Measuring Success of PPP Transport Projects: A Cross Case Analysis of Toll Roads

Journal:	*Transport Reviews: A Transnational Transdisciplinary Journal*
Manuscript ID:	TTRV-2014-0070.R3
Manuscript Type:	Original Article
Keywords:	Key Performance Indicators (KPI), Performance measures, Project success, PPP (Public Private Partnership), Qualitative Comparative Analysis (QCA), Toll Roads

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ABSTRACT

The aim of this paper is to measure 'overall' success of a Public Private Partnership (PPP) transport projects using 04 case studies. All four case studies are PPP toll roads from 04 different EU countries (UK, Spain, Portugal and Greece). The case studies have been analysed using a manual Qualitative Comparative Analysis approach. According to the paper, three different perspectives have been used to measure the success of a project, i.e. project management perspective, stakeholder perspective and contract management perspective. The 'overall' success has then been deduced by bringing these three perspectives together as a holistic approach. The findings are presented in a form of a matrix and the final outcome of the paper shows a simple methodological approach that can be used to measure success of a PPP transport project. Since the study takes more of a qualitative approach, researcher bias and perceptions have a major role to play in the final outcome. However, to reduce 'biasness', quantitative measures have also been used to quantify the Key Performance Indicators and performance measures in the case studies. It is hoped that the study makes a valid contribution to the areas of transport PPPs and performance measurement.

Keywords
Key performance indicators (KPI); Performance measures; Project success; PPP (Public Private Partnership); Qualitative Comparative Analysis (QCA); Toll roads

1. INTRODUCTION

Analysis of project success varies according to different contextual factors of a project, e.g. the type of sector, type of project, type of contract, different funding and finance arrangements, project characteristics, and stakeholder involvement. If type of sector is taken in the aforementioned contextual factors, there are some factors that are inherent to specific sectors that may contribute to the success/failure of a project as well. These have been talked in many literatures including Tabish and Jha (2012); Takim *et al* (2004); Li *et al* (2005); and Qiao *et al* (2001). For example, in road projects, the traffic demand may be one of the key factors that may lead to a success of a project. In Ports, the level of integration with other transport modes will be a key factor in project success. In building projects, the market conditions will be a key factor for a project success. Thus, due to the complex nature of construction projects and the complexity and differences of many contextual factors, it is difficult to identify a robust approach that can be used for measuring success of construction projects.

Many authors have attempted to assess success of PPP projects (in general and/or with specific to transport). Some fo them (e.g. Zhang, 2005; Tiong et al, 1992; Walter and Scholz, 2007) have done so by assessing critical success factors (CSFs) in PPP projects. Some (e.g. Yuan et al, 2009; Mladenovic et al, 2013) have attempted to analyse success of PPPs through the use of Key Performance Indicators (KPIs). Furthermore, some other researchers have examined success by assessing value for money aspect in PPP projects (Grimsey and Lewis, 2005; Burger and Hawkesworth, 2011; Nisar, 2007); or by assessing PPP delivery in order to identify the success of a project (e.g. Aziz, 2007; Songer and Molenaar, 1997). However, according to Hodge and Greve (2007), strong and independent evaluation of success of PPPs has been sparse. It appears that insufficient research has been undertaken to be fully informed on outcome (success/failure) of the PPPs to-date, thus, as Hodge and Greve further affirm, there is a serious need for rigorous assessment of PPPs. The main purpose of this paper is to fulfil this gap by presenting a robust assessment of success of PPPs. This is fulfilled by developing a

methodology for measuring success in PPP road projects using both qualitative and quantitative strategies.

The above is presented within the paper in three sections. The first section discusses the case study approach used for the study. The second section then presents the Qualitative Comparative Analysis (QCA) approach used for case study analysis. The final section of the paper presents the overall findings and discussions with regard to success assesssment.

2. CASE STUDY APPROACH

According to Yin (2009), case studies are the preferred research strategy when, 'a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control'. Taylor *et al.* (2009) suggest that case study research should attempt to achieve depth by including multiple, polar cases and including multiple, analytically similar cases. What is achieved through this approach is the element of verification or testing of theory as it shifts from deductive to inductive or the need to apply replication logic (Eisenhardt, 1989). Considering the main research question of this paper 'how to measure success in transport projects?', there was a need to adopt an exploratory approach with the use of in-depth case study research. The present work draws on that of Yin (2009) and Voss et al (2002). According to the latter it is important to identify when to use case research. The case studies approach in measuring success of PPP projects using Key Performance Indicators (KPIs) is not new in research literature. For instance, Chan and Chan (2004) have identified a set of KPIs for measuring success in construction projects using three hospital case studies; McKinnon (2009) have studied KPIs for measuring success in road freight transport; and Yuan (2009) have used a case study approach to select performance objectives and KPIs in PPP projects to achieve value for money.

For the case study methodology, a case template developed by P3T3 COST Action (TU1001) was used to collect data. Development of an in-depth template was a challenge initially. This challenge includes the study questions, its propositions, its unit(s) of analysis, the logic linking the data and, finally, the criteria for interpreting the findings. This ultimately leads to developing a theory with respect to the subject under study or identifying the basic factors connecting the various actors and elements of the study (Roumboutsos and Liyanage, 2012). The case template included questions ranging from actors, project specifics to performance monitoring; this is to address P3T3 working group (WG) and auxiliary working group (AWG) objectives along with the aspect of transferability of results. Herein, actors are the participants in the project, i.e. the public contracting agency and sponsors, the private participants and the users who benefit from the project. Secondly, the specifications of the project are described mostly with regard to what the project is all about (what), project timelines (when), location (where), why the PPP option was selected for the project, the tendering procedure (which way). Finally, the template focused on identifying the key performance indicators (KPI) and also the critical success factors (CSF) to evaluate the success criteria of the project. This section of the case study template included the following main questions:

1. Brief Description of performance indicators monitored in the project (narrative).
2. Are performance indicators explicitly stated in the contract (Yes or No answer)?
3. If the answer Yes to question 2, please list the performance indicators mentioned in the contract and explain how these performance indicators evaluated in the project (narrative).
4. If performance indicators are not explicitly stated in the contract, are there any indicators that are used for evaluation within different stages of the project or are there any indicators used in project report (Yes or No answer)?
5. If the answer Yes to question 4, please list the performance indicators and explain how these performance indicators evaluated in the project (narrative).
6. Are there any penalties connected with the aforementioned KPIs for lack of performance (Yes or No answer)?
7. If the answer Yes to question 6, please list them and explain what they are (narrative).

8. Can you please list the key factors that are critical to the project's success or failure, explain why these are critical (narrative) and identify their level of importance (Likert scale of 5; 1 being not significant at all to 5 being extremely significant).

The findings presented in this paper discusses many of the data obatained from the aformentioned questions. Many members of each EU country participated in the P3T3 project were involved in the data collection process of PPP transport related cases. Some collected data only on one case study per country, whereas many provided multiple case studies in respective countries. Both primary and secondary data were collected to fill in the case study templates. Secondary data was mainly collected using the information widely available on the web or some information was collected from related project documents/reports. Semi-structured interviews were also conducted with few project participants to fill in the case study template. The filled case templates could contain about 10 – 20 pages of narratives and Likert scale based answers. The templates were then analysed using qualitative comparative analysis, which is discussed in a latter section of this paper.

Overall, four projects have been chosen to achieve the purpose of this paper, i.e. measuring success of PPP projects. Given the complexity of different contextual factors mentioned in the previous section, the scope of the study is limited to only PPP toll road projects. Choosing a particular type of PPP project makes the cross case analysis and synthesis consistent, reliable and valid.

The four tolls projects have been selected from the most active countries in terms of the use of PPPs within the EU. These are the UK, Spain, Portugal and Greece. The four cases chosen are the M-6 UK, R-2 Spain, A-23 Portugal and Attica Greece. Details of these four case studies are given in the next section.

3. CASE STUDY DESCRIPTIONS

A brief summary of all four case studies, with the project identification and some basic information about the public grantor, the private contractor, repayment method and financial details, are given below in Table 1.

Table 1: Summary of the case studies

PROJECT NAME	M6 U.K.	R-2 Spain	A23 Portugal	Attica Greece
Identification				
Geographical region	Midlands UK	Madrid, Spain	Beiras, Portugal	Athens, Greece
Cost	£485 mill.	€ 500 mill.	€ 628 mill.	€ 1.300 mill.
Contract Duration	53 yrs.	25 yrs. (Ext. to 39)	30 yrs.	25 yrs. (or before)
Tender call	1992	04/02/2000	October 1997	18/02/1995
Contract approval	2000	02/01/2001	13/09/1999	23/05/1996
Operational start	08/12/2003	06/10/2003	27/07/2003 (Completion date)	18/03/2001
Public Authorities				
Government Sponsor	Department of Transport	Ministry of Public Works	Ministry of Public Facilities	Ministry of Development and Infrastructure Transport
Commissioning Authority	DFT/ Highways Agency	Infrastructure Secretariat	National Road Institute	L.S.E.P
Private Contract holder				

Name Consortia/Contractor	Midland Expressway Ltd	HENARSA, S.A.C.E.	Auto Estradas da Beira Interior, S.A.	Attiki Odos
No. partners Consortium	2	5	6	3
Details	Macquarie	ACS Group Acciona Group	Soares da Costa, ES Concessões, Globalvia, Alves	Ellaktor J&P AVAX Piraeus-ATE B
No of contractors	4	2	6	14 originally
Financial Details				
No. Banks/Bond Holders	1 Bank	EIB + >10 banks	EIB + >10 banks	EIB + >10 banks
Method of payment				
Toll	Direct	Direct	Direct/Availability (Initially shadow)	Direct

The M6 Toll road, originally called as the Birmingham North Relief Road (BNRR), is a greenfield project that connects M6 Junction 4 at the NEC to M6 Junction 11A at Wolverhampton in the area of Birmingham, U.K., with 27 miles (43 km) of six-lane motorway. The agreement is a Design, Build, Finance and Operate (DBFO) contract and was of the main new project in the country. This model is more commonly referred to as the Private Finance Initiative (PFI) in the UK. For more info on the M6 Toll Road, UK, please refer to Boles and Liyanage (2013).

