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Achieving better infrastructure procurement and project outcomes

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INAUGURAL LECTURE
PROFESSOR SAMUEL LARYEA
SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT
7 NOVEMBER 2023

CONTENT

1. Introduction remarks
2. Acknowledgements
3. Research interests and contributions
4. Inaugural lecture outline and key points
5. Conclusions and future research
6. Appendix - Presentation slides

INTRODUCTION REMARKS

Thank you, Professor Garth Stevens, Deputy Vice Chancellor: People Development and Culture, and Professor Thokozani Majozi, Dean of the Faculty of Engineering and the Built Environment, for the warm welcome and introduction.

I would also like to thank all of you who have made the time to be here today. I really appreciate it and I thank you for your support. I also want to acknowledge the people who are with us online.

When I completed my first degree at the Kwame Nkrumah University and Science and Technology (KNUST) some 21 years ago, an academic career was certainly not one of the options I ever contemplated, let alone dream about the possibility of reaching the zenith of an academic career – a professorship – and have the opportunity to give an Inaugural lecture at a prestigious university like Wits which is renowned for academic excellence.

I would like to thank God for my career so far, and I also would like to acknowledge a few people and institutions who have supported and enabled me to get to this point.

ACKNOWLEDGEMENTS

There are a few people and institutions I would like to acknowledge before I get into my lecture today.

- Firstly, I would like to thank all my teachers who contributed to my education especially my teachers at Suhum Secondary Technical School who were so outstanding.
- Secondly, I have been very fortunate to be at universities that gave me excellent opportunities to develop. I would like to acknowledge KNUST, the University of Reading, and Wits.
- Thirdly, I would like to acknowledge my colleagues, collaborators, postdocs, and students who have contributed significantly to my work over the years. I particularly would like to acknowledge Prof Ron Watermeyer from whom I have learned a lot and co-authored a couple of evidence-based research papers.
- The fourth group of people I would like to acknowledge are those who have served as mentors to me over the years. I would not be here today without the mentoring provided by people like Prof Ayim, Prof Will Hughes, Prof George Ofori, Prof PD Rwelamila, Prof Raymond Nkado, and Rev Peter Sagoe
- Fifth are the people in my WABER Conference family who have shaped and contributed to my journey in the past 14 years.
- Lastly, and obviously, I would like to thank my family, in particular, my three girls whom I live with, and my family back home in Ghana without whom I would not be here.

RESEARCH INTERESTS AND CONTRIBUTIONS

The focus of my research has been on analysing tendering, procurement, and contracting processes in the construction industry to determine how they may be improved for better project outcomes and value for money.

- **Tendering:**
  - Ethnographic studies of contractors' tender processes, which was the first ever live observational study of the entire bidding process of contractors, to analyse the whole process, and ascertain how risk influences pricing levels. This was the research for my PhD.
  - Impact of tendering procedure on price formation in construction contracts

- **Procurement:**
  - Impact of innovative and collaborative procurement and contracting strategies
  - Electronic procurement
  - Procurement strategy and outcomes
  - Using procurement to achieve socio-economic development objectives
  - Procurement of professional services with a specific focus on the relationship between fees and quality.

- **Construction contracts:**
  - Risk apportionment and commercial review of construction contracts

The research has been highly relevant in academia and industry (e.g. ICE/NEC). I have drawn on it in my teaching over the years, and now I have also drawn on it to develop new academic programmes like the PG Diploma in CM which we started offering in 2022.

OUTLINE OF INAUGURAL LECTURE

The slides for the lecture are attached and the full lecture is also available on YouTube: https://www.youtube.com/watch?v=2QzDH87Y90Q

SUMMARY OF KEY POINTS IN THE INAUGURAL LECTURE

Ten key variables in the relationship between infrastructure procurement and outcomes were discussed in the Lecture. These are summarised as follows:

1. ***Client leadership***

   Projects with strong client leadership tended to be more successful.

   i. **The client is the leader of the infrastructure delivery process; and has the greatest influence on procurement outcomes. We will not achieve better procurement outcomes with clients who are unable to play their leadership role effectively**.
   The Institution of Civil Engineers (ICE) in the UK published a client guide in which they highlighted that: "*The role of the client is the single most important factor in determining the success of construction projects and capital works programmes, regardless of their size, complexity, and location.*" This has also been one of the key conclusions from my own research on why some projects are implemented better than others.

