Project Management Development – Practice and Perspectives
Sixth International Scientific Conference on Project Management in the Baltic Countries
April 27-28, 2017, Riga, University of Latvia
ISSN 2256-0513, e-ISSN 2501-0263

AN EMPIRICAL INVESTIGATION ON THE PROJECT PORTFOLIO RISKS CORRELATIONS

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Abstract

Project portfolio risk management is currently of interest to both researchers and practitioners. To be properly conducted, portfolio manager must take a holistic approach and have appropriate competencies. Although this subject is topical and important, there is a lack of available empirical studies, concerning the issues of project portfolio risk linkages. This paper revolves around searching for correlations between risk significancy ratings in the hypothetical project portfolio. Based on literature analysis a list including risks characteristic for a project portfolio was developed. The listed risks were assessed by experts using the Delphi method. After the assessment procedure, when the expert consensus had been achieved thirty six project portfolio risks were selected. The applied research procedure assumed risk assessment, according to the approach suggested in the literature of the subject, including significance of a given risk. Significancy of risks was assessed by respondents who had an experience in the portfolio management. During the research work, Spearman's rank correlation coefficient had been applied and calculated, as well as correlations between significancy ratings for particular risks in the hypothetical project portfolio had been identified. The result of the conducted empirical research identified important correlations between risks in the project portfolio.

Key words: *project portfolio risk, project portfolio risk correlations*
JEL code: M2

Introduction

Key aspects of project risk management have been thoroughly covered in the available literature on the subject, both in terms of tools [Raz and Michael, 2001 Baccarini and Archerv, 2001] and interpersonal links [De Bakker et al., 2011]. The studies also define uncertainty and risks in terms of project management [Perminova et al., 2008]. On the other hand, project portfolio risk management is a relatively new issue [Patanakul and Milosevic 2009]. The available studies point to the considerable constraints of traditional, that is to say, single-project oriented risk management in the context of a multi-project environment [Olson, 2007]. Given the specificity of this environment, organizations that initiate projects in a changing environment implement them together, this increases their flexibility [Anavi-Isakov and Golany, 2003; Olson, 2008; Spalek, 2014].

Based on the work of Markowitz [Markowitz 1959], a portfolio can be defined as a collection of projects which facilitate the maximization of expected value if managed collectively, given the assumed level of risk [Sanchez et al., 2008, p. 97; Taroun, 2014]. The references to the literature on the subject demonstrate that portfolio risk management is a much broader issue than risk management of individual projects [Pellegrinelli, 1997] and requires a holistic view to be taken [Olsson, 2008; Lee et al., 2009]. This is due to new risks which are derived from relationships that develop between projects within the portfolio [PMI, 2008, p.85]. Identifying the risk level of projects implemented within the portfolio may be carried out in parallel; this has a positive impact on the effectiveness of these measures [Teller et al., 2012; Teller and Kock, 2013]. The question raised of the effectiveness of portfolio risk management

ISSN 2256-0513, e-ISSN 2501-0263

points to considerable expenditures involved in this operation, and refers them to the expected effects [Kutsch and Hall 2009]. Accordingly, properly conducted project portfolio risk management is conducive to minimizing the likelihood of errors and failures, which in turn has a positive impact on the success of a portfolio [De Reyck et al., 2005; Meskendahl, 2010; Teller, 2013]. On the other hand, with reference to the personal aspect, it should be noted that risk management requires a comprehensive perspective from a portfolio manager; otherwise problems with monitoring risk at the portfolio level may appear [Olson, 2007]. In other words, risk management requires unique competencies from a portfolio manager, that facilitate the development of the desired conduct of organization participants [Blomquist and Müller 2006; Jonas, 2010; Beringer et al., 2013].

Whereas the research conducted focused on the area of basic research, it was also decided to pose the following research question (PB1): which project portfolio risks will correlate with one another, on considering the significance of each of them? In order to answer the above questions, research was carried out, which involved the identification of a specific risk for a project portfolio, assessment of its significance and the calculation of correlation coefficients for individual risk pairs.

