Kickstarting the productivity conversation
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Laing O'Rourke recognises the importance of the recently released discussion paper, *Kickstarting the productivity conversation*, and welcomes the opportunity to respond to a number of its points. Laing O'Rourke has demonstrated a long commitment to improving efficiency and productivity in the construction sector, as can be seen through enduring investments in innovative construction technology, industry leadership in safety and culture, and active involvement with local universities and training institutions.

Laing O'Rourke's response to the discussion paper will focus on three major areas. These are:

1. Improving industry productivity through streamlined tender and procurement practices.
2. The role that data driven approaches to construction can play in improving productivity and efficiency.
3. How standardisation of contracts can improve asset delivery and governance productivity.

Forward looking regulation to support competition and innovation

What new tools can be harnessed to enable and adaptive, iterative and outcomes-based approach? Is there scope for greater uptake for these tools in NSW?

The construction industry is one of the least productive and is experiencing declining productivity year-on-year. This has ramifications across the economy given the scale and role construction plays within the economy and in boosting economic growth. Laing O'Rourke believes that reforming procurement processes for infrastructure will substantially increase productivity through reduced project costs and an increase in the availability of skilled labour. The importance of this initiative has already been previously recognized in the NSW Government Action Plan: A ten point commitment to the construction sector, where the fifth identified priority area is 'Reduce the cost of bidding'.

In a standard design and construction tender process there will typically be three competing contractor organizations. The typical cost of the tender process to each organization is 1.1 – 1.3% of the total capital cost of the project. These costs are predominantly labour costs, and involve teams from both the contracting organizations and their external design partners.

As only a single contractor will be awarded the tender, this immediately requires 2.2 – 2.6% of the total capital cost of the project to be wasted on the unsuccessful tenders. These costs are reflected in higher costs on subsequent project tenders as corporate overhead is recovered in preliminaries. Furthermore, a typical tender period of 12 – 18 months ties up skilled engineering labour for its duration, 66% of which will ultimately be unproductive. This reduces the available pool of skilled engineering labour, putting upwards pressure on labour costs and reducing the ability of the skilled labour to work on alternative infrastructure projects.

NSW Government Action Plan: A ten point commitment to the construction sector, Section 1, promotes a more collaborative form of tendering, and Section 5, provides a number of points that would immediately help to address this inefficiency, and thus improve sector productivity. As a more generalized concept, the Early Contractor Involvement (ECI) model has been demonstrated to reduce tender times by up to 60%, and with tender costs only approximately 0.2 – 0.3% of the total project capital cost.

To demonstrate the potential productivity improvements, a simple example is given. In Western Sydney the NSW Government has committed to $30 billion spent on major infrastructure over the next four years.

Traditional tender processes: $660 - $780 million in unproductive costs

Early Contractor Involvement (ECI): $120 - $180 million in unproductive costs

Total productivity gain: $540 - $600 million

Major productivity gains can therefore be realised from this reform. It would enable the State to accelerate or bring forward other projects in its pipeline or allow new projects to be considered. It also makes skilled engineering labour more available to aid in the delivery of these projects.

Getting the most out of existing assets

How could agencies use data and 'smart' infrastructure to improve asset management?

Laing O'Rourke strongly believes that there is substantial opportunity in increasing productivity through the use of 'smart' infrastructure, and has committed to this ideal through investment in its Engineering Excellence Group (EnExG). The EnExG is a leading construction innovation group and has researched, developed and deployed numerous initiatives based on the concept of 'smart' infrastructure. This response will briefly discuss this opportunity in light of this experience.

In the Discussion Paper, Section 6.4, numerous references are given to the use of sensors to deliver granular data on the performance of infrastructure assets. Examples are given on water management systems, structural health, and residential precincts. Laing O'Rourke understands the significant potential that improved sensor deployment can bring to infrastructure management, but cautions that the scope of the discussion outlined in the Discussion Paper may be too limited.

It is important to clarify what is meant by 'smart' infrastructure. Fundamentally, 'smart' infrastructure allows people to make better decisions, or eliminates the need to make trivial decisions. This requires the creation of knowledge, and avenues through which this knowledge can be effectively delivered. Simply collecting data, be it from embedded sensors, improved organizational procedures, harnessing public datasets, or otherwise, does not create this knowledge. The process of transforming data into knowledge is not trivial, and requires careful consideration of who is going to use that knowledge and what it is going to be used for. Data from a sensor brings no benefit if this transformation is not effectively performed, and may actually create new hazards if the data is not correctly understood.

Laing O'Rourke thus suggests that scope of investigation in the Discussion Paper be broadened beyond physical sensors, which appears to be the current focus. The human interfaces and experiences that these sensors will inform are of equal, if not greater, importance, and are still the subject of considerable research and exploration. The complexity, and potential opportunity, of these interfaces may soon increase significantly through the continued development of emerging technologies such as virtual reality, augmented reality, and other novel information delivery pathways. Laing O'Rourke, through the EnExG, has performed considerable research and development of augmented reality applications in particular, and has seen significant value in its ability to more deeply understand infrastructure and reveal previously hidden information. As an example, this work with augmented reality has been demonstrated to significantly reduce the risk of service strikes in construction projects, and so greatly reduce the associated remediation costs and disruption to the surrounding communities. For complicated projects in existing built environments services strikes can represent one of the greatest risks to delivery. Claims can measure a significant percentage of the total capital cost of the project through remediation, claims and schedule extension, with some high-profile examples in NSW coming to light recently. Beyond the cost to the client and contractor, it has been estimated that the indirect costs of the disruption to the surrounding communities can be up to ten times larger than the direct cost to the contractor and client. Laing O'Rourke's work with augmented reality has also been showcased through the Wynyard Station Upgrade project and is a standard component of all current deployments.

