GDP, the budget balance, the trade coefficient etc.

However, the advantage of the fixed exchange rate over alternative regimes is not sustainable in all cases when countries are grouped according to their income level, i.e. development. Using the «natural classification» of countries due to the *de facto* exchange rate regime, it is possible to bring to proof that the fixed exchange rate in industrialized countries is linked to a three-percentage-point higher annual inflation than in the countries from the same group which have the floating exchange rate. On the other hand, in the group of developing countries with a low *per capita* income,

the fixed exchange rate is related to lower inflation rates, while in the group of developing middle-income countries, different regimes do not show a statistically significant difference. Such differences in the results can be explained by different circumstances which different income-groups of countries are facing. The main difference reflects in the volume and stability of the foreign capital inflow. Countries at a low development level are not very attractive for the foreign capital, which, therefore, does not considerably reflect to the overall price level. Monetary stability in medium developed countries may be threatened by significant, but unstable, capital inflows. Despite their high amounts, international capital flows in developed countries do not have any destabilizing effects, due to the development of their financial markets and stability of flows. Accordingly, only in the group of countries at a medium development level has an important relationship between the foreign capital inflow and the overall price level been identified.

The relation between the applied exchange rate regime and economic growth is less clear and more difficult to prove than the one between the exchange rate regime and inflation. Various empirical research projects have not managed to disambiguate the question of the relation between monetary integration and economic growth (Bayoumi, & Eichengreen, 1994; Ghosh, et al., 1998; Edwards, 2001; Edwards, & Magendzo, 2001; Levy-Yeyati, & Sturzenegger, 2002; Rogoff, et al., 2004). The reason for that is probably the fact that the effects of monetary integration are difficult to isolate from many other effects influencing the growth of an economy. The already mentioned study, Ghosh, Gulde & Wolf (2002), came to a conclusion that the highest average annual growth rate had been achieved by the group of countries with a managed flexible exchange rate. Econometric methods more complex than those used in this research have not provided any clearer results, either. As a matter of fact, some studies produced contradictory results. For instance, Rogoff, et al. (2004) claim in their study that developed countries with the floating exchange rate achieve higher economic growth rates than those applying the fixed exchange rate, while, in the group of developing countries, there is no statistically noteworthy relationship. As

opposed to this, the study conducted by Levy-Yeyati & Sturzenegger (2003) indicates the existence of a significant relationship between the floating exchange rate and economic growth exactly in the group of less developed countries, while in developed ones, this relationship disappears.

## RESEARCH METHODS AND DATA

This paper tends to test the effects of monetary integration on inflation and economic growth by comparing the long-term average of the mentioned economic indicators in the two groups of countries: countries without their own national currency and countries with their respective currencies applying the flexible exchange rate. Countries applying dollarization, currency board or monetary union membership belong to the first group. The classification of countries based on the applied exchange rate regime has been made according to the data from De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework (IMF, 2010). Data on actual inflation and economic growth rates, as well as those on the current account balance of the observed countries, are taken from the publication World Economic Outlook (IMF, 2010).

Testing the hypothesis on the influence of monetary integration on raising monetary stability and increasing inflation rate and economic growth rate will be conducted due to comparison of average inflation rate and economic growth rate, in the period 2005-2009, between the group of countries which have their own currency and the group of countries without a national currency, so that the analysis belongs to so-called „cross sectional“ researches. Statistical significance of a observed difference in average values obtained is being tested through using an appropriate statistical tool – two-sided Student’s t-test for unpaired data. Since application of the t-test is justified only in case that the data are sampled from a normal population which follows a normal distribution, this assumption is tested using the method of Kolmogorov and Smirnov. All calculations and statistical tests in this paper is done in the *Statistical Package for the Social Sciences – SPSS*.

According to the experience acquired on the previously mentioned analyses, a sample of countries must be chosen taking into account the differences in their development levels, so this analysis consists of two complementary parts. The first part is devoted to testing the difference in actual inflation rates between developing countries and transition economies, while the second part provides the same analysis conducted on a sample of developed countries.

There are 23 countries applying dollarization or the currency board against a group of 40 countries with the freely floating exchange rate. If observing only developing and transition countries, 21 countries apply dollarization or currency board arrangements and 10 countries have freely floating exchange rates. With an aim to properly sample and make a better comparison,

very small, mostly island, countries with insufficiently diversified economies have been excluded from the group of countries without their national currencies. The 40 sampled countries include 18 developing and transition economies and 24 developed countries. There are 21 countries with their own national currencies with freely floating exchange rates, while a foreign or the regional currency (euro) is used as a legal tender or the currency board is effective. The structure of the sample is demonstrated in Table 3.

## IMPLICATIONS OF MONETARY INTEGRATION ON SELECTED ECONOMIC INDICATORS

### The influence of monetary integration on the inflation rate

As far as the sample of developing and transition countries is concerned, the average annual rates of inflation in a four-year time period (2005-2009) have been observed. The parameters for the sample are presented in Table 4.

**Table 3** Sample

	Countries with national currency	Countries without national currency
Developed countries	Australia	Austria
	Canada	Belgium
	Israel	Finland
	Japan	France
	Republic of Korea	Germany
	New Zealand	Greece
	Norway	Ireland
	Sweden	Italy
	Switzerland	Luxembourg
	Great Britain	Netherlands
	USA	Portugal
		Spain
		Hong Kong*
Developing and transition countries	Albania	Ecuador
	Brazil	El Salvador
	Chile	Panama
	Mexico	Dominica
	Philippines	Bosnia and Herzegovina*
	Poland	Bulgaria*
	South Africa	Estonia*
	Turkey	Lithuania*
	Congo	
	Zambia	

\* Hong Kong, Bulgaria, Estonia, Lithuania and Bosnia and Herzegovina have their own respective currencies but apply the currency board regime.

**Table 4** The parameters for the sample of developing and transition countries

	Freely floating exchange rate	Currency board and dollarization
Average value	6,129%	3,373%
Sample size	10	8
Standard deviation	4,001	1,146
Standard error	1,265	0,4052
Minimum value	1,77	1,53
Maximum value	13,43	5,40
Median	4,870	3,335
Lower limit of the confidence interval (95%)	3,267	2,414
Upper limit of the confidence interval (95%)	8,991	4,331

According to the data obtained, the mean value of the average inflation rates in the group of countries with the freely floating exchange rate is 6.13% versus 3.37% in the group of countries implementing dollarization or the currency board. The statistical significance of the difference can be tested using the two-sided Student's t-test for unpaired data. The test result (statistics  $P=0.0448$ ) suggests a statistically significant difference in average inflation rates; thus it can be concluded that monetary integration contributes to monetary stabilization of developing and transition countries.

When speaking about developed countries, in the time period 2005-2009, the average inflation rate in countries without the national currency was 2.19%, and 1.95% in the group of countries with the freely floating exchange rate. The other parameters are presented in Table 5.

**Table 5** The parameters for the sample of developed countries

	Freely floating exchange rate	Without national currency
Average value	1,953%	2,189%
Sample size	11	13
Standard deviation	0,9806	0,6979
Standard error	0,2956	0,1936
Minimum value	0.10	0,98
Maximum value	3,15	3,43
Median	2,00	2,18
Lower limit of the confidence interval (95%)	1,294	1,767
Upper limit of the confidence interval (95%)	2,611	2,611

The result of the t-test ( $P=0.4982$ ) suggests that the observed difference in the actual inflation rates is not statistically significant. In other words, different exchange rate regimes in the two defined groups of developed countries did not have an impact on the difference in inflation rates.

The results obtained through the analysis lead to the conclusion that monetary integration can serve as a means of stabilizing the overall price level in less developed economies; however, it cannot influence differences in inflation rates amongst developed countries.

### The influence of monetary integration on economic growth

By analogy with the conducted statistical analysis of the influence of monetary integration on inflation, its impact on the average growth rate of the real GDP can also be tested. This time as well, the development level of countries should be taken into account, so the first part of the analysis includes developing countries and countries in transition, and the second one developed countries. The average growth rate of the real GDP observed relates to the time period 2005-2009.

**Table 6** The parameters for the sample of developing and transition countries

	Freely floating exchange rate	Dollarization and currency board
Average value	5,00%	5,50%
Sample size	10	8
Standard deviation	1,099	2,010
Standard error	0,3475	0,7107
Minimum value	3,30	3,13
Maximum value	6,73	9,10
Median	5,315	5,600
Lower limit of the confidence interval (95%)	4,214	3,827
Upper limit of the confidence interval (95%)	5,786	7,188

In monetary integrated developing and transition countries, the mean value of average inflation rates is slightly higher (5.5%) than in countries with freely

floating exchange rates (5%). The statistical significance of the difference was tested based on Welch's correction. The resulting P value (0.5356) indicates a statistically insignificant difference in the achieved GDP growth rates, which is not the proof of a clear impact of monetary integration on economic growth in this group of countries.

The second part of the analysis is related to the group of developed economies. The parameters for the sample are given in Table 7.

**Table 7** The parameters for the sample of developed countries

	Freely floating exchange rate	Without national currency
Average value	3,11%	2,97%
Sample size	11	13
Standard deviation	0,8017	1,708
Standard error	0,2417	0,4737
Minimum value	2,23	0,98
Maximum value	4,63	6,85
Median	3,08	2,38
Lower limit of the confidence interval (95%)	2,575	1,942
Upper limit of the confidence interval (95%)	3,652	4,006

The difference observed in the achieved average growth rates of the real GDP at an annual level in the four-year time period, 3.11% against 2.97% in favor of countries with freely floating exchange rates is not statistically significant ( $P=0.8060$ ), so that no clear link between the applied exchange rate regime and economic growth was found this time, either.

No impact of monetary integration on economic growth has been proved in any one of the observed groups of countries; a lack of a clear empirical link between monetary integration and the growth rate seems to speak more about the impossibility of modeling the complex influence of various direct and indirect

variables on economic performances rather than about the absence of such a link.

### The influence of monetary integration on the current account balance

The influence of monetary integration on the current account will be tested in the same way as in the case of the two previous parameters, inflation and the real GDP growth. This time, too, developing and developed countries will separately be observed in order to remove the influence of the different development levels and take into account all the differences existing between these two groups of countries in terms of foreign trade performances and current transfers of income.

The first part of the analysis is related to developing and transition countries. The current account balance (% GDP) is observed in the time period from 2005 to 2009. The parameters for the sample are accounted for in Table 8.

Both groups within developing and developed countries are faced with the current account deficit

**Table 8** The parameters for the sample of developing and transition economies

	Freely floating exchange rate	Dollarization and currency board
Average value	-2,57%	-10,40%
Sample size	10	8
Standard deviation	3,506	9,031
Standard error	1,109	3,193
Minimum value	-7,27	-24,13
Maximum value	2,17	2,60
Median	-2,385	-9,420
Lower limit of the confidence interval (95%)	-5,079	-17,956
Upper limit of the confidence interval (95%)	-0,063	-2,854

and there is an important difference in their values. In the group of countries applying dollarization or currency board arrangements, the average deficit is 10.4% of the GDP, whereas in the group of countries with freely floating exchange rates, the deficit is much lower, 2.57% of the GDP.

That this difference is the consequence of the applied exchange rate regime is confirmed by the t-test's results. Because of unequal variances, Welch's correction was performed. The value of P statistics ( $P=0.0491$ ) indicates that there is a small possibility of the observed difference in deficit to be random, i.e. that the observed difference is the result of sampling rather than a real difference between the observed groups.

The study results suggest that the lack of the national monetary and exchange rate policies in countries implementing dollarization or currency board arrangements influences the current state of balance to a great extent. The reason for this lies in the fact that the monetary policy of a country whose currency is used in countries with dollarization or the currency board, does not often correspond to the economic situation in countries that have renounced their national currencies. This is the result of dissimilar economic structures and their inconsistent movements in the economic activity, on the one hand, and, on the other, it is the consequence of the poor flexibility and ineffectiveness of other adjustment mechanisms.

When speaking about developed countries, other results can be expected, considering the fact that the EMU member states (comprising the major part of the sample) conduct an active regional monetary policy and along with it are at a similar development level. The economic cycles of these countries, their openness to foreign trade and the commodity structure of exports are much more consistent than in the event of developing and transition economies. Nevertheless, despite many limitations, the balance of payments adjustment mechanisms in these countries function much more efficiently.

The parameters for the sample of developed countries from the aspect of the size of the current account deficit are given in Table 9.

**Table 9** The parameters for the sample of developed countries

	Freely floating exchange rate	Without national currency
Average value	2,21%	0,85%
Sample size	11	13
Standard deviation	8,213	6,326
Standard error	2,476	1,754
Minimum value	-8,58	-9,00
Maximum value	18,13	9,35
Median	1,93	1,15
Lower limit of the confidence interval (95%)	-3,309	-2,976
Upper limit of the confidence interval (95%)	7,726	4,670

The difference noticed in the amount of the current account deficit in the two observed groups of countries (2.21% vs. 0.85%) is not statistically significant ( $P=0,6510$ ), which confirms the initial assumption that, in developed countries, the difference in deficit is not related to differences in the applied exchange rate regime.

## CONCLUSION

The research on the effects the renunciation of national monetary sovereignty has on the inflation rate confirms that renouncing the national currency in favor of a strong foreign currency contributes to establishing monetary stability in developing and transition economies, whereas using a foreign or the regional currency within the group of developed countries does not affect a decrease in the inflation rate.

Considering the level of development, the difference noticed in the results can be explained by the fact that, in general, developing countries have unstable national currencies, i.e. a long history of high inflation in the time period prior to the renunciation of the national currency. Moreover, exactly this can be seen as the main reason why some of these countries decided

to officially accept a foreign currency. On the other hand, developed countries which have renounced their monetary sovereignty (first of all the Eurozone member states), had in most cases had relatively low inflation rates (with the exception of Ireland, Italy, Portugal, Greece and Spain) before the introduction of the euro, too, so the effect of monetary integration is statistically insignificant.

In regard to the effect of monetary integration on the economic growth rate, the conducted analysis did not prove its existence in developed countries, nor did it prove its existence in developing ones. However, this conclusion should be interpreted with caution, having in mind the difficult isolation of some effects in a variety of factors determining the rate of economic growth.

The study results are also indicative of the fact that the lack of a national exchange rate policy in developing countries which decided to officially implement dollarization affects the current state of balance, thus causing a sharp increase in deficit. The conclusion is not surprising since the monetary policy of the most developed countries cannot suit the countries at a considerably lower level of development and weaker economic and export structures and the lower productivity growth rate. It is also often the case that, although reduced, inflation in developing countries applying dollarization is at a higher level than inflation in the country whose currency is used (Balassa-Samuelson effect), so it comes to a steady loss of price competitiveness on the world market.

Unlike the group of developing countries and countries in transition, the impact of monetary integration on deterioration in the current account balance has not been proven in its member states, i.e. in developed countries. The reason is that the Eurozone member states (making up the largest portion of the sample) pursue an active common monetary policy, as well as that they are at a relatively similar development level, so the economic cycles of these countries and their openness to foreign trade and the commodity structure of exports are much more consistent than developing and transition economies are.

Finally, the basic limitations of the presented study and avenues for future research on the influences of monetary integration should also be stressed. This is primarily related to the statistical tool applied for testing the hypotheses. Although frequently used in literature and appropriate for the comparative analysis carried out in this paper, in certain cases, the applied methods cannot clearly identify and isolate the impact some variables have on inflation, the current account and, above all, economic growth. Namely, macroeconomic indicators are the ones affected by an indefinitely large number of variables whose influences intertwine, as is the matter with any social system, which makes every modeling difficult and results unreliable. The goal of future research in this field is to specify more complex econometric models that will «control» the impact of a greater number of independent variables, not just economic development, as it is the case in this study.

Also, the conclusions of the conducted analysis make room for future research which would be a scientifically and methodologically valid way to predict the effects of the introduction of the euro in Serbia, which in recent years has been an increasingly discussed topic among experts.

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## ANALYSIS OF SERVICE QUALITY ELEMENTS IN CORPORATE BANKING

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Customer orientation in the last couple of years has been experiencing an expansion in many service-based organizations including banks. The needs of financial services users are dynamically changing, making it necessary for banks to be oriented towards developing long-term relationships with their clients in order to become and remain profitable. The main objective of this research is aimed at studying attitudes of corporate clients – small and medium enterprises – on different elements of the service quality delivered by a banking institution. The results of the conducted study emphasize three key elements of a service offer in corporate banking, including, respecting and understanding a bank's clients, professionalism and image. Such findings additionally confirm the necessity for modern banking institutions to embrace the concept of tight cooperation with clients, only possible if they are truly committed to the marketing orientation in their everyday business.