   ii. There is another study relating to the role of the client which was published by the Construction Industry Institute (CII) in the USA. That study showed that there are three critical keys to successful infrastructure procurement and project outcomes:

a. *A knowledgeable, trustworthy, and decisive owner/developer;*
b. *A team with relevant experience and chemistry assembled as early as possible, but certainly before 25% of the project design is complete;*
c. *A contract that encourages and rewards organizations for behaving as a team.*

The procurement and contract strategies selected by clients should promote these conditions of success.

2. Procurement strategy

i. *The purpose of a construction procurement strategy is to identify the best way to achieve the intended objectives/outcomes of a project.* ***This is the link that connects procurement with outcomes****. I have argued in some of my papers that "If this strategic exercise is done and implemented competently, the deviation between expected and actual outcomes should be as small as possible"*. However, many projects proceed without a properly prepared procurement strategy. We will not achieve better outcomes when many projects proceed without a procurement strategy.

ii. In one of my research papers on procurement strategy and outcomes, I put forward a theory, based on the evidence, that "***An appropriate construction procurement strategy which is developed by an experienced client team and proactively implemented by an integrated delivery team working collaboratively is more likely to achieve the intended project outcomes***". There is a new ISO standard (22058: 2022) that provides guidance on procurement strategy and tactics.

3. Clarity of project information

i. **The project documents and information in the construction industry is generally poor and incomplete**. Some industry experts have told me that the degree of design completion at the start of projects is generally between 40-60%. This has created a situation where around 60-80% of the estimates at the start are provisional sums that may later change significantly.

ii. Much of the research I have done on project information and the quality of tender documents shows that the quality of documents and information is generally poor and this seems to be declining further as time goes on. This matter is currently a major subject of debate in our South African construction industry and some have blamed a practice known as discounted fees for this phenomenon. Together with my PhD student Neil Govender and co-supervisor Prof Ron Watermeyer, we have just completed comprehensive research on this, and we found that contrary to the assertions by some industry groups, fees is not the only major reason for the decline in the quality of project documents. While fees was identified as a key factor influencing quality, there are other significant factors, such as the time required to produce PSOs, experience, available information, and project briefs, that also influence quality significantly. This highlights the need for project stakeholders to effectively manage professional fees in conjunction with these other key factors to ensure the quality of PSOs is not diminished. This is a subject we will be shedding more light on in the coming months.

4. Managing risk positively

i. Construction is a process that is always fraught with risk and uncertainty because of its nature. I talked about the new universities project where up to 74% of the project scope was unknown and not capable of being priced by the contractor at the start of construction.

The question is how do you deal effectively with this reality and still achieve the intended project outcomes? This was the question we examined in our research paper on "Managing uncertainty in fast-track projects" (Laryea and Watermeyer, 2019). Information is always going to be incomplete and always uncertain. We need to master the management of risk and uncertainty effectively to be able to achieve better outcomes.

ii. Evidence from the study showed that setting a rigorous control budget, designing to a budget, working collaboratively, disciplined management of the control budget, and continuous value engineering were the key management techniques used to manage the high degree of uncertainty and deliver the project successfully within budget. Given that these are client-led delivery-management issues, the findings demonstrate how infrastructure project outcomes can be significantly improved when the client functions as the leader of the infrastructure delivery process.

5. Pricing and continuous value engineering

i. Pricing is one of the things we do poorly in the construction industry. We end up with many provisional sums in the project budget which results in pay-as-you-go contracts. This is one of the main reasons for significant deviations from intended outcomes.

ii. Some industry experts have told me there are projects with 60-80% provisional sums in the price. The practice of including many provisional sums in the BoQ needs to stop if we are to achieve better outcomes. The BoQ is the most popular BoQ method of pricing, and I must repeat something I have said in the past. The BoQ is not the most effective as it fails to link costs to the programme. This is one area where an alternative pricing strategy like an activity schedule provides a better chance to achieve intended outcomes. This is a subject I dealt with in a paper with Andrew Murray on "Tendering and administering activity schedule-based NEC3 contracts".

iii. One way to deal with the inefficient pricing method is to adopt the discipline of the control budget which is about designing to a budget and continuous value engineering throughout the construction phase to keep within the budget. There is a famous 2017 court judgment in the UK where Fosters, one of the world's famous architects, was slapped with penalties of £3,604,694 (net of interest) for designing a hotel in the Heathrow airport that would cost Riva (the developer) more than twice its original intended budget to build.

