‘CALL TO ARMS’: USING THE CREATING SHARED VALUE BUSINESS GOVERNANCE PARADIGM TO DELIVER PROJECTS’ BUSINESS-SOCIETY IMPACT AGAINST THE UN SDG 2030 TARGETS

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Using 'Creating Shared Value' to Support Measurement of the Sustainable Development Goal (SDG) Targets for Infrastructure Projects

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Abstract

This paper aims to bring to the forefront the need for projects to be aligned with SDGs. The paper builds on the governance literature and navigates from the dominant 'Corporate Social Responsibility' (CSR) idea to 'Creating Shared Value' (CSV). This literature moves towards a synergy between achieving economic business success on projects (including financial objectives) and wider benefits to society and the environment. It provides an empirical lens which is wide enough to capture instances of impact that are relevant to SDGs. The use of this 'triple bottom line' – economy, society, environment - can link SDGs to normative project success criteria. The paper uses empirical evidence from the survey of 325 engineering project managers to highlight a current gap in measuring the United Nations' (UN) Sustainable Development Goals (SDGs) at project level.

The analysis of the survey results showed that the linking of infrastructure project success to SDG targets is problematic; while the appetite for action is very strong, especially by millennials (results: 87% of engineering project managers want to measure projects' SDG impact), only a third believe they have 'tools fit for purpose', which suggests that – at the bottom line – the UN SDGs are hard to materialise and take forward in impactful, transformative ways. The survey results indicated four primary shortfalls: in the tools and methods available; the leadership and decisions-making; the engineers' business skills in defining and measuring SDG impact; and, how project success is defined at the corporate level in terms of narrowly-defined project outputs (such as time, cost and scope) and not outcomes (longer-term local impacts and stakeholder value).

Keywords:

Sustainability; Governance; UNSDG; Project Success; Business-Society

Introduction

In 2015, the international community responded to the sustainable development challenge with the Sustainable Development Goals (SDGs) for 2030 in their report, 'Transforming Our World: The 2030 agenda for sustainable development' (United Nations General Assembly, 2015). The SDGs are the United Nations' blueprint, with 193 nations signatories to the SDGs, to deliver a better and sustainable future. The SDGs address the global challenges, such as poverty, inequality, climate chnage, environmental degradation, prosperity, and peace and justice. All the global goals are interconnected and the overarching ambition is to 'leave no one behind' in the achievement of the 2030 targets.

Alarmingly, and only four years in, the global commitment to deliver meaningful SDG action is falling behind on ambitions both at the local and global levels (Office of National Statistics, 2018). This is relevant for project managers because much of tomorrow's resilience and development will be delivered by the project management community, across all sectors, but especially infrastructure. For example, the IPCC's 2018 Report identifies that "*directing finance towards investment in infrastructure for mitigation and adaptation*" is key to meeting SDG targets. The estimated USD $97.5 trillion (Global Infrastructure Hub, 2017) of investment in infrastructure projects that is required globally by 2040, represents a massive opportunity to stimulate economic prosperity, reduce poverty and raise standards in health, education and gender equality. At the same time, the challenge of measuring project outcomes against SDG goals, targets and indicators within existing project governance frameworks should not be underestimated. The use of SDGs to measure success at project-level is important for two reasons: firstly they can help monitor progress at an international level; and, secondly they can help with selecting infrastructure projects which aim to address SDGs in the design stage/front-end of projects. In turn, investment decisions can be targeted towards the distribution of funding to infrastructure projects that can achieve broader and longer lasting impact. Given the impending global crisis, there is a need to find new ways to increase the pace and scale of positive change, for governance thinking and models which address the UN SDG priorities and the need for new ways to measure and support the delivery of the UN SDGs 2030 targets.

Literature Review

The failure of not meeting the 2030 targets of the United Nations Sustainable Development Goals (hereafter, UN SDG) is amongst the most significant global Grand Challenges threatening our survival today and there is the potential for the project management community to play a key part in making a positive impact on the 2030 targets. Before examining how projects can help measure SDG success, we need to understand why this is important and how sustainable development has evolved into a 'three-legged stool' that needs to balance economic, social and environmental priorities; what recent many authors call: People, Profit and Planet (Sosik and Jung, 2018).

Sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (Brundtland, 1987). Since Brundtland's formative report, sustainable development (Sachs, 2016) has become an increasingly central theme for nation states and their citizens. Today, the Planetary Boundaries (Rockström, 2009) provide a global litmus test for how we are doing. The concept of nine planetary boundaries, within which humanity can maintain a positive development profile for future generations, was developed in 2009 by environmental scientists from the Stockholm Resilience Centre and led by Johan Rockström and Will Steffen from the Australian National University. In 2011, the then UN Secretary-General Ban Ki-moon urged global society to "*Help us defend the science that shows we are destabilising our climate and stretching planetary boundaries to a perilous degree*". The most significant global response to the Planetary Boundary challenge was in 2015, when all governments ratified the UN's seventeen Sustainable Development Goals (SDGs - United Nations, 2015), shown in Figure 1 below, to be achieved by 2030 (initially with 169 targets agreed in 2015 and then 244 indicators agreed in 2017). This represents a major step-change in the implementation of the global sustainability agenda (Sosik and Jung, 2018).

Figure 1: The Global Goals for Sustainable Development
(United Nations, 2015 - permission to use from SDG logo Guidelines)

Although the SDGs build on the earlier Millennium Development Goals (MDGs) (United Nations, 2000) by focusing on similar issues, the SDGs differ from the MDGs because they are for all countries in the world to implement – developed and developing alike (Sustainable Development Network, 2014). Also, unlike the MDGs, the SDGs are focused on monitoring, evaluation and accountability – across society, not just at national level, which is why it is critical that the link is made from the 'bottom-to-top', meaning from foundation of project level impacts that can then be assessed against the national and global targets and corresponding indicators. However, there appears to be a gap – the golden thread from national to project level seems to be missing – this is important because SDG's actually materialise at the project level. This is especially for infrastructure projects that reflect multimillion governmental investments, which are delivered by multiple stakeholders working across boundaries and where the governance of these actors is key.