**Keywords:** service quality, bank image, small and medium enterprises, corporate clients

JEL Classification: M31

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### INTRODUCTION

Over the past two decades, Small and Medium Enterprises (SMEs) have generated a lot of attention on behalf of banking institutions. This should not be much of a surprise considering that SMEs are one of the most significant drivers of the modern economy. An extensive study conducted by Ayyagari, Beck & Demirgüç-Kunt (2007) found that in 76 developed and developing countries, SMEs contributed over 50% to employment in manufacturing, while the relevant data for 35 countries in the same study imply that, on

average, SMEs generated about 42% of the national GDP. Additionally, according to the European Commission (2010) as of 2008, there were almost 21 million registered enterprises within the European Union (EU), of which only 43,000 were large scale enterprises (LSEs). In other words, there were 20.7 million SMEs accounting for 99.8% of all EU enterprises and employed over 67% of the EU workforce. Furthermore, Shen, Shen, Xu & Bai (2009) reported that 99.6% of all Chinese enterprises were SMEs accounting for almost 60% of the nation's GDP, while generating 3 out of 4 jobs in urban areas.

Evidently, SMEs represent the major impetus in developed market economies as well as in developing countries. This is confirmed by a study conducted in 2007 by the Statistical Office of the Republic of

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Serbia (2008). Namely, if the number of employees is used as the main criterion for determining the size of enterprises, some 96.2% of Serbian companies fall into the category of micro and small enterprises (up to 50 employees), 3.1% are classified as medium enterprises (from 50 to 249 employees), while the remaining 0.7% belong to large enterprises (more than 250 employees).

Such an evident presence of SMEs in the world's economy has not gone unnoticed by financial institutions. Certainly, many banks have recognized SMEs as a potential source of significant profits (Connolly, 2000). This is even more pronounced considering the results of the OECD (2009) study suggesting that, when in need of additional funds to support further growth, SMEs most frequently turn to bank lending – thus rendering banking institutions as one of the most significant sources of external capital for SMEs. Furthermore, Torre, Pería & Schumkler (2010) confirm that numerous banking institutions are approaching SME segment as a significant one and do have plans to further increase their presence in this segment through providing adequate banking services tailored to the specific SME needs. Such observations go along with those made by Silver & Vegholm (2009), who suggest that SMEs need to be treated as clients of great significance, implying that banks should make a substantial effort to identify SMEs' needs and adapt to them accordingly in order to further utilize the business potential that this segment offers.

## LITERATURE REVIEW

### Customer loyalty

Customer loyalty represents one of the most frequently researched areas in marketing nowadays. As a concept, it is used to describe the willingness of customers to continue to show interest in a given company over a longer period of time, while simultaneously recommending the company and its products/services to others. In the early phase of research, most of the attention was dedicated to examining loyalty with respect to branded industrial consumer goods (Cunningham, 1956), while the focus on investigating loyalty in the service sector context is a rather recent phenomenon, truly commencing as early as in the

1990s. Some academics believe that loyalty in service is still a relatively under-researched field and that it has not received the attention it deserves (Lewis & Soureli, 2006). Nevertheless, it has become apparent fairly quickly that loyalty is of great importance to service-oriented companies and hence it should be viewed as an asset of utmost value for all service providers (Andreassen & Lindestad, 1998).

Measuring customer loyalty, however, is not an easy task (Bauman, Burton & Eliot, 2005). The complexity in measuring customer loyalty rises from the fact that the concept of loyalty is comprised of behavioral and attitudinal dimensions (Rauyrueen & Miller, 2007). Behavioral loyalty is present if the customer repeats purchases regularly over a period of time. As such, behavioral loyalty is often seen as a mixture of the customer's intention to repeat purchases of services/products – including frequency and amount (Lewis & Soureli, 2006). On the other hand, attitudinal loyalty is viewed as consisting of customers' nature, preferences, trust or emotional relatedness to services/products and word-of-mouth (Zeithaml, Berry & Parasuraman, 1996, Andreassen & Lindestad, 1998). Yet, it is worth noting that the proposition that attitude and behavior comprise the two most significant components of loyalty has been criticized in marketing literature as well (Bloemer, Ruyter & Peeters, 1998).

### Service quality

The quality of delivered services certainly represents one of the major “triggers” of loyalty among customers and, as such, - has generated a considerable amount of interest among academics and practitioners. As a term, quality is used commonly in everyday life and we all do have an excellent notion of what represents a good or poor quality. In spite of such a widespread use, interestingly enough, researchers have not come up with a single definition of quality yet, mainly because quality as a concept is related to a great number of interpretations (Garvin, 1984). Indeed, what may be perceived as a superb quality by one individual may also be observed as an average, or even below average, quality by another person. Namely, elements including person's habits, attitudes, experiences, set of values or social class or cultural background are just some of the

factors determining the way in which quality may be perceived by an individual. This clearly suggests that measuring quality is a composite and challenging task. The complexity of measuring quality is further deepened by some characteristics of services – including intangibility and the fact that customers are often involved in the service process, hence directly influencing the quality of the service itself.

True complexity behind measuring quality in service setting is probably illustrated best by Seth, Deshmukh & Vrat (2005), who, in their study, presented 19 different models used to measure the quality of service. The technical and functional model (Grönroos, 1984), the gap model (Parasuraman, Zeithaml & Berry, 1985), the performance-only model (Cronin & Taylor, 1992) and the hierarchical model (Brady & Cronin, 2001) certainly represent the most prominent models frequently used in modern-day studies. One of the most frequently used models for measuring service quality is the SERVQUAL model (Parasuraman, Zeithaml & Berry, 1988), which we used for designing the survey instrument for this study.

### **CRM in contemporary banking**

The fierce competition in the domain of financial services has forced many banks to accept an approach based on the Customer Relationship Management (CRM) concept. Today, banks are oriented towards tight cooperation with their clients, because their survival and further progress often implies delivering a superior value – which should exceed customers' expectations over a longer period of time. In addition, a superior value cannot easily be copied by the competition, which also explains why it represents a corner stone in creating a sustainable competitive advantage. In rather dynamic market conditions, it is not enough for banks to be focused only on creating good quality products and services; also, it is of essential importance to build strong relationships with clients. Basically, the CRM concept puts clients into the spotlight of the overall bank's activity. However, in order to do so, it is important to convert transactions into interpersonal relations, yielding the CRM concept as an essential and unavoidable component of modern bank marketing. On the other hand, the implementation of the "one-

to-one marketing" concept is a strategy enabling the development of long-term relationships between a bank and its every individual client. This represents a special challenge particularly for large and financially strong banks, which also have an enormous number of clients.

The implementation of CRM is significant, considering that studies show that users of banks' services are becoming more dynamic and less loyal. Thanks to the Internet, clients have a greater opportunity than ever before to switch their business from one bank to another (Gupta & Shukla, 2002). The relationship between a bank and its clients is not only a simple sum of processed transactions in the past (Parasuraman, Zeithaml & Berry, 1988). The strong connectedness between the two sides within the financial services sector is, above all, based on mutual long-term benefits. In that context, banks plan on generating maximum profits through increasing levels of satisfaction and loyalty among clients. On the other hand, by having a long-term cooperation with a given bank, clients expect to be approved more favorable bank loans, an improved quality of the service, as well as to obtain a higher level of confidence in the bank (Binks & Ennew, 1997). Accepting the marketing orientation is a banks' answer to the impact of various factors from the business environment. It is essential that banks get to know their clients in order to assess risk when approving loans or doing some other transaction. As suggested by Buttle (2004), executing a marketing concept accordingly can assure that banks not only attract new clients, but also retain the existing ones. Truly marketing oriented banks have current and future needs of their clients in the focus of their everyday business. Creating active relationships and close ties with clients is a prerequisite for generating clients' loyalty and banks' long-term profitability.

The management of many banks give advantage and greater importance to corporate clients in comparison to individual clients. Although, fewer in number, corporate clients have more complex financial needs. Individual clients usually choose a bank based on savings interest rates, the affordability of various credit lines, the available range of payment cards offered by a bank and so on. In this domain, smaller banks have many difficulties to match offers made

by large banks. Unlike markets for individual users, within business-to-business (B2B) markets, the advantages of small banks come to surface far more easily. Regardless of the fact that smaller banks may not have a capacity to completely cover the financial needs of large enterprises, they can successfully meet the needs of micro and small enterprises. Respecting and understanding the client represents a powerful tool for generating long-term cooperation between small banks and micro/small enterprises. Finding an adequate business niche is a foundation for improving the competitive position of a small bank. However, in order to do so, a small bank needs to fulfill important conditions – the orientation towards clients and access to the modern information and communications technology (ICT).

A number of factors have a critical effect on the relationship between banks and corporate clients. These factors include the level of competition in the banking sector, the size of the enterprise, a need for getting a credit or use another bank's service, the transaction costs and financial condition of an enterprise. Generally, large enterprises have a more pronounced need for developing a relationship with a greater number of banks when compared to micro and small enterprises. Also, an enterprise's size sometimes influences its negotiating position. Large enterprises are less dependent on a relationship they create with a given bank, taking into consideration that they have more opportunities to cooperate with other financial institutions as well. On the contrary, as Zineldin (1996) stresses, small enterprises have a greater motive to establish a good, lasting relationship with one bank which they will remain loyal to.

The expansion of ICT allowed the development of electronic banking (e-banking). Transactions are no longer based solely on personal ties and contacts, but also on electronic relationships supported by ICT. This led to performing transactions faster and with fewer mistakes. The following data points to a notable increase in the use of e-banking services. It is estimated that in 2000 some 34.4 million people used the Internet for performing banking transactions. By 2004, the number of e-banking users grew to 122.3 million. The residents of Finland are a typical example of how e-banking can create the added value. According to the OECD

data, in April 2005, approximately 2.6 million Finnish residents (representing one half of the entire country's population) used e-banking services (Maenpaa, Kale & Mesiranta, 2008). Only 3% of Finnish residents go to a bank branch to make payments or complete some other transaction. Nevertheless, even though the use of CRM cannot be imagined without relying on modern ICT, managers should not undermine the significance of personal liaisons because they represent the foundation of a long-term relationship. Above all, banks must show that they understand and respect their clients, care about them and are sincerely oriented towards solving their problems and financial needs.

#### **SMEs as corporate clients in the banking sector**

The constant rendering of an excellent service quality to customers is extremely significant in all highly competitive sectors, including the banking sector. In their study, Wang, Lo & Hui, (2003) found that Chinese banks which delivered a superb service quality to their corporate clients had earned a reputation of excellence that ultimately led to higher retention levels among corporate clients. Another spill-over effect was that satisfied corporate clients were less eager to engage in split-banking, i.e. doing business with one or more competitor banks at the time. Studies on loyalty in the banking industry have quite frequently been conducted in marketing literature (Lewis & Soureli, 2006; Berg, 2008). In fact, many studies on loyalty and factors leading to loyalty in the services sector actually evolved around surveying banks' retail clients (Hallowell, 1996). However, only a few studies have been conducted in relation to understanding loyalty patterns among banks' corporate clients (Lam, Burton & Lo, 2009), even though they generate a considerable share of revenues to banking institutions (Tyler & Stanley, 1999).

A number of studies were focused on the factors influencing corporate clients' selection of the bank. Factors related to a range of offered services, service prices, personalized interaction, the affordability of lending and lending rates appeared to be the most significant ones for enterprises when choosing the bank to do business with (Nielsen, Terry & Trayler,

1998). The research also suggested that both technical and functional service qualities have a positive effect on the loyalty of SMEs, while stressing that investing in building strong relationships with SMEs will result in improved SMEs' loyalty of to their banks (Madill, Feeney, Riding & Haines Jr, 2002). On the other hand, Lam & Burton (2009) were among the first ones to quantify the impact that various variables have on the loyalty of SMEs. Their study found that, in order to maximize loyalty levels among SMEs, banks should devote their efforts to providing an excellent service quality, investing time in nurturing relationships and, especially, developing pricing strategies for loans offered to SMEs.

Finally, in their study, Silver & Vegholm (2009) addressed the issue related to banks' readiness to adapt to their SME customers. This research found that banks make modest efforts to adapt to their SME clients, mainly due to the banks' centralized organizational structure, lack of communication with SMEs and the insufficient understanding of SMEs' needs. A bank's failure to adapt to the needs of SMEs is, in a sense, furthered when it comes to SMEs' internationalization efforts. Although it has been documented that SMEs are rather dependent on banking/financial institutions when going into foreign markets (Spence, 2003), a recent study by Lindstrad & Lindbergh (2010) reveals that banks are poorly utilizing their role as a prospective provider of information and services to SMEs going abroad.

## RESEARCH METHODOLOGY

In order to investigate the level of the client satisfaction across different elements of services delivered by banks, an empirical study was conducted through the use of a survey method. The survey method is one of the most frequently employed methods in the marketing field studies. The questionnaire used to gather primary data included 21 statements that mirror various elements of service quality in banking. The respondents expressed their views on a ten-point Likert scale (1 – I completely disagree with the statement; 10 – I completely agree with the statement). The statements were determined based on the review of relevant services marketing literature (Parasuraman, Zeithaml, & Berry, 1988; Jamal

& Anastasiadou, 2009). In that manner, we created a foundation for analyzing courtesy, professionalism and competence of employed staff based on the perceptions of clients. In addition, the bank's image as well as the level of empathy shown by the staff towards the client's problems were also analyzed.

The survey involved 133 enterprises whose managers rated the overall service quality of the bank they are doing business with. Those were mainly small and medium enterprises employing up to 250 employees. The majority of corporate clients of the banks that do business in Serbia actually belong to the category of small and medium enterprises. Also, these enterprises are significant in developing the nation's economy. In such a context, the research was directed towards examining attitudes of managers from small and medium enterprises regarding the quality of banking services. Enterprises included in the sample had randomly been chosen from the list of corporate clients that bank had done business with in the previous five years. In addition, all clients were grouped into three segments (large, medium and small clients) on the basis of the annual volume of transactions. The first segment (large clients) included the total of 30 enterprises, the second (medium clients) 48 enterprises, while the third segment (small clients) comprised 55 enterprises. Prior to administering the survey, the questionnaire was pretested on a smaller sample of 15 respondents in order to eliminate possible ambiguities related to the questionnaire. Beside this, in order to create a clear and easy-to-follow questionnaire, researchers had also conducted one group discussion with bank officers.

The data analysis was done in the *Statistical Package for the Social Sciences (SPSS)*. In terms of statistical analysis, we implemented the explorative factor analysis and the variance analysis. The factor analysis was used to group a large number of statements into a smaller number of factors. The reliability of the obtained results and the internal consistency of the statements were measured through the values of the alpha coefficient. The suitability of the data for performing the factor analysis was tested by applying the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The testing of evenness among the average values of the statements for the three client groups was done through one-way ANOVA. The use of the mentioned procedure represents a logical solution for comparing

averages in a situation when there are more than two groups of respondents.

## RESEARCH RESULTS

Prior to doing the factor analysis, the values of the KMO test (KMO = 0.877) and Bartlett's test ( $p = 0.000$ )

had shown that the necessary conditions were met for its usage. The values of the KMO index range between 0 and 1, where the implementation of the factor analysis is inappropriate if the KMO is lower than 0.5. Bartlett's test is based on chi-square statistics. The obtained results in our case reveal that we can reject the null hypothesis (the non-existence of a significant correlation between the variables). As a method

**Table 1** The results of the explorative factor analysis

Statements	Factor 1	Factor 2	Factor 3
<i>Factor 1: Respecting and understanding clients</i>			
Paying personal attention to clients	0,831		
Courtesy of employed staff	0,817		
Respect for clients	0,798		
Understanding financial needs of clients	0,784		
Focus on what is the best for clients	0,748		
Readiness to help clients	0,741		
Clients' confidence in the bank's employees	0,692		
Orientation towards clients	0,648		
Clients' sense of safety	0,619		
Providing information to clients	0,590		
<i>Factor 2: Professionalism</i>			
Accuracy of the delivered service		0,707	
Promptness in providing a service		0,694	
Employee appearance		0,669	
Efforts made when solving clients' problems		0,654	
Respecting previously agreed deadlines		0,648	
Fulfilling previously made promises to clients		0,558	
<i>Factor 3: Image</i>			
Image with respect to the competition			0,828
Interior			0,820
Modern equipment			0,803
Bank's image			0,663
Branch's image			0,618
Eigenvalue	6,673	3,997	3,337
% of described variance	31,776	19,033	15,892
Alpha	0,94	0,82	0,84

of the factor analysis, in this research we used the principal component analysis. In order to get a clearer interpretation of the factors, we utilized the varimax rotation.

