PROJECT PRODUCTIVITY

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CONTENTS

EXECUTIVE SUMMARY

Measurement and improvement of knowledge work is one of the most challenging managerial issues of the 21st Century. In order to better understand and improve the productivity of knowledge work in projects, BHP commissioned researchers in the John Grill Institute for Project Leadership at The University of Sydney to address this challenge.

The study focuses on the productivity of the project management function in owner side capital intensive projects and draws on extensive research and interviews with over 55 senior and project managers and team members from Sydney Water, Telstra InfraCo, Woodside Energy and Woolworths Primary Connect. The findings of the study were:
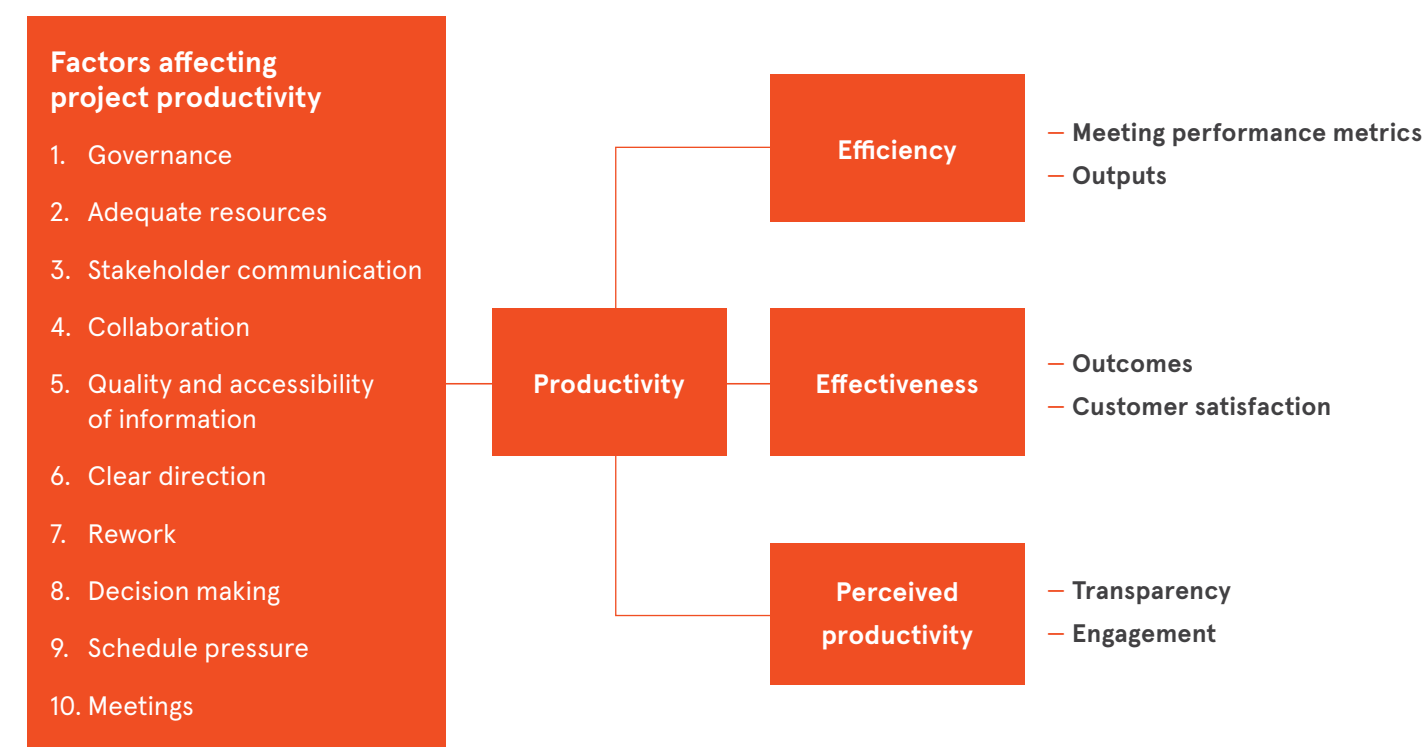
Measuring productivity:

Measures of productivity fall into three areas: efficiency, effectiveness and perceived or subjective interpretations of productivity. 17 measures were identified as key to monitoring productivity, and best projects select and use multiple measures in combination to provide a comprehensive understanding of productivity and how it addresses organisational goals.

Improving productivity:

10 factors were identified that can be used as levers to improve productivity. The most influential factors were found to be: governance, adequate resourcing, relationship factors associated with collaboration and stakeholder communication, quality and accessibility of information and clarity of direction. Further opportunities to improve and sustain productivity in project work were identified in: rework, decision-making, schedule pressure and meeting quality.

The findings and results of the study are summarised in the diagram below. The report captures and illustrates the understanding and lived experience of productivity in capital intensive projects using the words of the interviewed practitioners.

Factors affecting project productivity

1. Governance
2. Adequate resources
3. Stakeholder communication
4. Collaboration
5. Quality and accessibility of information
6. Clear direction
7. Rework
8. Decision making
9. Schedule pressure
10. Meetings

Productivity

Efficiency
— Meeting performance metrics
— Outputs

Effectiveness
— Outcomes
— Customer satisfaction

Perceived productivity
— Transparency
— Engagement

If you want to skip ahead

For a summary of ways of measuring productivity, go to page 27.

For a summary of the conditions that support or reduce project productivity, go to page 28.

INTRODUCTION

The project management function of an organisation is an essential component in delivering and maintaining business value. However, project management presents unique challenges in understanding productivity, and communicating whether a project management function is operating in a productive way. Due to the variation between projects and the uncertainty that is common during project planning and execution, simple measures of productivity may fail to effectively communicate the productivity of processes involved in defining, planning, and delivering projects.

To address this issue, this study sought to understand:

– methods to measure and communicate the productivity and impact of project based work

– innovative ways of improving sustainable levels of productivity in the way that projects are managed.

The scope of the study included understanding the productivity of project management functions and personnel. The study scope did not include consideration of the productivity of relatively standardised trades and services commonly employed on projects, or consideration of efficient use of materials in projects.

THE STUDY PROCESS

The purpose of the study was to understand project management productivity in organisations currently delivering capital intensive projects, working on the client-side of project definition and delivery.

This study sought to understand the perspectives of key practitioners working on projects, and to synthesise these different viewpoints to common themes faced in measuring and managing project management productivity. A research approach was chosen that provided the opportunity to draw upon leading research in the field and qualify this in the context of current organisational practice. This provided a vehicle to share best practice between participating organisations.

Between May and September 2021, 55 semi-structured interviews were held with project practitioners. The interview questions focused on gaining an understanding of the organisational constraints, how project productivity was understood in the context, methods of measurement, and factors contributing to or inhibiting productivity.

The interviews involved representatives from:

– BHP
– Sydney Water
– Telstra InfraCo
– Woodside Energy
– Woolworths Primary Connect

Interviewees were sought from senior management, middle management, and team member levels. This provided a range of perspectives on productivity and insight into the different dynamics affecting projectivity at different organisational levels.

Refer to Appendix 1: Interview Profile for details of the interviewee demographics.

All interviews were transcribed using Otter.ai software, then reviewed for transcription accuracy. The transcripts where de-identified to preserve the anonymity of the participants.

The literature on project productivity was reviewed to identify codes used to analyse the interview data. The analytical codes were refined through trial coding of interviews, resulting in a final set of analytical codes (Appendix 2). Three independent coders were trained through normalisation sessions, designed to ensure consistency in the coding process.

The analysis process followed a Thematic Analysis approach to coding using a priori codes, comparable to that described by Fereday and Muir-Cochrane (2006). This provided an opportunity to test theory driven codes, while allowing other themes to emerge from the data.

PROJECT WORK AS KNOWLEDGE WORK

PROJECT MANAGEMENT PRODUCTIVITY

A large body of research has investigated organisational and worker productivity from an operational perspective. However, the findings of research into operational productivity must be viewed with caution. Operational work typically involves standardised patterns of activity and interaction that are amenable to benchmarking. In a stable environment, productivity is relatively simple to measure and understand.

Measurement of productivity of some areas of knowledge work, where the work is routine, such as factory operations or call centres, may be relatively straightforward. Productivity can be measured as amount of time spent on routine tasks per employee and per unit of time. Where there is less routine, as in project work, it has proven challenging.

Drucker (1999) distinguishes between the labour productivity of manual and knowledge workers. Measuring the productivity of manual workers was a major concern of the 20th century and is now well understood, particularly in manufacturing. A comparable distinction would also be made between repetitive white collar work and knowledge work. According to Drucker (1991, 1999) knowledge worker productivity measurement and improvement are the most challenging managerial issues of the 21st century and this was confirmed in a meeting with the Australian Statistician, David Gruen, at the start of this study.

Project work can be considered to be knowledge work, characterised by non-repetitiveness, creativity and intangibility (Heidary Dahooie et al., 2018), autonomous, unpredictable, unstructured and organisationally contingent, responding to changing demands (Bosch-Sijtsema et al., 2009), undertaken by workers who deal primarily with information or develop and use knowledge (Drucker, 1991, 1999). Project work, as knowledge work, involves collaboration, interaction and communication (Heerwagen et al., 2004).

Although there is very little literature dealing directly with project management productivity, there is a substantial body of relevant research on the productivity of knowledge workers. However, even in this literature there is considered to be a paucity of research on productivity measurement (Bortoluzzi et al., 2018).

Productivity is a term that is often used with an underlying assumption that it is commonly understood. However, it is subject to many different formal definitions and informal interpretations.

From a scientific perspective, productivity can be thought of as the relationship between inputs and outputs (van der Voordt, 2004) which is reflected in the Australian Productivity Commission's calculation of productivity *"as the ratio of the quantity of output produced to some measure of the quantity of inputs used"* (Productivity Commission, 2021, p. 5). In economic terms the main categories of productivity are labour, capital, material, and total factor productivity (Gordon et al., 2015), the latter capturing all other factors, including changes in knowledge, use of organisational structures or management techniques.

In the context of project management, there is broad consensus within the research literature that project management improves organisational productivity (Cleland, 1984; McHugh & Hogan, 2011), performance (Abbasi & Al-Mharmah, 2000), efficiency (Jeff Stimpson, 2008), and / effectiveness (Shenhar et al., 2001). Three studies stand out in this area.

Research into 251 projects undertaken by a German life insurance company showed a clear relationship between the costs associated with project management and the resultant benefits that the organisation accrued (Lappe & Spang, 2014).

A study of 65 organisations in 2008 investigated the return on investment in project management capability. This research showed that the majority of organisations received tangible value from the implementation of project management (Thomas & Mullaly, 2008).

Pollack and Adler (2014) also address productivity at the organisational level, in what is described as the "first large-scale study that has analysed the impact of project management on productivity" (Georg Gemünden, 2014, p. 4). Based on self-reported data from two longitudinal surveys of Australian businesses, this research found that project management capability significantly increased organisational productivity.

Although previous research has established that project management generally improves organisational productivity, no previous research has investigated how to understand productivity at the level of individual projects or project management functions. This study represents worlds-first research into this area.

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KNOWLEDGE WORKER PRODUCTIVITY

Based on a systematic review of 513 papers published since 2007, Bortoluzzi et al. (2018) concluded that there were no consistently applied measures or definition for workplace productivity. However, some studies stand out as providing insight into how productivity can be measured.

From a review of the literature on productivity of knowledge workers, Ramírez and Nembhard (2004) identified thirteen measures that had been used to measure productivity. They found that between one and five of these measures were used in combination to understand productivity. These measures included:

– quantity (outputs and outcomes)
– costs and/or profitability
– timeliness
– autonomy
– efficiency
– quality
– effectiveness
– customer satisfaction
– innovation/creativity
– project success (including communication)
– responsibility/importance
– knowledge workers' perception of productivity
– absenteeism

Similar proposed surrogates for measuring workplace productivity include engagement, output and performance metrics relating to organisational goals (Bortoluzzi et al., 2018; van der Voordt, 2004). Henderson (2004, 2008) in considering the impact of project managers' communication competencies has provided perhaps the most useful approach to assessment of labour productivity of project teams by drawing upon 8 outcome related questions in Mott's (1972) well validated Organizational Effectiveness Questionnaire that cover productivity, quality, efficiency, anticipation of problems, innovation and adaptation to change.