The Radial 2 Toll road, ***R-2,*** is a greenfield project for the construction and operation of a toll motorway in the north east area of Madrid in Spain. The concession has a length of 80,7 Km, and includes the toll road R-2 for 62,3 km and a 18,4 km section of the M-50 loop, between the existing A-2 and A-4. The PPP option of the project is Built, Operate and Transfer (BOT) contract. Even though the initial cost was projected around € 500 M, final cost might approach € 900 M, when all payment related to land acquisition may be settled. The concessionaire, named as HENARSA, S.A., is responsible for the construction, operation and financing of the road, it is entitled to receive revenues for the services provided and finally hand-over to the grantor during contract termination. For more info on R-2, Spain, please refer to Villalba-Romero and Liyanage (2014).

The A-23 Beira Interior Toll road project, is a combination of some existing infrastructure and a new construction of a toll road in the centre of Portugal, linking the north-south axis A1, near the Spanish border. The contract is Built, Operate and Transfer (BOT). The concessionaire is SCUTVIAS– Auto Estradas da Beira Interior, S.A. for most of the length of the project (178 out of 217 km) and is responsible for the design, construction, operation and maintenance during the concession period, after which the road will be delivered to the grantor. The remaining section is managed by the national road institute, Instituto das Estradas de Portugal - IEP. For more info on A-23, Portugal, please refer to Ribeiro *et al.* (2013).

The Athens ring road,i.e. Attica Tollway is a greenfield project, consisting of three-lane ring road around the city of Athens in Greece. It extends along 65 km and connects the 30 municipalities of the Attica basin.This is part of the Trans European network. The construction of the project was performed in parallel with flood protection works, as it passes through three large hydrographic basins. It is a hybrid structure of a PPP project under a Build, Operate and Transfer (BOT) contract with strong public financial support. The concessionaire is Athiki Odos, more commonly known as Attica Tollway. They are responsible for the construction and operation of the road. It has established back to back contracts with the concession agreement, with "Attiki Odos Construction Joint Venture" for the project construction and with "Attikes Diadromes, S.A." for the operation and maintenance of the project. For more info on Attica, please refer to Halkias *et al* (2013).

4. QUALITATIVE COMPARATIVE ANALYSIS

The term Qualitative Comparative Analysis (QCA) has a long historical epistemology. The logical foundations for the QCA were laid by Hume in 1758 and later by Mill in "canons", described in "A system of logic" published in 1843. Mill refers to the method as "*if two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree, is the cause (or effect) of the given phenomenon*". It is also a method of difference, which establishes the absence of a common cause or effect, even if all other circumstances are identical (Mill, 1843). QCA has been developed as analytical technique by Charles Ragin since 1987, initially in comparative politics and historical sociology and most recently it has been applied to construction studies by Chang *et al.* (2010), McAdam *et al.* (2010), Schaffer-Boudet *et al*, (2011) and Gross and Garvin (2011).

The basis of QCA is comparative and has a strong tradition of case oriented work. This method has been populated largely by area and country experts, and enjoys high status because of the state and corporate actors' usage (Berg-Schlosser *et al*, 2008). Case oriented researchers often believe that quantitative cross-national researches ignore the gap between the qualitative research and the knowledge of specific cases. QCA attempts to bridge these gaps of qualitative and quantitative analysis by utilising methodological tools that have proven to be very useful to social science research.

In this paper, QCA was carried out to answer mainly one research question – "*how to measure the 'overall' success of a project*?" (based on PPP toll road context). During the QCA process, the following 4-step approach was carried out to answer the research question:

Step 1 – Development of KPIs and Performance measures
Step 2 – Defining success (three different perspectives)
Step 3 – Holistic perspective
Step 4 – Success Criteria

The details of these four steps are discussed in the following sections.

4.1 Step 1 – Development of KPIs and Performance measures

The terms performance measure and performance indicators are used interchangeably in the literature. Distinguishing these terms provides useful clarification. Performance measures are 'markers or signs of things you want to measure but which may not be directly, fully or easily measured' (Adair et al 2003). A performance measure is one of the several measureable values that contribute to the understanding and quantification of an indicator. Performance measures are quantitative measures of capacities, processes or outcomes relevant to the assessment of a performance indicator (Liyanage, 2006). Performance indicators (or Key Performance Indicators – KPIs), on the other hand, are not 'direct measures of quality; rather, they are flags to alert users to possible opportunities for improvement'. Such types of indicators are extremely important to an organisation in achieving its strategic goals, objectives, vision and values that, if not implemented properly, would likely result in a significant decrease in performance (Benchmarking Study Report, 1997). According to KPI Working Group (2000), the purpose of the KPIs is to enable measurement of project and organisational performance. Collin (2002; as cited in Chan and Chan, 2004) advocates that the process of developing KPIs involved the consideration of factors such as:

- KPIs are general indicators of performance that focus on critical aspects of outputs or outcomes;
- only a limited, manageable number of KPIs is maintainable for regular use;
- the systematic use of KPIs is essential as the value of KPIs is almost completely derived from their consistent use over a number of projects;
- data collection must be made as simple as possible;
- KPIs should be designed to use on every project for easy comparison of performance;

- the KPIs must be accepted, understood and owned across the organisation;
- KPIs will need to evolve and it is likely that a set of KPIs will be subject to change and refinement.

With the abovementioned factors in mind, a set of KPIs (and performance measures), including objective indicators and subjective ones, were developed to develop a 'success' methodology for this paper. The approach followed to develop the indicators are discussed below.

The data gathered from the 04 case studies selected, using the case template, were categorised and coded using QSR NVivo (NVivo is a qualitative data analysis computer software package produced by QSR International). The main categories developed for the case study data emerged from the different sections of the case template itself. The categories and codes were then transformed to a tabular format, and, the codes were given a Likert scale to easily quantify the results. Although the study is mainly qualitative, for data reduction purposes, the introduction of a Likert scale was useful. It made it possible to triangulate the data and to add internal consistency to the qualitative descriptions (Miles & Huberman, 1994) (Please refer to Table 2). However, to better capture the answers, there was a need to use different Likert scales (or a binary scale). For example, for the question 'Was the project completed on time?' a simple 'Yes' or 'No' was sufficient; whereas, for a question like 'To what extent has the objectives being achieved?' a Likert scale of 5 was important, 1 being very low to 5 being very high. Also for a question like 'Has the financial outcome been equal or better than expected for the private partner?' a Likert scale with some minus values (-2 to 2) was needed to portray the negative answers. Developing these different Likert scales allowed further exploration of the answers.

The categories developed were identified as Key Performance Indicators (KPIs) and the codes developed within them were identified as performance measures to define the success criteria of a project. The different categories, codes and Likert scale developed are given in Table 2 below. Different questions needed different sets of value to gauge success, thus, three predefined Likert scales and a dichotomous choice (Yes or No) were used accordingly. As per the table, altogether, 11 KPIs and 32 performance measures were developed during the QCA process. The performance measures were presented in a 'question' format so that the answers to the case studies can be easily derived from the filled templates. A focus group was then conducted (in June 2013 in University of Twente, Netherlands) to refine the selection of KPIs, performance measures and Likert scale. The focus group included members of the Working Group 2 (WG2) in the COST TU1001 project. 11 members were present during the focus group discussions and they all had in-depth knowledge and experiences on the subjects of transportation and/or construction management.

Table 2: KPIs and Performance Measures

KPIs	Performance Measures (PM)- Criteria	Scale	Success Max. Value
1. Objectives	1. Are the objectives specified in the contract SMART? Specific, Measurable, Achievable, Realistic and Time bound.	1 to 5	5
	2. To what extent has the objectives being achieved?	1 to 5	5
	3. Have/will user benefits been monitored?	1 to 5	5
	4. Have user benefits been as large as expected?	-2 to 2	2
2. Risks	5. How much risks have been transferred to the private sector?	1 to 5	5
	6. Was risk allocation agreed quickly?	1 to 5	5
3. Contract project specifications	7. Has the deliverables specified clearly in the contract?	1 to 5	5
	8. Are the roles and responsibilities of different parties involved in the contract are clearly defined?	1 to 5	5
	9. Are minimum standards for condition of infrastructure and equipment specified in the contract?	1 to 5	5
	10. Are there any performance targets?	1 to 5	5
	11. Is the method of measuring performance targets clearly defined?	1 to 5	5
	12. Are there penalties for non-compliance?	1 to 5	5
	13. Does the contract have procedures for amendments, dispute resolution or termination?	Yes/No	Yes
	14. Has the contract proceeded without renegotiations?	Yes/No	Yes
	15. Are there any guarantees specified in the contract?	Yes/No	Yes
4. Tendering Process	16. No. of bidders (negotiation vs. final)	1 to 3	3
	17. Time from tender notice to financial close (< 3 years)	Yes/No	Yes
	18. Legal challenges to outcome	Yes/No	No
5. Construction Phase	19. Was the project completed on time?	Yes/No	Yes
	20. Was the project completed within budget?	Yes/No	Yes
	21. Was the project completed according to the specifications and design?	Yes/No	Yes
	22. Are there any penalties for non-compliance?	Yes/No	Yes
6. Operations	23. Were the services specified in the contract delivered?	1 to 5	5
7. Maintenance	24. Are the deliverable standards for infrastructure and equipment being met?	1 to 5	5
8. Monitoring and Evaluation	25. Is there a formal monitoring procedure in place?	1 to 5	5
9. Finance	26. Was finance available when needed?	1 to 5	5
	27. Was the project cash flow sufficient to expected payments to all parties?	1 to 5	5
	28. Did the project result in financial benefits to users (e.g. in terms of charges)?	-2 to 2	2
	29. Has the financial outcome been equal or better than expected for the private partner?	-2 to 2	2
10. Actual Traffic and Revenue	30. Traffic Actual/Forecast?	1 to 3	3
	31. Revenue Actual/Forecast?	1 to 3	3
11. Downturn impact	32. Revenue Impact from 2008-2013?	1 to 3	3

