
MULTICRITERIA ANALYSIS – INSTRUMENT FOR AN ACCURATE ANALYSIS OF THE IMPACT OF THE SERVICE SECTOR ON THE ECONOMY

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Abstract:

The current paper represents an attempt to introduce multicriteria analysis as an efficient instrument to prove that the development of services in Romania has a major impact on all aspects of our economy and represents the right path to pursue in terms of economic growth, on a medium and long term basis. The paper presents a general approach to multicriteria analysis as a means to successfully reveal the impact of the service sector on the economy of Romania. Several advantages as well as limits are presented, along with a brief presentation of the concept of composite synergy of services, corollary of the multicriteria analysis.

Key words: *multicriteria analysis, critical variables, service sector*

1. Introduction

The service sector in Romania has known a booming period over the last 20 years, ever since the fall of the communist regime in our country. Being almost non-existent until the Revolution, it became of the utmost importance once our economy began to evolve from a centralized form, in which the state controlled every aspect of economic and social life, towards a form of a functional market economy, which it was declared on January 1st, 2007. This entire period was known as the transition period.

Services in Romania have been at the core of our economic development since the transition process began. This statement is supported by the fact that Romania has become more and more globalized, i.e. globalization has become a driving force in our country, and, in many aspects, we have recovered much of the gaps which layed between our country and the rest of the members of the European Union. Gaps have been recovered in some fields, such as communications and information technology, but remain big and omnipresent in terms of services such as the medical field, financial services, and so on. Thus, globalization has proven to be a driving force, a cause as well as an effect for the development of services in Romania. Services expanded, constructing infrastructure for their corrent providing, such as

telecommunications infrastructure for broadband internet and 4G communications, in which our country is situated among top European countries. Yet there are many fields in which Romania is still way behind the European average, such as transportation infrastructure, where we are, to our shame, among the last of the member states. And this is to name only one example.

However, in spite of all the setbacks that we recorded during our transition period, services have become the driving force within our economy at this time, and even if many progresses must still be achieved, services in Romania have become the most important part of our economy. In fact, this is revealed by numbers in all fields, such as investments, where the tertiary sector has recorded, in 2011, more than 51 % of all investments made in our economy. Other sectors, such as industry, recorded 42 %, and agriculture an appalling 2, 5 %.

Thus, we notice the fact that our economy has become more and more dynamic. And its dynamic nature is speeded up by the existence and expansion of all services. This is due to the fact that, differently from goods trading and consumption, services are intangible and it is virtually impossible to separate the provider from the consumer. In most cases, services are consumed at the same time they are produced, and thus, the speed of consumption grows. Transactions within the tertiary sector are even faster, and this contributes to an increased dynamic within the sector, a dynamic which is noticeable, but seldom analyzed.

So, although we can agree on the fact that services influence almost every aspect of our life, that computers run our worlds, the impact of such an influence has been seldomly analyzed and attempts to quantify it have been all but non-existent.

Considering the fact that the services sector in our country has high dynamics, and cannot be analyzed statically, we submit to criticism the mathematical model of multicriteria analysis, considering the fact that it takes a mathematical and economic algorithm which considers several variables in order to analyze the impact of the service sector on the economy.

The usage of the multicriteria analysis concerning the services sector also allows for the argumentation of the “composite synergy” of services, a phenomenon that happens in our country as well. A multicriteria analysis represents a complex endeavour which considers several factors, in order to understand the impact of the service sector on the economy.

At this time, multicriteria analysis is used as a support instrument for decision making in terms of major investments, which states, as well as multinational corporations use. We propose an adaptation of this analysis at a more macroeconomic level, because macroeconomic decisions must be taken considering the major factors of influence within an economy. Thus, when the need for major investments occurs, of medium and long term macroeconomic decision, which have to be taken, such as major infrastructure projects, given their strategic importance, one requires a thorough analysis of all the factors involved, which may influence that investment. The need for such an analysis derives from the fact that these investments have effects which are noticeable on a medium and long term basis. As a result, the practical and economic

necessity occurred to elaborate a pragmatic mathematical instrument which could help present results as close as possible to what future reality will bring.