Research results

Risk identification

The studies in the literature on the subject facilitated the selection and identification of risks specific to a project portfolio [Fricke et al., 2000; Pender, 2001; Cooper et al., 2001; Pennypacker and Dye, 2002; Cooper et al., 2002; Elonen and Artto, 2003; Kendal and Rollins, 2003; Archer and Ghasemzadeh, 2004; De Reyck et al., 2005; Martinsuo and Lehtonen, 2007; Blomquist and Müller, 2006; Caron et al., 2007; Olson, 2007; Rajegopal et al., 2007; Blichfeldt and Eskerod, 2008; Müller et al., 2008; Olson, 2008; Sanhez et al., 2008; Payne, 2009; Meskendahl 2010; Jonas, 2010; Teller et al., 2012; Beringer et al., 2013; Teller et al., 2013]. All of the risks identified based on the literature on the subject were classified into one of three categories suggested in the literature (component, structural and general risk) [PMI, 2008]. The identified risks were evaluated by experts in accordance with the Delphi method [Linstone and Turoff, 2011; Von der Gracht, 2012; Hofman and Grela, 2015].

ISSN 2256-0513, e-ISSN 2501-0263

Table. 1.

Project portfolio risk list (names without descriptions)

Component risk	Structural risk	Overall risk
1.1 Significant changes in the project or program environment 1.2 Change in an approach of key project or program stakeholders 1.3 Significant change in the basic parameters of particular portfolio elements 1.4 Improperly defined priorities for particular portfolio elements 1.5 Disturbances of information flow and communication within the portfolio elements 1.6 Ignoring risks by portfolio element managers 1.7 Lack of developed methodical standards within the scope of portfolio element management 1.8 Improperly operating Steering Committees of projects, project groups and programs 1.9 Conflicts between project and program managers within the portfolio 1.10 Conflicts between portfolio element managers and the parent organization's decision-makers 1.11 Improper competencies of project and program managers 1.12 Risks arising from the application of innovative technical and material solutions in the portfolio elements	2.1 Too large portfolio from the point of view of the portfolio executors' capacity 2.2 Significant portfolio fragmentation 2.3 Overly complicated hierarchical structure of portfolio management 2.4 Significant portfolio homogeneousness 2.5 Portfolio diversity range too wide from the point of view of portfolio executors' applied capacity 2.6 Mismatch between the portfolio structure and the parent organization's strategy 2.7 Improper portfolio balance	3.1 Lack of transfer of information and knowledge among the portfolio elements 3.2 Improper control over life cycles of projects and programs 3.3 Unavailability of resources necessary to execute works within the portfolio 3.4 Lack of coordination of the involvement of key resources in the execution of the portfolio 3.5 Relationships among products created by the portfolio elements 3.6 Problems with access to the portfolio financing capital 3.7 Possibility of the lack of financial liquidity within the portfolio 3.8 Portfolio financing collapse 3.9 Non-compliance of a key element strategy with the portfolio's strategy 3.10 Conflicts among objectives of projects and programs executed within the portfolio 3.11 Conflicts between portfolio managers and portfolio element managers 3.12 Lack of involvement of top-level and middle-level managers in portfolio execution 3.13 Lack of appropriate competencies of the portfolio manager and of the portfolio support structures 3.14 Risks arising from the unknowns at the cost estimation of the execution of selected portfolio elements 3.15 Risks related to the personnel stability of the portfolio managing team and the possibility of losing key portfolio element managers 3.16 Lack of developed methodical standards within the scope of portfolio management 3.17 Formulation of fixed-price contracts for the portfolio elements

Source: Hofman M., Grela G., 2015, Project portfolio risk identification - application of the Delphi method, "Journal of Business and Economics", Vol. 6 (11), pp. 1857-1867.

ISSN 2256-0513, e-ISSN 2501-0263

Under this research phase, after reaching a consensus, experts recommended 36 risks specific to the project portfolio, that is to say, 12 risks of component risk category, 7 of structural risk category, and 17 of general risk category (see Table 1).

Research sample description

Under the next research phase, the likelihood and impact of each identified risk on the project portfolio was assessed. This assessment was made by respondents who hold professional experience in project program or portfolio management. A request for participation in the assessment of the above variables for each identified risk of the project portfolio was addressed to a group of 400 persons. 73 experts (that is to say, 18% of all respondents) assessed portfolio risk. In the group of respondents who made the assessment, 8% of respondents had amassed 16-25 years of professional experience in the management of multiple projects, 15% - 11-15 years, 47% - 5-10 years, while 30% - had less than 4 years of experience. Within the assessing group, 64% of experts worked for service companies, 21% - worked for manufacturing companies, while 11% - worked for mixed-profile companies. Based on the characteristics of the survey participants, it may be assumed that the sample included individuals with experience in the management of various project portfolios, both in terms of their size, type and industry. Respectively, it may be assumed that the results obtained may describe the materiality level and illustrate the relationships between risks for the full scope of the project portfolios.

