OXFORD ECONOMICS AUSTRALIA

A DATA RICH FUTURE FOR CONSTRUCTION

A DISCUSSION PAPER FOR THE 2024 *FOUNDATIONS AND FRONTIERS* FORUM

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ATTN: Attendees of the Foundation and Frontiers (FF24) Forum

Oxford Economics Australia fully supports *Foundations and Frontiers (FF24)* – a new tripartite construction industry forum to be held on the 8th August 2024 in Sydney.

We wish participants to the forum success in addressing critical challenges facing the sustainability of the construction industry. A sustainable and productive construction industry is vital to delivering critical economic, social and environmental policy objectives over the coming decade and beyond. These include affordable housing, the provision of quality health and education services, productivity-enhancing transport infrastructure, secure and safe water supplies, energy transition supporting a pathway to net zero emissions by 2050 and a strong defence capability (amongst many others).

Yet the industry remains beset by issues which put policy achievement at risk. High and rising delivery costs, limited market capacity and capability, and poor productivity outcomes increasingly places a gap between what needs to be delivered and what can be afforded.

In our view, improving the construction industry's productivity performance is the key route to solving many of these issues. Our research shows that if productivity in the construction industry had matched the broader productivity performance across the Australian economy over the past 34 years, industry output could have been nearly 40% higher than it is now and costs to deliver individual projects could have been much lower.

Having measurable and achievable targets is critical in turning around poor productivity outcomes. This paper brings together our thoughts on current productivity industry outcomes, its measurement, and how a system of richer productivity data collection could be implemented. Notably, we highlight the questions that would need to be answered to make it a reality.

Improving productivity outcomes will be difficult. Poor construction productivity performance is a global challenge. However, our long experience in working with industry and government stakeholders demonstrates the success of truly collaborative approaches.

We look forward to working with you to meet this challenge.

Regards,

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1. ABOUT OXFORD ECONOMICS

Oxford Economics Australia (OEA), formerly BIS Shrapnel, brings together the very best in economics and construction industry analysis. We are proudly independent in conducting research and analysis and seek to engage collaboratively with industry and government stakeholders, recognising that our combined experience and skills can yield powerful insights and solutions.

1.1 BACKGROUND TO OXFORD ECONOMICS AUSTRALIA (OEA)

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. In 2017, Oxford Economics purchased the respected Australian forecasting and consultancy company, BIS Shrapnel (formed in 1964) to become BIS Oxford Economics. In 2023, the company become Oxford Economics Australia (OEA). OEA has an Australian staff of over 50. It combines deep knowledge of the Australian economic and construction industry environment with access to Oxford Economics' global capabilities to provide powerful insights to clients.

1.2 CREDENTIALS AND RELEVANT EXPERIENCE

OEA is a leading independent economic analyst and forecaster and a construction industry expert. We understand the critical role played by the construction industry in delivering investment in new assets which in turn drives economic growth. Through a strong understanding of industry drivers, challenges, opportunities and constraints, OEA is Australia's leading forecaster for the construction industry. We regularly produce industry research and forecasting reports across all sub-segments of the construction sector (engineering construction, non-residential building and residential building) covering upstream supply chains, construction, operations and maintenance. We undertake subscriber and bespoke commissioned reports and, through regular consultation and industry/government roundtables, provide sound advice and an independent interface for the public and private sectors to engage. Beyond our regular construction subscription services we regularly undertake:

- Demand forecasts for labour, materials, plant and equipment
- Supply chain analysis and risk assessments
- Market capacity and capability assessments
- Cost escalation analysis, forecasting and review
- Regional and pipeline analyses
- Thought leadership through market research
- Broader macroeconomic and industry analysis
- Forums and roundtables for collaboration between government and industry