A concept first theoretized by Boardman and Greening (Boardman, 2004), multicriteria analysis is part of the broader concept of cost-benefit analysis, which is also used by the European Union. In fact, the E.U. prepared the Working Document no.4, (European Union, 2005) which had the basis in the 1997 document “Guide for the Cost-Benefit Analysis of Large Projects” (European Union, 2012). To this day, multicriteria analysis is one of the most used instruments in decision making worldwide. In Romania, multicriteria analysis and cost-benefit analysis are used within European-funded projects and deals with economic and social matters and issues of investment projects.

2. Composite synergy of services – several traits

The composite synergy of services is a relatively new concept within services economics in Romania.

The incipient point is that for our economy, services have become the core of our economic evolution, but their relentless development also carries out several risks. Synergy was a term first used in biology and medicine, but it became one of the most used in economics due to its broader sense, meaning that when certain elements work together, they generate a composite effect, meaning that they generate a result which is bigger than the sum of its parts. And it is precisely this fact which has been mentioned before, as noticeable, within the sector service, but it is precisely this fact that is, without rigorous analysis, difficult to prove.

A first premise when assuming that composite synergy within the service sector exists is the one that there are no “closed” systems within our economy, meaning systems which do not communicate with their exterior world, i.e. other systems, or, to put it differently, there are no systems which are autarchic. By systems, we mean any kind of economic agents, corporation, and state organisms. This statement implies that, regardless of the system involved, be it economic or social or of another kind, it is open to “exchanges” with any external environment or system. As an immediate result, there is an inherent openness of systems towards trading, in order to communicate with their external environment, either economically or of another kind. This is even more valid in terms of the tertiary sector, a sector with prowess and openness to change, and to some extent, relying on communication in order to develop.

A second premise for the existence of the composite synergy of services is that the geographical criterion becomes a non-issue in contemporary economics. We have no notions of proximity and distance, a valid cost element in goods trading. So, the notion of “international trade with services” occurs, meaning the trading of services between two economic agents, which oversees the borders of a country. The specifics of the service sector are truly marked by the impossibility of separation between the

provider and the consumer, but this does not imply neither physical nor geographical proximity.

Finally, the third required premise is given by the fact that services development in a certain region, geographical area within a state, produces visible effects on the development of that region as a whole and implies the development of other sectors within the respective region. This premise is essential to mention because, of the three major sectors of the economy, studies have proven that services produce the highest added value. Ergo, services produce the highest well-being in real terms for the country, region which provides them, in a higher measure than industry or agriculture.

Summing up the premises mentioned above, one can foresee the need for both theory and practice, to define in a pertinent manner, this major contribution that the service sector may have on the well-being and living standards of a region. The proposed concept is that of “composite synergy”.

In order to determine and fundament the synergic and composite effect of services on the economy, it is necessary to have a multiple perspective, a dynamic perspective. Such a requirement implies the use of a mathematical instrument called multicriteria analysis, apparently the only tool capable of analyzing a dynamic sector such as the services sector. Multicriteria analysis involves the establishment of critical, predefined set of variables, which influence the service sector in a direct manner, as well as international trade with services, and which influence, indirectly, other branches of the economy, namely of our national economy. Two antagonic scenarios will be generated as a means to prove the existence of synergy within services.

If the observation of the synergy effect is relatively easy, its measuring is a somewhat difficult endeavour, and here is where problems become a bit more complex. As a result, the need to define synergy and choosing an adequate mathematical and statistical data, with a practical economic applicability, in order to reveal composite synergy, occurs.

Thus we can partially conclude that composite synergy represents *“the ability of the service sector within a country to influence, via its own development, in a direct and indirect manner, the other sectors of the economy, actively contributing in a greater manner to their development than if investments within the service sector would not take place”*.