In cases where it is not possible to directly measure knowledge worker productivity, self-assessed measures of perceived productivity and other subjective evaluations have been found to be effective. These are better than no measure of productivity (Bortoluzzi et al., 2018) and have the flexibility to capture intangible aspects of the unique fluid characteristics of knowledge work (Jääskeläinen & Laihonen, 2013).

Team productivity should not be thought of as only the sum of individual productivity.

A number of researchers (Bosch-Sijtsema et al., 2009; Plum & Mawson, 2015) propose that knowledge worker productivity should be assessed at the team level not the individual level. This is because tasks in the context of knowledge work are rarely individual undertakings. They are usually performed in collaboration with others. Team productivity should not be thought of as only the sum of individual productivity, and overall productivity of the project or the larger organization is dependent on multiple contributions towards overall organizational (or project) goals. This was consistent with what was reported by the interviewees:

"I'm generally less interested in productivity or individual performance, I'm very focused on capital efficiency. So what do I get for my million dollars? Do I get $300,000 worth of materials, do I get $200,000 worth of implementation costs, and the rest of the money's going on engineering and internal costs, and trying to keep that proportion of materials installation as big as possible, because what I find is if we bring in process, and we bring in [company] oversight, and we bring in multiple layers of organizations to support what is ultimately the construction and the materials, then you end up getting per unit a million dollars spent, and much less of the end product being installed. You end up spending it on process, people, overheads, and that's where productivity of process, and organizational structure and contract construction can add the most value for me." *A4_004SM*

MEASURING PRODUCTIVITY IN CAPITAL INTENSIVE PROJECTS

It is not simple to measure the productivity of project management work. Participants in this study consistently remarked upon the difficulties involved in understanding whether projects were being managed in a productive way. The difficulties involved in measuring productivity were amongst the most commonly identified factors in this study, at all organisational levels, and across the participant organisations.

"It's very difficult to do that; very difficult to measure that productivity." *A6_009TM*

"There's no real, not that I'm aware of, no metrics as such for productivity in the owners team." *A1_010TM*

"Where it gets a lot trickier is when you're dealing with complex, multi disciplinary type projects." *A3_005PM*

"So I would say we don't measure productivity and assess productivity all that well." *A2_005PM*

It was common for participants to have measures or benchmarks that allowed them to understand the productivity of repeated, standardised, or trade work, but when it came to understanding the productivity of project management staff as knowledge workers, or at the level of the team or the project management function, there were no clear and direct examples of productivity measurement.

"Obviously, we have productivity measures for blue collar worker sites, from that perspective, but not from an overall project management overhead/productivity." *A4_002SF*

"I think the non-tangible, where it comes into the cultural people management, people development is the more challenging part." *A6_003SM*

"And obviously, clocking hours against deliverables becomes very difficult during the execution phase where you're not obviously producing too many deliverables." *A7_011TF*

This study extends our understanding of project management productivity in capital intensive projects. When asked to describe productivity in the context of their organisation's projects, the aspects most frequently mentioned by participants, are shown in Figure 1. Meeting a typical combination of performance metrics was clearly and not surprisingly the most popular response. The dominance of this perspective is increased when independent mention of **cost**, **schedule**, **quality**, **outcome** and **output** dimensions are considered, all of which are performance metrics treated separately, below.

Productivity measures by frequency of mention
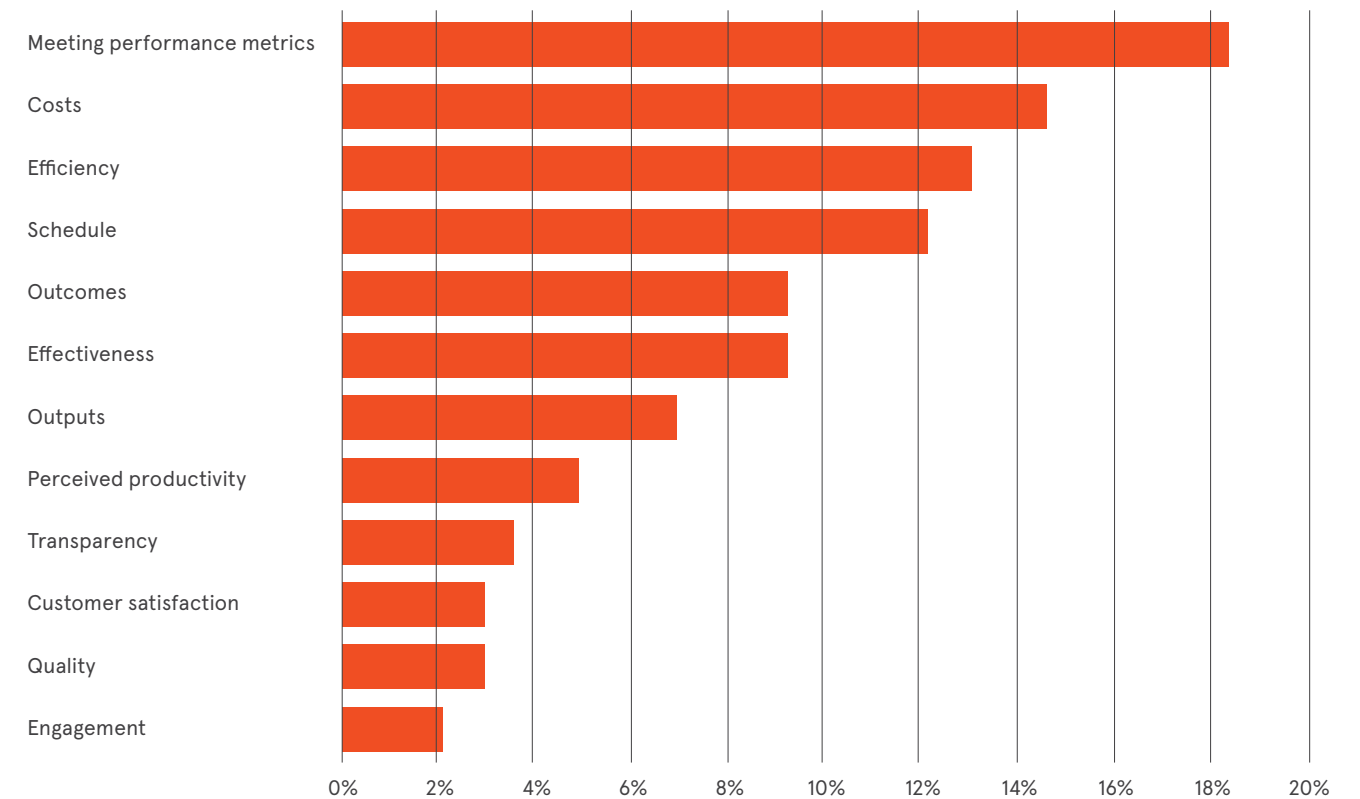
Efficiency includes components of all these dimensions but with a focus on achieving minimum input for maximum output. **Effectiveness** looks at productivity from the perspective of doing the right things and being innovative in striving for continuous improvement. **Transparency** refers to openness and honesty of actual performance data to track productivity. Relatively low frequency of reference to **customer satisfaction** as a factor in productivity is interesting and may be explained by the nature of the organisations and project management functions included in the study. Participants from only two of the organisations in the study mentioned customer satisfaction when describing what was considered to be productivity in relation to their projects and these were the organisations that provide goods and services directly to consumers. **Engagement** was referred to as a softer measure of productivity.

This study found twelve measures relevant to understanding project management productivity in capital intensive projects.

- Meeting performance metrics
- Costs
- Efficiency
- Schedule
- Outcomes
- Effectiveness
- Outputs
- Perceived productivity
- Transparency
- Customer satisfaction
- Quality
- Engagement

Although we identified 12 different measures of productivity based on the interviews with the five participant organisations, it is important to note that the majority of these 'measures' do not directly measure productivity. Many of the measures that directly measure some aspect of productivity are often highly context dependant. For example, a team that is consistently meeting performance metrics may be assumed to be productive. However, this only holds true if we can also assume that the performance metrics they are meeting are an appropriate assessment of what productive 'should' look like in the context of that particular project and they are dependent on the quality of the underpinning estimates. A consistently performing team may be lucky enough to be given estimates with significant contingency. A team that rarely meets their time and cost baselines might be highly productive, but always given stretch targets to challenge them to excel further.

Many of these measures are actually proxies for productivity and can be used to measure aspects of the context, team, or project that may be more conducive to productive work. High levels of team engagement are typically associated with productive teams, but engagement and productivity are not the same phenomena.

Factors like engagement, perceived productivity, and transparency might be lead indicators of productivity that can be used to measure whether a team is likely to be operating in a productive manner. Other measures may be an indicator of productivity for a manager to use when interpreting the productivity of their personnel, but do not provide the kind of productivity measure amenable to quantitative assessment or management reporting.

Participants in this study consistently remarked upon the difficulties involved in understanding whether projects were being managed in a productive way.

It was clear from the interviews that there was a tendency to rely on predetermined performance metrics, and that this was partly because these were easy to measure, either because they aligned with cultural expectations of value within the organisations, or because the data was available through existing management reporting systems, rather than because they were the most effective ways of measuring productivity. This suggests an error in favour of ease of measurement over accuracy of measurement. Research by Bortoluzzi et al. (2018) concluded that when measuring the productivity of knowledge work it is important to use a variety of measures, and that no one measure is likely to capture the complete picture of productivity. Instead, organisations should construct a suite of measures, based on the demands of their local business needs.

In the following section we discuss each of the 12 measures in turn.

Meeting performance metrics

Productivity in capital intensive project contexts was consistently interpreted as being able to predictably meet performance metrics, primarily those relating to cost and time, and delivering expected outcomes in alignment with business strategy.

"When we talk productivity we talk budget, cost forecast and time." *A3_002PM*

"It is predictability to delivering our projects on cost on time safely, it is efficiently delivering our products smarter, more effectively, and it is delivering, at the end of the day, the value of the project that it was set out to achieve." *A6_002SF*

"Okay, hit your target on cost and schedule, get the outcome, and then you're done." *A8_003SM*

"… obviously in project world you've got the challenging trilogy of quality, cost and schedule. Productivity to me is getting the right balance across the three." *A1_004PF*

"Look, it's probably about getting the details right and getting the budgeting right, getting the forecast right, delivering on time, achieving your milestones." *A2_010PM*

It was acknowledged that assessing productivity on the basis of pre-determined cost and time was the easy part but not the full story. Safety, for instance, "not killing anyone, not hurting anyone is a given" [A6_003SM] is fundamental to project productivity.

Interviewees noted significant effort during project execution in monitoring performance against pre-determined metrics through a variety of reporting mechanisms. Earned Value Management was a common approach to monitoring progress.

"So usually when we reach around the CPI SPI of 30% of the project progress, this is where we establish a trend, and we monitor the trend on a monthly basis, and we monitor the milestones." *A3_002PM*

"… so predictability, we essentially measure our cost performance against KPIs set per project, as well as the schedule KPIs per project." *A1_002SF*

Predicably meeting performance metrics was a core value. There was a general perception that if one were delivering a project and predictably meeting milestones and targets, then the project was being delivered in a productive way. There was awareness of the importance of predictability to organisational forecasting, with potential personal repercussions if a project was not delivered to expectations.