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As referenced earlier, the scope should also be extended to include not just data from physical sensors, but also data that can be collected from a variety of other sources. These can include publically available information, such as weather data, improved insight on organizational data, or greater transparency and access to government data. Data from sensors provides a powerful compliment to these other sources of data.

Laing O'Rourke also recommends that the scope of the discussion be expanded to how 'smart' infrastructure can be embedded into projects at the design stage, through construction and delivery, and ultimately into asset management. The current Discussion Paper appears to maintain a focus on infrastructure that has already been delivered. The reasons for this suggested earlier engagement with 'smart' infrastructure are threefold:

1. A number of infrastructure sensors are most effectively embedded into the infrastructure during construction, rather than as ad-hoc additions after completion.
2. Some sensors and other instrumentation can have dual use through the delivery phase into the management phase. This can strengthen the economic utility of the instrumentation program.
3. Tracking the performance of infrastructure through its delivery phase can help more accurately predict its future performance, as a complete picture of the lifecycle of the asset is gained. This is particularly true for extended concepts such as lifecycle carbon analysis, where the behaviour and operation of on-site plant and machinery may form an important contribution.

As an example to the first point, Laing O'Rourke has researched and developed in-situ strain gauges that are embedded into the infrastructure. These can give very finely detailed understandings of the forces that infrastructure is subjected to, which can then go on to inform predictive maintenance schedules, or provide early warning of unexpected faults. Laing O'Rourke predicts that moving towards such a predictive maintenance regime could reduce operational maintenance costs by at least 15-20%, along with more intensive capital utilisation through asset 'sweating'.

As an example of the second point, Laing O'Rourke has developed the Toolbox Spotter. The Toolbox Spotter is a machine learning informed camera, which is used on operational sites to forewarn when personnel are entering hazardous areas or scenarios. The Toolbox Spotter would then have carry over utility during the asset management phase, where it would be used to monitor the condition of the asset and if the asset is being maintained safely and appropriately. This dual use of the Toolbox Spotter, and similar technologies, can help ameliorate the cost of their use. The Toolbox Spotter has been estimated to reduce the cost of lost time injuries, and the human and financial costs associated with them, by 5-15%.

Towards the third point, Laing O'Rourke is developing and trialling vehicle and plant tracking technology, which among other users, can inform on the lifecycle analysis of the project. These can have significant implications for environmental auditing and impact analysis, along with generalized productivity benefits. Among other worksite 'internet of things' (IoT) developments, bought together under the umbrella concept of the 'connected site', Laing O'Rourke expects direct productivity improvements of approximately 1-5% in the delivery costs of construction projects.

In accumulation, these 'smart' infrastructure concepts under development by Laing O'Rourke can significantly improve the productivity of construction projects through the delivery and management phases. Overall productivity gains in the order of 10-20% may be achievable if they applied in a considered and holistic fashion, with clients, contractors and communities all

part of the delivery solution. For these reasons Laing O'Rourke suggests the scope of the Discussion Paper be broadened to include the concepts described previously.

Maximising value from investments

How can we further strengthen the governance and transparency around infrastructure projects?

Laing O'Rourke would like to briefly discuss the role that standardised contracts may have in improving the productivity of the construction industry, and how governance and transparency may be improved.

Construction projects are an inherently complicated endeavour, with many individuals, organisations and other groups coming together to create a singular vision. The number of variables involved in the delivery of a project ensures that no two construction projects are the same, and many of these variables, such as detailed ground conditions and future labour costs, are highly unpredictable yet extremely impactful to the ultimate cost of the project. In such an environment anything that can be done to create predictability and transparency will bring substantial productivity improvements.

The standardisation of government contracts is one area in which Laing O'Rourke believes this predictability can be created. Standardised contracts would allow contractors and clients to tender, discuss and negotiate from a common starting point, and would assist in reducing the cost of doing business for both Government and industry. A standard form contracts:

- allow both client and contractor to understand the risk that is assigned to each party
- allow clients and contractors to have a better understanding of the costs of the risks that each is required to assume, which allows for more accurate budgeting and estimating
- reduce the time during tender spent by bid teams in deciphering alternative, and often justify new, ways in which risk is dealt with, and
- reduce the cost incurred by all participants on legal advisors.

By way of example, the Commonwealth of Australia has developed a standard set of contracts to be used by the Department of Defence. This means the contractor's bid teams, lawyers and their management team are well versed as to the risk that the organisation is to assume in entering into an agreement with the Department of Defence for a construction project. This results in significantly less time being spent reviewing contractual clauses, and more time focussing on the technical, resourcing, pricing and programming aspects of a project, which allows for innovative and more collaborative outcomes.

Laing O'Rourke estimates that the productivity improvement through contract standardisation can be extremely significant, with its experience suggesting that time for contract review can be reduced by 5-10 times when standardisation is present. This represents a substantial cost in labour that could be more effectively deployed and utilised.