The results of the factor analysis show that the statements grouped around the three formed factors. The first factor "Respecting and understanding clients" describes 31.776% of the variance. This factor entails the attributes of the bank's quality of services related to providing personal attention to clients, the courtesy of bank officers, the understanding of clients' financial needs, their readiness to assist clients and so on. The second factor, "Professionalism" describes 19.033% of the variance. This factor includes the elements of a service such as the precision and promptness of the delivered service, fulfilling promises and respecting the previously agreed deadlines by bank officers. "Image" as the third factor contains elements such as the bank's image, a branch's image, modern equipment and image in comparison to the image of competitors. This factor accounts for 15.892% of the variance. All three factors describe 66.701% of the total variance.

All the three factors have a high level of reliability. As it can be seen in Table 1, the values of the alpha coefficient are higher than 0.7, which is the necessary lower threshold of reliability as suggested by Nunnally (1978). Given that high values of the alpha coefficient were obtained – for all the three factors, the values were higher than 0.8 – it can be implied that the statements which grouped around each individual factor are internally consistent.

Finally, by employing the ANOVA test, quite interesting results were obtained with respect to comparing means among corporate clients belonging to different segments (Table 2). Namely, based on the annual volume of transactions that each enterprise conducts through a given bank, three segments were formed: large, medium and small clients. Based on each statement, we wanted to examine if there are statistically significant differences in client perceptions. However, the obtained results stress evenness in attitudes among corporate clients regarding different quality elements of the bank's service offer. Only in the case of the two statements, namely "Efforts made when solving clients' problems" and "Respecting previously agreed deadlines", did differences emerge in the mean

**Table 2** The results of the ANOVA test

Statements	F	Sig
Paying personal attention to clients	0,675	0,511
Courtesy of employed staff	0,543	0,582
Respect for clients	0,910	0,405
Understanding financial needs of clients	0,841	0,434
Focus on what is the best for clients	0,159	0,853
Readiness to help clients	0,155	0,857
Clients' confidence in the bank's employees	0,762	0,469
Orientation towards clients	0,733	0,482
Clients' sense of safety	0,243	0,785
Providing information to clients	0,243	0,785
Accuracy of the delivered service	0,928	0,398
Promptness in providing a service	1,596	0,207
Employee appearance	1,049	0,353
Efforts made when solving clients' problems	2,969*	0,045
Respecting previously agreed deadlines	5,654**	0,004
Fulfilling previously made promises to clients	0,762	0,469
Image with respect to the competition	0,483	0,618
Interior	0,602	0,549
Modern equipment	1,616	0,203
Bank's image	0,016	0,984
Branch's image	0,133	0,875

\*\* p < 0,01; \* p < 0,05

values of the three observed groups of respondents. In the case of the remaining statements, evenness in mean values is notable in the observed groups.

## CONCLUSION

Contemporary trends in banking business stress the increasing importance of personal interactions between a bank's staff and its clients for the further

development of their long-term relationships. If a bank wants to strengthen its long-term relationships, it is crucial that an estimate be made on future cash flows the bank will have through cooperation with a given client. However, in order to gain a better perspective regarding the expected events, it is imperative that a bank be fully committed to the marketing orientation.

A good relationship with clients is an important factor not only for improving a bank's competitiveness, but also for meeting business objectives in dynamic market conditions. Creating stronger client relationships should be a daily goal to accomplish through showing care, respect, understanding and empathy for clients, on the one hand, while stressing promptness and accuracy in completing transactions, on the other. Good communication with the client, competent staff and modern ICT certainly represent the three key elements of a bank's marketing strategy. However, without an adequate support of the financial sector, marketing alone cannot help a bank to be doing business profitably in the long-run. Managers must be aware of the fact that clients in retail banking are mostly driven by savings interest rates or the attractiveness of loans when choosing a bank, while corporate clients choose a bank primarily based on a bank's capacity to meet their financial needs.

The findings of our empirical study reveal the significance of the three elements of a bank's service offerings. These are: respect for clients, the professionalism of a bank's staff and its image. The first two factors reflect intangible effects of a bank's service offers and stress the significance of improving interactions with clients, including respect, understanding clients' problems, empathy as well as the prompt and accurate completion of financial transactions. Image, as the third identified factor, also includes the tangible elements of quality such as modern equipment and the appearance of interior in a bank's branches. The results of the conducted study are also implicative of the fact that the bank whose corporate clients were surveyed was able to establish similar levels of the relationship quality with different clients, regardless of the value and frequency of transactions they complete with the bank. Namely, statistically significant differences in clients' responses appeared only in the case of the two observed attributes.

It is important to mention that this study was mainly directed towards measuring the quality of services in corporate banking. It would be useful for future studies to include an analysis of financial elements, such as, the interest rate, the diversity of the offered payment cards, the availability and affordability of loans and home mortgages. It would also be interesting to investigate if, and to what extent, the mentioned elements are important to the client when selecting a bank in comparison to intangible service components. In addition, it would be quite useful to conduct a comparative analysis of attitudes and perceptions amongst a bank's corporate and retail clients.

Future studies could also explore the impact that the factors of service offering have on client loyalty. In that respect, it is useful to design and test a new model that would include three independent variables (respecting and understanding clients, professionalism and image) and one dependable variable (client loyalty). Through employing the multiple regression analysis, the statistical significance of the mentioned factors on client loyalty could be determined. Furthermore, by implementing a moderated regression, apart from the main effects, the interaction effects could be tested as well. In that way, a more universal analysis could be performed on the key loyalty antecedents in corporate banking.

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## SYSTEM DYNAMICS MODELS IN MANAGEMENT PROBLEMS SOLVING

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The models represent the key methodological tool for management problems solving in System Dynamics (SD) as a functionalist systems methodology. Above all, it is about mathematical models, built according to appropriate feedback structures, i.e. specific elements and flows that form feedback loops. Since SD is based on the assumption that a system structure represents the behavioral key determinant, SD models provide an effective prediction of the future system behavior. The paper focuses on the modeling process in SD, as a complex, iterative process, consisting of the following phases: model conceptualization, formulation, testing and implementation. Although being extremely useful in solving numerous organizational managing problems, SD models have certain disadvantages as a consequence of their quantitative nature. Qualitative modeling and group model-building, as possible directions for further SD development, are appropriately important in SD models' deficiencies elimination.

**Keywords:** System Dynamics, modeling process, System Dynamics models, management problems solving

JEL Classification: M10

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### INTRODUCTION

Different systems approaches and methodologies can be applied in researching and solving contemporary management problems. System Dynamics (SD), as a relevant systems methodology, is appropriate for management problem situations characterized as complex and unitary. According to this, and bearing in mind the SD key determination – focused on researching the feedback structure generating a certain system behavior – SD represents relevant structuralist-

functionalist systems approach to management. The basic allegations of the management problem situations in SD are the structure and processes within SD, and the key tools in management problems solving are appropriately developed models. In that sense, the research will be focused on the SD modeling process, i.e. SD models as relevant tools for management problems solving within contemporary organizations.

The aim of the paper is to demonstrate SD possibilities, i.e. its models, in dealing and solving contemporary management problems. In fact, the aim is to demonstrate the ways in which SD can help managers move through adequate problem areas in predicting a future behavior and designing certain policies for an improvement in organizational functioning.

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This paper is based on the following key hypothesis: If the structure represents the key determinant of a system behavior, then SD models – through appropriate computer stimulations – provide a prediction of a future behavior for the researched system.

First of all, the paper introduces the key SD features as a functionalist systems approach to management. Then, the process of SD modeling is researched, i.e. certain characteristics and modeling process phases are specified. Since the focus is on the modeling process itself, each phase is considered separately – conceptualization, formulation, testing and implementation. The SD model is briefly illustrated in the paper on an example of a new product adoption on the market, because this is about tools with an exceptional applicative potential. Finally, some deficiencies of SD models are identified, as well as possible directions for further SD development through qualitative modeling and group model-building.

#### SYSTEM DYNAMICS – A FUNCTIONALIST SYSTEMS APPROACH TO MANAGEMENT

System Dynamics, as a systems approach to management problems solving, is based on the theory of information feedback and control. SD focus is on the problems that can be modeled as systems, essentially made of different elements and flows, i.e. inter-elementary relations that create a feedback loop and are represented as continual processes. Appropriate deterministic model structures not evolving over time are developed for those systems. SD modeling and simulation are widely used in the field of social, and especially economic, systems and different types of organizations, with a significant stress on the policy and design analysis.

J. W. Forrester (1972) made foundations of SD, originally entitled as Industrial Dynamics. SD deals with time changeable interactions of different parts of the management system in order to determine in which way the organizational structure, policy, time delay in making decisions and actions interact affecting the system's success.

Since management problem situations are represented by a appropriate structures and processes within, the

theoretical base of SD is as follows (Petrović, 2010, 369): A system's behavior is primarily conditioned by its structure. It is supposed that the considered structure and processes can be represented by adequate diagrams and mathematical models of system. According to the SD theory, a lot of variables of the existing complex systems become casually connected in corresponding feedback loops. System connections between feedback loops constitute the system's structure, and that structure is the key determinant of the system's behavior. (Jackson, 2003, 67).

As an essential SD aggregate, a structure is determined by (Petrović, 2010, 370-371): line, feedback direction, nonlinearity and loop multiplicity. The number of levels, i.e. number of variables used for representing the structure of the researched system, determines the system line. Feedback can be positive and negative, considering the direction. Positive feedback causes an increase, i.e. creates a rise or a fall, and the negative one means a specific preventing or controlling influence. The nonlinear connecting of positive and negative loops can lead to loop domination, allowing controlled growth. Management problem situations are, as a rule, represented by structures with multiple positive and negative loops. It is assumed that an effective prediction and control can be made and conducted, respectively, by specified structure characteristics. Time-based mathematic SD models simulate possible scenarios of an organization's functioning, and, in that way, provide relevant trends projections. Starting with the fact that a concrete prediction is reliable, the focus is accordingly transferred to introducing appropriate control policies.

Beside SD prediction and control, the SD model is of a great importance, and its basic aggregates are levels and rates. The level is considered to be a changeable value over time. In other words, levels are the present variable values, i.e. values that have resulted from an accumulated difference between inflows and outflows (Forrester, 1972, 68). Apart from levels, rates define the present flows among a system's levels. Rates correspond to an activity, while levels measure the resulting state which the system has been brought to by the activity. For example, the number of employees represents the level determined by the hire rate and the quit rate; or the debt level is determined by the borrowing rate and the repayment rate, etc. (Sterman, 2000, 200).

The mathematical expression of the SD model is represented by a system of equations (levels and rates equations) controlling variable interactions of the considered problem situation that change over time. Since the modeled system moves over time, from time to time it is necessary that equations be converted. Different pieces of software, such as: DYNAMO, Powerism, Venism, have been developed to support SD modeling and simulation.

### THE MODELING PROCESS IN SYSTEM DYNAMICS

Modeling, as an integral part of the learning process in organizations, represents an iterative, continual process of the formulating, testing and revision of both formal and mental models. As an adequate expression of management problem situations, the models are a powerful tool for identifying and representing their key determinations, ways they are manifested and their relevant implications. According to that, valid models are an extremely useful methodological tool in organization management, i.e. in deciding on the way a manager should go through management problem areas in contemporary organizations (Petrović, 2010, 572). The aim of the SD model is to identify policies and organizational structures that improve functioning and provide an organizational success.

The modeling process should be focused on important questions, such as essential organizational problems, and is part of the organizational and social contexts. Before the modeling process starts, the modeler must have access to the organization and identify clients. That is about individuals and groups whose behavior is affected by the modeling process, i.e. whose behavior has to be changed in order to solve the problem. The modeling process should be consistent with clients' skills, abilities and aims. Most clients are interested in the fact that models should support conclusions already made, or use them as power tools inside the organization. However, the modeler must be prepared to inform clients about their wrong assumptions, if the modeling process says so (Sterman, 2000, 84-85).

The SD model should have the following characteristics, namely, it should be (Forrester, 1972, 67):

- able to describe any problem in cause-effect relations;
- mathematically expressed in a relatively simple way;
- able to include numerous variables, within practical computer ability limits;
- able to manage different discontinuities, not affecting the results, but generate discontinued changes in decisions when necessary.

SD modeling is a process carried out through several phases, and authors classify it in different ways.

Luna-Reyes & Andersen (2003, 275) specify the modeling process phases according to various authors. In that sense, there are following classifications: conceptualization, formulation, testing and implementation; then: problem definition, system conceptualization, model formulation, analysis of model behavior, policy analysis and model use; or: diagram constructing and analysis, simulation phase (stage 1) and simulation phase (stage 2).

Also, Sterman (2000, 86) classifies the modeling process phases into: problem articulation, dynamic hypothesis formulation, simulating model formulation, model testing and policy formulation and implementation.

In spite of different classifications of certain phases, generally, the modeling process includes the following activities (Jackson, 2003, 68-69): Above all, the conceptualization phase, clarifying the problem and identifying variables having an influence on it. Then, the feedback loop model revealing relations among variables is built. That model, in the formulating phase, further develops into an appropriate mathematical model, i.e. level and rate equations. Those equations, helped by a certain piece of software, provide a relevant computer simulation of a system behavior. The model validity is estimated in the testing phase, and possible ways for improving the results for the system functioning, i.e. certain policy designing, are identified in the implementation phase.

The aim of the conceptualization phase is to build a conceptual model representing a relevant problem within the system. It is necessary that the following activities be conducted in this phase (Albin, 1997, 6):

- the definition of the model purpose;
- the determination of the model boundaries and identification of its key variables;
- the description of the model behavior, i.e. building the reference mode of the key variables;
- the presentation of the system feedback loops by diagrams.

The most important step in the modeling process is problem defining, i.e. setting the model purpose. Each model is the representation of a certain system. In order to be useful, a model should deal with a specific problem and simplify rather than reflect the system in details. The system usefulness lies in the fact that they simplify reality by creating a representation of something that can be understood (Sterman, 2000, 89). The modeler should also consider who the model is primarily designed for. Reaching agreement on the model purpose is of an essential importance. It is very difficult to decide which system components are important without a clear and strictly defined purpose. If the purpose is defined too widely or too abstractly, the model will include too many components and will be too complex for any practical analysis.

The most common mistakes in defining the model purpose are (Albin, 1997, 9):

- the purpose does not enable system understanding;
- the purpose does not reveal policies to improve the system behavior;
- the purpose does not reflect mental models and is not used as a communication and unification tool.

After having chosen the problematic focus field, the modeler must collect relevant data and define the model. When talking about the model boundaries, it is necessary that the fact that every feedback system has closed boundaries which are a frame for generating a certain analyzed behavior be stated. Above all, the modeler has to explore all components considered to be necessary for the system model. It is about the initial components list. In order to specify the model boundaries furthermore, the modeler must divide the initial components list into two important groups (Albin, 1997, 10; Sterman, 2000, 97):

- endogenous – dynamic variables included in the feedback loops of the system, and
- exogenous – components whose values do not directly affect the system.

After dividing these two groups of components, it is necessary that we determine which components are stocks and which are flows. It should be marked that exogenous components can be neither stocks nor flows, but adequate constants (Albin, 1997, 11). The endogenous phenomenon explanation is something that is tended to within the SD, as well as that a problem should be described dynamically, i.e. as an appropriate kind of behavior, developed over time. The time interval should be determined in a way that it can include enough information about the past in order to show the reasons for the occurrence of the problem and describe its symptoms. Also, it should include relevant information about the future to include the delayed and indirect effects of potential policies. The most significant difficulty in mental models is a tendency to think of causes and effects as local and current. In dynamic, complex systems, the cause and effect are distant over time and space, which considers feedback systems to be the ones with long delays, distant from the decision point or the problem symptom (Sterman, 2000, 91).