"Well that will widen the impact of how the business that's delivering projects performs, so you need to be predictable." *A6_001SM*

"But since I've been in this role, I would say, I've got a very acute awareness of why the predictability is so well managed at [company] because the reaction to bad news has been astoundingly surprising to me…" *A8_001SM*

The predictability of meeting performance metrics was the prime proxy for project management productivity. However, this metric is somewhat fraught. It is dependent upon the quality of the original estimation process as eloquently expressed in Roger Atkinson's (1999) paper "*Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria*." If initial estimates are poorly conceived, then they reveal little about whether the project is being delivered in a productive way.

Predictably meeting performance metrics is the prime proxy for project management productivity.

In addition, reliance on predetermined performance metrics can constrain innovation and reduce opportunity to create value upon discovery. Although interviewees referred to internal value optimisation mechanisms, a strong emphasis on predictability may undermine opportunities to provide value not originally considered when the project was planned.

Cost

The cost and budget were two of the prime measures of productivity in our sample of organisations that focused on capital intensive projects.

"I would say it is primarily focused around productivity, cost takeout, cost avoidance, from an operational standpoint would be our main driver of productivity." *A2_014PM*

"So for me, in my space in lump sum contracts, I'm very focused on how do I get the [company] overheads down." *A4_004SM*

"If you ordered in bulk, it's cheaper, right. So, if you do that, you're productive, you're reducing costs." *A2_008TM*

"The business is loaning us capital to achieve a certain rate of return. Effectively the project can't complete until that rate of return has been established." *A5_016TM*

Cost is used as a measure of productivity at four different levels:

1. Portfolio
2. Project lifecycle
3. Project manager
4. Project team

At the portfolio level, cost is considered as a long-term metric that could be used to measure trends in project productivity. It becomes useful when the organisation has a sufficiently large sample of projects. Although individual variation in projects was anticipated, analysis of project costs across the portfolio could provide an understanding of longitudinal trends.

Within the life of a single project, the interviewees noted the inverse relationship between costs incurred during the study / design phase, and costs during delivery. Reducing investment in the study / design phase was anticipated to leave the project vulnerable to higher chances of problematic discoveries during delivery, leading to delay and rework.

"… that was actually something that was standing out to me, when you were talking about relativity between study cost and project cost. Because I imagine if the study is doing its job well, then you're going to find savings, which reduce the project cost." *A6_005PM*

Cost was also considered to be a measure of individual project manager productivity. In this case, cost was understood less as a clear measure, and more as a way of interpreting the amount of work that an individual should be able to manage, if they are working productively. This was used as a way of assigning projects to project managers and making comparative evaluations.

"So you can say, for example, as a rough rule of thumb, that a project manager should be able to manage certainly millions of dollars a year in that environment." *A3_005PM*

At the project team level, cost was used as way of understanding whether the overall project team was working productively. This was understood as the relationship between the number of staff working on the project as a percentage of the overall project costs.

"… for me, describing productivity is looking at, really, one set of metrics, which is about number of FTE's that we actually have versus the capital and duration complexity that we have to deliver a project in, right? So for me, it's about what is our overhead of an FTE dollar, [Company] FTE versus complexity." *A4_002SF*

Efficiency

Efficiency generally implies the application of minimum input for maximum output, or the least effort or use of resources for the greatest impact. As the focus of this study is productivity in the project management function of capital intensive organisations, it is not surprising that capital efficiency and return on investment were considered as indicators of productivity. From a project perspective, efficiency includes aspects of time, cost, quality and scope and when describing how productivity is defined in the project management function of their organisation, participants often referred to efficiency in close association with or interchangeably with productivity.

In terms of capital efficiency, there are many well accepted measures available such as net present value, internal rates of return and capital efficiency ratios [A1_001SM]. Return on investment can be measured if incremental revenue increase can be connected to particular project effort.

"... most of the projects that I work on either have a return on investment proposition or they have a revenue uplift associated to them. I've got one that is related to safety that's not driven by the commercials. But even still, that's now morphing towards something that will be commercially beneficial." *A5_006TM*

As a general indicator of productivity in the management of projects, efficiency involves delivering value as quickly as possible, using minimum capital, effort and resources. Productivity was described as *"how efficiently you're developing those deliverables"* [A1_013T] and *"ensuring that we achieve the outcome in the most efficient manner, with respect to time and capital"* [A8_012TM]. At the portfolio level, it can be seen as being able to *"deliver the optimal portfolio faster and cheaper, at the best quality that we can"* [A6_002SF].

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As a general indicator of productivity in the management of projects, efficiency involves delivering value as quickly as possible, using minimum capital, effort and resources.

From an efficiency perspective, improving productivity involves *"a reduction in cost to deliver, and in elapsed time to deliver"* [A2_001SF] and *"taking something that you do regularly, and doing it quicker ... less time, less money, productivity goes up"* [A3_006SM]. There is also a strong theme of optimisation.

"Productivity ideally is one of optimization. How do we get the most out of the same, or how do we get the same with less ... just doing each and every step or activity or phase in the most optimal way." *A5_005PM*

Efficiency is often associated with headcount or resources required or the number of people working on a project relative to capital expenditure or value delivered as an indicator of input to output.

"I'm always looking for the evidence that we actually need to add more people to manage projects. It's very easy to say oh we've got another ten pieces of work, we need to put on another three project managers and I'm always looking for the evidence to suggest that we're at the right utilization rate and we need to increase our headcount." *A2_001SF*

This idea of efficiency in terms of ratio of people to projects is influenced by the ability of individuals *"to manage multiple projects or the extent of the volume and value of projects an individual can manage"* [A2_001SF].

The efficiency and capability of individuals will affect productivity in terms of the number of projects they are able to manage at one time and their ability to deal with challenges:

"... how efficiently can they handle a changing project environment to still deliver ... as quickly as possible and pragmatically, ... that, I suspect needs to go into the consideration of productivity. Because, if they've handled that well, then I would define them as an efficient or an effective project manager." **[***A3_007PM***]**

Schedule

Managing a project to a pre-determined schedule, and achieving milestones, is a key measure of productivity. Delivery according to baselines was a core value amongst the majority of the interviewees.

"Okay, so obviously you've got your hard, cold numbers of you know, has the project manager been meeting their baseline milestone dates that were set in the original business cases..." *A3_007PM*

"... we are always schedule driven and so our scheduling tool is really the key tool there basically so all our activities are defined to the nth degree and we track against the baseline." *A6_012TM*

The centrality of the schedule is unsurprising, given its role in coordinating the many stakeholders and contractors typically involved in capital intensive projects. The schedule plays an integrative role, giving a common point of reference, defining the temporal interfaces between the actors.

Time was also noted as a driver of cost. The relationship between the labour on a project and the benefits that the organisation accrued from the project was seen as a key way of measuring the overall productivity of projects. Schedule was predominantly thought of as a driver of cost through man hours, rather than a direct aspect of productivity.

"So productivity really is, I guess, man hours, time taken to deliver against the value that it's given the business." *A5_006TM*

"And we've set up a site factor that correlates with that and says ... for your typical 10 hour working day, say the maximum productive time is 7.6 hours and a productivity factor of 1.4, that's for onshore. Our offshore assets are a little bit less than that, we say we are 9.5 hours productive out of a 12 hour day because we've slightly different working days between onshore and offshore." *A4_005PM*

However, there were multiple instances where the interviewees described crisis situations, at which point schedule became the primary way of understanding productivity. At these points, productivity was understood in terms of the speed with which a solution could be brought to bear.

"And we had 12 months from when we were requested to start a project when we were told we needed to have this new accommodation in place. So in that scenario, and the impact of missing that date is that this whole shutdown's in jeopardy." *A7_005PM*

At the individual level, time was also seen as a way of measuring client-side productivity. Acknowledging that during delivery, the client plays a key enabling role for the contractor, time was considered an essential way of monitoring whether the client team were an obstruction to contractor progress, or expediting their progress. This was measured as the client's responsiveness to contractor requests or submissions.

"So if we need a safety plan reviewed, they've got 14 days to review it. On our engineers, if a contractor submits a request for information, they've got three days to turn that around. So all of that helps drives productivity, and that's measured all throughout our online system as well." *A3_003PM*

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Managing a project to a pre-determined schedule, and achieving milestones, is a key measure of productivity.

Outcomes
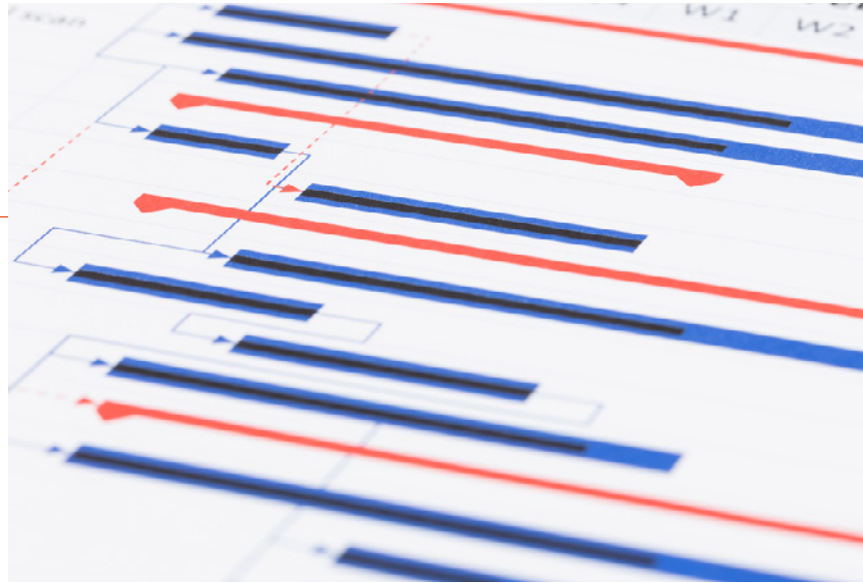
There has been considerable discussion in recent years in project management practice about the need to move from a focus on delivery of outputs from projects to focus more on the outcomes those outputs are expected to deliver for the business. From this perspective, productivity is not just a matter of the level of effort or resource expended in efficiently and predictably delivering outputs, but is concerned with the quality of the outcomes achieved for the business.

"How do we get this whole project operation across the line and deliver a business outcome?" *A5_014PM*

"… one way of definition is, how many of our outcomes have we achieved?" *A2_015TM*

For some, productivity of the project management function may be delivering an outcome that is more productive for the business [A5_009SM] which involves effective transfer from the project to business and operations [A5_014PM].

Outcomes, like outputs or deliverables is a broad term that may mean many things from shareholder value, to risk reduction or social value [A7_003SM, A1_005PM, A2_005PM]. However, as several participants pointed out, outcomes may not be realised or called to account until after the project has closed and the team disbanded. Some business outcomes will not be realised until a program of projects has been completed. They may never be called to account unless there is some form of measurement such as post investment review [A6_005PM, A2_005PM].

"You can't see any progress going on, but magically everything sort of works towards the end." *A2_005PM*

"There are the business case measures of what outcomes we intend to achieve with this. At the end of the day a project creates a capability, and the capability needs to serve an outcome." *A5_002TM*

Effectiveness

Whereas efficiency focuses on achieving minimum input for maximum output, productivity from an effectiveness perspective is concerned with doing the right things to achieve the most beneficial outcome, and being innovative in striving for continuous improvement. It can look slightly different at the level of the project, the project portfolio or the business.

Being effective at the business level means identifying, defining and delivering the right set of projects that will deliver the best value or return on investment for the business, not just in monetary terms but in alignment with the overall strategy including such concerns as risk, safety, sustainability, reputation and corporate social responsibility.

"We're trying to define the problem that the business is trying to solve and we're now trying to pick a solution that is delivering the best value for the business." *A8_012TM*

"Linking the project progress and closure to our organisational goals and objectives, is another area that we can define as productivity." *A2_008TM*

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Productivity from an effectiveness perspective is concerned with doing the right things to achieve the most beneficial outcome, and being innovative in striving for continuous improvement.

Effectiveness at this level may include deciding not to proceed with a project, to modify the scope or delay progress in order to improve beneficial outcomes for the business.