Recent evidence from the UK's Infrastructure and Projects Authority (IPA Report, 2018) suggests that projects are the major vehicle through which national level strategic change is delivered. In 2017-18 the IPA had oversight of 133 projects in the national portfolio, representing a whole life cost of GBP £423 billion and an annual project spend of GBP £27 billion (IPA, 2018). This is estimated at nearly 20% of UK's national expenditure (Morris, 2017), which is just the 'tip of the iceberg', as it does not account for all change projects, programmes or portfolios (APM, 2015).

The literature research explores whether measurement of SDG impacts at the project level is currently ineffective despite the endorsement of the SDGs by all the world's governments. It identifies a two-fold dilemma in terms of governance. Firstly, a fundamental misunderstanding of the interdependent relationship between business and society. The failure to appreciate this dissonance frequently leads to sustainability being overlooked, both as a strategic opportunity for creating and maintaining competitive advantage by firms and as a source of significant business risk. If businesses, and the projects that drive the changes needed, are to deliver on the SDGs by 2030, a new approach is required. Secondly, the SDG framework itself has its own limitations. As described earlier, the 17 SDG are defined by 169 targets. This is further delineated by the UN Statistical Commission's Interagency and Expert Group on SDG Indicators (IAEG-SDGs), which includes 244 individual indicators to monitor the 169 targets of the SDGs. This increases the granularity of definition, which is both good and bad. There are many (Riley, 2001; Morse, 2013; Hak, 2016) that criticise the SDGs for being too broad and deep – ultimately being impenetrable except for the deep-specialist. Conversely, the advocates suggest that the 17 SDG icons provide the communications medium for ensuring simplification, thereby enabling the simplest messages to be kept to 17 powerful, interlinked, themes. There are further studies (Sachs, 2012; Holden et al, 2017) that contend, which targets and indicators are needed to add credible evidence-based measurement to ensure meaningful tracking of progress against a pre-determined baseline. For example, climate change (IPCC, 2018) uses the pre-industrial age temperature levels and related gas emission pathways as a proxy for the objective to reduce global warming below the 1.5^0C levels by 2030. Yet some authors (Morse, 2013; Hak, 2016) challenge the assertion that the targets and indicators are fit for purpose by suggesting that they are inconsistent and difficult to quantify, implement, monitor, and report, as well as it being difficult to learn lessons. They also challenge the governance of the SDG oversight mechanism because the goals are non-binding, with each nation creating their own made-to-measure national plans that aims to be specific to their needs to have ubiquitous relevance.

Some argue (Swain, 2018) that the real challenge resides with the tactical and operational issues that the project managers have to contend with. These include: (a) what are the interdependent relationship between SDGs to prevent them being assessed in silos?; (b) how can the targets and indicators that were designed for national and global level reporting, be cascaded down to project level?; and (c) how do the SDG targets and indicators compare with existing targets provided by other industry standards' sustainability reporting mechanisms such as by the Global Reporting Initiative (GRI) (see www.globalreporting.org), or project-specific sustainability tools such as the UK's Buildings Research Establishment's CEEQUAL (https://bregroup.com)?.

In the infrastructure sector, recent analysis by the UK Infrastructure Transitions Research Consortium's (ITRC is a partnership involving seven universities and over 50 groups from infrastructure practice and policy) has provided some confidence that the higher-level targets do have influence at the project level. The analysis (Hall et al., 2018) indicates that 81% of the SDG targets are influenced by infrastructure investment projects. However, despite the positive conclusion from the analysis (ITRC, 2018), there is conflicting evidence that the sub-target indicators can be applied coherently at project level. The 244 SDG Indicators were developed with nations under the leadership of the Interagency and Expert Group on SDG's (IAEG-SDG) to provide greater granularity and relevance for measurement – but there are many challenges to their use by both developing and developed nations, because whilst detail is good for clarity, it adds complexity. For example, the UK's Organisation for National Statistics (ONS), which is responsible for reporting the UK's progress against global SDG indicator measurement, shows that in October 2018 they only had data for 64% of the IAEG-SDG's indicators, with 9% of statistics 'in progress' and 27% with no data available. The challenge of the indicators' utility for measuring success becomes worse below the national level, where this research team has identified that only 12% (29) of the 244 indicators could be used meaningfully at the project level. To find answers, we therefore need to explore the project level further.

At the project level, the Association of Project Management's Body of Knowledge (APM, 2012) defines sustainability as "*an environmental, social and economically integrated approach to development that meets present needs without compromising the environment for future generations*". The APM's definition has been based on the modern concept of sustainable development as derived from the Brundtland Report (1987), which suggests that efforts to create improvements in the short-term should be without a negative impact in the longer-term. It also recognises that project strategies need to consider success against the triple bottom line (or otherwise noted as TBL or 3BL) of social, environmental (or ecological) and financial aspects. However, the over emphasis on the last of the TBL criteria, namely finance, brings us to the root of the problem of measuring projects' SDG impact. This is because the crux of the sustainability reporting problem lies with the dominance of accounting tools, which has been the pre-eminent business method of reporting for over 500 years since Luca Paccioli first published his papers on double entry bookkeeping (Yamey, 1949). This has largely remained unchanged. In other words, there has been a proliferation of mechanisms and economic models to track different elements of the TBL, including: ESG (environmental, social and governance) (Elkington, 1994) that includes the three core areas used in the business investments measurement of ethical and sustainability impacts of a company; Social Return on Investment (SROI) (Emerson et al, 2000; Millar and Hall, 2013); Net Positive (Forum for the Future, 2018; Rainey et al, 2015); Double and Quadruple Bottom Lines (Sawaf and Gabrielle, 2014); a myriad of capital (human, social, manufactured, financial, natural) analysis models; Environmental Full Cost Accounting (Schaltegger and Burritt, 2000); Boston Consulting Group's Total Societal Impact framework; Integrated Reporting (Eccles and Krzus, 2010); Blended and Shared Value (Bonini and Emerson, 2005); and, Impact Investment (Bugg-Levine and Emerson, 2011). Recently this has been extended to new frameworks that focus on specific issues such as Sharing and Circular Economies (Preston, 2012); Carbon Productivity (Malhi et al, 2009; Suess, 1980); and Biomimicry (Elkington, 2018). The contention of this research

study is that the proliferation of financially-driven sustainability measurement theories, tools and concepts cause confusion and often leads to sub-optimal governance because of the short-term focus on profit instead of wider TBL outcomes.

