Risk Analysis for Realization of Project “European Quality of Health through Reconstruction and Energy Efficiency in Multi-specialized Hospital for Active Treatment Ruse”

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Abstract: The object of this paper is to present an analysis of the risk enterprise in the project BG161RO001.1.1-08/2010/006 “The European healthcare quality through reconstruction and energy efficiency in Ruse Hospital,” its specific deviations and plans to get out of difficult situation in the implementation of the project. By modernizing health infrastructure of the Ruse hospital and commissioning of medical equipment for high-tech hospital activities in terms of diagnosis and treatment of malignancies an increase in the competitiveness of Ruse Hospital and its recognition as a leading medical center in Ruse region and across North Central region is intended. Risk analysis in project implementation helps build a methodology for proper planning and dealing with the real process of implementation through appropriate corrective measures

Key words: risk analysis, risk control, action plan, magnetic resonance system, computer tomograph, electronic system.

Резюме: Изпълнението на проект по доставка на апаратура в болница Русе и извеждане на социалната им ефективност. Целта на този доклад е да представи анализ на риска в изпълнение на проект BG161RO001.1.1-08/2010/006 "Европейско качество на здравеопазване чрез реконструкция и енергийна ефективност на Болница Русе" при неговото специфично изпълнение. Чрез модернизиране на здравната инфраструктура на Болница Русе и въвеждане в експлоатация на медицинско оборудване, с което да се предоставят високотехнологични болнични услуги по отношение на диагностиката и лечението на злокачествени заболявания. Целта на проекта е да се увеличи конкурентоспособността на Болница Русе. Очаква се лечебното заведение да бъде признато като водещ медицински център в област Русе и в целия Северен централен регион. Анализ на риска при изпълнението на проекта помага за изграждане на
I. Introduction

According to recent analyzes of European organizations, the healthcare in the European Union is generally improving and this is largely due to increased investment in European projects for modernization of healthcare. The main topic is to manage risk while realizing the project goals.

Ruse Hospital for Active Treatment is working on a project BG161RO001.1.1-08/2010/006 since 2011 “The European healthcare quality through reconstruction of the energy efficiency in MBAL Ruse”, which is an integral part of the medium-term framework investment program in implementation of the Framework Agreement BG161PO001-1.1.08-0001-1 on a scheme for providing grants BG161PO001/1.1-08/2010. “Support for reconstruction, renovation and equipping of the state medical and health facilities in the urban agglomerations”, which are implemented with the financial support of Operative Program “Regional Development” 2007 to 2013 financed by the European Union through the European Regional Development Fund (Ministry of Finance of the Republic of Bulgaria, 2005; Dasgupta, Marglin & Sen, 1972; European Commission, 2003; European Commission, 2004b).

The aim of this paper is to present the analysis of risk in the implementation of project “The European healthcare quality through renovation and energy efficiency in the MBAL Ruse”.

II. Determination of Methods, Responsible for Risk Taking

In the realization of the project within the approved plan corrective operations are not necessary, but in case of incompatibility between the actual and planned performance it is necessary to take corrective actions.

A definition of the corrective actions is

I. Въведение

Здравеопазването в Европейския съюз, според последните анализи на европейски организации, като цяло се подобрява и това до голяма степен се дължи на увеличените инвестиции по Европейски проекти за модернизирание на здравеопазването. Русенската мно- гопрофилна болница за активно лечение (МБАЛ Русе) от 2011 г. работи по проект BG161PO001.1.1-08/2010/006 “Европейско качество на здравеопазването чрез реконструкция и енергийна ефективност в Многопрофилна болница за активно лечение Русе”, който е неразделна част от Средносрочната рамкова инвестиционна програма в изпълнение на Рамково споразумение BG161PO001-1.1.08-0001-1 по схема за предоставяне на безвъзмездна финансова помощ BG161 PO001/1.1-08/2010 “Подкрепа за реконструкция, обновяване и оборудване на държавните лечебни и здравни заведения в градските агломерации”, които се осъществяват с финансовата подкрепа на Оперативна програма „Регионално развитие“ 2007-2013г., съфинансирана от Европейския съюз чрез Европейски фонд за регионално развитие (Ministry of Finance of the Republic of Bulgaria, 2005; Dasgupta, Marglin & Sen, 1972; European Commission, 2003; European Commission, 2004b).

