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WORD OF THE EDITOR

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During its 8 years of existence, many authors from more than 20 countries have recognized this journal (previously entitled Serbian Project Management Journal) as a vital reference in their academic or professional career.

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The Journal is deposited in the Serbian National Library and is recognized in EBSCO, Google Scholar, Research Gate, and Serbian Citation Index. In the time to come, the editorial team will pay particular attention to indexing Journal in other scientific databases.

It is our genuine wish to continue further contribution to the project management development and implementation in Europe and all around the world, through publishing latest achievements and research in the field.

Editor in Chief

Prof. Vladimir Obradović, PhD

A COMPARATIVE NEXUS OF IMPACT ASSESSMENT OF FILLING STATION CONSTRUCTION PROJECTS ON ENVIRONMENTAL SUSTAINABILITY IN OWERRI, IMO STATE: AN EMPIRICAL PERSPECTIVE

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Abstract: The discovery and use of crude oil and its refined products have evidently had positive effects on the economy but one can't turn a blind eye to the many negative effects it has had and is still having on the environment. Prominent amongst them is the hazardous effects filling stations who are involved in the sale of oil products as the downstream sector have on the environment coupled with the fact that most filling stations do not comply with the reports of Environmental Impact Assessment carried out sequel to their construction. As such, this study sought the significance of EIA exercise in filling stations construction and the extent to which their activities affect the environment in other to ascertain how sustainable the filling stations are. The study which is descriptive survey has a sample size of 110 respondents. Furthermore, the data were analyzed using descriptive statistics and for the hypotheses, using t-test and correlations to ascertain relationships. It was found that the significance/importance of carrying out an EIA exercise is non-negotiable. Further analysis also showed that the filling stations do not go through with what is contained in the EIA reports, as their operations are not also done in accordance with best practices as they release a lot of pollutants to the environment which aids in rapid degradation of the environment. All these prove beyond doubt that filling station construction projects in Owerri, Imo state are not on a sustainable path and as such it is recommended that all stakeholders such as Government regulatory agencies which include the Department of Petroleum Resources, Filling station owners/workers and even personnel in the Construction sector should join hands in ensuring that filling stations are properly planned, constructed and that their operations are environmentally friendly. The Federal Ministry of Environment (FME), Environmental activists, Civil Societies, etc. should also embark on a massive orientation as a large part of the populace do not know what EIA is all about.

Key words: environmental impact assessment, sustainability, filling station projects.

1. INTRODUCTION

Degradation of the environment is one of the ten threats officially cautioned by the United Nations High-level Panel on Threats, Challenges and Change. This degradation has resulted to the inability of the earth to meet its social and ecological needs and objectives. The reason for this degradation is not self-caused but the resultant effect of the actions of man in his quest to exploit the resources of the earth. The earth being filled with many resources were sought and harnessed by man which gave those that found it economic empowerment. This exploitation started to emerge in an industrial scale in the 19th century as the extraction and processing of raw materials (such as in mining, steam power, and machinery) developed much further than it had in pre-industrial era. This continual depletion no doubt became the subject of great concern to many governments and groups as they began to consider the future of man (with his creations) and the future of the earth. This gave birth to so many terms and terminologies of which "sustainability or sustainable development" is one of them. The United Nations (an apex world body) took the bold step and set up a commission (World Commission on Environment and Development) also known as the Brundtland Commission which defined sustainable

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development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs." Ever since the publication of the report, great attention has been paid by many governments and organizations to the subject - sustainable development. Many tools and frameworks have been re-enforced while some new ones were developed to ensure its implementation hence confirming indeed that man really wants to save the earth.

Environmental Impact Assessment (EIA) which was first introduced in the United States in 1970 was also identified by the Brundtland commission as a strategic tool that should be employed by all countries to assess the potential environmental impacts of developmental projects. This Environmental Impact Assessment will further provide/suggest ways of mitigating these negative effects of such developmental projects on the environment. When the effects are too severe and might not be controlled, the project's plan might not be implemented at all. Furthermore, with the discovery of crude oil and the fast growing population in Nigeria coupled with the growth in economic activities, many people in the quest to live comfortable and have ease of movement now own their own personal vehicles. These have resulted to the continual increase in the number of vehicles in the country and the increase in the demand for petroleum products as it is the source of energy for all these machines. Also the number of filling stations continually increases as entrepreneurs seek to mitigate the supply gap thereby generating some revenue. Amidst the increase in revenue generated by these ventures, our environment no doubt have continually been degraded as these filling stations pose great treat to our environment especially when they are not checkmated both at their construction phase and operational phase.

With incidents of fire outbreaks in filling stations, destructive effect on the environment and inadequate location of many filling stations (sited close to residential buildings) which is against the regulation of Department of Petroleum Resources (DPR) which is the body responsible for the approval for location of a filling station in the country, abandonment of many filling stations, incorporation of more services in filling stations against their original design, etc. Against all these, one needs to analyze the role of environmental impact assessment and the level of compliance amongst filling station operators so as to ensure protection and preservation of the environment (Mshelia, John, & Emmanuel, 2015). The primary aim of this project is to evaluate how the application of EIA can improve the quality of filling station construction projects To identify the extent to which sustainability of the environment can be attained with the current filling stations construction and operations trend.

2. LITERATURE REVIEW

Sustainability (from 'sustain' and 'ability') is the process of change, in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (Michael, et al., 2016).

Research has shown that the issue of sustainability has become a serious challenge all over the world especially after the World War II as many of man's actions in trying meet his needs has caused great devastation to his environment.

Conceptual pillars of Sustainability/ Sustainable development

Khan (2005) stated that the paradigm of 'sustainable development' as described in *Agenda 21,* actually rests on three conceptual pillars. These pillars include 'economic sustainability', 'social sustainability', and 'environmental sustainability'

Economic sustainability, by means of growth, development, and productivity, has guided and shaped conventional development science in the past. The belief that economic growth will 'trickle down' to the poor, market allocation of resources, sustained levels of growth and consumption and an assumption that natural resources are unlimited have been its hallmarks. 'Sustainable development' goes beyond development's concern with monetary capital to also include natural, social and human capital. Economic growth and

consumption which depletes these is unadvisable and steps should be taken to discourage it.

Social sustainability spreads across notions of equity, participation, sharing, empowerment, accessibility, cultural identity, and institutional stability. It seeks to ensure that the environment is preserved through economic growth and the alleviation of poverty.

Environmental sustainability includes ecosystem integrity, carrying capacity and biodiversity. It seeks natural capital being maintained as a source of economic inputs and as a sink for wastes. Resources must not be harvested faster than they can be regenerated. Wastes must be emitted only as fast as they can be assimilated by the environment (Khan, 2005)

The paradigm of sustainable development in *Agenda 21* as detailed by Khan (2005).

Element Criteria
Social Sustainability
- Equity
- Empowerment
- Accessibility
- Participation
- Sharing
- Cultural Identity
- Institutional Stability

Economic Sustainability
- Growth
- Development
- Productivity
- Trickle Down

Environmental Sustainability
- Eco-System Integrity
- Carrying Capacity
- Biodiversity

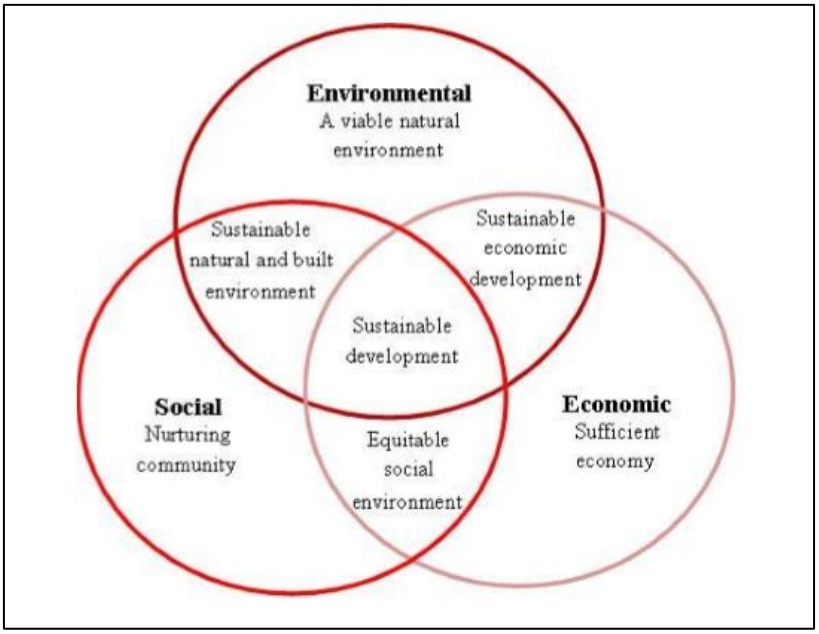

Figure 1. Fundamentals of Sustainable Development (United Nations Conference on Environment and Development, 1992)

3. EIA IN NIGERIA

Due to the illegal dumping of toxic wastes in Koko, which is in the former Bendel State in 1987, the Nigerian Government promulgated the Harmful Wastes Decree which served as the legal framework for the effective control of the disposal of toxic and hazardous waste into any environment within the borders of Nigeria. This was immediately followed up with the creation of a regulatory body, the Federal Environmental Protection Agency (FEPA) in 1988. FEPA was charged with the overall responsibility of ensuring that the Nigerian environment is well protected and developed. To ensure its full implementation a National Policy on the Environment was developed. This became the main working document for the preservation and protection of the Nigerian environment. Also, states and local

government councils were also encouraged to establish their own environmental regulatory bodies for the purpose of maintaining good environmental quality as it applies to their particular terrain (Echefu, & Akpofure, 2007).

The EIA Decree No. 86 of 1992 was an additional document with the same aim of protecting the Nigerian environment. Its major aim was regulating the industrialization process with due regard to the environment. By this Decree, no industrial plan/development/activity falling under the FEPA's mandatory list could be carried out without prior consideration of the environmental consequences of such a proposed action, in the form of an environmental impact assessment. The EIA process in Nigeria is not a one-way process that results in the preparation of a report that contains the effects of the project and associated mitigation measures. It also deals with monitoring the constructional and operational phases, and acting on the results of such monitoring up until final abandonment/closure (Yusuf, Agarry, & Durojaiye, 2008). The post closure care is also an integral part of the EIA process.

The EIA procedure in Nigeria according to the Federal Ministry of Environment, Housing and Urban Development (FMEH & UD) EIA procedure, involves the following steps:

1. The submission of project proposal to the Federal Ministry of Environment for screening to determine the need or otherwise for EIA.
2. The vetting of Terms of Reference (TOR) for the EIA studies to ensure that only significant issues (impacts) are studied in the EIA. A site verification exercise may be required to aid the process.
3. Submission of draft EIA report for review.
4. Review of draft EIA report.
5. Submission of final EIA report, which addresses all the issues raised from EIA exercise.
6. Decision-making by the Federal Ministry of Environment's technical committee and the Honorable Minister.
7. Certification (issuance of Environmental Impact Statement (EIS) and certification).
8. Mitigation and compliance monitoring to ensure compliance with all stipulated mitigation measures and project specifications in the project's EIA report.

The EIA process cuts across the various stages a project undergoes from proposal to approval for implementation, resulting in the issuing of an Environmental Impact Statement (EIS) and certificate (Echefu, & Akpofure, 2007). The evaluation is completed with a review of the report; there are different forms of review depending on factors such as the nature, scope, anticipated impacts, etc.

4. EFFECTS OF FILLING STATION CONSTRUCTION AND OPERATION ON THE ENVIRONMENT

Filling stations represent a business activity branch that works primarily with the retail sale of fuel (fossil fuel). These endeavors store various types of fuel tanks that in most cases are underground, and they also possess a set of lines and pumps that are part of the storage system and commercialization of products. Because of the storages and subsequent activities that take place there, there is high possibility of degrading the environment.

The contamination of the soil and underground water is one of the major environmental impacts caused by the activities of filling stations, since this is related to health problems, environmental damage and adverse social impacts. There are several known causes and sources of groundwater contamination. However, one of the most hazardous is contamination through leaks in underground storage tanks of fuel, the severity of which increases due to the characteristics of the fuels being rich in toxic substances of a mutagenic and carcinogenic character, and to the great likelihood of movement in the soil, and the fact that a leak is not always detected immediately. Over time these tanks may leak due to corrosion, cracks, defective piping, and spills during refilling and maintenance activities. Petroleum and other fuels pollution from leaking underground storage tanks leaches into the surrounding soil and groundwater and can

contaminate nearby water bodies and ecological systems (Thales, 2015).

Gas stations exist as part of the built environment and are widely located across localities. As a result, they may be surrounded by residential dwellings, businesses, and other buildings such as schools, religious stations, etc. Operation of filling stations may thus create opportunities for a variety of human populations to be exposed to vapors during station tank filling and vehicle refueling. These human populations can be broadly grouped into three groups: populations exposed occupationally as a result of employment in various capacities at the service station; those exposed as customers engaging in vehicle refueling; and those passively exposed either by residing, at- tending school, or working near the refueling station. The rate of exposure of the population to these poisonous gases is influenced by the size and capacity of the refueling station, spatial variation in pollutant concentrations in ambient air, climate, meteorological conditions, time spent at varying locations of the service station, changing on-site activity patterns, physiological characteristics, and the use of vapor recovery and other pollution prevention technologies (Markus, Bernat, Ni, Ana, & Keeve, 2015).

5. RESEARCH DESIGN

In view of the scope the strategy adopted involves the use of descriptive and cross-sectional survey. The questionnaires administered consist of multiple-choice question. This is in agreement with Baridam (2001) observation that multiple — choice question are quick and easy for the interview to handle. It is easier to analyze statistically than using the opened question. The populations of study in this study are mainly filling station workers, govt. agencies, construction professionals and this include all those involved in carrying out an assessment of the Environmental Impact a filling station project would have on the environment.

Another very important component of the population under study, is the locals i.e. those dwelling in the area where the filling station construction project is sited or to be sited. This is because they constitute the living components of the environment and are the ones directly affected by the activities of the filling station be it positive or negative. The sample size of this research is 110 respondents as a total of 160 questionnaires were distributed, 140 were retrieved and 30 out of 140 wrongly/not filled. This sample study are made of construction professionals of filling station construction projects (especially those concerned with/in the EIA process), filling station workers, govt. agencies together with the locals as earlier stated, and the procedure employed is probabilistic sampling which gives every respondent equal opportunity to express opinion and ensures reliability of information obtained and randomization sampling technique which was used in obtaining information from sample, by removing all elements of bias from a particular section of people. The instrument used in data collection and measurement are questionnaire, interview and participant observation method. The data were analyzed using Simple percentage and relevant descriptive statistics. However, for the hypothesis, Pearson correlation method and T-test were used to analyze the hypothesis.

6. DATA ANALYSIS

Respondents in their Strata

Table 1: Relationship between EIA and filling station (**Const. Professionals/EIA Experts, n=67**)

Respondents Category	Frequency	Percentage (%)
Construction Professionals/EIA Experts/Agencies	**67**	**61.0**
Community Members/Filling Station Workers	**43**	**39.0**
Total	**110**	**100**

	Item	Frequency		Percentage (%)
1	Was EIA carried out for the filling station	Yes No Undecided	49 2 16	73.13 2.89 23.88
	Total		67	100
2	Stage at which EIA was carried out	Before Construction During Construction After Construction	29 8 12	59.18 16.33 24.49
	Total		49	100
3	Was the cost of EIA high	Yes No Undecided	25 15 9	51.02 30.61 18.37
	Total		49	100
4	Were there changes made in the project design due to EIA	Yes No Undecided	20 21 8	40.82 42.86 16.33
	Total		49	100
5	Did the changes made result to increase in the total cost of the project	Yes No Undecided	10 7 3	50 35 15
	Total		20	100

The table above depicts the strata of respondents and their percentages, however, some selected members of both stratum were grafted totaling 54 to answer research question three.

Research Question One

The table above shows the relationship between EIA and filling station construction. The result reflects the opinion of respondent in this category, there are 67 respondents and thus some questions has total different from 67 due to question type especially following preceding question. The results shows that 73.13% reported that EIA was carried out in their filling station, while 2.89% reported that it was not carried out in their filling station, while the rest was undecided.

However, some of the responses were based on the responses in the previous item/s or item/s before (for example, if yes, we used the total of those that answered yes to answer the following question that require only thereby making the total to vary Majority also reported that EIA was carried out before the construction stage of the project. High cost of EIA was also discovered as 51.02% reported that the cost of carrying out the EIA was high. The result also shows that 67.35% of the EIA was carried out by the government agency. The high cost of EIA can be linked back to the government agency. This shows that the government agency in charge charges high amount of money for the EIA. This may discourage people from carrying out EIA. The study also reveals that there is a high level of monitoring of the activities of the filling station by the government agencies. These visits were meant to ensure that they comply with set rules guiding the industry and to ensure safety of lives.

Research Question Two

Table 2: Effects of Filling Station on the environment (**Community Members/Filling Station Workers, n=43**)

		SA	F	**A**	F	**N**	F	**D**	F	**SD**	F	**T**	F
1	Noise form the generating set of the filling station disturbs the public	2	4.65	12	27.91	11	25.58	16	37.21	2	4.65	43	100
2	There is usually traffic congestion during operating hours of the filling station	0	0	4	9.52	14	33.33	23	54.76	1	2.38	43	100
3	There have been cases of air pollution due to the operations of the filling station	7	16.67	26	61.90	3	7.14	5	11.90	1	2.38	43	100
4	The wastes generated by the filling station is not managed or disposed properly	3	6.98	20	46.51	11	25.58	8	18.60	1	2.33	43	100
5	Any case of fire outbreak in the filling station will greatly affect nearby residents	23	54.76	18	41.86	0	0	0	0	1	2.38	43	100
6	There is no adequate firefighting equipment in the filling station	2	4.76	14	33.33	19	45.24	4	9.52	3	7.14	43	100

Source: Field data, 2019

NB: SA = Strongly agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree

The table shows the impacts of filling station on the environment as identified by the community members. The results show a high level of negative impact of filling station construction and operations on the environment.

Research Question Three

Table 3: The Current Filling Station Construction and Operation Trend (**Selected Respondents from stratum 1 and 2=54)**

	Item	Frequency		Percentage (%)
1	Are there safety training for workers before employment?	Yes No	45 9	83.33 16.67
	Total		54	100
2	Are workers given personal protective equipment?	Yes No	25 29	46.30 53.70
	Total		54	100
3	Are workers mandated to use the personal protective equipment?	Yes No	24 30	41.18 58.82
	Total		54	100
4	Are there firefighting equipment?	Yes No	53 1	98.18 1.82
-	Total		54	100
5	Is there fire detection system installed?	Yes No	21 33	38.89 61.11
	Total		54	100
6	How often the fire detection system is maintained?	1-6 Month 6-12 Month Above 2 Years	14 17 2	45.71 48.57 5.72
	Total		33	100
7	Have there been underground tank leakages in the station?	Yes No	10 44	17.31 82.69
	Total		54	100
8	Is there a mechanism to detect underground tank leakage?	Yes No	24 30	44.23 55.77
	Total		54	100
9	How often the tanks are checked for leakage?	1-6 Months 6-12 Months Above 2 Years	23 27 4	42.59 50.00 7.41
	Total		54	100
10	Are runoff water treated?	Yes No	13 41	24.10 75.9
	Total		54	100
11	How waste from the filling station disposed?	Thrown to public drainage Burning Burying Thrown into the bush	10 15 4 25	18.51 27.77 7.4 46.29
	Total		54	100
12	Any proactive way adopted to reduce waste?	Yes No	30 24	53.85 46.15
	Total		54	100

Source: Field data, 2019.

The table above shows the current operational and construction trends amongst the filling stations. A critical look and study of the table shows that 55.77% of the filling stations do not have a mechanism to detect underground tank leakage. 61.11% do not have a fire detection system. 49.02% of the wastes generated are thrown into the bush. All these and much more shows that we are not on a sustainable path.

Test of Hypothesis

Hypothesis One

H_{01}: There is no significant relationship between EIA exercise and sustainability of filling station construction projects.

Table 4: Descriptive Statistics for Hypothesis One

	Mean	Std. Deviation	N
EIA Exercise	20.7182	2.25499	110
Sustainability of filling stations construction projects	20.7909	1.79753	110

Table 5: Correlations Statistics for Hypothesis One

		EIA Exercise	Sustainability Of Filling Stations Construction Projects
EIA Exercise	Pearson Correlation	1	.882
	Sig. (2-tailed)		.000
	N	110	110
Sustainability of Filling Stations Construction Projects	Pearson Correlation	.882	1
	Sig. (2-tailed)	.000	
	N	110	110

From the table above, the Pearson correlation shows a value of 0.882 which represents a strong positive relationship; and as such from the correlation decision rule, a rho (r) value above ±0.5 signifies a strong relationship either in the negative or positive, and from ±0.7 clearly depicts a very strong relationship. Since value in the table above is 0.882, we conclude that there is a high level of relationship between EIA exercise and sustainability of filling stations construction projects. To buttress the decision, the sig. value is 0.000, which is lower than the p-text value of 0.05 level of significance; therefore we reject the null hypothesis and accept the alternative which says that there is a significant relationship between EIA exercise and sustainability of filling station construction projects.

Hypothesis Two

H_1: The awareness of EIA exercise by the local community is not significant as regards the current demands of stakeholder commitment.

Table 6: Correlations Statistics for Hypothesis Two

		Awareness Of EIA Exercise By Local Community	Current Demands Of Stakeholders Commitment
Awareness of EIA Exercise by Local Community	Pearson Correlation	1	-.132
	Sig. (2-tailed)		.170
	N	110	110
Current Demands of Stakeholders Commitment	Pearson Correlation	-.132	1
	Sig. (2-tailed)	.170	
	N	110	110

From the table above, the Pearson correlation shows a value of -0.132 which represents a strong negative relationship; and as such from the correlation decision rule, a rho (r) value of ±0.1 - ±0.49 signifies a weak relationship either in the negative or positive. Since value

in the table above is -0.132, we conclude that there is a weak relationship between awareness of EIA exercise by the local community and current demands of stakeholder commitment. To buttress the decision, the sig. value is 0.1700, which is lower than the p-text value of 0.05 level of significance; therefore we accept the null hypothesis that the awareness of EIA exercise by the local community is not significant as regards the current demands of stakeholder commitment.

CONCLUSION

The study is an Impact Assessment of filling station construction projects on Environmental Sustainability with Owerri as the study area; showing the importance of carrying out an extensive EIA before the commencement of filling station projects. The effects of filling station construction projects on the environment; which doesn't augur well for environmental sustainability is emphasized and the level of awareness/involvement of the local community in EIA exercise was also studied. The study agrees with Aisha and Olatunde (2017) that filling stations do not work with their EIA results especially in the construction phase of the project and during operations, hence we are not on a sustainable path.

RECOMMENDATIONS

For sustainable filling station construction which would in the long run contribute to environmental sustainability, the follwing recommondations are proposed:

1. The Department of Petroleum Resources need to carry a re-evaluation of all filling stations so as to determine their level of compliance with its guidelines for operating a filling station and mete out strict sanctions to those who do not comply with the guidelines. These re-evaluations should be carried out yearly.
2. The public need to be sensitised on Environmental Impact Assessment so that they can be involved in the process and ensure that it is carried out for relevant projects in their neighbourhood.
3. The design of filling stations should be made to show how runnoff water will be treated before it is introduced to the public drainage.
4. There should be improvement in the design of underground tanks so as to put in place a system that can detect underground leaks.
5. Filling station operators should consider other alternative sources of energy that are renewable and that generates less noise.
6. Further research should be carried on mitigative measures to be employed in reducing the negative effects of filling station construction projects on the environment.

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FACTORS CONSTRAINING THE APPLICATION OF LESSONS LEARNED ON CONSTRUCTION PROJECTS IN NIGERIA

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Abstract: Lessons learned is a new form of creating knowledge while also sharing information amongst practitioners in the built environment. The aim of this study was to identify and evaluate the factors constraining lessons learned application in the delivery of construction projects in Port-Harcourt, Rivers State, Nigeria. The study adopted a survey research design technique with the aid of a snow balling sampling technique. A sample size of 111 respondents was determined from a population of 200 made up of practitioners from the built industry. These samples were drawn from some construction firms located in the study area. The questionnaire for the survey was modeled using the Likert scale. Retrieved data were later presented via charts and figures, while Cronbach's alpha coefficient tests and factor analysis were deployed in analyzing the main issues underlying the study via the IBM SPSS Statistics version 20. The findings from the study show that the constraints to lessons learned deployment could be grouped into six (6) constraints; the most important factor grouping being lack of comprehensive approach to lessons learned followed by lack of time, degeneration into blame sessions that becomes emotionally damaging, poor organizational culture, lack of willingness to share project faults caused by individual or group performance and finally lack of a lessons learned repository.

