# Strategic management

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# Management Decisions in Transfer Pricing

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**Abstract**
The article is aimed at highlighting the importance of management decisions on valuing transactions between related parties and the effect of such transactions on an entity's profit. The article will primarily focus on transactions carried out between members of multinational companies, with an emphasis on Societas Europea, as well as within a company – e.g. the establishment and the founder, as well as between partners, shareholders and the company itself.
Transactions carried out between related parties may be different, e.g. the purchase and sale of goods, services or financial transactions. Individual transactions must be valued in accordance with the legislation of each country of the European Union, following the principle of an independent relation. In the pricing of transactions between related parties, there may be downward pressure on prices and thus, the correct profit from a transaction may be unrecognized. The subject of the article will be the just complexity of setting transfer prices, the risk of deviations in the valuation of transactions between related parties from the aspect of requirements of the legislation.

**Keywords**
Transfer pricing, management decisions, arm´s length principle, the European Company.

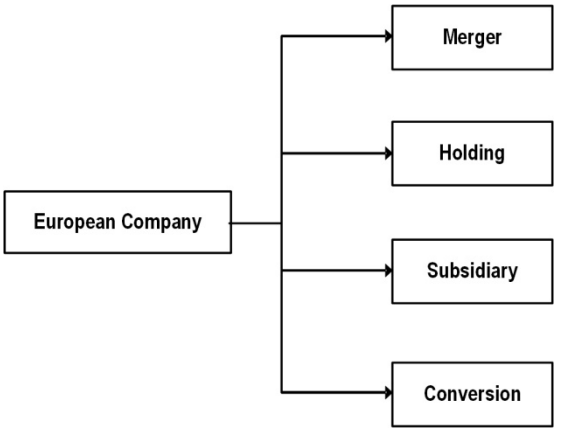
## Introduction

The sale of goods, providing services and various financial transactions are carried out at present, not only between firms within the same state, but also between those in different countries. Carrying out transactions with business companies outside one country, doing business with a view to improving and extending the scope and positions in individual markets, increases a company's performance and leads to a better recognition of a profit. Since there are different groupings of companies, multinational companies and companies also establish their operations in other countries. Transactions carried out within these groupings, multinational companies as well as between a company and its establishment should correspond to the arm's-length principle even if such transactions are impacted by various non-market factors. Due to a broad range of dependents, the contribution will focus on transactions carried out between members of multinational companies, in particular on relations within the European Company and the pricing of these transactions subject to compliance with the arm's-length principle.

## 1. The European Company

The European Company represents a capital company or a firm that may carry out business in the European Community. It represents a certain period of a joint-stock company, whose share capital totals 120,000.- € (Máziková, 2010). The company is registered in the Commercial Register of the State where it has its registered office and, at the same time, must also be registered in the Official Journal of the European Union. Any European company has a specific possibility of changing its registered office within the European Union, where the company does not terminate its activities, but rather continues its activities in another country. The European Company can be established in four different ways, namely it can be:

- a merger,
- a holding,
- a subsidiary,
- a conversion.




**Schema 1** Ways to found the European Company
**Source:** Own processing

A **merger** of joint-stock companies in European society is regarded as the setting up of a European company, where two or more joint-stock companies from different Member States of the European Union merge, make a fusion. The successor company is the European Company. There is a condition: at least two founding companies must be governed by different laws.

A common **holding** company in the form of a European company is regarded as the formation of a European company with at least two limited liability companies governed by the law of another Member State of the European Union, resp. if one company has a subsidiary company governed by the law of another Member State. Shareholders of two or more joint-stock companies or limited liability companies holding at least 50% of the voting rights in these companies place their shares in the new European Company in exchange for its shares. The European Company will become the founding companies of the parent company.

When creating a **subsidiary** of the European Company, the European Company with several subsidiary entities or a single European Company is established. A European subsidiary may be established by other legal entities as the capital of the company, i.e. a European subsidiary may be established by all types of companies, cooperatives and other legal entities, either public or private ones, except non-profit organizations (companies) (Parajka, 2007).

When **converting** an existing joint-stock company formally and materially established within the European Community into the European Company, it is conditional that it should only apply to joint-stock companies and that, for at least two years, it should have had the status of a subsidiary company governed by the law of another Member State.

## 2. Valuing a transaction between related parties

The establishment of the European Company is always based on a relationship between two or more interconnected companies, no matter if they are interrelated as the parent and the subsidiary, the creation of a holding of, a merger or a fusion between two or more companies that are located in different states of the European Union. All transactions carried out between such companies represent foreign related parties' transactions. It may be a different type of transaction purchase and sale of goods, providing services or financial transactions that need to be properly valued. The valuation of individual transactions between related parties must be carried out in such a way as to adhere to the arm's-length principle, which also properly recognizes both a profit and a loss company, as well as subsequently the tax base and income tax (Pakšiová & Janhuba, 2012).

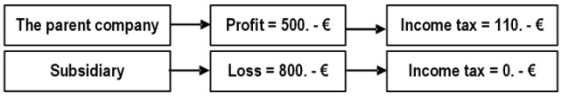
**The arm's-length principle** is based on comparing the terms of the contract price of individual transactions made between related parties and independent persons. The arm's-length principle ensures the equality of related parties and independent persons in order to achieve balanced taxation, thus preventing the creation of tax benefits for related parties, due to the fact that it gives the related parties and independent persons to the same level.

Transfer pricing is essentially aimed at creating prices so that the profit of the whole group and individual operations is optimized, without having made a reduction in the tax burden and prevention of tax evasion.

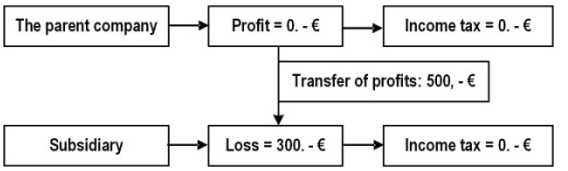
**Example 1**:

The parent company made a profit of EUR 500.- € and should pay the income tax of 22%, which means 110.- €. Its subsidiary generated a loss of EUR 800.- €. Carrying out fictitious transactions and transfers of profits from the parent company to the subsidiary, the parent company shows a zero profit and the loss of the subsidiary recognized in the amount of 300.- €, with the tax

burden on groups of addicts reduced from 110.- € to 0.- €.



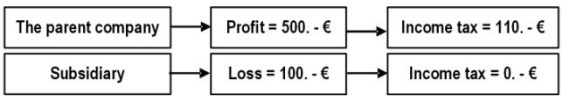

**Schema 2** The profit or loss and the tax burden of the related parties before the transaction
**Source**: Own processing



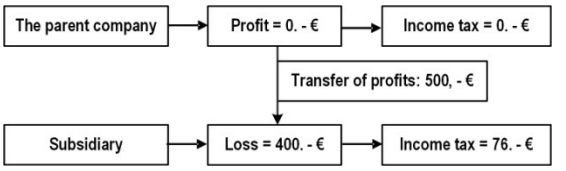

**Schema 3** The profit or loss and the tax burden of the related parties after the transaction
**Source**: Own processing

**Example 2:**

The parent company made a profit of EUR 500.- € and should pay the income tax of 22%, which means 110.- €. Its subsidiary generated a loss of € 100.- € and income tax in that country is 19%. Carrying out fictitious transactions and transfers of profits from the parent company to the subsidiary, the parent company shows a zero profit and the subsidiary recognizes a profit of 400.- € and the tax of 76.- €, with the tax burden on groups of related parties reduced from 110.- € to 76.- €.




**Schema 2** The profit or loss and the tax burden of the related parties before the transaction
**Source:** Own processing




**Schema 3** The profit or loss and the tax burden of the related parties after the transaction
**Source:** Own processing

When applying the arm's-length principle, managers may use any of the transactional methods in order to value the transaction correctly and without a benefit (Kubaščíková & Stanley, 2013). A distinction is made between direct and indirect methods of transfer pricing. Under **the direct method**, the price of a controlled transaction and an uncontrolled transaction price are compared. In **the indirect transfer**, **the pricing method** is modified in that transaction prices are subject to an indirect control through a variety of indicators such as the net profit margin.

There are two subdivisions of transfer pricing method, namely the unilateral and the bilateral methods. The unilateral method only examines one of the parties to a transaction. On average, it examines the party carrying out less complex functions and bearing a smaller risk. For the purpose of an examination, either a domestic or a foreign entity plugged into a transaction can be chosen. The bilateral method examines both parties to a transaction and their contribution to the expected profit earned. Consequently, profits are split between such related parties in accordance with the arm's-length principle.

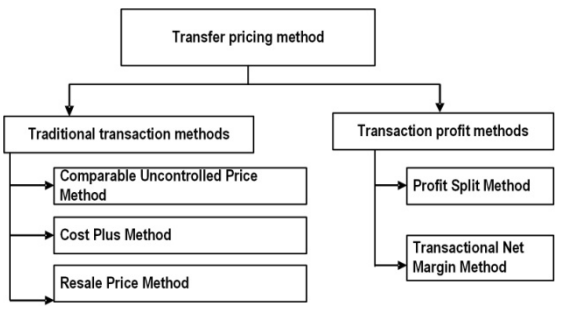
When choosing a transfer pricing method, it is necessary that the most suitable method for a particular transaction should be selected, taking into account the specifics of each transaction. The basic breakdown of transaction valuation methods is based on methods of their allocation, which are based on the comparison of prices – the so-called traditional transaction methods, and those based on the comparison of the profit – the so-called transaction profit methods.

**The traditional transaction methods** are:

- Comparable Uncontrolled Price Method (CUP),
- Cost Plus Method (CPLM),
- Resale Price Method (RPM).

**The transaction profit methods** are:

- Profit Split Method (PSM),
- Transactional Net Margin Method (TNMM).




**Schema 4** The transfer pricing method
**Source**: own processing

**Comparable Uncontrolled Price Method**

The Comparable Uncontrolled Price Method is based on the comparison of prices for individual transactions between related parties in trade relations with the price used for transactions between independent parties in comparable conditions. This is a direct and unilateral transfer pricing method.

This method is applied when a company trades the same goods to the same markets with independent parties or when there is a similar company making the same product in the same market at the same level of the market and the company applies similar prices.

The method is unsuitable to use when goods are sold resp. providing specific services and are only sold within a group of related parties. There is no possibility of making a comparison between sold goods or provided service. The sale of goods is carried out at different levels of the market (retail, wholesale) or in other quantities.

**Cost Plus Method**

The Cost Plus Method is based on adding a price premium to actual direct and indirect costs of the production of a good product that is the subject of transactions between related parties. The applied premium price must be the one that would apply in a transaction with independent parties in a comparable store under comparable conditions. It is the case of the indirect and the unilateral transfer pricing methods.

This method is most commonly used in manufacturing companies, especially in construction contracts or the provision of the basic administrative services, such as financial advice, legal advice, IT.

**Resale Price Method**

The subsequent Resale Price Method is calculated as a transfer of assets purchased by the foreign related party converted to an independent market price. The calculations are based on the price at which the foreign related person sells an asset to an independent person, with a subsequent price reduction on the normal amount of the trading range, i.e. margins. It is the case of the indirect unilateral transfer pricing method.

This transfer pricing method is particularly suitable to use in the case of distributors who do not contribute to the assessment of products sold and when sales are made by related parties and independent parties (Mateášová & Meluchová, 2013).

**The Profit Split Method**

The method of dividing profits is based on dividing expected profits from controlled transactions between related parties, expecting independents in joint ventures and respecting the arm's-length principle. Profit sharing is then carried out either on either planned or actual earnings. It is the bilateral method.

This method is especially suitable to use in cases of transactions where both companies are an important intangible asset and individual transactions are so interconnected that they cannot be assessed separately.

**Transactional Net Margin Method**

The Net Margin Method determines the amount of the profit margin of the business or financial relationship between related parties in relation to the fixed base, for example costs and revenues, and compares it with the profit mark-up used in relation to unrelated third parties. It is the unilateral transfer pricing method.

Those methods can only be applied to individual transactions or for more of the same transactions. If several different types of transactions are made, it is then necessary that each transaction should be examined on an individual basis. It is the most widely used method of determining transfer prices.

## Conclusion

Every transaction carried out between foreign related parties is specific and needs to be assessed individually with respect to its compliance with the arm's-length principle. In valuing the type of transactions of buying and selling goods or providing services or financial transactions, valuation must be such that it properly reports a profit or a loss company, and subsequently the tax base and income tax as well. It is important to avoid transfer of profits to companies operating at a loss and thereby minimize income tax or a transfer of profits to companies in countries with a lower tax burden.

When fixing prices for individual transactions carried out between related parties, managers can make a choice between different methods of transfer pricing. Each of these methods is specific and appropriate for a different type of a transaction. The correct method of the valuation of transactions between related parties can be chosen depending on the type of transaction, its characteristic and the possibility of having it compared with other transactions that the given trading company

has carried out with independent parties under comparable conditions, and in compliance with the arm's-length principle. When using the single transfer pricing method, special rules are applicable to each case. Choosing a specific transfer pricing method is necessary for a company to justify and demonstrate, through appropriate transfer pricing documentation.

**Acknowledgments**

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# Measures of Profitability in Life Insurance Product Management

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**Abstract**
One important part of strategic management of any business is about how to make the business more profitable. For example, in life insurance business, the source of profit is life insurance products. One of them is also loan protection insurance or credit insurance as a special type of term insurance product. Although we know that there exist many business strategies to improve the profit, in this article we introduce profit test, the main idea of which is to determine the price of a product (premium) so as to meet company's profit requirement. The aim of this article is firstly to describe credit insurance on Slovak insurance market and then, using method of profit testing, state a price of the model credit insurance product. At the end of the article we carry out sensitivity analysis for one special profit criterion - profit margin - varying in each analysis only one element of the pricing basis.

**Keywords**
Loan protection insurance, repayment of loans, equal total payments method, term insurance, profit testing, profit criteria, sensitivity analysis.

## 1. Loan protection insurance as a type of term insurance product

Term insurance is one of the simplest forms of life insurance contract. It provides a protection for a limited number of years and pays a sum assured on the death of the policy holder in the case that death occurs within this limited period of time. But in the case that the policyholder survives till the end of the limited period, no benefit is paid (the contract expires). The benefit may be a level sum assured, or a sum increasing or decreasing with time from the beginning of the contract. A decreasing term insurance can often be used to repay the outstanding part (balance) of the loan. An increasing form is used to provide an income for a family until the time as the children begin to work.

One disadvantage of the term insurance is that if the policyholder survives until the end of the limited period, it expires. But then if a further cover is required, a new contract can be concluded. Obviously is in term insurance contract so called renewable option, which allows the insurer to take out at the expiry date of the original term insurance a new contract (without medical underwriting). The new contract can also be a different type of a contract (endowment contract). This case is called convertible option.

A significant part of term insurance policies are used to pay off outstanding part of the loan, for example mortgage protection term contracts or if the policyholder is a corporate body, this contract is used to provide also protection against the financial loss in the case of the death of a key person in a certain organisation. Credit insurance is becoming popular also in Slovakia. It is a useful tool for all parties involved in the transaction. For the providers of the loan it makes protection in recovering the loan especially in the case of the unfortunate death of the borrower. It can also assist the family of the borrower by repayment of the loan (e.g. allowing them to retain house or car). But there are benefits also for the insurer (such as lower distribution costs, potentially less

anti-selection and possible better mortality experience).

Credit insurance indemnifies losses from non-payment of commercial debt. Credit life cover is provided to cover many risks, but primarily death. These products are sold to cover personal consumer (car, credit card), mortgages and small corporate loans. For self employed businessman the aim is to avoid catastrophic losses, grow profitability and minimize losses. In Slovakia, there exist two basic types of business loans. First is so called bank overdraft loan (short term period loan or credit – approximately one year). This is account with authorised overdraft. In our article we will work with the second type, long term period, so called instalment loan. This type is used by companies and business persons to finance machines, technologies etc. The main difference between these loans is in interest rate, which is connected with the risks covered by the loan. Interest rate also depends on whether the loan is secured or unsecured. For unsecured credits interest rate on Slovakia credit market is 7 % p. a. and more. For secured debt that means in majority cases guaranteed by real estate property or corporate body the interest rate is 3 % p. a. and more (Poláček & Páleš, 2012). For example value of these type of loans in one Slovak bank moves from 3 500 € to 1 000 000 €.

Credit insurance provides sometimes some cover not only in the case of the death but also in the case when borrower cannot meet the repayments on the loan because he loses his job, or is sick or injured. Approximately three types of the packages of the risks are available on insurance market in Slovakia. The first – basic package – contains basic risks: death and invalidity. The second package contains basic risks plus sickness absence. The third – complex package – contains also risk of unemployment with previously mentioned risks. There may be many limits to what is covered and also some policy exclusions. For example, most consumer credit insurance products cover only for involuntary unemployment (when creditor is fired or loses his job in a similar fashion) and not when creditor decides to end his job. Next possibility is that customer may only be paid a percentage of the outstanding balance. Another possibility is that customer may not be able to use the policy in the case of a pre-existing medical condition.