Целта на статията е да се представи анализ на риска при реализиране на проект “Европейско качество на здравеопазването чрез реконструкция и енергийна ефективност в МБАЛ Русе”.

II. Определяне на методи, отговарящи за поемане на риск

При изпълнение на проекта в рамките на одобрения план не са необходими коригиращи действия, но в случай на несъответствие между фактическото изпълнение и планираното е необходимо предприемане на коригиращи действия.

Дефинирането на коригиращите действия се извършва в документ, който е
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provided in a document that is part of the whole document "Risk Management" and is called "Plan for risk management." It consists of two main parts: description of the activities that should be done to take the risk and update the "matrix division of responsibilities" by developing a "matrix of risk distribution." (Nonchev, 2009; Brau & Florio, 2004; Department of Health, 1995; Drummond et al., 2005; Flyvbjerg, Bruzelius & Rothengatter, 2001; Pohl & Mihaljek, 1991; Pohl & Mihaljek, 1992).

In the plan for management of the risk are recorded the activities, that should be taken in reference to the risk. The main direct activities of the project are:

- Supply of high-tech equipment, which will enhance the competitiveness of MBAL Ruse and approve it as a leading medical center in Ruse region, and particularly in the North Central region (Manukova, 2011; De Rus & Nash, 2007; Asian Development Bank, 2002; Dixit & Pindyck, 1994);
- Building repairs (building of 2 lifts and sterilization department);
- Accompanying indirect activities: project management, auditing, publicity and others.

The most common measurements are (Drummond & McGuire, 2001; Mooney, 1992; Flyvbjerg, Bruzelius & Rothengatter, 2001; Pohl & Mihaljek, 1991; Pouliquen, 1970):

**Risk rejection** - to make recalculation of these risk parameters for which the risk is in values that are unacceptable to the individual participants. At the recalculation process the data, which are "most sensitive" are altered. In this particular project this is done for risk-sharing, which is contained in the contracts between the Employer - in this case the **Ministry of Health** and various contractors on the project (suppliers and builders).

**Risk controlling** - the values obtained for the risk are considered final. There are actions planned to be carried out to ensure the quality of the variables quantities that are at risk, so as not to reach their final negative values. For example, if the esti-
mated duration of the critical path has a high percentage of risk control activities on the „most sensitive” works must be planned, and in case of reaching a longer duration of the variable, additional measures have to be taken right away, such as providing more resources (funds, labor, materials, etc.).

1. Upon delivery of Multi-detector CT (computed tomography) the risks are:
   - Risk during the delivery – to occur unforeseen circumstances such as damage of the road (Danube Bridge) and late delivery. For this purpose we provide both type of transport on land and sea;
   - Hazard during operation with CT not to reduce the time taken for the procedure.

2. Risk during Supply of Stationary digital graphic X-ray image appliance
   - Risk of improper assembly of the apparatus. Confusion of plates in the assembly process, which results in short circuit and creates a risk of burning the specialized equipment.
   - Risk of improper adjustment of the apparatus, which can result in too high radiation load for the patient during the examination.

3. Risk during delivery of medical Ultrasound systems
   - Risk of being unable to activate five Doppler display modes;
   - Risk of failure for a wide frequency range of the probe sets.

4. Risk during supply of Magnetic-resonance imaging system
   - Risk of impossibility to start work - for example, during the operation with the apparatus is used helium. During its transportation the helium may run out and after the delivery of the appliance it is not able to start work. As a result it would be necessary to return the apparatus to the producers factory and ship it again.
   - Risk of late delivery.

Sharing the risk – the control over the modification of the individual risk param-

изчислената продължителност по критичния път е с висок процент на риск, задължително се планират дейности по контрола върху „най-чувствителните” работи и в случай на достигане на по-голяма продължителност от приемливата, веднага да се предприемат допълнителни мерки, като осигуряване на повече ресурси (финансови средства, труд, материали и др.).