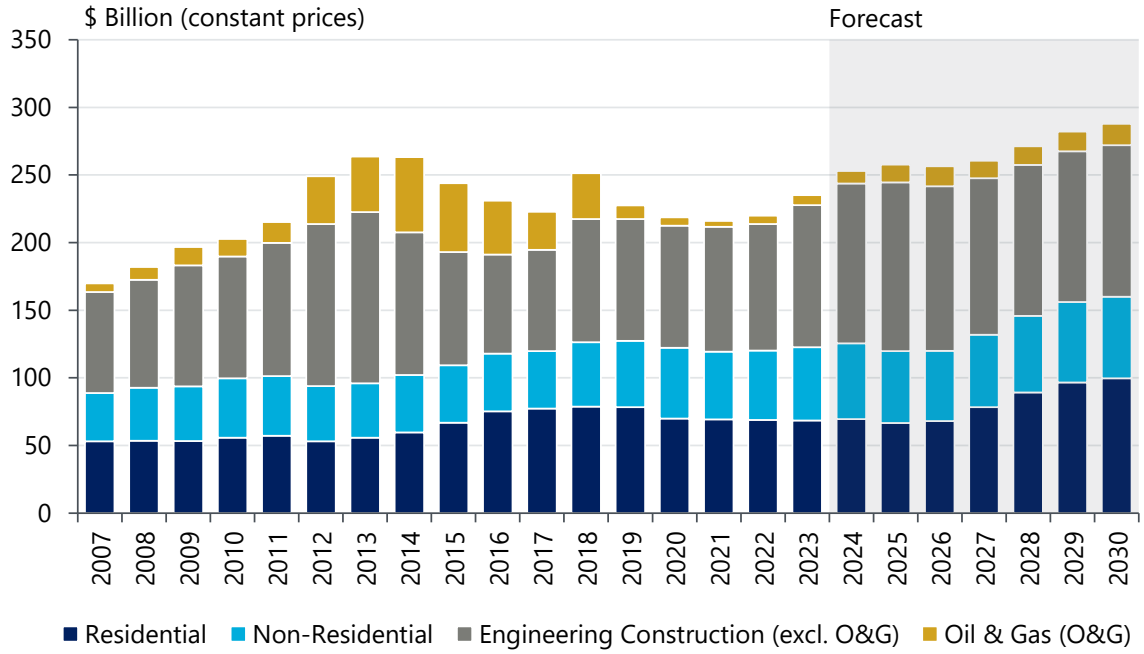
1.3 OUR COLLABORATIVE APPROACH

OEA is a completely independent firm with no vested interests in any of the industry sectors and markets which we research and forecast. We help our clients to better understand the markets in which they operate through reliable and detailed market data, analysis of developments and drivers

and thoroughly researched forecasts, analysis and policy positions. Our goal is to provide clients with the information required to make the best possible decisions.

Our detailed, regional knowledge of construction projects and total market activity across both the public and private sectors are drawn principally from our regular subscription services, which are updated on a quarterly basis. Our *Building in Australia* and *Engineering Construction in Australia* services are considered market leading for analysis and forecasting of the whole construction market. Our demand side analysis incorporates known project activity as well as future demands (driven by population, social, economic, environmental and other requirements) which will go beyond knowledge of specific projects. On these measures, Australia faces a strong upswing in construction work later this decade as shown in Figure 1.

Figure 1: Total Construction Work Done, Australia, Constant Prices



Source: ABS, Oxford Economics Australia

Year ended June

Our senior staff have decades of experience advising industry and Australian governments on sectoral challenges, risks and opportunities. We regularly provide deep insights into key trends in infrastructure, construction and maintenance sectors, as well as policy positions and thought leadership. We have highlighted the importance of the construction industry and supply chains to the broader Australian economy, opportunities for economic growth and employment from targeted infrastructure investment, as well as the need for reforms in planning, assessment, procurement and delivery to maximise efficiency and industry sustainability.

2. THE PRODUCTIVITY CHALLENGE

The Australian construction industry, according to ABS productivity measures, is in the midst of a productivity crisis. Since the peak of the resources investment boom in Australia (in 2014) measured productivity in the industry has declined 17.6% while productivity across the broader market has risen 4.3% (based on FY2023 ABS productivity data). Productivity in the construction industry in FY2023, according to these measures, is worse than it was in 1990; a long-term trend decline which has been observed in other countries including the United States. This Chapter discusses the current productivity measures and outcomes while Chapter 3 focuses on the need for metrics that can help steer productivity back to positive territory.