The premium is mostly regular. Single premium contracts are also popular. In this case the bank/loan provider adds the amount of a single premium to the loan. Of course it is administratively simpler for the bank. The cover is usually decreasing, but some companies also offer level cover. In each case the loan (amortization) schedule is usually fixed at outset.

The main distribution channel is bank insurance. This is natural because the credit is usually offered by banks. Also it becomes very easy for banks to sell this type of insurance by showing it as an additional benefit to the loan. The benefit for the bank is that it increases their income. The benefit for the borrower is that in case of bank insurance the bank offers the client lower interest rate on the loan (about 0,1 – 0,5 % on the Slovak insurance market). An alternative approach is to make insurance compulsory for anyone taking the loan. In some countries customers seeking loan must purchase bank insurance to get the loan. Another different possibility is that customer can buy the credit insurance voluntarily and sometimes also by any life insurance company.

Underwriting is also interesting aspect of this product. Underwriting is different for this type of a product because of the following factors. Of course the reason for insurance is a loan. Hence there is limited anti-selection. Secondly the borrowers usually have some financial standing and some minimum level of income. The loan provider (bank) will check the credentials of the potential borrowers before giving the loan. This can be called preliminary underwriting. So up to a certain limit, the underwriting at this type of product is simplified.

## 2. Amortization of loan. Annual percentage rate.

Amortization is the process of decreasing the amount of the loan (debt) over the life of the loan. So all repayments of debts (which are interest-bearing) by a series of payments which are made at equal units of time is called amortization. Many consumer loans (for example mortgages) are repaid by this method. Each repayment of the loan consists of two parts: one portion is applied for reducing the principal (amount of the loan) and another portion is applied for paying the interest on the loan.

In our examples we will work with the loans where we will have only one lender (debtor) and only one borrower (creditor). Each of the periodical payments will be repaid at the end of the period. Timing of payment will be yearly. Payment which is used for repayment of the outstanding part of the loan at the end of the year $t$ is called

principal (amortization) payment and is denoted $Q_t$. Total payment at the end of the year $t$ (which is of course sum of principal payment and interest payment $I_t$ at the end of the year) is denoted $A_t$.

There exist several ways how to calculate loan repayments (it depends on the needs of the lender and the borrower, and the characteristics of the loan). We will work with the following loan amortization (repayment) methods – Equal total payments per time period (year) method.

In what follows we denote the amount of the loan $D$, number of payment periods (years) $n$ and interest rate compounded once a year $i$. When a loan is repaid by an annuity, then the periodical value of a yearly annuity payment (the amount of the loan is the present value of the immediate annuity and a portion of each payment is applied against the principal and the remainder against the interest) is

$$A = \frac{D \cdot i}{1-(1+i)^{-n}} \tag{1}$$

Interest payment (decreases as times goes on) at the end of the year $t$ is

$$u_t = D_{t-1} \cdot i \tag{2}$$

the amount of the loan repaid or principal payment (increases with each payment) at the end of year $t$ is

$$Q_t = A - u_t \tag{3}$$

and unpaid balance (outstanding principal) at the year $t$ is

$$D_t = D_{t-1} - Q_t \tag{4}$$

Making use of these results we can construct an amortization schedule, in which we can separate each instalment $A$ into the interest $u_t$ and principal component $Q_t$.

In our article we use the so called Annual Percentage Rate (APR) as the rate of interest. The annual rate that is charged by investing or borrowing, is used to express as a single (percentage) number representing the actual yearly cost of funds over the whole term of a loan. So this rate includes also any fees and additional costs which are associated with the transaction. The EU regulations are from directives 2008/48/EC and 2011/90/EU, and at this time are fully in force in all member states since 2013. A single method of calculating the APR was introduced in directive 98/7/EC and is required to be published for the major part of loans. In the EU is the basic formula for calculation of APR:

$$\sum_{l=1}^{M} S_l \left(1+\frac{APR}{100}\right)^{-t_l} = \sum_{k=1}^{N} A_k \left(1+\frac{APR}{100}\right)^{-t_k}, \tag{5}$$

where: $M$ is the number of cash flows paid by the lender,

$l$ is the sequence number for the cash flows paid by the lender (draw down),

$S_l$ is the cash flow (drawdown) in period $l$,

$N$ is the total number of cash flows paid by the borrower,

$k$ is the sequence number of the cash flows paid by the borrower (repayment),

$A_k$ is the cash flow (repayment) of period $k$, and,

$t_l$ and $t_k$ is the interval, expressed in years and fractions of a year between the date of the first cash flow and the date of cash flow $l$ or $k$.

The left side of the equation is the present value of the cash flows made by the lender and the right side is the present value of the cash flows made by the borrower (Mucha, 2010).

## 3. Profit testing as a method of product pricing in life insurance. Profit criteria

The main idea of this method is to determine such amount of the premium for the contract as to meet the company's profit requirement. Briefly proposed premium rates are tested by projecting possible levels of future business, claims, expenses, investment experience and profit. Pricing actuary will follow the steps on the Figure 1 (Dicsson, Hardy, & Waters, 2009; Sakálová, 2001; Krčová, 2005).

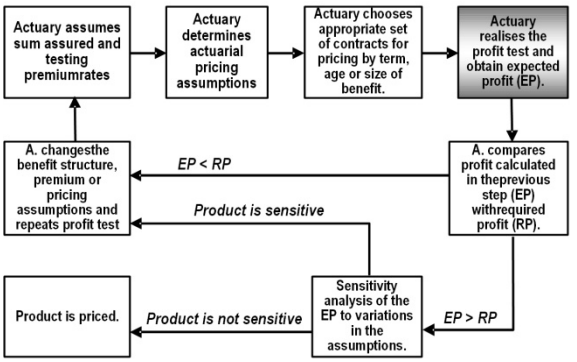


**Figure 1** Profit testing scheme
**Source:** Authors

For measuring expected profit (Pinda, 2010) of the contract are used various profit criteria. Profit criterion is a single figure, which tries to summarise the relative efficiency of the contracts with different profit signature $\{\sigma_t\}_{t=1}^{n}$.

**Net present value.** Discounting the profit signature at the risk discount rate $r$ we obtain the accumulated present value of expected future profits $PR_t$ or the first criterion - net present value (*NPV*). So

$$NPV = \sum_{t=1}^{n} (1+r)^{-t} \cdot {}_{t-1}p_x \cdot PR_t = \sum_{t=1}^{n} (1+r)^{-t} \sigma_t \quad (6)$$

*NPV* is the best profit criterion to use, but there also exist some practical problems connected with it. It is subject to the law of diminishing returns and it says nothing about competition.

**Net present value as a percentage of the initial commission.** Because initial commission can partly reflect the work with selling the contract, it is usual to express *NPV* as a percentage of the initial commission, which the life insurance company intends to pay. Obviously in practice *NPV* as a percentage of the initial commission need not be less than 50 %.

**Profit margin – *NPV* as a percentage of the present value of the future premiums.** Alternatively, the *NPV* can be expressed as a percentage of the present value of the future premiums, which of course will be paid under the policy. So the appropriate formula in the case of a regular premium is

$$\frac{\sum_{t=1}^{n} (1+r)^{-t} \cdot \sigma_t}{\sum_{t=1}^{n} P_t \cdot {}_{t-1}p_x \cdot (1+r)^{-(t-1)}} \quad (7)$$

Life insurance companies require profit margin to be about 5 to 10 %.

**Discounted payback period.** The discounted payback period is the policy duration at which the emerging profits first have a discounted value of at least zero. That means, it is the time it takes for the office to recover its initial investment interesting it at the risk discount rate. So it is the first time $k$ for which ($PVFP_k$) is non-negative

$$PVFK_k = \sum_{t=1}^{k} (1+r)^{-t} \cdot \sigma_t \quad (8)$$

## 4. Example

As an example we consider that a businessman aged 35 takes from a bank a loan of 100 000 € for 10 years to compensate the cost connected with his business. Bank offers him annual interest rate 4 %. The bank calculates with two types of administrative expenses with respect to this business. First are initial expenses at the amount of 2 % from the value of the loan and second are yearly 50 € regular administrative expenses. After calculations of these fees and additional costs we obtain the annual percentage rate 4,49 %.

Bank considers using equal total payments per time period (year) method. Amortization schedule for this loan is in the Table 1.

**Table 1** Amortization schedule (in €)

| Year | $A$ | $u_t$ | $Q_t$ | $D_{t-1}$ |
|---|---|---|---|---|
| 1 | 12 329.09 | 4 000.00 | 8 329.09 | 100 000.00 |
| 2 | 12 329.09 | 3 666.84 | 8 662.26 | 91 670.91 |
| 3 | 12 329.09 | 3 320.35 | 9 008.75 | 83 008.65 |
| 4 | 12 329.09 | 2 960.00 | 9 369.10 | 73 999.90 |
| 5 | 12 329.09 | 2 585.23 | 9 743.86 | 64 630.80 |
| 6 | 12 329.09 | 2 195.48 | 10 133.62 | 54 886.94 |
| 7 | 12 329.09 | 1 790.13 | 10 538.96 | 44 753.32 |
| 8 | 12 329.09 | 1 368.57 | 10 960.52 | 34 214.36 |
| 9 | 12 329.09 | 930.15 | 11 398.94 | 23 253.84 |
| 10 | 12 329.09 | 474.20 | 11 854.90 | 11 854.90 |

**Source:** Authors

The bank offers borrower an additional product to the loan agreement – loan protection insurance. This product is priced using profit testing. Pricing actuary sets the appointed profit – profit margin would be 5 %. Time is measured in years from the date of issue. Sum assured is 100 000 €. The policy has the single premium 1 565 € (calculated from the features of the contract with the use of actuarial software by the unnamed insurance company) paid at the beginning of the contract.

Office calculates initial expenses 100 € per policy and initial commission 9 % of the single premium. Marketing expenses are 2 % of the premium, renewal expenses are each year beginning from the second year 10 € (subject to the inflation) and claim expenses are calculated as 50 % from the product of two factors – probability of death in the year and the sum assured. We will assume that experienced mortality follows the Statistical office unisex table from year 2012. Technical interest rate is 1.9 %, rate of return from company's assets is 3 %, risk discount rate is 2.5 % and rate of inflation is 1.4 %.

So we are going to realise profit test of term insurance with decreasing sum assured, where sum assured is sum of outstanding part of the loan, yearly interest and expenses 50 € for managing the loan account, i. e. in the first year: 100 000 + 4 000 + 50 = 104 050 €, in the second year 91 670.91 + 3 666,84 + 50 = 95 387.75 €. Clearly initial commission decreases the value of the loan, i. e. businessman obtains 98 000 €. Value of the sum assured in each year is in the following table (Table 2).

**Table 2** Sum assured (in €),

| Year | Sum assured in € | Year | Sum assured in € |
|---|---|---|---|
| 1 | 104 050,00 | 6 | 57 132,42 |
| 2 | 95 387,74 | 7 | 46 593,45 |
| 3 | 86 378,99 | 8 | 35 632,93 |
| 4 | 77 009,89 | 9 | 24 233,99 |
| 5 | 67 266,03 | 10 | 12 379,09 |

**Source:** Authors

First we calculate net cash flow $CF_t$ for years $t$, pre $t$ = 1, 2,…, 10 using the following formulae (Ondrejková Krčová & Sakálová, 2014) and results can be found in the Table 3:

$$CF_t = P_t - N_t t + i \cdot (P_t - N_t) - (M_t + DC_t) \cdot q_{x+t-1}, \quad (9)$$

where $P_t$ is the regular yearly premium received at the start of the year $t$ (2nd column of Table 3),

$N_t$ are the yearly expenses assumed to be incurred at the start of the year $t$ (3rd column of Table 3),

$i \cdot (P_t - N_t)$ is the interest for the year $t$ on the premium minus expenses (4th column of Table 3),

$M_t \cdot q_{x+t-1}$ is value of expected cost of the death benefit which happened during the year $t$ and which is paid at the end of the year $t$, where $M_t$ is sum assured payable on death and $q_{x+t-1}$ is probability of a person aged $(x+t-1)$ dying during the year (5th column of Table 3),

$DC_t \cdot q_{x+t-1}$ are the claim expenses in the case of death till the end of the year $t$ (6. column of Table 3).

**Table 3** Net cash flows

| Year | Cash flows at the start of the year | | | Cash flows at the end of the year | | *Cash flows $CF_t$* |
|---|---|---|---|---|---|---|
| | Premium | Expenses | Interest | Death claims (*DC*) | Claim expenses | |
| 1 | 1 565.00 | 272.15 | 38.79 | 101.11 | 50.56 | 1 179,97 |
| 2 | 0.00 | 10.14 | -0.30 | 105.76 | 52.88 | -169,08 |
| 3 | 0.00 | 10.28 | -0.31 | 110.72 | 55.36 | -176,68 |
| 4 | 0.00 | 10.43 | -0.31 | 107.76 | 53.88 | -172,38 |
| 5 | 0.00 | 10.57 | -0.32 | 100.92 | 50.46 | -162,28 |
| 6 | 0.00 | 10.72 | -0.32 | 91.98 | 45.99 | -149,01 |
| 7 | 0.00 | 10.87 | -0.33 | 84.41 | 42.21 | -137,81 |
| 8 | 0.00 | 11.02 | -0.33 | 76.64 | 38.32 | -126,32 |
| 8 | 0.00 | 11.18 | -0.34 | 58.77 | 29.38 | -99,66 |
| 10 | 0.00 | 11.33 | -0.34 | 33.25 | 16.63 | -61,55 |

**Source:** Authors

The table above shows that net cash flow at the end of the first year is positive (the premium was single at the beginning of the contract), and in the other years the cash flows are negative.

The net cash-flow figures, however, are difference between the income and the outgo in each year, but they do not represent the profit, because they are without setting reserves. So policy values are calculated and the corresponding reserves are set up at the end of each year, immediately before the payment of any premium then due. So we calculate policy value ${}_{t-1}V$ at the beginning of the year $t$, for $t$ = 1, 2,…, 10 (Sekerová & Bilíková, 2007; Gerber, 1988) using the following formulas (Dicsson, Hardy, & Waters, 2009):

$$\text{for } t = 1 \quad {}_{t-1}V = \frac{M_t \cdot q_{x+t-1} + p_{x+t-1} \cdot {}_tV}{1+i} - \text{single net premium} \quad (10)$$

and

$$\text{for } t = 2, 3, \ldots, 10 \quad {}_{t-1}V = \frac{M_t \cdot q_{x+t-1} + p_{x+t-1} \cdot {}_tV}{1+i} \quad (11)$$

The Table 4 shows the reserves:

**Table 4** Net reserves

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Reserves | 0.00 | 707.61 | 615.99 | 517.63 | 420.29 | 327.84 | 242.48 | 162.97 | 89.62 | 89.62 |

**Source:** Authors

The reserve will be invested and so there will be an additional income item representing the investment income earned on that reserve. Under this product (term assurance is a risky product) no surrender value will be payable (also in the case of a premature repayment of the loan), because sum assured is much higher than reserves.

So putting reserves and cash flows together, the profit emerging at the end of the each year is:

$$PR_t = CF_t + i \cdot {}_{t-1}V - \left( p_{x+t-1} \cdot {}_tV - {}_{t-1}V \right) \qquad (12)$$

Where $i \cdot {}_{t-1}V$ is interest on the reserve at the end of the year $t$ (2nd column of Table 5),

$p_{x+t-1} \cdot {}_tV - {}_{t-1}V$ is the change (increase) in the reserve allowing for survivorship during the year $t$, that is, the reserve we expect to set up at the end of the year less the reserve we started with (3. column of Table 5).

The set $\{PR_t\}_{t=1}^{n}$ is called **the profit vector** for the contract.

**Table 5** Profit vector

| Year | Interest on the reserve | Change in the reserve | $PR_t$ |
|---|---|---|---|
| 1 | 0.00 | 706.93 | 473.04 |
| 2 | 21.23 | -92.31 | -55.54 |
| 3 | 18.48 | -99.02 | -59.18 |
| 4 | 15.53 | -97.93 | -58.93 |
| 5 | 12.61 | -92.94 | -56.73 |
| 6 | 9.84 | -85.75 | -53.43 |
| 7 | 7.27 | -79.81 | -50.73 |
| 8 | 4.89 | -73.55 | -47.88 |
| 9 | 2.69 | -57.07 | -39.91 |
| 10 | 0.98 | -32.63 | -27.94 |

**Source:** Authors

Finally we apply the survivorship factor ${}_{t-1}p_x$ to $\{PR_t\}_{t=1}^{n}$ and calculate value of the profit with respect to the original contract from the beginning. For $t = 1, 2, \ldots, 10$ we obtain then

$$\sigma_t = {}_{t-1}p_x \cdot PR_t \qquad (13)$$

or profit figures that are in the following Table 6 and are known as the profit signature of the contract.