Current thinking suggests that the TBL framework is in need of 'rethinking' (Elkington, 2018). Indeed, Elkington's contention is that his definition has not been implemented according to its true meaning and he insists that businesses should now monitor and report economic (not just financial), social, and environmental value added — or they will become negatively impacted. Many contend (Hubbard, 2009; Elkington, 1998 and 2013; Joyce, 2016) that private sector success is still overly influenced by financial perspectives. This is often restrictively linked to share price value and viewed (Ahmad et al., 1989) as an inherent weakness of the system that drives short-termism in governance and decision-making. As a result, and relevant to the assessment of how project managers can measure projects' SDG impacts, there has been a growing demand for knowledge on how sustainability reporting can be broadened.

As a result of the increased knowledge and tempo of the uptake of sustainability language, it has become more mainstream with many academics (Tilt, 2007) and practitioners (Perrini and Tencati, 2006) seeking to further develop the current accounting-centric method towards a broader, or holistic, approach, such as the Balanced Scorecard (Kaplan and Norton, 1996). However, the proliferation of sustainability accounting terminology (sustainability accounting is often referred as: social accounting; corporate social reporting; corporate social responsibility reporting; social and environmental accounting; and non-financial reporting) also negatively impacts the ability to have a single consistent view and this results in the project world being mired in confusion.

Moving from Corporate Social Responsibility to Creating Shared Value

The debate on governance has moved on from notions captured under a corporate social responsibility (CSR) agenda to creating shared value (CSV) priorities, which seek to change the way in which business creates value for its stakeholders, i.e. place socially aware priorities, such as the SDGs, at the heart of core business thinking and strategies. Most of the current sustainability efforts (such as CSR) have focused on the identification of harms to society in general and the creation of corporate responses to meet those harms as described in general. As a result, many sustainability efforts have been largely divorced from the specific business model of each organisation. In reality, sustainability activities have often functioned as additional actions for the purpose of deflecting stakeholder criticism, conducted regardless of their actual relevance to the business' capabilities, suppliers or customers. The net effect is to leave core business activities and risks unchanged. Moreover, sustainability cannot be delivered through CSR because it is both inefficient and ineffective (Porter, 2011). CSR is inefficient because it can create irrelevant 'add-on' activities that add to the costs of doing business without either adding to the real value created for any of the business' stakeholders, or without removing real business risks. CSR is ineffective because it continues to pit society and business as opposing forces rather than recognising the opportunities of their real interdependence.

However, the current thinking on governance has moved on to suggest that there is potential to link projects' objectives to SDGs through the concept of 'Creating Shared Value' (CSV); a concept first developed by leading business strategist Michael Porter of Harvard Business School (Porter and Kramer, 2006 and 2011). CSV provides a unifying theory that can help rethink projects' definition of success by demonstrating impact across the TBL (Elkington, 1994) of all SDGs. It can do this by adopting CSV because it: (a) Recognises the interdependence between society and business; (b) Moves society and business away from zero-sum competition to positive-sum competition; (c) Enables new ways for business to create competitive advantage that are more resilient against sustainability risks and mimicry by other firms; and (d) Combines traditional CSR and business operations into new integrated, and company-specific, strategies for creating shared value. Since business and society are interdependent, the best outcomes for each will be obtained when businesses develop strategies that integrate social needs with real commercial opportunities and *vice versa*.

CSV also enables a new understanding of the SDGs. Under shared value strategies, the SDGs become a governance framework for each business to discover its unique shared value proposition, rather than being an additional external cost on business. The CSV theory can also be cascaded to the project level because it provides a mechanism to optimally define project success, both in terms of time, cost, and scope (and quality), but also broadened to consider the societal and environmental aspects. This is the core theoretical proposition of this paper; that CSV is not just at organisational level theory, but also relevant at the portfolio, programme and project levels.

Method

Research procedure

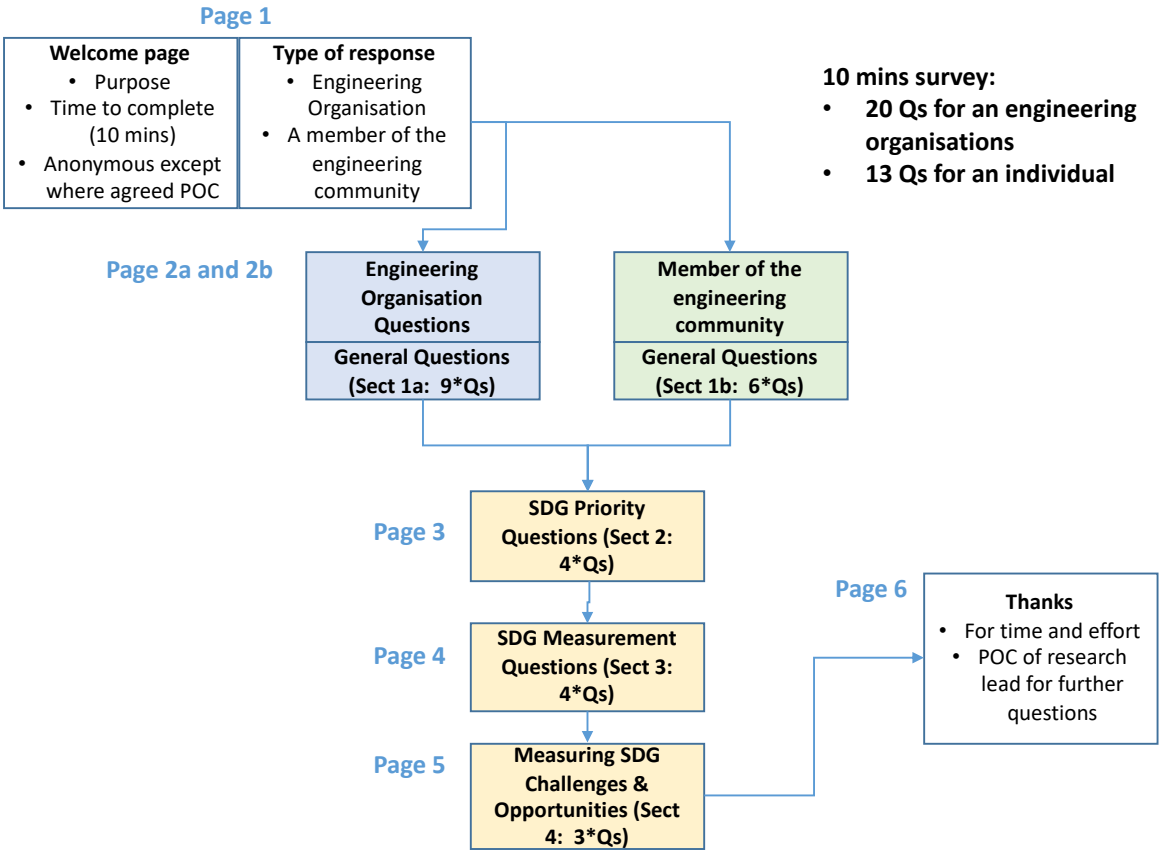
The early analysis has been built on a cause-effect (problem-solution) reasoning model, which is based on two stages; firstly, an online survey was completed by 325 engineers, and secondly, 40 semi-structured interviews were conducted with CEOs and corporate Heads of Sustainability. Only the first stage is shared in this paper. Each stage is part of an exploratory research process to deepen our understanding and narrow the scope while establishing priorities for the final research design, which is to be developed using industry-based case studies in operational project delivery. The method used is a form of exploratory data analysis (EDA), which is an approach for assessing data-sets to identify their main themes and is regularly conducted with diagrammatic interpretations (Tukey, 1977). According to this approach a statistical model is sometimes used, but in the main, EDA is used for observing what the data indicates beyond modelling or the hypothesis testing task.