Research procedure

As mentioned above, experts with experience in managing multiple projects assessed 36 risks identified in the formula of the Delphi method (see Table. 1). According to the approach suggested in the literature on the subject, the operationalization of each assessed risk included two variables: (1) risk likelihood, and (2) impact of the risk on portfolio goals [Baccarini and Archer, 2001; pp. 143-145; Jaafari, 2001; pp. 91-93; PMI, 2004; pp. 242-252; IPMA, 2006; pp. 47]. The variables studied were defined on an ordinal scale. A variable - risk likelihood - was shown on the following scale; 1 meant very low risk likelihood, 2 - low, 3 - average, 4 - high, 5- very high risk likelihood. A variable – risk impact - was assessed on a scale, where 1 meant very low impact of risk on portfolio goals, 2 - low impact, 3 - average impact, 4 - high impact, 5 - very high impact of risk on portfolio goals. Respondents assessed individual risks in a special questionnaire, which was posted on the website (CASI method was applied). It contained all the risks from the list, along with their names and description. Risks from the list were distributed in the questionnaire at random, in order to avoid suggesting their categorization referred to in the literature on the subject (structural and general components) to respondents [PMI, 2008]. While assessing these variables based on the experience of the last programme or portfolio managed (*ex post* approach), the respondents anticipated their likelihood and the impact of individual risks on the goals of a hypothetical portfolio (*ex ante* approach).

Research results

Due to the ordinal scale where the examined variables were measured, the pattern proposed by Ch. Spearman [Fieller, Hartly and Pearson, 1957; Zar, 1972] was used to determine

ISSN 2256-0513, e-ISSN 2501-0263

their correlation. Tables 3a, 3b, 3c and 3d attached hereto show Spearman's rank correlation coefficients defining correlations between respondents' assessments concerning the significance of project portfolio risk. In order to assess the statistical significance, the threshold of $p<0.05$ was adopted. To interpret the correlation level, the approach suggested by J. D. Evans was applied, where correlation in the range of 0.4 - 0.59 is referred to as moderate, and that of 0.6-0.79 - as strong [Evans, 1996]. The analysis omitted correlations below 0.4, determined by Evans as weak and very weak.

After rejecting the values below 0.4, following the analysis of the obtained results, correlations between 0.4-0.59 and 0.6-0.79 were identified. 0.69 was the highest correlation level, and it was posted as a risk significance between 3.13 (lack of appropriate competencies of the portfolio manager and of the portfolio support structures) and 1.7 (lack of developed methodical standards within the scope of portfolio element management). Two more correlations were identified in the strong section, that is to say:

- 3.16 (lack of developed methodical standards within the scope of portfolio management) and 1.7 correlation of 0.61,
- 3.11 (conflicts between portfolio managers and portfolio element managers) and 1.9 (conflicts between project and program managers within the portfolio) correlation of 0.67.

Lack of appropriate competencies of the portfolio manager and of the portfolio support structures directly translates into methodological standards for the management of both portfolio elements and the entire portfolio. Employing a relevant manager at the position responsible for project portfolio management in an organization is a key determinant of the possibility of attaining goals set by the parent organization. Consequently, this person should be particularly verified for their skills and experience in project portfolio management upon selection.

In the range 0.4-0.59, the correlations between the following variables were identified: 1.2 and 3.15, 3.1, and 1.3, 2.6 and 1.3, 1.4 and 1.1, 1.4 and 2.7, 1.5 and 3.1, 3.1 and 1.6, 1.7 and 1.9, 1.7 and 1.10 , 1.7 and 2.3, 1.7 and 3.2, 1.7, and 3.11, 3.16 and 1.8, 3.13, and 1.8, 1.10, and 1.8, 1.9 and 1.10, 1.9, and 3.4, 1.10, and 3.16, 3.13, and 1.10, 1.10, and 3.11, 1.10, and 3.9, 3.2 and 1.10, 2.3, and 1.10, 3.14 and 1.12, 2.2 and 3.11, 2.3, and 3.9, 2.3 and 3.10, 2.3 and 3.11, 2.3, and 3.13, 3.16, and 2.3, 2.6 and 3.9, 3.2 and 3.3, 3.2 and 3.14, 3.4 and 3.11 , 3.6 and 3.7, 3.7 and 3.8, 3.7 and 3.16, 3.9 and 3.10, 3.9 and 3.16, 3.10, and 3.11, 3.11, and 3.13, 3.16, and 3.11, 3.13, and 3.16, 3.14, and 3.17, 3.16 and 3.17 (see Table 3a , 3b, 3c, 3d attached hereto. The most interesting correlations between risks in this range include:

- correlation between risk 1.4 (improperly defined priorities for particular portfolio elements) and risk 2.7 (improper portfolio balance) of 0.49,
- correlation between risk 3.4 (lack of coordination of the involvement of key resources in the execution of the portfolio) and risk 1.9 (conflicts between project and program managers within the portfolio) of 0.52,
- correlation between risk 3.1 (lack of transfer of information and knowledge among the portfolio elements) and risk 1.5 (disturbances of information flow and communication within the portfolio elements) of 0.58,
- correlation between risk 1.7 (lack of developed methodical standards within the scope of portfolio element management) and risk 3.2 (improper control over life cycles of projects and programs) of 0.51,

ISSN 2256-0513, e-ISSN 2501-0263

- correlation between risk 3.13 (lack of appropriate competencies of the portfolio manager and of the portfolio support structures) and risk 3.11 (conflicts between portfolio managers and portfolio element managers) of 0.50.

Table 2 shows the number of instances of significance of individual risks in correlation with strength of at least 0.4.

Table 2

Number of instances of significance of individual risks in correlations with strength of at least 0.4 (*Source: own studies)*

Risk number	Number of instances
1.10	9
3.11	9
3.16	9
1.7	7
2.3	7
3.13	6
3.9	5
1.9	4
3.2	4
1.8	3
3.1	3
3.10	3
3.14	3
3.7	3
1.3	2
1.4	2
2.6	2
3.17	2
3.4	2
1.1	1
1.12	1
1.2	1
1.5	1
1.6	1
2.2	1
2.7	1
3.15	1
3.3	1
3.6	1
3.8	1

ISSN 2256-0513, e-ISSN 2501-0263

The following three types of risks were most common (occurred 9 times):

- Conflicts between managers of portfolio elements and policy makers of the parent organization.
- Conflicts between a portfolio manager and managers of portfolio elements.
- Lack of developed methodological standards within the scope of management of portfolio elements.

Personal conflicts between key persons within the scope of project portfolio management are a key determinant affecting the assessment of potential success for the entire project portfolio. Efficient conflict management and identification of its causes may - by conflict resolution - contribute to improving portfolio management quality, and consequently may be conducive to increasing the efficiency of the entire project portfolio. If a conflict may not be resolved or is ignored, this situation could adversely affect both the effectiveness and efficiency of the entire project portfolio, and thus may challenge the whole parent organization. Developing methodological standards for project portfolio management is a prerequisite for the implementation of organizational learning and evasion of the same mistakes by both portfolio managers and their rank and file members. While developing standards of conduct, processing management competencies may be useful, in particular process mapping and modeling.

Conclusions

The research conducted identified a number of interesting correlations between project portfolio risks. Analysis of values of Spearman's rank correlation coefficients for risk pairs identified for a project portfolio (listed in Tables 3a, 3b, 3c, 3d) yielded correlations from the range between 0.4-0.59 (moderate) and 0.6-0.79 (strong). 0.69 was the peak level of correlation, posted between a risk significance of 3.13 (inadequate portfolio manager competence and no portfolio support structures) and a risk significance of 1.7 (lack of developed methodological standards for portfolio management). Two more correlations were identified in the strong section, that is to say: 3.16 and 1.7 correlation of 0.61, 3.11 and 1.9 correlation of 0.67. A number of correlations at a moderate level were identified in the range of 0.4-0.59, of which the most interesting correlation was found between the risk 1.4 (improperly defined priorities for particular portfolio elements) and the risk of 2.7 (incorrect portfolio balance) of 0.49, correlation between a risk of 3.4 (no coordination of involvement of key resources in the portfolio) and of 1.9 (conflicts between project and program managers within the portfolio) of 0.52.

The research conducted yielded an answer to the research question PB1, that is to say, it demonstrated project portfolio risks which are either strongly or moderately correlated with one another. This finding warrants a better understanding of the correlations between risks in the project portfolio.