**Table 6** Profit signature

| Year | Survivorship factor | Profit signature |
|---|---|---|
| 1 | 1,000 000 | 473,04 |
| 2 | 0,999 028 | -55,48 |
| 3 | 0,997 921 | -59,05 |
| 4 | 0,996 641 | -58,73 |
| 5 | 0,995 247 | -56,46 |
| 6 | 0,993 754 | -53,09 |
| 7 | 0,992 154 | -50,34 |
| 8 | 0,990 356 | -47,42 |
| 9 | 0,988 226 | -39,44 |
| 10 | 0,985 830 | -27,54 |

**Source:** Authors

From the profit signature of the contract, where values are discounted back to time 0 using the rate of return required by the shareholders (so called risk discount rate – 2.5 %) we obtain discounted profit signature (Table 7).

**Table 7** Discounted profit signature

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Disc. profit signature | 461,50 | -52,81 | -54,84 | -53,20 | -49,90 | -45,78 | -42,35 | -38,92 | -31,58 | -21,52 |

**Source:** Authors

We calculate first profit criterion – net present value. From the final table it can be seen that the total expected discounted profit is 70,60 € and the company would need to consider whether this was an appropriate profit.

$NPV$ = 461.50 + (–52.81) + (–54.84) + (–53.20) + (–49.90) + (–45.78) +
+ (–42.35) + (–38.92) + (–31.58) + (–21.52) = 70.60 €.

In the preceding part of the article are formulas for other criteria, so we can easy present values of them in the following Table 8. The most important for us is profit margin.

**Table 8** Selected profit criteria

| | |
|---|---|
| Net present value | 70,60 |
| *NPV* as a percentage of initial commission | 50,13 % |
| Profit margin | 4,51 % |
| Discounted payback period | 1 year |

**Source:** Authors

Profit margin is 4.51 %, which is appropriate value for company needs. It is not necessary to carry out the profit test again.

Question is how would be the effect of changing elements of the pricing basis on the profit criteria used above, especially on the profit margin. So we carry out sensitivity analysis for profit margin varying only one element of the pricing basis in each analysis. That means for example, that if we change only amount of the premium 1 545 €, 1 555 €, 1 575 € and 1 585 €, then the resulting values of profit margin are in Table 9. Other changes in the assumptions with resulting figures of the profit margin are also given in Table 9 below.

**Table 9** Sensitivity of profit margin of changing some assumptions

| Premium in € | Profit margin |
|---|---|
| 1 545 | 3.41 % |
| 1 555 | 3.97 % |
| 1 565 | 4.51 % |
| 1 575 | 5.05 % |
| 1 585 | 5.58 % |

| Rate of investment return in % | Profit margin |
|---|---|
| 2.50 | 3.24 % |
| 2.75 | 3.88 % |
| 3.00 | 4.51 % |
| 3.25 | 5.15 % |
| 3.50 | 5.78 % |

| Risk discount rate in % | Profit margin |
|---|---|
| 2.00 | 3.98 % |
| 2.25 | 4.25 % |
| 2.50 | 4.51 % |
| 2.75 | 4.77 % |
| 3.00 | 5.02 % |

| Age | Profit margin |
|---|---|
| 33 | 21.03 % |
| 34 | 13.63 % |
| 35 | 4.51 % |
| 36 | -4.04 % |
| 37 | -13.24 % |

**Source:** Authors

For better illustration of our results from Table 9 we display particular figures on the Figure2.

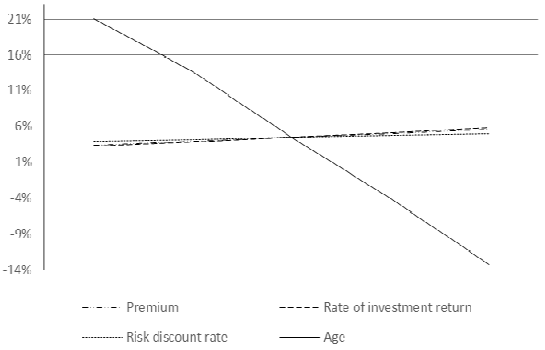


**Figure 2** Sensitivity of profit margin of changing some assumptions
**Source:** Authors

As we see from Table 9 and also Graph 1, change in only one factor, i. e. rate of investment return and risk discount rate (rate of returns) and also change in the premium has a small effect on the profit margin. On the other side the effect of mortality (age) on the profit margin is most important. When changing age, it is caused by type of insurance product – term insurance product.

## Conclusion

However, despite the fact that the profit is quite sensitive to the change in mortality on the one side and on the other side not very sensitive to the change of interest rates (risk discount and investment return), we can say that product is properly priced. It is also interesting that if the insurance company insured entrepreneur aged 34 years, then sufficient premium amount to have a minimal profit of 4,52 % is of 1 398 €. However, if the yield on assets and the risk discount rate decreased by 0,5 % then the 34 year old entrepreneur needs to pay single premium 1 428 €. It is therefore interesting to observe the changes of profit when changing more than one assumption. SM

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# The Role of the Software Architect in Agile Development Processes

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**Abstract**
Software architecture stands as the backbone of any software system, regardless of the methodology it was developed with. The responsibility for the choice of the architectural solution, its design and evaluation in the traditional development process lies in the role of the software architect. Traditional architecture development is based on three architectural phases: architectural analysis, architectural synthesis and architectural evaluation. The highly ceremonial character of the traditional process is also reflected in the role of the software architect, who is responsible for generating numerous architectural artefacts.
The proponents of agile development start from the position that an architecture emerges gradually, after every iteration, as a result of continuous code refactoring, rather than from a previously built structure. In accordance with this, agile processes do not contain any of the traditional phases (the analysis, the synthesis and the evaluation) of the architecture development process. Agile processes also have a different view of the responsibility for a developed architectural solution, delegating it to all the members of the agile team.
In terms of expanding agile development processes with traditional architecture processes, with the aim of enabling the development of a complex system, the current research and efforts have also identified change in the role of the software architect. This paper aims to describe the modified role of the software architect in agile processes for developing complex software solutions, integrating findings of the existing literature and the results of the conducted empirical research. The empirical research results feature as a part of the research conducted within the doctoral dissertation entitled "The Methodological Framework for Developing the Software Architecture of Business Software in Agile Processes", submitted at the Faculty of Economics in Subotica of the University in Novi Sad.

**Keywords**
Software architect, software architecture, agile development processes.

## Introduction

Advocates of the postulate of the vital role of an architecture in the development of high-quality software intensive systems question the scalability of agile development processes, as they do not pay sufficient attention to architecture (Ihme & Abrahamsson, 2005; Nord & Tomayko, 2006; Parsons, 2008). They tend to characterise agile practices as amateurish and limited to the domain of very small internet business solutions.

Contrary to this, proponents of agile development processes identify a previously planned architecture development with the traditional Big Design Up-front (BDUF) strategy, which is contrary to the basic agile principles and values, as it leads to massive documentation and the development of functions that are unnecessary in implementation (Babar, 2014). Agile development advocates a philosophy based on rapid development, direct and continuous communication with stakeholders, the team self-organisation and the creativity of all participants, with the aim of avoiding excessive planning, modelling and documenting (Abrahamsson, Babar, & Kruchten, 2010). Agile processes do not have activities typical of the development of software architecture, such as analysis, synthesis and evaluation, as these require additional costs without producing an adequate business value for the client (Babar, 2014). For

this reason, they are focussed on developing software functionalities, regarding an architecture as a by-product of the development process itself. They consider the concept of metaphor and the refactoring technique as an adequate substitute for the traditional process of an architecture development. According to them, an architecture emerges gradually, after each iteration, as a result of continuous modifications of the program code (an emergent architecture) rather than from a previously built structure (Beck, 2004;Thapparambil, 2005; Babar, 2014). Such a development strives to shorten as much as possible the initial development phase, which, according to the proclaimed agile principles, has no visible and useful results for the user.

Contemporary software intensive systems are characterised by a high level of decentralisation, heterogeneity and integration with other systems. In accordance with this, it can be said that, today, there is a new gap in the software industry between the constant growth of business software and shortcomings of agile methodologies to support its development and maintenance. The described state has in practice initiated a large amount of research over the past year, which is on the line of finding a compromise between both the rapid delivery of the functional product to the user and the development of a stable software solution (Nord & Tomayko, 2006; Parsons, 2008; Ihme & Abrahamsson, 2005; Bellomo, Ozkaya, & Nord, 2013). Such a trend can be characterised as the traditionalization of agile development processes (Matković, Tumbas, & Sakal, 2011).

Over the past few years, the scientific community has recognized that opposing development processes (traditional vs. agile) have been playing complimentary roles in the development of software and has studied the possibility of their coexistence and advantages of their integration (Nord & Tomayko, 2006;Kruchten, 2007; Ambler & Lines, 2013). Agile processes provide companies with efficiency, quality and flexibility in adopting change, but it is important for the development of complex software solutions to use some of the traditional architectural practices as well (Nord & Tomayko, 2006; Parsons, 2008; Ihme & Abrahamsson, 2005; Babar & Abrahamsson, 2008). Current research shows that the refactoring technique, as the dominant architectural practice in agile processes, can be a sufficiently successful practice, as long as high-level software architecture is good. This is the way how to avoid a high degree of refactoring, implicating high system development costs in later development phases, as well as the erosion of an architecture, which can jeopardise the success of the entire process (Ihme & Abrahamsson, 2005; Kruchten, 2008;Stal, 2014).

Craig Larman opines that the described dichotomy between agility and an architecture is unfounded. *Along these lines, Satoshi Basaki noted,* "It *seems* that *many agile method users misunderstand* what *agile methods* are, *just ignore architecture*, and *jump* onto refactoring" as the one and *only* panacea. The cornerstone of this claim is said to be in the words of the creator of the XP agile methodology, Kent Beck, who proposes: "Architecture is just as important in XP projects as it is in any software project. Part of the architecture is captured by the system metaphor." Beck also pointed out the significance of dealing with non-functional system requirements, as well as the possibility to extend the XP process development, to the extent that depends on the project context (Abrahamsson et al., 2010).

Current research confirms the importance of finding "middle-of-the-road" between two extreme architecture development methods (Kruchten, 2007; Babar & Abrahamsson, 2008; Boehm, 2002), with a focus on finding mechanisms for bridging the gap (Nord & Tomayko, 2006; Parsons, 2008; Ihme & Abrahamsson, 2005; Lycett et al., 2003; Boehm & Taylor, 2005; Babar, 2009; Abrahamsson, Babar, & Kruchten, 2010; Babar, Ihme, & Pikkarainen, 2009).

In the context of the described research subject, the following research questions emerge:

**RQ1: What is the role of software architecture in the development of complex software solutions by agile development processes, according to current findings in the literature?**

**RQ2: What do the results of the conducted empirical research show in terms of the role of the software architect?**

## 1. Research methodology

The empirical research was conducted by the application of the classical variant of the Delphi technique, implying three "circles" or research iterations (Helmer & Rescher, 1959; Keeney et al., 2011).

The first iteration was the qualitative research component and the data were therefore gathered by means of semi-structured interviews. A semi-structured interview consisted of a previously prepared and expert-evaluated set of questions.

The interviews were conducted face-to-face and recorded in order to obtain the greater accuracy and completeness of the gathered data. The nature of the research problem required a deliberated selection of sample units ($n \geq 20$). The sample was, therefore, comprised solely of experts versed in agile development and software architecture design. The research was conducted in relevant companies in the ICT sector in Serbia. The previously transcribed data were subjected to a qualitative analysis in the NVivo software. The qualitative analysis of the data was conducted according to the recommendations of Miles and Huberman (1994).

The second iteration of the empirical research was the quantitative component. The research instrument was a questionnaire with checklists, check tables, and the Likert-formatted evaluation scale. It was made based on the results of the first iteration and the respondents received it in the electronic form (e-questionnaire). A quantitative analysis of the gathered data was performed in the SPSS software.

The third iteration of the research was also performed by the electronic dissemination of the questionnaire. The questionnaire was made based on the results obtained in the second circle of research.

The following methods were used for the quantitative analysis of the data in the second and the third circles of the research: the measures of the central tendency/location and dispersion measures – the median and the interquartile range; the arithmetical mean and the standard deviation; the coefficient of variation; Spearman's rank correlation coefficient; the *Kendall rank correlation coefficient; Kendall's coefficient of concordance (W);the Goodman-Kruskal Index of Predictive Association (for assessing the degree of stability between two consecutive Delphi iterations); kappa; the Content Validity Index; inferential statistics procedures, the chi square test; bootstrapping; a quantitative content analysis; etc.*

*The theoretical research was conducted by applying the* Systematic Literature Review Method. The Systematic Literature Review was realised according to the framework set by Kitchenham (2004): Planning the Review, Conducting the Review, Reporting the Review. The stages associated with *Planning the Review*are: 1. The identification of the need for a review; 2. The development of a review protocol. The stages associated with *Conducting the Review*are: 1. The identification of research; 2. The selection of primary studies; 3. A study quality assessment; 4. Data extraction & monitoring; 5. Data synthesis. *Reporting the Review*is a single stage phase, whose presentation was given in the Theoretical Background Section.

The defined research protocol implied a strategy for searching the primary research material. Specifically:

- The search sources were chosen – the electronic databases IEEE Xplore, Science Direct, and the ACM Digital Library.
- The search keywords were defined: agile software architecture, agile methods (methodologies) and architecture, agility and architecture, software architect.
- The criteria were defined for the inclusion and exclusion of the research material – the acceptable items were peer-reviewed scientific and expert papers published in periodicals and collections of papers presented at conferences and workshops from 2000 to 2014, and all the papers were excluded from the analysis if their term of agility had no link to agile methodologies, the papers without empirical research or a proposed approach/method, and the papers based solely on experts' opinions.
- The quality of the research material was evaluated and met the defined criteria of inclusion, according to the criteria proposed by Dyba and Dingsoyr (2008),and the key data from the relevant research material were extracted and synthesised with the NVivo software, for the easier management of the key concepts, findings and conclusions contained in the publications.

The total number of hits, for each electronic basis individually, is presented in Table 1. The conducted research resulted in ten relevant papers dealing with the issue of the role of the software architect in agile development processes.

**Table 1** Search results of electronic databases

| Data sources | Number of hits by keywords | Number of papers Included in further analysis | Number of excluded papers |
|---|---|---|---|
| IEEE Xplore | 701 | 43 | 658 |
| Science Direct | 46 | 12 | 34 |
| ACM Digital library | 237 | 12 | 225 |
| **Total** | 984 | 67 | 917 |

## 2. Research results

The following section of the paper describes the role of the software architect in agile processes of developing complex software solutions, by using findings from the existing literature and the results of the conducted empirical research.

The empirical research results show that a formal role is played by the software architect, who is also a very experienced programmer, in all agile times. The findings are in compliance with the opinions and proposals of (Coplien & Bjornvig, 2010). As an experienced programmer, the software architect usually joins the development team at the beginning of a project, so as to set the main part of the software (RESP.5) with programmers. In agile processes of developing complex software solutions, the role of the software architect is essentially changed in comparison with the traditional one, demanding his involvement throughout the development process. The software architect features as some kind of a mentor, advising and helping programmers during the project in resolving architectural questions and problems (RESP.11). In practice, such a condition is in accordance with opinions expressed in the literature, proposed by (Hadar & Sherman, 2012).

Faber (2010) believes that architects should provide value to clients, through meeting non-functional demands of the system and providing continued support to programmers during the process of implementing solutions. Agile teams are aware of this fact in practice and strive to set up an ideal situation, where architects would feature as service providers to programmers and the client. However, achieving such a role of the software architect inevitably requires "raising awareness, confidence, skills and knowledge in the domain of the problem and technology" of all team members. An identified problem in practice is a constant inflow of new people in the fact that an average engineer in a team is at the junior level (RESP.20). Raising the level of the technical knowledge of team members is best achieved by their involvement in discussions on architecture during its setup at the beginning of the project and during planning iterations. This is the way how to avoid bottlenecks of people who become specialists in architecture, whereas other team members lack both architectural knowledge and an overall picture of a solution (RESP.20).

Respondents believe that architect themselves must build (on) their system-related, technological and domain knowledge at the very beginning of the project so that they could provide continuous assistance to programmers and stakeholders (RESP.19). For these reasons, it is essential for architects to participate in meetings with stakeholders and hear first-hand what the problems are because, on the contrary, they will never obtain full information through the documentation forwarded to them (RESP.7), and, although being technical personnel, they are still not at the level of architects, so they are unable to communicate the full 100% of all requirements (RESP.16).

Hopkins and Harcombe (2014) deem that the success of software architecture requires that software architects view the problem being solved at the beginning of the project, and do so from several different perspectives, as each business problem is different and has unique architectural aspects of its own. The respondents have a similar opinion, stating that the most important thing for an architect in resolving a problem is to understand how the target organisation operates (RESP.13). Understanding the business processes, i.e. the business case, of the target organisation is the basis for identifying architecturally significant requirements (RESP.12).

Developing complex systems requires the existence of a formal role in the team, involved in the identification of requirements (the product owner), which, on the other hand, does not mean that the software architect should not participate in their prioritisation (RESP.16), either. On the contrary, the respondents' opine that the product owner should prioritise requirements from the aspect of the user value, and the architect from the aspect of the costs, risks and technical dependencies of the solution (RESP.20). Developing an agile architecture requires generating a unified list of prioritised functional and non-functional system requirements (RESP.16).