The term “composite” has not been added randomly, as it aims to underline the composite effect which the development or regression of services has on other sectors of the economy. In the case of complementary sectors to the services sector, the influence is strong and direct, and in terms of other sectors it has an indirect influence, of variable intensity. A first analysis attempt will be presented below.

This definition attributes, since its beginning, a well-defined role for the services sector, and individualizes it as a factor of influence in the modern economic development of our country. Also, it is clearly stated that the influence of services, as well as the impact of international trading with services, on the national economy, can be manifested in a direct and indirect manner. One must not confuse the means to

manifest the influence of services with the intensity with which it manifests. To put it simply, services do not contribute, via their high added value, only to the development of providers in this sector, a logical development, by the essence of economic activity, but also it contributes to the development of tangent sectors.

3. Critical variables and the two generated scenarios

The first step in using the multicriteria analysis is to identify the critical variables. This is the incipient point of the analysis, and the most important, because the correct identification of these variables leads to correct results. Critical variables are those which can alter the results generated by the analysis one way or another. Although this model has certain limitations, considering the lack of other instruments, it is considered adequate for illustrating the current point of the paper. Ergo, identifying the critical variables in this scenario means to identify the variables whose manifestations will directly influence the tertiary sector and, the economy, indirectly.

However, the correct identification of the critical variables concerning the service sector is somewhat difficult, because the service sector is prone to risks, or exogenous turbulence, which often manifest. Statistical analysis conducted by the INS (INS, 2011) has proven that the service sector generates the highest added value of all the three sectors. However, the services sector is also the one which registers strong setbacks during crises, such as the crisis of 2008 – 2011 was. One must thus consider both sides of the coin. The tertiary sector manifests “composite synergy” during periods of economic growth, but also economic regression, during recession periods. In fact, these aspects are strongly influenced by economic cyclicality (Tanasescu, 2005). Considering all the elements presented above, and the particularities of the service sector, the following scenarios will be generated:

Scenario A – in which we find that composite synergy, does not manifest itself within the tertiary sector as a driving force towards development.

Scenario B – in which composite synergy manifests itself within the tertiary sector of our economy.

The two scenarios have been selected for the demonstration of the existence of this phenomenon, justifying the composite synergy of services, in accordance with the algorithm of multicriteria analysis. Thus, the main idea of this demonstration is that a demonstration of the high impact of the service sector in our economy, as well as international trade with services on the national economy implies an existence of the composite synergy of services. This purpose has been translated, according to the first stage of the multicriteria analysis, in the generation of the two scenarios mentioned above.

The next stage is a brief presentation of the main traits of the two generated scenarios, which will be analyzed below. As mentioned, the two scenarios will be slightly antagonical, precisely to prove the point and validate or invalidate the hypothesis of the paper, namely that the service sector has an important impact on the

Romanian economy. The chosen hypothesis is that there is a composite synergy within the services sector.

Scenario A – implies for a almost non-existent manifestation of composite synergy within the service sector, i.e. a reduced impact of investments within the service sector on other sectors of the economy. This premise implies the fact that services have a marginal influence on the economy, as a whole.

So, major investments within the service sector do not manifest an important influence on the subsequent development of adjacent sectors of the economy. Also, contracted European Funds do not have a major impact on the service sector. This scenario corresponds to a low influence of services development on all other sectors of the economy.

Scenario B – in this scenario, the situation is exactly the opposite of Scenario A. According to the algorithm of multicriteria analysis, this is the other way, meaning that investments within services have both at a macroeconomic, and microeconomic level, an important impact on the development of adjacent sectors, as well as the service sector. Ergo, this is a clear manifestation of the composite synergy of services.

Benefits which result from the manifestation of composite synergy are multiple and greater than the sum of their parts and surpass the sphere of economics as well as the sphere of the service sector. The high added value of the output generated by the production and consumption of services also manifests its influence via an increase of the wages of the employed work force within this sector and as a result, on their standard of living.