2.1 CURRENT MEASURES OF INDUSTRY PRODUCTIVITY

Productivity can be defined as the ratio of a volume of output to the volume of inputs; that is output per unit of input.[1] Output, in the current context, is usually referenced as the "gross value added" by the construction industry over a period.

Often, productivity is couched in terms of comparing output to a single input such as labour or capital (e.g. labour productivity), but when multiple inputs are considered simultaneously, various 'multifactor productivity' measures can be produced. The Australian Bureau of Statistics (ABS) produce a number of productivity measures which align with international best practice[2] for statistical agencies and reflect modern growth accounting frameworks, namely:

- **Annual indexes of labour and multifactor productivity (MFP)** for the market sector as well as for each industry division within the market sector (illustrated in Figure 2 below)
- **Quarterly estimates of labour productivity** (i.e. GDP per hour worked) for the market sector and for the whole economy, and quarterly and annual GDP per capita.

Annual productivity measures for the market sector are published in Australian System of National Accounts and annual industry level MFP indexes in Estimates of Industry Multifactor Productivity. Quarterly indexes of GDP per hour worked are published in the National Accounts

2.2 RECENT CONSTRUCTION INDUSTRY PRODUCTIVITY PERFORMANCE

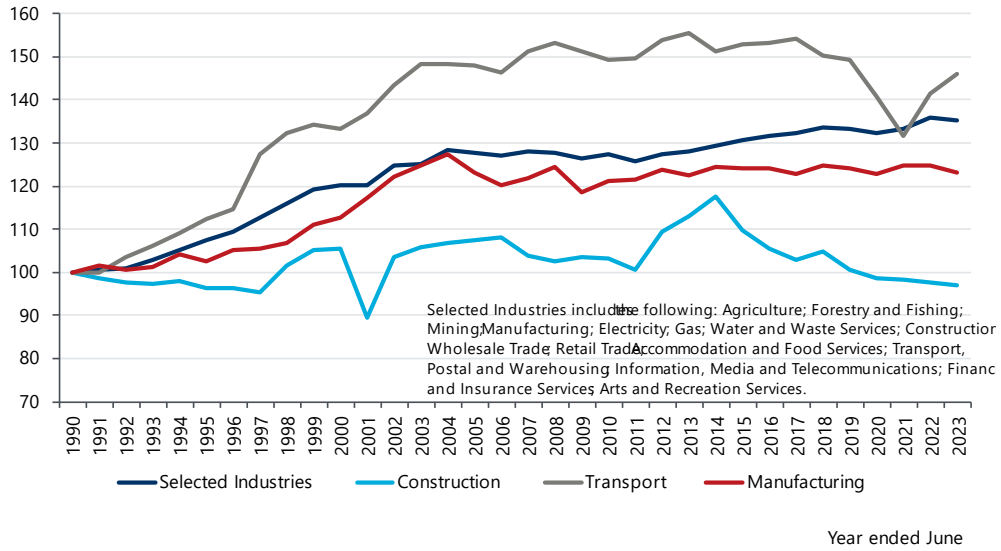
Growth in productivity implies that output has grown by more than the growth in inputs. For the construction industry, it is useful to consider multi-factor productivity (MFP) as distinct from labour productivity alone. The latter considers how output changes with a given change in labour inputs,

[1] Australian Bureau of Statistics. (2020-21). *Chapter 19 Productivity measures*. ABS. https://www.abs.gov.au/statistics/detailed-methodology-information/concepts-sources-methods/australian-system-national-accounts-concepts-sources-and-methods/2020-21/chapter-19-productivity-measures

[2] OECD (2009), *Measuring Capital - OECD Manual 2009*: Second edition, OECD Publishing, Paris, https://doi.org/10.1787/9789264068476-en provides a link between systems of national accounts (SNA) analysis and productivity measurement, but rich technical details of productivity measurement can be found in OECD (2001), *Measuring Productivity: Measurement of Aggregate and Industry-Level Productivity Growth*; OECD Publishing, Paris, https://unstats.un.org/unsd/nationalaccount/docs/OECD-Productivity-e.pdf

while the former represents changes in output driven by changes in the combined value of inputs, which effectively means "doing things better than in the past".