4.2 Step 2 – Defining Success

Many authors define project success in different ways; Ashley *et al.* (1987) describe project success as "achieving results much better than expected or normally observed in terms of cost, schedule, quality, safety, and participant satisfaction"; Shenhar *et al.* (1996) indicates that project success should be perceived as major vehicles for organisational and societal prosperity; Shaoul *et al* (2007) concludes that success should be determined at a micro level in terms of technical achievements but should also consider social and financial objectives. A project is traditionally being considered successful when it has satisfactorily met the "iron triangle" measures: time - finished on-time; cost - within budget; and quality - finished according to specifications (Atkinson, 1999; Khosravi and Afshari, 2011); or a good combination of these measures (Phua, 2004). Nguyen *et al.* (2004) have measured success of a project using this traditional approach, but also includes the project development in accordance with the stakeholders' satisfaction. Furthermore, Savindo *et al.* (1992) base the success of the project on the achievement of expectations of different stakeholders, such as the owner, the planner and engineers, the constructor or the operator; introducing, therefore, the participants' requirements. Authors such as Pinto and Slevin (1988) and Bryde and Brown (2005) also identify the main elements of project success as satisfaction of the stakeholders. Cox *et al.* (2003), however, have evaluated project success based on contract specification; not only technical specifications but also other quantitative measures. On the other hand, Freeman and Beale (1992) and Toor and Ogunlana (2008) have identified process performance (efficiency and effectiveness of different processes involved in a project) as the main criteria of project success. Likewise, there are many other researchers who have identified different ways and means of measuring project success either in general or specifically with regard to PPPs (Public Private Partnerships). For examples, Aziz (2007) has discussed principles in the implementation of PPP in UK and Canada; Tabish and Jha (2012) has identified a positive interrelationship between success traits and project success; Takim and Adnan (2008) and Takim *et al* (2004) have developed an approach that analyses the measurement of PPP success in Malaysia; Li *et al* (2005) have deduced the factors that show the attractiveness of PPP procurement in the UK; and, Farinde and Sillars (2012) have proposed a holistic success model for construction projects in Nigeria. Furthermore, Zhang (2005); and Chan (2001) have developed frameworks for measuring success in PPP projects; and Qiao *et al* (2001) have identified and analysed critical success factors of BOT (Built-Operate-Transfer) projects in China and their relative importance.

Likewise, many authors define/assess project success in different ways. As mentioned in the introduciton section of this paper, defining 'success' of a project can differ according to different contextual factors (e.g. type of project). It takes more of a subjective form depending on what someone wants to look at in a project. For example, a project can be successful in terms of achieving cost targets; however, it may be unsuccessful in the view of time targets. Similarly, a project can be successful from a private partner point of view but it may not be a success in view of user perspective. In this study, taking all above into consideration, success was defined using the following three perspectives (*note: there are three elements per perspective as well*):

1. Project management perspective – Time, Cost and Quality
2. Stakeholder perspective – Public, Private and User
3. Contract management perspective – Contract, Process, Results

Therefore, a project is considered a 'success' if the above elements within the three perspectives have been achieved/met successfully.

Taking the three perspectives (and elements) into consideration, the KPIs and (mainly) the performance measures developed in Step 1 were categorised according to the perspectives. The main area of impact of the KPIs/performance measures were considired during this process of categorisation. An example of how the performance measures are categorised is given in Table 3. Although the process was very much subjective, the focus group held (see section 4.1) as part of the

reearch, assisted in reducing researcher bias to a great extent. The following sub-sections describe how the 32 performance measures developed during the QCA are spreaded across the 03 perspectives.

Table 3: Categorisation of KPIs and Performance Measures against the three perspectives – an example

KPIs	Performance Measures - Criteria	Perspectives		
		Project Management	Stakeholder	Contract Management
Construction Phase	Was the project completed on time?	Time	Public	Process
	Was the project completed within budget?	Cost	Public	Process
	Was the project completed according to the specifications and design?	Quality	Public	Process
Finance	Was finance available when needed?	Time	Private	Results
	Did the project result in financial benefits to user?	Cost	Users	Results
	Has the financial outcome been equal or better than expected for the private partner?	Cost	Private	Results

1) Project management perspective: Quality, Cost and Time

As mentioned in the introduction section, the traditional and most common method of measuring success relates to the measurement of time, cost and quality targets (Atkinson, 1999; Khosravi and Afshari, 2011; Phua, 2004). Therefore, it was essential to take this into considering in this study context. The 32 performance measures emerged from the case study approach was divided according to the 03 categories (see Figure 1). Of the 32 indicators, 16 are related to quality, 13 are related to cost and 03 to measure timely completion.

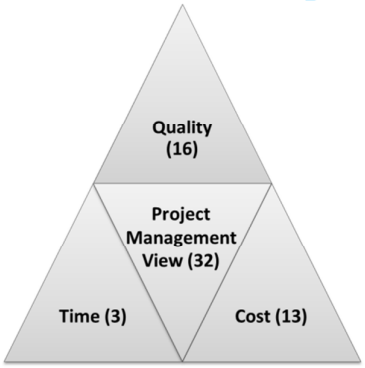

Figure 1: Project management perspective

2) Stakeholder perspective – Public, Private and User

Stakeholder view is also important when measuring success of projects – please refer to the introduction section (Bryde and Brown, 2005; Pinto and Slevin, 1988; Savindo *et al*, 1992). This is even more so important for stakeholders involved in a PPP project, as it's a long term

partnership between the public and private sector; and users are either directly or indirectly involved within the payment process of the PPP project. Some PPP projects can be very successful in terms of reaping benefits from private sector point of view; however, it may be a costly provision in view of users. Therefore, to measure the success of PPP projects, it is important to consider the stakeholder view as well. 03 main stakeholder categories were identified for the purpose of this paper and they are the public sector, private sector and the users. Herein, the public sector includes any public administration that acts as sponsor, contracting or regulating at any level; the private sector includes the different private participants in a PPP project, mainly land owners, constructors, operators, financiers and advisory firms or individuals.

Of the 32 performance measures developed as part of the QCA analysis, there are 19 indicators are identified under 'Public', 8 comes under 'Private', and 5 clearly impact on User benefits (see Figure 2).

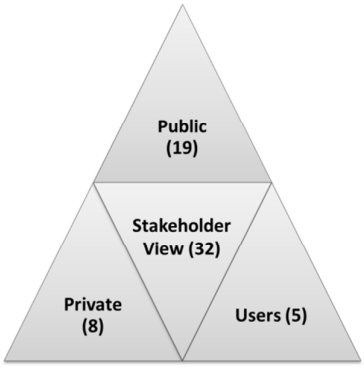

Figure 2: Stakeholder perspective

3) Contract Management perspective – Contract, Process, Results

As mentioned in the introduction section, many authors have introduced different perspectives or new elements to evaluate the project performance and success in relation to type of contract, i.e. contract management perspective (Cox *et al.*, 2003; Freeman and Beale, 1992; Toor and Ogunlana, 2008). Contract management perspective is part of a procurement function where its main aim is to ensure terms and commitments agreed in a contract are adhered to. This is different from project management view, as project management focuses on ensuring that the project is delivered in accordance to the three main project elements, i.e. cost, quality and time. Measuring 'contract' performance is very important, especially in PPPs, due to its complexity and long term nature. Some authors have carried out similar researches in relation to measuring the performance of PPP 'contract' (Aziz, 2007; Li *et al*, 2005; Qiao *et al*, 2001; Zhang, 2005).Therefore, for the purpose of this paper, contract management perspective was also taken to measure the success of projects. The 32 performance measures were re-grouped again within this perspective (see Figure 3). For this particular perspective, KPIs and its performance measures are categorised as numbered in Table 2, in Contract (Objectives, Risks and Contract Specification), Process (Tendering, Construction, Operation and Maintenance), and Results categories (Monitoring, Finance, Actual traffic and revenues, and Downturn impact). Under this, three categories can be mainly measured, i.e. PPP contract (15 measures), PPP process (09 measures) and final results (08 measures).

Figure 3: Contact management perspective

An example of how the four case studies are analysed against each of the above perspectives and categories, is given below (Table 4). The table shows the part of results for one of the elements of contract management perspective.

Table 4: Case study analysis – An example

PPP As a Contract Perspective - Elements	KPIs	Performance Measures	Likert Scale	M6	R-2	A-23	Attika
CONTRACT	Objectives	Are the objectives specified in the contract SMART?	1 to 5	1	2	5	4
		To what extent has the objectives being achieved?	1 to 5	2	2	4	5
		Have/will user benefits been monitored?	1 to 5	5	2	4	5
		Have user benefits been as large as expected?	-2 to 2	-1	-1	2	2

4.3 Step 3 – Holistic Perspective

This step involved the consideration of the three different perspectives in a holistic format to identify the 'overall' project success. This can be determined using the following matrix. As yet, the table does not yield any valuable findings/conclusions. This will be fulfilled during the assessment of success criteria in the next step.