The reference mode, i.e. a set of diagrams showing the way a problem occurs and how it can evolve in the future, is built after determining the model boundaries and time interval. The reference mode, in fact, represents the key variables behavior over time and can be useful before and after the model building. Reference modes can be changed during the modeling process, and, according to the initial reference mode, the modeler can reassess and redefine the model purpose.

The last step in the conceptualization phase represents the feedback system structure. SD uses different types of diagrams in representing feedback structures. Those are causal loop diagrams, stock and flow diagrams, structure diagrams and policy structure diagrams (Lane, 2008, 9). This paper briefly considers causal loop diagrams and stock and flow diagrams, as the most commonly used tools for the diagram-based representation of a system structure in SD.

Causal Loop Diagrams (CLD) show, above all, the orientation of feedback, as well as the key elements, i.e. variables, and their mutual interaction. Variables are connected by causal links, represented by adequate arrows. Relations that produce change in the same direction (rising or falling) are marked with a positive sign in the causal loop diagram. The positive feedback link means that if the cause increases, the effect also increases above what it would otherwise have been. Also, if the cause decreases, the effect decreases below what it would otherwise have been. Opposite to that, the negative feedback link means that if the cause increases, the effect decreases below what it would otherwise have been; and if the cause decreases, the effect increases above what it would otherwise have been (Sterman, 2000, 139).

Therefore, each link is characterized by a certain polarity, i.e. by the effect direction which the influencing variable has on the influenced variable (Lane, 2008, 5). This describes the structure of the system, not behavior of the variables. Also, this describes something that would happen if a change occurred, not something that really happens. The previously stated expression below or above what it would otherwise have been, has an important significance because an increase or a decrease in the causal variable does not necessarily mean the effect will actually increase or decrease. Beside determining the link polarity, it is necessary that loop polarity be determined. Since there are more possible positive and negative links, the loop polarity can be determined by multiplying the signs of the link polarities in a loop and finding the net sign (Lane, 2008, 10).

CLD have certain deficiencies, such as: a lack of precision, a lack of distinctions between stocks and flows, mistakes in determining the loop polarity, etc. (Lane, 2008, 12-14).

Stock and flow diagrams are more detailed than causal loop diagrams. Each causal loop has to contain at least one level. If a causal loop does not contain a level, the behavior over time that should be examined cannot be identified. Each element is represented adequately in stock and flow diagrams (Sterman, 2000, 192):

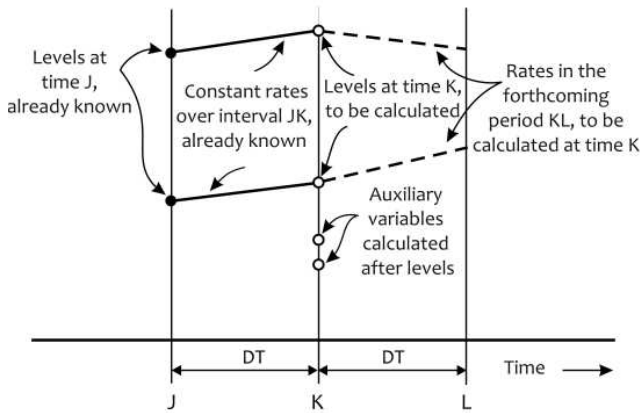
- stocks are represented by rectangles;

- inflows are represented by arrows that flow into" the stock;
- outflows are presented by arrows that "rise" from certain stock;
- valves represent flows;
- clouds represent the sources or sinks for the flows. The source represents the stock which the flow arises from, and sinks represent the stocks which the flows "flow into".

Some mistakes (such as determining the link and loop polarity) can be avoided by presenting feedback loops in stock and flow diagrams; therefore, relations among components in stock and flow diagrams are strictly defined, contrary to causal loop diagrams. Being generally more complex and more time demanding to create, stock and flow diagrams provide much more information than causal loop diagrams. According to that, they are an adequate base for making conclusions about the system behavior (Lane, 2000, 244). However, there are certain limits for their use: they can encourage excessive detailing; be too complex and technically oriented; cannot enable a diagram explanation for all types of phenomena, etc. (Lane, 2000, 244; Lane, 2008, 15).

According to causal loop diagrams and stock and flow diagrams, it is possible to determine a set of equations in the model formulation phase, i.e. develop an adequate mathematical model of the situation which is being researched. Due to the fact that time is one of the key factors, it is necessary to determine the successive series of the system's state over time, and consequently a periodically converted equation. According to Forrester (1972, 74), a series of calculations that should be done is presented in the Figure 1.

The basic equations of the SD model are divided into two groups: level equations and rate equations; however, level equations are calculated first (Petrović, 2010, 377-379): Level equations show the ways for determining levels in time K, based on the levels in time J and on rates over the interval JK. Level equations are independent of each other, and only depend on information before time K. That is why the level in time K depends on: the previous level value in time J and the rate in the time JK.



**Figure 1** Calculations in time K

Source: Forrester, 1972, 74 (According to: Petrović, 2010, 378)

Rate equations are converted at the present time K, after level equations have been calculated. The values having been determined by rate equations determine the rates that represent actions which will be taken in the following KL time interval. Therefore, rate equations determine flows among the levels of the observed system. Rate equations are calculated according to the present level values in the system, and the starting level and the “flow-into” level are included as a rule. Rates cause level changes. Generally, rate equations should be observed as a control tool of what will happen within the system in the forthcoming period. However, certain auxiliary variables, as an appropriate subgroup, can appear within rate equations. Rate equations are independent one of another, and their mutual interaction is done through their future effects on the levels.

Time is indexed, i.e. moved to the right for one time interval, when the level is calculated for time K and rate for the KL interval, i. e. in Figure 1, levels in time K become levels in time J, and rates for interval KL, rates for the JK interval. This means that time K, representing the present, moves by one DT length interval. Then, a set of calculations can be repeated in order to determine a new state of the observed system in the time which is for one DT interval later than the time from the previous state. The developed model determines the movement of the system throughout

time. Generally, a level, i. e. stock, can be presented by the following equation (Sterman, 2000, 194):

$$Stock(t) = \int_{t_0}^t [Inflows - Outflows] ds + Stock(t_0) \quad (1)$$

where stock is determined in time t (time K in Figure 1) and inflows are determined at any moment between the starting time  $t_0$  and the current time t. The same way, the net flow of change of any stock, i.e. its derivative, represents a difference between the inflow and outflow, defining a certain differential equation:

$$d(Stock)/dt = Inflow(t) - Outflow(t) \quad (2)$$

Beside level and rate equations, the so-called auxiliary equations, i.e. equations decomposed from an appropriate level equation in a situation when a level equation is extremely complex, represent a separate class of equations in the model. Contrary to level and rate equations, auxiliary equations have to be calculated in a precisely determined order. In principle, auxiliary variable depends only on: already known levels and auxiliary variables that can be calculated.

Apart from the stated equations, equations for the starting values are significant. They define the initial values of all levels and some rates that have to be determined before the calculation of model equations starts; however, these equations are used to calculate the values of some constants. Converting the presented equations is done by computer, i.e. specially developed software used in SD. When the formulated model enters computer software, it is necessary that several preliminary simulation researches be done. It is necessary that an appropriate value of the DT interval be determined and the system state stability analyzed. (Petrović, 2010, 382-383):

When determining DT time interval, it is necessary that attention be paid to the relation between the stimulation speed and accuracy. Generally, the DT time interval is determined by the shortest time constant used in the model. The state stability analysis of the system gives information about the reliability of the model itself or the stability of the modeled reality segment.

Testing or the model validation is considered to be a comparison of the model to the reality in order to accept or reject the model. In fact, validation in SD is a process of establishing confidence in the model correctness and usefulness. This is about a complex process, where everybody has their own aims and criteria for the model validity. The idea of validity as an equivalent for confidence is in conflict with the understanding of validity equally as an absolute truth. Confidence in some model is an adequate criterion because there are no proofs for absolute correctness that a model represents reality. Validity is also relative in a sense that it can only be properly assessed for a particular purpose. According to that, validation cannot be a completely objective and formal process, but must have subjective and qualitative components. In other words, model validation is a gradual process of establishing confidence in models (Forrester & Senge, 1979, 8; Barlas, 1996, 188).

There are a great number of tests for model validity that can be classified in different ways. Forrester & Senge (1979) find following tests:

1. tests of model structure (parameter verification test, boundary-adequacy structure test, extreme-conditions test, etc.);
2. tests of model behavior (behavior-reproduction test, behavior prediction test, change-behavior test, etc.);
3. tests of policy implications (system-improvement tests, changed-behavior-prediction tests, policy-sensitivity tests, etc.).

Barlas (1996, 189) singles out the following validity model tests in SD: structure validity tests (direct structure tests and structure-oriented behavior tests) and behavior validity tests.

Since there are many tests, there is a question if all tests have to be used. Besides, it is important that the question when to end the model validation process be considered. In that sense, ending the model validation process depends on the following determinants: the costs of validation, a potential degree of model validity, the model size, clients' expectations and clients' experience with modeling, relative importance, i.e. risk of decision, data intensity and availability and the modeler's level of expertise (Schwaninger & Groesser,

2012). In spite of the fact that it will not always be possible to use all the tests for establishing confidence in the SD models, a wide range of tests increase a probability for using a greater number of tests and including more people into the whole process of model validation. Thus, one of the key determinations of the previously mentioned tests is the easiness of implementation. The accessibility of the whole testing process is crucial for the probability of a modeling success in SD (Forrester & Senge, 1979, 36; Richardson, 1996, 147).

The last phase in the modeling process is the implementation phase, i.e. models application in policy designing. Once trust into the structure and model behavior has been established, the model is used for designing appropriate policies. Designing policies is much more than changing the parameters value, and includes creating completely new strategies, structures and decision rules. While the feedback system structure determines its dynamics, policies will include change of dominant feedback loops by the redesigning of stocks and flows structures; by eliminating the time delay; by change of flow and quality of information available at the key decision points; or by fundamental reformulating the decision-making process within the system (Sterman, 2000, 104). In fact, SD models can be used for redesigning: system structures and/or decision policies (Petrovic, 2010, 382). The model implementation does not end with the ending of a certain project or solving a certain problem, but can be applied for solving some other, similar problems (Sterman, 2000, 81).

## ILLUSTRATION OF THE SYSTEM DYNAMICS MODEL APPLICATION

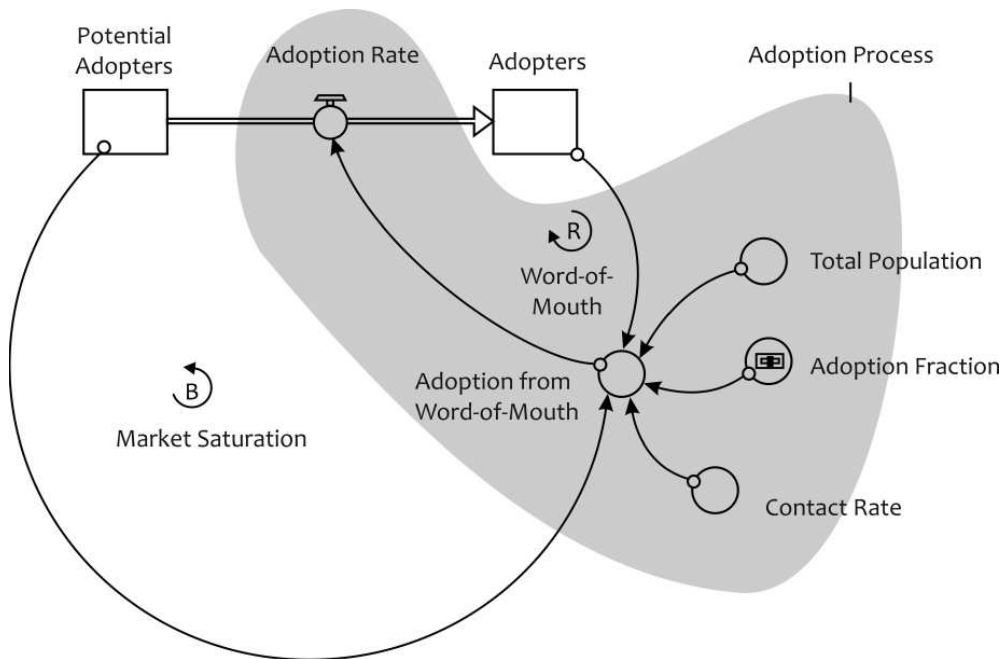
Let the object of the observation be a company that has introduced a new product to the market, with an to research the process and predict the dynamics of the adoption of the new product in the market. In that sense, an appropriate SD model providing the prediction of the dynamics of the adoption of a new product on the market can be developed. F. Bass (1969) gives preliminary assumptions of the models developed further within the SD conceptual framework (Morecroft, 2007; Sterman, 2000).

Figure 2 shows the model of a new product adoption and the identified key stocks, flows and feedback loops. This is the model inclusive of potential adopters, considering the word-of-mouth for the product only. The model, in which the adoption rate represents the result of the word-of-mouth, implies the two following assumptions (Bass, 1969): Above all, it is necessary that there be initial adopters, i.e. the value of this variable in the model must not be zero, which means that there must be one or more people who have already been using the product. Also, it is assumed that the product is bought only due to the information and recommendations of the current adopters. These kinds of assumptions limit the model generality, which can be prevented by advertising, an important determinant of a new product adoption on the market.

There are two key stocks (Sterman, 2000, 324-325): adopters and potential adopters, and the adoption rate is equal to adoption from the word-of-mouth. Also, there are two feedback loops – one, positive or reinforcing, represented by the word-of-mouth, and the other, negative or balancing, represented by market

saturation. The positive loop shows that, if there are more adopters, there will be more people who can orally propagate the product. First, this loop dominates the system and generates growth. Contrary to that, the negative loop slows the system down, since the number of potential adopters decreases due to market saturation (because each new adopter originates from potential adopters). The aim is to eliminate potential adopters, i.e. make all potential adopters be transformed into product adopters.

It is assumed that the total population (a potential product market) is made up of a million people occasionally talking about their shopping. This tendency is marked by the contact rate and is assumed to be 100. The number of adopter contacts with the rest of the population per year represents the multiplication of the contacts rate and adopters. Some of these contacts lead to product adoption (while the contact of two adopters cannot generate a product adoption). A probability that any randomly selected contact, i.e. the one between an adopter and a potential adopter, is equal to the proportion of potential adopters in



**Figure 2** Key stocks, flows and feedback loops in the process of a new product adoption

the total population. This relation decreases if the process of adoption continues, and reaches zero, when the market is completely saturated. However, not all adopter contacts will result in product adoption. The fraction of successful contacts is called the adoption fraction, its assumed value is 0.02, which means that 2% of all contacts lead to product adoption. The contact rate and the adoption fraction determine the word-of-mouth.

Time is marked in years in the model, and  $dt$  represents a moment small enough to provide numeric accuracy. The number of adopters at a specific time equals the sum of the previous number of adopters and time ( $t-1$ ) and the adoption rate over the interval  $dt$ . Contrary to that, the number of potential adopters at time  $t$  equals the subtraction of the previous number of adopters (i.e. the number of adopters for time  $t-dt$ ) and the adoption rate over the interval. It is considered that, initially, there are 10 adopters among the total population of one million, so the rest are potential adopters. The adoption rate is equal to adoption from the word-of-mouth.

If the stated variables are marked like this:

- A - adopters
- AR - adoption rate
- PA - potential adopters
- IPA - initial potential adopters
- AWM – adoption from word-of-mouth
- CR - contact rate
- AF - adoption fraction
- TP - total population

then the following equations can be determined (Morecroft, 2007, 168- 169):

$$A = A(t - dt) + (AR) * dt \quad (3)$$

$$PA(t) = PA(t - dt) - (AR) * dt \quad (4)$$

$$IPA = TP - A \quad (5)$$

$$AR = AWM \quad (6)$$

$$AWM = CR * A * (PA/TP) * AF \quad (7)$$

The dynamics of product adoption by the word-of-mouth is shown in Figure 3, where initially there are only ten adopters who start transferring their own experiences, i.e. propagate a product. During the first five years, adopters and their followers very slightly influence the rest of potential adopters who have not heard of the product yet. According to that, in a certain period of time, the adoption rate is close to zero; however there is a relatively small growth compared to the total population of million people. During the fourth year, adopters begin to grow in number. Therefore, the largest number of the total population become product adopters in the time interval between the fifth and the eighth year from the product introduction to the market. After that, the adoption rate begins to fall, since market saturation grows.