Key words: Constraints to lessons learned, construction project delivery, lessons learned.

1. INTRODUCTION

One of the significant challenges confronting public and business project organizations is the ability to ensure that lessons are learned and previous mistakes identified during the life of a project are not repeated. The knowledge and project management literature abounds with suggestions that lessons learned in practice are seldom corrected (Duffield, & Whitty, 2012). While Ekambaram and Økland (2019) were of the view that although the gains of knowledge transfer are still visible, hence, it is still difficult implementing inter-project knowledge transfer and harvest the desired benefits ensuing there from. The construction industry according to Che Munaaim, Abdul-Rahman, Low and Yahya (2007), is notoriously known for its time-bound, one-shot, complex, fragmented, unique, and goal driven nature. In this era of knowledge and technology, construction projects have increasingly become complex and fragmented in size, construction methods, designs, human relationships, and clients' needs. Adequate information and knowledge is needed to drive a project throughout it's shelve life. Hence, each project requires enough contribution and integration of knowledge from the various multidisciplinary team members alongside their knowledge and experiences from previous projects to bring to bear.

According to Chin, Gao and Low (2015), the construction industry has been limited, largely due to the temporary state of most projects and their associated impediments. The dearth of research in this specialized area often gives rise to inadequate attention on the underlying reasons of failure to undertake most reviews (Chin, et al., 2015). In as much as the deployment of lessons learned has been widely

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publicized in project management articles and other management related fields, and given the fragmented nature of construction projects and other constraining factors, lessons learned have failed to achieve their maximum potential (Chin, et al., 2015). According to Ekambaram and Økland (2019:238); "There is an increasing focus on leveraging learning and reusing knowledge across projects". As stated by Ferrada, Núñez, Neyem, Serpell and Sepúlve (2016), most construction firms are project based organizations that are characterized by uncertainty, uniqueness and complexity, which make them unique from other business firms. With this in mind, it is cumbersome to manage the knowledge emanating from their activities via delivering of a custom-built facility. Ferrada et al. (2016) further reiterated that a lot of the project based firms are continuously failing to learn from their previous experiences, as depicted by their continued intention to 'reinventing the wheels', consistently making mistakes and failing to transfer lessons learnt from one project to the other (Desouza, & Evaristo, 2006; Landaeta, 2008). While McClory, Read, and Labib (2017) were of the view that in as much as lessons are often identified, their capture and categorization processes are often marred with problems of both availability of time and processes, while their deployment in future projects appears to be limited to a greater extent.

The aim of the study is to identify and evaluate the constraints to lessons learned application in the successful delivery of construction projects in Nigeria. The study will be of outmost importance to project managers, professionals from the built environment and the general public knowing fully well that the lessons learned from previous projects are useful. The outcome of the study will further provide hints on how best issues bordering on lessons learned and its adoption in the delivery of construction projects could be handled with a view to ensuring the successful delivery of construction projects to schedule, cost, quality and stakeholder's satisfaction.

2. LITERATURE REVIEW

Lessons learned as opined by Chin et al. (2015); Ononuju, Amade, Amaeshi, Adu, and Iringe-koko (2019), is also called post project reviews, is fundamentally a method of drawing lessons from projects. While Jugdev (2012) reiterated that lessons learned is commonly used synonymously with project assessments, project reviews, project completion audits, post mortems, reviews, appraisals, after-action reviews, debriefings and post-implementation evaluations. It is broadly defined as a systematic method of capturing knowledge that accrued from a project with the sole objective of using it for the benefit of subsequent projects, most especially the future ones and for the good of the entire organization. While McClory et al. (2017) reiterated that lessons-learned process is meant to retrieve the outcomes and experiences of previous successes, failures, and other near-miss situations, and absorb them in to an organization's database with a view to using them for future use. Lessons learned according to Wiewiora, Trigunarsyah, Murphy and Chen (2009), have been validated by a project team and as such it represents the views of a consensus on the key issues that should be taken into cognizance in future projects. They further opined that lessons learned are part of the knowledge transferred that can be regulated, including transfer of mainly explicit knowledge. Jugdev (2012) defined lessons learned more broadly as learning (in its various forms) that occurs throughout the life of a project and between several projects. The main purpose of lessons learned according to Carrillo (2005), is to capture certain experiences either successful or otherwise by avoiding the repetition of mistakes that are expensive with a view to improving future performance of an organization and its stakeholders.

The United State (U.S.) Department of Energy (2008:2) defined lessons learned as a work practice or innovative approach to project management that is captured and shared to promote repeat application or an adverse work

practice or experience that is captured and shared to prevent recurrence. In the present day project management thought, Anbari, Carayannis and Voetsch (2008), opined that there has been a long-standing belief that post-project reviews are of value. They reiterate that there is need for project evaluation to be implemented at various phases of a project's life cycle. In the termination phase of a project, a post-project evaluation ought to be carried out specifically to ascertain the level of success of the project viz a viz its planned and actual objectives. This evaluation process according to Anbari et al. (2008), should be able to explain some major variances, lessons learned from the project as well as make recommendations for the success of future projects. Albano, Kane and Thomas (2011:1) stated that the successful project manager prides his or herself on having a record of finishing on schedule, under budget, and meeting other requirements. Hence, when faced with some unexpected impediments, the need to resolve such an impediment with the outmost zeal is eminent. The project manager should as a matter of necessity and urgency deploy the lessons learned activity prior to and at the end of the project.

2.1 Construction projects and lessons learned practices

According to Olapade and Anthony (2012), a lot of studies have shown that a good number of building projects initiated with good intentions are abandoned at different stages of their design and construction processes. Some of the reasons responsible for the failures and subsequent abandonment were adjudged to have resulted from incorrect estimates; lack of available skilled personnel; inadequate planning; poor risk management; misunderstanding of the work requirement; poor quality control by regulatory agencies; corruption and communication gap among the personnel. Other factors are cost; the developer and the contractors; inability of clients to engage contractors or designers capability to do the work; failure on the part of contractors to obtain vital inputs such as materials, manpower and machines. Inconsistent government policies, lack of accountability, high level of corruption, incompetent contractors, non -availability of building materials, lack of utilities or infrastructural facilities, wrong location and so on has been advanced as remote causes of abandonment of building project by (Olapade, & Anthony, 2012; Ononuju, et al., 2019).

The construction industry as stated by Ferrada et al. (2016), is a knowledge-based industry. The industry relies heavily on knowledge input from the various professionals on its project's team. In as much as construction is a project-based industry, most of its knowledge is generated from projects. The ability to capture, share, and utilize the combined knowledge of the recent workforce is critical to avoid losing essential corporate knowledge assets. This in a nutshell implies that construction firms need to dwell more on what is learned in each project with a view to continuously improve on organizational performance.

2.2 Constraints to lessons learned application in construction projects

A comprehensive literature review of the constraints to lessons learned is as discussed below. Although most of the constraints are components of project management, they are not a holistic representation of the entire constraints within the Nigerian environment owing largely due to paucity of researches in this area. In a multi-sector study consisting of construction, arts, healthcare and education, Paranagamage, Carrillo and Ruikar (2012) identified factors that affect project learning and knowledge transfer. The factors include; strength of the relation between two or more organizational actors, shared interpretations between parties, history of previous working relationship, absorptive capacity and motivation. Others include lack of incentives, lack of a learning culture amongst others.

In an attempt to implement lessons learned practices and indeed other knowledge management initiatives, a number of challenges have been identified as constraints

to the implementation of lessons learned as opined by (Paranagamage, et al., 2012). The constraints include; poor organizational culture, lack of top management support, lack of dedicated resources such as staff, time and money, and poor ICT infrastructure. The processes for capturing lessons learned continues to evolve, but there are still a lot of barriers affecting lessons learned that have been identified by researchers. Notable amongst them are those identified by Larson and Gray (2011), they include; lack of time, most lessons learned are captured when the project is complete; teams get little direction or support after the lessons are reported, lessons learned often degenerate into blame sessions that becomes emotionally damaging, lessons learned are not being used across different locations, lessons learned while implementing the project are seldom used to improve the remaining work in the project. Others include too often the lessons learned are not used in future projects because the organizational culture fails to recognize the value of learning. What is needed to overcome these barriers is a methodology and management philosophy to ensure lessons learned are identified, utilized, and become a significant part of project management organizational culture (Larson, & Gray, 2011).

While Ferrada et al. (2016), on the other hand were of the view that lessons learned databases are not widely used because the documents that exist tend to focus very much on what had been achieved by a project team only. Wiewiora et al. (2009) on the other hand identified constraints related to social communication to include; lack of social communication between projects, sharing of "bad news" is not encouraged, lack of time for social communication, lack of willingness to share project faults caused by individual or group performance. Wiewiora et al. (2009) further stated that constraints related to inter-project transfer of documented lessons learned includes; lack of comprehensive approach to lessons learned including processes of transfer of lessons learned beyond the project, transfer of lessons learned is fragmented, lessons learned are not included in the project scope and/or budget, lack of a lessons learned repository, lack of time to produce lessons learned reports.

Constraints related to project manager includes; lessons learned have a low priority for the project manager, young project managers are overconfident and are reluctant to take advice from others, project managers do not like passing on their expertise and prefer to control the information (the knowledge) they possess, project managers do not want to criticize processes or people from the organization (Wiewiora, et al., 2009). Marlin (2008) articulated the following as constraints to lessons learned. They include; the lack of leadership involvement in and commitment to the learning process, separating the "accountability" issue from the "process" issue, lessons learned captured on a project seldom benefit that project, lessons learned should be captured during or at the end of each project stage, too many problems, the root cause of the problem is not always apparent, lessons learned process must ensure that the most significant lessons are institutionalized. There is need to make sure these "positive" learning's gets into the lessons learned database. For instance, are you opening yourself up for any legal action? Periodically, management should as a matter of necessity review their organization's lessons learned processes, lessons learned should be captured and placed in a database that is readily available to everyone in the organization to access easily.

3. METHODOLOGY

This study adopted a descriptive survey research design largely because of its inability to modify most situations under investigation. It normally involves the acquisition of information about a certain aspect of the population and getting information on their characteristics, opinions or attitudes (Kothari, 2004). The descriptive research design is appropriate where the study seeks to describe the characteristics of certain groups, estimate

the proportion of people who have certain characteristics and make predictions. It was also useful in summarizing the data collected in a way that provided descriptive information. A snow-balling sampling method was deployed with a view to eliciting responses from the population. A total of one hundred and eleven (111) questionnaires were retrieved and from an envisaged population of about two hundred (200) which thus formed the sample size based on the snow-balling sampling technique. The snow-balling sampling technique according to Saunders, Lewis and Thornhill (2007) was adopted for this study largely due to its ability to identify difficult members from a distinct population. The main parties in the study consist of builders, architects, engineers, project managers and quantity surveyors. This response rate was necessitated by the difficulties associated with retrieving questionnaires from respondents in the study area and as such the response rate was quite commendable. Finally, one hundred and two (102) questionnaires were found useable for subsequent analyses. The use of structured questionnaires was deployed as a means of eliciting information from the practitioners. The questionnaire was designed on the basis of the information gotten from the literature review as well as personal observations of the construction projects visited in course of carrying out this study. The questionnaire was categorized into various sections. The first section deals with soliciting information about the demographic characteristics of the respondents, where it seeks to acquire information such as their primary roles and responsibilities on the construction projects in relation to lessons learned, their level of experience in the construction industry and the number of projects they have been involved in the past years. The second section sought to look at the constraints to lessons learned activities in the delivery of construction projects. The questionnaires comprises of close-ended and a few open-ended questions that were fussed with a view to getting details from the practitioners as well as clearer picture on some of the issues in context. The questionnaire was formulated using A Likert five point scale ranging from 1-5 intervals. Semi-structured Interviews were also utilized with a view to identifying other underlying issues bordering on lessons learned and its application in the construction process. While performance data on some previous construction projects data bordering on lesson learned activities were also consulted and utilized for purpose of this study from some selected ongoing construction projects located in Port-Harcourt in Rivers State. The survey instruments were further subjected to face, content and construct validly test via previous researches done in the past. According to Somekh and Lewin (2004), validity is the extent to which a researcher has measured what he or she sets out to measure. Thus it is the state of accuracy or meaningfulness of interferences that is associated with research outputs. Validity is the degree to which an instrument achieves and measuring what it is expected to measure. While reliability as stated by Somekh and Lewin (2004), is the tendency of a questionnaire to consistently and continuously give similar results under the same conditions. Reliability test was conducted using Cronbach's alpha coefficient test. In a bid to achieve the objectives of this study, the use of both primary and secondary methods of data collections was deployed. The questionnaires were designed based on the information needed, as well as who needs the information, method of communication to be adopted viz (email, telephone or personal interview). The researcher had semi-structured interviews with some key professionals from the construction firms/projects visited. The primary data collection method was adopted largely due to its ability to provide first hand information, as well as confirm some issues raised in some of the data collected via the questionnaire and captured some other details about lessons learned that might have been left out in the questionnaires.

The collected data were organized for analysis by carrying out data cleaning which involved editing, coding, tabulating. Descriptive statistics was deployed in analyzing the quantitative data. While charts and figures were used to present and explain the results.

Factor analytical technique (factor analysis) was adopted in evaluating the barriers to lessons learned application in the delivery of construction projects in the study area. This was achieved with the aid of IBM SPSS version 20. In analyzing the data collected, the weighted score of respondents to each of the barriers (factors) to lessons learned were generated. The factor analysis technique is a method of quantitative multivariate analysis that aids in representing the interrelationships that exists among a set of continuously measured variables that are usually represented by their interrelationships usually an underlying linearly independent reference variables known as factors. The method further seeks to collapse a set of numerous operating variables into a selected fewer interrelated attributes called principal components (Gaur and Gaur, 2009). The eigenvalue determines the principal components that are orthogonally varimax rotated with a view to obtaining more evenly distributed variables amongst a set of components. Factor analysis assumes a mathematical procedure that an n x n matrix A has an eigenvalue λ, if there exists a non-zero vector x, called an eigenvector associated with λ , for which (Pallant, 2005):

$Ax = \lambda X$ ……..(1)

Thus the model shows that the matrix A - λI is singular and therefore;

det; (A - λI) = 0…….(2)

3.1 Results and discussions

3.1.2 Questionnaire response

The study population consists of 200 practitioners from some selected construction firms located in Port-Harcourt, Rivers State. The snow balling sampling technique was used in selecting the professionals from the construction firms. Thereafter 111 questionnaires were retrieved which later formed the sample size based on the snowballing technique, while 102 questionnaires were later found to be fit for further data analyses.

3.1.3 Reliability tests

The consistency level for each item in the category related to the questions bordering on the barriers to lessons learned application for successful construction project delivery was conducted using the Cronbach's alpha. The Cronbach's alpha coefficient as opined by Pallant (2005) has been adjudged as a critical tool for determining the extent of reliability of a data. The table below shows the result of the internal consistency of the various categories of item of the constraints to lessons learned using IBM SPSS version 20.

Table 1: Cronbach's alpha coefficient

Reliability Statistics	
Cronbach's Alpha	N of Items
.894	15

The result of the Cronbach's Alpha coefficient of all the fifteen (15) constraints to lessons learned application for successful construction project delivery is 0.894. This is a clear indication that the instrument is reliable. In a nutshell, the instrument deployed for this study was adjudged reliable given the results of the reliability statistics shown in table 1.

3.1.4 Demographic information

Section one of the questionnaire captured the respondent's characteristics in viz; their discipline, years of experience in the industry, qualifications as well as types of project executed, constraints to lessons learned etc.

3.1.5 Respondents discipline

Figure 1 shows the respondents discipline, 28 (27.45%) are engineers, 18 (17.65%) are quantity surveyors, 10 (9.80%) are architects, 15 (14.71%) are project managers, 13 (12.75%) builders, while others are 18 (17.65%).

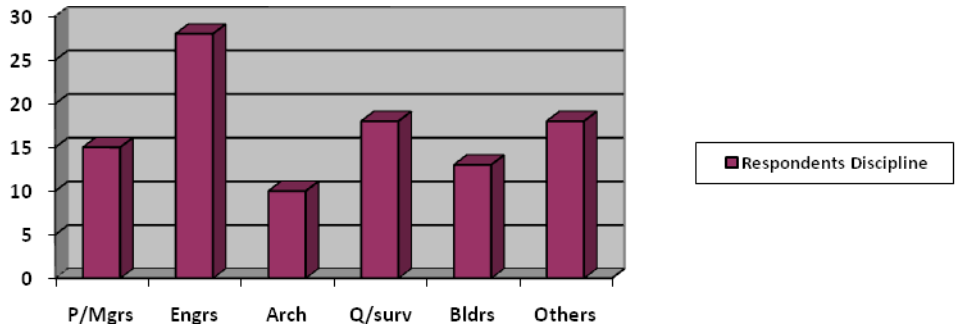

Figure 1: Respondents discipline

3.1.6 Respondents years of experience in the industry

Figure 2 depicts the experience of the respondents in the industry. 16 (15.69%) of the respondents have spent 1-5years, 18 (17.65%) spent between 6-10 years, 48 (47.06%) 11-15 years, 12 (11.76%) 16-20 years, while 8 (7.84%) spent over 21 years in the industry.

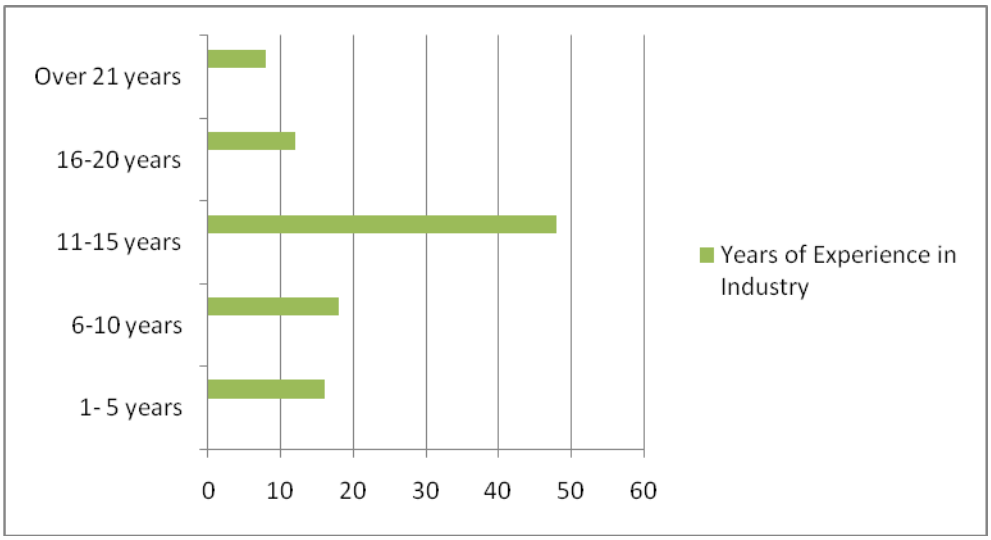

Figure 2: Respondents years of experience in the industry

3.1.7. Respondents academic qualification

Figure 3 shows the academic qualifications possessed by the respondents. In all 17 (16.67%) had OND (ordinary national diploma) as qualification, 62 (60.78%) had HND (higher national diploma) /B.Sc/B.Eng, 23 (22.55%) had MBA/M.Sc as qualification, while none had Ph.D.

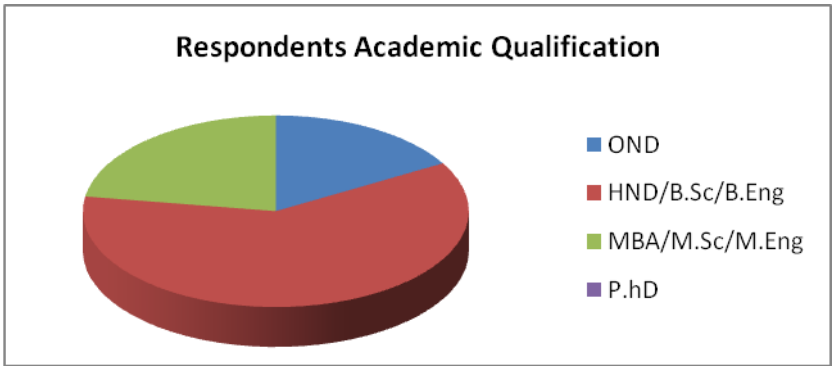

Figure 3: Respondents academic qualification

3.1.8 Types of construction projects executed

On the types of construction projects executed by the respondents, the figure below shows that 25 (24.51%) were building projects, 52 (50.98%) are road projects, 12 (11.76%) were bridges, while others were 13 (12.75%).

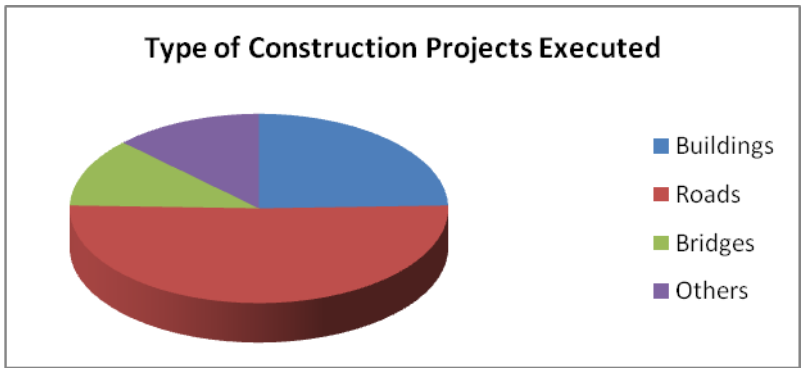

Figure 4: Specific types of construction projects executed

3.1.9 Constraints to lessons learned application to construction project delivery-Survey findings

The respondents were made to indicate their level of agreement with the identified constraints to lessons learned application to successful construction project delivery based on their experience in their organizations. The findings are presented in Tables 2. Fifteen (15) factors were identified from the literature as constraints to lesson learned application to successful construction project delivery. The (15) factors are shown in table 2.

Table 2: Constraints to lessons learned application to construction projects

	Constraints to lessons learned application	Symbol
1	Lack of time	X_1
2	Teams get little direction or support after the lessons are reported	X_2
3	Degeneration into blame sessions that becomes emotionally damaging	X_3
4	Lesson learned not being used across different locations	X_4
5	Lesson learned is seldom used to improve the remaining work in the project	X_5
6	Lesson learned is not used in future projects because the organizational	X_6

	culture fails to recognize the value of learning	
7	Poor organizational culture	X_7
8	Lack of top management support	X_8
9	Lack of dedicated resources such as staff, time and money, and poor ICT infrastructure	X_9
10	Lack of a lessons learned repository	X_{10}
11	Lack of comprehensive approach to lessons learned	X_{11}
12	Lessons learned are not included in the project scope and/or budget	X_{12}
13	Lack of willingness to share project faults caused by individual or group performance	X_{13}
14	Lack of social communication between projects	X_{14}
15	Lack of time to produce lessons learned reports	X_{15}

The results of the analysis using factor analysis are as shown from tables 3 to 4 respectfully.

Table 3: KMO and Bartlett's test for constraints to lessons learned application for construction projects.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.598
Bartlett's Test of Sphericity	Approx. Chi-Square	561.173
	Df	105
	Sig.	.000

The following tests were required to test for the appropriateness of factor analysis for factor extraction, including the Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy, anti-image correlation, measure of sampling activities (MSA) and Barlett test of sphericity. The outcomes of these tests are displayed in table 3. The 15 factors were subjected to factor analysis, with principal component analysis and varimax rotation. In the first instance, the analysis is to determine the strength of the relationship between the variables based either on correlation coefficients or partial correlation coefficients of the variables. The Barlett's test of sphericity is assumed to tests the hypothesis that the correlation matrix is an identity matrix. In this case, the value of the test statistic for sphericity was large (Barlett test of sphericity=561.173) and the associated significance level is small (p=0.000), suggesting that the population correlation matrix is not an identity matrix. An observation of the correlation matrix of the barriers to lessons learned application for successful construction project delivery shows that they all have significant correlation at 5% level, depicting that there would be no need to eliminate any of the variables from the principal component analysis.

The value of the KMO statistic is 0.598 which is not less than 0.6 which according to Gaur and Gaur (2009), is a satisfactory condition for factor analysis to hold. Hence, these tests indicate that factor analysis is the appropriate tool for factor extraction and as such factor analysis was adopted for the study.