Table 5: The three perspectives together

Project Management	Stakeholder	Contract Management
Quality (16) Time (3) Cost (13)	Public (19) Private (8) Users (5)	Contract (15) Process (9) Results (8)
= The 'Overall' Success		

4.4 Step 4 – Success Criteria

The next step was then to identify the success criteria according to the three perspectives. In order to do that, two actions are carried out: 1) calculating percentage of success for each KPI/category/perspective; 2) Deriving conclusions based on not only the percentage of success, but

also by reviewing the qualitative data in case study templates. However, it is worthwhile noting that the number of performance measures allocated to different KPIs, as shown Table 2, different; and, subsequent division of the performance measures according to the categories in the three different perspectives is also different (see Table 5); as a result, the number of KPIs come under each category is different as well (see Appendix 1). Accordingly, when the percentage of success is calculated in Table 2 (given in column D), the performance measures/KPIs, intrinsically, are not treated as equal, as they gain different weightings under each perspective. One thing to be mentioned here is that, 'neutral' responses was not considered for the final evaluation of 'success', the main reason being they are neither describe success nor failure. One limitation that could be identified here is the calculation of this weighting; however, since they are not calculated for the final percentages of success, this was not an issue. An example of the evaluation of the success criteria is given below. The example is given using the evaluation of the M-6 UK from a project management perspective.

Table 6: Evaluation of the success criteria – An example

Category / Sub-Category	No. of performance measures under each perspective and KPI (A)	Score (Success – Failure) (B)	No. of Success factors (C)	Percentage of Success (D)	Conclusion (E)
QUALITY	16	10-3	10	63%	S/F
Contract Specifications	9	6-2	6	67%	s/f
TIME	3	2-1	2	67%	S/F
Tendering process	1	0-1	0	0%	f

An *element* of the Project Management perspective.

A *KPI* that comes under an element.

Number of success answers – Number of failure answers Neutral answers are ignored (e.g. 3 of a 5-point Likert scale, or 2 of a 3-point Likert scale).

% of Success (D) = (C) / (A) x 100%

Final result – derived through both quantitative and qualitative analysis. This is presented in Capital letters for each main element and simple letters for each KPI.

The result for the Column (B) above is calculated by adding outer values as follows:

- Failure corresponds to the lower values and is represented by 1 in a 3-point Likert scale of 1 to 3; by 1 and 2 in a 5-point Likert scale of 1 to 5; by -2 and -1 in a 5-point Likert scale of -2 to 2; and by NO in the binary scale. These values are added together for each element/KPI.
- Similarly, success corresponds to the higher positive values such as 3 in a 3-point Likert scale of 1 to 3; by 4 and 5 in a 5-point Likert scale of 1 to 5; by 1 and 2 in a 5-point Likert scale of -2 to 2; and by YES in the binary scale.
- Neutral values (2, 3 and 0, respectively for the same Likert scales mentioned above) are considered neutral, and therefore do not count in the assessment of success or failure.
- Similarly, blank values (or missing values) are also not considered.

In effect, the above means that neutral values and missing values are not considered for the conclusion. The conclusion under column (E) above is derived according to the percentage of success given in column (D) and according to the qualitative analysis. The latter involves analysing the contents of the case templates and compares this result within a case and across cases to derive more reliable conclusions. Therefore, at the end of the analysis, after an in-depth qualitative review, similar success percentages in different KPIs may end up giving different conclusions. The scale presented therein (Column E), is as follows:

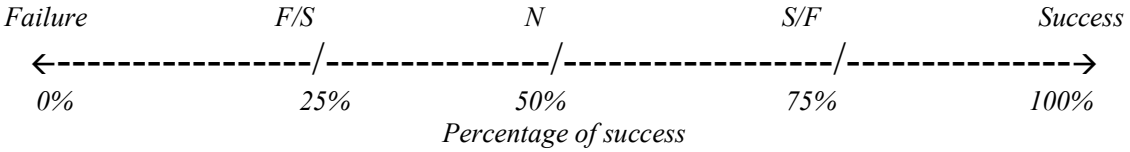

Figure 4: Scale for deriving conclusions to evaluate the success criteria

The scale given above represents the following level of success:

- S (or s) = Success;
- F (or f) = Failure;
- N (n) = Neutral;
- S/F (or s/f) = More Success than Failure; and
- F/S (or f/s) = More Failure than Success.

5. RESULTS AND DISCUSSIONS

Based on the 4 steps discussed above, the preliminary findings of the case studies, according to each perspective, can be presented in Appendix 1. Taking all tables in Appendix 1, the summary of the results can be presented in Table 7.

Herein, initial evaluation (item 1. in Table 7) is the starting point where, irrespective of the three perspectives, success answers are divided by the total number of performance measures to get an 'estimated' percentage of success, e.g. for M6, there are 16 success answers; therefore, the percentage of success is 50% - which gives a rough estimation that the project, overall, is neutral. Thus, all performance measures get an equal weighting. This is different from the analyses presented in items 2, 3 and 4 in Table 7 (as explained in Column D in Table 6 as well). The next step carries out further analysis considering the three perspectives as explained in section 4.4. The subsequent step was to determine the 'overall conclusion', based on the initial evaluation and based on the evaluation of the three perspectives. Other than the quantitative analysis (of percentages), a qualitative analysis was also required in this stage to derive at conclusions that determine the overall level of success. The qualitative analysis was based on the case template/descriptions; therefore, subjectivity could be a limitation herein. However, care was taken to avoid the limitation as much as possible (e.g. both researcher who carried out the study made sure to go through the case templates and derive at overall conclusions and then the combined view was then taken for the final analysis).

Table 7: Overall results

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
1. INITIAL EVALUATION	32	16-12	16	50%	N	15-14	15	47%	F/S	31-0	31	97%	S	23-3	23	72%	S/F
2. PROJECT MANAGEMENT PERSPECTIVE																	
QUALITY	16	10-3	10	63%	S/F	10-4	10	63%	S/F	15-0	15	94%	S	12-2	12	75%	S
COST	13	4-8	4	31%	F/S	3-9	3	23%	F	13-0	13	100%	S	10-0	10	77%	S
TIME	3	2-1	2	67%	S/F	2-1	2	67%	S/F	3-0	3	100%	S	1-1	1	33%	N
CONCLUSION FOR 2.					S/F				N				S				S
3. STAKEHOLDER PERSPECTIVE																	
PUBLIC	19	11-4	11	58%	S/F	10-6	10	53%	S/F	18-0	18	95%	S	14-2	14	74%	S
PRIVATE	8	2-6	2	25%	F	3-5	3	38%	F/S	8-0	8	100%	S	4-1	4	50%	N
USERS	5	3-2	3	60%	S/F	2-3	2	40%	F/S	5-0	5	100%	S	5-0	5	100%	S
CONCLUSION FOR 3.					S/F				F/S				S				S
4. CONTRACT MANAGEMENT PERSPECTIVE																	
CONTRACT	15	8-4	8	53%	S/F	7-6	7	47%	N	15-0	15	100%	S	11-2	11	73%	S/F
PROCESS	9	6-2	6	67%	S/F	7-2	7	78%	S/F	8-0	8	89%	S	8-1	8	89%	S
RESULTS	8	2-6	2	25%	F	1-6	1	13%	F	8-0	8	100%	S	5-0	5	63%	S/F
CONCLUSION FOR 4.					S/F				F/S				S				S/F
5. Overall Conclusion					S/F				F/S				S				S

Overall, it is apparent that A-23 project has been very successful from all perspectives and considering all performance measures together (initial evaluation). Thus, the project is considered as successful. The repayment mechanism used in this project is a combination of shadow, availability and direct toll collection. Moreover, demand risk is shared between the public and private sector out of such combination: the public sector is responsible for collecting user fees and pays to the private sector a shadow toll depending on measured traffic intervals, which shows the private partner exposure to the demand risk. However, the qualitative analysis suggests that the repayment mechanism used is 'unfair' in view of users; which, therefore, questions the success of the project in social terms. Future progress will anyway show to which extent the potential benefits are shared with the users in general; this could be done by either reducing the user fee or reducing (over a period of time) the amount of shadow payments to the private partner. The project has considered long and drastic negotiations between the Portuguese Government and the private operators. Had these negotiations not been occurred, the project would have been socially unsustainable, due to the amount of payments the Government would end up paying to the operators. This shows how important re-negotiations are when it comes to resolving unforeseen issues.

The Attica project is also, overall, quite successful. The project, however, faced with many issues such as archaeological findings, land expropriations, relocation of public utilities and design variations for environmental reasons. There were also some problems with regard to risk transfer, which had to be modified later in the project, especially in terms of guarantees that finally resolved with the State support in order to achieve the financial close. All these resulted in long delays in the initial phase, but an effective management and the support of many Greek industries ensured the construction to be completed within budget and on time for the Olympic Games. Other notable matters related to performance are: actual traffic was higher than expected and very low impact from the economic downturn. The success of the project is also evident notably in terms of active traffic management, high level of safety, incidents management plan and response, incentives for promotion of electronic users, and customer service satisfaction. Considering all, the project can be considered slightly Successful (S).

Achieving the overall conclusions for the two cases mentioned above were very much easy due to majority of the KPIs achieving a high percentage of success. However, final evaluation of the other two case studies, i.e. M-6 and R-2, were not as clear cut.

