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PERFORMANCE OF PUBLIC PRIVATE PARTNERSHIPS: AN EVOLUTIONARY PERSPECTIVE

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PPPs are held to be a powerful way of mobilising private finance and resources to deliver public infrastructure. Theoretically, research into procurement has begun to acknowledge difficulties with the classification and assessment of different types of procurement, particularly those which do not sufficiently acknowledge variety within specific types of procurement methods. This paper advances a theoretical framework based on an evolutionary economic conceptualisation of a routine, which can accommodate the variety evident in procurement projects, in particular PPPs. The paper tests how the various elements of a PPP, as advanced in the theoretical framework, affect performance across 10 case studies. It concludes, that a limited number of elements of a PPP affect their performance, and provides strong evidence for the theoretical model advanced in this paper.

Key Words: procurement, asset management, organisational arrangements, adaptation, routines

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1 INTRODUCTION

Public Private Partnerships (PPPs) are a way of mobilising private finance and resources to deliver public infrastructure. According to [1] PPPs are "a contracting arrangement in which a private party, normally a consortium structured around a Special Purpose Vehicle (SPV), that takes responsibility for financing and long term maintenance or operation of a facility to provide long term service outcomes". According to [2], growth in the use of PPPs "is due in a large part to the scope to bring in private sector management skills, the opportunity that bundling design, construction and operation, or parts thereof, provide to improve efficiency and the ability to bring forward the provision of the infrastructure service." In summary PPPs "work best where government has considerable skill in contract negotiation and management, and where there is adequate competition for the projects. The costs of tendering, negotiating and managing contracts can be considerable – with tendering costs alone estimated at up to 3 per cent of the project cost. And while risks may be transferred to private partners, the cost of risk will be factored into the cost of finance. The main advantage of PPPs comes from the scope for lowering the total cost of the project through improving project risk management. And while contract negotiation can be lengthy, PPPs provide a more flexible, and potentially more timely source of finance for important infrastructure investments that might otherwise be constrained by public debt pressures" [2]. While some authors hold very positive views on the performance of PPPs [1], other authors point to significant differences in performance of PPPs [3], particularly as a result of the different types of risk and cost.

Theoretically, research into procurement in general has begun to acknowledge difficulties with classification of procurement routes, which do not sufficiently acknowledge the varieties which exist in specific approaches to procurement. According to [4] "The procurement routes selected for the project were virtually impossible to classify according to the commonly accepted labels … the contracts had been 'heavily amended' to a point that they no longer adhered to the type of

structure that the industry would normally perceive to belong to any particular procurement route. Procurement is significantly more complex than construction academics would wish it to be – the variability is such, it is argued, that it is virtually impossible to classify procurement by any sort of rational positivistic approach". This finding also holds for PPPs, as once the underlying characteristics of PPPs are taken into consideration, wide variations can be seen to exist when they are compared to each other [3]. Traditional approaches to procurement, which attempt to link different types of infrastructure procurement (such as PPPs or alliances) do not take into account the complexity and variation possible between projects, and this failure to take into account the all of the variables involved in projects results in considerable difficulties in assessing and comparing the performance of different projects.

There is considerable variety within the procurement models relating to infrastructure, which has led to confusion, and a realisation that simple high level correlation techniques between PPP and success does not hold [3], particularly when success is viewed as more than on time and on budget. New analytical approaches need to be developed which can cope with the variability evident in procurement projects, and yet which can still provide some framework for analysing performance. This paper advances a new theoretical framework developed from organisational theory, evolutionary economics and complexity theory which can take into account the variety evident in procurement projects, in particular PPPs, and provide a framework for performance assessment. This theory is outlined in the section below.