Table 4: Communalities, total variance explained and component matrix for constraints to lessons learned for construction projects.

Component Matrix[a]								
Constraints	**Component**							
	Communalities	1	2	3	4	5	6	7
X_{11}	.845	.756						
X_2	.771	.739						
X_{14}	.736	.712						
X_8	.825	.690						
X_{12}	.853	.686						
X_4	.662	.614						
X_9	.787	.593						
X_1	.780		.738					
X_{15}	.807		.575					
X_3	.812			.598				
X_6	.872							
X_7	.811				.677			
X_5	.792				.614	.512		
X_{13}	.898						.726	
X_{10}	.799							.580
% of Variance		25.367	13.221	11.144	8.679	7.701	7.499	6.734
Cumulative %		25.367	38.589	49.733	58.412	66.113	73.612	80.346
Extraction Method: Principal Component Analysis. **a. 7 components extracted.**								

In estimating the possible intensity of the constraints to lessons learned application for successful construction project delivery was achieved with the aid of the communality extraction as depicted in table 4. The least extraction value of 0.662 is associated with the factor X_4, lessons learned not being used across different locations, while the highest extraction value of 0.898 is associated with the factor X_{13}, lack of willingness to share project faults caused by individual or group performance. This shows that each of the factors has indicated some potentials for affecting the barriers to lessons learned application for successful construction project delivery.

A total of seven (7) principal components were extracted from the initial fifteen (15) constraints. These seven components generated cumulative variance explanation of 80.346% as shown by the extracted sums of square loading in table 4. When the above varimax is rotated, it generated the same sums of squares loading also. The findings from the results shown above indicates that 15-factors can be grouped into seven decision matrix (components) for constraints to lessons learned application for successful construction project delivery. However, 6-principal components were later extracted for effectiveness. In the first component, 7 factors (X_{11}, X_2, X_{14}, X_8, X_{12}, X_4, and X_9) in that order loads positively maximally, 2 factors (X_1 and X_{15}), loads positively maximally in the second component, while 1 factor (X_3) loads positively maximally in the third component. In the fourth component, 2 factors (X_7 and X_5) load positively maximally. In the fifth component, no factor loaded. In the sixth component, 1 factor (X_{13}) loaded positively maximally.

While finally in the seventh component, 1 factor (X_{10}) loaded positively maximally.

3.2 Discussion of results

On the constraints to lessons learned application, the study found that although the fifteen (15) factors were identified from the literature as constraints to lessons learned application to successful construction project delivery. The practitioners understood these factors in seven key dimensions (factors 1-7) as presented in table 4. A further examination of the constraints to lessons learned application gave rise to 6-principal components which were later extracted for effectiveness. In the first component, lack of comprehensive approach to lessons learned loaded positively maximally, in the second component, lack of time loads positively maximally, in the third component, degeneration into blame sessions that becomes emotionally damaging loaded positively maximally. In the fourth component, poor organizational culture load positively maximally. In the fifth component, lack of willingness to share project faults caused by individual or group performance loaded positively maximally. While in the sixth component, lack of a lessons learned repository loaded positively and maximally. These findings are also in line with those existing in the literature to a greater extent most importantly that of (Larson, & Gray, 2011; Paranagamage, et al., 2012¸ Wiewiora, et al., 2009) who were of the view that constraints to lessons learned are mostly related to inter-project transfer of documented lessons learned evidences which includes processes of transfer of lessons learned beyond the project amongst others.

4. CONCLUSION AND RECOMMENDATIONS

From the outcomes of the results, the study now concludes that; The most significant constraints to the deployment /application of lessons learned in the delivery of construction projects are; lack of comprehensive approach to lessons learned; lack of time; degeneration into blame sessions that becomes emotionally damaging; poor organizational culture; lack of willingness to share project faults caused by individual or group performance; and lack of a lessons learned repository. On the constraints to lessons learned adoption/application in construction project delivery, this study recommends that a comprehensive approach to lessons learned forum be created through conferences, workshops, face-to-face interactions with a view to help understanding what lessons learned is all about. In the absence of a concerted effort of this sort in place, the tendency to get the lessons learned technique to the delivery of construction projects in Nigeria would not be achieved. Further work is required in the areas of lessons learned associated with larger infrastructure projects that are not just limited to the core areas of construction, but to include other aspects of both IT, industrial based and other mega development projects.

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APPLICATION OF EVENT CHAIN METHODOLOGY IN SCHEDULE RISK ANALYSIS

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Abstract: Risk management has become one of the key components of successful project management, and quantitative risk analysis an indispensable ingredient of successful decision process. Although academics proposed numerous methods and techniques that determine the probability and impact of project risks, just a few have earned wider application in practice. This paper aims to bring the practitioners closer to event chain methodology, as one of the recent project risk modeling techniques that can simplify and improve accuracy of existing methods at the same time. Theoretical part emphasizes the significance of managing the risk events and event chains that affect projects every day, while practical demonstration and case study approach give insights in capability of event chain methodology and its value in real life situation.

Key words: event chain, Monte Carlo simulation, project risk, quantitative risk analysis.

1. INTRODUCTION

Risks and uncertainties are an inevitable part of each project, and many of these events are very hard to identify and analyze (Hulett, 2016). The inability to anticipate all project circumstances leads to inaccurate project plans, overruns in terms of cost and schedule, and failure to meet stakeholder expectations. Development of realistic schedule that considers potential threats and uncertainties remains one of the key success factors of any project, and one of the biggest issues when it comes to the project management.

Following the analysis of 318 industrial projects from different environments, Merrow (2011) shows that up to 65% are considered a failure. Therefore, a huge scope of study is open for the application of risk prevention, as presented in Kardes, Ozturk, Cavusgil, and Cavusgil (2013). The literature has identified a number of reasons for poor schedule estimates and insufficient implementation of risk management methodologies (Intaver Institute, 2011). Wrong estimations can be result of unintentional action (psychological bias) or intentional action (organizational pressure) by project planners, which further lead to inaccurate forecasts (Virine, & Trumper, 2015). Other biases that can be attributed to project forecasting are the optimism and planning fallacy (Buehler, Griffin, & Ross, 1994; Lovallo, & Kahneman, 2003).

A reason for false estimation can be related to selective perception as confirmation bias (Plous, 1993) and use of heuristics as cognitive bias (McCray, Purvis, & McCray, 2002). Selective perception is tendency of managers to emphasize the evidence that confirm their hypothesis and ignore the opposite (Evans, Barston, & Pollard, 1983). The availability heuristic relates to situation where decision makers base their judgments on similar good or bad performed tasks that have been previously completed. Anchoring heuristic relates to a tendency to remain close to the preliminary estimate.

The accuracy of project plans can be significantly improved by updating the original plan (Wysocki, & McGary, 2003). This requires the analysis of uncertainties throughout the complete lifecycle of the project and incorporating new knowledge into the project plan. Major problem with accuracy of estimates is complex relationship between different risks. Risks may occur at different times during the activity execution, one can cause other events, risks can be correlated, and these relations needs to be identified and visualized. Although there are many scheduling techniques that include project

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performance measurement and other analytical techniques, most of them are complex and inconvenient to use.

This paper has a goal to explore the applicability of event chain methodology (ECM) as a technique that can simplify the process of risk and uncertainties modeling and mitigate the negative effect of cognitive, confirmation and psychological bias. ECM promise to improve forecasting accuracy by creating a flexible framework that includes visualization, performance measurement, execution of migration plans, moment of events, correlations between uncertainties and repeated tasks (Intaver Institute, 2011).

2. FOUNDATION AND PRINCIPLES OF ECM

Risk management usually implies the use of the workflow and various tools and visualization techniques. Project Management Institute (PMI) defines this process as risk identification, qualitative and quantitative analysis, risk response planning, response implementation, and risk control (PMI, 2017). Certainly, one of the key steps when it comes to development of reliable project schedule is risk identification. Proper risk analysis is impossible without extensive risk identification process.

Project Management Body of Knowledge (PMBOK Guide) recommends the use of different risk identification techniques such as checklists, brainstorming, interviews, assumption analysis, SWOT, root cause identification, and various diagramming techniques (PMI, 2017). Although templates and check lists represent an effective way of identifying risks, most of the project risks are industry specific, so generalization should be avoided. Universal check lists like the one developed by Scheinin and Hefner (2005) can be a beneficial and serve as a good starting point.

When it comes to risk analysis, PMI suggest the use of several techniques, such as expected monetary value, sensitivity analysis, and Monte Carlo analysis. Expected monetary value requires the use of decision tree in order to identify project alternatives and support decision making. Sensitivity analysis determines which risk events have the most potential impact on project schedule. Monte Carlo simulation uses probabilistic inputs to generate the distribution of potential results, which enables the inclusion of risk and uncertainty in the project scheduling (Schuyler, 2001). Monte Carlo analysis and sensitivity analysis form the basis for the application of the ECM.

ECM represents a technique for schedule network analysis that enables modeling and visualizing of risk events. Project schedule is usually altered by a series of risk events that can be interdependent. The focus of ECM is identification and analysis of risk events and situations in which one event causes another (i.e. event chains). The main idea is to detect the events and chains with the most significant impact on project schedule and address them before they severely impact the project. Application of ECM analysis usually includes the following steps (Virine, 2013):

1. Creation of best-case scenario estimates of activity and project duration. Due to overconfidence project managers tend to develop optimistic schedule, which is usually impossible to prevent.
2. Definition of risk events and chains with detailed probabilities and impacts on project schedule. This includes development of risk-breakdown structure with all necessary attributes.
3. Execution of Monte Carlo simulations in order to obtain statistical distributions of key outcomes, such as project duration and percentiles of finish times for project activities.
4. Execution of sensitivity analysis that identifies risk events and event chains with the most significant effect on key variables. Reality check validates proper definition of probabilities.
5. Repetition of analysis and reassessment of risk probability and impact throughout project, inclusion of actual project data and risk occurrence that enables up-to date forecasts of project duration.

ECM is based on six principles that include single and multiple events identification, definition of the moment of event and excitation, visualization of event chains, Monte

Carlo analysis, sensitivity analysis and measurement techniques (Intaver Institute, 2011). Most of these are illustrated by Fig. 1, which is followed by an explanation. Although ECM is considered a relatively modern concept in project management, it uses some traditional quantitative methods such as Monte Carlo and sensitivity analysis, Bayesian theorem, as well as some terminology from the quantum mechanics ground and excited states. ECM is already fully or partially implemented in several software application (Virine, & Trumper, 2015).

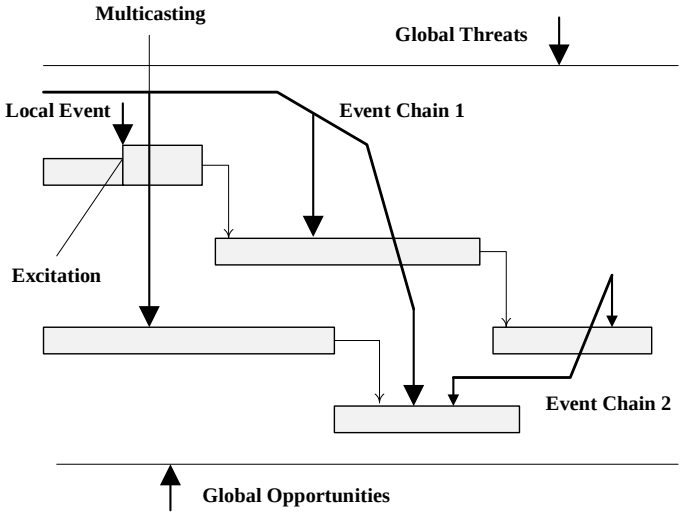

Figure 1: Example of an event chain diagram

1. *Moment of event and excitation* - most of the real-life project activities are not a uniform and continuous and they are impacted by events that transform them from one state to another. These events include changes in resources, material or work that may alter one or more activity's duration. Assignment of event to activity includes subscription of the impact, probability of occurrence, excited state and the moment of event, which can be also probabilistic. Events can be positive or negative, and it can transform activity from ground to excited state, as well as vice versa (mitigation efforts).
2. *Event chains* - event chains occur when one risk event (sender) causes another event (receiver), which usually lead to creation of ripple effect through the project and significant impacts. An event can cause multiple events in different project activities or can impact different resources, creating a multicasting effect. Each receiver can act as sender as well, if it triggers another event.
3. *Event chain diagrams* - event chain diagrams enable visualization of complex relationships between events and schedule, and they are used for the significant events only (Virine, & McVean, 2004; Virine, & Rapley, 2003). Event chain diagrams builds on original Gantt charts with specified modifications (Fig. 1). Some of the basic rules that can be easily comprehended include: down arrows represent negative impacts, up arrows positive impacts, individual arrows represent events, multiple connecting lines represent multicasting, arrows outside the chart represent global events affecting all activities, arrow size represents the relative probability of an event, horizontal position on the bar represents the mean moment, etc.
4. *Monte Carlo analysis* - Monte Carlo simulation is performed to quantify the cumulative impact of the identified events and event chains (Avlijaš, 2019). Beside probability distributions and impacts of risk events, inputs also include the probability distributions and impacts that relate to fluctuations

in activities duration, which should not have the same root cause as the events to avoid double count of risk. In addition to traditional Monte Carlo analysis results, ECM includes calculation of success rates, probabilistic cash flows, conditional branching, etc.

5. *Critical event chains* – risk events and event chains with the most significant impact are called critical. Sensitivity analysis is used to identify critical events and mitigate their negative impacts by analyzing the correlations between event chains, project duration and cost. Critical events can be visualized by using a sensitivity chart, that enables calculation of correlation coefficients, event costs and total project cost with risks and uncertainties.
6. *Performance measurement* - Using of actual performance data ensures the use of updated information and recalculation of probabilities of occurrence and moments of events. This further enables creation of updated project schedule and durations, which is usually accompanied by charts that illustrates variation of chances of completing a project within specific deadline. The chance to meet the deadline is constantly updated and it usually decreases over time due to different project risks, but it can also improve due to risk mitigation actions performed by managers.

3. ILLUSTRATIVE EXAMPLE

A simple case will be used to illustrate how risk events can be managed with the use of event chain methodology. Illustrative project consists of three activities (A, B, C) with finish-to-start (FS) relationships. In order to examine different implications, this sequence is presented in four different scenarios: base case, single risk event, multiple independent risk events, and event chain. The data given in Table 1 provides information related to project activities and their attributes in terms of duration and dependencies. Table 2 provides information on probabilities and impacts of risk events that extend activity durations. Generally, events can not only affect schedule, but also cost, safety, performance, quality, technology, and other objectives (Agarwal, & Virine, 2017).

Table 1: Activities, dependencies and durations for the sample project

Activity attributes			**Duration (Base case scenario)**		
Activity	**Predecessor**	**Expected (Te)**	**Optimistic (a)**	**Most likely (m)**	**Pessimistic (b)**
A	-	5 days	4 days	5 days	6 days
B	A	4 days	3 days	4 days	5 days
C	B	3 days	2 days	3 days	4 days

Table 1 provides three-time estimates (optimistic, most likely and pessimistic) which indicate the risk level for each activity. These are used to calculate expected activity durations (Te), and the formula is based on the beta statistical distribution (TE = (a + 4m + b)/6). Beta distribution is generally used more often than a normal distribution, as it is very flexible in form and can deal with extremes (e.g. when a = m, or b = m). Before running the Monte Carlo simulation, assumptions for the activities and risks need to be defined. Definition of assumption includes selection of suitable probability distribution and definition of parameters. This was done separately for the regular variation in activity duration and risk events. For the duration of project activities BetaPERT probability distribution was used. BetaPERT represents a special case of the beta distribution, which unlike triangular distribution uses three parameters (a, m, and b) to create a smooth curve that fits well to the normal or lognormal distributions (Davis, 2008).

Table 2: Risks and scenarios for the sample project

Activities and risk events		Single event	Multiple events	Event chain
Activity	**Impact**	**prob. for scenario 2**	**prob. for scenario 3**	**prob. for scenario 4**
A	1 day	30%	30%	30%
B	2 days	0%	30%	30% (100% in case of risk A)
C	3 days	0%	30%	30% (100% in case of risk B)

For the risk events custom distribution was used. This type of distribution represents a unique situation and relies on single values, discrete ranges, or continuous ranges. In this case, each risk events were assigned a discrete probabilities and possible impacts of 1, 2, 3 days, respectively for each activity. Oracle Crystal Ball software was used for the simulation. For each input software selects samples from the assumed distributions, inserts these into mathematical model for thousands of times and calculate distribution of the outcome variable (Williams, 2004).

As can be seen from Table 1, the critical path is simple, and it consist of activities A-B-C. The shortest period in which illustrative project with expected activities duration (Te) and predefined dependencies can be completed is 12 days. For each of 4 scenarios 1,000 trials were simulated, and the resulting statistical distribution of project duration is provided in form of frequency charts depicted by Figures 2-5. Beside distribution of the output variable, these figures show the 90th percentile, which is considered as high estimate of project duration.

The statistical distribution for the simulated base case is calculated with the given beta distribution and has a mean of 11.98 days and a median of 11.96 days. Since the base case scenario does not include risk events, competition time can be shorter than expected. As can be seen from Fig 2. the maximum simulated duration was 13.96 and high estimate of project duration is 12.82 days (90% certainty). A slightly different situation is with scenario 1 that includes one risk event assigned to activity A with probability of 30% and 1-day impact. As can be seen form Fig. 3 single risk event scenario results with a mean project duration of 12.27 days, median of 12.25 days, maximum value 14.74 of days, and high estimate of project duration 13.39 days.

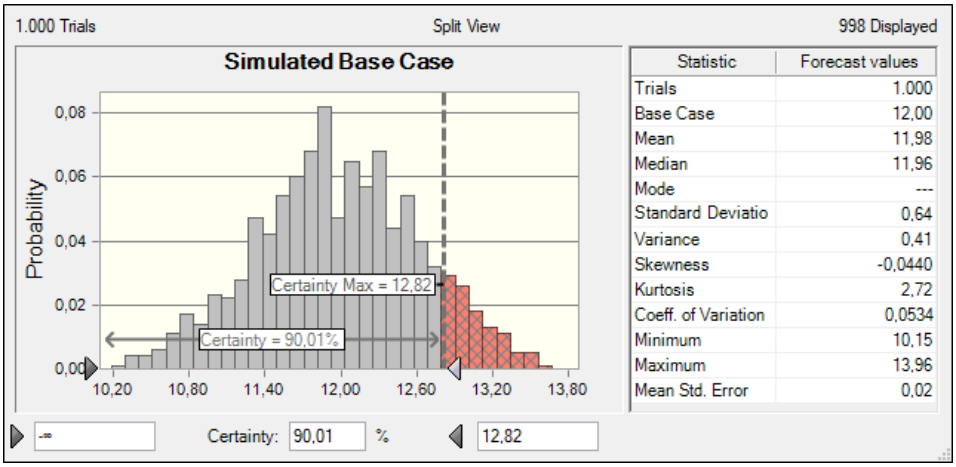

Figure 2: Simulated Base Case - high estimate of duration (90th percentile)

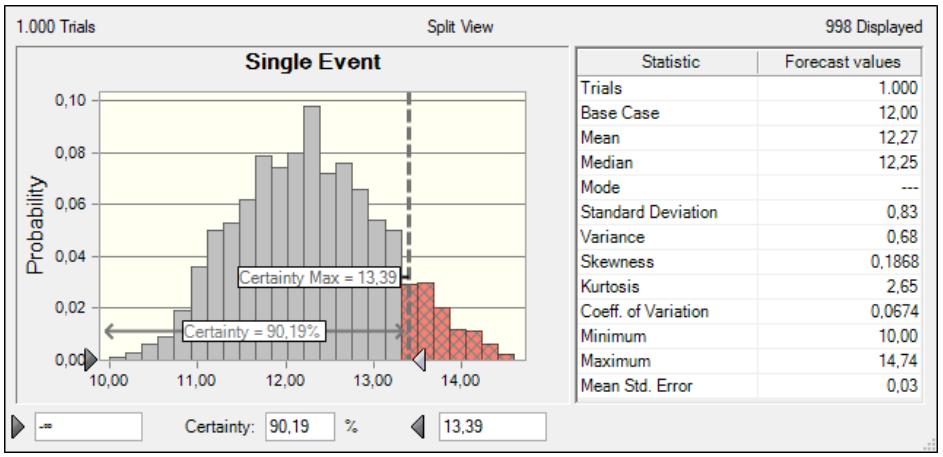

Figure 3: Single risk event - high estimate of duration (90th percentile)

Due to the increased number of risk events, significantly different results were obtained in the last two scenarios. Fig. 4 shows a third scenario with three independent risk events, one related to each activity, each with probability of 30% and 1, 2, and 3 days of impact respectively. As can be seen form Fig. 4, this multiple independent risk event scenario results with a mean project duration of 13.75 days, median of 13.53 days, and maximum value of 19.12 days.

The last scenario includes event chain with three interrelated risk events. Risk event related to activity A has a probability of 30%, and potential impact of 1 day. If the first event occurs, other two represent certain events that extend the project duration of activity B for 2 days and activity C for 3 days. As can be seen form Fig. 5, event chain scenario results with a mean project duration of 15.24 days, median of 15.99 days, and maximum value of 19.89 days.

Bimodal distribution of the output variable makes the results of the last scenario significantly different from the result obtained in the multiple independent risk events scenario. High estimate of project duration in the event chain scenario is 18.35 days, which is more than 2 days longer than the high estimate of the project duration in the independent risk event scenario (16.33). These results unambiguously indicate that event chain leads to longer project competition time compared to the series of independent events with equal probability and impact.

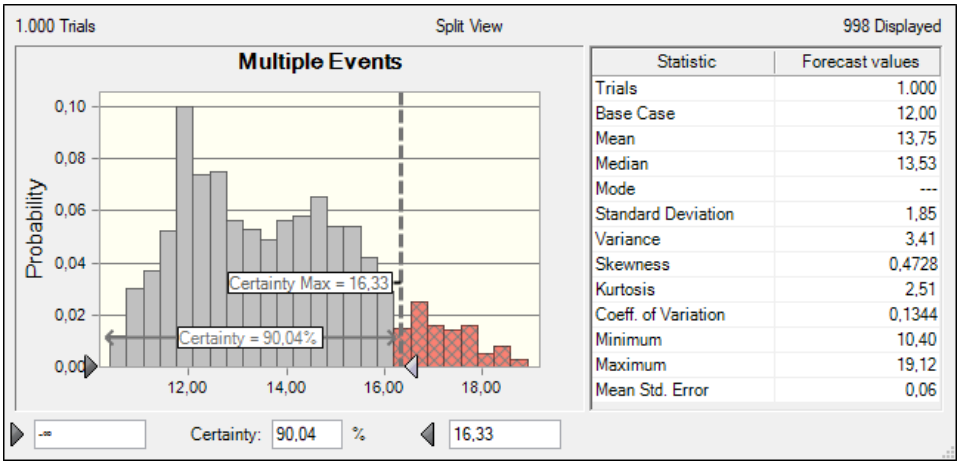

Figure 4: Multiple (independent) risk events - high estimate of duration (90th percentile)

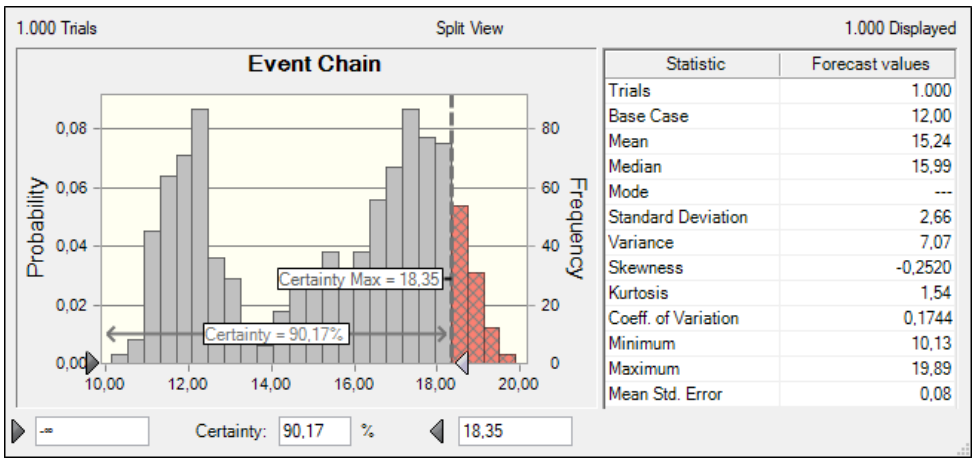

Figure 5: Event Chain statistics - high estimate of duration (90th percentile)

Finally, sensitivity analysis was performed in order to identify the most critical events. This was done by computing the rank correlation coefficients between every assumption and every forecast. Figure 6 shows the sensitivity charts that rank the variables from the most important down to the least important in the examined scenarios. High correlation coefficients indicate that the variable significantly impacts project duration, and positive coefficients indicate that an increase in the variable leads to an increase of project duration.