In terms of M-6, initial evaluation of the performance measures gave a neutral result and further analysis of the three perspectives showed no clear percentage of success. At least one element each in all three perspectives was a failure or more failure than success, namely; return to the private sector (stakeholder perspective) and results (contract management perspective), or cost (project management perspective).. Many issues contributed to these failures are lack of setting SMART (specific, measurable, achievable, reliable and time bound) objectives at the initial phases of the project, lack of clear specifications, and lack of achieving user benefits. In addition, the time taken for the tendering process, legal disputes and the downturn impact that mainly affected the private operators, were also some of the other issues arose within the project. In contrast, creation of enough competition during the tendering process by the public sector, satisfactory completion of the construction and O&M activities, and transparency and clarity of many elements of the contract, can be considered as the main strengths of the project that contributed to the overall result of S/F – more successful than failure, according with the three different perspectives. Nevertheless, a cross case analysis clearly shows that M-6 was lowly successful compared to A-23 and Attica.

Initial evaluation of the R-2 project showed more failure than success. Then the in-depth analysis according to the three perspectives showed a variation of results. For example, the result of the stakeholder perspective and the contract management perspective was more failure than success was considered neutral. At least one category each in each perceptive was a failure, i.e. cost (project management perspective), results (contract management perspective), and private and users (stakeholder perspective). The project was heavily affected by the economic downturn and this could be one of the main reasons for the aforementioned failure. Other issues attributed to the failures are in terms of finance, traffic and revenue performance (it was much lower than expected), lack of clear objectives at the start of the contract, lack of renegotiation clauses, and cost and time overruns during the construction phase. Taken all these into consideration, overall, the project can be more appropriately considered more failure than success (F/S).

The overall evaluation of the analysis was that A-23 was a clear success, Attica was successful, M-6 was lowly successful (compared to A-23 and Attica) and R-2 was considered as more failure than success. However, 'Success' of a project deem to change according to the 'eye of the beholder'. Therefore, some may interpret the success of the 4 case studies in different ways, irrespective of the final results of success evaluated using the aforementioned methodology. For example, the M-6, overall, was considered more success than failure, although it is more failure than success in term of costs; it is a failure for one of the three stakeholder, i.e. the private sector; and it is a failure under the results category. Thus, the purpose of this paper was to evaluate the overall success of the selected projects from all perspectives considered, rather than being biased against one particular category or perspective.

6. CONCLUSIONS

Efforts to measure the success of projects have been made by numerous researchers. However, no single methodology has proven to be the best due to the nature of construction projects and due to the complexity surrounding different contextual factors of projects. This is true for PPP projects as well. The purpose of this paper was to assess the success of PPP projects taking four toll case studies into consideration. The case studies considered were M-6 UK, R-2 Spain, A-23 Portugal and Attica Greece. The success of these projects was determined using three different perspectives. First, taking the traditional project management perspective of measuring success against time, cost and quality. Second, using the stakeholders' stance in terms of achieving success of projects; herein, public sector, private sector and users were considered as the three main stakeholder groups. Third, contract management was taken into consideration to measure the success. The main three elements

considered under this perspective were contract, process and results. These three different perspectives were then populated onto a matrix to analyse the overall success of the four case studies. The matrix included 11 KPIs and 32 performance measures that were developed using a Qualitative Comparative Analysis (QCA) approach. The results were derived mainly using a qualitative analysis, and some aspects of quantitative analysis.

The main contribution of the paper is not the final evaluation of success of the 4 case studies, but the methodology adopted to derive conclusions in assessing success. Therefore, the number of case studies used for the paper is not significant. The methodology involved a simple 4-step approach, which is explained in the paper in-depth. It brings a new analysis approach that complements the existing literature on how to measure success in PPP projects.

Indeed, this paper shows how the perception of success of a project may change using new perspetives of analysis, and this holictic approach could eventually be used as a comprenhensive evaluation tool of PPP transport projects. The set of KPIs and performance measures developed in this study are simple and easy to understand/measure. Also both qualitative and quantitative KPIs and performance measures developed make the evaluation of success more robust. The approach could become a very valuable tool for project managers as well as policy makers for on-going evaluation of PPP projects. The results of the 'success' evaluation could be used as a benchmarking tool that compares success of within and across projects. It can also be used to learn from past experiences. Most importantly, in terms of the PPP procurement method, it could also be used for renegotiation purposes, if the need arise. The tool can also be used for ex-post evaluations, where the results can be used for future project planning and to determine prorities in execution of such new projects. The methodology could also be adapted to other transport projects procured through any other mean (e.g. traditional) or to other types of PPP projects.

In-depth look at the methdology further highlighted three lines of further research: 1) explore possibilities of assigning different weighting to KPIs and performance measures, according to the type of project; 2) explore other perspectives that can be used to categorise the performance measures and compare the results to see if they come up with different answers; 3) extend the analysis to a bigger number of case studies of roads and other modes of transport to further test and validate the proposed approach. It is hoped that this method will shed some lights to assessing the overall success of PPP toll road projects, which can be extended to other infrastructure projects and other PPP projects in general as well in the future. At times, determining success or failure of a project is not a clear cut approach; it needs an in-depth analysis of strengths and weaknesses either enable/hinder a progress of a project and the analysis of their level of impact on the project overall.

ACKNOWLEDGEMENT

This work was supported by the EU COST programme under Grant COST TU1001on "Public Private Partnerships in Transport: Trends and Theory". The findings presented in the paper are taken from the case study database developed as part of the aforementioned project. Herein, case studies developed by Boles and Liyanage (2013), Villalba-Romero and Liyanage (2014), Halkias *et al* (2013), and Ribeiro *et al* (2013) were very useful for the cross case analysis. This COST Action is chaired by Prof. Athena Roumboutsos from University of Aegean, Greece. Her immense support in completing the case study database and analysis should be very much acknowledged as well. Without her, the work would not have been completed as expected.

REFERENCES

– Adair, C., Simpson, L., Birdsell, J., Omelchuk, K., Casebeer, A., Gardiner, H., Newman, S., Beckie, A., Clelland, S., Hayden, K., and Beausejour, P. (2003). Performance Measurement Systems In Health and Mental Health Services: Models, Practices and Effectiveness A State ofScience review. *The Alberta Heritage Foundation for Medical Research* Alberta.

- Ashley, D.B., Lurie, C.S., & Jaselskis, E.J. (1987). Determinants of construction project success. *Project Management Journal*, 18 (2), pp. 69 - 79.

- Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, 17(*6), pp. 337-342.*

- Aziz, A. (2007). Successful Delivery of Public-Private Partnerships for Infrastructure Development. *Journal of Construction Engineering and Management*, pp. 918-931

- Benchmarking Study Report (1979). *Serving the American Public: Performance Measurement*. Last Accessed date: 02-04-14. http://govinfo.library.unt.edu/npr/library/papers/benchmrk/nprbook.html#summarybest

- Berg-Scholosser, D., De Meur G., Rihoux, B. and Ragin, C. *et al.* (20098). "Qualitative Comparative Analysis (QCA) as an approach". In: Rihoux, B. and Ragin, C. (eds): *Configurational Comparative Methods.* SAGE Publication Inc.

- Boles, C. and Liyanage, C.L. (2013) M6 Toll Road in Roumboutsos, A, Farrell, S., Liyanage, C. and Macario, R. "*COST Action TU1001 – 2013 Discussion Papers: Part II Case Studies*", ISBN: 978-88-97781-61-5. http://www.ppptransport.eu/

-

- Burger, P. and Hawkesworth, I. (2011). How To Attain Value for Money: Comparing PPP and Traditional Infrastructure Public Procurement, *OECD Journal on Budgeting,* 11(1), pp. 91-146.

- Bryde, D.J. and Brown, D. (2005). The influence of project performance measurement system on the success of a contract for maintaining motorways and trunk roads. *Project Management Journal*, 35(4), 57-65.

- Chan, A.P.C. (2001). Framework for measuring success of construction projects. *Report 2001-003-C-0.* Last accessed 02-05-14. http://eprints.qut.edu.au/26531/1/2001-003-C-1_Framework_for_Measuring_Success.pdf1

- Chan, A.P.C. and Chan, A.P.L. (2004). Key performance indicators for measuring construction success. *Benchmarking: An International Journal*, 11(2).

- Chan, H., Levitt, R.L. and Garvin, M.J. (2010) Collective effect of strategic, cultural, and institutional factors on concession renegotiations. Paper presented at the 2010 Engineering Project Organization Conference, South Lake Tahoe, CA, 4–6 November.

- Cox, R.F., Issa, R.R.A. and Aherns, D. (2003). Management's perception of key performance indicators for construction. *Journal of Construction Engineering and Management*, 129(2), 142-151.

- Farinde, O. and Sillars, D. (2012). A holistic success model for the construction industry. Working paper proceediongs of *Engineering Project Organisation Conference*. Ed. Army Javerick-Will. University of Colorado and Ashwin, Mahalingam, IIT-Madras. (http://www.epossociety.org/EPOC2012/Papers/Farinde_Sillars.pdf, Last accessed 03-August-2014)

- Freeman, M. and Beale, P. (1992). Measusuring project success. *Project Management Journal*, 23 (1), pp. -17.

- Grimsey, D. and Lewis, M.K. (2005). Are Public Private Partnerships value for money?: Evaluating alternative approaches and comparing academic and practitioner views, *Accounting Forum,* 29(4), pp.345-378.