2 LITERATURE REVIEW

In their seminal work, [5] highlight the importance of 'routines' as a unit of analysis in organisations, as they provide the basis of an evolutionary theory of organisations: "The first is the idea of organizational routine. At any time, organizations have built into them a set of ways of doing things and ways of determining what to do". Routines are patterns of behaviour [5] which structure the specific ways organisations may do specific things. Empirical examples of routines include such aspects as budgeting and hiring of staff [6, 7]. As PPPs are recurrent patterns used by governments as a mechanism to procure infrastructure, this research holds that PPPs are a particular example of a routine which are implemented by government as a set way of achieving certain infrastructure projects. While early discussion of routines has focussed on viewing routines as undifferentiated singular entities, recent research has noted that there can be different elements in a routine, and it is helpful to discuss these elements in some detail. Identifying the various elements of a routine can assist in providing conceptual clarity about the nature of the routine, and [8] suggests that routines in organisations, can be viewed as being similar to genes in organisms. Thus routines are structured ways of undertaking specific activities and consist of various specific elements. It is this detailed view of routines, examining the various elements of PPPs, which goes beyond traditional approaches to analysing the performance of PPPs.

Despite early theorists [5] arguing from an evolutionary perspective of economics that routines are the analogue of genes in organisations, attempts to specify how routines can be seen to be similar to genes are still very few [8 p.662]. While well established in the routine literature, there is little in the organisational or economic literature to assist in explicating and examining the genes of routines. To understand routines as genes, by way of analogy, it is necessary to turn to biological theorists – particularly those who can theoretically inform the organisational theory of routines and how the genes of routines affect performance of the routines.

One theorist who has provided a cogent explanation of complex adaptive systems and relates this to performance of organisms is Kauffman [9, 10]. The work of Kauffman [9, 10] has not been engaged with significantly in the routines literature to date (although some mention his work in passing [see 11]). However, the wider organisational theory literature has begun to engage with Kauffman's work [12] as it provides a pragmatic approach to using biological metaphors which can be readily applied to the problems of business and government. Such application has focussed on search and stability in organisations [13], and designing organisations in order to respond to changes in their landscapes or business environment [14, 15].

Kauffman [10], focuses on biological entities in his work, which examines how genes affect the fitness of an organism in a given landscape. Kauffman's [10] approach can readily be understood as for animals, certain traits (derived from their genes) result in improved performance on particular landscapes. For example, thick fur or blubber helps animals to survive in the cold climates like the Antarctic, whereas long legs and short hair are better on savannahs. The sum of the genes of animals contributes to their fitness – or performance – on various landscapes [16]. Fitness is the essential element of adaptation [17], and is therefore an essential element of adaptive systems. The most appropriate rules, (i.e. the ones that 'work') are the ones that tend to be reinforced – as they have a high level of fitness for organisms in relation to the 'landscape'.

> *Each gene has several alternative forms called alleles ... and these forms usually have distinct observable affects on the organism. The objective in genetics, as it is for rules, is to determine the effects of different alternatives at different positions. In mathematical genetics there is a classical approach to determining these effects. It is to assume that each allele contributes something positive or negative to the overall fitness of the organism [16]*

Both [10] and [16] argue that the fitness of a particular animal on a given landscape can be determined by identifying the genes of the animal, and assessing how these contribute to the overall performance of the animal on a given landscape. In a similar fashion, [18] has argued that routines can be conceptualised as genes sequences of DNA. As [5, 106] argue

organizations respond routinely with a wide variety of specialised routine performances, each 'customised' for a particular configuration of the environment. In other words, there is not a single routine, but rather a number of different ways in which the routine can be performed, and the effectiveness of the routine needs to match the environment in which it is situated. Thus routines have been conceptualised as similar to DNA sequences in the routines literature. In both biological literature and routines literature, there is an understanding that there are various elements of a routine (or gene), which contribute in various ways to performance.