If there were zero initial adopters, even with a million potential adopters, there would be no growth, since the product is not known. All the above stated demonstrates a need for the existence of initial adopters in order to start with the the word-of-mouth, which represents the key model assumption. It is necessary that more elements, such as product advertising, included in order to create a base of initial adopters. In that sense, this model can be expanded by introducing advertising and following their effects on product adoption (Morecroft, 2007, 171).

Since SD models can be applied to any dynamic system, there are a great number of case studies and examples of their successful use (Forrester, 1972; Sterman, 2000; Morecroft, 2007).

## QUALITATIVE AND GROUP-MODEL BUILDING IN SYSTEM DYNAMICS

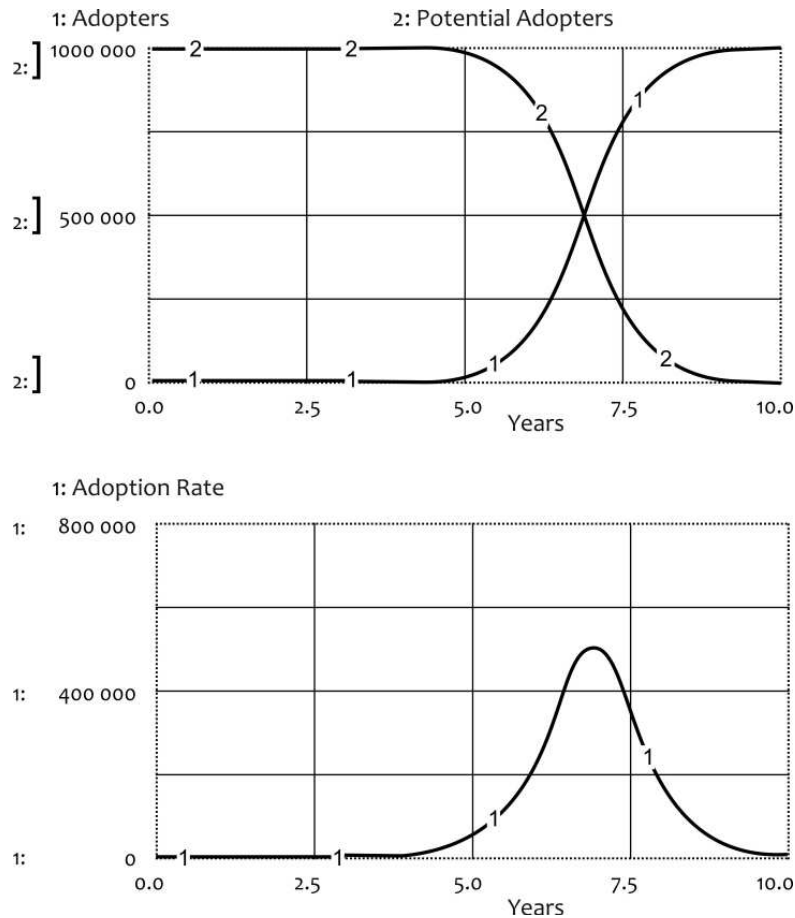
There are certain advantages in management problems solving in SD: SD's strength lies in an assumption that the structure is the key determinant of a system behavior and the structure can be represented by appropriate positive and negative feedback loops. The understanding of feedback structures can help managers to manage complexity better and provide

more efficient decisions for achieving their goals. Since SD models pointing out the key decision points and actions of the ones who make those decisions are included in the models, the consequences of the current policies can be determined and alternative strategies can be researched (Jackson, 2003, 78).

However, critics consider SD models as imprecise, and not strict enough, i.e. those models are usually built on ignoring certain theories in the researched field or without a sufficient amount of collected data. If SD models are imprecise, then a precise prediction of the future system states can all but be provided, at the same time it will be just partially useful to decision-makers (Jackson, 2003, 79 – 80).

Richardson (1996), too, states the following problems as the key ones in a further SD development: understanding models behavior, model validity, the improvement of practical models application, models accessibility and availability, qualitative versus quantitative modeling, i. e. identifying conditions in which it is better to use qualitative tools, as well as conditions that demand formal quantitative modeling, etc.

SD was based strictly on building quantitative models to last for a long period of time. Although SD models are a mathematical representation of problems and policy alternative, for the most part, the available information is not numerical by nature, it is rather



**Figure 3** Dynamics of product adoption by the word-of-mouth

qualitative. In spite of a general agreement on the importance of qualitative data and tools during the SD models development, there are no clear descriptions of the purpose and time of their using.

The lack of an integrated set of procedures for acquiring and analyzing qualitative information makes a gap between the modeled problem and the problem model. The gap is even more visible when a model considers the use of the soft variables, such as consumers' satisfactions or products quality. Problems connected with the quantification and formulation of qualitative variables has led to the development of the qualitative SD (Coyle, 2000; Homer & Oliva, 2001; Luna Reys & Anderson 2003; Dhawan et al, 2011). In that sense, certain diagrams, such as causal loop diagrams, can be used as qualitative tools for policy conclusions without quantification and simulation (Coyle, 2000, 233).

However, there is a question if certain qualitative tools should be used with or without additional quantification and simulation. Although there are situations where qualitative instruments are used without additional quantification and simulation, simulation is almost always considered to be wanted in a policy analysis, even when there are some uncertainties and soft variables. In fact, it is necessary that a danger of conclusions made only according to qualitative tools as well as the limitations of the simulation models be recognized and understood. (Homer & Oliva, 2001). Some researches on the effects of the quantitative and qualitative modeling in SD demonstrate the fact that, for relatively simple problems, represented by simple diagrams, it is enough to use qualitative modeling tools in SD. On the other hand, for complex assignments, it is necessary that quantitative models and simulation be included (Dhawan et al., 2011, 321). In spite of the fact that quantification is useful, one should carefully try to quantify soft variables. This is about a research field extremely important for a further development of SD (Coyle 2001, 362).

It could also be concluded that the question of using qualitative data and tools in SD is not an adequate one. The adequate ones would be where and how. Although certain authors think that the significance of qualitative data mostly stands out in the conceptualization phase, and less in the model formulating phase, qualitative

data are present in all phases of the modeling process (Luna – Reyes & Andersen, 2003, 275). According to that, some of the key techniques for collecting qualitative data can be identified in each modeling phase – such as interview, Delphi technique, the nominal group technique, etc. (Luna Reyes & Andersen 2003, 287 – 292).

Another type of critiques in SD is connected with the unitary nature of management problem situations, i.e. the functionalist systems paradigm which is the base for SD. Problem situations in organizations represent certain subjective constructions and participant interpretations, because the identifying of certain structures considers a continual process of negotiating with participants i.e. clients in the modeling process. In the given context, a tendency to research an SD system objectively, from outside the system, with a help of models built on the feedback process, represents a very complex task to do. Also, in SD, we start with the fact that there is accordance upon the model purpose, which neglects the purpose and aim variety that different participants have in management problems solving (Jackson, 2003, 81).

Group model-building arises as a response to these critiques (Vennix, 1995; Vennix 1999; Rouwette, 2001) or participative modeling (Lane, 2010), which is trying to include different participants, i.e. clients perceptions and opinions, in the model-building process. This is, in fact, an attempt to apply SD to some insufficiently defined, i.e. unstructured problems, and in that way to approach an interpretative paradigm. The research of certain cognitive limitations, i.e. ways for increasing capacity of group data processing, on the one hand, and the way participants see and interpret different problem situations, on the other, are important in researching the group model-building effectiveness in unstructured problem situations (Vennix, 1999, 381).

In order to effectively face the unstructured problems the system dynamicists should, above all, accept the fact that in many situations it is not useful, or that all the phases of the modeling process are even impossible to use. As previously stated, in some situations, it is better to apply only certain qualitative tools without quantification and simulation (Coyle, 2000, Dhawan et al, 2011). The fact is that it is necessary to precisely

estimate the conditions and effects of the qualitative and quantitative modeling.

Beside the stated, it is necessary that different ways of inducing the team learning and effective communication within the groups be explored to improve the modeling process. To ensure learning, participants have to become modelers. It is necessary that the participants take an active part in a model development to enable effective model learning. Generally, in estimating the group model-building effectiveness, it can be concluded that participating in the modeling process increases clients' commitment and makes the implementation easier (Rouwette, 2001, 32, Vennix, 1995, 55).

However, tending to approach the interpretive paradigm, SD risks losing its key functionalist feature to identify laws that govern the behavior of systems. It means that, above all, SD should keep its functionalist characteristics (Jackson, 2003, 81). In fact, certain knowledge and skills necessary for model building in SD should be combined with the appropriate skills and knowledge necessary for facilitating participation and negotiation within groups (Vennix, 1999, 392).

Certain SD deficiencies can be overcome by a combined use of SD and some other interpretive systems approaches, such as Soft System Methodology (Coyle & Alexander, 1996; Lane & Oliva, 1998; Rodriguez Ulloa & Paucar – Caceras, 2005). Besides, SD can be combined with other functionalist approaches such as Organizational Cybernetics (Schwaninger, 2004; Schwaninger & Perez Rios, 2008).

## CONCLUSION

SD, as a relevant structuralist–functionalist systems methodology, is based on the theory of information feedback and control. It is adequate for solving complex – unitary management problems, i.e. problem situations. Management problem situations in SD are expressed by the feedback structure and the process within, represented by appropriate diagrams and mathematical system models.

SD models represent an extremely powerful tool for management problems solving within organizations.

Developed through an appropriate modeling process, the SD model can be used in redesigning adequate organization policies and/or structures. The modeling process itself is an extremely complex iterative process of the modeler's moving through certain phases. Although there are different classifications of the modeling process phases, the following phases can be identified: the conceptualization phase, i.e. identifying a problem and presenting it by feedback loops; the formulating phase, i.e. the phase of building a mathematical model represented by appropriate level and rate equations; the testing phase or model validation by comparing it to the realistic world; and the implementation phase, i.e. model application in designing policies for improving the results for an organization's functioning.

Based on the assumption that the structure generates a certain behavior, SD models enable the prediction of a future system behavior through computer simulations, which is shown on the example of a new product adoption on the market. The key hypothesis in the paper can be confirmed by researching the theoretical-methodological and applicative aspects of management problems modeling within the conceptual framework of SD.

In spite of a great number of successful SD model applications in management problems solving, the SD models have certain limitations. This is about different problems connected with the quantification of certain soft variables and possible imprecisions and mistakes to follow. Qualitative SD or qualitative modeling in SD accentuating the significance of a single or combined use of certain qualitative and quantitative tools in SD come to surface as a response to these deficiencies. The limitations connected with the functionalist paradigm which SD is based on, should also be mentioned. It is related to the fact that SD assumes the existence of accordance on the model purpose, by which different perceptions and clients i.e. participants in the modeling process are neglected. In that sense, there are tendencies that SD approaches to the interpretive paradigm through group model-building. Despite the fact that soft variables and participants' perceptions should be included in research, SD should not lose its key structuralist-functional features in tending to approach the interpretive paradigm.

Bearing in mind the identified deficiencies of SD and its models, it is necessary that different assumptions, conditions, and ways of a combined use of SD and other systems approaches to management be researched. SD can be used in combination with appropriate interpretive systems methodologies such as Soft System Methodology (SSM), where SD models represent an adequate support to SSM tools in research of organizations' structures and their functioning. Besides, SD could be combined with systems approaches that also belong to the functionalist systems paradigm, such as Organizational Cybernetics. A combined SD use, i.e. the SD model use with other methodologies, methods and techniques, represents a special field relevant for future researches.

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**Review paper**

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## SUPPLY CHAIN ARCHITECTURES IN AN E-ENVIRONMENT

Dragana Rejman Petrovic,\* Igor Milanovic, Zoran Kalinic

The concept of supply chain management (SCM) has occupied serious research attention in recent years. This concept goes beyond intra-organizational boundaries to achieve a greater value of the entire supply chain network.

The development of ICT, together with the Internet environment, has an impact on the management concept of traditional supply chains, allowing the integration of participants and the management of complex interfaces between organizations in the supply chain network. The e-business model connects the separate activities of the supply chain in an integrated, coordinated, flexible, efficient and responsive system.

This paper analyzes the key aspects of e-SCM and different supply chains architectures in an e-environment as the starting point for defining the generic architecture model of e-SCM.

**Keywords:** supply chain architectures, supply chain management, e-environment, e-SCM

JEL Classification: L29, M10, M11, M15

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### INTRODUCTION

The focus of contemporary organizations, based on the concept of supply chain management, was created as a response to ongoing business requirements related to the business process improvement, flexibility, agility and supply chain collaboration.

Looking for additional sources for cost reduction and process improvement, organizations are beginning to introduce modern management tools in their chains of suppliers and customers. During the last decade, computational techniques and methods of management for internal functions in business

have systematically been applied, such as Enterprise Resource Planning – ERP, Total Quality Management – TQM and Business Process Reengineering – BPR, to optimize operations of organizations and activate high agility, lean manufacturing and distributed functions with the highest quality and service.

Cost reduction and process optimization in supply chains, which used to be predominant inside organizations in the past, focus on applying the same paradigms of management and technology, but outside internal supply chains. The goal of management is to eliminate all forms of dissipation created by some entities in the supply chain, such as logistics, inventory, purchase, product development, finance and others.

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The application of the Information Communication Technology (ICT) tools based on the concept of the

Internet enables organizations to observe the supply chain as a source of competitive advantage. With the emergence of e-business, these tactical advantages rapidly increase, so additional strategic capabilities enabling the entire supply chain create the radically new regions of the market value, which was practically impossible in the past. E-business technologies enable even small organizations to connect their supply chains with each other and be able to implement competitive business models that, previously, only large organizations had (Arsovski et al., 2012).

Numerous authors observe the SCM concept from different perspectives. Sachan and Datta (2005), Cousins et al. (2006) and Storey et al. (2006) define the concept, principles, nature and development of supply chain management and indicate the existence of intensive research conducted in this field worldwide. Also, they critically evaluate trends in the theory and practice of supply management.

SCM represents the strategic and systematic coordination of traditional business functions inside and outside an organization and in the supply chain, in order to improve long-term performances of individual organizations and the supply chain as a whole (Mentzer et al., 2001).

Gunasekaran and McGaughey (2003) extend the scope of SCM outside material management, partnerships, and information technologies to the TQM field, the achievement of the commitment, organizational structures, and training and behavior issues of employees.

Fawcett et al. (2008) indicate the necessity of analyzing an environmental pressure driving SCM and a barrier analysis as well as the implementation of appropriate solutions providing the supply chain performances necessary for the maintenance of competitive advantage.

The emergence of the Internet and electronic communications has enabled organizations to better respond to customer requirements. Tarn et al. (2002), Sanchez and Perez (2003) and Wieder et al. (2006) examine the functions, current development and reasons for the ICT integration, analyzing the

problems of ERP, Electronic Data Interchange (EDI) and presenting possible solutions to SCM.

The experiences of organizations that have used ERP systems indicate that the application of these systems achieves a higher overall performance, but there is no evidence of a similar effect on the performance of the entire supply chain. On the other hand, organizations using EDI have generated more benefits and fewer technical and organizational difficulties than those that have not implemented the EDI technology.

Papers on this topic generally indicate the impact of the Internet on the SCM. Lee (2002) indicates that there are four types of Internet impacts:

- information exchange,
- knowledge exchange,
- e-commerce, and
- a new structure of supply chains.

Swaminathan and Tayur (2003) describe three ways of how the Internet influences supply chain. The first is reflected in the system using resource planning more easily. The second points to information exchange. The third considers the possibility of the information exchange integration and decision-making through the supply chain.

Johnson and Whang (2002) examine how the Internet is changing SCM and they classify papers into three main categories:

- e-commerce,
- e-purchasing, and
- e-collaboration.

In recent years, numerous studies have emphasized the importance of information exchange within supply chains (Lambert & Cooper, 2000; Lau & Lee, 2000; Barratt, 2004).

The goal of this paper is to perform an analysis of the key aspects of e-SCM and different architectures of supply chains in an e-environment, the key components and relationships between different actors in the supply chain (internal and external), and the definition of the generic architecture model of e-SCM.

The key hypothesis set in this paper is the following: Considering a large number of factors affecting the architecture of supply chains in the e-environment, the definition of the generic architecture model of e-SCM reaches a higher level of integration, synchronization and resource optimization in supply chains.

The results of the analysis indicate the key elements in the supply chains architecture and enable us to design the generic model of the e-SCM environment.