6. Programme

This variable refers to two aspects (1) allowing sufficient time for all the planning stages to be fully completed, and (2) preparing proper construction programmes in the detailed manner that is prescribed in the NEC form of contract.

i. **Time should be allocated correctly in the pre-planning phase. Sufficient time should be built into the overall programme to allow for all planning stages to be fully completed. The procurement process should not be rushed**. Good planning should include getting the construction sequence right, assessing and managing project risks, and using value management to assess the contribution of each part of the construction process to improve the likelihood of achieving the project objectives and value for money and to minimise the likelihood of delays, extra costs and waste/inefficiency.

ii. Construction programmes that are prepared in the meticulous manner prescribed in the NEC form of contract are more likely to achieve the intended outcomes.

7. Form of contract

i. The form of contract is the document used to set up the contractual relationship between the parties involved. Here I will limit myself to the main contract between the client and contractor.

ii. The forms of contract used in the construction industry have evolved significantly since the 1800s from adversarial to collaborative style contracts and today we have modern contracts that are structured on the principles of collaboration and teamwork, like the NEC form of contract.

iii. Research has shown that modern contracts that promote collaboration and teamwork are more likely to achieve better project outcomes. Therefore, the choice of an appropriate form of contract is key as well.

8. Management approach for execution (delivery management)

i. The management approaches currently used to deliver infrastructure projects have proved largely ineffective in relation to consistent and efficient outcomes. This is a critical thing we must fix if we seek to achieve better outcomes.

ii. When you go to different construction Schools around the world and you ask people in the different Schools what approach are they being taught to deliver intended project outcomes. They may all say different approaches including PMBOK, ISO, etc. There is no consistent and standard management approach to execute infrastructure projects to achieve the intended outcomes. This is unlike the medical and aviation fields where everyone is taught the same principles, and they apply it consistently to achieve their intended outcomes

iii. There is an ISO Standard for delivery management currently in development and I hope it will provide useful guidance based on sound management principles that will enable us to achieve consistent and efficient outcomes

9. Contracting model

i. The traditional system of contracting in the construction industry is that we award the project to a contractor, and then that main contractor will also award substantial components of the work to other subcontractors. So, strictly speaking, contractors are typically not carrying out work themselves, but taking responsibility for bringing it about. Currently, we place more emphasis on their price when selecting a contractor. However, the nature of our contracting model suggests we should be placing more emphasis on their management and organisational ability compared to their price and ability to build.

ii. The second point here relates to risk and contingencies. Contractors typically have to bid on a lump sum, taking on some of the risk of their prices changing, but not all of it because transferring too much risk is expensive as someone has to create a contingency. I don't think risk management is well understood as the management of contingencies. It is more frequently characterized in terms of probability and responsibility, rather than a simple question of who holds the contingency sums and who has to price for the cost of creating and holding contingencies. This seems largely absent from the narrative around late projects.

10. Professional consultants

i. In current practice, professional consultants including architects, quantity surveyors, engineers, etc. are appointed by the client with no liability for poor/late/inaccurate information. There is no motivation for high performance and the client ends up paying for their inefficiencies

ii. The other point I want to make here is in relation to the specialization of construction professionals in the way it is done in the aviation and medical fields. The current era of generalist construction project managers needs to be re-examined. Apply lessons from the aviation field to certifying construction procurement and project management professionals

CONCLUSIONS AND FUTURE RESEARCH

In conclusion, it seems evident that the issue will not go away soon because it is a complex combination of different variables. Perhaps the real problem is that we cannot simply engineer these issues away with better technology, since they are not technological problems. Going forward, much of my research in helping to address this will focus on client leadership, delivery management, project governance and social value.