Investments within services help the areas where they are located, on a medium and long term basis and also helps to improve our country's economic position as a whole, on the global services market, in an attempt to overcome the position of importer of services, a position which creates disadvantages in terms of balance of payments.

The next step in multicriteria analysis is to select the so-called critical variables. This is one of the most difficult steps in the analysis process, as the choices must only comprise of phenomena which can truly manifest and present relevant alterations to the results of the analysis.

To illustrate the current example and the concept of composite synergy, we have selected five critical variables, noted as C1 through C5, as follows:

- ✓ An increase in the capacity of production, distribution and export of services produced in our country (Criterion 1 – C1),
- ✓ Attracting non-refundable European funds concerning the development of the service sector (Criterion 2 – C2),
- ✓ Costs of investments in the “support” infrastructure of services (Criterion 3 – C3),
- ✓ Liberalization of the tertiary sector of the national economy (meaning deregulation) (Criterion 4 – C4)
- ✓ An increase in the standard of living of residents within areas in which service producing companies or providers operate (Criterion 5 – C5)

Due to the limited available space, there will be no additional explanations as to why these criteria have been selected, but we limit ourselves to state that their selection was based on a solid scientific basis, concerning empirical tests and data provided by the INS and the National Prognosis Commission.

After the presentation of the critical variables, the next stage in multicriteria analysis is the creation of a table in which all criteria are noted in relation with the others. The table is presented below. The table serves to establish the number of points for each criterion, determining its importance for the analysis. The minimum number of points is 0, and the maximum number of points is 1. Each criterion has ½ point in relation with itself. The sum of all horizontal points determines the maximum number of points for a respective criterion.

Table 1: The determination of the number of points which belongs to each criterion

	C1	C2	C3	C4	C5	Points
C1	½	1	1	0	1	3,5
C2	1	½	1	1	½	4
C3	½	1	½	1	1	4
C4	½	1	½	½	0	2,5
C5	1	½	1	0	½	3
TOTAL	3,5	4	4	2,5	3	-

Source: own calculus

The following table presents the determination of the weighting coefficient which belongs to each criterion, namely its degree of importance, considering the importance of each criterion as rationed to the other criteria. The used method was that of normalization.

Namely:

In establishing the hierarchy of criteria importance, the following formula was used:

$$\mu_n = \frac{P + D_p + n + 0,5}{-D_p' + (Ncrt/2)}$$

In which:

- P represents the sum of points obtained by each criterion,
- D_p represents the difference between the points of the considered criterion and the criterion situated on the last level,
- Note: The first level has the highest number of points,

- n represents the number of criteria which have a smaller number of points than the considered criterion,
- Ncrt represents the number of considered criteria, in this case 5,
- Dp' represents the difference between the considered criterion and the criterion on the first level, considering the fact that the last level has the smallest number of points.

As a result of the calculus, we have the following results:

For C1:

$$\mu_1 = \frac{3,5 + (3,5 - 2,5) + 2 + 0,5}{-(3,5 - 4) + 2,5}$$

So the result is : $(3,5 + 1 + 2,5) / 2$, meaning a share of 3,5.

For C2:

$$\mu_2 = \frac{4 + (4 - 2,5) + 3 + 0,5}{-(4 - 4) + 2,5}$$

So the result is : $(4 + 1,5 + 3,5) / 2,5$, meaning a share of 3,6.

For C3:

$$\mu_3 = \frac{4 + (4 - 2,5) + 3 + 0,5}{-(4 - 4) + 2,5}$$

So the result is : $(5,5 + 3,5) / 2,5$, meaning a share of 3,6.

For C4:

$$\mu_4 = \frac{2,5 + (2,5 - 2,5) + 0 + 0,5}{-(2,5 - 4) + 2,5}$$

So the result is : $(3) / 1$, meaning a share of 3.