The survey

The survey approach to data gathering was selected because it is recognised (Lenth, 2001) as one of the most important methods in applied social science. This approach enabled

a rapid and cost-effective way to assess a statistically significant group of engineering project managers' perceptions of the relative importance and current capability for measuring SDG impacts on their projects. The participants were all members of the UK's leading civil engineering professional society. A benefit of using this style of survey approach is that it delivered both qualitative research outputs, by using open-ended questions that captured text-based commentary, and quantitative research outputs, by using a scoring mechanism aligned to the questions. The questions (shown in Figure 2 and Appendix 1) focused on four areas: their perceived importance of measuring SDGs on their projects; the current capability (such as skills, tools and methods) to do so; their identification of today's challenge of measuring projects' SDG impact; and, the opportunities to improve. SurveyMonkey© was chosen as the web-enabled cloud-based software survey development tool because it was highly customizable and provided a comprehensive set of back-end capabilities, such as data analysis and representation tools that helped present the data in a concise and informative manner.

Figure 2: Survey Questions Sequence; adopting twin-line methodology of engineers' confidence in Measuring Projects' SDG Impact (full table of questions at Appendix 1).



The tool also provided guidance on bias elimination and sample selection best practice. This enabled a structured approach for presenting the questions, which were designed to capture the required data, which at its core, sought to establish whether this research area was of perceived importance to practicing professionals, and if it was of high importance, was there a gap between the import of measuring SDG impact versus their capability to do so? It achieved this through using both open-ended and closed questions within a clear structure that explored firstly broader and secondly, more specific areas and concepts within the research

areas. The survey was co-branded using the research funders' logos and was sent out to participants by the UK's leading civil engineering institution, thereby giving reassurance to the participants since they would recognise the institution's logo, which would be likely to increase the response rate. Data protection that fulfilled ethical and legal data management requirements, including GDPR (general data protection regulation), were also considered and managed during the design stage of the survey. For example, by sending the survey from the engineering institution to their members, it conformed with the members' original opt-in agreement to receive similar knowledge sharing initiatives.

Access

The survey aimed to access between 250-300 qualified engineers, that would have given a response rate of c5% of a total number of 6,500 targeted participants (Statistica, 2018; ICE, 2018), at 95% Confidence Level, it would give a Confidence Interval of 6.19, using a worst-case percentage of 50% (Survey System, surveysystem.com).

The questionnaire was designed to distinguish between the generations and, more specifically, capture the responses of millennials (i.e. people born between 1983 and 2000) (US Public Interest Research Group, 2016; Howe and Strauss, 1991) who, according to the U.S. Bureau of Labor Statistics (2017), within the next two years, will reflect 50% of the US workforce, growing to 75% by 2030.

The millennials can be viewed as the generation who are rapidly becoming the organisational leaders and already acting as policy shapers (Baird, 2015), which is relevant to this study as they will increasingly be owning the selection and reporting of SDG priorities on their projects. In order to secure access to this sample of engineering project managers, the lead researcher partnered with the UK's leading civil engineering members' professional society, the Institution of Civil Engineers (ICE), who jointly aligned this survey with the overarching theme of the 2018 Global Engineering Congress (GEC) that had formal delegations from over 20 global engineering organisations and over 2,000 independent delegates jointly focused on a one-week collaboration of the global profession to 'agree actions that will deliver increased infrastructure SDG impact' (European Council of Civil Engineers, 2018; and World Federation of Engineering Organisations, 2018). This allowed for significant public and user engagement throughout the study.

A potential limitation of the study may have emerged as organisations participated, which was linked to gaining authorization from senior leadership. This was a form of nonresponse error (Singleton and Straits, 2009) and the strategy to reduce this error was to firstly diagnose the problem and then find ways to mitigate the error. The reasons given when the researcher followed-up with a few known participants who had waivered their anonymity and volunteered their feedback, was that no official statement would be given by large organisations on a survey without having secured senior leadership sanction. These organisations were later approached at the interview stage of the research study, which involved CEOs and Heads of Sustainability who had the authority to provide a corporate statement on their organisations' SDG measurement strategy.

