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WHITEPAPER

DO YOU NEED A LARGER PROJECT TEAM?

COPING WITH GROWTH IN CONSTRUCTION MEGAPROJECTS

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EXECUTIVE SUMMARY

Evidence suggests that scaling up teams, especially in the later stages of a project, can lead to greater inefficiencies and miscommunication, hindering project performance. Lean, agile teams empowered with AI and advanced project management tools outperform larger groups by mitigating the risk of communication overload and decision-making complexity. The construction industry must pivot towards nurturing a skilled workforce and leveraging technological advances to sustain growth and meet the fast-evolving market needs.

Demand Surge and Skill Shortage

The construction industry, particularly in sectors such as data centers, infrastructure, and large-scale commercial projects, is currently witnessing a significant surge in demand. This trend is not isolated; for example, the data center sector alone has seen its capacity requirements grow between seven to tenfold in the last five years. In the US, the total MW capacity for data centers under construction escalated from under 500 MW in 2020 to an astonishing 3,500 – 5,000 MW today. This exponential growth is emblematic of a broader trend across construction megaprojects, which are scaling up both in size and complexity. While this surge presents numerous opportunities, it also introduces substantial challenges, notably a pervasive skill shortage in the market. The existing workforce is struggling to keep pace with the escalating demand, leading to a pronounced gap in necessary skills and resources.

Regional sectors are facing major challenges with project resourcing and supply chains due to materials and logistics costs, market fluctuations, and Brexit/EU immigration regulations affecting the movement of labor and impacting professional project staff and work permits. Geopolitical tensions in Ukraine and the Middle East, as well as China-U.S. relations, have added to the uncertainty. While the UK market for project resources is stable, major hub centers, such as Germany, continue to struggle for appropriate resources due to immigration laws.

With material costs rising by as much as 60% and labor costs up by an average of 30%, combined with lower resource and staff availability, the industry must move to operational models that offer friendly, fast, and flexible customer outcomes. This can only be done by correct project resourcing and leveraging new project management technologies that are becoming available in the market.

Insufficient Training Programs

In the UK, the traditional path to construction knowledge was a three-to-six-year apprenticeship for school leavers. However, the entry-level apprenticeship uptake across England since 2014-15 has witnessed a 72% decrease, **according to an IPPR study** *(https://www.ippr.org/media-office/lpc-apprenticeship-decline-analysis-naw2022)*. These figures should make all construction companies and stakeholders sit up and take notice when looked at in conjunction with the current labor shortages and forecasted industry growth.

Young people entering the construction industry and working their way to senior positions at project and company levels, along with university graduates, is how we maintain the width and breadth of industry knowledge needed to sustain effective project success.

As the number of people joining the industry fails to keep pace with the resources that the construction industry loses to other sectors and retirement, we will continue to struggle to deliver projects on time, on budget, and without defects.

Because of the strain on finding the skills needed, a common condition in the industry is the 'Peter Principle'. This is where people are good at what they do, so they are promoted too quickly, without the necessary training and support, to a level of incompetence. The result is that the business sets them up to fail. This has become all too prevalent in the rush to secure project resources.

This lack of properly trained resources means that new entrants into the industry are not being adequately prepared to handle the increasing complexity of demands, with 'burn-out' and low morale being a constant project issue. Thus, the lack of sufficient skills is already a concern and is expected to become more severe with the ongoing demand for large-scale projects and megaprojects.

Supply Chain Vulnerabilities

The soaring demand, paired with a skills shortage, has stretched an inadequately skilled supply chain. The strain on suppliers, especially smaller ones, is putting them under considerable threat of bankruptcy, which could destabilize the supply chain ecosystem and impact the industry's ability to meet demand. The past 12 months have seen almost 4,500 small operators in the industry go into insolvency. In an environment of high interest rates, there is broad-based concern that this number may rise in 2024–2025.

Figure 1: Quarterly Supply Chain Insolvencies 2019-2023

As we see the number of tier 2 and 3 contractors fail, this will lead to either a loss of knowledge for the industry or those skilled people being absorbed by either other contractors or program management and construction management consultancies that supply skilled people to general contractors and customer organizations alike. This comes with its own subtle dichotomy for the industry when creating project teams, as both business operating models are sometimes mutually exclusive.

For example, a contractor may wish to keep their project staff lean, with clear lines of responsibilities and accountabilities that are driven through company and personal goals and objectives, yet this may not always be the case with third-party-supplied resources. This can lead to a disconnect, with a project office developing a "them and us" paradigm.