1. При доставка на Многодетекторен компютърен томограф рисковете са:
   - Риск при доставката да се проявят непредвидени обстоятелства като повреда на пътя (Дунав мост) и забавяне на доставката. За целта се подсигурява както сухопътен така и морски транспорт;
   - Риск при работа на апарата да не се намалява времето за провеждане на процедури;

2. Риск при доставка на Стационарен дигитален графичен рентгенов апарат
   - Риск от недобро сглобяване на апарата. Объркване на платки и пластини при сглобяването, в следствие на което се предизвиква късо съединение и съществува риск от изгаряне на специализираното оборудване.
   - Риск от недобре настройване на апарата, в следствие на което да се постигне прекалено високо лъчево на- товарване за пациента по време на изследването;

3. Риск при доставка на Ехографски системи
   - Риск от невъзможност да се активират пет доплерови режима на изображаване;
   - Риск от невъзможност за широк честотен диапазон на сондите на апаратата;

4. Риск при доставка на Магнито-резонансна образна система
   - Риск от невъзможност да заработи апарата – например при работата на апарата се използва хелий. При транспорта на апарата, хелия изтича и при доставката не е възможно да бъде започната работа. В резултат се наложи връщане на апарата до завода произвodu- дител и доставка отново.
   - Риск от ненавременна доставка.
eters will be distributed among the project participants, as this process is regulated in very clear and well defined conditions, rights, responsibilities, etc. An example of risk sharing in the project is contained in the contract between the contracting authority and the contractor under the project.

Transferring the risk - the risk is shared with an additional participant who so far has not been included as a participant in the project. An example of transfer of risk is the insurance or the bank guarantee. Example: When one of the companies slides in bankruptcy or lacks liquid funds to be granted a credit from a financial institution to complete the project (this is in the basis of the bank guarantee).

Taking the risk - if the risk parameters of the project are within the risk, that is accepted for small or moderate, there are not planned additional activities besides the standard ones, related to the entire management of the project.

III. Measurement for Control of the Risk.

The measures for taking a risk with reference to the duration of each construction and mounting works in general, and the groups from the building works in the investment project are related to:

1. Providing additional working hours to cover the delays in implementation. Weekends during the period of performance of each group of work or long working hours are foreseen to be used as such reserve fund. In the present investment projects, the probability of delay in the implementation is significant at the examination of the risk of the duration. At the same time, the necessary amount of working time is provided to ensure the implementation of these groups of work with the terms that are foreseen in the technical project. Simultaneously, it has been found that the available reserve time is completely enough to cover possible delays of these groups of work, in which case additional reserve of time is left, which can cover unforeseen delays due to force majeure circumstances.
2. As a second measure to overcome the risk, relevant to the time for implementation of the works in the Investment project is indicated the augmentation of the duration of the working day. In this way, depending on the delay in the agreed time-frame, additional amount of working time of the contractors in the project should be ensured.

3. At the third place is the provision of additional resources - labor, materials and mechanization to compensate for the time lag.

**Measures to control the risk regarding the value of the construction and installation works**

In the process of the development of the investment project are taken into account the possible changes in the prices of the resources during the period of implementation of the construction and installation works. This means that the prices, set in the project, of the various factors involved in the production process are averaged, according to the prices of these factors in the beginning of the period of implementation of the project and the expected price change according to inflation rates by types of goods and services, fees, etc., during the period provided for the project (24 months).

**Measures for assuming the risk connected with the value change of the particular production factors** - wage of the contractors, materials, cost of mechanization, etc., are the following:

1. Provision of additional funds for compensation of the cash needs arises.

2. In order to save money on condition that the quality of the materials needed is not neglected, in the **Contract between the Contracting Authority and the Contractor** is foreseen a clause in which the Contracting Authority in the Project – The Hospital participates in negotiating the prices of the purchased materials.

These measures, which adjust the duration of the individual works and groups of works in the project, as well as the measures related to overcoming the risk of the project costs are set out in the planning.
stage of the implementation of the investment project.

Depending on the occurrence of the risk are identified the appropriate persons in charge:

- **untimely financing** - Responsible for the Management, Ministry of Health;
- **failure of the procedure under ZOP** - Deputy Director for Economic activities of the companies executors;
- **incorrect attitude of the contractors** (violating the terms of contracts) - Project Manager, Design Engineers, Construction Supervision;
- **bad weather** - Project Manager, the contractors
- **accidents and damage** - Project Manager, the contractor;
- **change in macroeconomic indicators of the environment** - Project Manager, Managing Director and Economic Director.