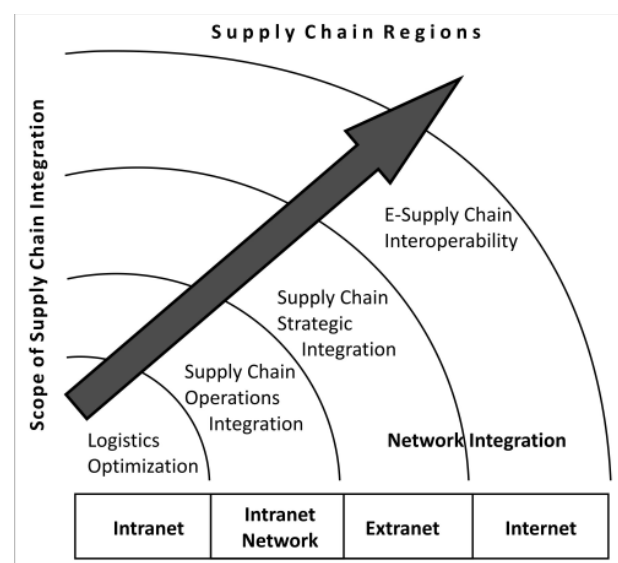
The methodological approach is based on the general theory of the supply chain, the quality management system, the management of business processes and stakeholders' requirements.

The paper is structured in such a manner that the second part describes the development of SCM concepts with a special emphasis on the analysis of the role of ICT and e-SCM. The third section describes the key features of the concept, and in the last fourth, part, an analysis of the key components of supply chains architecture in an e-environment is presented as well as the generic model of supply chains architecture in an e-environment.

## SUPPLY CHAIN MANAGEMENT IN E-ENVIRONMENT

The development of SCM has gone through several stages. The first stage defines the era of internal logistics as important functions in an organization. In the second stage, the logistics are transferred from the decentralization to the centralization of basic functions, leading to new attitudes in optimizing costs and customer service. The third stage testifies the drastic expansion of logistics, including new concepts of interest in connection with the internal operations of the analogue functions performed by business partners in the supply chain. As the concept of integration in the supply chain expands, the old concept of logistics is being replaced in the fourth stage, an integrated approach to supply chain management. With the implementation of the Internet technologies in the concept of SCM, the fifth stage appears, supply chains in an e-environment, e-SCM. The stages of the development of e-SCM are shown in Figure 1.

E-SCM provides supply chains with resources for the implementation of the strategic options of the SCM original model. In the late 1990s, organizations recognized that they were not only isolated entities defining the business strategy for their existence, but also a part of a much broader environment in which various business systems exist.



**Figure 1** SCM development stages

Source: Ross, 2003, 15

ERP systems and the EDI technology impose serious limits to communications and the information range and erect barriers by restraining the participation of organizations. On the other hand, the integration of the Internet and SCM provides the entire supply chain with a possibility of creating a value for their customers, by defining a plan for achieving agility, creating a flexible system and high-performance networks with a Web accessible to customers and suppliers and a critical flow of information. Therefore, the application of the Internet technology gives a new dimension to the concept of SCM (Arsovski, et al., 2012).

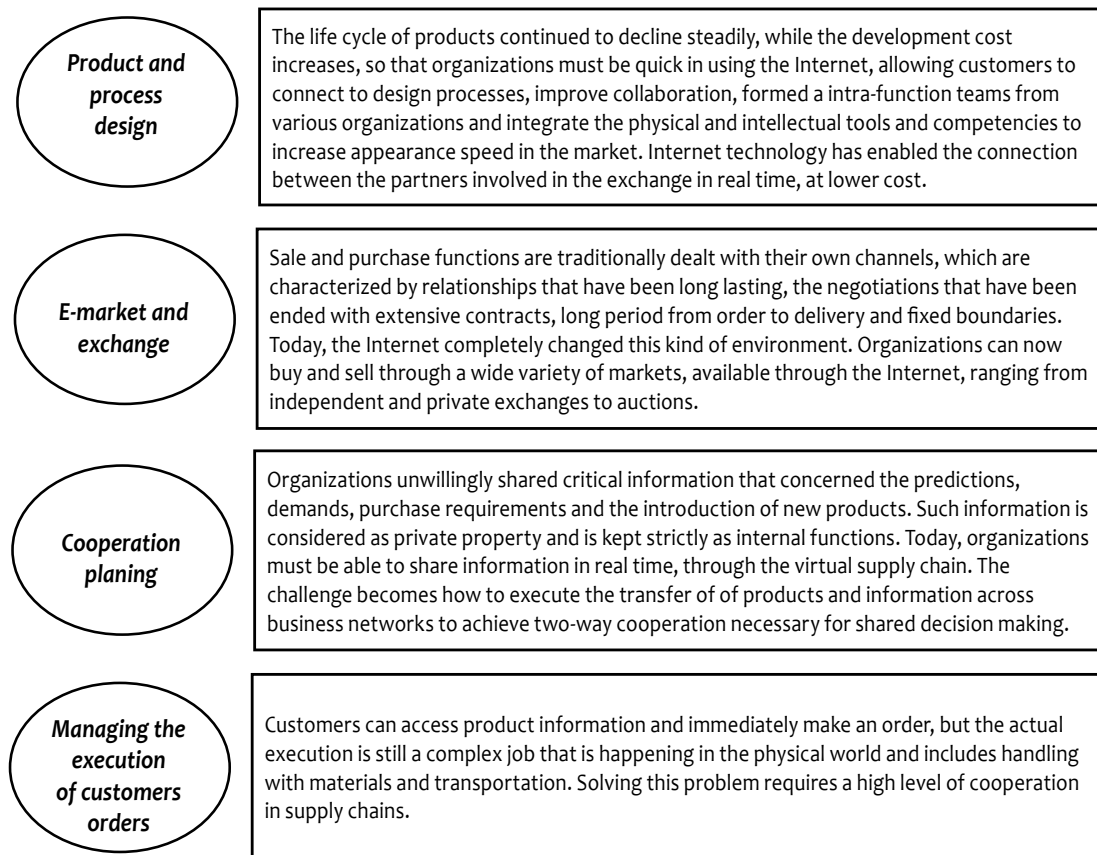
E-SCM is a three-stage process. The first stage is characterized by the integration of processes and functions within an organization. The second stage is characterized by the cross-integration of operational functions in the supply chain partners, such as transportation, inventory in supply chains and supply forecasting. The third stage is the highest level of achieving synchronization functions in the entire supply chain from the whole purchasing network into a single virtual organization able to optimize the competencies and resources from anywhere and at any time in the supply chain in order to gain an insight into market opportunities, by using the Internet capabilities (Rejman & Milanovic, 2012).

Using e-business tools has created major changes in the SCM, in the field of the product and processes design,

e-markets and exchanges, planning cooperation among organizations and managing the execution of customer orders (Ross, 2003, 11-13) (Figure 2).

In this environment, there is a constant migration from vertical to virtually integrated organizations. Organizations representing the business systems that consist of narrowly defined functional areas are oriented towards internal processes and are not interested in establishing cooperation between organizations. However, organizations with a strategy of expansion and winning new markets have realized that working with all members of the supply chain, including competitive channels, is a good way to meet the ever-higher requirements of customers.

Instead of a physical system of the channels network, managed by time and space, the virtual supply chain,



**Figure 2** Areas of changes in supply chain management

supported by the Internet technologies, provides partners from all parts of the world with an insight into the possibilities and possible unanticipated events in real time. Virtual organizations enable the development of strategies oriented towards the supply chain and redefine the fundamental assumption about who the customers are and how to shape internal and partner competencies (Arsovski et al., 2011).

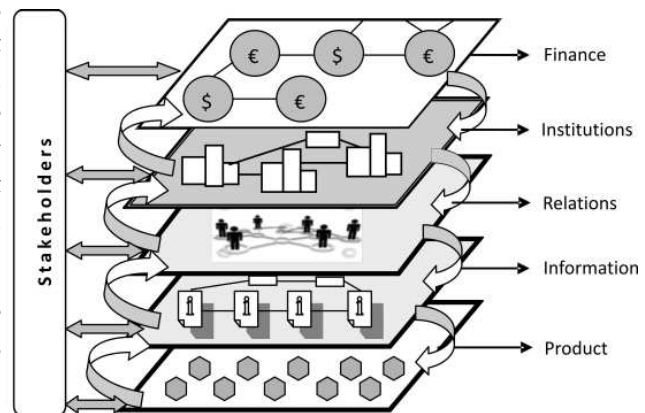
Conventional supply chains are not able to meet the needs of today's customers and thus hamper business partners within the network to be effective. Mostly, they can be described as slow, expensive, insufficiently accurate, inconsistent, inflexible and inaccessible. On the contrary, supply chains supported by the Internet are ready to provide customer service that conventional supply chains were not able to.

Competitors are changing business environment and at the same time irreversibly changing the supply chain and the management of its functions. The traditional supply chain (purchasing/production/distribution) is linearly connected. The modern approach to supply chain management means that organizations need to improve their communication and information flow. In this way, the traditional supply chain turns into an adaptive and real-time supply network. This enables organizations to manage a flexible, responsive supply chain network as a whole.

Supply chain networks are highly complex, interdependent structures with a number of related suppliers, service providers and customers who are also members of other supply chains. Individual elements of the supply network interact at different levels:

- the products level,
- the information level,
- the relations level,
- the institutions level, and
- the finance level (Gomm & Trumpfheller, 2004) (Figure 3).

Therefore, designing an efficient supply chain network involves an analysis of the key components and requirements of stakeholders with interfaces at the horizontal and vertical levels, in order to achieve



**Figure 3** Interaction of different network levels in the supply chain

Source: Gomm & Trumpfheller, 2004

an effective interaction between the participants in the supply chain and improve the performances of processes, functions, organizations and the entire supply chain.

## CHARACTERISTICS OF SUPPLY CHAIN MANAGEMENT IN E-ENVIRONMENT

With the appearance of the Internet technologies, the concept of supply chain management assumes a completely new dimension. The main problem that was a barrier to the total activation of SCM models was the a mechanism that would allow a connection between business systems. The Internet overcomes this gap.

Actually, in the entire supply chain, an access to and display of database data, forecasts, an inventory, capacity planning, product information, financial data and other aspects of organizations needed for effective decision-making are allowed.

To ensure operations, the full benefit and advantage provided by the implementation of e-SCM, it is necessary to define:

- e-information,

- e-collaboration, and
- e-synchronization.

### **E-information**

E-SCM enables a completely new insight into the functioning of information throughout the supply chain. Today, the fundamental competitive advantage is speed, being the fundamental attribute of information obtained from the Internet. Organizations acquire capital using e-information on the basis of the created system allowing a simultaneous use of data about the supply chain in real time. In this way, it is possible to manage the supply chain in any situation and effectively respond to the planned as well as unexpected situations. E-information allows greater transparency and more control throughout the supply chain. The aim is to strengthen the organization with more efficient models of process management in supply chains as well as provide managers with an insight into the key events in order to timely implement potential corrective measures. Information about unforeseen events allows a management-efficient analysis, as well as planning and forecasting in the supply chain.

E-information ensures a deeper and broader relationship between organizations in the supply chain network, while facilitating cooperation at all levels, from product design to customer services (Johnson & Whang, 2002).

### **E-collaboration**

E-SCM allows organizations to achieve successful relations with partners throughout the supply chain and create a channel structure without "cracks". If information between networked business partners is better synchronized, the whole supply chain is able to work as if it were a single organization. At the same time, the supply chain network is created with traditional entities such as suppliers, manufacturers, distributors and retailers, as well as a new kind of intermediaries, such as virtual/contract manufacturers, service providers and on-line trade exchange. The realization of completely new sales methods and new sales channels is also enabled. For a business to be successful, organizations must keep pace with new

principles of cooperation within the supply chain. This includes the establishing of the partners network throughout the supply chain supported by web connections (Johnson & Whang, 2002).

### **E-synchronization**

To accept challenges of operating on the market, organizations must adopt new methods of timely connecting e-information. It is the transfer of e-information in the quickest possible way through the supply chain and the interconnecting of all parts of the network in order to form a smooth supply chain, i.e. e-supply chain synchronization. The goal of synchronization is to achieve a direct link between demand and supply in all parts of the supply chain network by using ICT resources (Johnson & Whang, 2002).

## **SUPPLY CHAIN ARCHITECTURES**

The management of supply chains in an e-environment requires that organizations in the supply chain should analyze the concepts, methods, techniques and business processes, internal and external interfaces, stakeholders' requirements, the level of the applied information and communication technologies and define optimal models of an integrated supply chains architecture.

Supply chains architecture consists of:

- the architecture of internal operations,
- the architecture of inter-organizational operations, and
- the architecture of inter-organizational technologies (Ross, 2003, 313-332).

### **Architecture of Internal Operations**

Organizations and supply chains are not monolithic structures and always search for the realization of a comparative advantage. They grow and develop internally, and at the same time, increasingly become dependent on other systems. The constant destruction and rebuilding of organization architecture are

a response to the principles of internal business development and increased interdependency.

The term organization architecture has a broad meaning. It consists of the components of an organization responsible for the process performances, including purchasing, production and sales. Also, it refers to a corporate culture evolved in time, and running the current and future attitudes, expectations and evaluation of opinions on what the mission of an organization is. It consists of ICT resources that collect, analyze and use the data warehouses of an organization, as well as the core competencies of employees in organizations.

Without an effective architecture, an organization's evolution would be interrupted and its ability to adapt to changing business paradigms and ICT resources would significantly be reduced.

Before the appearance of the e-SCM nature of information and communication technologies, organizations' ability to go beyond their own borders was seriously limited. Technologies such as the telephone, fax and EDI enabled information to be exchanged between business partners; however, the connecting of business, data and knowledge transfer was limited in space and time. In addition, databases are considered to be an organization's property. The organizational architecture built on such an information model has significantly been limited and highly institutionalized. The structure of the organization was designated as a special configuration of the responsibility centers that had their goals and had to be aligned with the organization's strategy. The management's role was to resolve conflicts between responsibility centers and encourage and lead to overlapping targets.

At the beginning of the late 1980s, there were two new concepts: Just-in-Time manufacturing – JIT and BPR. The first focused on the fact that each individual in an organization aspires devotedly to the continuous improvement of business processes. The BPR concept was radical and focused on the fundamental change in thinking and a radical redesign of business processes to achieve dramatic improvements. Instead of a continuous improvement, the BPR concept meant the complete redefinition of business processes

and their rebuilding. Although the implementation of these two concepts enabled the achievement of competitive advantage, their effects could not be felt throughout the entire supply chain. Instead of being a revolutionary business philosophy, in fact, they were a logical culmination of old organizational models which considered organizational frameworks to be a boundary preventing organizational change from crossing it.

Transition from BPR and JIT/TQM to e-SCM requires changes in the following business architectural elements:

- the management of organizational processes,
- the focus on customers,
- the reengineering of employee roles,
- employee management, and
- the development of a virtual organization (Ross, 2003, 316-321) (Figure 4).

E-SCM requires that organizations create such an organizational environment where processes, data and information in the supply chain are interconnected via communication channels and integrated databases. Today, SCM in an e-environment is recognized as a strategic business philosophy and a concept affecting all aspects of the supply chains network via process channels engineering, a continuous improvement and an overall integration of business partners in the exchange.