One way of measuring effectiveness is to monitor ideas for value optimisation, and whether they are seen through to delivery and generation of business value [A6_002SF]. However, it is much easier to find ideas for optimising value if the initial solution is poor and expensive and much more difficult if the initial solution is well conceived [A7_005PM].

At the project level, to be productive, the project manager is expected to be effective by doing the right things to deliver value.

"if I had to put something around productivity … it would be more about how effective you are at driving outcomes I think, rather than work output over time." *A5_015TF*

"The effectiveness of the project manager is not about just delivering the investment on time and cost. It's greater than that, especially for organizations like ours where you want sustainability." *A6_003SM*

Effectiveness of the project manager and team is difficult to measure. One method of assessment is understanding, from reviews, the extent to which they are in control of the project, and how well they deal with issues when they arise.

Outputs

Productivity may be measured in terms of the work done or outputs delivered. This is one of the easier and more commonly used approaches.

"Productivity means, how much work you get done, in real simple terms." *A2_006PM*

It can be done by *"tracking against deliverables"* [A1_018TF]. Earned value management can be used to track outputs *"in terms of the number of deliverables through the door and signed off and approved"* but this *"can sometimes be totally the wrong story"* [A8_014TM]. Where hours of work are recorded and allocated against particular projects, tasks or deliverables it is possible to measure the amount of work done and resources used to achieve deliverables and the quantity of output delivered. However, this can be relatively meaningless unless there are available benchmarks. Such benchmarks are only possible to develop where the same or similar deliverables are regularly produced.

"So, in terms of productivity the throughput … I track that on a weekly basis, how many of these, do my internal resources, and our external contractors get done per week. That's one key measure of productivity." *A2_006PM*

Where agile approaches are used, outputs can be user stories or features and the number of these delivered over a set period can be measured as an indicator of productivity. Other organisations track deliverables at milestones [A5_014PM].

"… productivity for us … is really larger milestones … we wouldn't necessarily then drill down into things such as similar projects and hours spent by the project manager on one project, similar to another. We don't get to that detail." *A5_016TM*

In engineering work, productivity may be measured based on deliverables such as the number of drawings or specifications, and number of hours to produce them assessed against norms developed over time. Where contractors are involved they may submit norms for engineering work as part of the contracts against which productivity can be measured [A4_005PM].

Perceived productivity

Regardless of the effort we put into aiming for transparent and objective measures, *"measuring productivity is quite subjective on many fronts"* A2_005PM. Research suggests that self-assessed measures of productivity and assessment of observed behaviour are widely used, especially for knowledge work (Bortoluzzi et al., 2018).

Managers are able to observe what they perceive to be productivity but this is primarily related to activity and output rather than efficiency, effectiveness and delivery of outcomes.

"… inherently as a manager, you know, roughly, which parts of the team are working hard. You can see the emails, you can see when people are online, all these sorts of things. *A2_005PM*

"… we pay attention to our documentation. If documentation, during and after or before the project has been completed properly, recorded properly, accurately, then again, that's another way of measuring how productive the project team has been." *A2_008TM*

Many of the measures used for productivity in knowledge work are proxies, such as health checks or employee perception or satisfaction surveys to *"understand the mood of the team"* [A6_014TM]. On projects, if everything is progressing according to plan, if there are no issues or incident, there may be an assumption of productivity.

"… when we track it every week in our project working group meetings, when we check in with them to see how they're progressing, we think that we're actually being extremely productive, and we're on track or, we're delivering it faster. But really, we're not maximising that productivity." *A5_004PF*

Transparency

Transparency featured as both a proxy measure for productivity, and a factor contributing to increased productivity. In terms of measuring productivity, transparency provided a measure of team psychological safety, transparency in the relationship with the contractor, and transparency in reporting data. Transparency acts as a measure for understanding whether there are factors that impact upon productivity.

Psychological safety is a factor that is known to increase a team's ability to raise sensitive issues, without fear of censure. Teams lacking psychological safety will be more reluctant to raise issues at early stages. Thus, issues are more likely to result in delay and rework, reducing productivity. If staff are willingly open and transparent with management, it is an indication of increased psychological safety, a precursor to productivity.

"And that's a cultural thing where [you] … never put up a red project 'cause you get your head beaten in. So, culturally, that's not a good thing and something I don't want in my team. So I ask for some transparency. Nothing wrong with having a red project, you know, most projects do go red at times. It's what you're doing to return to green, is my general philosophy on it." *A2_005PM*

A transparent environment was also reported to be one where it was easier to be up-front about changes to a project, with the potential consequence that projects could be managed with less contingency, reducing the overall capital requirement for a project.

"So I think we've just gone to the mode of appreciating, well if there's increases it's easier for us to explain the increases or decreases as opposed to the padding because then why you've padded it out so much, that's a more difficult conversation…" *A6_012TM*

Transparency between the client and contractor also provided a measure of the productivity of the client team. The contractor relationship was seen as a major way of understanding client productivity. If the client project management team is not being productive, a transparent relationship between the client and contractor will provide an effective way of communicating this issue at a more senior level and addressing any delay that the client is causing the contractor.

"We heavily rely on our leaders to manage and be very transparent in the performance of their own teams and some of it is metric based because if an owner's team is underperforming, but we've got a strongly performing contractor, that will come out through the relationship management piece, right?" *A4_001SM*

The transparency of internal documentation also provides a proxy measure of productivity. Transparent and detailed internal documentation provides a way for management at the program or portfolio level to understand if the client team is productive.

"… there's so much data, very hard to hide if you've got an underperforming owner team." *A4_001SM*

Customer satisfaction

The satisfaction of the customer was considered an important aspect of understanding and measuring project productivity for some project management functions. The majority of the interviewees were involved in the project function of a client organisation that was delivering projects to a separate operational part of their business. However, only interviewees from organisations that provide goods and services directly to consumers provided evidence that their client project organisations had a strong customer orientation, viewing the operational aspects of the business as the client for the project organisation.

"… customer satisfaction, that is what's on the top of the agenda, making sure customers are satisfied, happy with their involvement, trusting us as the party to provide this project management service to them…" *A2_008TM*

In these cases, the satisfaction of the business with the project outputs was considered a central measure of overall project productivity.

Quality

The quality of the end product was identified by the interviewees as a factor in understanding productivity, but it is interesting to note that consideration of quality of project outputs was rare; significantly less than consideration of time and cost, the other two aspects of the project management Iron Triangle. In some cases, interviewees explicitly discussed not considering quality an aspect of productivity.

"So there are quality elements that we track, but from a productivity perspective, no." *A2_006PM*

The quality of the project outputs appeared to be seen as something within the contractor's remit, not that of the client. Where client's consideration of quality did have an impact on project productivity, it was in terms of the quality of the project process, and the ability of process to assist in avoiding reputational damage, delays due to land access, and meeting broader social targets related to diversity, inclusion, and team development.

Engagement

Project productivity was also measured in terms of employee engagement. Engagement was not considered a direct measure of productivity, but acted in a way that is comparable to transparency. Engagement is a factor that contributed to a productive environment, and could be taken as a proxy for productivity. Employee engagement surveys were used as the primary method of measuring engagement.

"I feel like morale is a huge contributor to whether someone is productive or not. Now, whether or not you can measure that their productivity has risen, because then their morale has risen, is something that I don't think we accurately measure at all. But it's absolutely proven that if they are happier, if we have more of a team cohesion, they feel like they're part of a team and they are very aware of what goals it is that they're trying to reach." *A5_004PF*

"Morale is a huge contributor to whether someone is productive or not."

PROJECT PRODUCTIVITY MEASURES

Research into productivity typically treats it as a dependent variable that can be improved or diminished by particular factors. In project research, project success is most widely used as the dependent variable, and there is a considerable amount of research addressing the relationship between factors such as project management methodologies and competencies of project managers, and project outcomes or project success (Ika, 2009; Jugdev & Müller, 2005). However, there remains no common definition for what constitutes project success (Albert et al., 2017; Davis, 2014). Furthermore, the relationship between productivity and success remains complex, and productivity may both contribute to the success of a project, and be the result of successes within a project. Measurement of both productivity and project success remains challenging.

This section summarises productivity measures in capital intensive projects, drawing on the interviews and the documentation provided by the participating organisations.

Table 1:
Summary of Project Productivity Metrics.

|	Measure	Description	Comment
Project Level Measures	Earned Value	The Cost Performance Index and Schedule Performance Index based on initial estimates of time and cost.	Dependent upon the quality of initial estimates. Estimates with slack may increase predictability but reduce productivity.
	Cost (portfolio level)	Trend-based analysis, benchmarked against a large sample of comparable projects.	Dependent upon a large body of data and a classification system that allows comparison of like for like.
	Cost (project phase)	The relative staff overhead costs of project phases, e.g. comparing study/design phase costs to delivery overhead or capital costs.	Reduced study / design costs as productivity gains may result in additional rework, and lower predictability.
	Cost (project team)	The relationship between staff costs and overall project costs (e.g. Opex vs. Capex).	Reducing owner staff overhead may reduce contractor oversight and overall quality, and increase rework.
	Schedule	Is the project meeting pre-determined milestone dates.	Dependent upon the quality of initial estimates. May ignore productivity gains through discovery during the project.
	Labour efficiency	What percentage of hours per shift are effective labour hours.	Constraints will be site-dependent.
	Response time	Client team turnaround of contractor RFI, claims, variations and other documentation.	Overly rapid response may indicate immature responses.
	Relationship early warning	The ratio of early warnings about contractor issues to issues with contractors that result in substantive issues, e.g. claims.	Dependent on an effective way of flagging and acting upon problems before they escalate.
	Transparency with contractor	The contractor provides a rapid indicator if the owner's team is not working productively.	Dependent upon senior peer-to-peer relationships with the contractor to escalate issues.
	Transparent documentation	Detail in internal documentation provides traceability of decision-making.	Too much time on detailed documentation takes away from design and delivery activities.
	Contractor output	Speed and quality of contractor output suggest the owner's project management team are facilitating the process.	An effective contractor may be able to work around an unproductive owner's team.
	Internal customer satisfaction	If the business is satisfied with the outcomes of the project, it can be considered a productive endeavour.	Significant delay in understanding success, and the business may not be motivated by productive delivery.
Individual Measures	Manager assessment	Detailed questioning provides an indication of whether the project manager is aware of the factors they should be considering in this kind of project.	Dependent upon a manager with detailed knowledge of the kinds of projects their project managers are working on.
	Cost (project manager)	An assessment of the productivity of an individual project manager. The dollar value of projects an individual should be able to oversee, taking complexity into account .	Dependent upon a manager with detailed knowledge of the kinds of projects their project managers are working on.
	Efficiency	The measure of inputs to outputs, e.g. drawings per day per FTE .	May ignore fluctuations in the complexity of individual pieces of work.
	Transparency within owner team	Individuals comfortably transparently raising issues without fear of blame indicates psychological safety.	Psychologically safety is a precursor to productivity.
	Employee engagement surveys	Engaged employees are more likely to be motivated and productive.	Engagement is a precursor to productivity.

FACTORS AFFECTING PROJECT PRODUCTIVITY

Participants in this study were asked to describe times when they considered their productivity or that of their teams, was higher or lower than usual. In responding to this question and throughout the interviews they talked about the conditions and factors that supported project productivity and those that reduced or undermined it. Many factors were identified. Those that were mentioned most frequently are presented in Figure 2 and this is followed by discussion of how these factors can work to positively or negatively impact productivity in projects and the owner side project management function of capital intensive organisations and projects.

Figure 2: Factors impacting productivity.