Such an opinion of agile teams can in practice be said to be in line with Madison's (2010) view of the role of the software architect, who should set up a balance between business and architectural priorities so as to produce an agile architecture.

Blair, Watt and Cull (2010)opine that close collaboration between the software architect and the team is the key to the success of the project as a whole. In this regard, Kruchten (2013) especially points out the importance of collaboration between the architect and the business analyst (in terms of the identification and prioritisation of demands), the project manager (with respect to delivery plans, risks and costs) as well as programmers (concerning issues of the implementa-

tion of the limitations and evaluation of prototypes). The RESP.19 respondent links the success of an architecture to collaboration between the architect and the product owner and programmers. He also points out that should any of these roles fail, that can be disastrous for the architecture, because if the product owner does not understand well what he/she should do, a small omission in architecture by the architect may result in months of additional work. Likewise, an inadequate quality and unmotivated programmers may jeopardise the sustainability of the architectural solution (RESP.19).

Babar (2009)emphasises the importance of an interaction between the software architect and clients, with the aim of identifying requirements and their prioritisation and generating the artefact of the Software Architectural Overall Plan (SAOP). Buschmann (2012) points out the active participation of all stakeholders as the key success factor . Furthermore, the empirical research results indicate that software architects not only interact with stakeholders, but are also forced to help them identify architecturally significant requirements. The reason for this is that for the most part stakeholders do not know what they want, or, if they do know what they want, they are unable to grasp the implication of the requested requirements. What is crucial here is the role of the architect, who must recognise drastic changes in the approach and the architecture itself based on requirements, and tell the client what is feasible and what is not (RESP.10). In other words, he/she is responsible for presenting stakeholders with the value that a particular architectural solution provides to the user, as well as with entailed costs and risks (RESP.16). The responsibility for the choice of an architectural solution is rests mostly with the client (RESP.3), but in case the client insists on developing a risky solution, the software architect must make sure that he/she can always easily switch to the one that suits him/her better (RESP.1).

Empirical results show that, in an organisation with a large number of teams, the responsibility for the development of an architecture is diversified into several different architects' roles. In addition to the software architect, who works with teams on particular details of software architecture, there is also the role of the system/enterprise architect, who is responsible for the setup of the architecture of the entire product. The solution architect plays a role of an architect responsible for the implementation of an architectural solution in the target organisation (RESP.17). Unlike Babar (2009), who links the role of the solution architect to the responsibilities focussed on managerial aspects, in practice, respondents allocate these responsibilities to the system architect, whereas the role of the solution architect is linked by respondents to the team delivering a software solution. Babar (2009)identifies the role of the implementation architect as the one referring to his/her responsibility to monitor the implementation of user narratives, provide technical mentorship to programmers and monitor whether there are negative effects of refactoring. The respondents link these responsibilities to the role of the software architect.

The research results lead to a conclusion that the owners of an architecture (the system architect, the software architect, the solution architect etc.) on a complex project must have top-notch technical knowledge and the solid knowledge of the technical domain. The responsibilities of the architecture owner are as follows:

- to identify initial architecturally significant requirements at the beginning of the project, together with the client;
- to set up (envision) the initial architectural solution for the main part of the software;
- to review the architecture continuously in terms of meeting non-functional system requirements (through the continuous integration of the code, a set of metrics and tests);
- to have good collaboration with team members, aimed at sharing ideas and resolving problems;
- to lead technical discussions with other team members;
- to instruct other team members and provide mentorship in resolving architectural problems during the implementation phase;
- to understand the existing infrastructure, standards and technical solutions of target organisations;
- to know the possibilities and limitations of as many technologies as possible;
- to follow trends in terms of possible options of an architectural solution;
- to provide the visibility of architectural requirements on the product backlog and backlog;
- to manage the technical debt from the beginning of the project;
- to make timely decisions.

Kruchten (2009) identified a set of characteristics that the software architect ought to have: he/she should be a good visionary (so as to view and set up the picture of the system globally), able to make decisions, a skilful communicator, capable of resolving architectural problems that programmers cannot resolve. In addition to this, the respondents also pointed out the significance of the architect's leadership skills in the team (RESP.8) as well as the power of abstraction (RESP.5).

## Conclusion and research limitations

The formal role of the software architect is unusual for agile development processes. Agile teams are cross-functional and all team members share the responsibility for an architecture. The results of the conducted empirical research, however, present a different picture. Actually, the software architect in all agile teams included in the research plays a formal role, which, however, is significantly different from the traditional one. The difference is, first of all, in the continuous involvement of the architect throughout the development process.

The empirical results show that the other team members also make a contribution on their own part in the development of software architecture by continuously communicating and closely collaborating with the software architect. The members of the agile team participate in discussions about the initial setup of the architecture, but the final decision on the higher level architecture design is up to the architects and the client. A greater responsibility of the team members is noticed in the phase of the detail design, where they are expected to independently work on a solution, with the possible mentorship of the architects in the case of problems that they themselves are unable to independently resolve. This leads to a conclusion that the detail design is the part where the software architect's role of a coordinator is recognised. As the project commissioner and the budget owner, the client very often makes the final decision when choosing an architectural solution.

In addition to the software architect, in practice, there are two more formal roles responsible for an architecture played by agile teams: the roles of the system architect and the solution architect. In most cases, the system architect also has a managerial position in the organisation and is responsible for the architecture of the whole system. In other words, the system architect takes care of the coordination of the software architect's architecture with the architecture of the entire system. Software architects are members of development teams and, for the most part, are senior programmers and team leaders, too. Solution architects are parts of the software delivery team and therefore cooperate closely with employees who carry out operative activities in the target organisation.

In practice, agile teams are aware of the fact that responsibility for the architecture should rest on the whole team rather than on architects only. However, such a method of work requires experienced individuals in the team, with top technical knowledge, which is the key challenge faced by agile teams in practice. The rapid development of the IT industry in Serbia, on the one hand, and the limited workforce market, on the other, have brought about the fact that agile teams are to a great extent comprised of inexperienced individuals. The respondents see another problem in the inadequate higher education system in Serbia. College and university curricula do not correspond to the market needs, or more specifically, there is an inadequate study of current technologies, program languages, frameworks and architectural patterns. Also, the respondents opine that universities devote an insufficient curriculum time to knowledge and skills from the domain of software architecture and agile process development. Another problem they pointed out is that not a single higher education institution in Serbia profiles students for the profession of a software architect.

The results of the systematic literature review of lead to a conclusion that no similar empirical research in the area of software architecture in agile processes has been conducted in Serbia so far. This fact is also the limitation of the completed empirical research, as the obtained results cannot be compared with the results obtained by other researchers in the territory of Serbia. SM

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# A Statistical Analysis of the Labor Demand of the ICT Sector in the R. of Macedonia

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**Abstract**
The dynamics of the development of information technology dictates the fast rate of economic development, as part of the overall development process, not only to companies, but also society in general. Sustainable economic development is a benefit to the development of information society, but as an instigator of the process. ICT indirectly affects an increase in the gross domestic product of national economies and provides an incentive for macroeconomic policy makers to seek ways to establish equilibrium in the labor market in this sector as a priority in their programs, which would increase market potentials for engaging the active population. It is actually one of the specific objectives of the national strategy to reduce poverty and social exclusion in the Republic of Macedonia in the period from 2010 to 2020.
From that point of view, this paper will analyze the labor market and identify the factors causing imbalance in terms of labor supply and demand in the sector of information and communications. The main aim of the analysis will be to compare the structure of the offer with the structure of labor demand for the ICT sector, in terms of market demand and competition. Thus, on the basis of the basic indicators of the labor market, a comparative analysis with other sectors in the R. of Macedonia will be carried out, which will lead to certain conclusions regarding the flexibility of the labor market in the ICT sector.

**Keywords**
ICT sector, labor market, indicators, flexibility.

## Introduction

The ICT sector can be defined as part of the economy providing products and services in the field of information, communication and technology. The definition makes a distinction between the ICT industry and other sectors. However, the ICT sector is very broadly defined and, obviously, products not directly related to ICT are produced in this sector.

In such a broad definition of ICT, a number of activities can be included, such as (Van Druten L, Junne, Klabbers, & Hansen, 2002):

- Communications-mobile communications, cable companies, satellite services, providers of Internet services;
- Computers-software development and software services, hardware manufacturing and development services;
- Content-publishing, Internet content providers, e-commerce etc.

Basically, ICT allow users to store, organize, transfer and manipulate any type of information that can be written in the digital form. In order for an explosive development of the ICT sector, there should be a number of changes, often grouped

under the term of the "new economy" or ""network economy", contributing to it. These changes include (Turlea, Nepelski, De Prato, & Desruelle, 2011):

- the digitalization of economic processes, which simultaneously influence the generation of new organizational forms,
- the acceleration of economic growth, which is often expressed in short repetitive waves of innovation, and a continuous reduction in the product development cycle,
- the increased connectivity of regional economies, resulting in even greater economic exchange activities between cities, regions and countries.

Today, the ICT sector is not analyzed as a sector by itself, but rather as a sector being an important source of economic innovation, whose growth generates growth and development in other areas.

The two most important features through which the importance of ICT in the economy can be perceived are:

- in the short run, new technologies lead to a reduction in the relative prices of products,
- when a new technology has been applied within an economy, then it can be used by all manufacturers. It provides an opportunity for the development of new products and new ways of organizing business, thereby increasing the pace of growth and the total factor productivity.

The increasing importance of ICT becomes visible through a dramatic decrease in the price of ICT products, allowing their greater prevalence in many segments of the economy.

The application of ICT involves innovative ways of practicing business, new ways of management, new methods of monitoring and control etc., which in turn leads to lower costs and increased productivity. It also refers to the public sector.

Only companies willing to commit organizational change can fully take advantage of benefits offered by a new technology. The implementation of new business models and new ways of organizing, as well as new ways of combining labor and capital, are crucial for the implementation of ICT. It is also very important that we should say that the implementation of ICT requires the knowledge and skills founded by those who use the same technology.

## A need for labor in the ICT sector

According to recent research, a continual expansion of new uses of ICT will increase demand for greater skills of the employees in the ICT sector (Stimpson, & Tielens, 2010) in the next ten years. These trends lead to the creation of new jobs, so it is not surprising that the world's most sought-after professions are those belonging to the field of ICT. Such jobs are created as a result of the so-called digital economy that is now the main driver for the growth of national economies.

Key ICT skills can also be acquired through both educational institutions and training graduates from other disciplines. It is estimated that about a quarter of employees in the ICT sector lack formal education in the field of information and communication sciences.

Demographic changes, increased levels of migration, changing labor demand and the major technological change in the ICT sector contribute to the shortening of the working life, especially with employees in the ICT sector, and lead to intense competitiveness between labor and specific knowledge and skills (Ducatel, & Burgelman, 2010). In any case, there is a generally accepted view that well-qualified employees in the ICT sector are faced with shorter working life. Therefore, it is very important to build an appropriate strategy for the continuous supply of well-qualified ICT workers. As measures of this strategy could be stimulating for more students to choose areas of ICT, ways to engage other related specialists in the ICT sector should be promoted through additional retraining, attracting well-qualified foreign specialists etc. South Korea can be cited as an example of such good strategies for providing the highly-qualified workforce in the field of ICT. According to Microsoft's latest report, South Korea has the same number of engineers as the United States, although its population is six times as small. It is predicted that by 2020, 90% of the world's scientists and engineers will have been living in Asia.

The knowledge and skills employees should have in the ICT sector include various components, such as formal education, work experience, creativity, analytical thinking and understanding etc. When it the migration of workers from this sector is concerned, there are two aspects. On the one hand, when training costs are high, when the learning of the work is a long process, then too high a rate of mobility may imply that employers do not get the maximum from their employees. When training costs are lower, skills and knowl-

edge are easily transferable, and it takes less time for staff to engage in work processes, then a high rate of mobility will contribute to an increase in the dynamics of the sector.

From a quantitative aspect, a company's workforce or the workforce of a sector within an economy or between different countries is the net result between the inflow and the outflow of workers, for which reason it is a relatively unstable category. This is called the labor market migration, thinking of changes in workers' socio-economic status and working conditions. Every employee in a company, having his or her knowledge and skills, creates the basis for the operation of the company. When an employee leaves the company, a part of that base of knowledge and skills is lost; on the other hand, however, new knowledge and skills will come with newly-hired workers.

## An analysis of labor demand in the ICT sector

The ICT sector is an area of knowledge incorporated in almost all industries. Information and communication technology is built into all products and services, contributing to the creation of a new added value and increasing the productivity and profits of businesses. The ICT sector is the basis for the development of not only all economic activities, but also a foundation for the growth of competitiveness. On the other hand, typical activities of the sector of information and communications, such as the manufacture of computers or software, are exposed to ups and downs due to the great competition governing the global market, where fierce battles to conquer new markets are fought.

The knowledge and skills acquired in educational institutions as well as experiences in enterprises are the main generator of new products, technologies and ideas essential to the achievement of economic development, and thus social welfare. Therefore, the harmonization of economic growth and development and human resources policies with short- and long-term needs of the economy, the community and the individual play the key role. Maintaining competitiveness is only possible if such knowledge and skills are present in educational outcomes, occupational standards and qualifications provided by educational programs.

All indicators point at a great potential of this sector through the following mechanisms: the spreading of knowledge and ICT skills in other activities, the growth of the key sub-sectors with sustainable dynamics, an increased presence of the Macedonian business entities in the environment and so on.

The importance of the information and communications sector is indicated by the fact that it is one of the five sectors with the highest share in the total value added, calculated according to the cost of the factors of production in 2013, which is 7.7%, being preceded by the following sectors: manufacturing (24.6%) and wholesale and retail (23.5%), construction (10.8%) and transportation and storage (8.2%). In comparison with 2010, there is a decline in the sector in terms of its participation in the total added value, when it was the third sector. Although it is ranked lower than the construction sector in terms of added value, if the number of employees is compared (in the construction sector, it is three times as high as in the sector of Information and Communications), it can be concluded that it is at almost the same level. Today, there are 1446 active businesses in the sector of information and communications, out of 71 290. Unlike 2008, when the rate of the newly-created against the active business entities in this sector was 16.8, in 2010 it was 21.3%, the rate of newly-established enterprises in 2012, in terms of active businesses, amounted to 9.97%, thus ranking this sector amongst the nine sectors with the highest rate of newly-established businesses, which shows the reduced growth of this sector; hence a decreased demand for labor. The bit is the data for the rate of the surviving business entities formed in 2011, which survived 2012, which equals 75.3%, which is quite high, although the 2009/2010 survival rate was higher (82.4%). Today, on the other hand, only 2% of the total number of the employed population in the R. of Macedonia (690 962) are employed in this sector.

In order to perceive labor demand, important data for fulfilled and free employment in the information and communications sector are compared to other sectors in the Republic of Macedonia in 2014. is the findings are shown in Figure 1 and Figure 2:

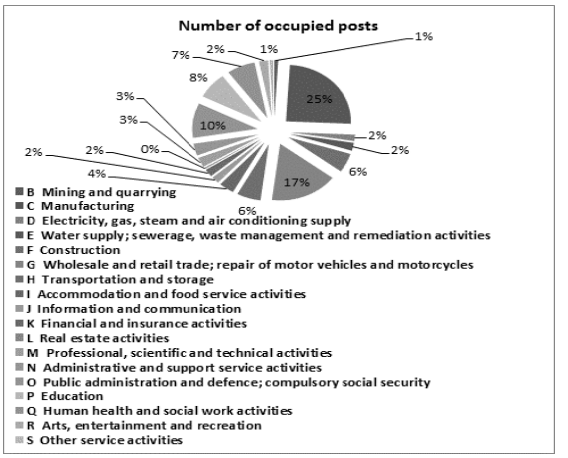


**Figure 1** The number of the occupied posts
**Source**: The authors, according to the State Statistical Office of Macedonia, 2015

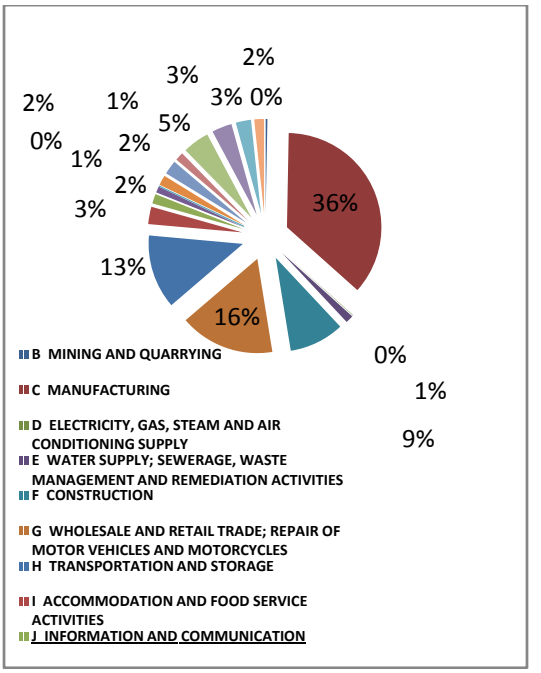


**Figure 2** The number of job vacancies
**Source:** The authors, according to the State Statistical Office of Macedonia, 2015

From the previous figures, it can be concluded that out of the total number of the jobs filled (386.909), the number of the jobs filled in this sector is 8446, whereas there are 59 free jobs, i.e. the rate of free labor is 0.69. The average of the jobs filled in all the (18) sectors is 21,494.94, which means the number of the jobs filled in the sector is 27% of the average in all the sectors. According to these data, it can be concluded that this sector is one of the eight sectors with the lowest number of free jobs, which means demand for labor in this sector is high.