For C5:

$$\mu_5 = \frac{3 + (3 - 2,5) + 1 + 0,5}{-(3 - 4) + 2,5}$$

So the result is : $(3 + 0,5 + 1,5) / 3,5$, meaning a share of 1,43.

So, the obtained values are as follows:

C1 – share of 3,5,

C2 – share of 3,6

- C3 – share of 3,6
- C4 – share of 3
- C5 – share of 1,43

The values are presented in the table below:

Tabelul 2: The determination of each weighing share for the analyzed criteria

	C1	C2	C3	C4	C5	Points	Level	Share
C1	½	1	1	0	1	3,5	2	3,5
C2	1	½	1	1	½	4	1	3,6
C3	½	1	½	1	1	4	1	3,6
C4	½	1	½	½	0	2,5	4	3
C5	1	½	1	0	½	3	3	1,43

Source: own calculus

Having obtained these numbers, the following stage of the analysis is to add grades to each of the criteria, which manifest themselves within the two scenarios mentioned above.

As a result, grades are given to each of the criteria, as compared to the expected intensity of each criterion within one of the two scenarios presented above, ergo, Scenario A and Scenario B. This stage is user sensitive, but a descriptive foundation of the grading system is used to justify the given grades.

The result of the grading process is shown in the table below:

Table 3: Grades given to each of the selected critical variables

	Scenario A	Scenario B
Criterion	Grade	Grade
C1	6	8
C2	5	9
C3	8	6
C4	7	8
C5	6	9

Source: calculus

The following stage of multicriteria analysis calls for an analysis of the consequences of calculated shares on each of the 5 criteria which were considered critical variables. The result is shown in Table 6:

Table 6: The share of critical variables / selected criteria with the grades obtained

Criterion	Share	Scenario A		Scenario B	
		Grade	Share x	Grade	Share x
			Grade		Grade
C1	3,5	6	21	8	28
C2	3,6	5	18	9	32,4
C3	3,6	8	28,8	6	21,6
C4	3	7	21	8	24
C5	1,43	6	8,58	9	12,87
Clasament final	-	-	97,38	-	118,87

Source: own calculus

Obtaining the results and generating conclusions:

This is the final stage of the multicriteria analysis, in which results are being interpreted. As a result of the multicriteria analysis, the two scenarios have obtained the following number of points:

- ✓ Scenario B „in which there is a composite synergy within the service sector” – 118,87 points
- ✓ Scenario A „the absence of composite energy within the tertiary sector” – 97,38 points

Thus, we can notice that Scenario B, which sustains the existence of synergy within the tertiary sector, is the correct one. Composite synergy is one of the important reasons as to which services become increasingly important in our daily lives, from all points of view, not just economically. Considering the point's difference between the presented scenarios, the existence of this phenomenon is further demonstrated by the continuous expansion of the services sector in our economy.

4. Conclusions of the current study

Services synergy reveals several social and economic benefits which manifest at various levels in our society. In short, they are, but not limited to:

- *Social benefits:*
 - o Creation of jobs, via direct investments in various service production / providing facilities,
 - o Creation of qualified staff, with a superior intellectual preparation concerning service providing and know-how, and which has better employment opportunities,

- The premise for an increased standard of living for inhabitants of areas where service providers activate;
- *Economic benefits, such as:*
 - An efficient form of unemployment tackling, as the areas in which services are being produced / consumed become highly evolved, a phenomenon visible in Romania, particularly after the year 2000, as well as after E.U. accession,
 - Increased competitiveness of the region, company, country on international markets,
 - Increased production / providing capacity and the continuous upgrading of economic parameters of resident companies which activate in services.

Of course, the elements presented here concerning composite synergy are more of a general presentation of the phenomenon, but are meant to lay the foundation for continuous research in the relationship between the service sector and the other major sectors of the economy, as the links between them become stronger and stronger.

Multicriteria analysis is an instrument, which, used efficiently, may help us to better comprehend mutations and expansion within the service sector of the economy, as well as its growing influence on our lives.

5. References

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