- Gross, M.E. and Garvin, M. (2011). Structuring PPP toll-road contracts to achieve public pricing objectives. *Engineering Project Organization Journal*, 1(2), pp. 143–56.

- Gudiyene, N., Ramelite, L. and Banaitis, A. (2013). An evaluation of critical success factors for construction projetcs using expert judgment. *First International Conference. Section: Industrial and Civil Engineering.*

- Halkias, B., Roumboutsos, A. and pantelias, A. (2013). Attica Tollway - The Athens Ring Road, Greece, in Roumboutsos, A, Farrell, S., Liyanage, C. and Macario, R. "*COST Action TU1001 – 2013 Discussion Papers: Part II Case Studies*". ISBN: 978-88-97781-61-5. http://www.ppptransport.eu/

- Hodge, A. and Greve, C. (2007). Public–Private Partnerships: An International Performance Review, *Public Administration Review*, 67 (3), pp. 545 – 558.

- Khosravi, S. and Afshari, H. (2011). A success measurement model for construction projects. *International Conference on Financial Management and Economics*. IPRD vol 11. IACSIT Press, Singapore.

- Li, B., Akintoye, A., Edwards, P. and Hardcastle, C. (2005). Perceptions of positive and negative factors influencing the attractiveness of PPP/PFI procurement for construction projects in the UK. *Engineering Construction and Architectural Management*, 12 (2), pp. 125-148.

- Liyanage, C. (2006). The role of Facilities Management in the control of Healthcare Associated Infections (HAIs). Unpublished PhD thesis. Glasgow Caledonian University.

- Mladenovic, G., Vajdic, N., Wundsch, B. and Temeljotov-Salaj, A. (2013). Use of key performance indicators for PPP transport projects to meet stakeholders' performance objectives, *Built Environment Project and Asset Management*, 3 (2), pp. 228-249.

- McAdam, D., Schaffer-Boudet, H., Davis, J., Orr, R.J., Scott, W.R. and Levitt, R.E. (2010). Site fights: explaining opposition to pipeline projects in the developing world. *Sociological Forum*, 25(3), 401–27.

- Miles, H., and Huberman, M. (1994). *Qualitative Data Analysis: A Sourcebook*. Beverly Hills: Sage Publications.

- Mill, J.S. (1843). A system of logic: ratiocinative and inductive, being a connected view of the principle and the methods of scientific investigation. London. *John W. Parker, West Strand*.

- Nguyen, L.D., Ogunlana, S.O. and Lan, D.T. (2004). A study on project success factors on large construction projects in Vietnam. *Engineering Construction and Architectural Management*, 11(6), pp. 404-413.

- Nisar, T.M. (2007). Value for money drivers in public private partnership schemes. *International Journal of Public Sector Management*, 20 (2), pp.147 – 156.

- Phua, F.T.T. (2004). Modeling the determinants of multi-firm Project success: a grounded exploration of different participant perspectives. *Construction Management and Economics*, 22 (5), pp. 451-459.

- Pinto, J.K. and Slevin, D.P. (1988). Critical success factors across the project life cycle. *Project Management Journal*, 19 (3), pp. 67-75.

- Qiao, L., Wang, S., Tiong, R. and Chan, T. (2001). Framework for Critical Success Factors of BOT Projects in China. *The Journal of Project Finance* , pp. 53-61.

- Ragin, C.C. (1987) The Comparative Method, The Regents of the University of California, Los Angeles, CA.

- Ribeiro, J., Counchinho, R. and Costa, J. (2013). Beira Interior A-23 Toll Road, Portugal. Submitted to the *COST TU1001 Case study database*. http://www.ppptransport.eu/

- Rockard, J.F. (1979). Chief executives define their own data needs, *Harvard Business Review*, 57 (2), pp. 81-9*3*

- Roumboutsos, A. and Liyanage, C.L. (2013), Introduction - Public Private Partnerships in Transport: Case Study Structure. in Roumboutsos, A, Farrell, S., Liyanage, C. and Macario, R. "*COST Action TU1001 – 2013 Discussion Papers: Part II Case Studies*". ISBN: 978-88-97781-61-5.

- Saquib, F., Farooqui, R. and Lodi, S. (2008). Assessment of critical success factors for construction projects in Pakintan. *First International Conference on Construction in Developing Countries (ICCIDC-I)*, Karachi, Pakistan.

- Saraph, J.V., Benson, P.G. and Schroeder, R.G. (1989). An instrument for measuring the critical factors of quality management, *Decision Sciences*, 20 (4), pp. 810-29.

- Savindo, V., Grobler, F., Parfitt, K., Guvenis, M. and Coyle, M. (1992). Critical success factors for construction projects. *Journal of construction Engineering and Management*, 118 (1), pp. 94-111.

- Schaffer-Boudet, H., Jayasundera, D.C. and Davis, J. (2011) Drivers of conflict in developing country infrastructure projects: experience from the water and pipeline sectors. *Journal of Construction Engineering and Management*, 137 (7), pp. 498–511.

- Shaoul, J., Stafford, A., and Stapleton, P. (2007). Evidence & Policy: *A Journal of Research, Debate and Practice*, 3 (2), pp. 159-179

- Shenhar, A. J., Levy, O., & Dvir, D. (1997). Mapping the dimensions of project success. *Project Management Journal*, 28 (2), pp. 5-13.

- Songer, A. and Molenaar, K. (1997). Project Characteristics for Successful Public-Sector Design-Build. *Journal of Construction Engineering Management*, 123 (1), pp. 34–40.

- Tabish, S.Z.S. and Jha, K.N. (2012). Success traits for a construction Project. *American Society of Civil Engineers*. DOI: 10.1061/(ASCE)Co.1943-7862.0000538

- Takim, R. and Adnan, H. (2008). Analysis of effectiveness measures of construction project success in Malaysia. *Asian Social Science*, 5 (7).

- Takim, R., Akintoye, A. and Kelly, J. (2004). Analysis of measures of construction Project success in Malaysia. In: Khosrowshahi, F. (Ed.). 20th Annual ARCOM Conference, 1-3 September, 2004, Heriot Watt University. *Association for Researchers in Construction Management*, Vol. 2, pp. 1123-33.

- The KPI Working Group. (2000). KPI Report for the Minister for Construction. Department of the Environment, Transport and the Regions, London, January 2000.

- Tiong, R., Yeo, K., and McCarthy, S. (1992). Critical Success Factors in Winning BOT Contracts. *Journal of Construction Engineering Management*, 118 (2), pp. 217–228.

- Toor, S.R. and Ogunlana, S.O. (2008). Critical COMs of success in large-scale construction projects: evident from construction industry. *International Journal of Project Management*, 26 (4), pp. 420-430.

- Villalba-Romero, F., and Liyanage, C. (2014). Madrid Radial 2 Toll Road (R-2 Spain). *Submitted to the COST TU1001 Case study database*. http://www.ppptransport.eu/

- Walter, A. I. and Scholz, R.W. (2007). Critical success conditions of collaborative methods: a comparative evaluation of transport planning projects, *Transportation*, 34(2), pp. 195-212.

- Yuan, J., Yajun, A., Skibniewski, M., Qiming Li, Q. (2009). Selection of performance objectives and key performance indicators in public–private partnership projects to achieve value for money, *Construction Management and Economics*, 27(3), pp. 253-270.

- Zhang, X. (2005). Critical Success Factors for Public Private Partnerships in Infrastructure Development. *Journal of Construction Engineering and Management* , January 2005, pp. 1-14.

Appendix 1: Results of the four case studies according to each Perspective

Table 8: Project management perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
QUALITY	**16**	**10-3**	**10**	**63%**	**S/F**	**10-4**	**10**	**63%**	**S/F**	**15-0**	**15**	**94%**	**S**	**12-2**	**12**	**75%**	**S**
Objectives	2	0-1	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Specifications	9	6-2	6	67%	s	5-2	5	56%	s/f	9-0	9	100%	s	5-2	5	56%	s/f
Tendering Process	1	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n	1-0	1	100%	s
Construction Phase	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	2-0	2	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
COST	**13**	**4-8**	**4**	**31%**	**F/S**	**3-9**	**3**	**23%**	**F**	**13-0**	**13**	**100%**	**S**	**10-0**	**10**	**77%**	**S**
Objectives	2	1-1	1	50%	n	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	n
Tendering Process	1	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Construction Phase	1	1-0	1	100%	s	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Monitoring	1	0-1	0	0%	f	0-0	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Finance	3	1-2	1	33%	f/s	0-3	0	0%	f	3-0	3	100%	s	2-0	2	67%	s/f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	0-0	0	0%	n
TIME	**3**	**2-1**	**2**	**67%**	**S/F**	**2-1**	**2**	**67%**	**S/F**	**3-0**	**3**	**100%**	**S**	**1-1**	**1**	**33%**	**N**
Tendering Process	1	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s	0-1	0	0%	f
Construction Phase	1	1-0	1	100%	s	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Finance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n
CONCLUSION FOR 2.					**S/F**				**N**				**S**				**S**