As far as the necessary qualifications in the sector of information and communications are concerned, it is necessary that we bear in mind the number of employees in enterprises. The classification of businesses in the sector of information and communication technology is presented in the following figure:

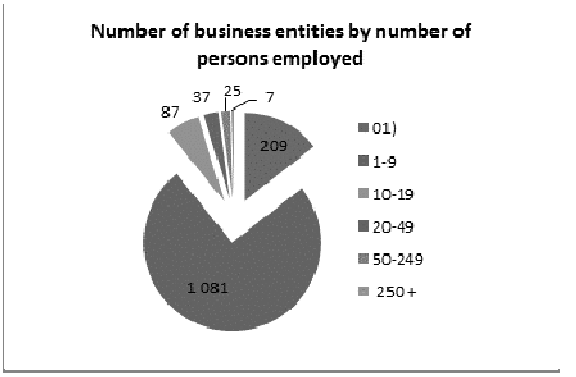


**Figure 3** The number of the business entities by the number of persons employed
**Source:** The authors, according to the State Statistical Office of Macedonia, 2015

The conducted qualitative analysis of a large number of businesses in this sector in the R. of Macedonia provides us with the evidence that larger businesses have proportionally specialized jobs, whereas small and medium-sized ones are significantly more complex, because employees perform more business activities, for which reason broader competencies are also expected there. Figure 3 allows us to perceive that businesses in this sector counting 1-9 employees are prevalent, with only 7 enterprises with more than 250 employees. Hence the need for employees' broader competencies. In this context, given the fact that in 2011 a new classification of occupations was adopted, there is no compliance of occupations in the ICT sector with the profiles that are required by businesses. It is necessarily required that a matrix of profiles and competencies for individual profiles should be created and an opportunity for conducting a comparative analysis of the labor market data at the regional, the national and the international levels should be provided.

## The working conditions of the labor market in the ICT sector

Motivation for education, with a part being modeled on the basis of information on the working conditions for those occupations that are generated from the information and communications sector. When working conditions are spoken

about, the level of the salary, the prevailing conditions of contractual obligations, the usual working hours, the safety measures of employment and so on are considered. The following figures show the net salary per individual sectors and the net salary in the sub-sectors within the information and communications sector in the R. of Macedonia:

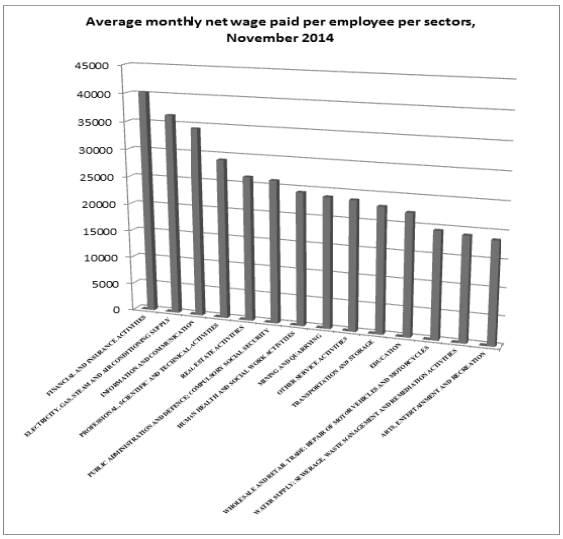


**Figure 4** The average monthly net wage paid per employee per sectors
**Source:** The authors, according to the State Statistical Office of Macedonia, 2015

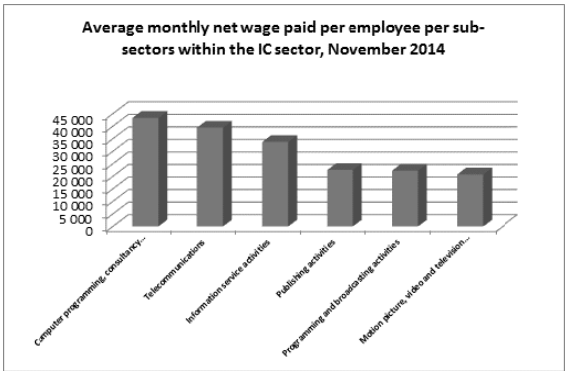


**Figure 5** The average monthly net wage paid per employee per sub-sectors within the ICT sector
**Source:** The authors, according to the State Statistical Office of Macedonia, 2015

According to the previous figures, the net salary in this sector ranks the third, after the financial sector and the sector for supplying electricity, gas, steam and air conditioning. On the other hand, compared with the average salary in the R. of Macedonia in this period, which amounted to 21,588 denars, the average salary in the sector is 34,319 denars. This fact indicates that 58.97% of the average net salary in this sector is bigger than the average salary in the R. of Macedonia. Given the big salary, it is clear that young people will be encouraged to enroll in educational programs in this sector, especially in the telecommunications sub-sectors and computer programming, consultancy and related activities, as well as information services.

Also, an analysis of the net pay for the first half of 2012 is carried out, Figure 6reveals that the ICT sector immediately follows the sectors of finance and the supply of electricity, gas, steam and air conditioning. It shows that such a tendency in the payment of the net pay is not just a single condition, but rather a tendency lasting for a longer period of time.

Given the employee's salary as the biggest motivating factor, young people should be expected to show a bigger interest in the future development of ICT skills and the knowledge of the area. It may also be a sufficient reason for retraining a number of employees in other sectors and their migration to the ICT sector.

As regards job security, it is necessary to take into account the ownership structure of the companies in the sector of information and communications, which is shown in the following figure:

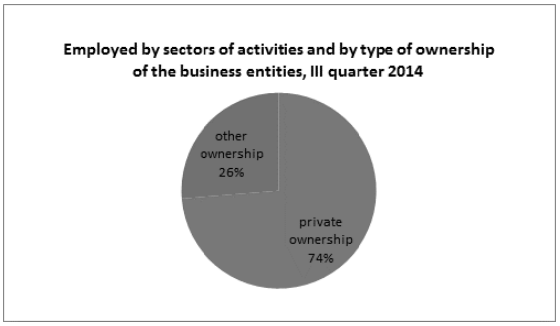


**Figure 6** The employed by sectors of activities and by the type of the ownership of the business entities
**Source:** The authors, according to the State Statistical Office of Macedonia, 2015

Out of the total number of the employees in this sector, 74% are employed in private business entities, and 26% of them in the businesses in another ownership (of the state, social, collective etc.). Employees can be said to have relative security through contracts of indefinite duration. There is no real security of the labor market any longer, especially when the ownership structure is like the one shown in the previous figure.

## Conclusion

Because of high unemployment in the R. of Macedonia, a need for following changes that have been made in the structure of the labor force and for conducting an analysis of the labor market in individual sectors has arisen.

Any business entity wanting to achieve a competitive advantage and above-average profits, which is also the major goal of any business entity, should require that ICT be introduced in its own future operations. There are users' continuously emerging needs and needs for developing new applications that, apart from offering a development perspective, also facilitate the work of those using them. Because of the benefits offered by this technology, it is continuously being developed and improved, and from that point of view, the information and communications sector has the key position in the overall structure of business entities in the R. of Macedonia.

According to the State Statistical Office, the majority of students of Informatics find work in three months upon graduation, and only after one year, they start thinking about moving out and finding other employment. Conversely, 1,330 graduate students are registered as unemployed with the Employment Agency; according to the competent authorities, however, they work for foreign companies from home. Demand for this staff has increased and for a new foreign investment, and the state is doing its best to meet the need, which, on the other hand, does not imply losing qualified staff in domestic companies.

The business sector in the country is affected by an outflow of ICT staff. This trend is seen as negative. For a long time, Macedonia has been faced with a shortage of staff, and the trend practically generates a shortage of required staff.

Taking into account the inequality in the proportion of employment in individual regions of the R. of Macedonia, data on the regional labor markets related to the sector are required, which prevents enterprises in this sector from being conducted a more detailed analysis of, as well as the basic indicators of regional labor markets. Because of that, the spatial concentration of businesses in the sector of information and communications is impossible to perceive, and it is not possible to perceive income distribution across the regions, either. These data will be a good basis for the mobilization of young staff in the R. of Macedonia given the fact that it depends on salaries in this sector, which are at a high level, unlike those in other sectors. At the same time, the danger of the eviction of the finest professionals in this sector will also be reduced, which is due to the deficiency of these profiles in the EU (especially in the field of computer programming, as a subsector in the information and communications sector, where the EU is estimated to have a shortage of 700,000 IT specialists by 2015). Also, the State Statistical Office has no data on the supply of labor from the subsectors by regions, which prevents a further analysis of the alignment of labor supply and demand in this sector. It affects the capability of human resource planning and the prediction of actual future needs of the labor market and of planning qualifications with a view of their rationalization, directed towards meeting the needs of the economy. SM

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# Critical Success Factors and Negative Effects of Development – The Boeing 787 Dreamliner

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**Abstract**
One of the most turbulent industries, which regards innovation as a necessity rather than a choice, is the airline industry. The paper presents the breakthrough innovation of the Boeing Company, its new aircraft model – the 787 Dreamliner. A number of innovations have been implemented within this new model. The concept of sustainable development and environmental protection has been applied as well in order to ensure positive effects on the whole society and the environment.
On the one hand, this type of innovations leads to a leadership position and the maintenance of a competitive advantage in the long run. On the other, a high level of the complexity of such innovations carries with itself a high degree of risk and uncertainty. Therefore, it is necessary to identify the critical success factors from the beginning of the innovation process, i.e. idea generation, to the end, i.e. the implementation of innovative products. All critical success factors should be taken as a complex system with constant redefinition and predicting even those, sometimes very hard to foresee, critical factors that can bring the process of innovation into question. Despite the fact that the critical success factors are known, the number of innovations that do not experience a market success is quite high.
Applying the criterion of significance, the paper identifies the list of the primary and the secondary critical success factors with respect to the new aircraft. After the identification, it can be concluded that the critical success factors regarding the new Boeing model had a negative impact on the innovation itself, which led to delays in the production process and the three-year prolongation of the delivery of the 787 Dreamliner. The failure to meet the planned objectives of the new aircraft model and the subsequent fall of the company's reputation, caused by the loss of its loyal customers and business partners, led to a distortion of the competitive position of the Boeing Company.

**Keywords**
Breakthrough innovation, critical success factors, the primary and secondary success factors, the effects of innovative activities.

## Introduction

Assessing the factors that predict a new product success holds critical importance for companies, as research shows that despite a considerable new product investment, success rates are generally below 25%. (Evanschitzky, Eisend, Calantone, & Jiang, 2012) Therefore, with the purpose of minimizing the innovation failure, it is necessary to identify critical success factors of innovations. For approximately 30 years, conceptual and empirical research has been undertaken to identify the critical success factors of new products (Ernst, 2002).

In order to identify critical success factors of a new product and their impact on the product performance, the paper will present and analyze the breakthrough innovation of the Boeing Company, the new airplane model – the 787 Dreamliner. Based on the available data on the development process of the new airplane model – the 787 Dreamliner, the analysis of the innovation poten-

tial will be conducted, as well as the identification of critical success factors. The paper classifies the critical success factors into the primary and the secondary ones, in order to highlight the importance and priority of the identified critical success factors. Finally, the paper confirms a critical negative impact of the primary and the secondary critical success factors leading to the delay and prolongation of the market acceptance of an innovation. Therefore, the aim of this study is to identify the critical success factors, group them into the primary and the secondary factors and finally assess the implications of these factors.

## 1. Critical success factors of a new product

Modern enterprises are facing growing global competition, whose challenges can only be answered through launching new products. However, innovation, particularly in dynamic contexts, is widely recognized as being critical to the growth and competitiveness of organizations (Tellis, Prabhu, & Chandy, 2009). Therefore, to make a new product capable of achieving a competitive advantage, it is necessary to analyze all critical success factors before launching the product.

Therefore, it is essential to make a list of potential success factors as well as actions that will positively affect their impact or minimize their negative impact. On the basis of that understanding, the conditions under which organizational groups operate are basic for successfully managing innovation (Koch, 2012). There are different classifications of critical success factors. One of these is the division into the group of the primary and the secondary success factors, according to the criteria of significance.

Some of the primary critical success factors of a new product are:

- available internal resources,
- defining the concept of a new product,
- drawing up plans and the selection of a new product strategy,
- the production process.

A firm's internal capabilities are important in generating breakthrough innovations (Ahuja, & Katila, 2004; Ahuja, & Lampert, 2001). A firm's internal resources may be insufficient and even inappropriate for achieving a breakthrough innovation, requiring that they should acquire external resources and combine a wide variety of resources and capabilities (Ahuja, & Lampert, 2001). Innovation can be conceptualized as encompassing two different activities: the development of novel, useful ideas and their implementation (Baer, 2012). Therefore, the first step is to define the concept of a new product, which should be based on previously conducted analyses, such as a preliminary and detailed market analysis, a detailed technical and financial analysis. On the basis of the above-mentioned analyses, it is possible to make a positive decision on a new product development and its implementation or a decision on stopping the process of a new product development if the market is not as big as expected or production costs are too high. The following primary critical factor involves the preparation of plans and the selection of a new product strategy. Defining the new product strategy involves: formulating an attractive new product development process, defining the goals, aligning the established goal with the business strategy at the organizational level, explaining the role of the new product in the realization of the planned goals, defining long-term production efforts. Before proceeding to the process of implementing the new product strategy, what needs to be done is analyze the feasibility of the new product concept from the technical, production and business standpoints, demonstrate benefits, performance and business opportunities, created by the new product and ultimately rank the new product on the production scale (Laster, 1998).

Some of the secondary critical factors are:

- an innovative organizational culture and climate,
- the creation of cross-functional teams,
- the leadership of talented people,
- the experience of the company's management.

An innovative organizational culture should encourage individuals to innovate, through the creation of a general policy on the need for the development of innovations and long-term benefits for growth and development. The creation of a cross-functional team is driven by an ever-shorter product life cycle, as an imperative of rapid changes in global demand and the need for increasingly flexible organizational structure and effective communication with the market. Functioning on the basis of a cross-functional principle involves the creation of a team of experts from different functional areas who have the knowledge and experience whose joint action is necessary for the successful implementation of the process.

Therefore, a cross-functional team is akin to a matrix organization, in which the team consists of different functional members (Hirunyawipada, Beyerlein, & Blankson, 2010). The basic characteristics that distinguish cross-functional teams from conventional teams are: functional diversity, integration within the organizational structure, the competitive identity, expected performance. Through the implementation of cross-functional teams, positive effects are achieved, such as: the speed, the easier management of complex tasks, the stimulation of the entrepreneurial culture, the focus on consumers, an increased creativity and organizational learning, higher motivation and more reliable information (Holland, Gaston, & Gomes, 2000). The leadership of talented people, as one of the secondary success factors, should ensure the adequate management of creative and innovation-oriented employees. In order to achieve the greatest effects through talent management, it is necessary to implement the following elements: educational opportunities, through educational programs; recognition programs; advancement opportunities; frequent, open and honest communication; competitive compensation; challenging work assignments; job rotation; ethical values and leadership development and mentoring (Swain, 2007). In addition, special importance is attached to the industry experience of the company's management, especially in the field of marketing and the implementation of R&D activities. Industry experience refers to the experience of a firm's management team in related industries and markets (Song, Podoynitsyna, Van der Bij, & Halman, 2008). Furthermore, marketing experience and R&D experience refer to the experience of a firm's management team in marketing and R&D activities.

This list of the critical success factors of a new product is not final; on the contrary, it is subject to reformulation, depending on the activity and specificity of the company. Certain critical success factors can be eliminated and new specific success factors could be added.

## 2. The breakthrough innovation of the Boeing Company

Today, many organizations are faced with intense pressures to innovate in order for them to meet customer requirements and especially to produce radical innovations that will draw the market spotlight and the market share to them (Miron-Spectar, Erez, & Naveh, 2011). Radical innovations are those that cause marketing and technological discontinuities on both the micro and the macro levels (Garcia, & Calantone 2002). On the other hand, radical innovation is characterized as an ambiguous and risky process, relying on emergent or undeveloped knowledge, and operating in unfamiliar technology or business domains (Kelley, O'Connor, Neck, & Peters 2011). Therefore, the very process of developing a breakthrough innovation is a major challenge for companies, given its complex and multidisciplinary nature.