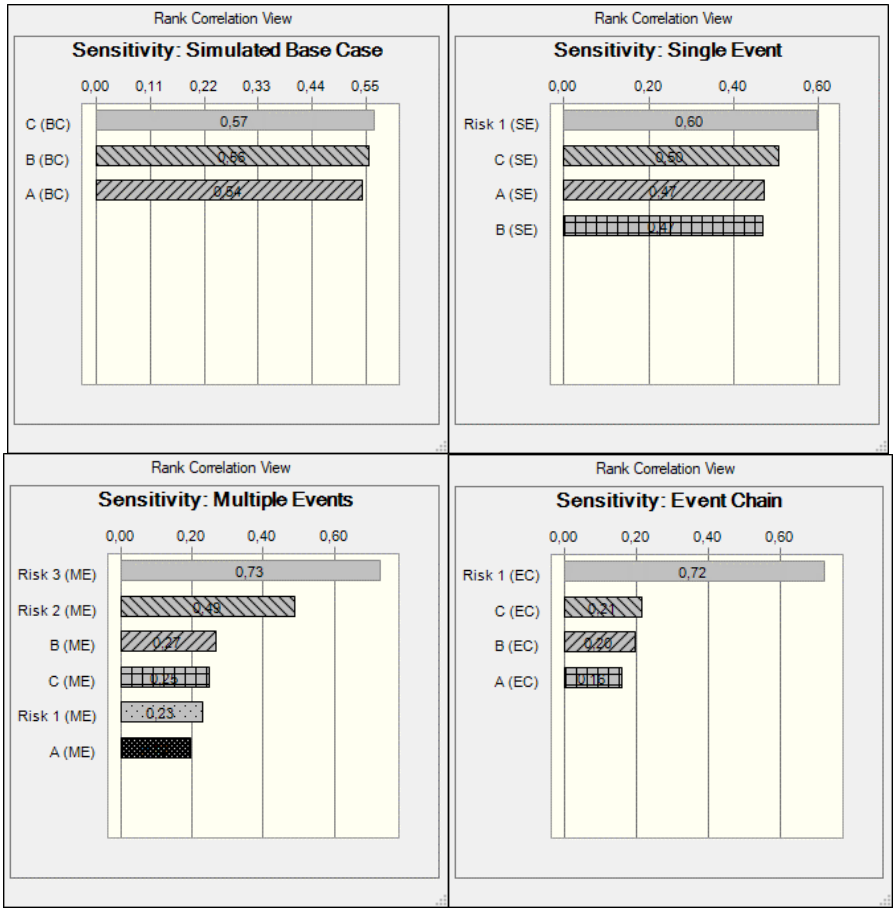

Figure 6: Sensitivity analysis for the examined project scenarios

Since the activities are the only inputs in the first scenario and they use the same probability distribution (BetaPERT), sensitivity analysis output in the upper left corner seems logical. A similar situation is with the second scenario (upper right corner), where the single risk event is depicted as the most significant. In the scenario with three independent risk events with equal probabilities (lower left corner), the last risk event is the most significant as it involves the greatest potential delay. In this case, first risk event appears less significant than the regular variation in the duration of activities B and C. Unlike the previous, the most important variable in the last scenario is the first risk event, which triggers the second and third risk event and at the same time significantly affects the project duration.

4. CONCLUSION

Existing literature has identified cognitive and motivational biases as the key reasons for poor project scheduling. Unlike the most traditional quantitative risk management methods, ECM suggest the use of additional factors such as interrelation between risk events, moments of risk occurrence, activity delays and repetitions, execution of risk response plan, etc. In this way, it seeks to reduce the impact of selective perception, overconfidence, availability heuristic and anchoring, as the most significant root causes of poor project time planning.

Starting from the original schedule baseline, ECM method upgrades the existing methods with additional information on risk events and their impacts and incorporates valuable historical information. As the project progresses and new information is discovered, the plan can be updated, increasing the accuracy of the estimates and the ability to control the project schedule. The complex relationships between project activities can be visualized using diagrams, which makes it easier to identify risk events, event chains and calculate their potential impact. ECM application is likely to increase with the ongoing expansion of international large-scale cross-sector projects, as it will provide a common risk assessment tool understandable to all parties involved throughout the project lifecycle.

The illustrative example was used to demonstrate the importance of identification and analysis of risk events and the simplicity of the ECM method, regardless of the type, size and complexity of the project. The application of the method does not require development and use of a specialized simulation software, so it is also possible to use existing tools for quantitative risk analysis. Therefore, some of the key benefits of the ECM described in this paper can be significant factor for greater application of this relatively novel approach and further integration with the existing project management practice.

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STRATEGIC PLANNING IN CORRELATION WITH INTERNAL AUDIT

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Abstract: Strategic planning and Internal audit are important for organizational existence in dynamic business world. Strategic planning, by definition sets up guidelines for organizations actions in achieving goals, while internal audit is designed to help organization to reach these goals. Research for this paper is based on theoretical considerations and surveys done in different types of organizations by overseeing the connection and correlation between strategic planning and Internal audit. Research showed that strategic planning is very demanding function in organization and requires many different resources in order to create sustainable strategy for the organizations future. Internal audit in organization is a function that adds value, by ensuring the management that system of controls in organization is functioning well, and the risks are put to minimum. This paper is a shorted version of authors Master thesis - Strategic Planning in Organization Aided by Internal Audit.

Key words: internal audit, strategic management, strategic planning, strategic thinking.

1. THREE TYPES OF STRATEGIC ACTIVITY

Three types of strategic activity are: strategic thinking, strategic planning and strategic management.

1.1 Strategic thinking

Strategic thinking defines well the creation of the vision in organization, which includes the process of defining and achieving objectives of organization in a difficult environment in which there is considerable uncertainty about the future. Strategic thinking is about reconsidering that future, sometimes in a small way. Strategic thinking usually may be as far as any strategist wishes to go, in manner of providing the rational framework, which clarifies how all current operations are to be organized (White, 2004, p 61).

Vision - a **Vision** is the "big picture" created with the passion that helps employees feel what they are supposed to be doing in the organization (Hitt, Ireland, & Hoskisson, 2009, p. 18). The vision of an organization defines what that organization is. It is at the core of the organization's identity, representing the reason why organization exists. It is closely linked with what the organization can do, reflecting its resources, capabilities and competencies. The vision precedes, but overlaps strategy. It is basically the creative or artistic part of strategy. The existence of a clear vision is a prerequisite for the formulation of a good strategy (White, 2004, p. 55).

Mission - a **Mission** specifies the business in which the organization intends to compete and the customers it intends to serve, according to Ireland and Hitt (1992). The organization mission is more solid than its vision. As well as the vision, a mission should establish an organization's uniqueness and should be inspirational and relevant to all stakeholders, according to Duncan (1999). Vision and mission together deliver the foundation of the organization's needs to choose and implement one or more strategies.

The possibility of creating an effective mission rises when employees have a strong sense of the ethical standards that should direct their performances as they work in order to help the organization accomplish its vision. Therefore, business ethics are a vital part of the organization's discussions upon decisions what it wants to become as well as who it anticipates to serve and how it wishes

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to serve those individuals or groups (Ward, Lankau, Amason, Sonnenfeld, & Agle, 2007).

Objectives and Goals - all organizations have objectives and goals. Objectives are organizations performance targets – the results and outcomes it wants to achieve. Organizational structure and activities are designed and resources are allocated around the objectives to enable their achievement.

Organization interpret their vision and mission into objectives. The goals are more specific and they translate the objectives to short term perspective, they provide meaning and sense of direction to organizational effort. Goals also act as benchmarks for guiding organizational activity and for evaluating how the organization is performing. Objectives with strategic focus relate to outcomes that strengthen an organizations overall business position and competitive strength. (Hitt, et al., 2009, p. 19).

1.2 Strategic planning

"Plans are of little importance, but planning is essential."
Winston Churchill, former British Prime Minister

Strategic planning undertakes a further step in the defining of the future in which strategic actions are created into formal and articulate written plans and action to achieve those plans. Any plan enforces the human will upon an environment which is full of unexpected changes (White, 2004, p 61).

Planning is a crucial management activity no matter what type of organization is being managed (Certo & Certo, 2012, p. 160). The essential purpose of planning is to help the organization reach its objectives (Certo, & Certo, 2012, p. 161).

Mintzberg (1994) finds a variety of reasons for planning. He states that organizations must create plan in order to coordinate its activities. According to him, organizations must plan to make sure that the future is seriously considered, organizations must plan to be "rational", and finally, organizations must plan to control.

Strategic plan should be simple, clear and written.

According to Mintzberg (1994), the three assumptions underlying strategic planning are:

- assumptions of formalization where the strategy making process can be programmed by the use of systems;
- assumptions of objectivity in which "thought must be detached from action, strategy from operations, perceived thinkers from real ones, and "strategists" from the objects of their strategies";
- assumptions of quantification where "the strategy making process is determined by 'hard data' including detailed 'facts' about the organization and its surroundings."

Strategic planning is involving the use of formal planning methods, including the development of explicit plans with a full range of objectives, and its application to all business units and functional areas within the organization, and at all levels. All parts of the organization have a carefully defined role to play in the realization of such a plan.

1.3 Strategic management

Strategic management is strategic thinking applied to action. Strategic management allows an organization to coordinate all its functional activities in accomplishment of clear objectives. It is about the reshaping of some part of the future. In a world of constant change this reshaping is a requirement for the long-term success of one organization (White, 2004, p 61).

According to Wheelen and Hunger (2012) strategic management is set of managerial decisions and actions that governs the long run performance of an organization. It includes environmental scanning, strategy formulation, strategy implementation, and finally evaluation and control.

According to David (2011), strategic management can be defined as the discipline of formulating, applying, and assessing cross-functional decisions that allow an organization to accomplish its objectives. According to this definition, strategic management focuses on assimilating all

functions in organization, such as management, marketing, finance, operations, research and development, and information systems to achieve organizational success. The purpose of strategic management is to exploit and create new and different opportunities for future of organization (David, 2011, p. 6).

Strategic management is what managers do to develop the organization's strategies. It's an important duty that involves all primary management functions in organization, such as planning, organizing, leading, and controlling (Robbins, & Coulter, 2012, p. 225).

1.3.1 Strategic management process

Many authors agreed that the strategic management process in terms of strategic planning is consisted of three phases – first phase - **strategy formulation**, which includes phases of development of vision, mission and statement, performance of external and internal audit and selection of strategy. Second phase is **implementation of strategy**, and final phase in **monitoring and evaluation of strategy**.

The **strategic management process** is the complete set of obligations, decisions, and actions required for an organization to achieve strategic competitiveness and to earn above average returns. (Hitt, et al., 2009, p. 6).

According to Mahoney and McGahan (2007), organization first step in the process should be to analyze its external and internal environments to determine its resources, capabilities, and core competencies.

After analysis of this information, the organization develops its vision and mission and formulates its strategy. To implement strategy, the organization takes actions toward achieving strategic competitiveness. Effective strategic actions that take place in the perspective of cautiously combined strategy formulation and implementation result in desired strategic outcomes. It is a dynamic process and very demanding (Hitt, et al., 2009, p. 6).

Other activity that has to be performed is internal examination of existed resources. That is how the resource-based model was introduced. Resources based model assumes that each organization is a collection of unique resources and capabilities. The exclusivity of its resources and capabilities is the basis for an organization's strategy and its ability to earn above-average returns (Acedo, Barroso, & Galan, 2006)

According to the resource-based model, differences in organization's performances across time are due to their exceptional resources and capabilities rather than to the industry's structural characteristics. This model also assumes that organization obtain different resources and develop exclusive capabilities based on how they combine and use the resources (Newbert, 2007).

Through continued use, competences become stronger and more difficult for competitors to understand and imitate. According to Schoemaker and Amit (1994) as a source of competitive advantage, a capability "should be neither so simple that it is highly imitable, nor so complex that it defies internal steering and control."

2. PERFORMING INTERNAL AUDIT IN PROCES OF STRATEGIC PLANNING

"Weak leadership can wreck the soundest strategy."—Sun Tzu

According to David (2011), the process of performing an internal audit matches the process of performing an external audit in organization. Representative managers and employees from the organization should be involved in shaping an organization's strengths and weaknesses.

The process of performing an internal audit makes available more opportunity for contributors to understand how their jobs, departments, and divisions fit into the entire organization. Advantage of this process is great, since managers and employees perform better when they understand how their work affects different areas and actions of the organization. Another aspect of performing internal audit is that it is an excellent opportunity for improving the process of communication in the organization, since in

order to understand the functions of the organization, representatives of every department communicate among themselves and most importantly, strengths and weaknesses can be determined collectively (David, 2011, p. 93).

Communication is the most important word in management during the process of performing internal audit in process of strategic planning.

In process of performing an internal strategic management audit, managers from different departments of the organization are able to understand the nature and effect of decisions in other business areas in their organization. Knowledge of these relationships is very important in process of creating objectives and strategies (David, & David, 2017, p. 180).

Performing an internal audit in organization in process of strategic planning, requires gathering, assimilating, and evaluating information about the organization's operations. In this stage, important success factors, that are consisted of both strengths and weaknesses, should be identified and prioritized.

A failure to identify and comprehend relationships among the functional areas of business of one organization can be harmful to strategic management and strategic planning process.

Ansoff (1987) explained well the process of strategic planning in organization in relation of including every business area in process. He stated that during the first fifty years, successful organizations focused their energies on optimizing the performance of one of the principal functions such as production or operations, research and development, or marketing. Nowadays, due to the growing complexity and dynamic environment, success more and more depends on a sensible combination of several functional influences. This switch from a single function focus to a multifunction focus is essential for successful strategic management and strategic planning.

3. INTERNAL AUDIT – FUNCTION IN ORGANIZATION

Internal audit is the profession-occupation that emerged in mid-20th century. Internal auditors are individuals that are certified for matter of performing internal audits in organization. Internal audit profession has its standards, procedures and guidelines that follows and that internal auditors work by.

Internal audit could be organized as an independent unit within the organization, or organization could have internal auditor as individuals. Either way, it depends on management requirements.

Internal auditors are right hand of a decision makers in one organization. They assure managers that system of internal controls in organization is functioning well and that risks of unwilling events are put to minimum.

Internal auditors are well experienced and independent individuals with great knowledge of organization that they work in, since they have availability of processes and people in organization by obtaining their regular audit job.

Evolution of internal audit profession was for sure pushed by constant changes in business world. Another feature of evolution of internal audit lays within the management in organization. Management understood that every aspect that could help in achieving organization goals is necessary and mandatory in turbulent business world. Internal audit function for sure is essential for one organization and for management.

Through the years, internal audit function went from being a monitoring - passive function in organization, up to becoming a consultant, very dynamic function in organization.

3.1. Basic roll and evolution of Internal Audit function / profession

The basic role of internal audit function is to provide assurance that management has implemented a suitable internal control system to prevent risk in organization.

Another roll of internal audit function is to help management achieve company's goals.

As well as providing assurance in functioning of system of controls in organization, internal auditing should provide internal consulting services to all levels of the organization in terms of training, assistance, guidance and counsels, and in that way it helps organization in achieving its goals.

Goodwin (2004) states that the new definition of internal audit function has moved its focus from internal audit function to a function of adding value to the organization by improving the operations of the organization and by evaluating and improving the effectiveness of the organization's risk management, control and governance processes.

At it's very beginning, in its pioneer phase, internal audit has been seen as a monitoring function, the "organizational policeman and watchdog" (Morgan, 1979), and it was tolerated as a necessary component of organizational control, but believed to be a passive to the accomplishment of major corporate objectives.

Internal audit function became major managerial control device trough measuring and evaluating the effectiveness of organizational controls, according to Carmichael, Willingham and Schaller (1996). That as well is related to the organizational structure and rules of business (Cai, 1997).

Internal audit function is defined as well by COSO (Committee of Sponsoring Organizations of the Treadway Commission, 1992) as a technique which brings essential security to the organization regarding the integrity of financial matters.

Definition of internal audit function, that was issued by the IIA in June 1999, evidently states that "the internal auditing activity should evaluate and contribute to the improvement of risk management, control and governance" (IIA, 1999).

This new definition moves the focus of the internal audit function from a function of assurance to value added function. By defining it as such, it shifted profession of internal audit function toward a standards-driven approach with a sensitive identity (Bou-Raad, 2000; Krogstad, Ridley, & Rittenberg, 1999).

Reding, et al. (2013) give internal audit function connection to the organization's goals. Internal audit function is intended to help the organization to reach its objectives. Fulfillment of organizational objectives defines the organization's accomplished success.

Organization's objectives and goals are what the company wants to achieve. If goals are clear and can be measured, they are estimate criteria of the organization's success (Reding et al., 2013).

COSO (Committee of Sponsoring Organizations of the Tredway Commission) categorizes organization's objectives as follows (Reding et al., 2013):

- Strategic objectives are what management do and plan to do in order to create value for the organization
- Operations objectives focus on organization's operations in order to increase effectiveness and efficiency
- Reporting objectives are about reporting internal and external information and the level of its reliability
- Compliance objectives concentrate on existing laws and regulations and their implementation in the organization

According to Pickett (2005, p. 8), internal auditors are able to assist top management with the following:

- Monitoring activities that management cannot monitor itself
- Identifying opportunities and minimizing risks of failure
- Validating reports to management
- Protecting management in technical analysis that is beyond their knowledge
- Providing information for the decision-making process
- Reviewing for the future as well as for the past
- Helping managers manage by pointing to violation of procedures and management principles.

Internal audit function has undergone dramatic changes and has expended its scope in order to make greater support to the organization goals. Internal audit function is as well performing its role in diverse cultural and legal environments within different organizations; which varies in size, structure, purpose and also in persons (Saud, 2015).

Achieving objectives and managing valuable organizational resources requires systems, processes and people. Internal auditors work closely with managers to review operations then report their findings. The internal auditor must be well experienced in the strategic objectives of their organization and the industry where organization is operating in order that they have a clear understanding of how the operations of any given part of the organization fit into the bigger picture.

As an independently organized unit, with authority and expertise it poses, internal audit function is useful and important tool for management so management is able to observe inner strengths of organization in order to use them in best way for achieving organization's goals and objectives and creating sustainable strategy for future of the organization.

4. RESEARCH ANALYSIS

As it was discussed in previous parts, strategic planning is very demanding and complex process in organization. It is one of the major rolls of top management in organization.

In order to create sustainable strategy for future, management needs to involve all relevant factors in organization.

During the process strategic planning, in previous parts of the paper were identified steps in process of strategic planning and resources that management has available for such operation.

It is evident that managers do perform internal audit in process of strategic planning as a part of process.

What could as well adds value and what could give more assurance and insights to the process of strategic planning in organization is to involve internal auditor during this process.

In this part of paper will be presented research results based on the indication that internal audit function could be significant in the process of strategic planning in organization.

This part of paper presents the data collected through two surveys – questionnaires.

First questionnaire was imposed to internal auditors in public and private sector and financial institutions in Serbia with idea and tendency to understand their opinion about their involvement into process of strategic planning in organization.

Second survey was imposed to decision makers in different organizations in Serbia in order to overlook their view of a roll of internal auditor in process of strategic planning in organization.

4.1. Internal Auditors Survey

First survey was prepared for Internal auditors with intention to understand what perception of strategic planning in organization internal auditors have.

Assumption is that the more experienced internal auditors would be more aware that their roll is necessary in process of strategic planning in organization. Experienced internal auditor have more knowledge about organization that they work in and do the auditing of system of controls. Internal auditors should be aware of potential risks and obstacles that organization could face.

Survey was conducted of twenty-six questions. Fifty-eight internal auditors responded on survey.

First set of question was general characteristics of participants, gender, age and education.

Thirty-eight percent of examined internal auditor are male, and sixty-two percent are female with average year of 41. This data shows that internal audit occupation is attractive for mid age workers, and that female are more involved in internal audit

occupation than male, based on this collected sample. This part of questions is conducted to see statistically ratio on percentage of male and female internal auditors as well as average age. This processed data is not further relevant for paper investigation.

Sixty percent of examined participants completed bachelor studies, thirty-six completed as well master studies. Majority (84,5%) of examined completed economic bachelor studies. Average years of working experience among participants is 16 years, and as an Internal auditor, average year of working is 5. This statistic show that internal audit profession is relatively new in Serbia.

In order to understand whether the participants are certified internal auditors, sixty percent answered that they have some sort of certification, opposite of frothy percent being non certified.

Out of 58 participants, twenty-one are certified as an Internal auditor for public sector (OIRJS), four of them are certified for international auditor certificate (CIA), four of them are certified with chamber of auditors (KOR) in Serbia. One has both CIA and KOR certification, two have KOR and OIRJS certification, and twenty-six are not certified yet.

Sixty-four percent of participants are from public sector, and most of them are working in local self-government. Out of 37 respondents from public sector, 17 are from local self-government, 12 are from state owned public company, and rest are from state government or other state owned institutions. Out of thirty-six percent that are in private sector, sixty-seven percent are within financial institutions. That is 21 respondents is from private sector, where 14 of them are from financial institutions, and 5 of them work in foreign owned organization, and two in domestic company.

Forty-one percent performed more than 45 internal audits in their career, seventeen percent performed between 15 and 25 audits, and 33 percent provided less than fifteen audits. Which shows that almost half of participants have been experienced in their work.

Within last employer, majority of 39 % (23 of them) performed less than 15 audits, 19 of them performed more than 45 audits, and 11 of them performed between 15-25 audits. This data showed that internal auditors do go for a job change among companies, but still large number of participants are well experienced in new organization, where 30 of them performed more than 15 audits within last employer.

Within last employer, most of the participants performed majority of internal audits - system audits, which means that internal auditors have overlook on particular systems in organization. More audits of systems that auditors perform, better understanding on organizations processes they have.

Important for internal auditors is for sure relation with managers/decision makers, since the management sets the tone in organization.

If management is fully aware of roll of internal auditors - that internal auditors are support system, consultants and in alignment with management in achieving goals of organization, then internal auditor's job in organization is reassured.

Forty out of fifty-eight participants answered that they have very good relation with decision makers in organization, which is 69% of examined. 22,4% answered that they have good relation with managers, and 8,6% answered that they have not so good relation with decision makers. This sample show that very high percent of participants have support form decision makers in completing their job as internal auditors.

Important relation as well is with the coworkers form other departments in organization. Since auditors need to process information, observe systems in organization, they have to communicate with workers responsible for certain systems in organization. Direct, open and trustworthy relation among internal auditors and coworkers from other department assures better understanding of potential risks in organization and brings organization closely in achieving its goals.

Sixty-five percent of internal auditors responded that their relation with coworkers is

very good, thirty-two percent assert good relation, and only 1,7% declare that they have poor relation.

Observing answers on relation of internal auditors with management and coworkers from another departments, it is showed that internal auditors do have support from both management and coworkers, whether they do feel slightly more comfortable in relation with coworkers from another departments.

Which leads us to next set of questions that are related with cooperation between internal auditors and decision makers when it comes to decision making in organization.

As it was stated above, roll of internal audit evolved during last seventy years, especially in last twenty years, where roll of internal audit is aligned with adding value to organization, by performing different duties.

According to Pickett, (2005) emerging roll of internal auditors is providing information for the decision-making process, which in some level involves internal auditor in process of decision making.

Internal auditors were asked whether they were involved in process of decision making in organization, for financial decision, operational decision, strategic decision, or if they were not at all involved in process of decision making.

Sixty-nine percent answered that they were not involved at all in any decision making process, 12% answered that they were involved in strategic decision, and 12% were involved in operational decisions. Only six percent were involved in financial decisions.
Analysis based on this answers clearly shows that roll of internal auditors in process of decision making is not recognized by managers/decision makers in organization.

Following question was intended to more closely examine reason of involvement of internal auditors in process of decision making in organization, by asking them were they willingly offered their expertise to the decision makers in process of decision making for financial, operational and strategic decisions. 67% answered that they never offered their knowledge and skills to the decision makers in process of decision making that are important for organization.

This implies that there is still to be working in relation decision makers-auditors when it comes to emerging roll of internal auditors in providing information for the decision-making process, which in some level involves internal auditor in process of decision making.