APPENDIX – INAUGURAL LECTURE SLIDES

Please see attached

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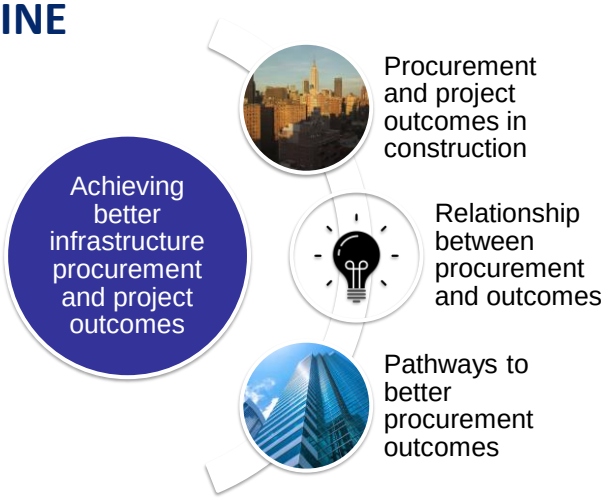
Professor Samuel Laryea | Inaugural Lecture | 7 November 2023



1

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OUTLINE



2

Procurement and project outcomes in construction (literature & projects)

University of the Witwatersrand, Johannesburg

www.wits.ac.za

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University of the Witwatersrand, Johannesburg

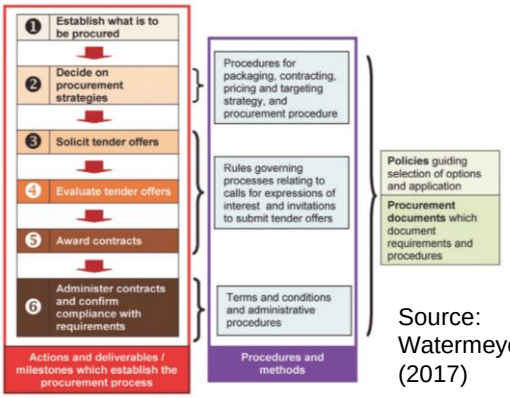
DEFINING CONSTRUCTION PROCUREMENT

- Procurement in the construction industry, in simple terms, refers to the process through which contracts for infrastructure projects are created, managed, and fulfilled (ISO 10845: 2020 and ISO 22058: 2022)

4

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BASIC ACTIVITIES IN CONSTRUCTION PROCUREMENT (ISO 10845-1: 2020)



Source: Watermeyer (2017)

Construction procurement is a more strategic activity than other general kinds of procurement

5

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PROCUREMENT OBJECTIVES/OUTCOMES

- **For example, New Universities Project:**

- **Primary procurement objectives:**

a) Cost: Deliver the university within a control budget;
b) Cost: Ensure that expenditure is within the amounts allocated in each financial year of the MTEF period and is capable of being accelerated should additional funding become available;
c) Time: Ensure that teaching spaces are capable of being occupied at the start of the required academic year, which meant that time would be of the essence.
d) Quality: Provide works that are capable of being readily maintained;
e) Quality: Make use of expertise within universities to ensure that the designs of the teaching spaces are aligned with current and future best practice;
f) Quality is such that maintenance costs are minimised.

- **Secondary procurement objectives:**

g) Promote broad-based black economic empowerment (B-BBEE);
h) Promote and support local participation throughout the supply chain and local employment through the delivery of the works; and
i) Support skills development by increasing the number of people who have part qualifications, national qualifications and professional designations awarded by statutory councils.

6

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FORMULATE AN APPROPRIATE CONSTRUCTION PROCUREMENT STRATEGY TO HELP ACHIEVE OBJECTIVES/OUTCOMES

- What is a Construction procurement strategy?
- What is the general nature of procurement and project outcomes in the construction industry?