Table 9: Stakeholder perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
PUBLIC	**19**	**11-4**	**11**	**58%**	**S/F**	**10-6**	**10**	**53%**	**S/F**	**18-0**	**18**	**95%**	**S**	**14-2**	**14**	**74%**	**S**
Objectives	2	0-1	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	n
Specifications	9	6-2	6	67%	s	5-2	5	56%	s/f	9-0	9	100%	s	5-2	5	56%	n
Tendering Process	1	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n	1-0	1	100%	s
Construction Phase	4	3-0	3	75%	s	2-2	2	50%	n	3-0	3	75%	s	4-0	4	100%	s
Monitoring	1	0-1	0	0%	f	0-0	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
PRIVATE	**8**	**2-6**	**2**	**25%**	**F**	**3-5**	**3**	**38%**	**F/S**	**8-0**	**8**	**100%**	**S**	**4-1**	**4**	**50%**	**N**
Tendering Process	2	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s	1-1	1	50%	n
Finance	3	2-1	2	67%	s/f	1-2	1	33%	f/S	3-0	3	100%	s	1-0	1	33%	f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	0-0	0	0%	n
USERS	**5**	**3-2**	**3**	**60%**	**S/F**	**2-3**	**2**	**40%**	**F/S**	**5-0**	**5**	**100%**	**S**	**5-0**	**5**	**100%**	**S**
Objectives	2	1-1	1	50%	n	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Finance	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
CONCLUSION FOR 3.					**S/F**				**F/S**				**S**				**S**

Table 10: Contract management perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
CONTRACT	**15**	**8-4**	8	53%	**S/F**	**7-6**	7	47%	**N**	**15-0**	15	100%	**S**	**11-2**	11	73%	**S/F**
Objectives	4	1-2	1	25%	f	0-4	0	0%	f	4-0	4	100%	s	4-0	4	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	s/f
Specifications	9	6-2	6	67%	s	5-2	5	56%	n	9-0	9	100%	s	5-2	5	56%	s/f
PROCESS	**9**	**6-2**	6	67%	**S/F**	**7-2**	7	78%	**S/F**	**8-0**	8	89%	**S**	**8-1**	8	89%	**S**
Tendering Process	3	1-2	1	33%	f	3-0	3	100%	s	2-0	2	67%	s	2-1	2	67%	s/f
Construction Phase	4	3-0	3	75%	s	2-2	2	50%	n	4-0	4	100%	s	4-0	4	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
RESULTS	**8**	**2-6**	2	25%	**F**	**1-6**	1	13%	**F**	**8-0**	8	100%	**S**	**5-0**	5	63%	**S/F**
Monitoring	1	0-1	0	0%	f	0-0	0	0%	n	1-0	1	100%	s	1-0	1	100%	s
Finance	4	2-2	2	50%	n	1-3	1	25%	f	4-0	4	100%	s	2-0	2	50%	s/f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f		1	100%		0-0	0	0%	n
CONCLUSION FOR 4.					**S/F**				**F/S**				**S**				**S/F**

Measuring Success of PPP Transport Projects: A Cross Case Analysis of Toll Roads

Table 1: Summary of the case studies

PROJECT NAME	M6 U.K.	R-2 Spain	A23 Portugal	Attica Greece
Identification				
Geographical region	Midlands UK	Madrid, Spain	Beiras, Portugal	Athens, Greece
Cost	£485 mill.	€ 500 mill.	€ 628 mill.	€ 1.300 mill.
Contract Duration	53 yrs.	25 yrs. (Ext. to 39)	30 yrs.	25 yrs. (or before)
Tender call	1992	04/02/2000	October 1997	18/02/1995
Contract approval	2000	02/01/2001	13/09/1999	23/05/1996
Operational start	08/12/2003	06/10/2003	27/07/2003 (Completion date)	18/03/2001
Public Authorities				
Government Sponsor	Department of Transport	Ministry of Public Works	Ministry of Public Facilities	Ministry of Development and Infrastructure Transport
Commissioning Authority	DFT/ Highways Agency	Infrastructure Secretariat	National Road Institute	L.S.E.P
Private Contract holder				
Name Consortia/Contractor	Midland Expressway Ltd	HENARSA, S.A.C.E.	Auto Estradas da Beira Interior, S.A.	Attiki Odos
No. partners Consortium	2	5	6	3
Details	Macquarie	ACS Group Acciona Group	Soares da Costa, ES Concessões, Globalvia, Alves	Ellaktor J&P AVAX Piraeus-ATE B
No of contractors	4	2	6	14 originally
Financial Details				
No. Banks/Bond Holders	1 Bank	EIB + >10 banks	EIB + >10 banks	EIB + >10 banks
Method of payment				
Toll	Direct	Direct	Direct/Availability (Initially shadow)	Direct

Table 2: KPIs and Performance Measures

KPIs	Performance Measures (PM)- Criteria	Scale	Success Max. Value
1. Objectives	1. Are the objectives specified in the contract SMART? Specific, Measurable, Achievable, Realistic and Time bound.	1 to 5	5
	2. To what extent has the objectives being achieved?	1 to 5	5
	3. Have/will user benefits been monitored?	1 to 5	5
	4. Have user benefits been as large as expected?	-2 to 2	2
2. Risks	5. How much risks have been transferred to the private sector?	1 to 5	5
	6. Was risk allocation agreed quickly?	1 to 5	5
3. Contract project specifications	7. Has the deliverables specified clearly in the contract?	1 to 5	5
	8. Are the roles and responsibilities of different parties involved in the contract are clearly defined?	1 to 5	5
	9. Are minimum standards for condition of infrastructure and equipment specified in the contract?	1 to 5	5
	10. Are there any performance targets?	1 to 5	5
	11. Is the method of measuring performance targets clearly defined?	1 to 5	5
	12. Are there penalties for non-compliance?	1 to 5	5
	13. Does the contract have procedures for amendments, dispute resolution or termination?	Yes/No	Yes
	14. Has the contract proceeded without renegotiations?	Yes/No	Yes
	15. Are there any guarantees specified in the contract?	Yes/No	Yes
4. Tendering Process	16. No. of bidders (negotiation vs. final)	1 to 3	3
	17. Time from tender notice to financial close (< 3 years)	Yes/No	Yes
	18. Legal challenges to outcome	Yes/No	No
5. Construction Phase	19. Was the project completed on time?	Yes/No	Yes
	20. Was the project completed within budget?	Yes/No	Yes
	21. Was the project completed according to the specifications and design?	Yes/No	Yes
	22. Are there any penalties for non-compliance?	Yes/No	Yes
6. Operations	23. Were the services specified in the contract delivered?	1 to 5	5
7. Maintenance	24. Are the deliverable standards for infrastructure and equipment being met?	1 to 5	5
8. Monitoring and Evaluation	25. Is there a formal monitoring procedure in place?	1 to 5	5
9. Finance	26. Was finance available when needed?	1 to 5	5
	27. Was the project cash flow sufficient to expected payments to all parties?	1 to 5	5
	28. Did the project result in financial benefits to users (e.g. in terms of charges)?	-2 to 2	2
	29. Has the financial outcome been equal or better than expected for the private partner?	-2 to 2	2
10. Actual Traffic and Revenue	30. Traffic Actual/Forecast?	1 to 3	3
	31. Revenue Actual/Forecast?	1 to 3	3
11. Downturn impact	32. Revenue Impact from 2008-2013?	1 to 3	3

Table 3: Categorisation of KPIs and Performance Measures against the three perspectives – an example

KPIs	Performance Measures - Criteria	Perspectives		
		Project Management	Stakeholder	Contract Management
Construction Phase	Was the project completed on time?	Time	Public	Process
	Was the project completed within budget?	Cost	Public	Process
	Was the project completed according to the specifications and design?	Quality	Public	Process
Finance	Was finance available when needed?	Time	Private	Results
	Did the project result in financial benefits to user?	Cost	Users	Results
	Has the financial outcome been equal or better than expected for the private partner?	Cost	Private	Results

Table 4: Case study analysis – An example

PPP As a Contract Perspective - Elements	KPIs	Performance Measures	Likert Scale	M6	R-2	A-23	Attika
CONTRACT	Objectives	Are the objectives specified in the contract SMART?	1 to 5	1	2	5	4
		To what extent has the objectives being achieved?	1 to 5	2	2	4	5
		Have/will user benefits been monitored?	1 to 5	5	2	4	5
		Have user benefits been as large as expected?	-2 to 2	-1	-1	2	2

Table 5: The three perspectives together

Project Management	Stakeholder	Contract Management
Quality (16) Time (3) Cost (13)	Public (19) Private (8) Users (5)	Contract (15) Process (9) Results (8)
= The 'Overall' Success		

Table 6: Evaluation of the success criteria – An example

Category / Sub-Category	No. of performance measures under each perspective and KPI (A)	Score (Success – Failure) (B)	No. of Success factors (C)	Percentage of Success (D)	Conclusion (E)
QUALITY	16	10-3	10	63%	S/F
Contract Specifications	9	6-2	6	67%	s/f
TIME	3	2-1	2	67%	S/F
Tendering process	1	0-1	0	0%	f

An *element* of the Project Management perspective.

A *KPI* that comes under an element.

Number of success answers – Number of failure answers Neutral answers are ignored (e.g. 3 of a 5-point Likert scale, or 2 of a 3-point Likert scale).

% of Success (D) = (C) / (A) x 100%

Final result – derived through both quantitative and qualitative analysis. This is presented in Capital letters for each main element and simple letters for each KPI.