Next set of question was imposed to understand whether internal auditors are aware of strategic planning in organization and their roll in whole process.

Internal auditors were asked if their organization has Strategic document. 86% answered that organization possess Strategic document.

When internal auditors were asked if they were involved in process of strategic planning, 77,6% answered no.

Same percentage of participants (77,6%) answered that they have good knowledge of organization and working experience in order to participate in process of strategic planning in organization, but when they were asked would they participate in process of strategic planning in organization on request of decision makers, only 55% answered that they would accept to be involved in that process.

This states that internal auditors do feel like they understand organization they work in, that auditors feel strongly that they have enough working experience, but at the other hand not as high percent of auditors is eager to be involved in process of strategic planning.

14 out of 58 internal auditors did perform audit of strategic document.

In order to understand better how internal auditors see their roll in strategic planning, following questions were asked:

Based on their experience, is it important that internal auditor is involved in process of strategic planning?

58,6 % percent answered yes, 27,6% answered no, and 13,8% were not opinionated on this topic.

This shows that internal auditor feel that roll of internal audit is important in process of strategic planning in organization.

Last question was to define where internal auditors see their roll most valuable in process of strategic planning, where 54% answered in process of implementation and monitoring strategic planning. 29% answered in audit of process of strategic planning. 7% answered that their roll is best seen in process of audit of strategic plan. 3% answered that they do not recognize roll of internal audit in process of strategic planning, and 7% answered that strategic planning is not internal audit roll at all.

According to this sample and answers from internal auditors, it could be stated that internal auditors do feel strongly and self-confident when it comes to understand the organization they work in.

Internal auditors do see their roll in process of strategic planning as well as they would prefer to be involved in process of strategic planning. Most valuable roll of internal audit in process of strategic planning, according to their answer would be in process of auditing implementation and monitoring of strategic planning.

4.2. Decision makers Survey

This Survey is conducted with intention to oversee if decision makers fully understand the roll of internal auditors in organization. Survey is conducted of twenty-five questions, and prepared in that way to oversee at decision makers previous experience in decision making, length of work in current organization and attitude towards internal audit and finally their opinion on position of internal audit in process of strategic planning in organization.

Among decision makers, 73,3 % are male, opposite to 26,7% of female. Forty-seven percent of them are over 40 years old. Sixty percent have bachelor degree, and 20 percent have master and PhD level of study completed.

Five of them have more than 25 years of working experience. Other examined have more than 10 years of working experience.

As decision makers, most of them (33,3 %) have less than five years of experience and only one examined have more than 25 years of working experience. Fifty-three percent of examined have between five and fifteen years of experience as decision makers.

Most of them (60%) are less than five years' decision makers in organization that they currently work.

In all but one organizations, internal audit unit is established less than 5 years ago. Only one organization have more than fifteen Internal auditors and one has between 3 and 10 auditors, other organization have between one and three internal auditors.

Most of the decision makers (66,7%) answered that they have good insight of internal auditor job in their organization. Very good insight of internal auditor job has 26,7% of examined. One examined answer that has poor understanding of internal auditor job in organization.

Seventy-three percent of examined answered that in their organization, Internal auditors perform audits of financial processes in organization.

All but one decision maker answered that their collaboration with internal auditors is good. Same answers were regarding the collaboration that internal auditors have with other coworkers in organization.

86,7% of decision makers have insights on skills and knowledge that internal auditors have.

All of the decision makers answered that they use recommendation and reports that internal auditors conduct as a part of their job.

Only three participants never included Internal auditor in process of decision making in organization.

According to the decision makers, internal auditors are proactive as well, all but one internal auditors offered their skills to managers in process of decision making.

In process of strategic planning in organization, all decision makers used help of internal auditors – 13,3 % directly involved internal auditor in process of planning, and 86,7% used reports and recommendations of internal auditors in process of strategic planning in organization.

According to decision makers opinion, most valuable roll of internal auditors in process of strategic planning would be in audit of implementation and monitoring of strategy. (40% of decision makers answered as this). 26,4 % of examined answered that most significant role of internal auditor would be in auditing of process of strategic planning. 13,3% managers answered that they do not recognize roll of internal auditors in process of strategic planning, and the same percentage of examined answered that strategic planning is not a roll of internal auditors.

According to this sample and answers from decision makers in organization, it could be stated that managers do recognize significance of internal audit in their organization. They use skills and knowledge of internal auditor in process of decision making, as well as they use reports and recommendation that internal auditors conduct in process of auditing systems of control in organization. Most valuable roll of internal audit in process of strategic planning, according to their answer would be in process of auditing implementation and monitoring of strategic planning.

5. CONCLUSION

All functions are necessary in process of strategic planning in organization, also, all functions in organization are essential for creation of good and sustainable strategy.

Decision makers need to be aware of potential that lays within the organization and they have to be able to embrace all functions within the organizational order not to miss any important aspect in preparation of sustainable strategy.

Strategic planning evolved significantly during past fifty years. Decision makers are more prepared to use every possible tool that exist in order to create sustainable strategy for their organization.

Internal audit function as well grew during last fifty years. It came a long way from a passive function in organization, to very dynamic one.

Internal audit has significant insight of systems and controls in organization. As such function in organization, it should have notable position in process of strategic planning, and decision makers should have reliable source of information to use in process of strategic planning throughout personal involvement and throughout reports and recommendation internal auditors prepare as their job.

Roll of internal audit in the process of strategic planning is significant, useful and valuable for the organization.

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COMPETENCES FOR THE FUTURE: A COMPARATIVE ANALYSIS OF AGILE CERTIFICATIONS

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Abstract: Worldwide project management organizations are constantly looking for the right set of skills for professionals in an agile world, training people to acquire them and offering different kinds of certifications. A person who wants to be certified in agile practice has a difficult choice when looking for a right certificate. This paper aims to provide a comparative analysis of the most eminent agile certifications in the global market in order to help people finding the most appropriate certification for them.

Key words: agile, competences, certifications.

1. INTRODUCTION

Digital era has created a huge demand for developing innovative project methodologies (Dybå & Dingsøyr, 2008; Gil-Garcia, Helbig, & Ojo, 2014). These methodologies were counterweight of traditional methodologies characterized as tightly regulated, bureaucratic and contradictory to the contemporary business environment (Chow & Cao, 2008; Hoda, Noble, & Marshall, 2008). It was necessary to go one step further and choose appropriate methodologies for success in the digital era. In the mid-1990s, agile project management methodologies emerged. Nowadays, there are many agile methodologies such as Scrum, Kanban, Lean, Extreme Programming etc. (Abrahamsson, Warsta, Siponen, & Ronkainen, 2003). They all share some common values - focus on people and their interactions over processes and tools, product functionality beyond exhaustive documentation, collaborating with the customer beyond a firm grip on contract items, and constantly responding to changes rather than following a plan (Beck et al., 2001.). Further, new methodologies have required from personnel to develop a new set of skills, in order to deliver modern projects well (Highsmith, & Cockburn, 2001). Recent research, conducted by the eminent consulting firm CEB, has shown that the position of a project manager in the IT industry is the most difficult-to-fill IT role generally (Matt McWha, 2016). Organizations are facing great difficulty to find adequate professionals for managing complex digital era projects. Traditional process-oriented project managers are no longer able to respond to the demands of innovative projects (Hoda et al., 2008) For that reason, worldwide project management organizations are constantly looking for the right set of skills for professionals in an agile world, training people to acquire them and offer different kinds of certifications.

This paper aims to provide a comparative analysis of the most eminent agile certifications in the global market in order to help people finding the most appropriate certification for them. The paper presents agile certificates from 9 well-known certification bodies: PMI, IPMA, APMG, Strategyex, ICAgile, Scrum.org, Scrum Alliance, Scaled Agile Academy and IAPM. Because some organizations offer a variety of agile certifications, the chapters in this paper are named by the organization provided certificate rather than by a specific certificate. Although the focus of the research was on certifications for project managers (and similar positions), the paper also provides a review of certifications for other roles in an agile project environment but does not explain them in detail. The last chapter compares the certificates according to the following criteria: an *organization that offers certification*, *name of the certification*, *prerequisites/required courses*, *the structure of the exam*, *certification maintenance and the price of certification.*

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2. PMI - THE AGILE CERTIFIED PRACTITIONER (PMI - ACP)

The Project Management Institute (PMI) is a global nonprofit professional organization for project management. PMI is developing standards, research, publication, hosting conferences and providing accreditation in project management (PMI, 2019.).

The Agile Certified Practitioner (PMI-ACP) is one of several certification types from the Project Management Institute (PMI). It is also the only certification for agile project management and fastest-growing certification of this institute (PMI, 2019). While most agile certificates are scrum-based, the advantage of PMI-ACP certification is that it includes many agile approaches withal Scrum, such as Kanban, Lean, Extreme Programming (XP) and test-driven development (TDD).

Also, comparing to other agile certifications based solely on training and exams, the ACP exam requires trainees to have real experience in project management and managing agile projects. Prerequisites are 2000 hours working on projects, 1500 hours working on agile project teams or with agile methodologies as well as 21 hours of training in agile practices (PMI, 2019). The exam consists of 120 multiple-choice questions and the available time is three hours. The exam can be in a paper-based or a computer-based format. The price depends on the testing format and the PMI membership and is in the range from 385$ for paper-based member testing to $495 for computer-based testing of PMI non-members. Those who achieve the certification Agile Certified Practitioner must earn 30 professional development units (PDUs) in agile topics every three years to maintain their status.

3. IPMA - AGILE LEADER CERTIFICATIONS

International Project Management Asociation (IPMA) is the world's first project management association founded in 1965. (IPMA, 2019). IPMA is promoting the development of project management competencies and expanding relationships with professionals, corporations, government agencies, universities etc.

In the field of agile practices, IPMA offers Agile Leader Certification which consists of 4 levels: (A) IPMA Certified Agile Organisational Leader, (B) IPMA Certified Senior Agile Leader, (C) IPMA Certified Agile Leader, (D) IPMA Certified Agile Associate. The IPMA certification scheme is based on the global competence standard – ICB4. For the people who want to take the IPMA Certified Agile Associate (Level D), it is not necessary to have experience in agile practice, while other levels of certifications require at least 30 months of practical experience in managing agile projects. The exam consists of written test and interview. The price of the certification is 1000 euro for Level C.

4. APMG INTERNATIONAL CERTIFICATIONS

APMG International is a global accreditation organization offering a number of certification in different fields such as Aerospace, Business Change, Risk & Benefits, Cyber Security, IT Governance & Service and Projects. All agile certificates from APMG are listed below: (1) Agile Change Agent certification, (2) Agile Digital Services Foundation certification, (3) Agile Digital Services Practitioner certification, (4) Agile Business Consortium Scrum Master certification, (5) Agile Project Management Foundation Certification, (6) Agile Project Management Practitioner certification, (7) Agile Program Management Foundation certification, (8) Agile Business Analyst Foundation certification, (9) Agile Business Analyst Practitioner certification.

For the purposes of this paper, only certificates relating to project management will be presented. Agile Project Management Foundation certificate is intended for project managers and agile team members looking to become Agile Project Managers. On the other hand, Agile Project Management Practitioner is a more advanced level of certification and it is intended for people who already have an Agile PM Foundation certificate. Agile PM Foundation is a closed book exam. It consists of 50 multiple choice questions and the maximum duration of the test is 40 minutes.

Agile PM Practitioner is open book objective examination. It consists of 4 questions and it takes 2.5 hours. Both exams require 50% to pass the exam. The price of the Agile Project Management Foundation certification is £218, while the price of the Agile Project Management Practitioner is £330.

Agile Program Management certification is different from Agile Project Management certification and has only a Foundation level of certification. This exam is for Programme Managers, PMO Managers, Risk Managers, Procurement professionals and Senior business people who have responsibility for programmes (APMG International, 2019.) The exam structure is the same as Agile PM Foundation exam. Agile Business Consortium Scrum Master is intended for anyone involved in product development using the Scrum framework. It is based on The Scrum Guide. The exam consists of 50 multiple-choice questions — no recertification requirements. APMG Scrum Master certification does not expire.

5. STRATEGYEX CERTIFICATES IN AGILE

Online learning company Strategy Execution (formerly known as ESI International, est. 1981.), in partnership with Duke University, offers many courses in agile practice. They believe that powerful strategic work can be achieved through a series of projects, hereof people running projects must possess the right set of competencies to ensure project success (Strategyex, 2019).

Strategy Execution offers many two levels of certification: Foundational and Professional certification in agile practice. Certification is organized in a way that people who want Foundational certificate must choose five courses, and Professional certificate requires taking nine courses from the listed below: Fundamentals of Lean and Agile, Continuous improvement with Lean and Kanban, Iterative Delivery with Scrum and Kanban, Eliciting and Managing Requirements, Establishing a Business Mindset, Managing Project, Facilitation Techniques for Business Analysis, High-Impact Communication, Critical Thinking and problem solving, Fundamentals of DevOps, Project Leadership and Management and Communication. The exact price of certifications is not specified because it depends on the chosen courses. The price of one course is from 1195 $ to 1795 $. As it is mentioned above, it is necessary to attend 5 courses for Foundational and 9 courses for Professional certificate.

6. INTERNATIONAL CONSORTIUM FOR AGILE (ICAGILE) CERTIFICATIONS

The International Consortium for Agile is an accrediting agency that offers comprehensive Agile certifications across all agile 'flavours". All ICAgile certificates are listed below: (1) Agile Fundamentals, (2) Agile Coaching (Agile Team Facilitation, Agile Coaching, Expert in Agile Coaching), (3) Agile Engineering (Agile Programming, Agile Software Design, Expert in Agile Engineering), (4) Agile Testing (Agile Testing, Agile Test Automation, Expert in Agile Testing), (5) Business Agility (BA Foundations, Agile Talent, Agile Finance, Agile Leadership, Agile Marketing, Expert in BA), (6) DevOps (Foundations in DevOps, Implementation DevOps, Expert in DevOps), (7) Delivery Management (Agile Project and Delivery Management, Delivery at Scale, Expert in Delivery Management), (8) Enterprise Management (Agility in the Enterprise, Coaching Agile Transitions, Expert in Enterprise Coaching) and (9)Product Ownership (Agile Product Ownership, Enterprise Product Ownership).

Agile Project and Delivery Management certificate is based on core components of agile project management and on providing course attendees with techniques for successful Lean and Agile implementation. The certification consists, of course, lasting 14-21 hours. The cost of the certification is $60 (ICAGILE, 2019).

7. SCRUM.ORG CERTIFICATIONS

Scrum.org is a global organization, founded 2009 by Ken Schwaber, the co-creator of Scrum. Scrum.org provides pieces of training, assessments and certifications for successful Scrum implementation. Compared to other

organizations mentioned above in this paper, that cover different agile methods, Scrum.org is promoting Scrum exclusively. Following Scrum Guide, there are 3 roles within the scrum - Scrum Master, Product Owner and Developer (Schwaber, & Sutherland, 2017). For each role, the Scrum.org offers various levels of certification and there are also certificates for a scaled scrum, scrum with Kanban and agile leadership.

Scrum.org offers three levels of certification for the role of Scrum master - fundamental, advanced and distinguished (PSM I, PSM II and PSM III). People who have passed Professional Scrum Master I Assessments proves a fundamental level of Scrum, understanding Scrum as described in the Scrum Guide and now how to apply Scrum in Scrum Teams. The cost of this exam is $150 USD. The exam consist of 80 questions (Multiple Choice, Multiple Answer and True/False), duration of the exam is 60 minutes; the passing score is 85%. People who want to upgrade their scrum knowledge can take the PSM II exam. This exam demonstrates an advanced level of Scrum knowledge and its implementation in complex situations. The price of the PSM II exam is 250$. The exam consist of 30 questions (Multiple Choice, Multiple Answer and True/False), duration of the exam is 90 minutes, passing score is 85%. Finally, the Professional Scrum Master level III (PSM III) assessment is available to anyone who has passed the PSM I and PSM II assessments. This exam demonstrates a distinguished level of Scrum and a deep understanding of Scrum in a variety of complex and organizational situations. The cost of PSM III is $500 USD. The exam structure is a combination of 34 Multiple Choice questions and essay. Time limit is 120 minutes. Passing score is also 85%. For all these exams there are no prerequisites in terms of mandatory courses but the Scrum.org offers variety optional courses for those who want it. Once passed the Scrum Master exam is unlimited, no need for recertification. Similar structure to the scrum master certification is also certification for Product Owners. There are three levels of Professional Scrum Product Owner Assessments- PSPO I, PSPO II and PSPI III. Also, Scrum.org serves certifications for Scrum Developers, Scaled Professional Scrum (available to anyone who wishes to validate knowledge of the scaling Scrum), Assessments for Professional Scrum with Kanban and Assessments for Professional Agile Leadership.

8. SCRUM ALLIANCE CERTIFICATIONS

Scrum Alliance is an organization that supports global adoption and effective practice of Scrum. The Scrum Alliance offers three types of certification: (1) Certifications by Scrum Team Role, (2) Guide Level Certifications and (3) Agile Leadership Certification.

The first group of certifications is very similar to Scrum.org certification program, and it is divided by the Scrum team roles - Scrum Master, Product Owner and Developer. Certification for Scrum Master consists of three levels: a) Certified Scrum Master, b) Advanced Certified Scrum Master and c) Certified Scrum Professional-ScrumMaster. The classification for the Product Owner was done in the same way: a) Certified Scrum Professional-Product Owner, b) Advanced Certified Scrum Product Owner, c) Certified Scrum Professional-Product Owner, while the certification for the scrum developer has two levels a) Certified Scrum Developer and b) Certified Scrum Professional. Guide Level Certifications are designed to authorize coaches and trainers as educators, mentors, and thought leaders in agile principles and the Scrum framework and to become a Certified Agile Coach or a Certified Scrum Trainer. The Scrum Alliance Certified Agile Leadership (CAL) program is a unique two-part education (CAL I + CAL II) and practice-based program to develop agile leadership competency and maturity (Scrum Alliance, 2019).

Unlike Scrum.org certifications that do not require courses, attending courses is mandatory for possessing a Scrum Alliance certificate. In fact, the courses are included in the price of certification, but that price is much higher than with the Scrum.org. For example, the price of Certified Scrum Master certification is around $1,547 per course and it depends on the country. After receiving certification, there is a $250 annual renewal fee. Price for Advanced

Certified Scrum Master certification is around 2800 $ and person who take the exam should have at least 12 months of work experience specific to the role of Scrum Master. Advanced Certified Scrum Master should have at least 24 months of work experience, and the price of certification is around 3500$.The price for all courses includes 2 years membership fee with Scrum Alliance.

9. SCALED AGILE ACADEMY CERTIFICATIONS

Scaled Agile Framework (SAFe) is a global framework for enterprise agility. The Scaled Agile Academy offers 13 courses: (1) SAFe 4 Program Consultant (SPC), (2) SAFe Agilist (SA), (3) SAFe 4 Practitioner (SP), (4) SAFe 4 Scrum Master (SSM), (5) SAF Advanced Scrum Master (SASM), (6) SAFe 4 Release Train Engineer (RTE), (7) SAFe 4 Product Owner/Product Manager (POP), (8) SAFe 4 DevOps Practitioner (SDP), (9) SAFe 4 Architect (ARCH), (10) SAFe Agile Software Engineering (ASE), (11) SAFe Agile Product and Solution Management (APSM), (12) Lean Portfolio Management (LPM), (13) SAFe Government Practitioner. For the purposes of this paper, only SAFe 4 Scrum Master (SSM) and SAFe Advanced Scrum Master (SASM) certifications will be described in more detail.

SAFe 4 Scrum Master (SSM) certification includes a two-day course. It is intended for people who want to perform the role of scrum master regardless of experience. First exam attempt is included in the price of the course if the exam is taken within 30 days of course completion. Each retake costs $50. The exam consists of 45 multiple choice questions; attendees have 90 minutes available and 73% is a passing score. SAFe Advanced Scrum Master (SASM) certification is intended for existing scrum masters. There are no prerequisites for taking the exam, but it is desirable to have some of the scrum master certifications such as Certified Scrum Master (CSM) or Professional Scrum Master (PSM) certification. The exam consists of 60 multiple choice questions; attendees have 120 minutes available and 70% is the passing score. The price of this certification is $995 per course and the first exam attempt is free. After receiving certification, there is a $100 annual renewal/membership fee.

10. IAPM CERTIFICATIONS

The International Association of Project Managers (IAPM), association and certification body for project managers, offers 8 levels of certification for project managers. Regarding agile certifications, there are 3 levels (1) Certified Junior Agile Project Manager, (2) Certified Agile Project Manager and (3) Certified Senior Agile Project Manager. First two categories are intended for people with no necessary project management experience while for Senior Agile certification, one must possess experience in managing projects. For passing the Junior Project Manager exam, it is necessary to have 65% of the 40 questions correct. Time limit is 35 minutes. The Agile Project Manager exam requires 65% of the 120 questions to be answered correctly within 80 minutes (it is the same for the Senior Project Manager exam). The price of listed certificates is 35 CHF, 183 CHF and 237 CHF respectively. IAPM certifications do not require recertification.

11. COMPARATIVE OVERVIEW OF AGILE CERTIFICATIONS

The following table presents a comparative overview of the agile certifications listed in this paper. Certificates are compared by six criteria: (1) organization that offers certification, (2) name of the certification, (3) prerequisites/required courses, (4) structure of exam, (5) certification maintenance and (6) the price of certification.

Table 1: Comparative overview of agile certifications

Org.	Name of certification	Prerequisites/Courses	Exam structure	Maintainance	The price of certification
PMI	Agile Certified Practitioner (ACP)	2,000 hours working on projects 1,500 hours working on agile projects 21 hours of training in agile practices.	120 multiple-choice questions 3 hours	30 PDUs in agile topics every three years	From 385$ to 495$
IPMA	(A) IPMA Certified Agile Organisational Leader, (B) IPMA Certified Senior Agile Leader, (C) IPMA Certified Agile Leader, (D) IPMA Certified Agile Associate	No prerequisites for level D. For level A, B, C: at least 30 months of practical experience in managing agile projects.	written test exam	Re-certification after 5 years	1000 euro
ICAgile	Agile Project and Delivery Management certificate	/	course 14-21 hours	/	60$

Org.	Name of certification	Prerequisites	Exam structure	Maintainance	The price of certification
IAPM	Certified Junior Agile Project Manager	/	40 questions 35 minutes	IAPM certifications do not require recertification	35 CHF,
	Certified Agile Project Manager	/	120 questions 80 minutes		183 CHF
	Certified Senior Agile Project Manager	Experience in managing projects (not specified how much experience is necessary)	120 questions 80 minutes		237 CHF
APMG	Agile Project Management Foundation	/	Closed book exam 50 multiple choice questions 40 minutes	/	£218
	Agile Project Management Practitioner	Agile PM Foundation certificate	Open book exam 4 questions 2.5 hours	/	£330
	Agile Program Management Foundation	/	Closed book exam 50 multiple choice questions 40 minutes.	/	information not found

	Agile Business Consortium Scrum Master	/	50 multiple choice questions 40 minutes.	/	information not found
STRAT-EGY EX	Foundational certification in agile practice	requires taking five courses	Courses and exam	/	the exact price depends on the chosen courses- the price of one course is from 1195 $ to 1795 $
	Professional certification in agile practice	requires taking nine courses	Courses and exam	/	

Org.	Name of certification	Prerequisites	Exam structure	Maintainance	The price of certification
SCRUM.ORG	PSM I	/	80 Multiple Choice questions 60 minutes	/	150 $
	PSM II	/	30 Multiple Choice questions 90 minutes	/	250$
	PSM III	/	combination of 34 Multiple Choice questions and essay 120 minutes	/	500 $
SCRUM ALLIANCE	Certified Scrum Master	/	courses and exam	Annual fee $250	around $1,547 depends on the country
	Advanced Certified Scrum Master	at least 12 months of work experience specific to the role of Scrum Master	courses and exam	Annual fee $250	around 2800 $ depends on the country
	Certified Scrum Professional-ScrumMaster	at least 24 months of work experience specific to the role of Scrum Master	courses and exam	Annual fee $250	around 3500$ depends on the country
SCALED AGILE ACADEMY	SAFe 4 Scrum Master (SSM)		45 multiple choice questions, 90 minutes, 73% is passing score		$995
	SAFe Advanced Scrum Master	desirable to have some of the scrum master certifications such as CSM or PSM	60 multiple-choice questions, 120 minutes 70% is passing score		$995

Agile Certificate Professional certificate (PMI-ACP), compared to other certificates, has an affordable price, and also it is well known that PMI certificates are synonymous for respectability in the project management world. On the other hand, ACP certificate requires working experience in agile practice and it is not appropriate for people just beginning project management career. Also,

ACP certificate requires continuously collecting PDUs.