Growth Paradox and Efficient Scaling

The construction industry is confronting a growth paradox. This is particularly evident in sectors experiencing rapid expansion, such as infrastructure and commercial development, where some companies' project portfolios have grown by multiples of five or ten. **The question arises as to whether their teams should expand commensurately.** Here we argue that simply adding more people to these growing projects may, in fact, slow them down.

Evidence suggests that scaling up teams, especially in the later stages of a project, can lead to greater inefficiencies and miscommunication, hindering progress.

This has been experienced by general contractors (GCs), where projects are under pressure for reasons of labor shortages, asset and material lead times, inefficient project management practices, and optimism bias in planning. In turn, these lead to customer and end-user frustration and pressure to have a finished product, so the GC leadership has "flooded" the project to help "get it over the line".

There is plenty of anecdotal evidence in the industry where GCs have taken on projects in EU regions and have not fully understood the local resourcing requirements and supply chain logistics. In addition, they have incorrectly assumed that a UK labor force will be as effective as normal when they are on rotational-based attendance in a regional project office.

Instead, the solution may lie in developing smaller, fully supported, highly competent, highly motivated, and well-compensated teams capable of delivering increased outputs to realize your competitive potential – a theme also adopted by the World Quality Week in 2023.

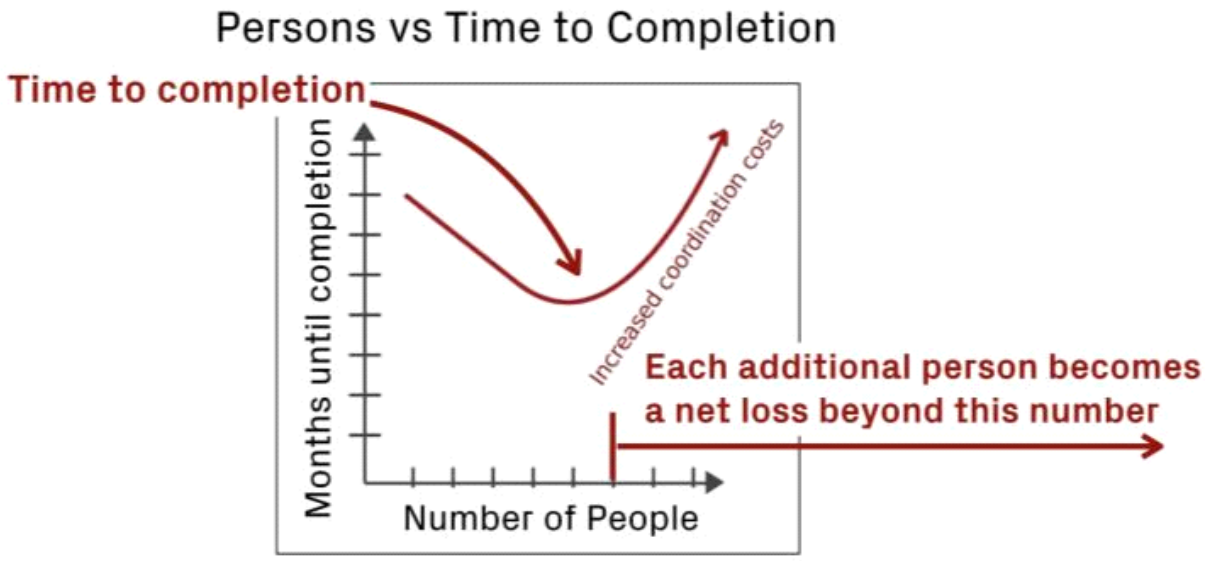
To meet the strong imperative for quick time-to-market in the industry within the context of an acute skills shortage, we argue that the **solution lies in focusing on training people and empowering them with the capabilities of AI.** Streamlined, lean teams with mature AI tools have a better chance of efficiently delivering on larger projects. Investment in training is crucial across the industry, particularly innovative approaches that enable smaller teams to achieve more thanks to AI assistance and other technological advancements. These strategies aim to ensure that fewer people can deliver greater results, thereby addressing the skills gap and meeting the high demand.

Theoretical Background

Management theory supports our recommendation that leaner teams are in fact better suited to lead large, complex projects and portfolios. Fred Brooks' "Mythical Man-Month" addresses the issue of: does a larger team complete a project faster? In that book, he proposes **Brooks' Law, which states: "Adding manpower to a late project makes it later."**

The underlying rationale is that as more people are added to a project, the complexity and communication overhead increases quadratically. New team members require time to become productive (a ramp-up period), and the increased communication channels can bog down progress, leading to further delays rather than speeding up the project.