Table 7: Overall results

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
1. INITIAL EVALUATION	**32**	**16-12**	16	50%	**N**	**15-14**	15	47%	**F/S**	**31-0**	31	97%	**S**	**23-3**	23	72%	**S/F**
2. PROJECT MANAGEMENT PERSPECTIVE																	
QUALITY	16	10-3	**10**	63%	S/F	10-4	**10**	63%	S/F	15-0	**15**	94%	S	12-2	**12**	75%	S
COST	13	4-8	**4**	31%	F/S	3-9	**3**	23%	F	13-0	**13**	100%	S	10-0	**10**	77%	S
TIME	3	2-1	**2**	67%	S/F	2-1	**2**	67%	S/F	3-0	**3**	100%	S	1-1	**1**	33%	N
CONCLUSION FOR 2.					S/F				N				S				S
3. STAKEHOLDER PERSPECTIVE																	
PUBLIC	19	11-4	**11**	58%	S/F	10-6	**10**	53%	S/F	18-0	**18**	95%	S	14-2	**14**	74%	S
PRIVATE	8	2-6	**2**	25%	F	3-5	**3**	38%	F/S	8-0	**8**	100%	S	4-1	**4**	50%	N
USERS	5	3-2	**3**	60%	S/F	2-3	**2**	40%	F/S	5-0	**5**	100%	S	5-0	**5**	100%	S
CONCLUSION FOR 3.					S/F				F/S				S				S
4. CONTRACT MANAGEMENT PERSPECTIVE																	
CONTRACT	15	8-4	8	53%	S/F	7-6	7	47%	N	15-0	15	100%	S	11-2	11	73%	S/F
PROCESS	9	6-2	6	67%	S/F	7-2	7	78%	S/F	8-0	8	89%	S	8-1	8	89%	S
RESULTS	8	2-6	2	25%	F	1-6	1	13%	F	8-0	8	100%	S	5-0	5	63%	S/F
CONCLUSION FOR 4.					S/F				F/S				S				S/F
5. Overall Conclusion					S/F				F/S				S				S

Appendix 1: Results of the four case studies according to each Perspective

Table 8: Project management perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
QUALITY	**16**	**10-3**	**10**	**63%**	**S/F**	**10-4**	**10**	**63%**	**S/F**	**15-0**	**15**	**94%**	**S**	**12-2**	**12**	**75%**	**S**
Objectives	2	0-1	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Specifications	9	6-2	6	67%	s	5-2	5	56%	s/f	9-0	9	100%	s	5-2	5	56%	s/f
Tendering Process	1	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n	1-0	1	100%	s
Construction Phase	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	2-0	2	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
COST	**13**	**4-8**	**4**	**31%**	**F/S**	**3-9**	**3**	**23%**	**F**	**13-0**	**13**	**100%**	**S**	**10-0**	**10**	**77%**	**S**
Objectives	2	1-1	1	50%	n	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	n
Tendering Process	1	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Construction Phase	1	1-0	1	100%	s	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Monitoring	1	0-1	0	0%	f	0-0	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Finance	3	1-2	1	33%	f/s	0-3	0	0%	f	3-0	3	100%	s	2-0	2	67%	s/f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	0-0	0	0%	n
TIME	**3**	**2-1**	**2**	**67%**	**S/F**	**2-1**	**2**	**67%**	**S/F**	**3-0**	**3**	**100%**	**S**	**1-1**	**1**	**33%**	**N**
Tendering Process	1	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s	0-1	0	0%	f
Construction Phase	1	1-0	1	100%	s	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
Finance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n
CONCLUSION FOR 2.					**S/F**				**N**				**S**				**S**

Table 9: Stakeholder perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
PUBLIC	**19**	**11-4**	**11**	**58%**	**S/F**	**10-6**	**10**	**53%**	**S/F**	**18-0**	**18**	**95%**	**S**	**14-2**	**14**	**74%**	**S**
Objectives	2	0-1	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	n
Specifications	9	6-2	6	67%	s	5-2	5	56%	s/f	9-0	9	100%	s	5-2	5	56%	n
Tendering Process	1	1-0	1	100%	s	1-0	1	100%	s	0-0	0	0%	n	1-0	1	100%	s
Construction Phase	4	3-0	3	75%	s	2-2	2	50%	n	3-0	3	75%	s	4-0	4	100%	s
Monitoring	1	0-1	0	0%	f	0-0	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
PRIVATE	**8**	**2-6**	**2**	**25%**	**F**	**3-5**	**3**	**38%**	**F/S**	**8-0**	**8**	**100%**	**S**	**4-1**	**4**	**50%**	**N**
Tendering Process	2	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s	1-1	1	50%	n
Finance	3	2-1	2	67%	s/f	1-2	1	33%	f/S	3-0	3	100%	s	1-0	1	33%	f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	0-0	0	0%	n
USERS	**5**	**3-2**	**3**	**60%**	**S/F**	**2-3**	**2**	**40%**	**F/S**	**5-0**	**5**	**100%**	**S**	**5-0**	**5**	**100%**	**S**
Objectives	2	1-1	1	50%	n	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Finance	1	0-1	0	0%	f	0-1	0	0%	f	1-0	1	100%	s	1-0	1	100%	s
CONCLUSION FOR 3.					**S/F**				**F/S**				**S**				**S**

Table 10: Contract management perspective

CASE STUDIES		M-6				R-2				A-23				Attica			
PERSPECTIVES / CATEGORIES AND KPIs	No. of Performance measures (PM)	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.	Score	Succ.	%	Concl.
CONTRACT	**15**	**8-4**	8	53%	**S/F**	**7-6**	7	47%	**N**	**15-0**	15	100%	**S**	**11-2**	11	73%	**S/F**
Objectives	4	1-2	1	25%	f	0-4	0	0%	f	4-0	4	100%	s	4-0	4	100%	s
Risks	2	1-0	1	50%	s/f	2-0	2	100%	s	2-0	2	100%	s	1-0	1	50%	s/f
Specifications	9	6-2	6	67%	s	5-2	5	56%	n	9-0	9	100%	s	5-2	5	56%	s/f
PROCESS	**9**	**6-2**	6	67%	**S/F**	**7-2**	7	78%	**S/F**	**8-0**	8	89%	**S**	**8-1**	8	89%	**S**
Tendering Process	3	1-2	1	33%	f	3-0	3	100%	s	2-0	2	67%	s	2-1	2	67%	s/f
Construction Phase	4	3-0	3	75%	s	2-2	2	50%	n	4-0	4	100%	s	4-0	4	100%	s
Operations	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
Maintenance	1	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s	1-0	1	100%	s
RESULTS	**8**	**2-6**	2	25%	**F**	**1-6**	1	13%	**F**	**8-0**	8	100%	**S**	**5-0**	5	63%	**S/F**
Monitoring	1	0-1	0	0%	f	0-0	0	0%	n	1-0	1	100%	s	1-0	1	100%	s
Finance	4	2-2	2	50%	n	1-3	1	25%	f	4-0	4	100%	s	2-0	2	50%	s/f
Traffic & revenue	2	0-2	0	0%	f	0-2	0	0%	f	2-0	2	100%	s	2-0	2	100%	s
Downturn impact	1	0-1	0	0%	f	0-1	0	0%	f		1	100%		0-0	0	0%	n
CONCLUSION FOR 4.					**S/F**				**F/S**				**S**				**S/F**

Article Title: Measuring Success of PPP Transport Projects: A Cross Case Analysis of Toll Roads

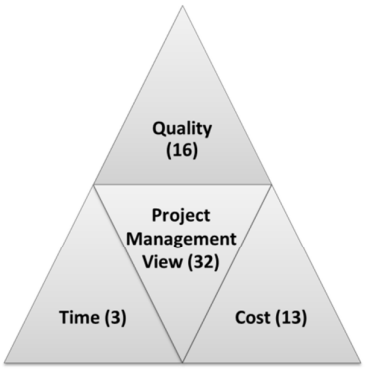

Figure 1: Project management perspective

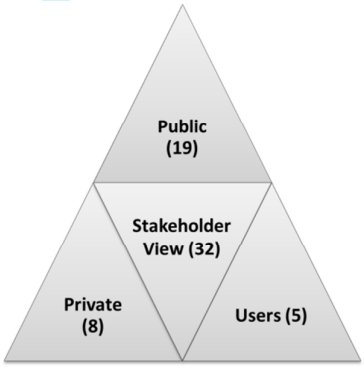

Figure 2: Stakeholder perspective

Figure 3: Contact management perspective

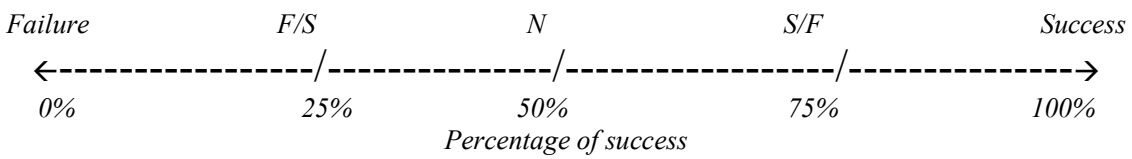

Figure 4: Scale for deriving conclusions to evaluate the success criteria

25th of November 2014

Dear Reviewers and the Editor/Guest Editor,

Thank you very much for the fruitful comments sent on our paper titled 'Measuring Success of PPP Transport Projects: A Cross Case Analysis of Toll Roads'. We appreciate your time and effort in helping us improve the quality of our paper.

We have considered all the comments of the reviewers and have revised the paper accordingly.

Comment from Reviewer: 1

Actions taken:
Corrected grammatical errors and made improvements on KPI's definition and content.

Comment from Reviewer: 2

Actions taken:
Introduction has been simplified and restructured. New references have been included stating the need for this paper, the existing gap as well as its relevancy and legitimization.
Additional efforts have been dedicated to define success in section 4.2, bringing some content from the introduction section.
Findings and conclusions have also been reviewed and extended in order to emphasize how the resulting evaluation tool is important, robust, could be highly valuable and may have policy implications in renegotiation processes and in setting project priorities.

Comment from Reviewer: 3

Actions taken:
Some corrections made

We expect all comments are basically addressed considering the space limitations and scope of the paper and thank you once again.
Looking forward to hearing from you.

Best Regards
Champika Liyanage and Felix Villalba-Romero