This suggests the following research question: **Research Question 1 – How can PPPs be conceptualised as a gene?**

2.1 Conceptualisation of PPPs as routines

In the previous section a theoretical proposition was put forward, that PPPs, as routine procurement arrangements, contain various elements or options which could be conceptualised as analogous to the gene of an organism, and the structure of these elements can be related to performance. While this has been advocated theoretically, operationalisation of the concept in specific situation remains to be achieved. This section outlines how a PPP project might be reconceptualised as something similar to a gene. It should be noted that this is a metaphorical approach and there is not intent to argue that a PPP is literally and actually a gene.

In order to determine the various elements of the routine, firstly the various elements or sections of the PPP 'entity' need to be determined. [19], [20] and [3] have already identified several key elements of any type of procurement project which will be used to analyse PPPs. These elements of PPPs are set out in Table 1 below, together with the various options available in each 'gene', and an explanation of each element follows. Importantly, this approach which does not rely on the traditional labelling system which has been soundly criticised [21] as it does not allow for the sheer level of variation evident in PPP projects.

Table 1

Genetic elements of a PPP routine

Asset specificity	Construction Cost	Cost risk transferred	Construction complexity	Revenue uncertainty	Revenue risk transferred	Govt contract management skills	Externalities or other negative events	Transaction costs
High or Low	*Actual $ cost*	*Yes or No*	*High, medium, low*	*High, medium or low*	*Yes or no*	*Poor, fair, good*	*Actual events*	*High, moderate, or low*

Each of these elements are discussed below

2.1.1 **Asset specificity:** Asset specificity can relate to variety of uses of an asset, or how specific the asset is to a particular location [19]. Dams exhibit high location specificity and can only be used for a single purpose in a single location, making them effectively a one of a kind asset with very high specificity. Manufactured goods, such as cars are not location specific, although cars are built for different purposes. Assets which can be used for multiple purposes, or are not location specific, have low asset specificity. The specificity of an asset can significantly impact its performance so is a key element, or gene, of PPPs. An asset may have high or low specificity.

2.1.2 **Construction Cost:** Cost is the simple value of the PPP contract and is a key performance element of PPPs.

2.1.3 **Cost risk transferred:** With any major project, there are risks that costs could increase beyond the contract price. Under some PPP arrangements costs can be transferred from government to the private sector as part of the contract [3]. Shifting of cost risk may significantly affect the performance of a PPP so is likely to be a key driver of performance. Cost risk is either transferred in the PPP arrangement or not.

2.1.4 **Complexity:** Task Complexity refers to the degree of difficulty in specifying the terms, conditions and outcomes of the procurement activity [20]. "Complex goods involve uncertainty the nature and costs of the production process itself. They also face more environmental uncertainty because complex goods are more likely to be affected by unforseen changes in the environment" [20]. Complexity is therefore a key element which can affect the performance of PPPs. Projects can evidence high, medium, or low complexity.

2.1.5 **Revenue uncertainty:** For some PPPs there is a level of uncertainty about how much revenue a particular asset will generate. As PPPs require investment by the private sector in public infrastructure, the revenue, or return, from such investment is an important element of the performance of the PPP [3]. Consequently it is a very important element which might affect the performance of PPPs. PPPs can have high, medium or low revenue uncertainty.

2.1.6 **Revenue risk transferred:** While revenue is a key risk, in some cases government underwrites or guarantees the income for a period of time, whereas in other cases the risk is transferred to the private sector [3]. Consequently, the transfer of revenue risk is an important element which can affect the performance of PPPs, as in situations of high revenue uncertainty the private sector may not be willing to accept the full risk for the project, leaving government with ongoing financial obligations for the project. Revenue risk is either transferred or not in PPPs.

2.1.7 **Government contract management skills:** PPPs are quite complex organisational and contractual arrangements, so the skills of the government agency in handling these contracts is critical to the successful negotiation, and completion of the project [3]. Government skill levels can be high, might be poor, fair or good.

2.1.8 **Externalities or other negative events:** Occasionally irrespective of the financial performance of a project, considerable negative external events can be generated, such as poor service levels, obstruction of other projects or interference with other infrastructure [21] These can affect an otherwise successful project and lead to a perception that the project is poor, even if it is delivered on time and on budget. Externalities need to be noted on a case by case basis, as they are idiosyncratic to the specific project.