Data Analysis and Results

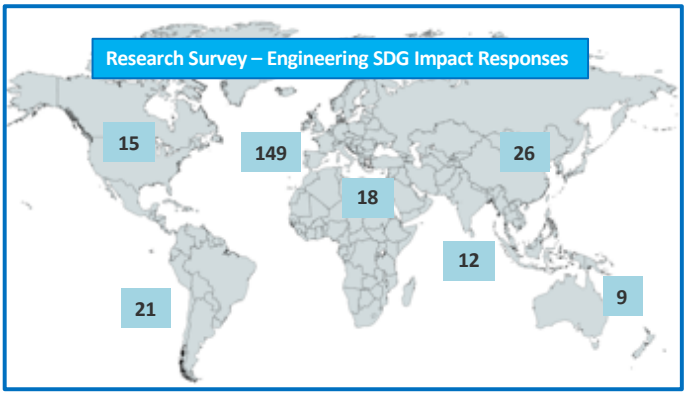
Descriptive statistics

Using an anonymous data collection approach, 325 survey responses were received during June 2018; 24 of which were corporate responses, with an average completion time of 7 minutes. There was a minimum of 159 answers for each survey response from individuals. From the 301 responses from individuals, 81% (243) were from qualified engineers, of which 45% had over 20 years of experience. When all the years of experience were added together it provided an indicative cumulative total of 3,628 years of professional engineering expertise, not including the non-engineers that covered professions ranging from lawyers, investment specialists and academics. This indicates that although the total number of survey respondents was limited to the 325, it did include a high level of expertise that adds to the weight and credibility of the responses. This result supported the requirement to have sufficient statistical power, and thus, validity for the research findings (Diekhoff, 1992). The descriptive statistical data is shown in the tables and charts in Figure 3.

Figure 3: Statistical Descriptive Data from Survey.

(a). Geographical region

Europe	149 responses
Africa	11 responses
Middle East	7 responses
Indian Sub-continent	12 responses
Asia	26 responses
Australasia	9 responses
North America	15 responses
Latin America	2 responses

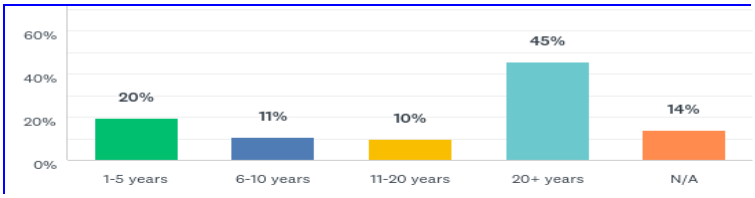


(b). Types of respondents

A qualified engineer	81%
An engineer working towards chartered status	4%
A student	10%
An academic / educator	2%
Supply chain	0%
Related engineering business	3%

(c). Years of experience

1-5 years	20%
6-10 years	11%
11-20 years	10%
20+ years	45%
N/A	14%

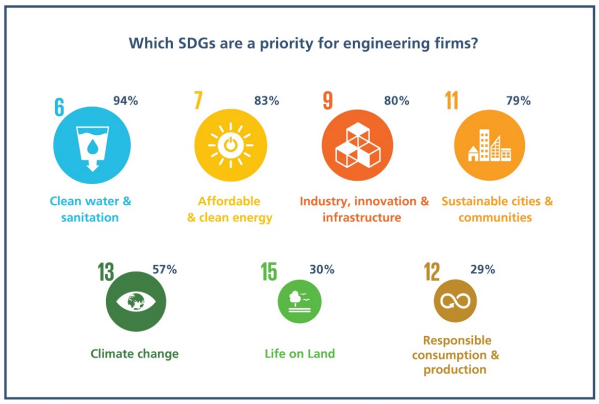


(d). Percentage of Millennials reporting

Millennials	40%
Non-millennials	60%

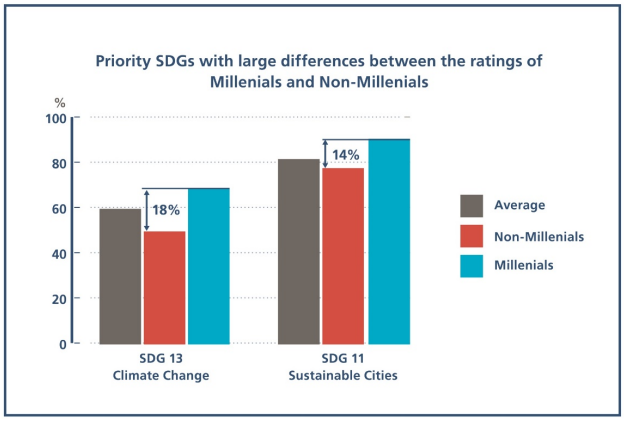
The survey results showed that engineers have a strong focus on five priority SDGs, namely: SDG6 (clean water and sanitation), SDG7 (affordable and clean energy), SDG9 (industry, innovation, and infrastructure), SD11 (sustainable cities and communities), and SDG13 (climate change).

Figure 4: Preference of the five top SDGs that engineering projects should measure impact.



The results also showed that there was a marked difference in millennial response as shown in Figure 5 below.

Figure 5: Preference of the SDG 13 and 15; differentiating between millennials.

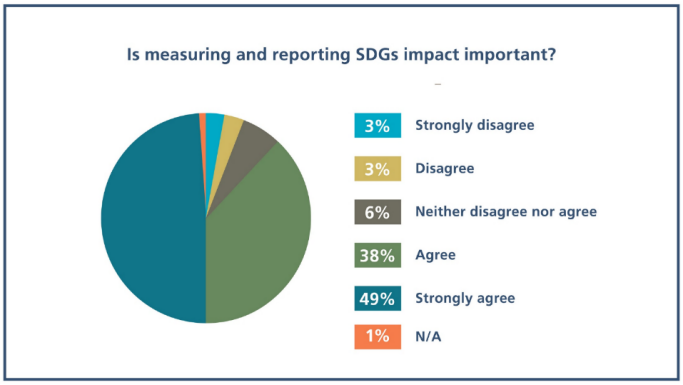


Six responses from the survey's questions are shown below, with summary data and supporting analysis.

Question 1: Should engineering businesses seek ways to measure and report SDG impact?