7

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ISO 10845-1:2020
Construction procurement Part 1:
Processes, methods and procedures

PMBOK Guide 2021
The paradigm shift from tools and techniques to objectives and outcomes when it comes to modern construction project management





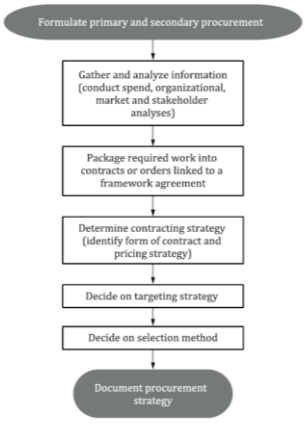


Figure 2 — Framework for the development of a procurement strategy

ISO 22058:2022
Construction procurement — Guidance on strategy and tactics

8

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Management, Procurement and Law
Volume 167 Issue MP5
Innovative construction procurement at Wits University
Laryea and Watermeyer
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Proceedings of the Institution of Civil Engineers
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Innovative construction procurement at Wits University

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Many construction projects end up with a wide gap between achieved and expected outcomes, which puts value for money for a project at risk. A root cause of this problem may lie in the development of an appropriate procurement strategy for projects. Wits University in South Africa has used a mixture of innovative procurement and contract strategies to deliver a portfolio of capital projects within 6% of the control budget over a period of 6 years (2008–2013). The research aim was to examine the procurement strategies and project organisation techniques adopted to deliver projects successfully. The strategic procurement approach has been based on the philosophy of collaboration, shared risk and integrated project teams, which is different from the conventional approaches in South Africa. A discussion of strategies including framework agreements, New Engineering Contract (NEC3) options, target cost contracts and early contractor involvement is presented to demonstrate how the use of collaborative procurement methods and integrated supply chains provides a key to deliver successful outcomes and value for money. Organisations intending to adopt similar approaches will require a team of experts to lead a change from traditional procurement cultures to more collaborative and integrated procurement methodologies.

R1.5 billion Wits capital projects programme delivered within 6% of budget

9

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Management, Procurement and Law
Volume 171 Issue MP1
Comparison of two infrastructure project implementation models in a developing country
Laryea and Watermeyer
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Proceedings of the Institution of Civil Engineers
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Comparison of two infrastructure project implementation models in a developing country

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Director, Infrastructure Options Pty Ltd, Randburg, South Africa; Visiting Adjunct Professor, School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, South Africa




A comparative analysis of public sector infrastructure projects implemented using a traditional public sector model against projects implemented using a modern management contractor model is presented. Traditionally, the implementation of public sector construction projects in South Africa is undertaken by an implementer such as the Department of Public Works. However, in 2014, the Western Cape Education Department created a framework contract and employed two management contractors with single-point accountability to implement maintenance and upgrading projects alongside those implemented in the traditional manner. A total of 122 projects implemented by management contractors are evaluated and compared with 35 implemented by the Western Cape Department of Transport and Public Works based on the cost performance, time performance and professional services costs of the two approaches. The practice of including contingency and provisional sums in contracts distorts the cost performance analysis, and superficial comparisons can be misleading. The management contracts delivered more projects on time. The professional services costs associated with management contracts was 9·2% compared to 15·6% for public works projects. The overall evidence demonstrates that the management contracting system is efficient and suited to the nature of maintenance and upgrading projects and delivers significant advantages.

Average cost overrun across 35 public projects was 18%

10

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Procurement strategy and outcomes of a new universities project in South Africa

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School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, South Africa

Abstract

Purpose – Construction project management outcomes in the literature typically portray significant deviations from expected outcomes. Various theories from studies that focus superficially on causes of project cost and time overruns rather than root causes have not addressed this problem. The need is for a better understanding of how procurement strategy provides a fundamental means to address this problem. The purpose of this paper is to examine the procurement strategy used to deliver a new universities project in South Africa within budget and to ascertain its influence on the outcomes.

Design/methodology/approach – A case study was designed to provide a comprehensive and intensive methodology to identify and examine the construction procurement strategy and its influence on the project outcomes. Document analyses and semi-structured interviews were used to collect data on the construction procurement strategy and outcomes from the client team.

Findings – The evidence brought forward demonstrates that the successful outcome was largely a consequence of the client team, procurement strategy and systems of delivery. However, the collaborative procurement strategy formed the basis of the successful project delivery and outcomes. A general observation from the data is that an appropriate construction procurement strategy developed by an experienced client team and proactively implemented by an integrated delivery team working collaboratively is likely to achieve the intended project outcomes.