Factors impacting productivity by frequency of mention
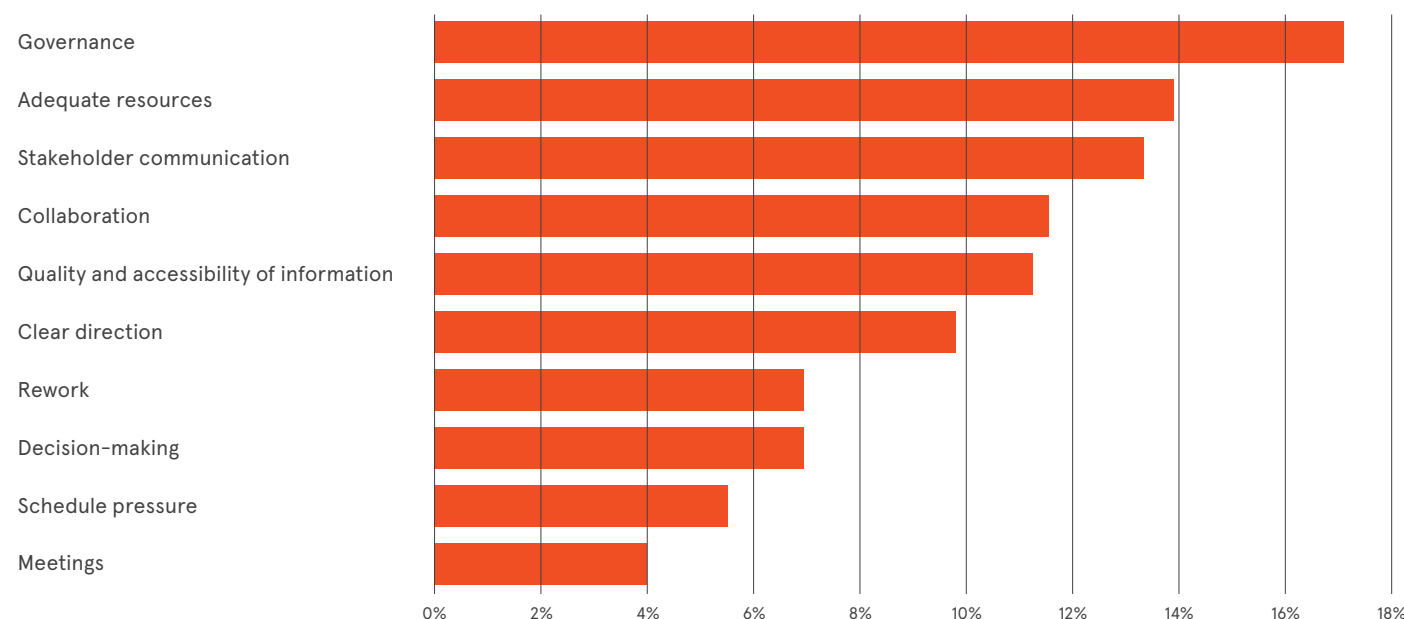
Governance

Effective governance supports many aspects of productivity. Conversely, time consuming governance processes can delay decision-making and reduce productivity by undermining efficiency, increasing costs and blowing out schedules.

If approval has to be signed off multiple times by different people, in each case reviewing risk, estimates, cost, and schedule as part of the governance process, this can reduce productivity considerably by adding effort and causing delays.

"It's a trade off, isn't it, predictability and efficiency, because in theory you have to trade one off but our organization wants both. We never give you any relief on the efficiency, but we want you to be predictable and so we've got to put layers of governance to make sure you got it." *A7_003SM*

Risk aversion and a desire for predictability go hand in hand. Owner side capital intensive project leadership typically strives to avoid surprises, putting in considerable effort up front to investigate and arrive at a solution that will provide the best return on investment and then to plan out the project for predictable delivery. This approach, putting time and effort into making the right investment and planning upfront, can be seen as productive from an effectiveness perspective, but may come at the expense of efficiency as it increases effort and may significantly increase time to delivery of the completed project. This needs to be balanced and different approaches to measurement of productivity applied in response to combinations of market and environmental conditions, drivers and desired outcomes.

The majority of capital intensive organisations have processes, policies and procedures that have evolved over time and despite attempts at renewal may still carry with them a degree of inertia {A1_015TM} so there may still be room for review to increase productivity.

"... we've got to improve our own efficiencies across the board by being less process driven. Empowering our leaders and our teams to take action and remove processes as long as they continue to own the outcome." *A4_001SM*

At the same time, these organisations are highly sensitive to risk and much of the governance has been developed to provide the strong discipline required to minimise vulnerability particularly to *"those low probability high consequence events that can take a company out"* [A4_001SM].

"That said, I think what we've seen over the last probably decade or so is that we've gone too far [with governance] and we think we can take some process out without adding an inordinate risk". *A4_001SM*

"... a robust governance structure [is] in place to ensure that we're not wasting money and spending frivolously. But ... as a result, ... it can take months to get a business case approved so if we could find a way to streamline that process, that will really help in terms of productivity, that really would." *A3_003PM*

There is clearly a need for informed balance between the discipline needed to protect the business and a fit for purpose approach to governance that will support productivity. There is tension inherent in achieving this balance and it should be done clearly and intentionally so that the project management function are not faced with the uncertainty of *"taking a fit for purpose approach, or ... here's your guideline just follow that"* [A8_012TM].

Some improvement could be achieved just by streamlining the systems that must be used as part of the governance framework.

"... we've got some very very good systems but we've also got some systems which are very clunky. And I have learned [that] using the systems is the best way to get anything done .... it can be frustrating using them, but you don't use them, your outcome won't be as good." *A6_015TM*

Time consuming governance processes can reduce productivity by extending the project lifecyle and time to market. Streamlined, fit for purpose governance and speedy decision making will support project productivity by reducing overhead, increasing speed to handover, and reducing delays.

" I think we can optimize the level of governance that projects are faced with...there's multiple stages of governance that we go through, and a lot of the time that's duplication.... there must be a better way to govern these projects to actually achieve the same outcome without having to duplicate a lot of the time." *A6_010TM*

Adequate Resources

Productivity, regardless of how it is measured, is dependent upon adequate resourcing and this applies to the individual doing the work, to the project and the portfolio of projects. It applies to all forms of resourcing including people, tools, equipment and supplies.

At the individual level, people, to be productive, need *"good infrastructure, good support"* [A6_003SM], the tools to do the work and the skills to use them.

"You have the tools, and you can do your job, that's all you need." *A2_008TM*

Individual productivity can be reduced when people become frustrated because of a lack of resources required to get on with their work or to progress the project. Some people cope better with frustrating or uncertain circumstances than others and loss of productivity in the project may be evidenced by *"disputes and missed milestones and continual re-forecasting of costs and all of the other more quantitative measures which would suggest a project in distress"* [A2_001SF].

At the portfolio level it is important to ensure that there is capacity to adequately resource all projects in portfolio.

"We've got backing, all the way up to the CEO and the CFO. It's fully funded and everybody's leaning in, we're starting to see some runs on the board." *A5_005PM*

For productivity from the efficiency perspective however, projects should not be over-resourced.

"We make sure that we've got just enough people who are occupied with healthy and meaningful work across all projects and there are not people who are underutilized or over utilized to a point where it can't be sustainable." *A5_014PM*

It is important to have the right resources. This may be people *"that can actually make the decisions"* [A7_008PM] or the required expertise or specialist knowledge or making sure that key resources are not spread too thinly or *"focused on something else"* [A8_012TM]. Adequate resourcing can also include being provided with the necessary leadership and decision making support. Schedule pressure was identified as a driver for adequate resourcing.

"In those cases when you do have one of those really schedule driven projects the internal resources that you need are available, whether that be people and the right people, not just bodies but getting access to the right people." *A5_005PM*

"Whereas when you're not under as much schedule pressure, you don't have the resources available to you, you don't have the luxury of having [the support] there to hold your hand and manage your through. It definitely takes longer." *A1_014TM*

Having the right human resources on a project is constrained by the availability of experienced and capable people.

"... in terms of project productivity ... we've got multiple teams with varying levels of experience, expertise, and wherever possible, we try and ... ensure that we've got the right level of expertise but ... we're also constrained ... with our headcount and also with the large number of projects that we've got on the go ... we don't always have the A team on each project and so it's a case of some projects, their productivity may well differ to others that are run by a team with broader experience." *A5_009SM*

"We have more work than we have competent project managers." *A2_001SF*

Individual productivity varies considerably as do ways of working and this will affect the productivity of the team and the project. If some members of the team are struggling this can cause *"more stress for that team"* [A5_009SM]. Recognising this and allocating people to projects and roles also takes experience and expertise with implications for overall productivity.

"... you might have several people to whom you've allocated three projects because that seems appropriate according to the utilization rate. But, one might be handling it really well. And then the other person might have disputes or delayed milestones." *A2_001SF*

Stakeholder Communication

Productivity on projects is affected by a wide range of issues associated with collaboration with internal and external stakeholder groups. These issues include integration between projects and contractors, between projects and internal stakeholders, and within projects across lifecycle stages.

In-depth, and early, communication with internal business customers is a key factor affecting productivity, and in ensuring that the 'right' project is delivered with a minimum of rework.

In-depth, and early, communication with internal business customers is a key factor affecting productivity, and in ensuring that the 'right' project is delivered with a minimum of rework. This kind of communication with internal customers on project definition is most pressing during the early conceptual stages of projects, leading to opportunities to question the real business value of proposed projects.

"... if that opportunity framing actually happened ... that encourages the customer to think twice about what they actually want and is it value for the business rather than, you know gold plating ..." *A6_004PF*

"... well maybe we should put that effort upfront, so that we know that once we do go midway through a project ... oops, we just realized $5 million down the track, that there was no more business value or the client has decided or the customer has decided that they no longer want this." *A6_004PF*

Irrespective of an intention to involve the customer in project definition, it was found that organisational structures and processes could become obstacles to value optimisation.

"Now I've got engineers who are on site who have got the history who can easily give a much more workable solution, except that conduit doesn't exist to the customer." *A8_004PF*

Internal customers were also seen as potential impediments to productivity on projects, particularly as a source of late scope changes, leading to rework, and eroding the ability of projects to predictably deliver to pre-determined milestones. Interviewees spoke of the need to protect project productivity from the vagaries of the occasional inconsistent customer.

"... scope always increases, people really love increasing scope so again productivity can be unrealistic." *A2_016TF*

"... if you don't make your decisions and if you don't document them, you bet your bottom dollar, couple of weeks later, or just close to deployment, or through testing when they're going, 'that's not what I expected, I wanted this'." *A2_016TF*

Effective communication within the project was equally viewed as essential for productivity. This included integration between lifecycle phases, to ensure that planners were drawing upon insight from those who would be delivering the project: *"There is a disconnect between the people that do the planning for the projects and the people that start executing those projects"* A7_004PF, and more general integration between the contractor and the different owner teams involved in delivery.

"... they were able to achieve the project successfully even with those extra constraints put on it because the project group {was} working together as an integrated project as opposed to the silos of different functions and the contractor and the owners team working on their own ..." *A6_007PF*

Managing external relations was shown in the interviews to be a key factor affecting the ability of a project manager to maintain the pace and productivity of projects.

Managing external relations was shown in the interviews to be a key factor affecting the ability of a project manager to maintain the pace and productivity of projects. External factors were regarded as a more significant risk for major delay than engineering-related issues: *"So time is a factor, generally, of complexity and more, I would say, external stakeholder management complexity rather than technical complexity"* [A4_002SF]. Those that invested time and energy maintaining social capital within their broader social network had the ability to call on resources in crises, avoiding unnecessary delay: *"He had relationships with Council, picked up the phone and stuff just happened"* [A2_005PM]. This highlighted the need for project managers to act as an information hub, keeping stakeholders abreast of change and avoiding unnecessary surprises.