Fig. 2. MULTIFACTOR PRODUCTIVITY INDEXES BY INDUSTRY: FY1990-FY2023 (1990=100)



According to ABS industry MFP measures, productivity has been declining in the construction sector since its peak in FY2014 and currently (FY2023) sits at a level below that recorded in FY1990. Meanwhile, the 'gap' between construction industry MFP and the corresponding measure for 'Selected Industries' has grown wider since the FY2014 peak. Since FY1990, relative growth in the 'Selected Industries' MFP measure has been 39% higher than for the construction industry.

In a previous paper for the Australian Constructors Association,[3] Oxford Economics Australia valued the opportunity cost (i.e. potentially foregone construction output) of the relatively poor construction industry productivity performance since 1990 at $56 billion, and this figure has been quoted extensively by industry and in the media. Using the same approach and updating to FY2023 data, the opportunity cost has risen further to $62 billion currently, and will continue to rise in future years whenever construction industry MFP growth trails the Selected Industries measure.

Australia's construction industry is not alone in experiencing relatively weak productivity growth – and when measured over a long period of time. Various international studies point to similarly poor productivity performance in the construction industry globally. In a 2017 paper, the McKinsey Global Institute estimated that boosting construction industry productivity and closing the 'productivity gap' to other industries could increase global construction output by $1.6 trillion – an amount roughly the size of the economy of Canada – and boosting global GDP by up to 2% per year.[4] More recently, in a

[3] Oxford Economics Australia (2023) "The Opportunity Cost of Long-Term Poor Productivity Performance in the Australian Construction Industry" accessed at https://www.constructors.com.au/wp-content/uploads/2023/08/BIS-Oxford-Economics-Australia-ACA-Construction-Industry-Productivity-Report-13.6.23.pdf

[4] McKinsey Global Institute (2017), *Reinventing Construction: A Route to Higher Productivity*. Viewed 21/4/21 at https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Operations/Our%20Insights/Reinventing%20constructio

2023 working paper, the US National Bureau of Economic Research noted that construction industry productivity was around 40% lower in 2020 than in 1970 "despite decided growth in aggregate productivity for the U.S. economy as a whole".[5]

2.3 POOR PRODUCTIVITY IMPLICATIONS

In a world of limited resources and an increasing number of urgent policy objectives requiring built solutions (e.g. achieving low greenhouse emissions energy transition, increasing the quantity of affordable housing, securing increasingly variable water supplies, building defence capability, providing quality education and health facilities for a growing population) productivity improvements offer the critical link to minimising market capacity and capability risks, enhancing industry sustainability and lowering infrastructure costs. As noted by the Productivity Commission in its 2014 inquiry into public infrastructure provision:

"As in all industries, improved productivity (when this also encompasses quality improvements) is the key method for reducing the costs of output to customers, improving business returns in the shorter run, and providing more infrastructure for a given spend."

Relatively slower growth in productivity, compared to the rest of the economy, means that greater pressure is placed on boosting the quantity of labour and capital inputs to achieve higher levels of construction output, rather than improving the way they are used together. Where labour and/or capital is scarce, this itself can lead to increased demand pressure on resources, increasing construction costs as well as potentially delaying construction projects. Rising construction activity through the remainder of this decade (as shown in Figure 1), without significant improvement in productivity, is likely to drive further cost escalation in construction as demand for project-critical labour, equipment and materials exceeds market's capacity to supply. While growth in construction costs have eased from its recent spike in FY2022 and FY2023, costs have not fallen in absolute terms and are at risk of reacceleration later this decade.[6]

n%20through%20a%20productivity%20revolution/MGI-Reinventing-construction-A-route-to-higher-productivity-Full-report.pdf