### **Architecture of Inter-organizational Operations**

Organizations need to cooperate through a predefined common mission to achieve the highest level of customer service. The development of new technologies, methods, techniques and standards affects the definition of an effective architecture between organizations and the promotion of the management's and employees' knowledge in an organization. The role of the Internet is to ensure the integration of databases in organizations, too. This vision of organizations requires that all members of the supply chain be closely integrated and their databases and information flows synchronized in order to eliminate obstacles in information sharing. The construction

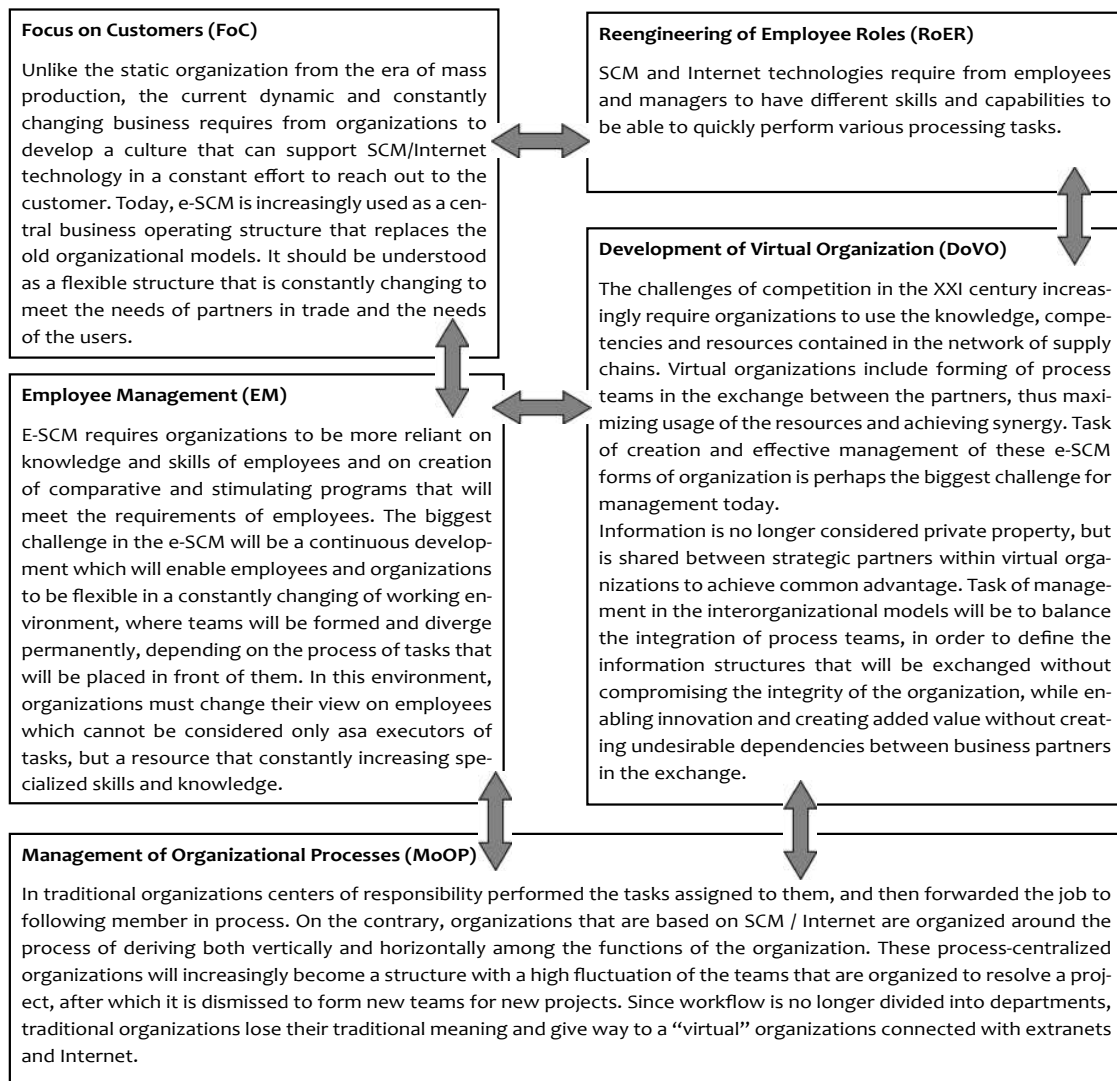


Figure 4 Architecture of internal operations

Source: Ross, 2003, 316-321

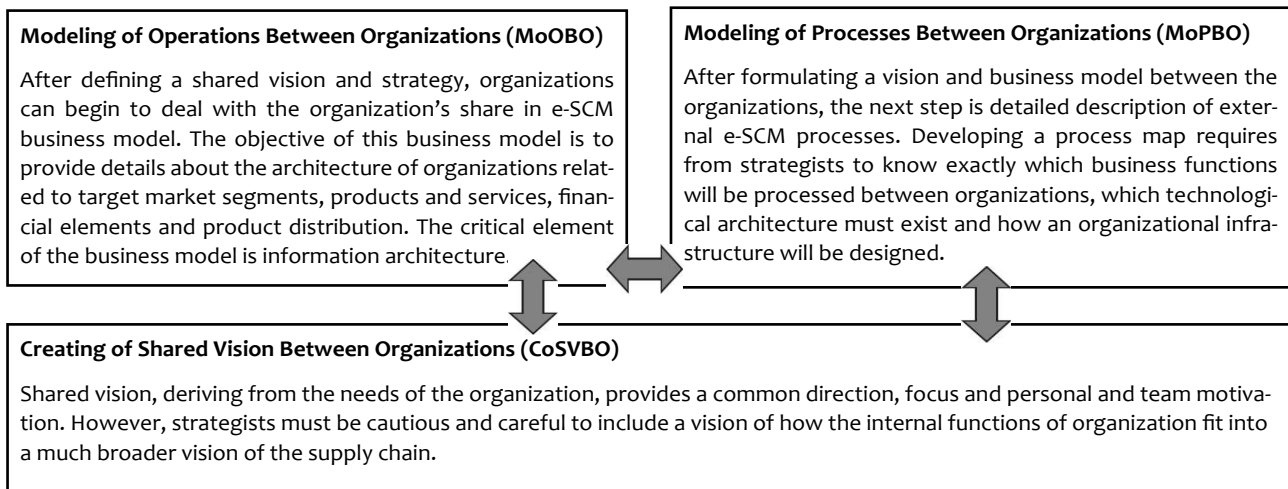
of such structures among organizations capable of synchronizing their information flows requires that partners in the supply chain continuously develop and maintain effective e-SCM strategies. This involves:

- the creating of a shared vision between organizations,
- the modeling of operations between organizations, and

- the modeling of processes between organizations (Ross, 2003, 321-325) (Figure 5).

**Architecture of Inter-organizational Technologies**

Strategic and operational business opportunities are directly related to the possibilities of ICT. An organization’s ability to effectively manage relationships with customers and suppliers and the function of production, logistics and finances are directly



**Figure 5** Architecture of inter-organizational operations

Source: Ross, 2003, 321-325

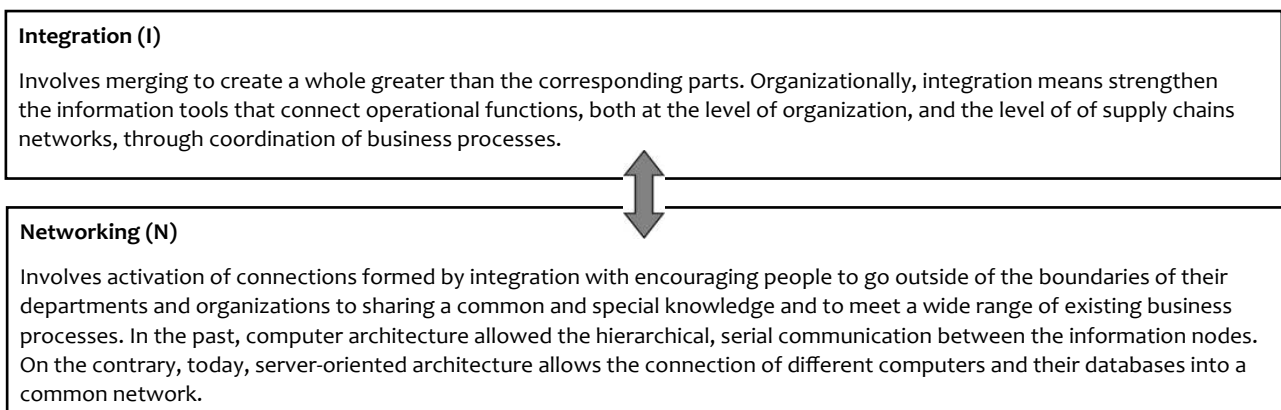
proportional to the speed at which organizations can create, store, access or transfer information and data.

In recent decades, information and communication technologies have extensively been introduced into organization operations. In the mid 1990s, the arrival of new concepts and technologies, such as e-SCM, forced organizations to use the ICT model going beyond the boundaries of an organization. Creating a necessary architecture amongst organizations requires new sets of ICT tools and significant infrastructure changes.

There are two critical dimensions influencing the development of technology architectures among organizations, namely:

- integration and
- networking (Ross, 2003, 325-330) (Figure 6).

The appearance of new information and communication technologies and information systems in recent years has changed the relationship between the integration and flexibility of inter-organizational information systems.



**Figure 6** Architecture of inter-organizational technologies

Source: Ross, 2003, 325-330

The basis for the improvement of e-supply chains are web services including the collection of interrelated information systems connecting technologies, regardless of the programming language used to create these components or the platform they operate on (Fensel & Bussler, 2002, Hagel, 2002).

They allow organizations to integrate with suppliers with possibly different internal systems in an easier way (Vidgen, et al., 2004; Wu, 2004). While web services offer many advantages in this field, their use with other technologies and systems offers great opportunities to improve the agility of the system.

There are other technologies contributing to the improvement of the agility of the system as follows:

- electronic trading hubs, in order to facilitate communication and trade between partners (Kaplan & Sawhney, 2000),
- business process management systems, in order to harmonize inter-organizational processes (Leymann, et al., 2002), and
- automatic data collection, in order to align the physical location and asset tracking with the information flow (Fisher, 1997) and others.

## GENERIC MODEL OF SUPPLY CHAIN ARCHITECTURE IN E-ENVIRONMENT

To define the generic model of e-SCM, different architectures were analyzed, as well as the elements and aspects of the architecture of supply chains in an e-environment as follows:

a) Architecture of internal operations:

- the management of organizational processes,
- a focus on customers,
- the reengineering of employee roles,
- employee management, and
- the development of virtual organization.

b) Architecture of inter-organizational operations:

- the creation of a shared vision between organizations,

- the modeling of operations between organizations, and
- the modeling of processes between organizations.

c) Architecture of inter-organizational technologies:

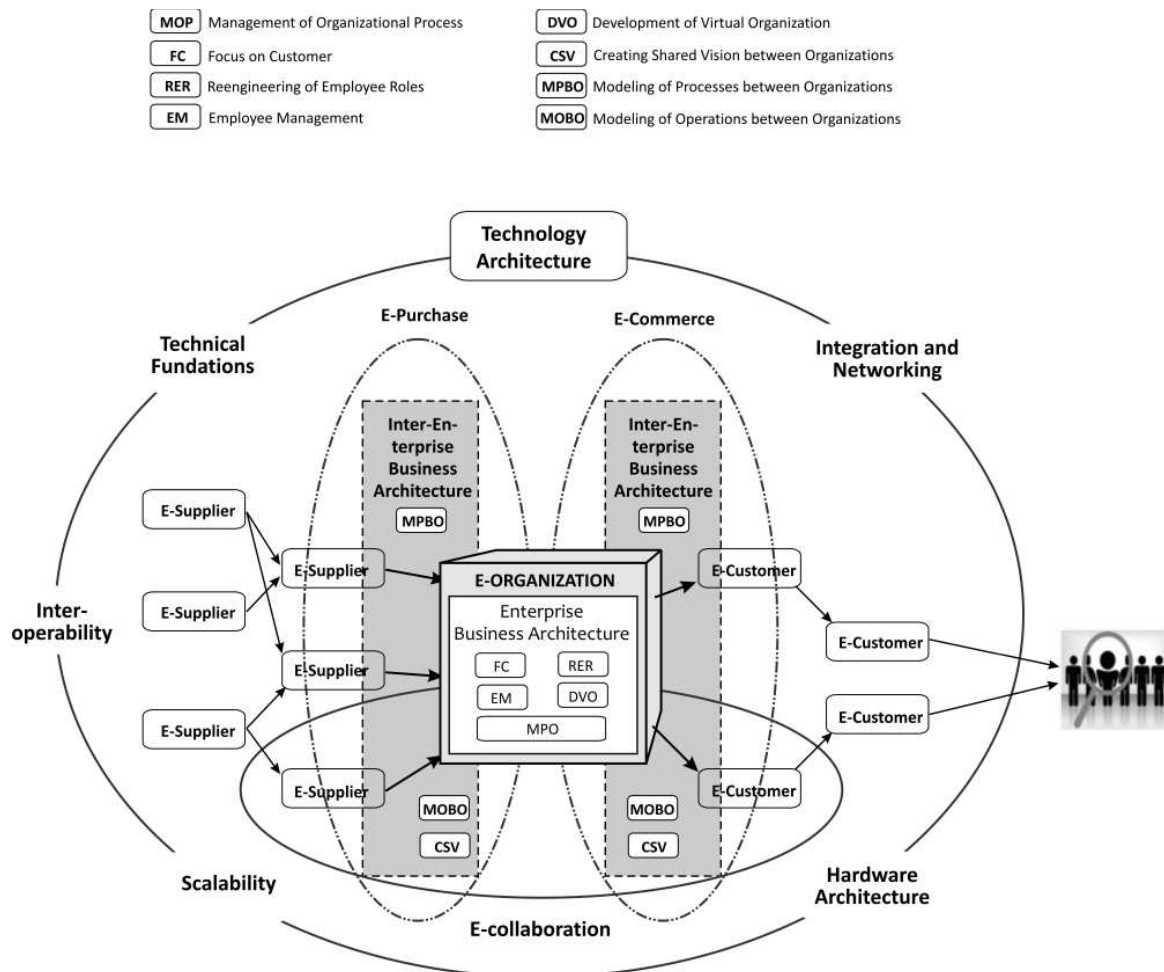
- integration, and
- networking.

By integrating internal operations architecture, inter-organizational operations architecture and inter-organizational technologies architecture for each particular organization in the supply chain network, the cost savings of transactions among organizations can be achieved, enabling access to information in real time, increasing the network flexibility and creating a basis for an effective management of complex interfaces between various participants in interlaced supply chains.

The proposed supply chain architecture generic model is based on the e-business model involving the development of an information system through the application of the information system's life cycle development including the planning, analysis, design, implementation and support of the information system (Arsovski, 2008).

Thereby, such an information system enables an efficient data transformation of documents, resources, processes and stakeholders in a corresponding integrated logical data model, which, by using appropriate Database Management Systems – DBMS, transforms itself in associated databases, members of supply chains (Rejman, 2010).

Figure 7 accounts for the supply chain architecture generic model of in an e-environment inclusive of the key elements of the supply chain architectures and their mutual interactions. The main interfaces exchanged between an e-organization and e-purchasing (suppliers) are: procedures, purchasing plans, contracts with suppliers, the verification of the zero series, certification, the audit process record, the organization's e-orders, supplier invoices, delivery notes, complaints, etc. The main interfaces exchanged among an e-organization and e-commerce (buyers) are: procedures, purchasing plans, contracts with customers, sales orders, the e-organization's invoices,



**Figure 7** Generic model of supply chain architecture in e-environment

sales orders, transport orders, complaints, quality in warranty and post-warranty period, etc.

The scope of e-business is very wide. It starts from market research through a collaborative product development, and ends with sending invoices, billing and transactions in a supply chain and data analysis. The proposed model enables operations in real time and recording indicators of trends on the market at the moment they occur. The e-business model includes two main sub-models of electronic operations defined on the basis of the parties involved in the business process and the nature of their business relationship, such as e-purchasing and e-commerce. The result is the restructuring of business doing exclusively in an

electronic form with continuous learning, changes and innovations.

The synchronization of chains at the horizontal level means e-collaboration providing a transparent way of planning demands to all organizations within the supply chain. The goal is to minimize the potential “bullwhip effect” resulting from an independent realization of purchases at every level in the supply chain. Achieving this goal implies an exchange of operational and strategic information throughout the supply chain using the EDI technology, extranets and monitoring through appropriate information and communication technologies.

The integration of all e-organizations in the supply chain, e-purchasing, e-commerce and e-collaboration is realized by using modern ICT resources defined in the framework of technology architecture. The essence of such an integrated supply chain model is based on maximizing the value for the end user, including not only the final consumer, but also all intermediate members in a supply chain whose product/service is used as an input for further production.

## CONCLUSIONS

The so-far analyses of the e-SCM concept have been indicative of the acceleration of the expansion of e-business; the improvement of the SCM concept and the fact that pieces of information from the supply chain have been gaining more significance, because they allow the definition of future production, services, market and competitive advantage.

E-SCM provides an efficient organization and control of data, optimal distribution of information to all members of the supply chain and all levels of management within an organization. E-SCM enables organizations to connect the key aspects of their business, from product/service development to customers' orders, with all business partners in the supply chain.