Acknowledgements

The paper was written as part of a research project financed by the funds of the National Science Centre which were granted based on decision no. DEC-2013/09/B/HS4/01311

ISSN 2256-0513, e-ISSN 2501-0263

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Project Management Development – Practice and Perspectives
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ISSN 2256-0513, e-ISSN 2501-0263

Appendix 1. Correlation tables for the project portfolio risks

Table 3a

Correlation coefficients for rating the significance of individual risks from the component risk and structural risk categories

	1.1.	**1.2.**	**1.3.**	**1.4**	**1.5.**	**1.6.**	**1.7.**	**1.8.**	**1.9 .**	**1.10.**	**1.11.**	**1.12.**
1.1.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.2	0.3415*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.3	0.0746	0.2455*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.4.	0.4805*	0.3270*	0.3196*	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.5.	0.1084	0.2796*	0.2471*	0.2097	NA	NA	NA	NA	NA	NA	NA	NA
1.6 .	0.1001	0.3473*	0.3525*	0.197	0.4072*	NA	NA	NA	NA	NA	NA	NA
1.7.	0.2648*	0.2561*	0.2149	0.2913*	0.3498*	0.3320*	NA	NA	NA	NA	NA	NA
1.8.	0.3201*	0.4060*	0.2669*	0.3949*	0.3403*	0.4406*	0.4231*	NA	NA	NA	NA	NA
1.9.	0.2188	0.3899*	0.259*	0.3254*	0.4270*	0.3577*	0.4575*	0.3623*	NA	NA	NA	NA
1.10.	0.2386*	0.3714*	0.1481	0.2554*	0.4027*	0.4397*	0.5720*	0.4757*	0.4698*	NA	NA	NA
1.11.	0.0572	0.1538	0.1375	0.05	0.2949*	0.3641*	0.2358*	0.0183	0.2035	0.3328*	NA	NA
1.12.	0.1941	0.2796*	0.0528	0.1247	0.3065*	0.3223*	0.3600*	0.2347*	0.4385*	0.3324*	0.2963*	NA
2.1.	0.1932	0.3397*	0.3695*	0.2294	0.2885*	0.2588*	0.2226	0.1893	0.1903	0.2762*	0.0692	0.1675
2.2.	0.437*	0.2740*	0.1016	0.4159*	0.3001*	0.108	0.2842*	0.2953*	0.4351*	0.2903*	0.0386	0.4253*
2.3.	0.309*	0.3694*	0.0805	0.3398*	0.3358*	0.3857*	0.5140*	0.3891*	0.3632*	0.5261*	0.3232*	0.2333*
2.4.	0.2227	0.1634	-0.1642	0.141	-0.0813	-0.1054	0.2671*	0.1756	0.1064	0.2686*	-0.0208	0.2643*
2.5	0.1710	0.2779*	0.3035*	0.2643*	0.1846	0.2261	0.2990*	0.1606	0.3264*	0.2644*	0.0411	0.3322*
2.6.	0.1630	0.2464*	0.4658*	0.4376*	0.1560	0.2965*	0.2973*	0.2669*	0.1254	0.4132*	0.1879	-0.0044
2.7.	0.1464	0.1055	0.2856*	0.4886*	0.2380*	0.3176*	0.1380	0.2823*	0.2323*	0.1599	0.0855	0.3460*

Source: own studies
** risks which feature statistically significant differences ($p<0.05$)*

ISSN 2256-0513, e-ISSN 2501-0263

Table 3b

Correlation coefficients for rating the significance of individual risks from the structural risk and overall risk categories