"... a poor project manager who's not being effective in preparing them for what's to come, is going to find out pretty quickly that they're not going to play ball, they won't let contractors on site at the times they we're expecting and so yeah, if there's changing requirements on a project, the quicker or the more effectively the project manager can communicate them and get people to understand their perspective, the more likely the project is not going to get stuck in limbo and you won't suffer gridlock on progress. Yeah, that's, I guess, it's hard to explain given all the stakeholders but that's the sort of day in the life of a project manager, handling change." *A3_007PM*

Collaboration

Projects involve many people, business and functional units and organisations, contractors and suppliers that must work together to achieve results. There are many dependencies within and between organisations and it is therefore not surprising that interdependence and collaboration were often mentioned by participants as factors that either improved or hampered productivity. Stakeholder communications arise from these interdependencies and collaborations, so that, taken together, these two relationship related factors have a significant influence on productivity.

Interdependencies that can undermine productivity include resource availability, different levels of quality, efficiency and effectiveness across teams relying upon one another to progress the work, functional or business units that contribute to the project operating at different speeds and supply chain issues.

"... you're probably going to get a six or seven teams minimum across the organization to make that happen." *A2_014PM*

"If you have one link in that chain that isn't a professional, that isn't doing their right task then the whole thing could stumble, quite significantly." *A3_001SM*

"You do lose a lot of productivity if you have one person holding three of the streams and then there are people just waiting for the information really to get started on something." *A5_014PM*

"You can have inefficiency particularly if you have a technical and commercial stream running at different paces. Then you're only as fast as your slowest ... You do have to put a stop on some technical work to allow commercial to catch up ... otherwise you do get out of sync." *A4_002SF*

In all participating organisations, in addition to the direct project team, there are multiple functions and business units that either contribute to, are users or recipients of the products of the project. In addition, there will be consultants, contractors and suppliers who contribute in many ways through design and delivery to operation. In capital intensive projects, there also tend to be

different teams responsible for different phases, further increasing the interfaces that need to be negotiated. Establishing good collaborative relationships between the parties can improve productivity in many ways through decision making, communications, quality and accessibility of information, reduced rework and expediting of delivery.

Quite simply, if the right people, at the right level, can get together, they can quickly resolve problems and remove blockages that might impede productivity.

"... a lot of blockers that don't need to be there can easily be removed when you get the right people around the table to remove them." *A1_007PF*

Participants from all organisations claimed that productivity and overall performance improved when there was *"closer relationship and interaction"* [A6_004PF] with the client and between all parties involved in delivering the project across all phases of the lifecycle.

Reference was often made, by participants, to the need for a more *"collaborative approach"* and the benefits that collaboration brings in terms of productivity.

"I see teams being very productive because we all are working towards a singular goal, a singular outcome, as a group rather than individuals". *A2_015TM*

"The reason that the productivity is very high, is we have incredible collaboration between the business, the business space and the IT people". *A2_016TF*

"If you can get the right people to understand what it is you're trying to attempt, you can save a lot of abortive effort and I think that's where [company] can get a lot of benefit from this collaborative environment." *A3_005PM*

Reference was often made, by participants, to the need for a more *"collaborative approach"* and the benefits that collaboration brings in terms of productivity.

Collaboration ensures that you *"get different views in there"* [A1_009TM] and can expedite approvals if the *"recommendation has actually been developed with a collaborative team and a diverse team"* [A1_009TM].

"Basically I've got a team of electrical engineers, techies, mechanical engineers. We've got SMEs within our team. So we rely on the contractors, and also our stakeholders view, once we put this back together and say, yep, okay we're happy with this we can present this." *A2_007TM*

One form of collaboration is the use of integrated teams which are "made up of the client's project team and the supply team of consultants, constructors and specialist suppliers" (OGC, 2007). This form of "holistic team" [A3_001SM] can improve productivity by reducing delays and other inefficiencies caused by interdependencies.

"You've got the same skill set, doing different things, sitting in different teams, each one of them needing about 10 days to do a review of a document. When really, you can just upskill one team to have them do the lot." *A1_004PF*

"… they were able to achieve the project successfully even with those extra constraints put on it because of the project group working together as an integrated project as opposed to the silos of different functions and the contractor and the owners team working on their own, it was all really well integrated … when they actually had to work together to achieve, upfront, some of their commercial things [like] contracts that take three months to negotiate and … they were doing this within six weeks, four weeks getting contracts out the door, just by taking a different approach to things and not seeing all this overhead or blocking, just taking all that noise away and just getting the job done." *A1_007PF*

Collaborative contracts such as the NEC4 suite of collaborative contracts, and Project 13 delivery model (ICE, 2019) provide a basis for effective collaboration between client organisations, contractors and other delivery partners. This approach has been adopted by Sydney Water (MPA, 2020) as a *"more collaborative way of working where we have target costs, you have supply chain inside your own business, that are aligned to the same values and same key legal requirements"* [AA_006SM]. This has facilitated development of *"a combined team, culturally minded … working together to solve … problems"* [AA_003PM].

Co-location and face to face engagement are not essential to collaboration but are often considered central particularly for integrated project teams and collaborative contracting. There are expectations that this will involve *"working side by side with our contractors"* and having *"face to face conversation… we can discuss and get in a room, you can go on a whiteboard, throw it all up together and then go away and do what we need to do"* [A3_003PM] and that this will improve productivity.

"The one thing that could really improve our ability to deliver faster, in terms of understanding how we can reduce the review cycles is actually have that more collaborative approach, where those kind of people who really understand what we need are actually sitting in close proximity to the people who are actually doing the work." *A8_014TM*

There were mixed views amongst participants as to the impact of remote working on collaboration. There were those who thought collaboration and productivity *"improved, because we've got [Microsoft] Teams and we use chats and we use Confluence®"* [A2_001SF]. But there were those who felt that *"you don't get the same collaboration that you do in person"* [A2_010PM] and that *"there are periods of time when you do need to be very collaborative, and that's difficult if you're not face to face"* A8_014TM.

Finally, some practitioners, particularly those from technical and specialist backgrounds, may find the *"collaboration aspect"* [A2_014PM] challenging. To others it comes more naturally, and as one participant said *"I've never seen collaboration bring negative results in my career"* [A1_018TF].

Quality and Accessibility of Information

The quality and accessibility of information can have a major impact upon productivity, in terms of the speed and accuracy of information, clarity of process, and long-term information capture to provide a basis for benchmarking and embedding organisational learning.

The convenience provided by appropriately configured information systems was regularly cited by the interviewees. Organisations that had invested in analytical support were gaining benefits in terms of reduced lost time searching for information, and improved decision-making through access to real-time data.

"That gives us real time information. So you're not searching for it, which again assists with productivity because you're not wasting time and having all these metrics in place like you have this one place to really pull where are you from a schedule perspective, cost perspective and resourcing." *A3_006SM*

Access to real-time information could provide productivity gains across the supply chain if major contractors were using compatible systems. Without a degree of information system supply chain integration, productivity was lost due to the need to reformat information to suit owner systems.

"So, because contractors don't all use the same tools there is some manual manipulation to ensure that the data that they provide is formatted in a way that we can suck it in …" *A4_001SM*

Access to high quality information is also a basic precursor to being able to measure productivity. Without a large repository of detailed historical data, it becomes impossible to accurately benchmark the time and cost associated with tasks, or to categorise different tasks by the factors that may be affecting productivity.

"So you measure that period, so say 10 days turnaround time. And then you do concept design for different complexities of project, and values of project, and we also measure the key points. So you can start to build a picture of a high complexity job's going to take say 20 days to design and quote, and so on and so on." *A3_006SM*

The clarity and detail in the documentation of internal processes also played a key role in improving productivity. When onboarding new staff, clear documentation provided significant productivity gains, allowing new starters to be productive and effectively operate within organisational norms and processes much more quickly.

"… we had really got everything fully defined so that you could get a new project manager starting that day and you'd be able to just say, alright, I want you to go … and have a look through the end to end process. You don't need to know it all off by heart, you just need to know where to go to look at what phase of the project you're delivering." *A3_007PM*

Well-developed documentation was also found to reduce lost time on repetitive tasks. For example, one interviewee described the time wasted on preparing planning and approval documentation that was recreated anew for each project. Investment in standardising documentation, and providing prompts for common responses reduced time spent 'reinventing the wheel' for each new plan.

"… a couple of years ago, that, depending on the team you were in, [planning documentation] looked very different across the board. Whereas nowadays, I do have a standard template. And all the sort of fluff and words that you spend hours trying to write is kind of just there." *A1_013TF*

Lessons from previous projects should also be captured, so that the organisation avoids repeating mistakes, or missing opportunities to build benefits into a project that may have been missed on previous occasions. It was common practice to record lessons, as post implementation reviews, or reviews when milestones or stage gates were passed. However, it was unclear to what degree learning from previous projects played a central role in informing new practice. Interviewees spoke of the pressure to start the next project and progress towards delivery *"… we often tend to just deliver and move on to the next project and then it goes in this mad rush …"* A6_004PF. This suggests that there may be opportunities to improve how past learning informs future practice.

Clear Direction

Productivity is higher when there is clear direction and all members of the project team are *"on the same page"* [A6_007PF, A2_010PM, A6_013TF]. It is likely to be reduced when project vision or goals are unclear, ambiguous or subject to change or the project is being conducted in a shifting and uncertain environment. The positive impact of clear direction extends to the productivity of individuals, driving motivation to achieve shared goals and fostering a productive culture.

Across all organisations there is evidence that productivity is highest when there is clear and collective *"understanding of the value, on the direction we are heading, a clear alignment on the purpose and belief that what we're doing is of value"* [A5_005PM].

"I see with my team we're most productive when there's a clear purpose." *A7_009TM*

The role of leadership in articulating and maintaining clear direction and vision has a significant role in productivity of projects. Lack of alignment in the leadership team, changes in direction or priorities cause frustration, confusion and de-motivation that undermine productivity.

"It would be much easier if the top dogs were aligned and it cascades down." *A5_005PM*

"… if we're misaligned with the business expectations and then … keep changing tack, then you become less productive." *A1_003SM*

"Getting everyone on the same page [and] keeping it relatively steady" [A8_013TF] supports productivity while change and uncertainty will have the opposite effect unless effort is made to re-establish direction and build culture around it. Productivity falls when a project team knows that the project they are working on is unlikely to make it through the next approval gate.

"Everything just wires to a halt, the local coffee shops will get full of people just having chats." *A6_014TM*

Building and maintaining productivity is more difficult in the earlier, scoping phases of projects when there is a high level of uncertainty and ambiguity or in projects where scope evolves throughout the project as in brownfields projects [A4_001SM]. It is easier to maintain and measure during the delivery or execution phase when working with well defined scope and outcomes.

"… for the delivery team I have found that we're very productive when we've got clear tasks in mind and when I say clear goals and accountabilities and clear schedule constraints as well…and everyone basically knows exactly what deliverables are required". *A6_010TM*

"I tend to find that productivity lifts at the end, or, particularly when they see the excitement … people get excited about delivery, most people do." *A2_013PF*

Uncertainty and ambiguity, unclear or changing goal posts have a significant impact on the productivity of individuals and teams.

"Most people I've found are not very comfortable working in an ambiguous environment, I would say 99% of people just can't cope with it." *A2_013PF*

There is a very personal dimension to productivity, driven by the clarity of direction and purpose of a project and individual alignment with that. People talk about being able to see the value they can add and feeling ownership of the outcome, and this drives productivity and enjoyment for the individual and the team.

"I can see the value that I can add, I can see what they're trying to achieve, it can be something great, but the culture and the vision is what drives the productivity. That's why I'm here." *A3_006SM*

"… having that sort of relationship and rapport with one another that I guess we're all in it for the same reason, and we're trying to get the best outcome." *A7_013TF*

A high level of personal commitment and clear understanding of and emotional commitment to meaningful goals can drive and sustain productivity through periods of intense activity.

"Everybody understood the purpose, everybody had bought it, because it evoked a very strong emotional response, everybody cared about what we were doing." *A2_001SF*

There is a very personal dimension to productivity, driven by the clarity of direction and purpose of a project and individual alignment with that.