Today, one of the breakthrough innovations of the 21st century that will change the future of commercial aviation is the Boeing aircraft model – the 787 Dreamliner. The Boeing Company has a long tradition of the successful production of commercial aircraft models. The Boeing Company began an era of commercial aircraft production in 1957, when it first offered the model 707, which was dominant for two decades (Holzmann, & Shenhar, 2010). Today, however, the Boeing Company follows the vision that it should not wait for more than 10 years between the releases of two models so as not to lose continuity in the innovation process. The latest Boeing aircraft model, the 777, appeared in 1994, so that 2004 was the right year to start up a new project. On the other hand, waiting too long for perfect market conditions may result in a loss due to the non-implementation of innovations. Therefore, each innovative project should be approached with a certain level of risk. In order to minimize the risk of innovative project management, Boeing has developed and applied a new process for managing its enterprise-level research and development. This process, the Global Enterprise Technology System, provides a strategically-driven and systems-engineering-based approach to managing innovation (Lind, 2006). Therefore, in the course of innovation management, the Global Enterprise Technology System encourages a high level of research, as well as an efficient and effective implementation of R&D activities, multidisciplinarity and a systemic approach to the implementation of innovative projects.

The so-called breakthrough innovation of the 21st century offers a range of innovations within inputs, aerodynamics, systems, the engine that will increase the performance and capabilities of this aircraft model (Blake, 2010). Therefore, the focus is on system innovation, i.e. change in the architecture of the aircraft itself in order to achieve better effects. One of the radical changes within this innovation refers to the use of lighter materials in the process of making the fuselage

and wings, such as aluminum or plastic (Smock, 2009). In addition, the unconventional methodology of fish-themed design was applied in the process of constructing the fuselage, on the one hand, and the bird-themed design in the process of constructing wings, on the other (Trimble, 2007). For the construction of this type of aircraft, 23 tons of Carbon fiber, which is a lighter material than the ones that had previously been used, was utilized. Carbon fiber was used for the construction of the wings, the fuselage and the interior. Using the above-mentioned material will shorten the production cycle, reduce waste and maintenance costs. In addition to this, in the course of the production process, an emphasis was placed on the use of composite materials associated with a number of positive features, such as a better mechanical performance, durability, a higher damage tolerance, corrosion resistance, a lower degree of wear and fatigue during their use, a lower weight and flexibility in the design. Moreover, composite materials allow for a greater efficiency, which results in lower direct operating costs (Ravi, Starners, Holzwarth, & 2001). At the same time, this type of material enables a simpler design and a more automated production process, which leads to lower variable costs. Therefore, the 787 Dreamliner production process involved a radical shift based on the principle of a large percentage share of composite materials in the overall structure of the aircraft. This was the first time in the history of the airline industry that a 50% share of composite materials was used in the production of such a large aircraft model. The following picture shows the chronological trend of using composite materials in the airline industry, as well as the percentage share of composite materials in each model.

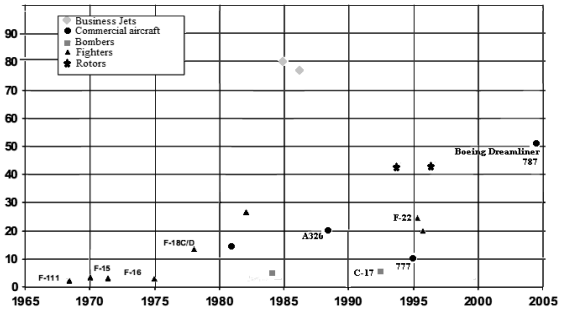


**Figure 1** The trend of using composite materials in the airline industry
**Source:** Ravi, Starners, & Holzwarth, 2001

Furthermore, instead of using a large number of partial computers, the Common Core System (CCS) was implemented, which allowed for a larger display in the aircraft cabin (Holzmann, & Shenhar, 2010). The computer system CCS involved 30 partial computers, which is far less compared to the Boeing 777, which had 80 partial computers. This enabled the easier coordination and implementation of the functions of the partial computers in the system.

Apart from the above-mentioned innovations, the positive effects of these innovations should be pointed out, which are reflected in a reduced fuel consumption by 20% compared to other planes of the same size, a 45% higher load capacity due to the reduced weight of the entire airplane, which will result in less need for repairs and a higher speed by 20%.

In addition to the innovations intended for a more efficient production process, in this airplane model the focus was placed on the implementation of the innovations that would benefit passengers, such as, for example, the better interior design of the passenger compartment that would meet the needs and preferences of travelers. Some of these innovations are reflected in the 50% larger windows of the aircraft, which are 19 inches high and 11 inches wide, the wider seats that provide more space for each passenger, better lighting, a new air purification system, a better system of wing control and turbulence avoidance, which results in better comfort for passengers (Blake, 2010). In addition to satisfying the needs of passengers, the new Boeing airplane model is oriented towards positive effects for all members of the society, through applying the concept of sustainable development and environmental protection. Some of these positive effects are reflected in the reduction in carbon dioxide emissions by 20%, a reduction in noise, compared to the similar types of airplane models produced by competing airline companies, so that noise in the aircraft only exists on the territory of the airport, compliance with all new legal frameworks concerning environmental protection, the reduced separation of nitrous oxide into the atmosphere, which in the case of the Boeing 767 model ranged from 70 to 95% , whereas in the case of the Boeing 787 Dreamliner, it has been reduced to the range of 48 to 64%.

## 3. The primary and the secondary critical success factors of the development of the new aircraft model – the Boeing 787 Dreamliner

A series of innovations included in the new aircraft model – the Boeing 787 Dreamliner – resulted in major developments in the aviation industry, but simultaneously carried with itself the very demanding and complicated implementation process. In order to make the process of the realization of the revolutionary aircraft model successful, it is necessary that the critical success factors of the aforementioned innovation should be identified. On the basis of the analysis of the available data on the revolutionary innovation of the Boeing Company, the next segment of the paper will present the potential critical success factors.

The first primary critical success factor is the concept of the Boeing 787 Dreamliner model. The design of an adequate concept of the Boeing 787 Dreamliner model was preceded by a long process of research on the part of the Boeing Company's Research and Development Department, as well as the research involving passengers themselves, based on traditional quantitative techniques, collecting qualitative data, applying the method of the ideal design, so that passengers could express their own visions, as well as developing various studies in cooperation with universities. In this way, the traditional framework of thinking about the system of values and psychological and emotional needs of travelers was expanded. Therefore, the existing formulation of the new product concept, based on internal thoughts, experiences and goals, was expanded with the opinions of the participants in the process of innovation production, as well as the ones using the results of the innovation process. The result of the new formulation of the innovation concept was the output that would fully meet the goals and desires of all interested parties. However, the new innovation concept carried with itself a high degree of novelty and risk in the process of implementation, which resulted in the delayed implementation of the innovations. The delays in the delivery of the new aircraft model, the Boeing 787 Dreamliner, led to the inability to gain return on investment. The minimum of 16 billion dollars were trapped in the plans awaiting implementation and in the unfinished construction of the new aircraft model.

Therefore, the Boeing Company was too ambitious when it started the implementation of this program. It aimed at applying a lot of things at once. The combination of next-generation technologies, the revolutionary design and the application of the principles of global supply led to significant time deviations in the timetable implementation. Therefore, the next primary critical success factor was the preparation of the timetable. Judging by the timetable, the configuration of the 787-3 aircraft was scheduled for the beginning of 2008, the 787-9 model for mid-2008, whereas the last model, the 787-10, was preliminarily scheduled for the beginning of 2011. The next activity, the test flight for the 787-3 model, was planned for late 2009, whereas the test flight for the model 787-9 was planned for early 2010. The certification and delivery of the model 787-3 was planned for mid-2010, of the model 787-9 for the end of the same year, whereas the certification and delivery of the model 787-10 was scheduled for the end of 2013 (Domke, 2008). The time interval between the presentation of the first 787 Dreamliner model and the last model stood for an optimal time schedule period, in which the improvements of the new model in the range of 1% would be achieved based on the experiences of the base model. However, due to the planned specifications, the popular airplane model faced the delay of the first test flight, which was prolonged until the end of 2008. The end of 2008 was not the definite date. Another delay occurred, so that the test flight was prolonged until 15 December 2009, when the Boeing 787 Dreamliner took off for the first time for the duration of three hours (Ostrower, 2009). In addition, the certification was also delayed due to the deviations of the constructed aircraft from the original specification, which required redesigning and reassembling. Finally, in August 2011, the certificate of the European Aviation Safety Agency was obtained, which resulted in the possibility of delivering the first 787 Dreamliner, which was achieved in September 2011. Therefore, the delivery – the last activity within the project of constructing the new Boeing model, the 787 Dreamliner – was delayed for three and a half years. It can be concluded that the time schedule was too rigid and rigorous, with minimal deviation opportunities, leading to a domino effect and the prolongation of the last program activity due to an untimely problem solution.

The next primary critical success factor is the production process of the new aircraft model. Therefore, the main reason for the delay in the delivery of the new Boeing model, the 787 Dreamliner, was linked to the production process

itself, which had experienced a number of delays due to the repeated performance of certain steps. The problems that arose in the production process are related to the implementation of the new production process based on the principle of the multi-partner supply chain that includes a large number of partners from different continents. The major driver for the involvement of suppliers is the pressing need to achieve target performances, quality characteristics and target prices for all systems, subsystems and airframe items of an aircraft (Wagner, & Hoegl, 2006). Also, for economic reasons, collaborations are growing in importance because of the rising cost of technology development, shortening product lifecycles and a difficulty in sustaining closed research and development models. (DeCusatis, 2008) This type of outsourcing is regarded as a vehicle for building the innovation capability by learning from and getting access to new competencies held by partners and suppliers. (Bengtsson, Von Haartman, & Dabhilkar, 2009) In this case, however, the negative effects of applying the multi-partner supply chain emerged, although the concept had previously been used within the Boeing Company, but to a lesser extent. In the course of the production of the aircraft model 727, out of the total suppliers, the foreign suppliers accounted for only 2%. After that, in 1990, the formulation of the program of the production of the Boeing 777 accounted for 30% of the foreign suppliers, whereas in the case of the Boeing 787 Dreamliner, their percentage was as high as 70% (Holzmann, & Shenhar, 2010). The increasing percentage of the foreign suppliers led to the greater dependence of the Boeing Company on sub-suppliers, an uncertainty whether the procurement function would be synchronized among all partners, whether it would be implemented on time and according to the principle of a high quality in order to meet the earliest and therefore most challenging demand. The multi-partner supply chain carries with itself a high level of risk and, therefore, requires continuous managerial assistance in the process of planning, specification, evaluation, transport, implementation, control and improvement. In addition to inadequate functional management within the supply chain due to poor coordination and communication, many partners faced the problem of an insufficient capacity to meet excess demand, which led to delays in the delivery of their parts and halted the activities in the process of the construction of the aircraft. Another flaw in the implementation of this supply chain was reflected in the mistaken assumption that the supply chain should be linear. In addition, the inclusion of a large number of suppliers leads to a need for the parallel execution of certain activities and frequent returning to previous activities. Moreover, the application of the multi-partner supply chain can lead to a future risk, due to the transfer of the know-how of the Boeing employees to the employees of all members of the supply chain, since the key function of the design is implemented within the Boeing department, whereas the planned design of all the parts of the aircraft is still sent to its contractors.

Another problem within the production process emerged for the reason of using the Exostar Supply Chain Management Solution, which uses the E2 server to monitor the entire process of procurement, the implementation of the planned schedule, the consumption, inventory management, information sharing among the partners, following the expectations of all partners and to assess achievements etc. (Smock, 2009). The Exostar Supply Chain Management Solution could not fully control the multi-partner supply chain, since it is a global web network difficult to control. Therefore, in December 2008, The Boeing Company opened the operating production center, with the aim of monitoring the global production of all suppliers in the supply chain as well as solutions to unexpected problems, with the purpose of conducting the timely elimination of delays.

In addition, design problems emerged within the production process. The central wing box and the internal installations failed the test, which had a negative impact on the production process itself. Furthermore, the fastener, whose production lasts for 60 weeks, had to be redesigned, which additionally prolonged the production process. The result of the redesign was reflected in the extension of the wingspan by 63.3m. Moreover, the fuselage of the produced initial 787-8 model lacked several passenger windows on the left and the right sides of the cabin. The solution to this design problem was very complex and required significant funds (Domke, 2008).

Another problem in the production process that had a critical impact on the success of the process itself was the use of composite materials, which are characterized by higher costs compared to conventional materials. Moreover, the use of these new inputs led to the extended testing of the production process in comparison to what had been envisaged in the initial plan. Despite the initially conducted testing, problems arose in the

course of using these materials. On the surface of the aircraft wings, bubbles appeared due to the entry of the air, which led to the easier breakage of the protective part of the material and required additional resolution.

The aforementioned primary critical success factors and the identified problems within them directly influenced the difficult production process of the Boeing 787 Dreamliner aircraft.

In addition to the presented list of the primary critical success factors, it is necessary that the secondary critical success factors be mentioned as well. The first secondary critical factor relates to the establishment of an innovative organizational culture and climate in the Boeing Company. The innovative culture of the Boeing Company promotes values such as leadership, integrity, quality, customer satisfaction, team work etc. Some of these values that underpin the innovative culture of the Boeing Company were not followed, which led to the negative effects in the production of the new Boeing model – the 787 Dreamliner. The next secondary critical success factor is the creation of the cross-functional team, which the Boeing Company implemented by using the multi-partner supply chain, with each partner performing a specific function. The above-mentioned secondary factor was also one of the causes of untimely production, due to the mismatch of the partners' tasks in terms of time, the design and the quality. One of the mistakes of the partners in the supply chain referred to the low-quality production and poor design of the electrical panel in the aircraft cabin, which led to the forced landing of the aircraft during the test flight.

## 4. The negative effects of the critical success factors and their consequences

The negative effects and problems during the production of the new aircraft model, the Boeing 787 Dreamliner, are related to ignoring the critical success factors. It can be concluded that the defined timetable was too rigorous and elusive, causing constant delays in the implementation of the planned activities.

The first delay led to the postponement of the first flight, which was scheduled for 27 August 2007. The reason for the delay lay in the multiple problems within the production process, such as the final assembly, which was supposed to be implemented by assembling 1200 individual parts of the model. However, the supplier delivered 30,000 parts that had to be incorporated into one whole. The other problems were reflected in the unfinished software, hydraulics, power systems and the other systems.

The next delay was related to the problems that had arisen within the domestic and the foreign supply chains, primarily due to the shipment delays and the incomplete supplier documentation. The third delay built on the previous one because not all problems in the global supply chain could be solved.

In addition to the technical problems in the production process of the Boeing 787 Dreamliner, the Boeing Company faced the problems within the organization due to the workers who were dissatisfied with their contracts. This led to a strike lasting for 56 days, starting in December 2008, which caused the fourth delay. The workers were against the global supply chain that directly affected the reduction in the work within the Boeing Company by 50%. Long-time employees of the company were threatened by mass layoffs. The erosion of working skills within the Boeing Company led to a fall in the attractiveness of this company in the eyes of new specialists and young workers who had just entered the labor market. The overall working atmosphere in the Boeing Company led to the formation of an unhealthy environment that demoralized workers and reduced their productivity. Once the strike of the dissatisfied workers was over, the negative effects were still felt and reflected in constant delays.

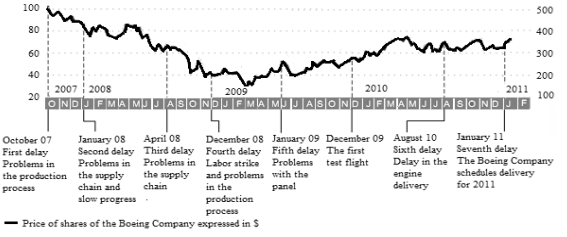


**Figure 2** The movement of the stock prices of the Boeing Company
**Source:** Peterson, 2011

The constant delays resulting from the series of problems explained in the previous part of the paper led to a fall in the stock prices of the Boeing Company, which is shown in Figure 2. The process of the delay in the delivery of the first Boeing 787 Dreamliner was reflected in the prolongation of obtaining return on investment. Large funds invested in this project are related to the research activities and the very production process of the 787 Dreamliner. According to the report

published by The Seattle Times, the costs of the Boeing 787 exceeded the planned expenditures, because only the research and development activities from 2004 to mid-2011 cost about 15 billion dollars. In addition to this, the capital expenditures, which included the costs of building plants and purchasing the necessary equipment, amounted to 3 billion dollars, the direct costs of the first 40 aircrafts amounted to 16.3 billion dollars, the inventory amounted to 12.7 billion dollars and other costs to about 2 billion dollars. On the other hand, according to the estimates by Joe Campbell and Carter Copeland, the Boeing Company invested 300 million dollars in the construction of a single aircraft of this type. Moreover, it is estimated that the return on investment per one delivered aircraft would amount to 50 million dollars (Cochennec, 2007). It is believed that financial recovery, i.e. a positive cash flow, can be expected in 2020, which means that Boeing will achieve a 20% margin per delivered aircraft after 1000 deliveries (Gates, 2011). Therefore, the profitability of the Boeing 787 Dreamliner and the speed of covering the costs of the development of this innovation and its production will depend on demand for this type of model. According to the current data, 821 models of the Boeing 787 Dreamliner have been ordered by 56 customers from six continents, with 20% of the largest customers accounting for 50% of purchase.