	2.1.	**2.2.**	**2.3.**	**2.4.**	**2.5.**	**2.6.**	**2.7.**
2.1.	NA	NA	NA	NA	NA	NA	NA
2.2.	0.1297	NA	NA	NA	NA	NA	NA
2.3.	0.1915	0.3264*	NA	NA	NA	NA	NA
2.4.	-0.023	0.3762*	0.3046*	NA	NA	NA	NA
2.5.	0.3834*	0.3198*	0.3352*	0.2133	NA	NA	NA
2.6.	0.1530	0.1842	0.2647*	0.0909	0.2878*	NA	NA
2.7.	0.2446*	0.2458*	0.1121	0.0461	0.0983	0.2164	NA
3.1.	0.3847*	0.2772*	0.1835	-0.0868	0.2401*	0.2231	0.2609*
3.2.	0.3502*	0.2452*	0.3993*	0.1837	0.3453*	0.2348*	0.1559
3.3.	0.3936*	0.3163*	0.1883	0.1456	0.3071*	0.0519	0.1588
3.4.	0.3712*	0.3729*	0.3870*	0.2644*	0.2917*	0.0923	0.2041
3.5.	0.1840	0.4354*	0.2692*	0.2757*	0.3173*	0.011	0.0411
3.6.	0.2361*	0.2447*	0.1189	0.0466	0.3169*	0.0072	0.1931
3.7.	0.0438	0.1306	0.2479*	0.1157	0.2720*	0.0381	0.0168
3.8.	0.1740	0.1442	0.2204	0.137	0.3613*	0.2218	0.1513
3.9.	0.1794	0.1444	0.4911*	0.138	0.3365*	0.5341*	0.1819
3.10.	0.1883	0.1975	0.4734*	0.1213	0.3650*	0.2545*	0.1795
3.11.	0.1928	0.5072*	0.4609*	0.1812	0.2407*	0.2236	0.2493*
3.12.	0.1142	0.0713	0.0816	-0.0981	0.0953	0.0953	0.2693*
3.13.	0.1375	0.3459*	0.5093*	0.2837*	0.3760*	0.3506*	0.2209
3.14.	0.3697*	0.2810*	0.4119*	0.1251	0.3737*	0.191	0.1901
3.15.	0.1593	0.2861*	0.3285*	0.3070*	0.2742*	0.1402	-0.0558
3.16.	0.1997	0.2550*	0.5768*	0.2413*	0.2190	0.2600*	0.3114*
3.17.	0.1761	0.165	0.3187*	0.1051	0.1630	0.1605	0.1939

Source: own studies
** risks which feature statistically significant differences ($p<0.05$)*

Project Management Development – Practice and Perspectives
Sixth International Scientific Conference on Project Management in the Baltic Countries
April 27-28, 2017, Riga, University of Latvia
ISSN 2256-0513, e-ISSN 2501-0263

Table 3c

Correlation coefficients for rating the significance of individual risks from the component risk and overall risk categories

	1.1	**1.2.**	**1.3**	**1.4 .**	**1.5.**	**1.6 .**	**1.7.**	**1.8.**	**1.9.**	**1.10.**	**1.11.**	**1.12.**
3.1.	0.1577	0.3255*	0.4782*	0.1895	0.5772*	0.5069*	0.2657*	0.3073*	0.3219*	0.2539*	0.2128	0.2815*
3.2.	0.2220	0.3237*	0.0969	0.1966	0.3506*	0.3116*	0.5066*	0.2948*	0.3049*	0.4953*	0.3079*	0.4020*
3.3.	0.1868	0.3976*	0.1957	0.2825*	0.3037*	0.0883	0.145	0.2151	0.1973	0.1639	0.1108	0.1349
3.4.	0.2613*	0.2617*	0.1964	0.3802*	0.3179*	0.2762*	0.2558*	0.2594*	0.5212*	0.3662*	0.1066	0.2866*
3.5.	0.3361*	0.2044	-0.1034	0.2135	0.2896*	0.023	0.2123	0.1853	0.3358*	0.1891	-0.0465	0.2311*
3.6.	0.1697	0.1619	-0.0271	0.1709	0.2367*	0.1272	0.1326	0.1716	0.2472*	0.1023	-0.0079	0.0931
3.7.	0.1642	0.0743	-0.1091	0.1135	0.3022*	0.1044	0.4200*	0.2633*	0.1638	0.2555*	0.1218	0.0508
3.8.	0.1150	0.1006	0.1549	0.2238	0.319*	0.2308*	0.2875*	0.1524	0.2505*	0.4162*	0.2059	0.1991
3.9.	0.2692*	0.4041*	0.3527*	0.4163*	0.2717*	0.3669*	0.2629*	0.4249*	0.3032*	0.4604*	0.3042*	0.0673
3.10.	0.2536*	0.3786*	0.2047	0.4097*	0.1348	0.2378*	0.2745*	0.1423	0.3346*	0.3879*	0.0884	0.2197
3.11.	0.2953*	0.3130	0.1334	0.3666*	0.3354*	0.3576*	0.4607*	0.2960*	0.6728*	0.5517*	0.2241	0.2774*
3.12.	0.0464	0.1689	0.3558*	0.2007	0.2033	0.3396*	0.0649	0.2862*	0.1655	0.1443	0.2553*	0.0856
3.13.	0.2691*	0.3042*	0.2248	0.3077*	0.2694*	0.4195*	0.6914*	0.4636*	0.3206*	0.5486*	0.2837*	0.4003*
3.14.	0.1989	0.2226	0.1327	0.2557*	0.2789*	0.2627*	0.3912*	0.3108*	0.2834*	0.4348*	0.0690	0.5072*
3.15.	0.3918*	0.4752*	0.0033	0.1724	0.2695*	0.0510	0.2645*	0.1211	0.2889*	0.3405*	0.1552	0.2156
3.16.	0.3142*	0.394*	0.2399*	0.3664*	0.389*	0.4151*	0.6153*	0.5594*	0.4466*	0.4836*	0.2179	0.2438*
3.17.	0.2546*	0.2241	0.2709*	0.1936	0.2469*	0.2536*'	0.4278*	0.2334*	0.2252	0.3051*	0.3140*	0.3587*