2.1.9 **Transaction costs:** While a project has direct costs, a key logic in economic literature, which is often understated in the contracting out literature, is that the total cost of the project involves not just the costs in delivering the project, but also in managing the contractual arrangements [22]. While a project may be delivered within budget, high costs in managing the contract may result in the project being too expensive overall, particularly if legal action is involved. Consequently, transaction costs are a critical element which may affect the performance of the project. Transaction costs can either be high, medium or low.

Kauffman [9, 10] suggests that the various elements of the routine can be related positively or negatively to performance. As has been noted above, each of the elements of the routine has the potential at least to affect the outcome of a particular PPP. Taken together, these elements of a PPP include critical aspects which can affect project performance, and allow for the detailed analysis of the elements, and how each of these might affect performance, and suggest a second research question:

Research Question 2: How does the elements of a PPP routine affect performance?

Finally, as alluded to in the introduction, other researchers have found that there is considerable variety in procurement approaches [4]. By viewing procurement approaches, such as PPPs as a routine, it is proposed that the variability in procurement approaches can be explored. This suggests the final research question:

Reseach Question 3: How variable are PPPs as routines?

The elements of PPPs and how these elements affect performance are analysed in the results section below. Firstly a brief discussion of research methods is appropriate.

3 RESEARCH METHODS

One useful way of undertaking in-depth analysis of a particular issue or technology as it impacts an organisation or industry, is by undertaking case studies, as such a strategy can provide strong recommendations for improvements in theory, technology or policy [23, 24]. As noted there is a dearth of existing work undertaken the area of routines [8, 25]. In such cases, exploratory research using case study methodology is seen to be appropriate [26]. This is because a series of case studies can develop the application of theory to an area [27], and test the applicability of that theory for utility in explaining specific phenomena. In particular, undertaking multiple case studies on the same phenomena, allows for comparison between the cases, and extension of theory.

In multiple cases a logic of replication is followed in order to compare data and improve the generalisability of the data [28]. Multiple case studies enable researchers to clarify whether a finding is peculiar to a singular case study, or whether it is consistently replicated across several cases [29]. Multiple case studies provide a much stronger case for generalisability than single case studies [29]. This is because examining a phenomenon in multiple situations leads to better understanding, and perhaps better theorising, about an even wider selection of cases [30]. By examining the elements of multiple PPPs and

comparing these with the perceived performance of the PPPs, underlying contribution of specific elements of the routine to performance becomes clear. The analysis of multiple PPPs enables both the individual elements and how these elements contribute to performance to become clear.

Existing research has already been undertaken into the performance of PPPs [3]. This paper will take this existing research and treat each PPP reported as a separate case which

Case studies are best suited to real life phenomena under conditions where researchers have little control [31], and are appropriate for examining events or activities [32]. As this paper is examining how routines can be conceptualised as a gene, then a case study methodology is appropriate as an overarching strategy. In particular the use of multiple case studies enables the comparison of different arrangements in order to determine the underlying contribution of specific elements to performance. The findings of the study are reported below.

4 FINDINGS

In attempting to develop a new theoretical framework this paper has uses existing reports of the performance of PPPs, as the focus is on testing the validity of the theoretical framework, not examining a new situation *per se.*

Data has been made available on the performance of PPPs against the elements identified above [3]. In fact the performance of 10 PPPs provides 10 case studies to test the validity of Research Question 1 – how can a routine be conceptualised as a gene. It also provides a useful set of comparative studies in which to answer Research Question 2: How does the structure of the routine affect performance?

While data is drawn from existing work, the theoretical framework used to assess the performance and the structure of the PPP as a gene is new. Consequently, these findings serve to extend and critique the existing work of [3].