The architecture of e-SCM enables the integration and e-synchronization of supply chains in a turbulent environment, sales plans, sales orders, complaints, etc. In this way, the optimization of all member resources (human, material and financial) in supply chains is achieved.

There are no identical supply chains even when it comes to a product/service, and especially a flow of different goods. This indicates that there are many factors influencing the creation of a specific supply chain, as well as that these factors are very different (a business organization, applied quality standards, methods and techniques applied in business, the applied ICT level, the structure and methods of the exchange of different interfaces among participants and others). The developed e-environment-located supply chain architecture generic model in, including

e-organization, e-purchasing, e-commerce and e-collaboration, can serve as a good basis for developing specific models for participants at different levels in the supply chain network and for different manufacturing and service organizations, particularly taking into account the interaction between the management of organizational processes, the reengineering of the role of the employee, the development of virtual organizations, a shared vision among organizations, business modeling among organizations and the modeling of processes between organizations.

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**Book review**

UDC: 330.341:32(049.32); 338.45(049.32)

## **INDUSTRIAL POLICY AND DEVELOPMENT: THE POLITICAL ECONOMY OF CAPABILITIES ACCUMULATION**

Cimoli, M., Dosi, D., & Stiglitz, J. (Eds.). (2009). New York, NY: Oxford University Press.  
ISBN 978-0-19-3527-8, XVIII + 575

Vladimir Micic\*

In the monograph called *Industrial Policy and Development: The Political Economy of Capabilities Accumulation* very complex issues related to relevant policies influencing sustainable economic development are analyzed. Primarily, that refers to the industrial policy together with comprehensive and deeper researches of the relations between the industrial and economic policies, with an emphasis on the fundamental factors of the economic development process and the significance of the accumulation of competitive capabilities. The contents of the Monograph consist of 20 papers written by 27 distinguished economists, researchers and practitioners from within the fields of the economic and industrial policies and economic development, including a Nobel Prize winner, Joseph Stiglitz, who is also one of the copy editors.

Apart from the introductory paper, the contents of the Monograph are structured in four well-proportioned sections which analyze the problems of the industrial policy from the theoretical and practical aspects. The theoretical approach encompasses the broad defining, systematic classification as well as mutual relation between the industrial policy and other economic

policies. In an applicative sense, for the most part the Monograph presents an analysis of national and regional experiences as well as a comparative analysis of the models of the industrial policy.

In the introductory paper *The Past and Future Policies of Industrial Development* (Chapter 1), the authors (Cimoli, M., Dosi, G., Stiglitz, J.) decide on the Monograph's goal, which relates to the analysis of the significance of the proactive industrial policy for economic development. It is highlighted that, the failure of the "Washington Consensus" has led to paying respect to the attitude of the necessity of the implementation of other regulatory mechanisms as well, apart from the market one. Facing the consequences of the global economic crisis has reinforced the attitude of the significance of creating and conducting the active industrial policy and institutional engineering.

In the section called *General Introduction* (Chapters 2 and 3, Cimoli, M., Dosi, G., Nelson, R., Stiglitz, J., Castaldi, C., Correa, N.), the authors indicate that institutions and the industrial policy are a sort of drivers of the development process, and at the same time technological and economic development are referred to in the context of the capability of the accumulation of knowledge, technologies and competitive capabilities. It is clearly emphasized that globalization has not led

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to the international economic convergence, nor does trade liberalization lead to a greater accumulation of knowledge and innovations, and that the industrial policy is faced with the limitations of the current WTO regime.

The problems dealt with in the second section (Chapters 4-7), called *The Industrial Policies in a Historical Perspective* (Reinert, S., Di Maio, M., Akyüz, Y., Peres, W.), the authors indicate that it is necessary that the state and the industrial policy should play an active role in the realization of comparative and competitive advantages. This section of the Monograph is dedicated to the principles, historical development and perspectives of the industrial policy, the analysis of the influence of the WTO on international trade and the technological progress of developing countries.

In the most elaborated section of the Monograph (Chapters 8-19), called *National and Regional Experiences* (Palma, G., Ramos, A., Castro, B., Singh, A., Dahlman J., Khan, H., Blankenburg, S., Mazzoleni, R., Nelson, R., Amsden, A., Mayer, C., Possas, M., Borges, H., Hobday, M., Perini, F., Cimoli, M., Coriat, B., Primi, A.), the authors present a larger number of empirical researches, comparative case studies, as well as a series of important rules for the creation of the industrial policy. Arguments are used to prove the important role of the industrial policy in the economic development of highly developed countries, and some examples from practical work are mentioned where the industrial policy stimulated and speeded up countries' economic growth and development. The results of the application of different models of industrialization in highly and newly-industrialized countries are empirically analyzed. One part of the analysis deals with the adaptability of the industrial policy to changes in the global economy and the flexibility and efficiency of different institutions in its implementation in Asia's countries. Among other things, different forms and possibilities of and impacts of the modern industrial policy and public policies on the economic development of Asia's and Latin America's developing countries are analytically observed. From the aspect of the national experiences of sustainable development, the role of knowledge, researches and innovations in a quick growth of China's, Brazil's and India's exports is specially analyzed. An important part of the research

in the papers is the relation between industrial development, on the one hand, and entrepreneurship, the policy of competition and the policy of the protection of intellectual property, on the other.

In the conclusive section called *The Future of the Industrial Policy in the New Millennium – Knowledge-oriented Development* (Chapter 20), appreciating different arguments, the consulting editors (Cimoli, M., Dosi, G., Stiglitz, J.) implicitly indicate the necessity of the coherence of the industrial policy the concept of sustainable development as an alternative to the unsuccessful "Washington Consensus". They implicitly indicate that the perspectives of the future industrial policy are in improving knowledge as the factor of "a directed development program".

For a longer time period, except for certain ones, numerous developing countries accepted the attitude that the industrial policy was responsible for inefficient and poor economic growth. However, observed through the historical development and empirical analysis of highly developed economics, the Monograph implicitly imposes a conclusion that the industrial policy had a significant place in their dynamic economic development. The emphasis was rather put on discussions if countries should have an industry policy or not, rather than on the key conceptual issues related to what type of industrial policy should be applied.

By analyzing current and relevant problems, the Monograph *Industrial Policy and Development: The Political Economy of Capabilities Accumulation* importantly contributes to the enrichment of economic literature. Among other things, its value also lies in that, in the time period of postindustrial development, the monograph again draws attention to the significance of the industrial policy for the successful accomplishment of developmental, economic and social goals. The Monograph clearly indicates the essence and significance of the contemporary industrial policy, its range, advantages and limitations in practice as well as the developmental role of the state and non-market institutions.

In a certain manner, not decreasing its contribution to economic theory and practice, the Monograph can be said to be unilateral to a certain extent, revealed in

the superficial consideration of the fact that developing countries are a rather heterogenic group. Also, the monograph is deprived of experiences related to the application of the industrial policy in European transition economies as well as in Africa's countries.

Finally, it can be assessed that the concept of the industrial policy, considered and presented in the Monograph, represents one of important pillars for overall economic development. It has broader frameworks, macro- and microeconomic strategic actions of the state and actions on the offer and demand side, through a series of horizontal and

vertical management mechanisms. This Monograph, being what it is, together with the conceptual solutions presented and proposed in it, could be useful and helpful to industrial policy-makers and creators of the policy of the development of Serbia's economy. Practically, it clearly demonstrates (1) what place should be given to the active industrial policy; (2) what the role of the policy as a driver and progress-maker and the bearer of sustainable economic development is; (3) what the world experiences in making its concept and implementing it are, and (4) that, apart from the industrial sector, it encompasses the development of other sectors and activities as well.

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**Book review**

UDC: 336.221.4(1-773)(049.32); 338.24.021.8(1-773)

## **TAXATION IN DEVELOPING COUNTRIES: SIX CASE STUDIES AND POLICY IMPLICATIONS**

Gordon, R. (Ed.). (2010). New York, NY: Columbia University Press.  
ISBN: 9780231148627, 1-320

Stevan Lukovic\*

The book *Taxation in Developing Countries: Six Case Studies and Policy Implications* is the result of the work of a larger number of economists of the Initiative for Policy Dialogue (IPD) organization, whose founder is Joseph Stiglitz, winner of the Nobel Prize for Economics.

Tax systems of developing countries differ from tax systems of developed countries and are not in compliance with conventional models of an optimal tax policy. The goal of the publication is to investigate economic pressures generated by such tax structures. The analysis was performed on the sample of six developing countries (Argentina, Brazil, India, Kenya, Korea and Russia). The authors began with a presumption that the observed countries are significantly different from each other in demographic and economic characteristics; however, on the other hand, their tax systems have a great number of common characteristics and weaknesses. Taking the above mentioned into consideration, this book determines alternative directions of the tax reform that can be applied to all the observed countries (as well as the majority of developing countries), which represents

a special contribution to the economic theory and practice.

The contents of the book are structured in the following manner:

Introduction (Roger Gordon);

- 1) Development-Oriented Tax Policy (Joseph Stiglitz);
- 2) Taxes and Development – Experiences of India vs. China, and Lessons for Other Developing Countries (Roger Gordon);
- 3) Tax Policy in Argentina – Between Solvency and Emergency (Oscar Cetrangolo, Juan Carlos Gomez Sabaini);
- 4) Tax System Reform in India (M. Govinda Rao, R. Kavita Rao);
- 5) History of Russian VAT (Sergei Koulayev);
- 6) Tax Reform in Kenya – Policy and Administrative Issues (Nada O. Eissa, William Jack);
- 7) Korea's Tax System – A Growth-Oriented Choice (Joosung Jun);
- 8) Tax Structure and Tax Burden in Brazil: 1980–2004 (Jose Teofilo Oliveira, Ana Carolina Giuberti).

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Although each chapter of the book offers an insight into specific problems which the observed developing countries are faced with, in their efforts to create an efficient and fair tax system, we shall highlight the first and seventh chapters as the key ones.

In the first chapter of the book, Joseph Stiglitz points out the fundamental idea that economists suggesting reforms of tax systems in developing countries, and mostly coming from developed countries, are negligent of differences in the economic and political structures, existing not only between developed and developing countries, but also between individual developing countries. While performing the reform of their tax systems, the majority of countries set goals such as higher efficiency in tax collection, the reduction in tax evasion and fraud, while very few state authorities and economists get to grips with the problem of the corruption of tax authorities, especially present in developing countries. Therefore, Stiglitz puts the forming of a corruption-resistant tax structure as the fundamental principle in the creation of a tax system, so, corruption must be taken as the integral part of the process of creating an optimal tax system.

To illustrate the above stated hypotheses, Stiglitz considers the consequences of developing countries' exaggerated reliance on the value-added tax (VAT) as the main source of tax revenues. According to him, in developed countries, the value-added tax can be efficient as part of the entire progressive tax system, but only if combined with a progressive personal income tax, which helps achieve redistributive goals at low compliance costs. Given the fact that the majority of developing countries have no political-administrative capacity to apply the progressive comprehensive personal income tax, the value-added tax can not only create distortions in economic behavior but a regressive entire tax structure as well (because developing countries, as a rule, have a significant share of this tax in their total tax revenues). An especially significant part of the chapter is the author's assessment of VAT, where he offers analytical and carefully produced proofs that, in a situation when the share of the informal sector in the gross domestic product is well present, this tax always creates significant distortions and can have a negative impact on economic growth and unemployment.

In the seventh chapter, as the fundamental specific characteristic of Korea's tax system, the author Joosung Jun points out that its goals are, first of all, rather non-fiscal and, to a lesser extent, fiscal in character. For the purpose of achieving non-fiscal goals, such as stimulating savings, investments, research and development, Korea offers a large number of tax incentives. On the other hand, as the basic fiscal goal, he mentions the collection of a sufficient level of revenues for financing infrastructure and education, which represents an integral part of Korea's economic growth strategy. Taking into consideration all the above stated, it can be said that Korea may be the only one developing country with a tax system exclusively oriented towards economic growth (Growth-Oriented Tax System). As Korea's specific characteristic, the author also states that multinational corporations are not so much present in Korea as they are in other developing countries. The share of foreign direct investments in the Korean gross domestic product has for years been below the average one for developing countries. That can have favorable consequences for the preservation of tax revenues since multinational corporations, whose goal is to pay tax at lower effective rates, take their profits over the state border (by means of transfer pricing or in some other manner). If we compare Korea's tax system with Serbia's tax system, we can notice that the goals of offering tax incentives are diametrically different because many tax incentives in Serbia (first of all, in the field of the corporate income taxation) are exclusively defined with an aim to attract foreign direct investments, whereas relying on the domestic investment potential is less present.

The authors of the book write, in detail and in a well-argued manner, about a large number of practical problems which tax policy creators in the observed developing countries come across. The conclusions they draw by analyzing the observed countries can be applied to the majority of developing countries. The book abounds in a large number of data, performed analyses and drawn conclusions and recommendations for economic and tax policy creators, which represents a special quality of the publication. The weak point of the book is in that it insufficiently emphasizes differences between the tax systems of developed countries and those of developing countries. An

improvement would be possible to make by conducting a comparative analysis of taxation in developing countries, which are the focal point of research carried out in this book, and in a certain number of developed countries, which would additionally increase the practical and theoretical significance of already performed researches. Given the fact that for each

observed country there is a chronology of changes made in their tax systems as well as the effects that the changes have had on their fiscal and macroeconomic aggregates, this book can serve as an extremely useful instruction in the implementation of the process of reforming Serbia's tax system, all with an aim to avoid making unnecessary mistakes.

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**Conference announcement**

UDC: 005:005.745(497.11 Kragujevac)“2012”

**CONTEMPORARY ISSUES IN ECONOMICS, BUSINESS  
AND MANAGEMENT - EBM 2012**

December 13-14, 2012, Faculty of Economics - University of Kragujevac, Serbia

Verica Babic\*

The Second International Scientific Conference titled *Contemporary Issues in Economics, Business and Management* (EBM 2012) will be held at the Faculty of Economics, University of Kragujevac on December 13 and 14, 2012.

Challenges of the turbulent competitive environment impose the inevitability of creating and implementing new economic and management concepts, principles, methods, models, tools and techniques. The EBM 2012 conference will provide researchers and professionals interested in different disciplines of business and economics with opportunities to share the latest research findings, brainstorm new research ideas and publish their papers. The conference is expected to arouse considerable interest of the scientific and professional community in the country and abroad, with the purpose of finding innovative solutions to problems caused by the escalating financial crisis and recession. By presenting their research results, the participants of the EBM 2012 conference will point to the ongoing changes in both theory and practice. The conference will foster networking among presenters from different countries, providing opportunities for academics to receive informal in-depth feedback

through discussions and enable them to establish contacts for their future cooperation.

Topics in all areas of economic policy, globalization and regionalization, management and marketing, accounting and business finances, quantitative methods and models in economics and the management and information system are covered. Both conceptual papers and empirical studies are welcome.

The conference will comprise two plenary and four parallel sessions. Besides plenary and parallel sessions, there will also be Graduate Student Sessions. In these sessions, students of MSc or PhD degree programmes can present their research and compete for the Best Student Paper Award.

EBM 2012 keynote speakers at the Plenary meeting will be:

Economics Loup Brefort,  
Chief of the Office of the World Bank  
in Serbia

Joost J. de Laat,  
University of Quebec, Montreal,  
Canada

Management Sverre Are Jenssen,  
Bodø Graduate School of Business,  
University of Nordland, Norway.

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Papers must be original and unpublished. All submissions are subject to a two-person blind peer review process. There are three possibilities for accepted papers to be published:

- All accepted and presented full-papers will be published in the electronic version of the Conference Proceedings.
- Selected papers will be published in the refereed edited book.
- The authors of the selected high quality papers will be invited to submit their papers for publishing in *Economic horizons* - a scientific journal issued by the Faculty of Economics, University of Kragujevac, Serbia.

#### Important Dates

April 1, 2012	Abstract submission
April 15, 2012	Abstract acceptance notification
July 15, 2012	Paper submission
October 1, 2012	Paper acceptance notification
December 13-14, 2012	Conference dates

For further details, please visit the following address:  
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President of the Program Committee  
Verica Babic

*Verica Babic* is a professor of Management and Decision Theory at the Faculty of Economics University of Kragujevac, Serbia. She received her Ph.D. in Economics from the Faculty of Economics University of Kragujevac. Her current research interests are corporate governance, entrepreneurship and knowledge management.

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