The total value of the different spheres of the risk shows that the project has a very low stage of risk. The first step in the analysis is to determine the risks associated with the realization of the project. They can be external - arising from the external environment (legal framework, political situation, weather conditions, etc.), or internal - arising from the operation of the port operator.

Based on the policy of the management of the public property and with reference to the accession of our country to the European Union, the probability of part of the risks to occur is minimal (e.g. currency risk, political risk, interest rate risk. Occurrence of other risks would either bring in reduction of the incomes under the levels that are set in the model, or additional expenses for investments for operation or maintenance of the hospital (risk of the performance, risk associated with the design, force majeure risk, inflation risk, regulatory risk, technology risk, residual value). Here why the analysis focuses on 4 main groups of risks:

**Construction risk** - these include: Geological risk, Risks of flooding and storms

В зависимост от поява на риска са определени и съответните отговорници:

- **ненавременно финансиране** – Отговорните за управление, Министерство на здравеопазването;
- **провяляне на процедурата по ЗОП** – Зам.Директор по икономическите дейности, фирми изпълнители;
- **некоректно отношение на фирмите изпълнители** (нарушаване клаузите на сключените договори) – Ръководител проект, Проектанти, Строителен надзор;
- **лоши климатични условия** – Ръководител проект, Фирми изпълнители;
- **аварии и повреди** - Ръководител проект, фирми изпълнители;
- **промяна в макроикономическите показатели на средата** – Ръководител проект, Изпълнителен директор и Икономически директор.

Общата стойност на различните сфери на риска показва, че проектът е с много ниска степен на риск. Първата стъпка при анализа е определянето на рисковете, свързани с реализацията на проекта. Те могат да бъдат външни - произтичащи от външната среда (правна рамка, политическа конюнктура, природни условия и др.), или вътрешни - породени от дейността на пристанищния оператор.

Изхождайки от политиката на стопанисване на публичната собственост и с оглед присъединяването на страната към Европейския съюз, вероятността част от рисковете да настъпят е минимална (напр. валутен риск, политически риск, лихвен риск. Настъпването на останалите рискове би довело или до понижаване на приходите под заложените в модела нива, или до допълнителни разходи за инвестиции, по експлоатацията или поддръжката на лечебното заведение (риска на изпълнението, риск, свързан с проектирането, форсмажорен риск, инфлационен риск, регулаторен риск, технологичен риск, риск на остатъчната стойност). Ето защо анализът се фокусира върху 4 основни групи рискове:

**Строителен риск** – тук се включват: Геологически и геодезически риск; Риск от наводнения и бури по време на...
during the construction process, Increase in the cost of the building activities during the execution; Risk of poor management during the construction; Archaeological risk through excavation. These risks are covered by the contract for implementation, as an obligation of the contractor and, therefore, their value is summarized, expressed by the value of investments. The probability of predefined investment costs to be exceeded is with 5, 10 or 15 %, or to be reduced - with 5%;

**Operational risk** – it is associated with events during the operation of the newly constructed assets and includes as follows:

- Increased operating costs;
- Natural disasters that can lead to destruction of assets;
- Poor or improper management of the newly constructed assets and others.

Quantitative values of the risks are reflected in the obligations of the contractors. There are discounted expenditures for operation and current repair of the system. The likelihood that the expenditures for the adequate exploitation of the assets should exceed the predefined ones is for 5, 10 or 15%, or to be at levels 5% under them ;

**Market risk** - it is connected with the incomes from the activity that are intended for the project assets and include respectively:

- Risk of low revenue collection;
- Delay in project implementation and hence a smaller volume revenue.

These risks are reflected in the discounted cash incomes from the project activity. The likelihood that the revenue from making health services should be lower than the ones that are set in the financial model is for 5, 10 or 15%, or to exceed them by 5%.