4.1 Structure of Canadian PPP

In the theory section, we advanced a proposition that as routines PPPs could be considered metaphorically to be like a gene, and a number of different project genes, or elements, were identified from the existing literature. 10 case studies were reviewed and each of these elements was identified for each case study.

As can be seen from Table 2, PPPs exist in a wide variety of configurations. Once viewed from the perspective of routines, there is no single form of PPP but rather a wide variety of projects and structures which happen to all bear the same name. Given the high variability between each of the PPPs reviewed, this finding supports the concerns of [21] who argued that the sheer variability of procurement projects makes treating each one the same thing highly difficult. Instead, examining the various elements of each PPP allows for the differences and similarities between each of them to become apparent, and as will be discussed in the next section, the elements which affect performance to become clear. Those elements which do not relate clearly to performance are not shown in the table.

Table 2: Structure and performance of 10 Canadian PPPs (derived and adapted from [3])

Project	*Type*	*Start Date*	*Cost risk transferred*	*Revenue uncertainty*	*Revenue risk transferred*	*Government contract management skills*	*Negative Externalities*	*Contract transaction costs*	*Success*
1	Waste management	1987	Partially	Moderate	Not first ten years	Poor	Chemical leaks, under utilisation.	High	No
2	Sports Multiplex	1999	Not effectively	Moderate	Partially	Fair-Poor	None evident.	High	No
3	Highway	1999	Yes	High	No	Poor	6 toll increases - roads congested	High	No
4	School	1997	Yes, but costs high	Low	No	Poor	Negative political outcomes	High	No
5	Highway	1995	Yes	High-Moderate	No	Fair	Toll-level problems	Moderate	No (qualified)
6	Bridge	1997	Yes	High	Revenue guarantees	Fair	None evident	Moderate	Yes (qualified)

Project	Type	Start Date	Cost risk transferred	Revenue uncertainty	Revenue risk transferred	Government contract management skills	Negative Externalities	Contract transaction costs	Success
7	School	1995	Yes	Low	Yes	Fair	None evident	Moderate	Yes
8	Gas power	1998	Yes	Low	Yes	Good	None evident	Average	Yes
9	Water treatment	2005	Yes	Moderate	Yes	Good	None evident	Low	Yes
10	Water treatment	2005	Yes	Low	Partially	Good	None evident	Low	Yes

Thus in response to Research Question 1 – by viewing PPPs as a set of elements, PPPs can be viewed in a similar way to a gene. Each PPP can be viewed as comprising a set of characteristics, or variables which in turn might relate to performance. This issue of performance is a critical aspect of the use of the metaphor of routines as genes and is discussed in the next section. Additionally, viewing PPPs as routines demonstrates the sheer variability of routines. Thus in answer to Research Question 3, there is a very wide variety of procurement routines.

4.2 The performance of PPP genetic structure

As outlined in section 4.1, the analysis of 10 PPPs according to their elements allows for a finer grained analysis than simply examining cost or quality which is often used to asses the outcome of projects. As suggested by Kauffman [9], by adopting a more fine-grained approach the performance of each of the PPPs, and how these might relate to different arrangements also becomes clear. As Table 2 suggests, projects 1 to 5 were considered not to be as success, while projects 6 to 10 were considered to be successes. Looking across the various elements, the relative strength of each of these in relation to successful and unsuccessful projects can be ascertained, and these are discussed below.

Kauffman [9] argued that for certain animals, certain genetic structures resulted in poor performance (e.g. polar bears in the desert). However, other genetic structures enabled animals to perform well (e.g. cheetahs in the savannahs of Africa). Each of the various elements and how these affect performance are discussed below.

4.2.1 **Asset specificity:** All the assets reviewed had high levels of asset specificity [3]– particularly location specificity, so this in effect formed a constant and has been removed from further analysis in this paper on the contribution of specific elements to performance.