The first set of results show that there was overwhelming agreement that it was important that engineering businesses seek ways to measure and report SDG impact. 87% of respondents either agreed or agreed strongly that this was important. Again, millennials rated this as more important than non-millennials (94% and 82% respectively) (see Figure 6 below).

Figure 6: Question 1: Should engineering businesses seek ways to measure and report SDG impact?

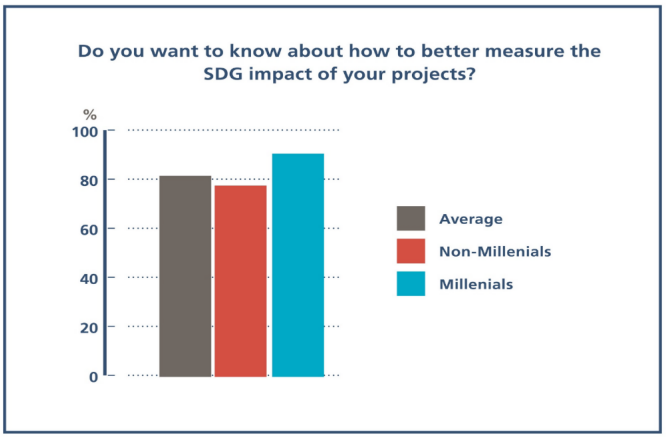


	STRONGLY DISAGREE (1)	DISAGREE (2)	NEITHER DISAGREE OR AGREE (3)	AGREE (4)	STRONGLY AGREE (5)	N/A	TOTAL	WEIGHTED AVERAGE
(no label)	3% 5	3% 5	6% 10	38% 60	49% 78	1% 1	159	4.27

BASIC STATISTICS				
Minimum 1.00	Maximum 5.00	Median 4.00	Mean 4.27	Standard Deviation 0.95

In addition, the overwhelming majority of engineers wanted to know more about how to measure SDG impact on their projects better (83% vs. 17%), especially among the millennial generation (see Figure 7).

Figure 7. Do you want to know more about measuring SDG impact on your projects?



ANSWER CHOICES	RESPONSES	
Yes (1)	83%	181
No (2)	17%	37
TOTAL		218

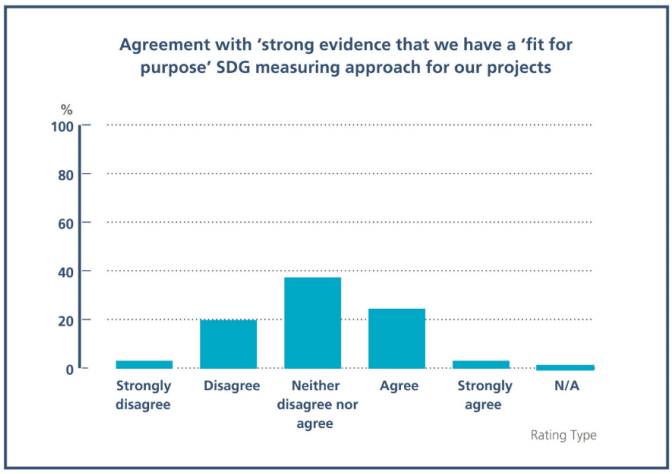
BASIC STATISTICS				
Minimum 1.00	Maximum 2.00	Median 1.00	Mean 1.17	Standard Deviation 0.38

The survey respondents gave very strong support to the view that it was important that engineering businesses seek ways to measure and report SDG impact. 87% of respondents either agreed or agreed strongly that this was important. Again, millennials rated this more importantly, at 94% versus 82% for non–millennials (see Figure 7).

Question 2: What is the engineers' view on current infrastructure projects and their achievement of the SDGs?

The second set of results reveals some areas where the current measurement of projects' SDG impact needs improvement (see Figure 8). Despite the strong support for the importance of measuring and reporting SDG impact, and the clear identification of five priority SDGs for the sector, only 34% of engineers believed that 'there is strong evidence that we have a 'fit for purpose' SDG measuring approach to track our projects' impact on SDGs. 37% neither disagreed nor agreed, probably due to the fact that it is such a complex and difficult challenge to measure impact and to-date, the industry continues to struggle to find a practical and workable solution to this issue.

Figure 8. Do we have a 'fit for purpose' measuring approach to track projects' SDG impact?



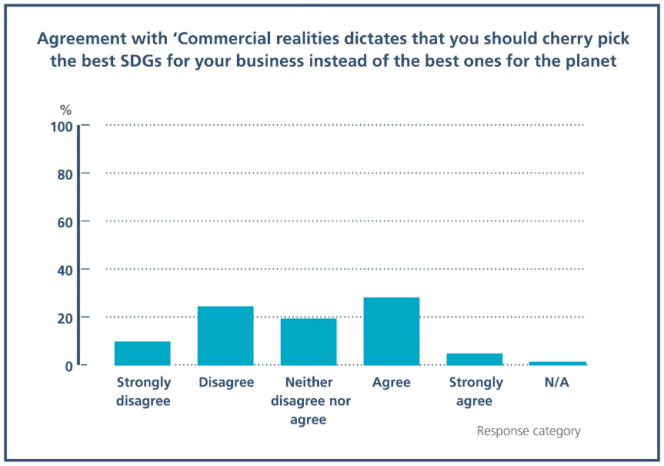
	STRONGLY DISAGREE (1)	DISAGREE (2)	NEITHER DISAGREE OR AGREE (3)	AGREE (4)	STRONGLY AGREE (5)	N/A	TOTAL	WEIGHTED AVERAGE
(no label)	5% 8	19% 31	37% 59	27% 43	7% 12	5% 8	161	3.13

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	3.00	3.13	0.99

Question 3: Do commercial realities dictate the SDGs you pick?

The next question probed the way in which commercial realities influence the selection of SDGs to measure (see Figure 9).

Figure 9. Do commercial realities dictate the SDGs you pick?