**Maintenance Risk** – the cost of maintaining the assets exceeds the predefined one with 5, 10 or 15% or is 5% below them. The distribution of risks is presented in Table 1.
<table>
<thead>
<tr>
<th>Risk performance</th>
<th>Scenario</th>
<th>Weight</th>
<th>Value</th>
<th>Probability</th>
<th>Risk value</th>
<th>Retained risk</th>
<th>Transfer risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>(likelihood of completion of construction activities of the project to be delayed so that the provision of services may not start on the scheduled date)</td>
<td>Under base expenditure: Подбазовите разходи</td>
<td>-5.00%</td>
<td>€ 14,685,993</td>
<td>-€ 734,300</td>
<td>5.00%</td>
<td>€ 0</td>
<td>€ 0</td>
</tr>
<tr>
<td>(вероятността за вършването на строителните дейности по проекта да се забавят до такова, че предоставянето на услугите да не започне в предвидения срок)</td>
<td>Base expenditure: Базови разходи</td>
<td>0.00%</td>
<td>€ 15,458,939</td>
<td>€ 0</td>
<td>20.00%</td>
<td>€ 0</td>
<td>€ 0</td>
</tr>
<tr>
<td>Slight increase</td>
<td>Леко превишение</td>
<td>10.00%</td>
<td>€ 15,458,939</td>
<td>€ 1,545,894</td>
<td>40.00%</td>
<td>€ 618,358</td>
<td>5.00%</td>
</tr>
<tr>
<td>Moderate increase</td>
<td>Умерено превишение</td>
<td>20.00%</td>
<td>€ 14,053,581</td>
<td>€ 2,810,716</td>
<td>30.00%</td>
<td>€ 0</td>
<td>€ 0</td>
</tr>
<tr>
<td>Serious increase</td>
<td>Сериозно превишение</td>
<td>40.00%</td>
<td>€ 11,711,318</td>
<td>€ 4,684,527</td>
<td>5.00%</td>
<td>€ 0</td>
<td>€ 0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Общо</strong></td>
<td><strong>8 365</strong></td>
<td><strong>227.00</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>€ 618,358</strong></td>
<td><strong>-€ 30,918</strong></td>
<td><strong>€ 587,440</strong></td>
</tr>
<tr>
<td>Construction risk</td>
<td>Scenario</td>
<td>Weight</td>
<td>Value</td>
<td>Weight</td>
<td>Probability</td>
<td>Risk value</td>
<td>Retained risk</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------</td>
<td>----------------</td>
<td>--------</td>
<td>-------------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Строителен риск</td>
<td>Under base expenditure: Подбазовите разходи</td>
<td>-5.00%</td>
<td>-39,914 €</td>
<td>1,996 €</td>
<td>10.00%</td>
<td>200 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Base expenditure: Базови разходи</td>
<td>0.00%</td>
<td>-42,015 €</td>
<td>0 €</td>
<td>35.00%</td>
<td>0 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Slight increase: Леко превишение</td>
<td>5.00%</td>
<td>-44,115 €</td>
<td>-2,206 €</td>
<td>20.00%</td>
<td>-441 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Moderate increase: Умерено превишение</td>
<td>10.00%</td>
<td>-46,216 €</td>
<td>-4,622 €</td>
<td>30.00%</td>
<td>-1,386 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Serious increase: Сериозно превишение</td>
<td>20.00%</td>
<td>-50,418 €</td>
<td>-10,084 €</td>
<td>5.00%</td>
<td>-504 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Total: Общо</td>
<td>100.00%</td>
<td>-2,132 €</td>
<td>0 €</td>
<td>-2,132 €</td>
<td>0 €</td>
<td>-2,132 €</td>
</tr>
</tbody>
</table>