4.2.2 **Construction Complexity:** All the projects were from low to medium complexity and there was no correlation between low or medium complexity and the outcome of a specific project [3]. Consequently, while an important element in projects, this variable does not relate to performance in the PPPs examined. There was a weak relationship between complexity and cost, as the more complex projects tended to be higher cost, but this did not directly relate to performance overall.

4.2.3 **Construction Cost:** While the cost varied significantly, there was no direct correlation between cost and performance. Indirectly however, the greater the value of the project, the more difficult it appeared to shift cost risk to the private sector [3]. Less complex projects tend to be less costly, and therefore less risky for the private sector to take on. However, there is some dynamic interaction between variables here, so further research is needed to unpack the relationships between complexity, cost and transferral of cost risks. Whereas some evaluations see cost as one of the key performance measures of PPPs [1] (dependent variables), in this framework there are multiple costs that are variables which influence the outcomes (independent variables).

4.2.4 **Cost risk transferred:** Every project which was successful, the cost risk was transferred to private sector. The results are more mixed for unsuccessful projects – only two PPPs successfully transferred cost risk, and another one did so with high costs associated with the transfer [3]. From a government perspective the logic of involving the private sector in a PPP involves financing a project, which means logically that there needs to be a shift of costs to the private firms.

4.2.5 **Revenue uncertainty and revenue risk transferred:** Under the framework adopted in this paper, different types of risk are acknowledged. While cost risk involves the possibility of the construction costs increasing

beyond budget, revenue risk relates to the operational life of the PPP. Revenue uncertainty is fairly complex, and does not seem to operate on its own. Instead, as [3] argues, as revenue uncertainty increased, the likelihood of revenue risk being transferred, decreased. In other words, the more uncertain the operational profit was for the private partner, the less likelihood that the private partner would accept this type of risk, although this was not a clear cut relationship. While cost risk may be off set by expertise in the private sector which can generate better estimates of cost than government [3]. Revenue risk is far more difficult for the private sector to ameliorate as it is beyond their power to increase the revenue generated by infrastructure assets. In case 6, the project was a success, even with otherwise negative elements, due to reasonable management skills and a limited revenue guarantee [3].

Some critical public policy guidelines assert that revenue risk can be transferred to the private sector under PPPs, [33], while some economists [3] and financial advisers [34] argue that this risk should not be transferred. This paper takes more nuanced approach, by acknowledging both risk and uncertainty. The more certain a private partner can be about the return on investment in the operational cycle, the more likely a project is to succeed. This differentiation between cost risk (in the construction phase) and revenue risk (in the operation phase of a PPP) is a useful distinction which warrants further exploration, and one which has begun to appear in detailed public policy documentation [35]. However, the assumption that revenue risk can automatically be transferred in PPPs evident in some public policy advice [33] is not supported with evidence found by [3] and reported here.

4.2.6 **Government contract management skills:** [3] does mention government contract management skills, although this is not given the same high level of focus in their paper as risk is given. And yet, the relationship between government contracting skills and successful completion of projects is arguably as strong, or even stronger than in the data, once interpreted and reordered as per Table 2, than that of risk. Such a finding also supports other work by the authors which found that the capability of clients to affect procurement is a critical driver of successful procurement arrangements [36].

4.2.7 **Externalities or other negative events:** Externalities were identified from the economic literature as a likely element of PPPs which could affect performance. As can be seen from table 2, in nearly every case the negative externalities is highly related to poor performance of the PPP (80% of cases)[3].

4.2.8 **Transaction costs:** As Table 2 demonstrates, high and moderate transaction costs (the costs involved with managing the contract) were also related to the poor performance of the PPP. However, moderate transaction costs, combined with low revenue uncertainty seemed to result in reasonable project performance [3].