[5] Goolsbee, A. and C. Syverson (2023) "The Strange and Awful Path of Productivity in the U.S. Construction Sector", National Bureau of Economic Research, Working Paper 30845, February 2023, viewed at https://www.nber.org/papers/w30845

[6] Hart, A. and T. Westrup (2024) Cost escalation pressures are easing but key risks remain, Oxford Economics Australia Research Note, 13th June 2024 accessed at https://oxfordeconomics.com.au/resource/cost-escalation-pressures-are-easing-but-key-risks-remain-construction-and-infrastructure/

3. IMPROVING PRODUCTIVITY THROUGH RICHER DATA TRACKING

3.1 CAUSES OF POOR INDUSTRY PRODUCTIVITY

A strong literature has emerged in recent decades which seeks to explain the potential causes of the construction industry's poor productivity performance – and hence how this performance may be improved. Noting the link between poor productivity outcomes and poor financial outcomes for the construction industry, the Australian Constructors Association, in conjunction with Oxford Economics Australia[7] have identified a number of productivity-inhibiting features of the Australian construction landscape and provided positive project case studies where these were successfully addressed, including (amongst others):

- An adversarial rather than collaborative contractual culture
- Inefficient risk allocation even as projects have become more complex
- Costly, increasingly bespoke and prescriptive procurement processes and
- Inadequate pre-construction planning and risk identification (resulting in significant reworks)

3.2 A DATA-RICH SOLUTION FOR PRODUCTIVITY IMPROVEMENT

Ultimately, actions which address these issues – whether on an individual project or more broadly across industry – can be expected to improve industry productivity. However, ensuring these improvements to industry productivity are identified and sustained will require substantial data collection – on a high frequency basis – that can be used to benchmark and track performance improvements effectively. In general, it is hard to improve performance when suitable performance indicators are either unknown, not tracked or measured.

While the ABS does provide broad labour productivity data for the construction industry (via the National Accounts and employment statistics) on a quarterly basis, detailed MFP data is only available annually around December following the end of the financial year. While produced to the highest statistical standards – and remaining the best overall measures of industry and economy-wide productivity performance – the construction industry and its stakeholders arguable require more detailed and frequent data to help identify root causes of poor productivity performance, where it is happening, and how best to apply solutions.

A rapid increase in industry's use – and creation – of big data should assist the development and use of a range of enhanced productivity metrics. As noted by Li et al (2023) the construction industry is

[7] BIS Oxford Economics (2020) Sustaining the infrastructure industry: Challenges, solutions and case studies, Response for the Australian Constructors Association to Infrastructure Australia's Australian Infrastructure Audit 2019, September 2020. Accessed at https://www.constructors.com.au/wp-content/uploads/2020/09/ACA-IA-Response-Final-Version.pdf

currently going through an ''intelligent revolution''.[8] Technologies such as the Internet of Things (IoT), cloud computing, robotics, automation, GPS mapping and Building Information Modelling (BIM) are creating a new wealth of data which can be leveraged to enhance construction efficiency, reduce waste and improve planning and decision-making. The challenge is that much of this data is collected privately, in planning or delivering individual projects and is not generally made available for identifying better construction processes and methods or tracking broader industry performance.

3.3 CRITICAL QUESTIONS TO ANSWER FOR A PRODUCTIVITY DATA PROJECT

In our view, leveraging this data will require the establishment of an agreed collaborative data framework agreement including key stakeholders – builders, civil contractors, unions and government agencies – and covering all stages of the project life-cycle (pre-construction, delivery and post-construction). While the details of this framework are beyond the purpose of this paper, we believe the framework should at least tackle the following critical questions and issues:

- **Who 'owns' the data?** Here, we believe there should be a differentiation between the raw data provided (which should be provided confidentially and hence ownership remains with the provider) and broader industry metrics that can be arrived at through analysis and aggregation. These broader metrics should not identify specific organisations or projects and ownership and responsibility for this data should be through a collaborative structure created by industry and government stakeholders.
- **What data which should be collected**? Given that productivity losses can stem from poor planning, procurement and/or delivery, ideally a wide range of data should be collected to include metrics at all stages of the project life cycle. This will require data to be collected from project developers/owners and construction delivery partners. Pinpointing the exact metrics which could be collected should be developed through a thorough collaborative consultation phase but may include data on expenditure on preconstruction activities such as geotechnical investigation and client costs, as well as indirect costs, direct expenditure on project during the period, planned versus actual timelines, headcount during the period (white/blue collar), various output measures which may be relevant (e.g. length of road/rail completed) and the value of rework expenditure incurred in the period.
- **What is the scope of collection?** Decisions will need to be made regarding the coverage of the data collection. Will it attempt to capture data across the whole of the construction industry (i.e. residential building, non-residential building and engineering construction), consider all projects versus projects of a certain size, asset type, procurement model used or complexity. Identifying characteristics of the data when it is entered may also be useful in subsequent component analysis.
- **Who should be responsible for collecting the data?** Given the sensitivity and confidentiality of the data to be collected, it is important that a neutral third party be used for raw data collection and storage (data warehousing) necessitating high levels of data security. Ideally,

[8] Fangyu Li, Yuanjun Laili, Xuqiang Chen, Yihuai Lou, Chen Wang, Hongyan Yang, Xuejin Gao, Honggui Han (2023) Towards big data driven construction industry, Journal of Industrial Information Integration, Volume 35. Accessed at https://www.sciencedirect.com/science/article/pii/S2452414X23000560)

this would be a role for an independent statistical agency / market research / data analyst who will also be entrusted with aggregating the data and make it suitable for public use.

- **Who will be the point of collection?** It will be important that there is a dedicated ''çhampion'' within organisations who will be the key contact point for data collection. Ultimately, these data champions be responsible for ensuring data is collected internally across the organisation during each reporting period and ready for entry for this project. This rich data collection exercise will be a very large undertaking and, to be successful, will require considerable support from industry and government organisations involved.
- **How should the data be collected and aggregated?** Again, the pros and cons of collection and aggregation method should be best left to a technical committee established within the collaborative structure, but data collection should aim to be efficient and ''relatively painless'' to encourage maximum participation from a large established representative panel of organisations. This will tend to lend itself to online survey methods for data collection, but there should be appropriate and professional management of each survey to ensure high levels of participation and a sustained high quality of the dataset. Aggregation will need to take into account rigorous statistical research methods to convert representative samples to broader population measures.
- **How often should data be collected?** In terms of frequency, there will likely be a trade-off between high frequency ("real time") usefulness and survey fatigue from participants. This may lend itself to a pronged approach where very simple data could be collected on a monthly basis and more detailed data collected quarterly. For the initial data collection, it will be important that historical data is also collected so that data integrity over a period of time can be examined and trends can be identified immediately. This means that the initial establishment of data is likely to be a more intensive process for data providers (and analysts) but should become much less onerous in future surveys.
- **How should results be published?** For community acceptance, it will be important that results are published regularly and stored publicly for easy retrieval, access and download. This may mean establishing a dedicated website or portal to house the data, which should be in a commonly used data format for easy manipulation (e.g. an Excel or CSV file). To encourage full participation, it will be important that individual agencies, projects and industry players are not identifiable in any data release. The purpose of the data is not to punish or reward stakeholders but rather to identify trends in metrics that indicate where productivity may be improving or be at risk. Consequently, it will be important that a data review board is established to provide necessary oversight and quality control for each data collection and review of results before publication.
- **How should this data collection be funded?** This is not an idle question. Undertaking and sustaining this data collection, while likely providing large benefits for industry, government and the broader community, will require substantial funding to be successful. Ultimately, the estimated cost should be established by the collaborative body once methodological decisions regarding scope, survey type, frequency etc have been addressed and funding sought from key industry stakeholders.