(probability of exceeding a predefined cost during the design and construction of the project)
<table>
<thead>
<tr>
<th>Operational risk</th>
<th>Scenario</th>
<th>Weight</th>
<th>Value</th>
<th>Weight</th>
<th>Probability</th>
<th>Risk value</th>
<th>Retained risk</th>
<th>Transfer risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Under base expenditure</td>
<td>-5.00%</td>
<td>-394,659 €</td>
<td>19,733 €</td>
<td>10.00%</td>
<td>1,973 €</td>
<td>0 €</td>
<td>1,973 €</td>
</tr>
<tr>
<td></td>
<td>Base expenditure</td>
<td>0.00%</td>
<td>-415,430 €</td>
<td>0 €</td>
<td>55.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>0 €</td>
</tr>
<tr>
<td></td>
<td>Slight increase</td>
<td>5.00%</td>
<td>-436,202 €</td>
<td>-21,810 €</td>
<td>20.00%</td>
<td>-4,362 €</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td></td>
<td>Moderate increase</td>
<td>10.00%</td>
<td>-456,973 €</td>
<td>-45,697 €</td>
<td>10.00%</td>
<td>-4,570 €</td>
<td>0 €</td>
<td>-4,570 €</td>
</tr>
<tr>
<td></td>
<td>Serious increase</td>
<td>20.00%</td>
<td>-523,442 €</td>
<td>-104,688 €</td>
<td>5.00%</td>
<td>-5,234 €</td>
<td>0 €</td>
<td>-5,234 €</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>100.00%</td>
<td>-12,193 €</td>
<td>0 €</td>
<td></td>
<td>-12,193 €</td>
<td>0 €</td>
<td>-12,193 €</td>
</tr>
<tr>
<td>Scenario</td>
<td>Value (€)</td>
<td>Probability</td>
<td>Weight</td>
<td>Transfer risk (€)</td>
<td>Retained risk (€)</td>
<td>Total (€)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>-------------</td>
<td>--------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under base expenditure:</td>
<td>4,147,720 €</td>
<td>5.00%</td>
<td>-20.00%</td>
<td>-1,147 €</td>
<td>0 €</td>
<td>-20.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight increase</td>
<td>466,560 €</td>
<td>10.00%</td>
<td>-10.00%</td>
<td>-66,666 €</td>
<td>-1,147 €</td>
<td>-10.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate increase</td>
<td>492,480 €</td>
<td>15.00%</td>
<td>-5.00%</td>
<td>-24,624 €</td>
<td>0 €</td>
<td>-5.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious increase</td>
<td>518,400 €</td>
<td>15.00%</td>
<td>0.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>0.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>544,320 €</td>
<td>55.00%</td>
<td>100.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Base expenditure</strong></td>
<td>466,560 €</td>
<td>10.00%</td>
<td>-10.00%</td>
<td>-4,666 €</td>
<td>0 €</td>
<td>-10.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>492,480 €</td>
<td>15.00%</td>
<td>-5.00%</td>
<td>-24,624 €</td>
<td>0 €</td>
<td>-5.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>518,400 €</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>0.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>544,320 €</td>
<td>55.00%</td>
<td>100.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Risk Analysis for Realization of Project "European Quality of Health through Reconstruction and Energy Efficiency in Multi-specialized Hospital for Active Treatment Ruse"

<table>
<thead>
<tr>
<th>Maintenance Risk Scenarios</th>
<th>Scenario</th>
<th>Weight</th>
<th>Value</th>
<th>Weight</th>
<th>Probability</th>
<th>Risk value</th>
<th>Retained risk</th>
<th>Transfer risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>(likelihood of maintaining cost of the assets to exceed the predefined one)</td>
<td>Under base expenditure: Подбазовите разходи</td>
<td>-5.00%</td>
<td>-73,872 €</td>
<td>3,694 €</td>
<td>10.00%</td>
<td>369 €</td>
<td>0 €</td>
<td>369 €</td>
</tr>
<tr>
<td>(вероятността разходите по поддръжката на активите да превишат предварително заложените)</td>
<td>Base expenditure: Базови разходи</td>
<td>0.00%</td>
<td>-77,760 €</td>
<td>0 €</td>
<td>55.00%</td>
<td>0 €</td>
<td>0 €</td>
<td>0 €</td>
</tr>
<tr>
<td>Slight increase</td>
<td>Леко превишение</td>
<td>5.00%</td>
<td>-81,648 €</td>
<td>-4,082 €</td>
<td>20.00%</td>
<td>-816 €</td>
<td>0 €</td>
<td>-816 €</td>
</tr>
<tr>
<td>Moderate increase</td>
<td>Умерено превишение</td>
<td>10.00%</td>
<td>-85,536 €</td>
<td>-8,554 €</td>
<td>10.00%</td>
<td>-855 €</td>
<td>0 €</td>
<td>-855 €</td>
</tr>
<tr>
<td>Serious increase</td>
<td>Сериозно превишение</td>
<td>20.00%</td>
<td>-93,312 €</td>
<td>-18,662 €</td>
<td>5.00%</td>
<td>-933 €</td>
<td>0 €</td>
<td>-933 €</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Общо</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>-2,236 €</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>-2,236 €</strong></td>
</tr>
</tbody>
</table>
Upon realization of the project two main economics indicators are observed (European Commission, 2008; Belli, Anderson, Barnum, Dixon & Tan, 2001; Estache & Serebrisky, 2004; European Commission, 2004a) - Net Present Value and Internal Rate of Return (Boardman, Greenberg, Vining & Weimer, 2006; Costa & Ramos, 1995; Gudex, Kind, Van Dalen, Durand, Morris & Williams, 1993; Reutlinger, 1970). The changing of risk management has impact on the cash flows and regulatory economic indicators.