	STRONGLY DISAGREE (1)	DISAGREE (2)	NEITHER DISAGREE OR AGREE (3)	AGREE (4)	STRONGLY AGREE (5)	N/A	TOTAL	WEIGHTED AVERAGE
(no label)	12% 19	26% 41	21% 33	31% 50	9% 15	1% 2	160	3.01

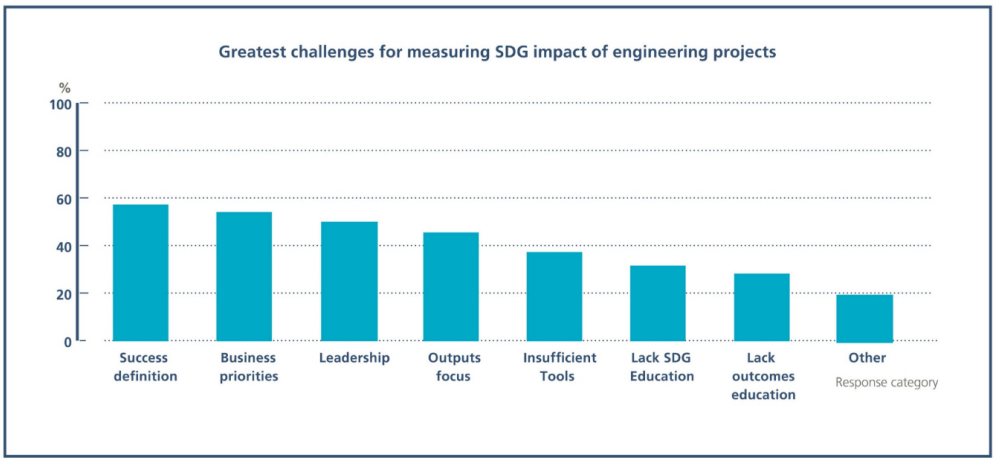
BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	3.00	3.01	1.20

Respondents were nearly equally split on this issue; 36% in total disagreed or strongly disagreed that SDG choice was influenced by commercial realities, while 39% agreed or strongly agreed, with 21% non-committal. It is likely that the 'agree' type of responses, as well as the non-committal responses, could reflect the difficulties an impact measurement approach that added value to the business objectives as well as addressing the wider 'societal shared values'.

Question 4: What are the greatest challenges for measuring SDG impact?

The respondents to the exploratory survey said that the four greatest challenges are as follows (see Figure 10): success definition (56%), business priorities (55%), leadership (52%), and a focus on outputs rather than outcomes (46%).

Figure 10. What are the greatest challenges for measuring SDG impact? (See Appendix 2 for full data)

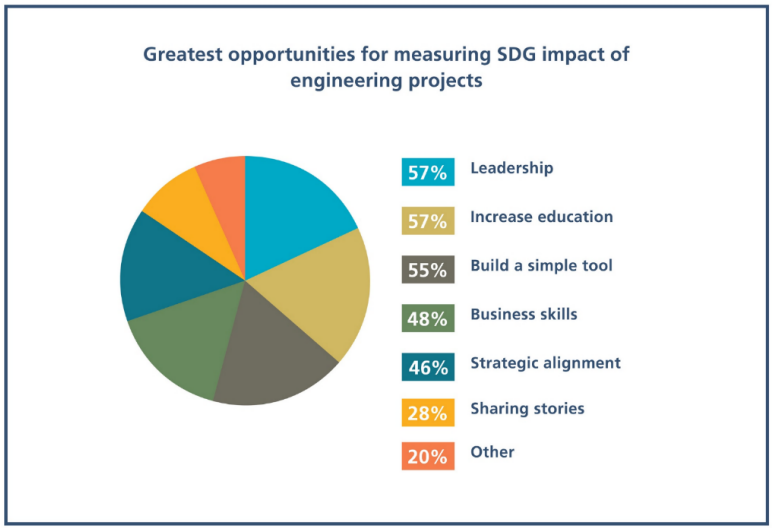


The four top challenges identified in the results can also be understood as reflecting the challenges of integrating business needs with the SDGs in the absence of shared value business strategies, although 'success definition' could also reflect the lack of KPIs to measure SDG performance on engineering projects.

Question 5: How could the achievement of the SDGs on future infrastructure projects be improved?

The final set of results reveals some initial views about how the performance of future projects against SDG goals can be improved (see Figure 11 below). This exploratory research shows that in terms of the greatest opportunities within engineering firms, the top four opportunities were leadership (57%), increased education and training in SDG impact skills (57%), use of a simple and widely used tool (55%), and business skills (48%).

Figure 11. What are the greatest opportunities for measuring SDG impact? (See Appendix 3 for full data)



Inferential statistics

Chi-Square analysis provided a p-value of between 0.001 and 0.132 (see Appendix 3). Therefore, the statistical validation has not been consistent and as such the findings should only be taken as an indicator of where further research can be focused. However, the survey has been followed by 40 interviews with CEOs and Heads of Sustainability and while analysis of this data remains underway, it provides increased confidence that there is a gap between current practices and engineers' strong desire to do better. It also identified four dominant critical success factors that are needed to close the gap.

Discussion and Framework Development

This exploratory survey research shows that the vast majority (87%) of engineers surveyed, have a strong appetite for action on the SDGs. From the engineers surveyed, millennial engineers are 15-20% more likely than non-millennials to want to work on projects that deliver the SDGs. However, this strong focus and desire, almost commitment, to the SDGs and their materialisation was accompanied by an especially strong frustration with the lack of solutions that are fit for purpose. The four critical success factors that were most commonly identified were: tools and methods; suitable training geared towards an understanding of the SDGs; definition of business success that differentiates between outputs and outcomes; and finally, the most frequently identified success factor, was the leadership and governance tailored to driving change under the SDG framework. This led to five core themes that emerged from the results, which are discussed below: leadership & governance (1); millennials (2); outputs vs. outcomes as definition of project success (3); business skills for engineers (4); and, performance measurement tools (5).

Leadership – Governance

The survey results are further evidenced by a report from Deloitte (2018) on findings from over 10,000 millennials. The Deloitte 2018 survey indicated a distinct, negative shift in millennials' attitudes on CEO's and business' motivations and ethics. Today, less than half of millennials believe businesses operate ethically (48% balanced against 65% in 2017) as well as a drop in the number of them that believe CEOs are committed to supporting society (47% balanced against 62% in 2017). This highlights that there is a significant mismatch between what millennials define as responsible organisations, and the people that lead them, in terms of what responsible businesses should aspire to achieve. The message is clear, that millennials want business leaders to be proactive about making a positive impact in society. Measuring projects' SDG impact is a way to do this.