The advantage of the IPMA Agile leader certifications is a 4-level structure. Level D IPMA certification does not require experience, and it is very convenient for young and new project managers. Also, there is no need for collecting PDUs and additional membership costs. Every five years certificate owner goes through a simple process of recertification (only proof that the certificate owner still meets the certification criteria). IAPM certification consists of 3 levels: certification for a junior agile project manager, agile project manager and senior agile project manager. These certifications are not expensive and first two levels do not require experience. Also, IAPM certifications do not require recertification. However, this certification is not so recognized in the world, such as IPMA`s and PMI`s certifications (Toljaga-Nikolić, Obradović, Mihić, 2011). The advantage of APMG certification is that it has multiple levels and focus on both: agile practice in general and scrum as one of the agile frameworks. These certificates are in the middle price range, do not require prerequisites for the first levels and there are no conditions for maintenance (no re-certifications). Strategyx offers serious courses in the field of agile practice. The disadvantage of this type of certification requires many courses (5 for Foundational certification and 9 for Professional certification), it takes a lot of time and it is very expensive (the cheapest course is 1195$). ICAgile also belongs to the group of cheaper certificates. In fact, this is a two-day course and after attending the course, the student receives a certificate. The certificate is not renewed and there are no conditions for attending the course. In terms of certifications for the scrum framework, the most famous certification bodies are the Scrum.org and the Scrum alliance. The Scrum Alliance is more expensive and requires some experience for higher levels of certification and also additional costs to maintain the certification. Scrum.org is cheaper and more convenient for people with no experience. Scurm.org does not require certificates renewal. Scaled Agile Academy also offers scrum certifications but its certificates are more expensive compared to the first two certification bodies but do not have the experience pre-requisites.

12. CONCLUSION

The most wanted certificates for agile practice nowadays are presented in this paper. All eminent certification bodies in the field of project management have in their palette agile certifications. A person who wants to take a certificate has a difficult choice when choosing the right certificate. The purpose of this paper was to help people who intend to be certified, making the right decision what certificate is the most appropriate for them. All the listed certificates have their advantages; it is just necessary to select the most appropriate certificate for each person. Beginners with no experience should start with some lightweight certifications such as ICAgile, Scrum.org or with lower levels of certification of other certification bodies, while professionals with experience can directly apply for certificates such ACP-PMI, or higher levels of certificates like IPMA level A, B or C.

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TRADITIONAL VS AGILE PROJECT MANAGEMENT IN THE SERVICE SECTOR

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Abstract: The paper focuses on the comparison of traditional and agile project management methods with the aim of examining the possibility of applying agile methodologies in the service sector, notwithstanding the fact that they are most used in projects in the IT sector. Based on the fundamental characteristics of the traditional PMI, IPMA and PRINCE2 methodologies, as well as on the specifics of the agile approach, a comparative analysis of theoretical aspects of traditional and agile methodologies is made, with the emphasis on Scrum, thus a comparison is made between applications of both types of methodologies on examples of projects in the service sector. The result of the comparative analysis is the final assessment of the possibility of applying agile methods in projects in the service sector, which serves to determine the elements of traditional methodologies which can be improved by the use of agile methodologies.

Key words: traditional methodologies, agile methodologies, Scrum, comparative analysis, service sector

1. THE SERVICE SECTOR

The service sector began rapidly developing at the turn of the 20th century and today it is an essentially important factor in every country's economy, often contributing the most to GDP. A country's economy depends to a large extent on the service sector functioning regularly and continually encouraging production, as well as further growth and development. Precisely because of this, the importance of project management in the service sector becomes greater day by day.

The execution of projects in the service sector is largely determined by the characteristics of services as an economic phenomenon, and in the foreground are (Kotler, & Keller, 2006): intangibility, variability, heterogeneity, inseparability of production from consumption, user participation in the service process and the lack of ownership of services. Essentially, services cannot be detected by senses, their consumption cannot be delayed nor can they be stored, ownership of services cannot be acquired, and the participation of the user is mandatory in the process of providing service. Relying upon these service characteristics, project mangers make plans, decisions and assessments, and complete other project tasks.

2. TRADITIONAL PROJECT MANAGEMENT METHODS

Great military campaigns or, for example, the construction of the Egyptian pyramids, were projects in some ways because they required dedication of a significant number of people, maintaining discipline and control, as well as determining the necessary workforce or number of soldiers, expenses, time and, also, predicting enemy tactics. Since there are similarities between original and contemporary projects, one can come to a conclusion that the project management is a result of the accumulation of knowledge and skills that ensued from experience in organizing and completing complex tasks.

The foundations of project management as a field of study were established by Henry Gantt, the creator of the Gantt chart, but its rapid development began later, in the 1950s, when the PERT method was developed, followed by CPM, WBS and other techniques which have significantly facilitated the execution of projects. Nowadays, project execution also requires a new kind of

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organization and usage of information technology (Jovanović, 2012).

2.1. The PMI Methodology

The Project Management Institute was founded in 1969 in Philadelphia, Pennsylvania. All the knowledge, skills and techniques required for successful project management were listed by the PMI in its publication *A Guide to Project Management Body of Knowledge*, or simply the *PMBOK Guide*. According to the PMBOK *Guide*, project management consists of 10 knowledge areas (PMI, 2017a): integration, scope, schedule, cost, quality, resource, communications, risk, procurement and stakeholder management.

2.2. The IPMA Methodology

International Project Management Association, known also as IPMA, was established in 1965 in Switzerland. IPMA project management standards are found in the handbook *The IPMA Individual Competence Baseline (IPMA ICB®)* which is designed for all the individuals working in project, program or portfolio management fields and not exclusively for Project Managers. The competence of those participating in a project consists of 28 elements divided into 3 areas – *Perspective, People & Practice*. The first area pertains to the capability of comprehending the project in a broader context, the second area includes people and interpersonal skills, while the third area is related to the application of technical knowledge and project management skills.

2.3. PRINCE2 Methodology

PRINCE (Projects In Controlled Environments) methodology was developed by the British government in 1989 and it was initially designed for the IT sector. It was upgraded to PRINCE2 in 1996 and today, PRINCE2 is a common methodology for managing projects which has a broad application irrespective of the type or complexity of the project. PRINCE2 methodology describes the practical knowledge required throughout the execution of a project (themes), general rules which should be followed over the course of the project (principles), as well as the processes constituting project execution (Axelos Group, 2017).

3. THE AGILE APPROACH

Business entities which utilize changes in the best way possible are characterized by agility - the ability to make changes and respond to changes with the aim of making profit in a turbulent business environment (Highsmith, 2009). Centering on flexibility as opposed following a plan in its entirety today is one of the key elements of doing business successfully which has led to the development of agile project management methods.

The term *Agile* is defined by certain authors as a set of methodologies which are used for project management in the IT sector. However, that definition is too narrow, since *Agile* is also a global framework for action, way of thinking and style of business management and decision-making based on agile values and principles which are commonly known as the ***agile approach***. The agile approach enables one to respond to changes quickly and efficiently and adapt to new conditions, because it focuses only on making initial plans, while most of the actual planning is done during the execution of the project.

3.1. Agile Values

In 2001, seventeen IT experts signed *The Agile Manifesto* in order to change the current way of developing computer software. The Agile Manifesto defines basic values and principles which help individuals and organizations interpret the agile approach in the best way possible and realize the benefits of its application. Compared to the traditional approach to project management, the agile approach values (Agile Alliance, 2001):

- Individuals and interactions over processes and tools;
- Working software over comprehensive documentation;
- Customer collaboration over contract negotiation;
- Responding to change over following a plan.

3.2. Agile Principles

The Agile Manifesto defines 12 principles which are the lodestar in agile project management, and their implementation within an organization is requisite on the way to achieving project agility. The application of agile principles consists of early and continual value creation, accepting requests for changes even in the later phase of a project, delivering working software frequently, focusing on simplicity, technical excellence and good design, but also on building self-organizing teams, establishing direct communication and on the constant increase in efficiency (Agile Alliance, 2001).

3.3. Scrum Basics

The main problem with traditional methodologies is their linear nature which prevents adaptability during unforeseen situations. The solution to this problem was found in Scrum – a framework within which people can address complex issues while delivering products of the highest quality in a productive and creative manner (Schwaber, & Sutherland, 2017). Defining Scrum as a framework, its creators highlighted the possibility to fit numerous techniques and methodologies within this concept.

Scrum introduces three completely new roles in projects which did not exist in that form beforehand, and those are: Product Owner, the individual responsible for maximizing values in a project and protecting stakeholders' interests, most often those of external customers (Voice of the Customer – VOC); Scrum Master, the individual responsible for all the participants in a project adequately comprehending Scrum and the agile approach (the administrator of the Scrum framework); Development Team, a group of professionals which work on developing products and which possess the required knowledge and directly create value in a project (Schwaber, & Sutherland, 2017; Scrum Study, 2017).

Scrum methodology also prescribes the following mandatory events: Sprint, a period lasting a month or less which results in a complete, usable and potentially shippable product increment (Mersino, 2015; Schwaber, & Sutherland, 2017); Sprint Planning, defining tasks, priorities and ways of their execution; Daily Scrum, a fifteen-minute meeting of the team members at the beginning of every workday, focused on current planning and resolving problems; Sprint Review, a meeting during which all the tasks completed over the course of Sprint are revised and stakeholders get to see the progress of the project; Sprint Retrospective, an internal meeting of the team members centered on improving action after Sprint.

The main source of information and the base for measuring progress are Scrum Artifacts: Product Backlog, a prioritized list of project requirements and product characteristics which is constantly updated in concordance with what goes on in a project (individual responsible: the Product Owner); Sprint Backlog, a sum of selected Product Backlog items and the plan for delivering product increment and reaching the Sprint goal (Schmidt, 2009), those responsible: the Development Team; Product Increment, which is delivered by the Development Team at the end of each Sprint, including the values created during the previous Sprints, individual responsible for giving approval being: Product Owner (Schwaber, & Sutherland, 2017).

4. THE COMPARATIVE ANALYSIS OF TRADITIONAL AND AGILE METHODS' APPLICATION IN THE SERVICE SECTOR

Adaptability is the key element which separates the traditional and agile approaches to project management. The traditional approach is tailored to stable systems in which the majority of processes are known beforehand, which is why the end results are also predictable. On the other hand, the agile approach is designed for systems which exist in conditions of great uncertainty and frequent change in the environment and, because of that, all project participants are required to be flexible. The projects' success will depend upon exactly that ability to adapt and implement changes in the project efficiently.

4.1. General Differences

The lower level of flexibility present in the traditional approach to project management is reflected by planning and documenting a project at its very beginning, that is, at the moment when the project products are least known and which is principally meant for generating ideas, thus, there is a risk of missing opportunities and responding inadequately to changes.

The agile approach eliminates this risk by limiting planning to a briefer time period, focusing on the most important activities that ensue. Taking into consideration the specific characteristics of services, above all the continual customer participation, projects in the service sector should definitely avoid early documentation accumulation.

Traditional methodologies accurately define techniques and tools for managing different segments of the project, which is certainly a virtue, but agile organization gives the team the freedom to independently choose methods and techniques which shall be used for the execution of the project. However, those methods and techniques are often defined within the frame of some traditional methodologies but the opportunity to choose and adapt gives them a completely new form in an agile environment.

Traditional methodologies are even more present in the service sector, since organizations and individuals are well acquainted with their elements, but that does not mean that there is no place for agile methodologies in this sector. On the contrary, even though the agile approach is still in the area of the new and the unknown which is why its implementation is often delayed, specific characteristics of services and of the agile approach are complementary and their combination can accelerate processes and increase project efficiency.

The significance of agile methodologies has been acknowledged by the most important project organizations, so, as a response, PMI, IPMA and PRINCE2 handbooks for agile project management were published.

4.2. Project Scope Management and Project Integration Management

Traditional methodologies place planning before the beginning of a project, which significantly increases the risk of not fulfilling the stakeholders' requirements. A Project Manager is entirely responsible for planning – this individual selects the tasks which shall be executed, determines interdependencies and makes a schedule, causing team members to be discontented with the schedule, deadlines and workload.

On the other hand, agile methodologies eschew planning out a project in its entirety before the beginning of its execution and focus on a limited time period which is predicable enough (Sprint). Scrum entails formation of the Product Backlog by the Product Owner, whereby the Development Team independently selects items which shall be worked on during Sprint. Thus, Development Team members actively participate in planning, coordinate their own capacities with the tasks they need to complete and continually create values while working on most important tasks. The planning process is repeated separately for each Sprint, which enables efficient implementation of changes in a project.

Example. Applying the traditional approach in a project organizing a marketing campaign would entail defining specific goals and planning the execution of all tasks before the campaign, but if the competition took countermeasures, the market conditions changed, or a new channel of communication were found, it is uncertain whether the traditional approach would lead to expected results. However, by applying the Scrum, the whole team participates in adapting plans and revising the Sprint goal, which enables the process of creating values to continue smoothly.

4.3. Project Schedule Management

Traditional methodologies tend to fix the time of the execution of certain tasks or of the whole project, while Scrum does not demand the scope of the project to be constant, which is why it focuses on a planning period which must be fixed. The duration of Sprint is not

changed, which enables the team members to fit the workload into the time frame and according to the capacity of the team instead of the traditional matching of the team capacity and time at disposal to the tasks which need to be executed. Now what is put first is executing tasks of the highest priority, which is why products are delivered to end users much earlier. The traditional approach has a great disadvantage in this segment, because it does not differentiate between important and unimportant requests, so it fulfils them all according to the phase of the project, which is why value is created much later.

Regarding Gantt charts, they can be used alongside agile methodologies, especially in organizations which are in transition from the traditional to the agile approach, i.e. in projects which have characteristics of both approaches, where they would serve to demonstrate time necessary for checking items off the Sprint Backlog, as well as for fitting them within the Sprint time frame.

Example. In the domain of schedule management, traditional methodologies in a project introducing new accounting software in an accounting firm would manifest through planning the project at its beginning, which prevents accurate prediction of the time it would take to deal with bugs or optimize software performance, while, with the agile approach to planning, these problems would simply be transferred to the next Sprint or they would be given a higher rank, so they would be resolved accordingly.

4.4. Project Cost Management

The traditional approach puts business related to budget under the supervision of a company's management, project office, Project Manager, or some other project institution depending on the significance and the place the project and project organization have within the company. Scrum determines the role of a Product Owner who manages expenses along with a Development Team, approves expenses and provides necessary resources. In most cases, resources are not collected in their entirety before the project, as is the case with the traditional approach. Rather, capital is partially allocated which means that the project is financed according to its progress and delivered product increments.

A change in stakeholders' requests and product characteristics usually lead to additional expenses if the traditional approach is adopted precisely because expenses are predicted much before they are incurred. The agile approach allows the Development Team to coordinate its activities with the budget by choosing tasks the execution of which incurs expenses which correspond to available resources. Such treatment of expenses eliminates unnecessary spending and focuses on tasks which contribute the most to the value creation process.

An important characteristic of the agile approach is the possibility of making profit before a project's final completion. Since each Sprint results in shipping functional project increments which have market potential, it is clear that agile projects generate profits much earlier compared to traditional projects.

Example. Executing a project focusing on service adaptation of a business center using traditional methodologies would require estimating costs for executing tasks before the work has even begun. However, problems can arise if there is a need to complete tasks beyond the defined scope or if the team does not have the capacity for them. In these situations, agile methodologies demonstrate greater efficiency, since obstacles do not have to be removed at the moment they appear and the execution of problematic tasks is delayed until the conditions for their successful completion are created.

4.5. Project Organization and Communication Management

In the traditional approach, a project team is the most common type of project management organization, with the emphasis on the leading role of the Project Manager in the process of achieving desirable results. Team members do not have a formal role in decision-making, except when the Project Manager delegates some authority to them. In that way, a significant number of

responsibilities is concentrated in the role of the Project Manager, who is often burdened with various tasks.

Agile methodologies do not acknowledge the Project Manager's role and shift the focus onto the team which is directly involved in delivering products. Teams independently decide upon their approach and the activities which shall be performed, but only in the domain of achieving defined goals, thus the team members are collectively responsible for a project's success or failure. In essence, most of the responsibilities of the traditional Project Manager have been delegated to the Development Team (e.g. planning and operational decision-making).

The roles of Product Owner and Scrum Master do not completely replace a Project Manager, but the tasks usually completed by this individual are divided between them. Namely, the Product Owner guides team members, but also protects the stakeholders' interests, being different from the Project Manager, who only cooperates with them. The Scrum Master performs the role of a motivator, educator and communicator, but is never involved in the decision-making process concerned with creating products. Additionally, Scrum Master removes obstacles which team members are faced with and protects their interests within an organization.

Direct communication and organizing meetings with a goal, team members' role and meeting schedules all defined in advance, are Scrum's great advantage when compared to traditional methodologies, since all the team members are completely involved and the stakeholders are enabled to participate, being continually informed of the project's progress. Traditional methodologies do not deal with the subject matter of a meeting in such detail and so meeting are most frequently held according to the *ad hoc* principle – problems have already arose and their resolvement is difficult and requires additional resources.

However, the flaw of agile methodologies is that they are not scalable enough for big projects which require several Development Teams, and thus a larger number of Product Owners and Scrum Masters.

Example. Establishing the role of a Project Manager in a project organizing a music festival would facilitate managing a large number of people involved in the project, but this also has a flaw in the form of being them being less prepared for situations like lack of resources, poor location, etc. Agile methodologies would in this case would face the problem of coordinating activities of all team members, but it would also be easier to adapt to unexpected circumstances, like the performer cancelling the show.

4.6. Project Risk Management and Change Management

A Risk management plan in traditional methodologies is a separate document which is continually updated by Project Manager who is responsible for risk identification and response planning, along with the project team members. On the other hand, agile methodologies have an integrated risk management system in its structure. Scrum treats identified threats as Product Backlog elements and the Development Team selects those which they shall remove during Sprint, which enables generating a response at the moment when the occurrence of a threat is more evident, and the team is better prepared to deal with consequences.

Traditional methodologies have the tendency to increase the levels of risk following the project's progress, while agile methodologies are instantly focused on delivering usable products which prevents losses incurred due belated realization that the project is not justified. Their flaw is also a limited budget which requires additional resources or setting aside a contingency reserve, while agile teams fit those costs within the scope of available resources.

The traditional approach generally responds negatively to change, as it often results in editing the project plan or requiring additional resources. The agile approach welcomes change and views it as a positive factor, since it engenders product quality enhancement and better performance.

Example. In a project starting a foreign language school, there is a risk of another school being in the same locations and in these conditions, the traditional approach would face the problem concerning procuring additional resources for promotion, while the agile approach would focus on using available resources irrespective of their initial purpose, because at that time decreasing the competitors' influence becomes the task of the highest priority. Furthermore, if there is a need to organize the first course earlier, the agile approach would have the advantage of allotting resources for the equipment of one classroom first and then for other activities.

4.7. Project Quality Management

Quality management in traditional methodologies is a separate functional area centered on developing products which meet acceptance criteria defined in project plans. Scrum in its structure has an integrated quality management system which entails delivering functional project increments at the end of each Sprint. Increments must be usable, which directly depends on the active implementation of acceptance criteria. Thus, the Development Team plans each day, assesses and improves project quality and do that alongside their regular activities.

Acceptance testing is often one of the last phases of a project in traditional methodologies. Problems arise if there is a need for changing product characteristics, because at that point it is difficult to make adjustments and it requires significant resources. Scrum does not allow this situation to occur, because product assessment is an integral part of each Scrum. Moreover, Scrum defines the Sprint Review meeting which is designated for assessing delivered increments and determining what changes need to be implemented so that products could meet acceptance criteria.

Example. Taking the traditional approach in a project developing new CRM software in a marketing supply chain would result in executing the project in phases so as to meet acceptance criteria defined at the project's initiation and the main product testing would be done after the development. The agile approach would gradually implement acceptance criteria during Sprints, quality check would be done alongside product development.

4.8. Project Procurement Management

Traditional methodologies appoint the organization working on the project and the Project Manager to be responsible for procurement and they strive to be within budget, which is why procurements are planned at the beginning of the project. This can lead to resource accumulation and money being tied to supplies, since resource amount and delivery time are often estimated according to initial plans when the level of project comprehension is significantly low, and the level of uncertainty quite high.

Scrum defines the responsibility of the Product Owner regarding procurements and the Development Team, besides identifying required resources, has more authority over determining specifics, suppliers and delivery time. Also, agile methodologies avoid contract negotiations and strive for dynamic cooperation with suppliers which enables procuring resources only in necessary amounts and delivery exactly at the time when resources are needed, but it also facilitates changing the supplier. Nevertheless, the agile approach is flawed in the sense that limited resources, like certain experts, are not always on the market, so their employment must be stipulated much earlier.

Example. If the traditional approach is applied in a project in adapting and opening a restaurant, material, equipment and furniture delivery, as well as employing workforce, would be stipulated at the beginning of the project, for all its phases. As regards Scrum, materials would be supplied before the adaptation, equipment shipping time would be agreed upon at the end of renovations and furniture would be delivered after all other work on the restaurant was finished. However, the aforementioned flaw of Scrum could manifest in the form of it being impossible to find a good chef.

4.9. Project Stakeholder Management

The traditional project team organization tends to show stakeholders in a bad light and

the main reason for that is insufficient communication between project team members and stakeholders. Information exchange is done via the Project Manager who presents stakeholders' requests to the team members and if they change frequently, this leads to adverse project environment due to misunderstandings between both sides.
Scrum improves communication between stakeholders and the Development Team, since during the Sprint Review meeting, stakeholders state their expectations and get acquainted with the project's progress and team members are provided with direct guidelines for resuming operation, which helps avoid misunderstandings and discontent due to the change of initially defined stakeholders' requests. This interactive approach is based on direct communication and eliminates the disadvantages of the traditional methodologies, which ensue from the relationship with stakeholders being too formal.

Accordingly, agile methodologies attach greater importance to continual cooperation compared to traditional signing of a contract which defines in advance all criteria which products must meet. Traditional methodologies, although proactive, definitely are not interactive in stakeholder management.

Example. Using the traditional approach in a project introducing a new type of loan into a bank's portfolio, we would identify the bank's management as one of the stakeholders whom the Project Manager would occasionally inform about the progress, involve in the project and consult before making decisions. Nonetheless, the bank manager can decide to change the target group, loan structure, or to the decrease the resources for execution, which would negatively impact the team's further operations. Scrum would identify these request changes much earlier and implement them without significantly endangering project efficiency precisely because continuity in communication between the stakeholders and the Development Team working on delivering project's products.

5. CONCLUSION

Adopting agile principles and values results in shortening the planning period, fostering cooperation with the stakeholders and decreasing adversity towards change. Decreasing the number of responsibilities and the Project Manager's role in planning and controlling engenders atmosphere of trust in team members who would have more authority. Also, holding meetings regularly improves communication, among team members and likewise with stakeholders, too. Enhancement is also possible in the form of fitting time within the context of delivering increments, by editing milestones so they would include acceptance criteria, which would subordinate schedule to the value creation process, and group project activities and according to their priority. Additionally, this would lead to improvement in the domain of cost because of avoiding unnecessary expenses and increasing chances for making profit early.

Further traditional methodology improvement would entail the Project Manager and the team focusing on defining risk responses only for current project phases or for those which immediately follow, which would significantly increase efficiency in risk management and simultaneously coordinating the measures taken with the available budget. Accordingly, project plans must be fluctuating instead of the customary practice of fixing them to time and expense limitations which prevent regular change implementation.

As regards quality management, the Project Manager should integrate planning, providing and controlling activities into project phases in order to achieve formal existence of a quality management process over the course of the whole project and, thus, increase the possibility meeting acceptance criteria and fulfilling stakeholders' requests.
Taking into consideration specifics of services and agile approaches' application in projects in the service sector, it is necessary to determine the optimal combination of traditional and agile methodologies which will enable projects to reach set goals. Choosing a proper combination which entails all the characteristics of projects in the

service sector is not an easy task and it requires excellent knowledge of both agile and traditional approaches.

Summa summarum, successful application of agile methodologies in projects within the service depends most on the nature of the projects and project activities, project managers' preferences and specifics of the organization which carries out the project.