The Boeing 787 Dreamliner is the fastest-ordered commercial aircraft in history. In 2004, when the R&D activities related to this aircraft model first started, 52 initial aircrafts were ordered. Highly innovative airline companies that focus on the environment, customers and the latest technology were the first buyers of the new aircraft model that offered the right combination of the aforementioned and promised a revolution in the airline industry. After the first year of research and development, over the next three years a growing interest in this airplane model was recorded. Therefore, it can be concluded that the Boeing Company offered the right airplane model at the right time. However, due to the failure to meet the promised delivery date, the interest in this model started rapidly decreasing in 2008. After the deep recession in 2009, demand for this model began to recover.

Despite the three-year delay, the carrier All Nippon Airways (ANA) expects 53 aircraft models by March 2018. In September 2011, the first Boeing 787 Dreamliner was delivered to All Nippon Airways. With 53 ordered 787 Dreamliner aircrafts, All Nippon Airways will replace the existing aircrafts and achieve positive effects reflected in cost reduction. Their goal was to receive the shipment in 2008 in order to meet excessive demand at the extended Tokyo airport. Although the goal could not have been achieved within the planned period of time, the airline company ANA is still a loyal customer of the Boeing Company's aircrafts. In addition to the great loyalty of the ANA carrier, there are instances of disloyal customers who cancelled orders.

All orders since 2004, when the program of the construction of the Boeing 787 Dreamliner was started, up to this day, are shown in Chart 1.

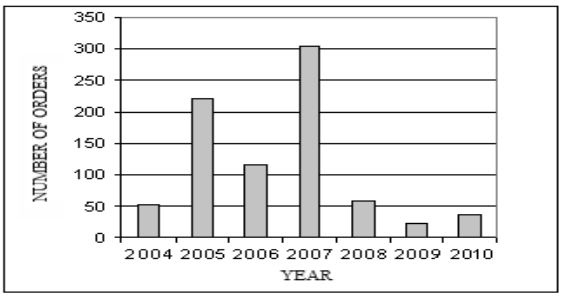


**Chart 1** The number of the orders of the Boeing 787 Dreamliner by year
**Source:** Ray, 2011

What must be taken into account is the share of the orders of the Boeing 787 Dreamliner in the total annual orders of the Boeing aircraft models (Chart 2.).

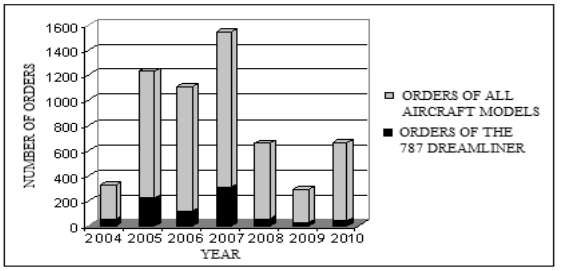


**Chart 2** The share of the orders of the 787 Boeing Dreamliner in the total annual orders in the period from 2004 to 2010
**Source:** Ray, 2011

In percentage terms, the share of the 787 Dreamliner orders in the total orders in 2004 was 19.12%, after which it rose to 24.61% in 2007, after which a large decline of 9.86% was recorded. However, the decline in the 787 Dreamliner orders did not stop at this percentage, but fell to just 5.92% in 2010. Despite a series of unintended consequences that have emerged over time and led to a domino effect, the 787 Dreamliner aircraft

remains the plane that led to a revolution in the airline industry.

## Conclusion

Identifying the critical success factors of a new product is a prerequisite for managing changes occurring on the market, with the aim of successful development in step with the latest trends. In order to achieve a competitive advantage by offering innovative products, it is necessary to define them in a timely manner, both in terms of the environment in which the company operates and in terms of companies interested in the successful launch and commercialization of new products. Disrespect for these can lead to adverse effects and certain weaknesses in the implementation of a new product. It happened to the Boeing Company in the process of designing and implementing its new model, the 787 Dreamliner.

On the basis of the conducted analysis, the paper defined the primary group of the critical success factors that were ignored by the Boeing Company, which led to a slowdown in the production process of Boeing's innovative boom. Some of the reasons for the delays in the process of the production of the new model were reflected in the ambitious time schedule that included a series of activities and tasks supposed to be carried out all at once within the Boeing Company. About 50% of the composite materials and the new generation technologies, such as powerful engines and the central computer system inside the cabin, were for the first time used in the construction of an aircraft. In addition to this, the revolutionary design and the implementation of the principles of global supply were just some of the reasons that led to difficulties in the production of the planned model, the Boeing 787 Dreamliner. The parallel implementation of a large number of breakthrough innovations led to an increase in costs of making the final product and reduced the competitive advantage of this innovative product.

In addition to the failures in the production process, the Boeing Company faced difficulties in the management and coordination of its global partners in the multi-partner supply chain, which led to the problems with the synchronization of its operations and time lags. Moreover, the inadequate creation of cross-functional teams and the teams' non-adherence to the myths and values promoted by the innovative culture of the Boeing Company led to a non-innovative and demotivating working atmosphere.

The stated omissions and disregard for the critical success factors influenced the financial difficulties of the Boeing Company, as well as the decline in reputation due to the three-year delay in the delivery of the first Boeing aircraft model, the 787 Dreamliner.

However, in addition to the known critical success factors, in the course of the realization of an innovative product concept, companies often face unpredictable critical factors. Therefore, once identified, the critical success factors related to the methodological approach should constantly be the subject of consideration in order to minimize or avoid their unpredictability that would lead to adverse effects. SM

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# Savings, but not as a Strategy

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**Abstract**
Our starting point is the diagnosis that the instrumentation of savings (austerity) in the current economic and political constellation is the dominant form of the involvement of different countries in global flows. In this sense of the word, savings refer to a certain context determined by deflation, which is realized through a reduction in rents, public expenditures. Such a type of savings is promoted in order to boost competitiveness and establish stability. Consequently, the center of the economic policy today is not the fiscal stimulants but rather on the savings in the sense described. Savings cannot be understood only as instrument of the ruling economic policy, but it is obvious that it also represents a certain ideological orientation that conceptualizes the way to economize on. Thus, savings in this conceptual-ideological sense is at least characterized by: a) a view of the position of the state in relation to economic flows, b) the treatment of demand. The paper criticizes reliance on savings as a policy that manages both stabilization and channels integration in globalization processes. First, we consider the promotion of savings as a guiding light for the economic policy to be hiding a logical error, namely, the replacement of a part for the whole. Because there is no doubt that in a thematized meaning savings are a rational economic instrument, but only in certain strategic frameworks, as a subordinated segment dosed economic rationalization. Therefore, savings cannot take the place of the economic strategy. Second, savings address not ultimate causes of a crisis but rather and only certain forms of manifestation, i.e. only symptoms. Third, savings as a strategy do not contribute to the overcoming of asymmetric processes of globalization, just as it does not contribute to convergence processes, either, i.e. leaves peripheral countries in peripheral trajectories. Fourth, in the ideological sense, savings suggest an image of the state which per se is a burden for economizing, i.e. the government expenditures are assumed to automatically squeeze out private investments. Our claim is supported by empirical data. Fifth, expansive savings with a focus on short-term fiscal consolidation has a contraction effect compared to aggregate demand. Pursuant to that, it does not create conditions for the dynamization of investments and the nominal GDP. Only the criticism of savings as a strategy can a more dynamic growth of peripheral countries be planned.

**Keywords**
Savings, crisis, government.

## 1. Austerity as a paradigm

Austerity is an extremely widespread notion in an economic reflection. For us, it is relevant that the term is present not only in economic, but also in non-economic disciplines; it is obvious that it is not a concept that draws the attention of economists only (Macilwain, 2010). Various terms are used in economic reflections, such as an "idea", an "ideology": we opted for the term "paradigm", which already occupies a prominent place in describing the orientation in economic science. It can even be considered that austerity can be directly correlated with the determining of the basic notion of economic science, which was postulated by Lionel Robbins a long time ago, namely with the notion of scarcity. Moreover, in some economic discourses, austerity is equated with scarcity (Tellman, 2015).

For the sake of simplicity, we will be satisfied with the indication that austerity as a paradigm is connected with:

a) voluntary deflationary processes,
b) corrective mechanisms aimed at the restoration or establishment of competitiveness (in Europe, the Lisbon Strategy that refers to Europe as the most competitive economy, is possibly mentioned many times), i.e. the "confidence of investors", "confidence-boosting effects" (JC Trichet),
c) the reduction in public spending, i.e. the cutting of the budget and appropriate consequences based on that.

There is no doubt that the issue of austerity involves many economic problems, but, for us, it will be sufficient that austerity:

a) can be understood in the context of the accumulation of the debt since the 1970s century, as an attempt to deal with the problem of the debt,
b) is necessarily understood as a "paradigm" in terms of integration into the global economic mainstream in terms of "peripheral" countries.

Let the assertion be clarified:

a) In terms of debts, empirical data regarding the perception of trends are convincing enough, as it can be seen in the following Figure. The first figure shows an unambiguous growth of the government debt with respect to the GDP dynamics; the fact that we have chosen only the selected OECD countries clearly shows the determining dynamics. The second figure, based on one selected and thus representative example (the USA), demonstrates the dynamics of the government debt as well as the debt of households, and last, but not least, the inflation rate. In economic theory, the situation evokes an old description of significant theorists I. Fischer on debt-deflation.
b) When related issues are raised, there are different concepts of 'periphery countries' joining the world economic flows; the import-substitution strategy; the so-called Washington consensus; as a reaction to homogenized concepts of the joining of the mentioned countries after the fall of the Berlin Wall, the theory of the variety of capitalism was developed, emphasizing the differentiation of the former socialist countries regarding initial resources, the degree of involvement in global trends, the acquired modes of collective learning in relation to market operations, the subtleties of business culture, etc. If the logic of austerity is treated as a paradigm in the indicated terms, then the mechanisms of fiscal consolidation can be said to represent certain modes of the inclusion of "periphery countries" in the world economy. Namely, these countries are forced to follow "competitive austerity", "competitive disinflation", in order to integrate into the circulation of the global economic dynamics. To that extent, we want to analyze the balance of the effects of austerity policies regarding adjustments in relation to global processes, including Serbia, which is to go through the integration process. As is well-known, integrations are rule-based. To what extent may "the paradigm of austerity" help conceive the integration strategy?

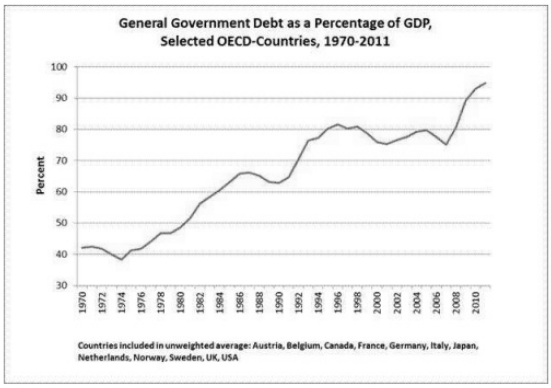


**Figure 1** General Government Debt as a Percentage of GDP
**Source:** Streeck, 2014


**Figure 2** Dynamic of government debt, household debt, and inflation rate (USA) — US Government Debt.....US Inflation Rate.—.—.—. US Household Debt
**Source:** Streeck, 2013

## 2. Austerity: lock-in?

Economic history advises caution that must not be overlooked: quantitative aspects need to be analyzed together with qualitative moments. Therefore, we are familiar with such economic constellations when the public debt was very high, which did not prevent the said country from stepping onto the robust path of development and growth (the British public debt in the 1920s was about 260% in relation to the GDP, yet it was followed by a significant developmental sequence in the Victorian period). This means that the debt does not have to be understood as an absolute obstacle in a developmental expansion, although it must be contextualized. Therefore, quantitative aspects should be explained through a qualitative horizon. Furthermore, this argument assumes that the debt/austerity-regime must operatively be connected with qualitative criteria. If there is a criticism addressed to "expansionary austerity", it must be understood in the sense that, in the last decades, there has been a lack of dialectic between the quantity and the quality, namely there were vicious circles between quantitative and qualitative aspects.

Let us now take a look at the different summaries of the selected critical considerations about austerity.

1) The fallacy of composition: There cannot be a guarantee of a harmony between the individual and the collective levels; it is not certain that individual austerity will transpose onto the collective level; more precisely, even if individual austerity can be imagined to be relevant, it is not certain that such collective austerity will be fruitful; in economic theory, it is refracted through the relationship between micro- and macro-economic aspects: what is true at the individual level may not be true for the whole;
2) The fallacy of simultaneity: This critical argument is linked to the first one: the simultaneous monitoring of all collective austerity is impossible without regressive moments for the economy;
3) The fallacy of homogenization: "Austerity policies suffer from the same statistical and distributional delusion because the effects of austerity are felt differently across the income distribution... although it is true that you cannot cure debt with more debt, if those being asked to repay the debt either cannot afford to do so or perceive their payments as being unfair and disproportionate, then austerity policies simply will not work" (Blyth, 2013);
4) The austerity policy is not sensitive to the demand side and reduces the spill-over effects of public investments;
5) Critical recapitulations, empirical arguments of both theorists and actors influencing the economic policy after the implementation of austerity measures and claiming that austerity must be made relative, that the anticipated results are overestimated and that austerity must be combined with other measures (Blanchard, 2012; Lagarde, 2011; Konzelman, 2014) in order to adjust the existing courses.
6) Based on these indications, it can be argued that there is a significant range of critical analyses of austerity as a paradigm and that these evaluations have even been done by the highest global scene. Of course, these indications differ; there is a scale by which the aforementioned estimates are differentiated. So, we discovered that there is a strong criticism about austerity emphasizing the negative synergy between the forces of the economy and the bifurcations of vicious circles regarding the application of austerity measures, even claiming that austerity policies inflicted damage especially in the European Economic Area; we also noticed, however, a minor criticism directed only to the combining of measures of austerity with other paths of the economic policy, or to the temporal arrangement of these measures in terms of long and short deadlines. The dilemma whether the debt is of a structural or conjectural character could be problematized: where is it claimed that austerity has only indirect economic effects, because it "only" proves the credibility of the State concerned, that it only wants to endure paths of fiscal rationality? However, it can be confirmed that even in minimalist terms, austerity must be problematized as a defining and long-term orientation towards integration, i.e. it must problematize austerity as a meta-framework for inclusion in the global economy.

## 3. "Development" that overwrites austerity in terms of integration: the selected forms of operationalization

Based on the implied claims, the situation can be problematized in such a way that austerity cannot be accepted as a form that manages integration. In fact, austerity can only be a subordinate and transitory moment in the integration process, and can only be meaningful in the case when there is a development strategy which austerity is subordinate to. In other words, the operationalization of development is herein assumed to be a mechanism considered as constitutive for the concrete involvement in the world trends. In fact, the goal of the economic policy and involvement in global trends is to prevent perpetual austerity. Namely, critics of austerity continually emphasize the fact that there is a risk of the economy being set on the path that becomes permanent. We think that such a danger is very real unless there is a distinctive and non-simulative articulated development strategy.

The following figure shows a constellation which appears as relevant at this point; thus, austerity as a subordinate mechanism can achieve relevance only from the perspective of development, rather than vice versa.

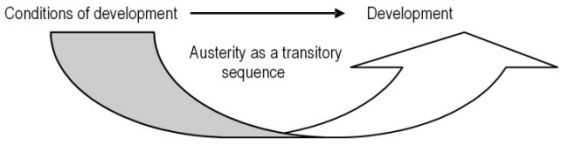


**Figure 3** Austerity as a mechanism subordinate to development
**Source:** The author's source

The development is, of course, a non-trivial term repeatedly used in economic considerations. We may recall the well-known term of "sustainable development", used in various studies for nearly thirty years. In addition to that, if integration processes are to be thematized for Serbia, no avoidance of the respective term is possible, especially taking into account the crucial importance of the operationalization of sustainable development for the European Union. However, in accordance with the dynamic of development conditions (technological, biophysical, innovative etc.), development must constantly be re-conceptualized, i.e. the concept cannot only be adopted as a simple "blueprint". Actually, this is not at all possible here, nor is it necessary that the concept of development should be analyzed in detail from an economic perspective; we have already tried to do this elsewhere (Lošonc, 2005). We are only interested in emphasizing the two aspects that will be reflected in the treatment of the public sector and consequently in the positioning of austerity. Accordingly, we will offer two unavoidable aspects in view of our topic.

### 3.1. Development and innovative modes: a state that creates conditions for development

We are not abandoning the field of macroeconomic considerations, but rather feel it is necessary that the results of multiple different analyses on innovation should repeatedly be taken into account. They can help us in respect of:

a) the fact that they shed light on those forms of pro-active roles of the state that are frequently ignored in various macroeconomic considerations,
b) the fact that they problematize the position of the state with respect to critical aspects of austerity as a paradigm,
c) the fact that they bring us closer to the concept of the pro-active role of the state in terms of "globalization" and "internationalization" and allow the re-conceptualization and modes of the inclusion of "periphery countries" in these processes.