Practical implications – The findings show three critical keys to achieving intended outcomes – people, procurement strategy and systems of delivery at the governance, portfolio, programme and project management levels.

Originality/value – The value of this paper lies in using a comprehensive methodology to study the relationship between procurement strategy and outcomes. The findings can be applied by client teams to achieve better outcomes and value for money in infrastructure projects.

Keywords Integration, Case study, Project management, Strategic management

Paper type Case study

R1.6 billion New Universities Project delivered within 2% of budget

11

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SOME PUBLIC INFRASTRUCTURE PROCUREMENT OUTCOMES IN THE SA CONTEXT

Project	Initial budget (R bill)	Estimated or final cost (R bill)	% Overbudget
Gautrain	25.1	30.5	21
Kusile	90	121	34
Medupi	33.6	105	213
Gauteng Toll Roads	6.3	90	1329
NMPP	11.1	23.4	111
OR Tambo	5.2	8.5	64
De Hoop Dam	7.9	20	153
FIFA Stadiums	8.1	18.4	126
N4 Toll Roads	2	3	50
			AVG: 233 /97

12

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£12.75M DG ONE COMPLEX IN SCOTLAND



Sporting and leisure facility initiated in 1998. Delivered by a design-and-build contractor 10 years later, 30% over budget and 40% longer than anticipated.

Open to the public for only six years, due to poor quality of construction. The eventual outturn cost was approximately double that of the contract price. The facility was only reopened in 2019.

Independent inquiry found that the fundamental failings relating to the facility's construction were failings on the part of the design-and-build contractor.

However, it also found that most of the Council's failings related to their lack of expertise as a client

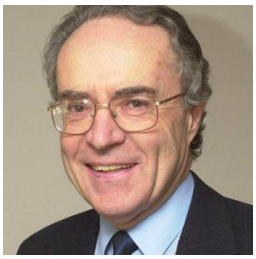
13

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HOW THE MANAGEMENT OF CIVIL ENGINEERING PROJECTS EVOLVED IN THE UK FROM THE 1760s TO PRESENT

THE SMEATON LECTURE 1999

Dr Martin Barnes - Smeaton to Egan: The extraordinary history of civil engineering management



14

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KEY POINTS FROM PROCUREMENT AND PROJECT OUTCOMES IN GENERAL

Many construction projects experience significant deviations from expected outcomes. Generally poor and inconsistent outcomes, but so are all projects, of any kind, in other sectors.

The construction field has failed to master procurement effectively enough to consistently produce efficient outcomes.

The current approaches for delivering construction projects have so far proved inadequate for producing *consistent and efficient* outcomes.

15

Relationship between procurement and outcomes in construction

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16

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RELATIONSHIP BETWEEN CONSTRUCTION PROCUREMENT AND OUTCOMES



The relationship between construction procurement and outcomes is largely unexplored in the research literature.

Research on successful projects reveals some of the key procurement practices leading to successful infrastructure procurement outcomes

17

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Innovative construction procurement at Wits University

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18

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19

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KEY VARIABLES IN THE RELATIONSHIP BETWEEN PROCUREMENT AND OUTCOMES

1. Client leadership
2. Procurement strategy
3. Clarity of project information
4. Ability to manage risk positively
5. Pricing and continuous value engineering
6. Programme
7. Having a contract that matches the agreement and expectations
8. Delivery management
9. Integrated project team
10. Competent and accountable professional team

20

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CONCLUSION FROM LARYEA (2019) ON ACHIEVING BETTER INFRASTRUCTURE PROCUREMENT AND PROJECT OUTCOMES

- "A construction procurement strategy developed by an experienced client team and proactively implemented by an integrated delivery team working collaboratively is more likely to achieve the intended outcomes"

21

Conclusions: Pathways to better procurement outcomes

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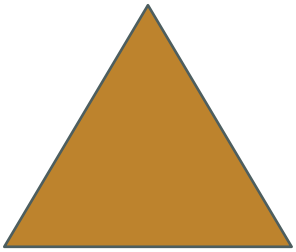
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22

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CONCLUSIONS AND FOCUS AREAS FOR THE FUTURE

Client leadership



Delivery management

Governance and social value

23



THANK YOU

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24