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THE POWER OF TRANSNATIONAL PROJECTS

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Abstract: The process of globalization has put organizations in the position of facing daily challenges in a dynamic and complex environment. Each organization strives to respond to market demands and maintain competitiveness in its field of business in the best possible way, which has led to the popularization of the use of project management in a wide variety of areas. This paper provides insight into the functioning of transnational projects which represent inseparable part of a transnational program. It gives an insight into the way of formation, what are their specifics, what is required to access a transnational project, as well as the basic characteristics that a project must fulfill in order to be called transnational. Transnational projects represent the cooperation of several partner countries in one region that co-finance a project with the financial assistance of European Union funds (ERDF, IPA). The specifics of transnational projects will be explained through the example of Danube transnational programme.

Key words: transnational cooperation, transnational programme, transnational projects.

1. TRANSNATIONAL PROJECTS

Nowadays, we can rarely imagine a project where people from different backgrounds and cultures do not participate. One of the specifics of transnational projects lies in the formation and functioning of teams working in different locations aimed at achieving common goal. One of the most widely accepted definitions is: "The transnational project is a temporary, cross-border organizational unit composed of individuals of different nationalities, working in different cultures, business units, and functions, thereby possessing specialised knowledge for solving a common strategic task within multinational corporations." (Marmer, 1998; Schweiger, 1998, as cited in Adenfelt & Lagerström, 2006). "The transnational project is founded upon the principle of leveraging the knowledge of dispersed units to a temporary unit to enable the creation of new knowledge needed for development of products, processes, and systems for multiple markets." (Demarets, 1997; Osterloh, 2000, as cited in Adenfelt & Lagerström, 2006).

Transnational projects face the challenge of a diverse group of individuals from different functional parts of organization to work together over a period of time to meet the specific goals of the project. Projects must build confidence and a sense of belonging between project members, as well as respect given deadlines and budget frameworks. Physical distance, cultural differences, language barriers and technological differences in infrastructure are some of the challenges that transnational projects face (Adenfelt & Lagerström, 2006). There is small chance that members know each other or have met before, so their work, communication and decision-making norms differ (Barczak, 2003; as cited in Adenfelt & Lagerström, 2006).

Transnational projects develop new approaches, methodologies and practices and demonstrate their feasibility. Proven effects often inspire policy makers to create frameworks that facilitate the implementation of new solutions. This is one of the principal reasons why these projects often reach their full potential years later after the project is completed. Some of the benefits of transnational projects are: Reducing inequality, achieving territorial cohesion, improving the use of scarce resources, addressing challenges beyond borders, building confidence, reinforcing macro-regional strategies, helping authorities improve services, creating attractive results for the regions, driving investment in our future, creating lasting change.

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The specifics of transnational projects (table 1) are reflected in the application procedure, the partners participating in the project, the financing method, the budget approved and the specification of the costs, the management responsible for project management, the project implementation method and the division into work packages as well as the preparation of project teams tasked with working on specific work packages.

Table 1: Comparison of transnational and traditional projects

Area	Transnational projects	Traditional projects
Application procedure	A public call for proposals is announced	None, as projects are approved based on the needs of the company / organization
Partners	Countries / organizations whose project proposal has been accepted and is going to be implemented and which are jointly participating in the implementation of the project	The project within the company / organization is implemented by an internal project team led by the project manager
Financing	The largest part (up to 85%) is financed from the funds of organizations, legal entities or unions such as the European Union whose best known funds are IPA and ERDF. The rest of the funding is provided by the partners before approving the project proposal.	From the funds of the company intended for the project / program; through loans / loans, corporate financing, concessions, through the establishment of a new project implementation company / special purpose vehicle.
Budget	A detailed budget with all cost items and by partners is submitted when developing the project design	The entire sum is approved at the board meeting with the project charter
Management	Work package leaders report to the project manager, who reports to the steering committee. The Committee reports to the European Commission and the project auditors	Centralized. The project manager manages the project
Realization	The project is divided into work packages that need to be implemented. They are managed by work package leaders with their teams. At the head of the project is the project manager with his main team	Project manager with project team with possible support of external associates and project sponsor
Project team	Each partner country assembles its own team headed by the leader of the work package being implemented. The main project team consists of a project manager with all work package leaders and experts as well as a support team.	An internal team within an organization / company that can be co-located or distributed.

2. TRANSNATIONAL COOPERATION

Transnational cooperation is an integral part of transnational projects and programs, and involves cooperation between multiple nations i.e. countries in a given geographical area and facilitates joint work between regions from several EU Member States on issues such as communication corridors, flood management, international business, scientific research and developing cost-effective and sustainable markets.

Problems addressed by transnational cooperation programs include (European Commission, 2007):

- Innovations, especially networks of universities, research institutions, SMEs;
- Environment, especially water resources, rivers, lakes, seas;
- Accessibility, including telecommunications, and in particular completion of networks;
- Sustainable urban development, especially polycentric development.

Cross-border and transnational co-operation programmes are called Interreg or territorial co-operation programmes. Within the European Union, transnational cooperation programmes are known as Interreg B.

Transnational cooperation involves national, regional and local authorities aiming to promote better integration within the Union through the formation of large groups of European regions (Interreg Europe, 2007). Interreg is designed to stimulate cooperation between EU Member States at different levels. One of their main objectives is to reduce the impact of national borders in favor of economic, social and cultural development throughout the European Union.

Transnational programs typically have three sources of funding: IPA funds, the European Regional Development Fund (ERDF) and national budgets of partner countries. IPA funds are a financial aid instrument targeted at candidate countries as well as potential candidates for EU membership. The European Regional Development Fund is an EU fund whose primary purpose is to invest funds from richer regions in the infrastructure of underdeveloped regions.

The European Commission is the main executive body of the European Union, which is supranational and acts outside the competence of the Member States. In addition to the European Parliament and the Council of the European Union, it represents one of the three main institutions governing the Union. The President and members of the Commission are elected by the Member States as they have been previously approved by the European Parliament.

The European Commission (2007) outlines some of the benefits of transnational cooperation:

1. Transnational cooperation helps to reduce and overcome regional disparities and strengthen cohesion in specific regions - by facilitating knowledge sharing, transnational cooperation empowers disadvantaged regions, thereby building capacity and enabling each territory to learn from others, using methods and solutions that are successfully developed or implemented elsewhere in the region;
2. Transnational cooperation builds trust that transcends borders and fosters European integration that aims to make Europe more competitive
3. Financing transnational cooperation is crucial in facilitating the implementation of macro-regional strategies
4. Transnational cooperation projects/ programs address applicable solutions and innovative approaches to solving complex problems and challenges
5. Stronger territorial cohesion - transnational partnerships typically explore new terrains and test new approaches to address common, complex and deeply grounded problems. This is how they generate new ideas and build capacity. Participants in transnational projects develop collaborations and a strong sense of shared interests, which often results in framing the problem from a territorial perspective;
6. Enables better use of limited resources.

3. TRANSNATIONAL PROGRAMME

Transnational cooperation programmes aim to foster cooperation and regional development through joint problem-solving. In addition, such programmes should encourage the sustainable and innovative development of the area in which they are implemented.

The Danube Transnational Programme (DTP) is a financing instrument for specific scope and an independent decision-making body. It supports the integration of policy in the Danube region in selected fields in accordance with the CPR / ERDF regulations. The strategic vision is "policy integration" in specific areas of activity below EU level and above national level. Transnational projects should influence national, regional and local policies. In order to achieve a greater degree of territorial integration of a very heterogeneous Danube region, the transnational co-operation programme acts as a driver of policy aimed at addressing common challenges and needs arising from specific policy areas. Transnational cooperation is therefore expected to deliver tangible results through the development and practical implementation of policy frameworks, tools and services. To this end, the programme seeks to promote concrete pilot investments. Current needs are related to the problems of how to improve institutional

frameworks for cooperation, how to improve the quality of policy and its implementation, and how to implement solutions. The success of the implementation of the programme will depend on the targeted selection of the most important interventions and on further increasing the efficiency of administrative procedures and reducing the administrative burden for users (Interreg Danube Transnational Programme, 2018).

4. PROGRAMME MANAGEMENT STRUCTURE

The Danube Transnational Program me will use a joint management system to manage, coordinate and monitor its implementation, which means that partner countries and the Commission will be responsible for managing and controlling the program (Figure 1).

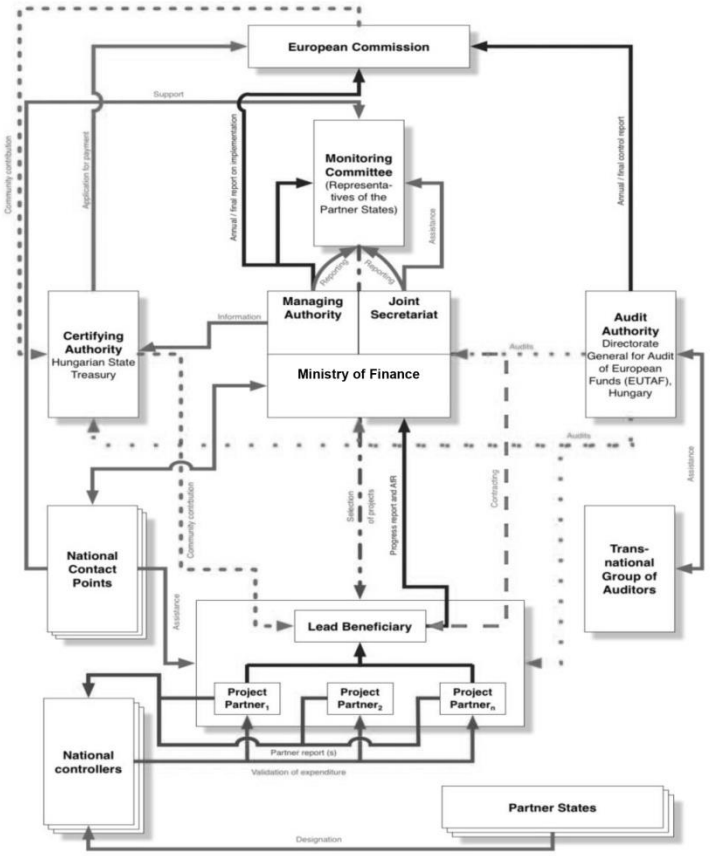

Figure 1: Programme Management Structure (Interreg Danube, 2018)

The governance structure consists of the following bodies (Interreg Danube Transnational Programme 2018):

- The Monitoring Committee (MC), composed of representatives of each participating country, oversees the implementation of the DTP and selects projects to be funded. Its overall task is to ensure the quality and efficiency of the overall programme implementation process. In order to accomplish this task, the Joint Committee will be assisted by the Joint Secretariat (JS).
- The Managing Authority (MA), assisted by the Joint Secretariat hosted by the Ministry of National Economy of Hungary, is responsible for the overall implementation of the programme, carrying out the functions set out in Article 125 of the CPR (Common Provisions Regulation) and Article 23. ETC (European Territorial Cooperation) Regulation. The Joint Secretariat (JC) will

be the focal point for potential project applicants and lead partners for selected/ongoing operations.

- The Certifying Authority (CA) is responsible for compiling and submitting certified cost statements and payment requests to the European Commission and receiving payments from the European Commission. The CA will use the payments received from the European Commission to compensate the lead partners in accordance with Article 132 of the CPR.
- The Audit Authority (AA) is responsible for ensuring that audits are conducted within the management and control systems and are based on an appropriate sample of operations and annual accounts. The audit body will be assisted by a GoA, composed of representatives from the responsible bodies of each partner country. Each participating country will establish National Contact Points (NCPs), complementary to the transnational activities of the Managing Authority (MA) and the Joint Secretariat (JS) and involving stakeholders from the national level, as well as to contributing to the management of national and transnational programmes and providing guidance and advice to potential applicants and project partners
- Leading Partners (LPs) located in one of the EU DTP Member States will be appointed by all partners participating in the project to carry out the tasks set out in Article 13 of the ETC Regulation. In particular, the Lead Partner will assume responsibility for ensuring the implementation of the entire operation, including arrangements for the recovery of amounts unduly paid.
- Each partner country will designate controllers to ensure that the costs incurred by the project partners are in line with Community and national rules, carrying out verifications within the meaning of Article 23 (4) of the ETC Regulation and Article 125 (5) of the CPR, which covers administrative, financial, technical and physical aspects of the business. Controllers will be appointed in accordance with the national provisions of each partner country. Each country participating in the DTP will be responsible for the verifications carried out in its territory.

5. CONDITIONS FOR PROJECTS

The European Union requires that all transnational cooperation programmes must be results-oriented. Such an approach should be reflected in the following (Interereg Project Requirements, 2018):

- Transnational relevance of the subject
- Achieving concrete and measurable output and results, in response to well-identified transnational challenges affecting the programme area
- Deliver lasting results, such as implementing/integrating investments prepared in a transnational context
- Quality of project partnership
- Efficiency in terms of mobilized resources
- Integrated territorial approach

Projects funded from these funds must be strictly transnational in nature, which means that they must achieve cooperation between different countries and regions. Projects that can be achieved without such cooperation are not considered transnational and will not be funded. Co-operation should be established vertically, between different levels of government and horizontally, between different policy sectors and policy actors and geographically, across administrative borders.

Transnational and territorial relevance is one of the main quality requirements for project financing. Each project must clearly contribute to the chosen programmes specific objective addressing development needs and territorial challenges specific to the programme area shared in the participating regions.

Horizontal principles which are crucial for successful implementation of transnational projects are as follows:

- Sustainable Development

Sustainable development means that meeting the needs of current generations must not jeopardize the ability of future generations to meet their own needs. When applying for funding, applicants must explain the impact of

their project on the economic, environmental and social aspects of the targeted region (Interereg Project Requirements, 2018).

Applicants must indicate every possible impact of their project: water, land, air and climate, population and human health, fauna, flora and biodiversity, natural heritage and landscape.

- Equal opportunities and non-discrimination

Projects must promote equal opportunities for all and prevent any discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation while preparing, designing and implementing transnational cooperation projects. In addition, projects must take into account the special needs of the various target groups that are subject to discrimination and the requirements to ensure accessibility for persons with disabilities. During project selection, it will be checked that the project complies with EU non-discrimination laws (Interereg Project Requirements, 2018).

- Equality between men and women

The Danube Transnational Program is committed to gender equality in line with EU policies in this area. Within their activities, projects must ensure equal participation of men and women and avoid any discrimination.

6. DURABILITY AND PORTABILITY OF PROJECT RESULTS

In order to ensure territorial impact and long-term benefits after the completion of the project, care must be taken that the objectives achieved during the implementation are lasting, long-term and transferable.

Sustainability is a prerequisite for the durability of output and project results. The following 3 sustainability dimensions must be considered during the project preparation phase (Interereg Project Requirements, 2018):

- Financial sustainability: financing of supporting activities and investments, impact of resources, resources to cover future operating and maintenance costs, etc.
- Institutional sustainability: identifying the structures that will take over actions once the project is completed and strengthening the capacity to transmit the effect.
- Political sustainability: the impact of the project on political choices that will lead to improved legislation, codes of conduct, methods.

In order to achieve the sustainability of project results, it is necessary to adopt a long-term strategic orientation and involve key stakeholders in the planning of project activities from the very beginning. This ensures that the planned outputs have the greatest effect on the right target groups.

Transnational cooperation programs are primarily designed for further territorial integration through enhanced cooperation in specific policy areas. Given the overall size of the budget and limited resources, transnational cooperation programs cannot support large investment interventions and therefore have a large economic impact (Interereg Project Requirements, 2018).

7. PROJECT PARTNERS

Establishing a stable and successful partnership is a key prerequisite for applying for funding and then implementing the project. The size of the partnership will reflect a transnational character, but a large partnership will not be the ultimate goal. Excessive partnerships can cause significant organizational, communication and coordination problems and thus be inefficient. Finding the right project partners is a long and difficult process. Applicants are advised to actively involve project partners already in the project development phase and to establish direct and personal relationships with them at that early stage. The partnership must be strategically oriented and tailored to the purpose of the project. The quality of the project depends largely on the integrated composition of its partnership. A good partnership should bring together all the competencies and capacities needed to achieve the project goals and achieve the set results (Interreg Danube Guidance for successful projects, 2018).

The lead partner is the developer of the entire project. The success of the project is most often linked to the ability and performance of the main partner in the future to cope with the most challenges.

The lead partner, together with the project partners, is responsible for drafting the application form and submitting it to the Managing Authority (MA) / Joint Secretariat (JS). Upon approval of the project, a Subsidy Contract will be concluded between MA / JS and the lead partner. The lead partner, formally the end user of ERDF, IPA and ENI funds, is the only direct link between the project partnership and the programme.

The profile of the potential lead partner should include solid experience in managing EU funded projects as well as experience in managing transnational cooperation projects; Strong institutional capacity, sufficient financial and human resources; Detailed knowledge of program rules; High level of commitment from both the organization and the project management team; Intercultural sensitivity and proactive management team approach; Thematic expertise on the topic of the project; Professional experience in the Danube Region (Interreg Danube Guidance for Successful Projects, 2018).

According to the geographical location criterion, two types of project partners are identified (Interreg Danube Project Requirements, 2018):

1. Directly funded partners: receive direct financial contribution from the Program (by ERDF, IPA and ENI) and bear full responsibility for their budget,
2. Indirectly funded partners not funded directly from the programme budget but supported and sponsored by an ERDF partner who is responsible for their participation in the project.

3. PROCEDURE FOR SUBMITTING A PROJECT PROPOSAL

Calls for Proposals are publicly announced on the transnational programme website and consists of two steps. In the first step, applicants are required to submit an Expression of Interest document electronically through the program monitoring system (eMS) stating the project objectives and expected results. The statement of interest in the program contains the logic of the intervention and shows the strategic relevance of the project proposal in terms of contributing to the programmes of specific objectives in accordance with the relevant constraints, where applicable, transnational character and impact, partnership and budget (Interreg Danube Application and Assessment, 2018) .

Once complete and accurate, this document is exclusively submitted electronically via the eMS system. Additional documents will not be accepted and/or considered and after submission no changes to the submitted document are possible. Applicants are notified of the outcome of the assessment process electronically (Interreg Danube Application and Assessment, 2018).

During the selection process, two criteria for deciding whether to apply through (Interreg Danube Application and Assessment, 2018) apply:

1. Eligibility criterion - the verification of the eligibility of the draft project proposal aims to confirm that the proposal has arrived within the stipulated timeframe, that the expression of interest is complete and meets the requirements, that the partnership and projects meet the criteria established at the program level. Failure to meet this criterion results in the rejection of the draft project proposal.
2. Quality criterion - is the basis for evaluating the expression of interest with the aim of bringing projects to a certain ranking for selection.

The draft proposals are then ranked based on the results achieved during the evaluation. The total score will be calculated as the average of the individual points of each question.

- The Commission will recommend project proposals with at least 75% direct selection.
- Project proposals with between 60% and 74% will require additional

discussions and will be decided by the Steering Committee.
- The Commission will recommend project proposals that have less than 60% rejection.

The applicants will be informed of the results of the assessment within 10 days of the official approval of the evaluation by the Supervisory Board.

The goals and results must be clearly defined and clearly indicate what changes the project will bring to its current state. The most important aspect of the first step is the proper formulation of the intervention logic. Transnational projects follow results-oriented principles and their implementation brings about change. It is therefore necessary to list in the project intervention logic all the necessary actions that will eventually lead to change.

3. MANAGEMENT OF PROJECT STRUCTURES

In defining the project management structure, the principle of lead partner is applied, which means that one institution is designated as lead partner in accordance with the requirements of the program. The lead partner acts as a facilitator between the Program (MA, JS) and the partner. In addition to its responsibilities regarding the implementation of project activities, the lead partner is responsible for establishing and maintaining sound project management and implementation.

Given that the implementation of transnational projects involves the participation of different countries, it is required that each partner country form a project implementation team in its territory to carry out the activities for which they are responsible at their geographical location. The Realization Team consists of two instances: the Main Team and the Support Team comprised of experts from different fields.

Although the size and composition of the project team may vary from project to project, the following are key positions (Interreg Danube Guidance for Successful Projects, 2018):
- Project Manager (PM)
- Financial Manager (FM)
- Communications Manager (CM)

The lead partner tasks include (Interreg Danube, 2017):
- Organizes partner work
- Oversees implementation of activities
- Provides development and delivery of deliverables and deliverables
- Involves project partners in each activity
- It takes care that activities and costs are at 20% flexibility
- Ensures quality of results
- Ensures the sustainability and transferability of project results
- Ensures target audience involvement

The tasks of the project partners include (Interreg Danube, 2017):
- Timely implement the activities for which they are responsible
- Contribute to the development and delivery of outputs and outputs
- Report to the lead partner
- Monitor activities and costs with 20% flexibility

4. PROJECT COMMUNICATION PLAN

Good communication between the actors involved in the project realization and implementation is key to its success. Therefore, special attention should be paid to the planning of communication activities to be carried out on the project, as well as to the appropriate staff and budget required. In the application phase, it is expected that the complete communication plan will be available and will show how communication will contribute to the successful implementation of the project.

When defining communication goals, it is necessary to keep in mind that these goals are in sync with the goals of the project and program. All activities envisaged in the project communication strategy must be consistent with the other project activities and be a useful tool for partnership in achieving the main project goals as well as for finally informing in all partner regions about their successes and

achievements. (Interreg Danube Guidance for Successful Projects, 2018).

5. FINANCIAL ABILITY AND BUDGET

Before submitting a project proposal, it is necessary for the lead applicant to do an analysis of the financial capacity of the organization. Such an analysis aims to determine whether the applicant and partner are capable of financing the project within the estimated amount of funding. Since EU funds may be required to cover project costs up to 85% of the total budget foreseen, it is up to the partners to cover the rest with their own funds. The analysis consists of two parts: making a financial statement and calculating the required coefficients for the final ability assessment. The figures included in the financial statement must relate to the most recent financial statements and balance sheets approved by the board of directors of the organization and submitted to the competent authorities.

6. COSTS

Legal framework of transnational projects is very specific and strict, and must be fully respected, otherwise project will be rejected. There are three sets of rules related to the area of project costs: EU regulations and provisions, program rules and national rules.

Costs for which reconciliation should not be used from project and program budgets are ineligible costs and include (Interreg Eligibility of Expenditure, 2018):

- Penalties, fines and costs of litigation, lawsuits and litigation
- Gift costs, other than those not exceeding EUR 50 per gift, which relate to promotion, communication, publicity or information
- Costs associated with fluctuations in foreign exchange rates
- Interest on debt
- Purchase of land and existing buildings
- Value added tax, unless it is recoverable under national VAT law
- Contributions in kind, as defined in Article 69 (1) of Regulation (EU) No 1095/2010. 1303/2013
- Division of project costs among project partners
- Used equipment

Eligibility of expenditure on budget items Regulation (EC) No. 481/2014 sets out the rules regarding the financing of specific items from the budget. These include (Interreg Eligibility of Expenditure, 2018):

- Staff costs
- Office and administrative expenses
- Travel and accommodation costs
- External expertise and service costs
- Expenditure on equipment
- Infrastructure and works

7. CHANGE MANAGEMENT

During the project life cycle, changes occur on the project for various reasons. These changes need to be specifically managed to minimize their impact on the project. Project changes will only be accepted in duly justified cases.

Depending on their impact, changes can be minor or major. Although minor changes only require the approval of the MA (MA) / Joint Secretariat (JS) of the PO, major changes, in addition to formal approval by the MA / JS, entail modification of the Subsidy Contract.

8. CONCLUSION

The contribution of this paper is to review and systematize the available data on the topic of transnational project management, providing insight into the specifics of the transnational project, as well as the opportunity to better understand its characteristics from both the managerial and the perspective of the potential applicant.

The main characteristic of transnational projects is that they must be result oriented, results achieved concrete, measurable and lasting, to demonstrate efficiency in the use of resources and the quality of the project partnership itself.

One of the key things for participating in transnational projects is the process of applying and fulfilling all the requirements required by the leading partner.

The transnational programme connects different partner countries in one region through transnational projects. Guided by the same goal and the outputs they receive, they are moving towards the goal of the program and accordingly make a major contribution to strengthening and developing the European Union.

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INTEGRATED CONCEPT OF STRATEGIC MANAGEMENT AS A TOOL FOR EFFECTIVE TECHNOLOGY TRANSFER IN R&D ORGANISATIONS

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Abstract: The process of strategic management in R&D organizations implies a broader context of observation, taking into account the impact of significant changes from the environment at national and international levels, as well as the specific characteristics of scientific research work. Efficient strategic management of R&D organizations means the existence of an integrated strategic management concept, and it is closely linked to efficient technology transfer, which is empirically presented in this paper on the example of R&D organizations (research institutes and faculties) in Serbia. Presented empirical research shows that efficient technology transfer has the strongest influence on the efficiency of R&D organizations, their results and collaboration potential. This paper aims to present an integrated concept of strategic management in R&D organisations as a tool by which many R&D results can be brought to life. The paper highlights the need for an integrated concept of strategic management in an R&D organisation with the aim to improve the technology transfer.