Rework

Unnecessarily redoing work that has been fully or partially completed affects the motivation of project teams members, and wastes time and resources. Three factors were found to affect the degree of rework on projects: insufficient or inaccurate scoping; inefficient internal review processes and decision making; and the contracting model.

The quality of the initial project scoping was regularly identified as a source or waste, delay, and rework: *"… if we go down a particular path, and then have to go back to the earlier stages in the investment process, that is a huge waste of money"* [A1_005PM]. This was typically considered an issue of initiating projects without developing a sufficiently detailed understanding of the project requirements: *"… it's often because we just haven't fully understood the scope of the project early on … and then we'll have to go and kind of rework something"* [A1_005PM]. However, a trade-off between the depth of initial scoping and the risk of rework was also acknowledged: *"… it's a trade-off between doing enough work and not trying to spend too much time versus being thorough and reliable and rigorous. It's a hard balance sometimes"* [A1_005PM].

It was also found that if internal processes are not clearly and efficiently defined, there was ample opportunity for lost time through double-handling of documentation, or when influential stakeholders had not been engaged in the process.

"… you can spend time working through certain deliverables for different plans and then find out that person wasn't aligned because they didn't get a certain update, for example, and then you spent time reworking it." *A6_013TF*

Inefficiencies in process affecting productivity also related to a lack of clarity about the boundaries between stakeholder groups, including inside the project team. A lack of role clarity could result in people conducting work already completed by others, or adding unnecessary steps in approval or consultation processes.

"Either duplicate action between the different packages and that real lack of clarity between those areas and how do you manage those interfaces more efficiently and effectively? And I think that's where we become inefficient. Because we end up doing the same job twice, effectively, or we have multiple people man marking each other, doing the same thing in different siloed teams." *A4_002SF*

Interviewees also commented on the impact that the approach to contracting had on owner's team rework. It was suggested that reimbursable contracts do not provide an incentive for contractors to provide high quality deliverables, which can result in significant increases in the time taken to review and approve documentation.

"I've got one of those moments where we've had some documents are up to rev, G, H, which is just frustrating and it just, you know, blows out, and wastes time and money because you know ultimately they are reimbursable contracts so the more times they have to do it the more they get paid for it, it's not like it's a fixed cost." *A1_014TM*

It was interesting to note that tighter demands on contractors may not necessarily be the only effective way of reducing the drain on the owner's team's resources. Poor quality of contractor deliverables may not always be a desire to bill more to a reimbursable contract, but a function of the ability to source the best resources under tight timeframes. Giving the contractor sufficient time to bring in the best resources and complete the work properly may reduce the overall impact on the project, despite a slower response rate.

"So, what we did was we loosened the on site times, we relaxed the SLAs. And, you know, we saw a substantial drop in the … amount of rework that was involved … we gave the contractor a bit more leeway to bring someone in from further afield or let someone finish up what they were doing before they attended site, whatever it was." *A2_011TM*

Decision Making

Slow decision making throughout the project can not only cause cost and schedule overruns but undermine morale and disrupt the flow of the project team especially where progress is dependent upon a particular decision.

"We need a decision … because it's now holding everything up because the team can't really move on to other work or start preparing for closing out the phase, until we make this decision." *A7_012TM*

Productivity will be increased if decision points are minimised and decisions are made promptly and with commitment.

While it is important to make good decisions, and to take the time to do the work to support those decisions, productivity will be increased if decision points are minimised and decisions are made promptly and with commitment.

"… by the time we actually get to the final design or definition phases … you've already chewed up maybe a year and a half to make a decision." *A8_004PF*

"[It is] more efficient when we can expedite some of the key decision making that goes on …" *A6_005PM*

"I guess one of those constraints to productivity would be really working through, I guess, that lack of commitment to a decision or to a strategy that's been put forward." *A1_009TM*

Effort expended in achieving decisions and approvals can be reduced and productivity improved through trust and collaboration. An example of this is in integrated project teams where owners team, consultants and contractors work together side by side allowing decisions and approvals to be expedited because all relevant parties are involved in their development.

"And in the end, the approval process is, yes. Something you are submitting? Yes, it is approved. So there is no two weeks, there is no comments, there is no anything, so we covered all of that before we do any official submissions." *A3_002PM*
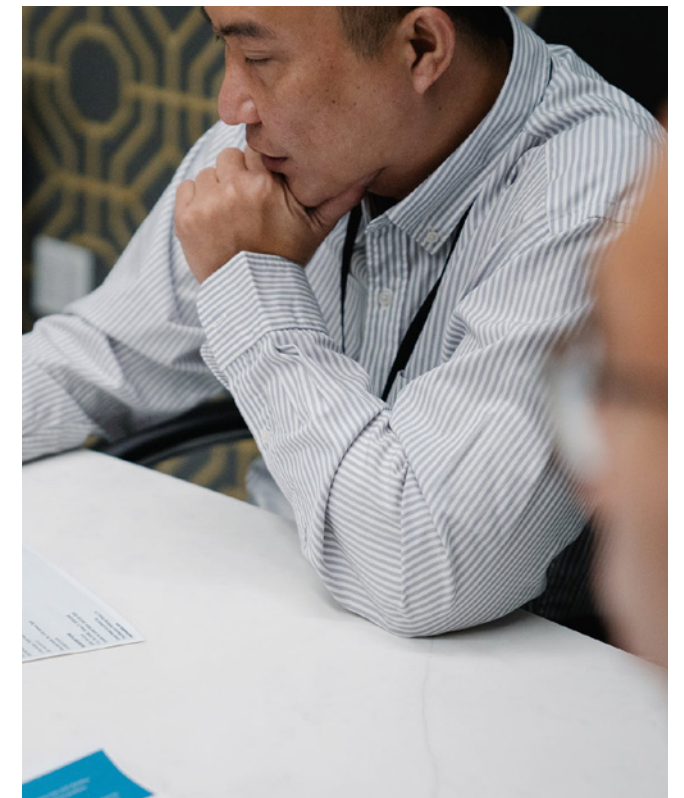
It may also be more productive to make decisions based on sufficient but perhaps not complete information in order to make the decision earlier. In a volatile and uncertain environment, quicker decisions and shorter project lifecycles become important, especially in capital intensive industries, as *"you only need commodity prices to change and have a bit of a swing and then all of a sudden, capital gets diverted from one asset or one commodity to another"* [A6_014TM].

"… where it's probably more productive, just to try and bring that decision forward. We won't have all the information, but it might not matter, we've maybe enough to make the decision." *A7_005PM*

Regardless of the governance structures, a sense of urgency can drive productivity by increasing the speed of decision making, increasing the willingness to accept risks, ensuring that adequate resources are provided.

"… under significant schedule pressure …we need just to make a call on what we think is the most appropriate and just move forward. ….I'm not suggesting any rules were broken, there was certainly a more practical approach to how it should be delivered. Because of that mad rush we were able to make decisions, accept risks, sign off on critical things, as opposed to coming to somebody to say, oh you've got three years to deliver the study, take your time with it. But hey, be productive while you're at it." *A6_004PF*

For productivity, responsibility for decision making should be clearly stated in the governance structure but it is equally important that those who are responsible for making the decisions accept the responsibility and do so quickly and with commitment. You don't want to be *"revisiting decisions over and over again"* [A8_009TM]. At the same time the decision-making process needs to be transparent so that effort expended in putting forward recommendations is seen as worthwhile, and for decision making to be timely there needs to be acceptance that decisions may sometimes be wrong.

"I think this probably comes back to the culture of the company you're working in. Are people empowered to make decisions. And if they make decisions and if they're empowered to make decisions and if occasionally, they make the wrong decision, what's the organizational response to that?" *A4_003SM*

Schedule Pressure

Pressure to complete work to a pre-determined schedule of milestones is one of the consistent driving forces in projects. The people interviewed consistently reported that the schedule not only played a key integrative role in their projects, acting as a central point of coordination, but was also consistently seen as a core value: *"we measure everything to the milestone"* [A5_013SF]; *"That tollgate period, that's our key deadline. That's our main KPI."* [A1_013TF].

The proximity of deadlines and key milestones was found to be proportional to productivity. The closer people are to a milestone, the more productive they tend to be; motivated by the increasing pressure to complete required tasks.

"So, pretty much the month leading up to that is all hands on deck …" *A6_013TF*

"… when the time arises, really, is when the productivity kind of goes up. When things need to be done, they get done. When we have kind of a bit more time pressure, or, you know, we need to make a decision quickly to save costs, things like that." *A5_015TF*

"So we are certainly flogged harder in execution than we are when we are contributing to a study. … And I'd like to think we're a lot more productive when we're in execution. When we're in the study phase, the pressure is not there." *A8_011TF*

During times of reduced pressure, when there was less urgency, or when working to more distant delivery milestones, pressure played significantly less of a motivational role. *"… if I don't have a lot on and I don't have deadlines, and I have quite tight timeframes to deliver, I find that I'm not as productive."* [A6_011TF].

It is also interesting to note that schedule pressure was not thought to increase motivation in all situations. The interviewees noted that not everyone gains motivation from pressure, suggesting that some personality types may not be suited to all aspects of project work. *"Some of the team members had never been through such pressure from the business before so it kind of creates a bit of discomfort amongst them and they could lose motivation … they don't seem to be able to cope with what's happening …"* [A7_010TM]. When people were unable to perform in high pressure environments, it was reported that significant management investment in time would be required to carry them through their responsibilities, emphasising the need to assign the right people to important tasks.

Although increased schedule-driven pressure was generally associated with periods of increased short-term productivity, there were clear consequences which may impact upon the overall productivity and outcomes of projects. These included lost opportunities and reduced quality. Interviewees reported time pressure reducing the opportunity to gain full value from the activities they were undertaking, sacrificing value optimisation in the rush to complete the next milestone. Too much pressure may decrease quality, creativity, value, and innovation.

"If time hadn't been such a factor, we might have had more room to explore, you know, how do we actually optimize what the existing operation needs for accommodation during that period?" *A6_005PM*

"So, there's a range of things that probably got left out. But, because I understood that and realize that schedule in this case was just more important, and we needed to push forward. So that's the case with being less thorough, and just driven to get the thing done as fast as possible." *A1_005PM.*

Meetings

Meetings can both support and reduce productivity. Well managed, meetings can promote productivity by ensuring that necessary information is communicated, and teams can develop trust, social cohesion and engagement to support collaborative work.

"Some of the routine meetings became more important around team engagement like the weekly progress meetings and the agenda and structure of those and making sure we're communicating the right things, broadly across the team." *A1_017TF*

"… structuring of meetings made a massive productivity improvement." *A6_017TF*

On the other hand, meetings that taker longer than necessary, and lack clear purpose and structure will undermine productivity. Such meetings reduce the amount of time available for productive work and this can result in stress and a lowering of morale which further reduce productivity. It can become a vicious cycle.

"Some people are almost career meeting attendees, and then wonder why no work gets done, but they feel busy." *A6_017TF*

"I find at times those meetings are just like, it's just a rabble." *A5_006TM*

"How am I supposed to do work when I'm in a meeting every day." *A3_006SM*

Productivity can be increased by deciding whether meetings are necessary, thinking through the intended purpose, deciding who needs to attend and managing the meetings effectively to achieve intended outcomes within the least possible time.

"How do we make these sessions these meetings as productive for them as possible by cutting out things they may not need to know?" *A2_015TM*

"Reduce the amount of meetings that they have every day that have no resolution or no impact to your day." *A5_006TM*

"… a weekly meeting should take one hour, and then we find that we're sitting in there for four hours, then either there's inefficiency in the meeting and the structure or the level of detail we're running to." *A7_011TF*

This may require some careful stakeholder management to ensure that people are not left with a feeling that they have been excluded or that they are missing out on information [A1_017TF]. Timing should also be considered to avoid meetings that are unable to achieve resolution because necessary information or decisions are unavailable. Allocated time should reflect the purpose of the meeting and alternate ways of communicating or sharing information should be considered.