Figure 2: When Adding People Delays a Project



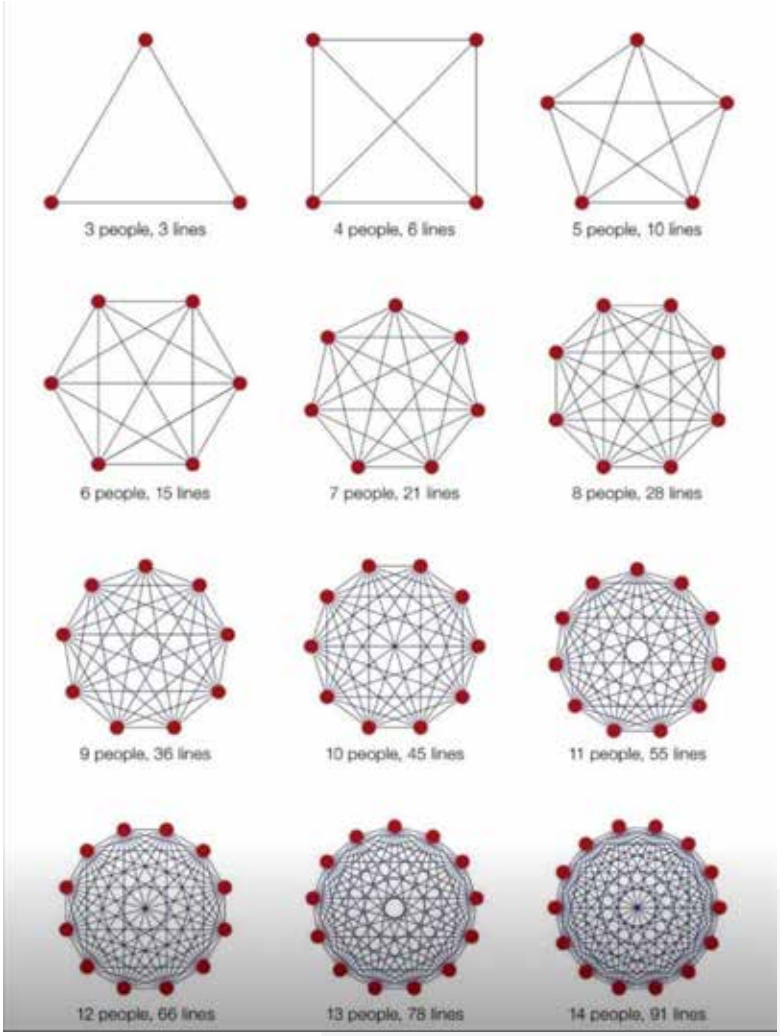
Source: Fred Brooks, Mythical Man-Month

Mathematically, if n is the number of team members, the number of communication channels is n(n-1)/2 , which grows in a quadratic fashion as n increases.

Milvio DiBartolomeo provides a compelling graphical illustration of this principle in Figure 3. DiBartolomeo's image presents a visual representation of how communication and complexity grow with the increase in team size, especially within the context of organizational structures like portfolio, program, and project executive teams and

boards. These teams, which are crucial for making informed decisions, are most effective when they are composed of members who have a clear and direct connection to the business, such as representatives of the project itself, users, suppliers, and those with assurance responsibilities.

Figure 3: Lines of Communication



Source: Milvio DiBartolomeo

In essence, to maintain effective organizational governance, it's critical to understand that expanding the size of these teams, even by one person, can complicate the decision-making process and the management of information. The delineation between decision-making authority and stakeholder engagement becomes muddled when the

group size exceeds the range of three to seven individuals. Thus, counter-intuitively, adding more people to a large complex project exposes it to greater risk.

Formally,

$$T \propto P^2$$

Time to complete a project (T) is proportional to the square of the Number of People (P) in the team.

Leaner and highly motivated teams, equipped with innovative AI tools, are better off when dealing with larger scales than big teams. High-performance teams adopt AI to make themselves even more productive.

Conclusion

In closing, this whitepaper underscores the critical balance between team size and project efficiency within the construction industry's current landscape of explosive demand and skilled labor shortage. Lean, agile teams empowered with AI and advanced project management tools outperform larger groups by mitigating the risk of communication overload and decision-making complexity. The industry must pivot towards nurturing a skilled workforce and leveraging technological advances to sustain growth and meet the fast-evolving market needs. Through strategic team composition and a focus on training and technological empowerment, the sector can navigate these challenges and continue to deliver on its ambitious objectives.