Key words: strategic management, R&D organizations, technology transfer.

1. INTRODUCTION

Research and development (R&D) activities are very important ventures, mainly performed by the: enterprises, higher education institutions, and research institutes. Research institutes in the narrow sense are recognizable, strategically oriented research organizations that perform key functions within European innovation systems. They generate almost half of public-funded R&D costs at European Union level (Arnold, Barker, & Slipersæter, 2010). Research institutes that are publicly funded represent an important aspect of the national innovation system and an important tool for fostering innovation and the performance of national economies. Their importance is reflected in the activities of creation, discovery, use, and diffusion of knowledge and their activities and impacts vary depending on the structure and type. Some are oriented to "blue sky" research; while others are pursuing short term market-oriented projects (OECD, 2011).

Frascati Manuel (2015) presents the internationally recognised methodology for collecting and using R&D statistics. It includes definitions of basic concepts, data collection guidelines, and classifications for compiling R&D statistics. According to the Frascati Manual (2015), one of the five basic characteristics of R&D indicates that "R&D activities should lead to the transfer of new knowledge". Taking into account the basic purpose of research and development, to enhance the stock of existing knowledge, the research output cannot be tacit (i.e. it cannot exist only in the mind of the researcher), because there would be a risk that the results and knowledge could be lost. Knowledge coding and its dissemination are a part of common practice in universities and research institutes. In the business environment, results are protected by secrecy or other intellectual property rights, but there is an expectation that processes and results should be useful to other researchers in the organisation (OECD, 2015).

The intellectual capital becomes increasingly important for organizational and project development as well as for economic progress. Nowadays, intangible assets become an important factor in future development

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(Milošević, Dobrota, & Barjaktarević Rakočević, 2018). Scientific work carried out in research organizations aims to enhance the existing knowledge base, while development activities aim to direct research and development results according to market demands. In research organizations, besides of R&D activities, there are often activities related to the dissemination of research and technology transfer results. In the transition countries, it has been observed that there was no correlation between market demands and R&D work (Jafee, A, 1984; Mosurović Ružičić, Semenčenko, & Kutlača, 2015; Radošević, 2018).

Understanding the essence of research and development activities enables the understanding of the concept of globalization of research and development, which is a basic characteristic of modern society. Globalization of R&D within the Frascati Manual (2015) means "financing, performance, transfer, and use of R&D".

The main objective of the strategic management in R&D organizations is an effective and efficient management of the research and development process, which should lead to the improvement of utilization of the R&D results. Current studies on technology transfer and international technology transfer have one comprehensive approach that includes researchers from a cross-section of disciplines including organizational management, political science, economics, sociology, anthropology, marketing, and recently the management of technology (Wahab, Che Rose, & Osman, 2012).

Efficient strategic management of R&D organizations means the existence of an integrated strategic management concept, and it is closely linked to efficient technology transfer, which will be empirically presented in this paper on the example of R&D organisations (research institutes and faculties) in Serbia. Technology transfer is a complex theme covered by many studies.

Technology transfer means moving of research results: „from an industrial R&D laboratory to the production line, from a non-profit R&D centre to an entrepreneurial new product developer, from university research centres to commercialization and from federally funded research centres to other scientific users or to industry for commercialization and new product development" (Suter, & Strauss, 2007).

2. NEW TRENDS IN TECHNOLOGY TRANSFER MANAGEMENT IN R&D ORGANISATIONS

The main failure of the most models for strategic management in R&D organisations is in the fact that neither the R&D process, neither the strategic management process was considered in a comprehensive, analytically acceptable framework. Usually, only some phases of these processes are described, which makes it impossible to see the importance of applying strategic management with all its components in research organizations, which further implies that strategic management in these organizations faces numerous methodological and organizational challenges.

A modern approach to the strategic management of scientific work indicates the need for separate consideration of R&D management, management of technology and technology management in the organisation (Chanaron, & Grange, 2006; Dabić, 2002; Murayama, Nirei, & Shimizu, 2015). Technology management can also be related to organisations that do not have the capacity for R&D activities but have a clearly developed need for specific scientific research results as well as information where they can find them. In these circumstances, cooperation between all innovation stakeholders within the national innovation system, where scientific research organizations have an important role, becomes increasingly important.

Changes in the research sector, which influence the need for applying the integrated concept of strategic management in R&D organisations can be systematized as follows (Arnold et al., 2010):

- *Convergence*. An increasing number of new technologies are based on science, which has a significant impact on technological progress. It is noted that there was a deletion of the

existence of a strict distinction between traditional scientific branches - myco-electronics, biotechnologies, etc. This is the way to the thematic specialization of the institutes.

- *Strengthening of the connections between universities and research institutes* by involving PhD students in research projects in the institutes. At the same time, universities will be able to generate knowledge according to market needs.
- *Globalization* is seen as the driver of change in many areas, but also in the field of R&D taking place within institutes. A growing number of researchers are collaborating with each other, putting science development at the forefront and deleting national boundaries.
- *Commercialization and the long-term importance of the market.* Almost all institutes engaged in R&D activities constantly strive to benefit from their scientific research work through concrete commercial use. Recently, institutes have achieved increasing market incomes (competing for public and private affairs), but the degree of this income also differs from the types of institutes
- *Organization and scale.* It is necessary to redefine or form new measuring scale for scientific R&D results of R&D organisations. The adequate scale is necessary in order to be able to participate in international project calls more successfully.
- Research institutions should have a measuring scale for their research. That way, they could more easily participate in the race for sources of international funding. Modern business conditions impose knowledge as a significant resource for competitive advantage formation, which is why recent organizational theories emphasize the concept of "organizational learning". Organizational learning represents the evolved ability of an organization to learn continuously and some organizational theorists even go so far as to think that it can be the sole source of competitive advantage (Robins, 2005). Organizational learning determines an organizational structure that has almost no vertical line of authority, which enables the mobilization and management of knowledge and the highest possible level of participation in solving innovative problems.
- *Politics.* Creating a single European Research Area and increasing participation in various European programs and initiatives.

These changes have led to a redefinition of research priorities that are slowly shifting from basic research to applied research and their commercial application. The R&D management process is gaining an important place within the strategic management of the organization. There is a new tendency of scientific research work management, especially related to research and development, which leads to the emergence of a brand-new approach called technological management, especially regarding R&D institutes.

3. MANAGING THE TECHNOLOGY TRANSFER IN SERBIAN R&D ORGANISATION

The process of strategic management in R&D organizations implies a broader context of observation, taking into account the impact of significant changes from the environment at national and international levels, as well as the specific characteristics of scientific research work. Bearing in mind the main characteristics of strategic management, on the one hand, and bearing in mind the basic characteristics of the scientific research process, on the other, there was a need to develop a comprehensive framework that would integrate all these characteristics into synchronized, unified whole, applicable in scientific research organizations.

From the second half of the last century, the scientific-research system in Serbia is in the process of transformation from a planning system to a market-driven system. Development of an integrated strategic management concept that would be applicable to research organizations in Serbia should lead

to an effective restructuring of these organizations.

3.1. Challenges

The economic transition from socialism to capitalism brought a lot of changes regarding technological competence, technological transfers, and research activities for the transition countries, after the 1990s (Svarc, & Dabic, 2019). Like the most post-communist countries, Serbia faces the major challenges during the transition process (Racine, Goldberg, Goddard, Kuriakose, & Kapil, 2009):

- *Limited experience regarding the practical application of the research results.* Scientific research organizations are generally more oriented on scientific work in terms of increasing the knowledge base, not on their practical application. There is a need for establishing international cooperation regarding the basic research in order to overcome the lack of financial resources and obsolete research infrastructure at the national level. But, a large number of national research organizations are not internationally competent;
- *Lack of experience to understand market needs*. For a long period of time, the R&D activities were mostly supported by the government regardless of the market needs. It led to the insufficient or almost non-existent link between the research sector and industry;
- *The age structure of management*. Managers of research organizations are not sufficiently trained in strategic management of the organization. Managers are not motivated enough to create changes. They are able to observe how the organization, both financially and in terms of staff, is going down with no intention of doing anything because they believe that the degradation process will take long enough until their retirement;
- *Members of the board of directors*. The board of directors of research institutes often includes members who are elected for political reasons that support organizational restructuring but on a general basis. There is a lack of the industry representatives that could make a concrete contribution to the restructuring process;
- *A large number of „non-productive" staff*. As a consequence of past human resources policy, there are still a lot of "non-research", administrative staff in research organisations;
- *Brain drains.* A lot of the researchers who have the capacity to trigger the change have left their organisations. They went either to foreign companies or abroad where they got better working conditions, both financially and intellectually. Most of those who are left are not interested in making any major change;
- *Lack of transparency*. In the past, a great deal of information on finances and other data has been designated as strictly confidential, so that the available figures of institutions are not sufficiently reliable and accurate;

Besides to the above-mentioned challenges, R&D organizations in Serbia are also faced with:

- Constant *lack of financial resources*, especially from the industry, international funds, etc.
- *Lack of research facilities and research infrastructure.* As a result of the ownership transformation and lack of funding in a large number of research organisations, there were no long-term investments in R&D institutions in Serbia. There is obsolete equipment which does not allow conducting the cutting edge research. Research and development laboratories within major R&D institutions are within the process of structural transformation and shutting-down.

The problem solutions can be sought in collaboration with other innovation stakeholders and the creation of appropriate infrastructural forms that can improve the quality of research outputs by diffusion and technology transfer. It is necessary to take comparative advantage based on quality,

educated scientific staff and, with adequate knowledge management, to increase the participation of researchers within national and intentional projects' calls.

3.2. Empirical research

The empirical part of this work is based on research that covered employees from the accredited R&D organisations in Serbia - research institutes and faculties (Obradović, Mosurović Ružičić, & Dobrota, 2019).

The integrated concept of strategic management in the scientific research organisations in Serbia was described with 14 consistent variables: external environment, internal environment, strategic documents, project portfolio, resources, organizational design, collaboration, monitoring, results, achievement assessment, system of lessons learnt, efficacy assessment, strategic management methods, and techniques and management capacity for managing innovation.

For the purposes of the research presented in this paper, we have developed the following research hypothesis:

The application of integrated strategic management concept in research and development organisations enables the efficient transfer of knowledge and technology from research organizations to the economy.

In order to test the starting hypothesis, the *strategic management concept* is presented with the set of components, which are systematized into consistent variables that express basic elements of the strategic management process in R&D organizations in Serbia.

Table 1 provides a descriptive summary of the variables that represent the core elements of the strategic integrated management concept. It gives an overview of each of the variables individually, number of its sub-elements, mean, standard deviation, minimum, maximum, results of Friedman's test (showing that the all sub-elements of the main variables differ among themselves), as well as Cronbach's Alpha, a measure of the validity of the scales by which variables are created.

Table 1: Presentation of the basic elements of the integrated strategic management concept

Variables	No. sub. el.	Mean	SD	Min	Max	Friedman	Friedman sig.	Cronbach's alpha
External environment	10	29.24	8.826	10	49	217.908***	<0.001	0.891
Internal environment	11	30.77	6.786	15	51	699.881***	<0.001	0.782
Strategic documents	4	11.62	5.008	4	20	109.032***	<0.001	0.888
Project portfolio	7	19.86	7.577	7	35	179.239***	<0.001	0.901
Resources	5	14.14	4.958	5	25	95.548***	<0.001	0.803
Organizational design	6	20.12	6.312	6	30	138.799***	<0.001	0.885
Collaboration	5	15.25	4.691	5	25	193.875***	<0.001	0.795
Monitoring	4	10.69	4.588	4	20	138.271***	<0.001	0.878
Results	7	23.40	7.050	10	35	253.243***	<0.001	0.836
Achievement assessment	6	16.28	6.651	6	30	245.375***	<0.001	0.902
System of lessons learnt	4	9.65	4.726	4	20	68.104***	<0.001	0.933
Ocena efikasnosti	13	41.68	14.543	13	65	229.952***	<0.001	0.963
Methods and techniques	3	6.56	3.432	3	15	40.632**	<0.001	0.869
Management capacity for managing innovation	7	20.762	5.707	7	35	250.44***	<0.001	0.773

Source: own research

For three variables, *internal environment*, *collaboration*, and *management capacity for managing innovation*, the value of Cronbach's Alpha is over 0.7 that indicate good internal consistency. Seven variables, *external environment*, *strategic documents*, *resources*, *organizational design*, *monitoring*, *results*, *strategic management methods and techniques*, have the Cronbach's Alpha value over 0.8, which indicate very good internal consistency. The rest four variables *project portfolio, achievement assessment, a system of lessons learnt, efficacy assessment* have the Cronbach's Alpha value over 0.9 which indicates excellent internal consistency.

It was further necessary to determine the difference between variables of the *integrated strategic management concept* by groups regarding the variable *Technology transfer efficiency* (Table 2). As all presented variables are not normally distributed, the Kruskal-Wallis nonparametric test is used to determine whether there are statistically significant differences between groups.

Table 2: Differences of elements of integrated strategic management concept regarding the variable Technology transfer efficiency

Variables	Groups	Mean	±	SD	Med.	K-W	K-W sig.
External environment	*Low transfer*	27.16	±	8.207	27	7.178*	0.028
	Average transfer	30.00	±	8.415	29		
	High transfer	30.39	±	8.797	32.5		
Internal environment	*Low transfer*	29.53	±	7.26	30.5	4.841	0.089
	Average transfer	30.16	±	4.995	30		
	High transfer	32.01	±	6.985	31.5		
	Low transfer	11.21	±	4.759	11	3.308	0.191

Strategic documents	*Average transfer*	10.97	±	5.064	10		
	High transfer	12.22	±	5.040	12.5		
Project portfolio	*Low transfer*	18.10	±	7.120	18	11.378**	0.003
	Average transfer	19.58	±	8.404	18.5		
	High transfer	22.00	±	6.881	22		
Resources	*Low transfer*	13.22	±	5.019	13	7.601*	0.022
	Average transfer	13.71	±	4.753	14		
	High transfer	15.38	±	4.469	15		
Organizational design	*Low transfer*	18.69	±	6.589	19	10.212**	0.006
	Average transfer	19.26	±	6.583	19.5		
	High transfer	21.88	±	5.645	22		
Collaboration	*Low transfer*	13.5	±	4.644	13	22.023***	<0.001
	Average transfer	14.29	±	4.053	14		
	High transfer	17.03	±	4.350	17		
Monitoring	*Low transfer*	9.38	±	4.364	8	11.848**	0.003
	Average transfer	10.61	±	4.278	10		
	High transfer	11.88	±	4.474	12		
Results	*Low transfer*	16.84	±	4.127	17	115.547***	<0.001
	Average transfer	23.32	±	4.905	23.5		
	High transfer	29.40	±	4.665	30.5		
Achievement assessment	*Low transfer*	15.19	±	6.43	15	10.392**	0.006
	Average transfer	15.34	±	6.727	14		
	High transfer	18.12	±	6.154	18		
System of lessons learnt	*Low transfer*	8.62	±	4.452	7.5	8.642*	0.013
	Average transfer	9.50	±	4.631	8		
	High transfer	10.79	±	4.660	12		
Efficacy assessment	*Low transfer*	37.06	±	14.232	37.5	14.281***	0.001
	Average transfer	41.42	±	15.137	41.5		
	High transfer	45.79	±	13.339	44.5		
Methods and techniques	*Low transfer*	5.76	±	3.149	4	9.104**	0.011
	Average transfer	6.87	±	3.626	6		
	High transfer	7.21	±	3.299	7		

Table 2 shows the differences between the elements that represent the integrated strategic management concept regarding the variable Technology transfer efficiency. Based on Table 2, it can be seen that there is a difference regarding the technology transfer efficiency in terms of nearly all presented variables.

The most evident difference was observed for the *Efficacy assessment* (KW = 117.84, p <0.001). When comparing groups Inefficient transfer (M = 27.12, SD = 10.845, Me = 26), Neutral efficiency transfer (M = 40.33, SD = 7.143, Me = 39), and Efficient transfer (M = 53.62, SD = 8.878, Me = 54), it is clear that the more efficient the technology transfer is, scientific research efficiency will be higher.

Another important difference was regarding the variable *Results* (KW = 45.369, p <0.001). With respect of the groups Inefficient transfer (M = 18.82, SD = 5.798, Me = 18), Neutral transfer efficiency (M = 23.11, SD = 6.55. Me = 22) and Efficient Transfer (M = 26.68, SD = 6.645, Me = 27), the more efficient the technology transfer is, the organization's results will be better.

A significant difference was also seen regarding variable *Collaboration* (KW = 18.833, p <0.001). When comparing groups Inefficient transfer (M = 13.02, SD = 4.278, Me = 14), Neutral transfer efficiency (M = 15.35, SD = 3.671, Me = 15.5) and Efficient Transfer (M = 16.49, SD = 5.005, Me = 16), the more efficient the technology transfer is, the cooperation in research and development activities will be better.

Figure 1, Figure 2 and Figure 3 represent the differences regarding the *Technology transfer efficiency* presented by boxplot diagram in terms of the variables *Collaboration*, *Results*, and *Efficacy assessment.*

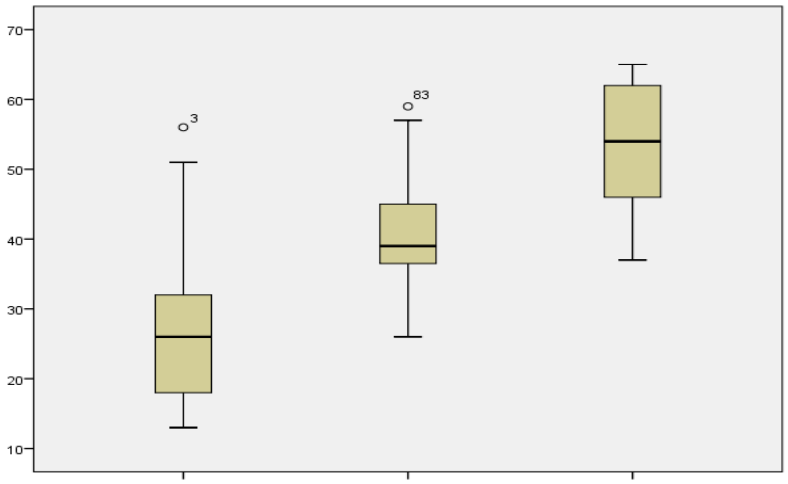

Figure 1: Boxplot diagram of the variable, *Efficacy assessment* versus *Efficiency of technology transfer (1.Inefficient transfer, 2.Neutral transfer efficiency, 3.Efficient Transfer)*

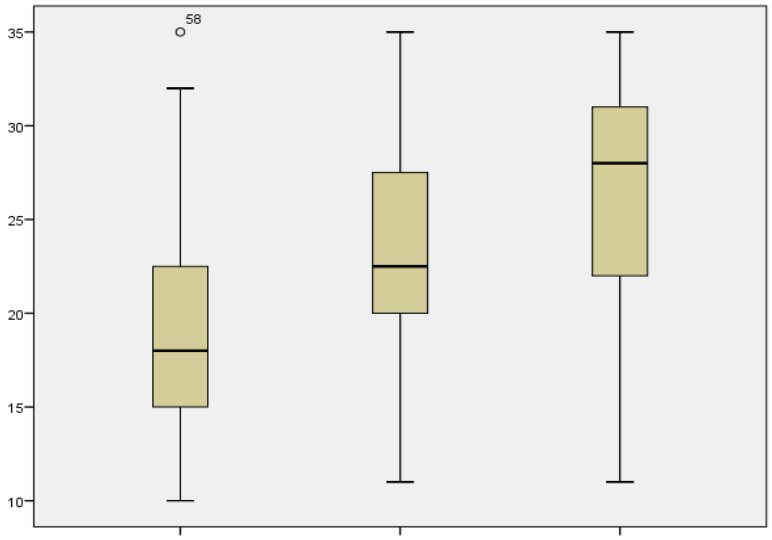

Figure 2: Boxplot diagram of the variable *Results* versus *Efficiency of technology transfer (1.Inefficient transfer, 2.Neutral transfer efficiency, 3.Efficient Transfer)*

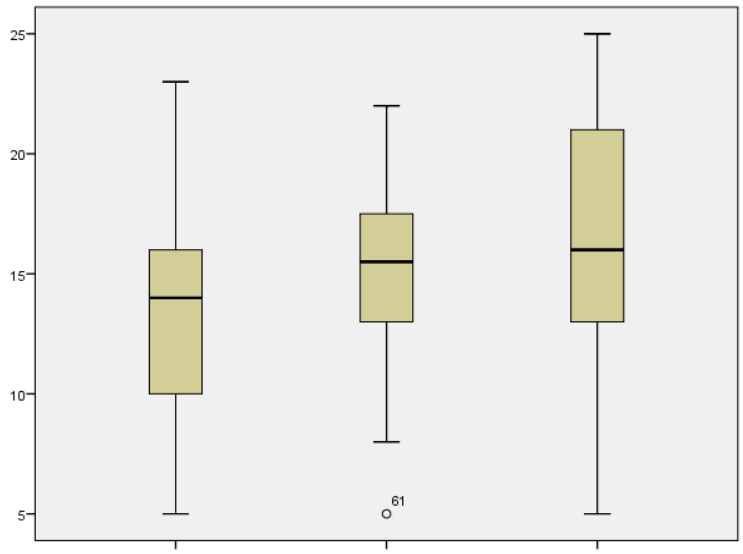

Figure 3: Boxplot diagram of the variable *Collaboration* versus *Efficiency of technology transfer (1.Inefficient transfer, 2.Neutral transfer efficiency, 3.Efficient Transfer)*

The empirical research shows that the efficient technology transfer has the strongest influence on the efficiency of R&D organisations, results in the organisations, and their collaboration, but also on all other elements of integrated strategic management concept which are presented in this research. The empirical research presented in this paper has proved previously determined research hypothesis, that the application of integrated strategic management concept in research and development organisations enables the efficient transfer of knowledge and technology from research organizations to the economy.

4. CONCLUSION

Historically, any form of technology transfer has generally been influenced by the economic developments of the period. Differences between types of technology transfer could be clearly understood if the human and technological developments are taken into account; goods (equipment and products) and knowledge (public information and know-how) are considered at the same time. Usually, in the process of technology transfer, there is a movement of human resources between suppliers and recipients of technology, in both directions, while the path of goods and knowledge is one-way, from suppliers to recipients of technology (Uchida, 1990).

Starting from the quite certain findings that the effective applying of scientific research work is an important factor of economic growth, it is necessary to find a way to maximize research potential. The main problem is that slow, inefficient transfer of technology is one of the crucial limiting factors of current economic and technological development in Serbia. One way to overcome this problem and encourage technology transfer is the application of an integrated strategic management concept in research organisations that would encourage technology transfer. The main recommendation for the management of R&D institutions is the recognition of technology transfer as an important project result. In order to improve the utilization of technology transfer as a project output, there is a need for a systematic approach to the strategic management of R&D institutions.

Based on the results of the empirical research presented in this paper, it can be clearly seen that the more efficient the technology transfer leads to better results in an organisation. Presented empirical research shows that efficient technology transfer has the biggest influence on the efficiency of R&D organizations, their results, and collaboration:

- the more efficient technology transfer, higher the efficiency of scientific research.

- the more efficient technology transfer, better the organisational results.
- the more efficient technology transfer, better the cooperation in research and development activities.

The systematic approach enables, among other things, establishing cooperation with all stakeholders outside the organisation. Insufficient technology transfer has been identified as a weak point in R&D organizations in Serbia in the previous period and accordingly, appropriate infrastructure bodies have emerged to encourage technology transfers (technology transfer centres). Transfer technologies have an undeniable significance for organisation and more broadly, exploit the ability of the economy to generate greater economic growth.

Low levels of R&D activities have a negative impact on levels of demand and funding for new products and services from the academic sector. There is almost impossible that universities develop and transfer new technologies if companies, governments, and investors are not seeking to finance and acquire them. The main goal of the strategic management in R&D organisations is to effectively and efficiently manage the R&D process, which contributes to utilization of the research results and reducing costs on that basis, as well as increasing the basic knowledge base.
Bearing in mind the specific features of research and development work, effective strategic management in research organisations provides benefits not only to the management of the organisation but also to decision-makers at the national level by maximizing the quality of policy coordination and budget planning and control through the efficient allocation of the available resources.

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