3.4 A POSSIBLE TIMELINE FOR STAGED IMPLEMENTATION

Given the high and growing opportunity cost of poor construction industry productivity, the sheer number of policy goals requiring built solutions which is challenging market capacity, and expectations of a strong growth cycle in construction in the second half of this decade – collecting richer industry productivity data should be a high policy priority. While industry associations and government agencies are aware of the challenges, the aim should be to design and establish a regular, high-frequency, productivity-focused data collection system this financial year (FY2025) and launch data collection itself in FY2026.

Achieving this, in our view, will require progress across four sequential stages:

1. Inception and Design (6-9 months)
2. Pilot Collection (3 months)
3. Initial Full Collection (2-3 months)
4. Ongoing Collection and Review (Periodical)

3.4.1 Inception and Design

This inception and design stage, realistically, can be expected to take considerable time (at least 6 months – even with approvals to proceed immediately). This will require leadership from industry, government and other major stakeholders to achieve the following objectives or similar, assuming a commitment to the data project can be made at the 2024 *Foundations and Frontiers* Forum.

- Inviting membership of a collaborative productivity data taskforce to all stakeholders
- Establishing the taskforce – ideally with diverse membership across government, industry, unions and independent market researchers and analysts.
- Once established, the taskforce can itself guide further developments including:
    - Enunciating key purpose, role, functions and outputs of the taskforce
    - Developing a budget to achieve objectives and a matching funding plan
    - Undertaking consultation within and outside the taskforce to develop a data framework agreement responding to issues such as those presented in Section 3.3 (noting this is not an exhaustive list)
    - Choosing a data collection / analyst partner
    - Establishing data champions within organisations to be surveyed
    - Establishing data collection methods and survey templates
    - Developing a publication data portal

3.4.2 Pilot Collection

Once collection materials have been developed, a trial collection should be undertaken to identify known and unknown challenges in administering the data collection, receiving timely responses and being able to develop aggregated and/or population data. This stage can also help elicit feedback from trial participants to improve the collection methodology and experience.

3.4.3 Initial Full Collection

Upon successful completion of the pilot collection, and making subsequent improvements, a full collection could be undertaken. Being the initial collection, it may be important to gather information not just for the current period, but also corresponding data for previous periods so that a time series for key critical data can be established immediately. This can be expected to add considerably to the length of the initial survey unless other methodologies are employed to create estimated historical series of the data. Upon completion of analysis, development and internal review of population-level productivity metrics, output can be published to the developed data portal.

3.4.4 Ongoing Collection and Review

Once established, ongoing data collection can be undertaken at regular intervals. It will be critical to ensure that strong participation is maintained so that survey results remain high quality and consistent from period to period. Regular reviews should be undertaken to seek improvement to processes to ensure value for money and output quality.

3.5 BENEFITS OF THE PROJECT

Oxford Economics Australia believes that the development of a set of richer and more timely productivity data for the construction industry is critical for improving better industry outcomes and delivering more infrastructure with existing spend. Well-targeted data may help identify better ways of designing, planning, procuring and delivering high quality infrastructure. It could also be used to better understand construction performance, identify where poor productivity faces systemic challenges and where reforms to boost productivity may be best targeted.

It is also important to highlight that only through a collaborative approach – including industry and supply chains, government and labour – will productivity challenges be overcome. In joining a collaborative effort in collecting better productivity data, it is important that all stakeholders share the subsequent benefits. Greater productivity should not entail reducing spend on necessary buildings or economic infrastructure or the loss of industry employment. Instead, richer productivity data should be used to help direct funding to most productive use, with the benefits cascading to the development of further productive projects that would have been unfundable within existing budget envelopes. In short, it is about doing more with what we have, not doing less. Australia has too many real policy needs requiring a productive building and construction solution over the coming decade to contemplate anything else.

Improving productivity outcomes will be difficult. Poor construction productivity performance is a global challenge. However, our long experience in working with industry and government stakeholders -demonstrates the success of truly collaborative approaches.

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