The results of event risk on the net present value and internal rate of return are as follows in Table 2:

<table>
<thead>
<tr>
<th>Risk</th>
<th>Scenario</th>
<th>Weight</th>
<th>Increase Value</th>
<th>Net Present Value</th>
<th>Internal rate of return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation Risk</td>
<td>Investment costs</td>
<td>0%</td>
<td>7,950,169,87</td>
<td>-7,946,438,26</td>
<td>-54,12%</td>
</tr>
<tr>
<td></td>
<td>Slight increase</td>
<td>5%</td>
<td>8,347,678,37</td>
<td>-8,343,946,75</td>
<td>-53,75%</td>
</tr>
<tr>
<td></td>
<td>Moderate increase</td>
<td>10%</td>
<td>8,745,186,86</td>
<td>-8,741,455,25</td>
<td>-53,46%</td>
</tr>
<tr>
<td></td>
<td>High increase</td>
<td>15%</td>
<td>9,142,695,35</td>
<td>-9,138,963,74</td>
<td>-53,25%</td>
</tr>
<tr>
<td></td>
<td>Serious increase</td>
<td>20%</td>
<td>9,540,203,85</td>
<td>-9,536,472,23</td>
<td>-53,10%</td>
</tr>
<tr>
<td>Operating Risk</td>
<td>Operating costs</td>
<td>0%</td>
<td>141,755,561,02</td>
<td>-7,946,438,26</td>
<td>-54,93%</td>
</tr>
<tr>
<td></td>
<td>Slight increase</td>
<td>5%</td>
<td>148,843,339,07</td>
<td>179,558,973,81</td>
<td>27,21%</td>
</tr>
<tr>
<td></td>
<td>Moderate increase</td>
<td>10%</td>
<td>155,931,117,13</td>
<td>179,558,973,81</td>
<td>27,21%</td>
</tr>
<tr>
<td></td>
<td>High increase</td>
<td>15%</td>
<td>163,018,895,18</td>
<td>186,907,798,00</td>
<td>28,00%</td>
</tr>
<tr>
<td></td>
<td>Serious increase</td>
<td>20%</td>
<td>170,106,673,23</td>
<td>179,558,973,81</td>
<td>27,21%</td>
</tr>
</tbody>
</table>

**Table 2. Results from the risk analysis**

**Таблица 2. Резултати от проявата на риска**

**IV. Conclusions**

Due to prognostication of the activity of the individual executives and identifying of the problematic areas the risk of default will be minimized and painless implementation of the project will be made possible.

Modernisation of health infrastructure in Ruse hospital, AD through commissioning

**IV. Заключение**

В следствие предвиждане на дейността на отделните изпълнители и идентифициране на проблемите области ще се минимизира риска от неизпълнение и ще бъде възможно безболезнено реализиране на проекта. Модернизацията на здравната инфраструктура в МБАЛ
of medical equipment for high-tech hospital activities in terms of diagnosis and treatment of cancer, increases the competitiveness of Ruse Hospital.

The risk analysis has helped to predict and build methodology to adequately deal with the implementation of the project.

Appropriate corrective measures have proved effective and led to a reduction in terms of implementation of the project.

Consequent prediction methods have proved their effectiveness in the activity of individual performers and identifying problem areas to minimize the risk of default and have led to a painless implementation.

The investment realized in Ruse Hospital has provided the economic sustainability of the hospital, while improving the quality of diagnosis and treatment. With the implementation of the project, energy costs and time to diagnose a patient have been reduced. As a result, on the one hand, financial stability of the hospital has been achieved and on the other hand, higher satisfaction and comfort of patients has been reported.

Reference/Литература


Manukova A. (2011). Medical Electronics, Ruse: Publishing Center of University of Ruse “Angel Kunchev”.