Summary of performance: These finding answers the second research question as to how the elements of PPP routines affect performance. As Kauffman [9] argues that the genes of an animal can determine its performance on a specific landscape. What would the metaphorical genes of a successful PPP be? According to the studies examined in this paper, a successful PPP is one with the following elements set out in Table 3:

Table 3

Genes of successful PPPs

Cost risk transferred	*Revenue uncertainty*	*Revenue risk transferred*	*Government contract management skills*	*Negative Externalities*	*Contract transaction costs*
Yes	Low - moderate	Yes	Fair to Good	None	Moderate to Low

A PPP likely to succeed is one where cost risk is transferred to the private sector, but one where there is low revenue uncertainty, medium to high contract management skills, low transaction costs and absence of negative externalities [3]. Indeed this finding begs the question about the utility of PPPs as a procurement vehicle: "Our analysis suggests that, in some sense, effective PPPs are not PPPs! Private sector project participation makes the most sense when it bears cost risks, but not revenue risks. In such circumstances, there is not that much different from what has been traditionally described as a 'build-operate-transfer' contract" [3].

This finding also relates to Research Question 3, which examines the variability of PPP routines. Viewed from the perspective advanced in this paper, while all of these projects were labelled PPPs, not all of them performed well, or contained the key aspects (financial risk transfer) which are a key component of PPPs. Consequently, while there are multiple varieties of PPPs, only some varieties can be considered successes.

5 LIMITATIONS

The analysis undertaken in this paper is based on existing research and amounts to a re-examination and an extension of previous studies. One of the issues with the existing assessment of performance is that it appears to be largely subjective. For example "negative externalities and high transaction costs lead us to conclude that this project was poor from a social perspective" [3]. Thus the poor performance is a subjective assessment not based on objective measures, but on the basis of theoretically driven criteria. In fact, performance is a highly difficult area in projects, as there are multiple criteria for claiming success and otherwise successful projects can be deemed unsuccessful by other authors or stakeholders. Nevertheless, other authors focus on financial performance of PPPs [1], which is certainly one valid measure. By extending the assessment of performance to include the social issues associated with PPPs [3] a wider array of actors becomes involved. As PPPs are often created to deliver public services such as waste management, water and electricity, it is important that the social impact of various PPPs is considered, as a project which is a financial success may well not be delivering the services it was meant to provide in the first place. Future research would need to consider other performance criteria of PPPs in order to explore the issue of performance more closely.

A second limitation is that in the reported outcomes of 10 PPPs [3], the conditions of the market are not taken into consideration. Other frameworks consider the issue of the contestability of the market in assessing performance [20], as this can seriously affect the performance of procurement arrangements. Indeed with the low contestability the logic underpinning contracting out in the first place, as competition drives cost down, making procurement from the private sector viable in the first instance [19]. Future research should also consider the impact of the market forces on projects which is not currently included in this model.

6 CONCLUSIONS

This paper set out to test the validity of a new theoretical framework for PPPs, using existing PPP research. In so doing, a set of findings enabled both research questions to be answered. Firstly, it is suggested that it is possible to examine the structure of procurement projects such as PPPs by identifying the various elements of the routine's 'gene'. Indeed such a process underscores the importance of undertaking such analysis at a detailed level as there is a high level of individual variation between projects.

A second outcome was that the re-analysis of the existing data enables a clear and concise picture of the influence of specific genes on the performance of PPPs. This finding supports the second research question which sought to identify if specific 'genes' can be shown to relate to the performance of PPP routines. It is evident that there are a number of elements which affect performance, and a few which do not – at least in the case studies reviewed here.

This study has demonstrated that viewing PPPs through the metaphor of genes enables the variation between the various elements of PPPs to become apparent, and to assess how these elements relate to performance. While a larger number of projects would test and generalise these findings to all projects, strong support for the theoretical validity of the framework advanced earlier in this paper has been demonstrated.

Consequently, the model advanced in this paper offers a novel theoretical framework which holds promise for providing a robust and accurate framework to asses the elements and performance of procurement arrangements such as PPPs. Aside from the theoretical value of such a framework, there is considerable practical utility to enable government and firms to assess under what circumstances to use PPP as a procurement method.

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