"… we really need to wait till we get the outcome of something else then we need to review that well, we should have not had this meeting or it should have been a lot shorter or should have just been an email." *A5_006TM*

It is often difficult to find or book meeting rooms that can accommodate meetings, and time can be consumed in travelling to the meeting location even when it is within the same company office location.

"… you need to traverse quite a lot to get from the east, to the west, to the north … and that took time as well if you didn't have enough meeting rooms or the meeting size wasn't enough." *A5_005PM*

Video-conferencing was used prior to the advent of COVID-19, but the pandemic has significantly accelerated this form of meeting with both positive and negative impacts for productivity. A positive impact is the ability to convene virtual meetings, bringing people together without concerns for availability and booking of meeting rooms, and enabling people to easily come together without travelling either small or large distances. A negative impact is that the ease of calling a meeting has led to an increase in the number of meetings being held and in some cases less thought and consideration given to the purpose of the meeting, the intended outcomes, the necessary participants, the structure and time allocated.

Apart from the ease of convening a meeting, remote working has in some cases led to an increase in meetings in an attempt by management to *"keep their finger on the pulse"* [A2_011TM]. It has also encouraged the use of meetings to maintain team communication and cohesion, and to replace the more informal communication and information exchange that can happen when together in an office.

"… people are booking lots of meetings, you know, that probably would in the past have been in the day to day corridor comment category." *A2_011TM*

Even those who had spent some time working from home prior to the pandemic found that the amount of time in meetings increased and their level of engagement was reduced.

"Before when we were working from home, yes I had meetings, but certainly nowhere near the extent that I've got now." *A2_011TM*

"… but I find it's been an increase in meetings since working from home." *A2_010PM*

"I sit in those meetings often pretty much on mute waiting for the outcome at the end and then look to move forward." *A5_006TM*

Overall, there seems to be a general perception that productivity has either remained steady or has improved as a result of remote working. But there is divided opinion about the impact upon individual productivity. While some appreciate the reduction in travel time to and from the office, others find that as their diaries are *"blocked out with meetings"* [A2_011TM] they find they have to work longer in the day to get their work done.

"I'll spend all day on meetings, and then all the work I was meant to do, and all the reporting and everything else… that's pushed after hours". *A2_010PM*

Experience clearly varies according to organisational and individual work practices. For some the remote working provides more time for work, and remote communications mean they are more contactable.

"… where we're at the office a lot of people were bogged down in meetings, I've actually found that working from home means I'm in less meetings and am actually more contactable." *A5_016TM*

In order to address the impact of meetings on productivity, one participant described rules that had been put in place for their project which had *"overnight made a massive difference"* [A1_017TF].

"And the rule is, nobody is allowed to schedule a meeting before 10am. On any given day, if we've got regular and recurring meetings there between 10 and 2 every day, and then ad hocs are meeting after 2pm." *A1_017TF*

CONCLUSION

There is significant evidence in the research literature that the use of project management provides productivity benefits at the organisational level. However, there has been no research that has investigated what productivity is in a project management context, or the factors that affect project management productivity. To this extent, project management can be considered a form of knowledge work, an area where it is acknowledged that measuring and understanding productivity remains one of the major challenges in organisational research.

Whether project managers are bringing difficult stakeholders together to negotiate mutually acceptable outcomes, developing a shared understanding amongst the project team, or triaging crisis situations, it is clear that project-based work is complex, dynamic, and difficult to measure. In this, it stands in stark contrast to operational or routine work, which can largely be standardised and benchmarked using simple metrics.

In this study, 55 interviews were conducted with representatives from five organisations working in capital intensive projects. The research methodology was based on Thematic Analysis, involving three independent coders.

The analysis revealed 12 concepts that are important to understanding productivity from the owner's perspective in capital intensive projects. These concepts are:

– Meeting Performance Metrics
– Costs
– Efficiency
– Schedule
– Outcomes
– Effectiveness
– Outputs
– Perceived Productivity
– Transparency
– Customer Satisfaction
– Quality
– Engagement

Building on these concepts that define productivity in the project management function in capital intensive projects, it was possible to identify 17 measures that can be used to monitor productivity (refer Table 1, p. 27). It is important to note that given the uncertainty and variation in project-based work, few if any of these measures directly measure productivity. They are largely proxy measures for productivity, which can be used to indicate aspects of the context which contribute to, or detract from, productivity. In addition, while they are referred to as measures, not all provide the basis for simple quantification. Some are concepts that are used by individuals as the basis for personal interpretation of productivity.

To use these measures in practice, it is best to use multiple measures in combination. As measure sets, they will provide a comprehensive understanding of whether a project team has been productive in the recent past, whether a project team is operating in a context conducive to sustained productivity, and their impact on organisational trends.

Based on the interviews, ten factors were revealed that have an impact on the productivity of project management functions in capital intensive projects. These are:

– Governance
– Adequate resources
– Stakeholder communication
– Collaboration
– Quality and accessibility of information
– Clear direction
– Rework
– Decision making
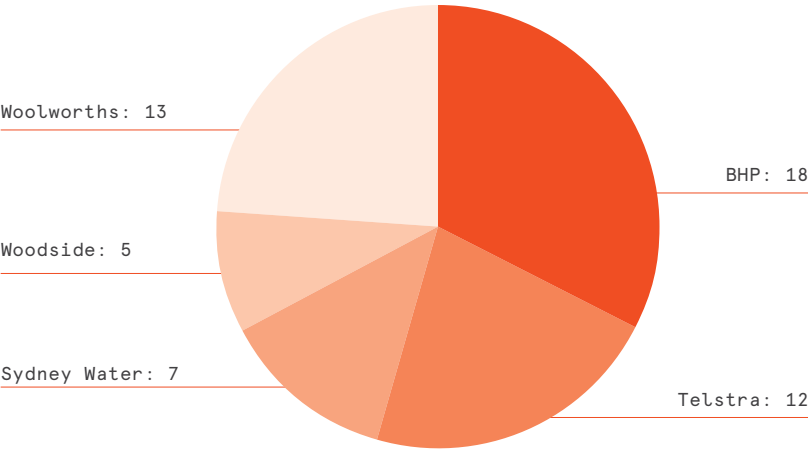– Schedule pressure
– Meetings

Understanding of these factors and how they can work to improve or undermine project productivity provides guidance, based firmly in the experience of practitioners, for establishing the conditions in which productivity can flourish.
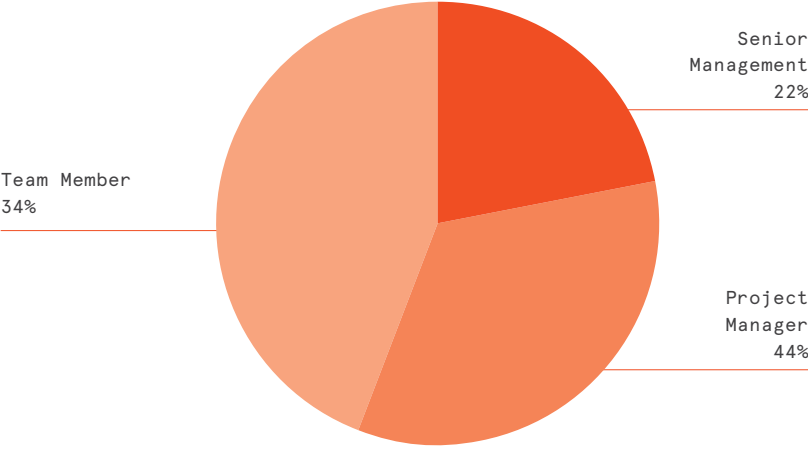
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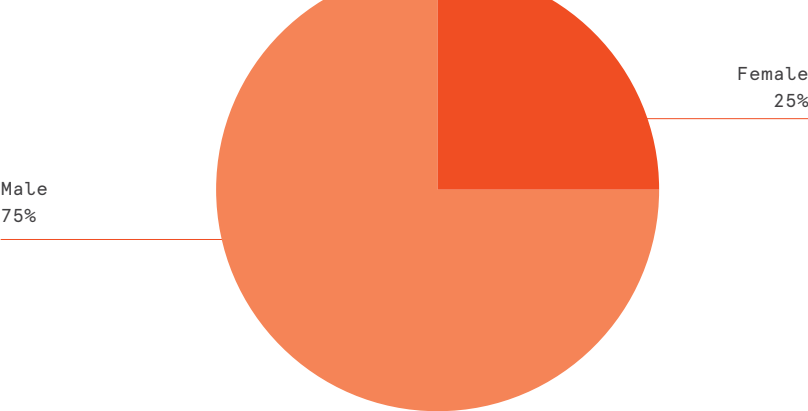van der Voordt, T. (2004). Productivity and employee satisfaction in flexible workplaces. *Journal of Corporate Real Estate*, 6(2), 133–148. https://doi.org/10.1108/14630010410812306

Appendix 1: Interview Profile

Participants

Woolworths: 13

Woodside: 5

Sydney Water: 7

BHP: 18

Telstra: 12

Role

Senior Management 22%

Team Member 34%

Project Manager 44%

Gender

Female 25%

Male 75%

Appendix 2: Analytical Codes

Code	Code
Factors: Achievement	Lifecycle: Across whole lifecycle
Factors: Adequate resources	Lifecycle: Design / Planning
Factors: Autonomy	Lifecycle: Execution / Delivery
Factors: Bureaucracy / Company policies	Lifecycle: Operation / BAU
Factors: Collaboration or interdependence, Degree of	Measures: Absenteeism
Factors: Crisis	Measures: Costs
Factors: Decision making & governance	Measures: Customer satisfaction
Factors: Degree of uncertainty &/or ambiguity: Other	Measures: Effectiveness
Factors: Degree of uncertainty &/or ambiguity: Role	Measures: Efficiency
Factors: Degree of uncertainty &/or ambiguity: Vision and goal	Measures: Engagement
Factors: Enjoyment	Measures: Innovation / creativity
Factors: Growth and advancement	Measures: Meeting performance metrics
Factors: Information / knowledge sharing	Measures: None or difficult
Factors: Interesting / meaningful work	Measures: Outcomes
Factors: Milestones	Measures: Outputs
Factors: Multi-tasking	Measures: Perceived productivity
Factors: Recognition	Measures: Quality
Factors: Relationship with supervisor / peers	Measures: Responsibility/importance
Factors: Responsibility	Measures: ROI
Factors: Rework	Measures: Schedule
Factors: Salary	Measures: Transparency
Factors: Security / Insecurity	Project Type: Brownfield
Factors: Social cohesion / group unity	Project Type: Greenfield
Factors: Social engagement (talking to people)	Way of working: Individual
Factors: Social support provided	Way of working: Organisational
Factors: Stakeholders	Who: Contractor / Supplier
Factors: Status	Who: PM / Owner function
Factors: Time wasting meetings	Work location: In the office
Factors: Trust & authenticity	Work location: On site (project)
Factors: Working conditions	Work location: Remote

Authors

Lynn Crawford

Professor Lynn Crawford has worked extensively with leading corporations and government agencies, assisting them in project capability development through global knowledge networks. Ongoing research includes project and program based competence and careers, productivity, governance, and disaster management. Lynn was instrumental in the formation of the Global Alliance for the Project Professions (GAPPS) and is a Life Fellow of the Australian Institute of Project Management (AIPM), an Honorary Fellow of the APM (UK) and recipient of their Sir Monty Finniston award for lifetime achievement in contributing to project management practice and research.

Julien Pollack

Julien Pollack started as a project manager in IT, organizational change, and manufacturing projects, before moving into research. He now explores multiple aspects of project management, with the broad aim of helping to transform the discipline into one that addresses the needs of complex and uncertain environments. This includes investigation of teams and team building, project management methodology, and projects with ill-defined objectives and outcomes. His research in these areas has been frequently published in the leading international project management journals and research conferences.

"In projects, we very rarely do the same thing twice. Measuring how well you did this time versus last time is never as straightforward as it might seem."

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