Therefore, we would like to combine the macroeconomic insights in relation to the logic of austerity and certain indications regarding the regimes of innovation. In fact, based on macroeconomic knowledge, we reached a conclusion that demonstrates the problematic aspects of austerity. However, we will now focus on certain knowledge leading us to innovative modes that also, but in a different manner, of course, warn us of the inherent limitations of austerity as a paradigm. Namely, austerity as a paradigm reduces the possibility of the state to maneuver in terms of development: in comparison to the austerity state, lock-in is predisposed to have a minimalist-defensive role. It should not be forgotten that we live in a time when there are many dilemmas about conceiving the strategy of the economic aspects of development (de-industrialization: yes or no?, the range of the tertiary sector of the industry; what to implement for "periphery countries" regarding de-industrialization; whether the existing forms of de-industrialization on the periphery are "premature", etc.) (Rodrik, 2015) and that new uncertain-

ties arise from it. Here, one must be categorical: the environment of the world economy is extremely uncertain and it can be claimed without any big risk that the same uncertainty and complexity will spread further. Our thoughts on the developing state and integration into global flows stem exactly from our knowledge of the presented type of uncertainty.

It seems that this situation brings new elements in the process of repositioning the state. Namely, it is not the case for the active position of the state to adopt the minimalist-state defensive perspective. It hardly needs to be proved that innovation is celebrated everywhere as the foundation of growth; it will be more than enough to allege the already mentioned Lisbon Strategy. However, as it can be seen from various studies of collective learning in technological systems as well as the impetus stimulating technological innovation and the completion of national innovative systems, it originates from the state. (In such a country as the USA, there is an entire government-based shadow system generating streams of innovation and pro-actively working so as to promote various modes of innovation) (Block & Keller, 2011). In this case, the consideration only insisting on the quantity (the ratio between the government spending and the GDP) misses important things. No matter how much it has been the subject of various attacks and reviews, the role of the state cannot be reduced to the role of creating legal preconditions, i.e. a framework of preconditions for the functioning of the market economy. Accordingly, different networks combining public and private aspects should be discussed: this situation is unaffected by any type of a strict and strong gap between the private and public spheres.

It should be noted that the activity of such a state will not be exhausted with traditional classifications of the state-imposed influence on the economy, i.e. on the basis of focusing on sectorial policies. If the Lisbon Strategy is mentioned again, which is certain in the case of Serbia as well, it seems then essential that this type of a country should play the role of an initiator of a dynamic knowledge-based economy. That the state has played a constitutive and creative role in promoting technological (Mazzucato, 2011) waves should, therefore, be taken into account (we have to mention a recent example, which is extremely relevant given the recent realignment of resource regimes on a world scale: shale gas is deeply connected to the activity of the US government) (Shellenberger, Nordhaus, Jenkins, & Trembath, 2012), those instances which , when the relation between technology and economics is discussed, are referred to in the literature as "techno-economic paradigms" (Mazzucato & Perez, 2014). They represent such patterns, connections between technological and economic trends, which:

a) alter the structure of economizing,
b) transform the conditions of inclusion in global trends.

Let us demonstrate that in the following figure:

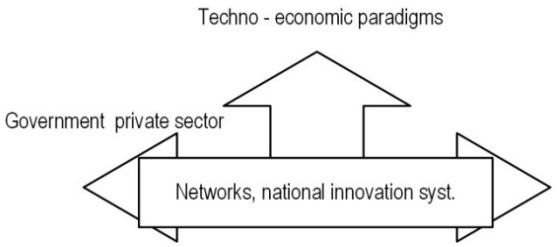


**Figure 4** A synergy between the government and the private sectors in the light of the socio-economic paradigm
**Source:** The author's source

Every engagement in the global economy interweaves with significant uncertainties; the global market is dynamic and propulsive: as shown by the tendency of globalization in recent decades, it can be said to be more complicated than the internal market. However, it is important to note that we are faced with uncertainties regarding the introduction and diffusion of different investments: as it is shown by authoritative studies, the degree of risk and uncertainty changes at different stages, but does not disappear. Dealing with the modes of risk and uncertainty is a structural moment that explains the configuration of the economy and determines modes of operation.

Let us now take a look at the estimated dynamics of risk with regard to the introduction of innovations in various stages, on the basis of which significant conclusions can be drawn:

**Table 1** The sequences of risk during the implementation of innovation

| Point at which investment is made | Risk of a loss |
|---|---|
| Seed stage | 66.2% |
| Start-up stage | 53% |
| Second stage | 33.7% |
| Third stage | 20.1% |
| Bridge of the pre-public stage | 20.9% |

**Source:** Mazzucato, 2011

As we can see, the greatest risk occurs right at the beginning, in the initial stages, when the "nexus of risk and rewards" is exposed to high uncertainties. However, after this initial phase, the degree of risk is reduced, but risk is intensified even in the last instance. We believe that gaining an insight into these sequences can lead to certain consequences for the state, i.e. in relation to the state's maneuvering. That the forms of the state performance and publicly founded policies vary depending on the dynamics of risk hardly needs any further argumentation: it can be assumed that, in the initial stages, the state should play a significant role. Many times, the state's activity has been based on an argument that it has not had a surplus of the knowledge of economic entities: consequently, its intervention is likewise determined by a lack of knowledge, on which basis the idea that the state actually crowds out the private sector has been developed. It is undisputed that such situations can be projected. But, it is not about the fact that the state and the public policy have to possess a greater knowledge of technological (and general economic) flows, as much as it is about the fact that, according to its capacity, the state should, of course. be able to become involved in those segments of innovative regimes where there is a serious uncertainty and where there is a likelihood of private equity being hesitant to invest. In terms of investment, there is always some "nexus between risk and rewards": the state should be involved when this nexus is uncertain for the participation of private capital. When it comes to the relevant sequences of innovative waves, this is definitely what it is about.

Here, we are inspired by the earlier indications made by Nobel Prize Winner Herbert Simon, who says that the public policy can reduce the level of complexity in terms of the context of decision making rather than in order to show off an excess of knowledge. Such a reduction allows better and more efficient decision making, i.e. transforms the environment regarding the performance of economic entities, which can now, in an altered way, evaluate relationships between risk and rewards. We believe that, in terms of the transformation of the environmental economy, the developmental state can be a constitutive factor in the involvement in the world trends. In terms of the indicated meaning, the reduction of complexity is clearly related to practicing certain modes of the public policy, and we think that this can be paradigmatically proved in the case of innovative regimes. In any case, the state focused on consolidation and being lock-in in relation to austerity faces difficulties in positioning itself in this possible role. We do not underestimate the weight of this orientation for one instance, because it requires organizational learning and the constitution of the capacities of government; however, it seems that it is a prerequisite to a successful placement on the international economic scene. Furthermore, it is obvious that this logic is used for promoting different organizational-institutional forms of synergy between the public and the private sectors. The minimalist articulation of the state reducing the possibility for the maneuvering of the state cannot meet these requirements in any case.

Lately, discussions have been initiated on economic and political alternatives, "austerity" *versus* "stimulus". With the dominance of austerity, the dilemma seems to have been resolved. Here, however, we have tried to offer another possibility stemming from the field of the mentioned alternative and emphasizing transformative capacities of the state in relation to the technological and economic environment.

### 3.2. Biophysical aspects: beyond the austerity paradigm

A simultaneous orientation towards integration processes and the transformation of the economic structure are impossible to imagine without ecological horizons. It will just be enough to point out the fact that the European Union is highly interested in ecologization and that a profound ecological commitment is inherent to its organizational capacities: it cannot be neglected by anyone, including the countries on the path of integration. The ecological constellation determines biophysical aspects and limitations of economizing concerning demand and supply.

Relatively rarely has economic science recently thematized the problem of the relationship between austerity as a paradigm and the ecological horizon of economizing. Finally, if austerity is associated with scarcity, as indeed it has been indicated at the beginning, it can even be said that, if the effect of austerity is a reduction in resource demand, that could mean a reduced strain on the environment, and even reducing prices of resources. In this case, we do not need to justify in detail how it is applicable to ecological economizing: since a famous economist, Stanley Jevons, has already recognized the so-called rebound effects (usually, it is about a divergence between "non-realized savings" in the practice of the using of resources in relation to "potential savings"), the

rationalization of resource efficiency is of paramount importance. But here, once more, we cannot ignore the objections against austerity, although we now apply it only to this case. Therefore, austerity diminishes the effects of public services, as well as their financial justification, and the anticipation of employment dynamics. As the research shows, even the impact on resource efficiency is very fragile and it is difficult to realize undeniable trends based on that (Chen & Galbraith, 2011). (There are possible reflections indicating that the alternation between a stimulus and austerity will move towards a blind alley, whereas the structure of fixed costs in relation to biophysical constraints of economizing will remain unchanged.)

Here, we only want to derive further insights on the basis of what has already been said in the previous section. If we found it appropriate to emphasize the intensity of risks and uncertainties, the same intention is even more pronounced here. Namely, in ecological systems, risk and uncertainty, as well as the highlighted complexity, are even more pronounced: the same instances can be said to be comprehensive here. It should not be forgotten that many descriptions that, since their affirmation, have been dealing with the ecologization of the economy, have precisely indicated a high degree of uncertainty in ecological systems (for example, the post-normal logic of the management of the earth resource system). As the same descriptions that, of course, had to be made, have emphasized, they are temporal sequences (the relationship between long and short deadlines) otherwise different from those in the economy, which further complicates the diagnosis and anticipations, as well as the calculation (discounting etc.). Here, there are transnational externalities that further complicate calculations and represent additional moments in terms of the mechanisms of inclusion in the rut of the world trends. Accordingly, if the issue of resource efficiency is to be posed, or another problem connected with the environmental dimensions of production is to be dealt with, the "nexus between risk and rewards" arises once again, but in an altered way, which once again, is impossible to understand through the logic of austerity.

Therefore, the findings about the necessity of reducing the complexity should be applied here as well. In other words, if risk and uncertainty are involved with ecologization, a broad interaction between public and private actors should be considered, as well as the constitutive role of the state. Finally, the ever-expanding field of ecological innovation cannot be subordinated: so, in this case too, we have in mind the creative role of the state. It should not be forgotten that the ecological horizon of economizing is not only "biofuel", but rather a new innovative system, a technological regime or a new logic (Mazzucato & Perez, 2014) of obsolescence.

Let us take a look at the following illustration:

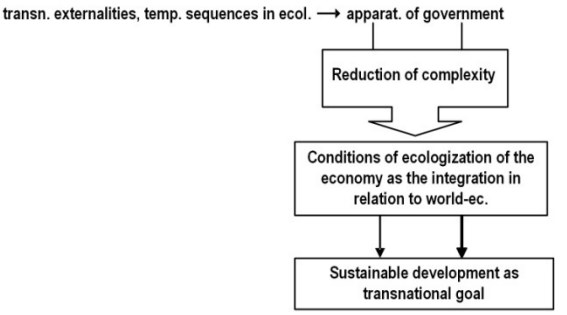


**Figure 5** Transn. externalities, temp. sequences, apparat. of government
**Source:** The author's source

## 4. Development as design

The phrase "developmental state" still exists. It has been discussed many times, especially the developmental state of East Asian countries, namely due to their successes and breakthroughs, globally speaking. At the same time, this phrase has been criticized, and it has been indicated that in no case can it be applied to other countries (Song, 2011). We mentioned this because there are certain aspects of our work that intersect with some reflections which can be found within this concept; finally, we have also used the term that makes a connection between the state and development. We have, however, focused on a different way in terms of re-conceptualization. Our orientation relies on certain insights in the revision of certain positions regarding the role of the state in relation to the mode of integration into the international mainstream (Bergh & Henrekson, 2011). Furthermore, we combine the two approaches that we have significantly adjusted to the chosen topic.

The first approach appears in the research with respect to innovative regimes for "directions of change" regarding the position of the state. That the state does not regulate specific innovative paths, but rather determines "paths of change", is emphasized. For us, this means that, by reducing complexity, the state directs paths of innovations. Another approach appears in the discourse of the European commission, referring to the concept of

design, emphasizing that the concept should be applied in a broader sense, especially when it comes to sustainability. That the procedural notion of design includes the coverage of complexity in tailoring policies according to a wider environment is highlighted.

We hereby explain the terms in question in the following way. Namely, according to design, there are at least three orientations:

- interdisciplinary competencies,
- holistic knowledge in relation to problem solving and confrontation with risk and uncertainty,
- transformative capacities.

According to the above-mentioned, we are speaking about development as design, namely about the paradigm of development inclusive of these orientations. Since the state following development as design does not remain anchored on the paths of austerity, it creates conditions for development and, thus, for inclusion in the global economy. Let us look at the following illustration:

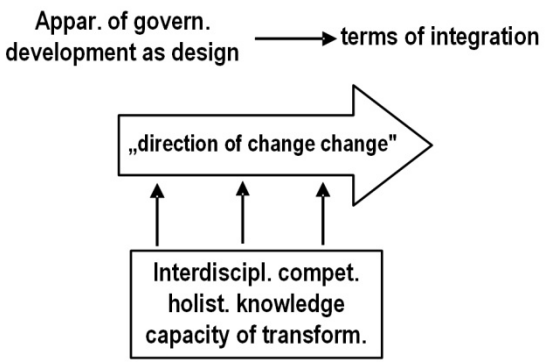


**Figure 6** Transn. externalities, temp. sequences, apparat. of government
**Source:** The author's source

## Conclusion

We started from the notion that austerity as a paradigm is currently a strongly present pattern existing as scenarios of involvement in the global economy. Afterwards, we acknowledged the relevant criticisms related to austerity, and expressed a view that austerity could only exist as a subordinate part of the re-conceptualized idea of development. We attempted to specifically analyze the position of the state in terms of development, taking into account the specific knowledge of the dynamics of innovative regimes and ecology. In particular, we emphasized the issues of risk and uncertainty as well as the role of the state as the reducer of complexity. At the same time, we illustrated this argument in the context of integrative processes in the world economy. We concluded that the state comprehended in this way can be understood in terms of development as design, and we determined the way we interpret the meaning of this term. SM

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Ljubojević, T.K. (2000b).
Ljubojević, T.K., & Dimitrijević, N.N. (1994).

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Dimitrijević, M. (2009, September). MySql server, writing library files. *Computing News, 57,* 10-12.

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VBScript with active server pages. (2009, September). *Computing News,57,* 21-22.

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*Web user interface* (10th ed.). (2003). Subotica: Faculty of Economics.

➲ **Group, corporate, or government author**

Statistical office of the Republic of Serbia. (1978). *Statistical abstract of the Republic of Serbia*. Belgrade: Ministry of community and social services.

➲ **Edited book**

Dimitrijević, M., & Tanasijević, V. (Eds.). (2004). *Data warehouse architecture*. Subotica: Faculty of Economics.

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➲ **Encyclopedia entry**

Mirković, D. (2006). History and the world of mathematicians. In *The new mathematics encyclopedia* (Vol. 56, pp. 23-45). Subotica: Faculty of Economics.

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Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54. Retrieved from http://www.ef.uns.ac.rs/mis/TestDriven.html.

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According to Mirković (2001), "The use of data warehouses may be limited, especially if they contain confidential data" (p. 201).

> Mirković (2001), found that "the use of data warehouses may be limited" (p. 201). What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in parentheses must be placed at the end of the quotation, e.g.

> He stated, "The use of data warehouses may be limited," but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ **Summary or paraphrase**

> According to Mirković (1991), limitations on the use of databases can be external and software-based, or temporary and even discretion-based. (p.201)

> Limitations on the use of databases can be external and software-based, or temporary and even discretion-based (Mirković, 1991, p. 201).

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> Boškov (2005) compared the access range…
>
> In an early study of access range (Boškov, 2005), it was found...

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> (Jovanov, Boškov, Perić, Boškov, & Strakić, 2004).

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> According to Jovanov et al. (2004), further occurences of the phenomenon tend to receive a much wider media coverage.
>
> Further occurences of the phenomenon tend to receive a much wider media coverage (Jovanov et al., 2004).

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>
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> (Bezjak, 1999; Griffith, 2004)

➲ **Two or more works by the same author in the same year**

If two or more sources used in the submission were published by the same author in the same year, the entries in the reference list must be ordered using lower-case letters (a, b, c…) with the year. Lower-case letters will also be used with the year in the in-text citation as well:

> Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work**, when you have not read the original:

Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

(Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**:

(Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

(Mirković & Boškov, 2006, p.12)

Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

(Theissen, 2004a, chap. 3)

(Keaton, 1997, pp. 85-94)

➲ **Personal communications, including interviews, letters, memos, e-mails, and telephone conversations**, are cited as below. (These are *not* included in the reference list.)

(K. Ljubojević, personal communication, May 5, 2008).

## FOOTNOTES AND ENDNOTES

A few footnotes may be necessary when elaborating on an issue raised in the text, adding something that is in indirect connection, or providing supplementary technical information. Footnotes and endnotes are numbered with superscript Arabic numerals at the end of the sentence, like this.[1] Endnotes begin on a separate page, after the end of the text. However, Strategic Management journal **does not recommend the use of footnotes or endnotes.**

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