Source: own studies

** risks which feature statistically significant differences ($p<0.05$)*

Project Management Development – Practice and Perspectives
Sixth International Scientific Conference on Project Management in the Baltic Countries
April 27-28, 2017, Riga, University of Latvia
ISSN 2256-0513, e-ISSN 2501-0263

Table 3d

Correlation coefficients for rating the significance of individual risks from the overall risk category

	3.1.	**3.2.**	**3.3.**	**3.4.**	**3.5.**	**3.6.**	**3.7.**	**3.8.**	**3.9.**	**3.10.**	**3.11.**	**3.12.**	**3.13.**	**3.14.**	**3.15.**	**3.16.**	**3.17.**
3.1.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.2.	0.2382*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.3.	0.1021	0.5286*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.4.	0.2052	0.3038*	0.3423*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.5.	0.1919	0.3492*	0.2777*	0.3612*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.6.	0.0427	0.0851	0.2786*	0.0229	0.2734*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.7.	0.1210	0.3241*	0.2787*	0.0555	0.3544*	0.4934*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.8.	0.2074	0.3309*	0.2196	0.1809	0.3269*	0.3572*	0.4643*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.9.	0.2186	0.3434*	0.2953*	0.2562*	0.2874*	0.2576*	0.2505*	0.3950*	NA	NA	NA	NA	NA	NA	NA	NA	NA
3.10.	0.0872	0.2543*	0.2689*	0.3899*	0.1599	0.1518	0.0266	0.2663*	0.5173*	NA	NA	NA	NA	NA	NA	NA	NA
3.11.	0.2640*	0.2433*	0.2050	0.5041*	0.3160*	0.1650	0.2791*	0.1676	0.3928*	0.4601*	NA	NA	NA	NA	NA	NA	NA
3.12.	0.3349*	0.0379	0.2715*	0.0897	0.0679	0.2155	0.1259	0.2035	0.2243	0.1136	0.0881	NA	NA	NA	NA	NA	NA
3.13.	0.2836*	0.3738*	0.1516	0.2439*	0.0648	0.1159	0.3075*	0.2760*	0.3160*	0.2701*	0.5013*	0.1646	NA	NA	NA	NA	NA
3.14.	0.2613*	0.5074*	0.1509	0.2847*	0.3287*	0.1779	0.2364*	0.3008*	0.2461*	0.301*	0.1864	0.0250	0.3983*	NA	NA	NA	NA
3.15.	0.1773	0.1916	0.1229	0.1577	0.4302*	0.1852	0.2408*	0.3144*	0.4033*	0.3016*	0.3366*	-0.0480	0.3007*	0.3780*	NA	NA	NA
3.16.	0.3298*	0.4029*	0.1554	0.3487*	0.2871*	0.2613*	0.4503*	0.2677*	0.5038*	0.3772*	0.5303*	0.1732	0.5859*	0.3920*	0.3388*	NA	NA
3.17.	0.3870*	0.3612*	0.0293	-0.0403	0.2247	0.2354*	0.2196	0.2892*	0.3682*	0.2126	0.1709	0.0944	0.2903*	0.4631*	0.4015*	0.4557*	NA

Source: own studies
** risks which feature statistically significant differences (p<0.05)*