Further research by the lead author, including interviews with 40 CEOs and Heads of Sustainability, is currently exploring this issue. As one CEO commented in the follow-on research, *"We need to balance the short-term business goals with the medium to long-term sustainability goals, in order to run businesses that will be profitable, as well as long-term sustainable. We can't sell anything to our customers if they are dead from the effects of climate change."*

Millennials

In a highly encouraging note, and aligned with the theme discussed above, the survey results indicate that millennial engineers are 15-20% more likely than non-millennials to want to work on projects that deliver the SDGs. This is a key insight for engineering business leaders to take note of (such as CEOs and other managers) because in the UK alone, 50,000 engineers (all forms) will have to be recruited per year until 2022 to meet the projected level of demand for qualified engineers (ICE, 2018). These talent management priorities will be important to

business resilience in the near future. Indeed, the identified lack of alignment between millennials' perceptions of businesses motivations balanced against their own imperatives is typically shown in their allegiance to employers (Deloitte, 2018). Simply stated, if businesses do not make a greater effort to demonstrate their ability to create shared value that achieve financial, but also environmental and social outcomes, then it will not engender loyalty. In turn, this may result in higher staff turnover, thereby damaging its business interests as well as negatively impacting the projects' delivery of SDGs.

Outputs / outcomes

The survey showed that engineers agreed that too often, projects define success by traditional outputs using the so-called 'iron triangle' of time/cost/scope (and quality) dimensions to deliver on the SDG goals. Instead, the majority of survey respondents agreed that the project management community needs to place a greater emphasis on the achievement of long-term outcomes and a corresponding broader definition of success.

Business skills for engineers

Following on from the previous theme of defining success through outcomes and not just through the traditional outputs of time, cost and scope (and quality), the survey results also indicated the need to build capability and capacity amongst engineers. The specific business skills of innovation and definition of broader TBL success was a useful indicator for future research. In this regard, it was suggested by a number of respondents that embedding business skills learning within core engineering educational programmes would help provide opportunities for meaningful improvements in the measurement of SDG performance on projects.

Measurement tools and processes (methodologies)

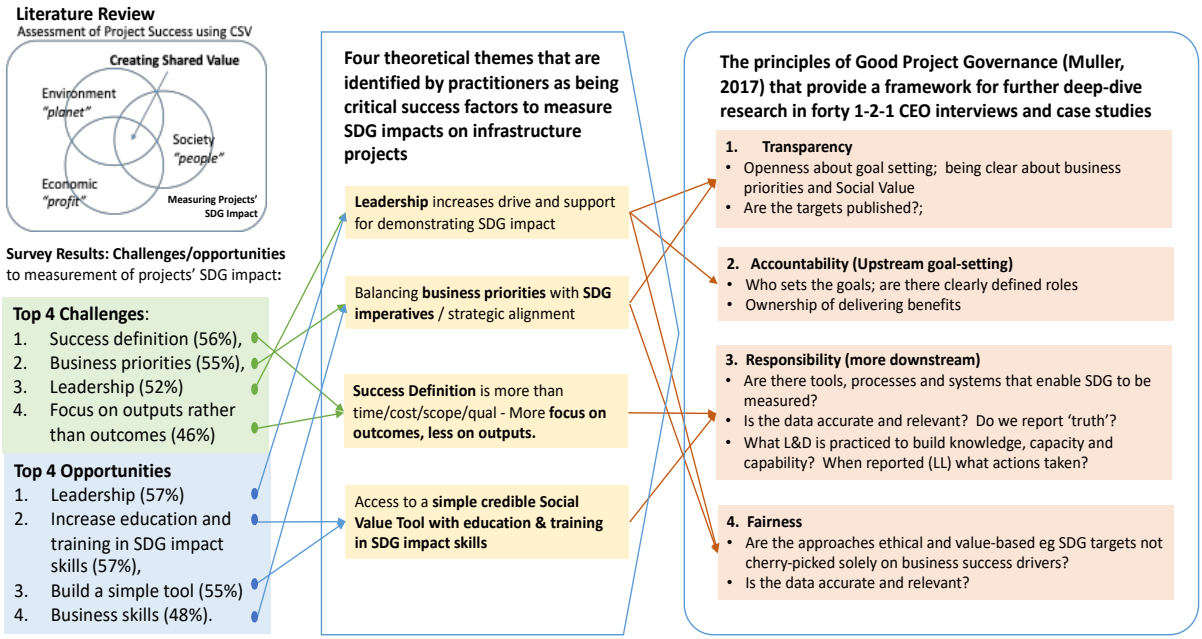
The survey responses showed that there is significant room for improvement on availability of 'fit for purpose' engineering tools and methodologies to measure SDGs. These results highlight the need for a new simple tool (such as a set of KPIs linked to the SDG indicators) developed with a global sustainability body, such as the Global Reporting Initiative (GRI). This might allow the engineering community to align projects' SDG reporting with the growing trend of using global standards to report sustainability, with 93% of the world's largest 250 corporations reporting on their sustainability performance in 2018, and 82% (Global Reporting Initiative, 2018) of these using GRI Sustainability Reporting Guidelines to do so.

Analysis of results and development of a future research model

The survey results have confirmed that there are four critical success criteria that are not currently in place and until this situation is rectified, the gap identified in the literature review will remain. The survey results have also been recognised widely and as reported in press briefings (New Civil Engineer, 2018) and used as a basis for designing an industry-led response to the SDG measurement challenges (Institution of Civil Engineers, 2019). The paper

therefore proposes a framework for further investigation that builds on the results from the survey and uses four factors that are identified by practitioners as being critical success criteria to measure SDG impacts on infrastructure projects. It is proposed to use these success criteria within a governance model, structured on the four governance principles (Muller, 2017) of accountability, responsibility, transparency and fairness, to understand how the four identified critical success factors can be harnessed to close the gap between engineers' perceived importance of measuring projects' SDG impact and their current ability to do so, as shown in Figure 12 below.

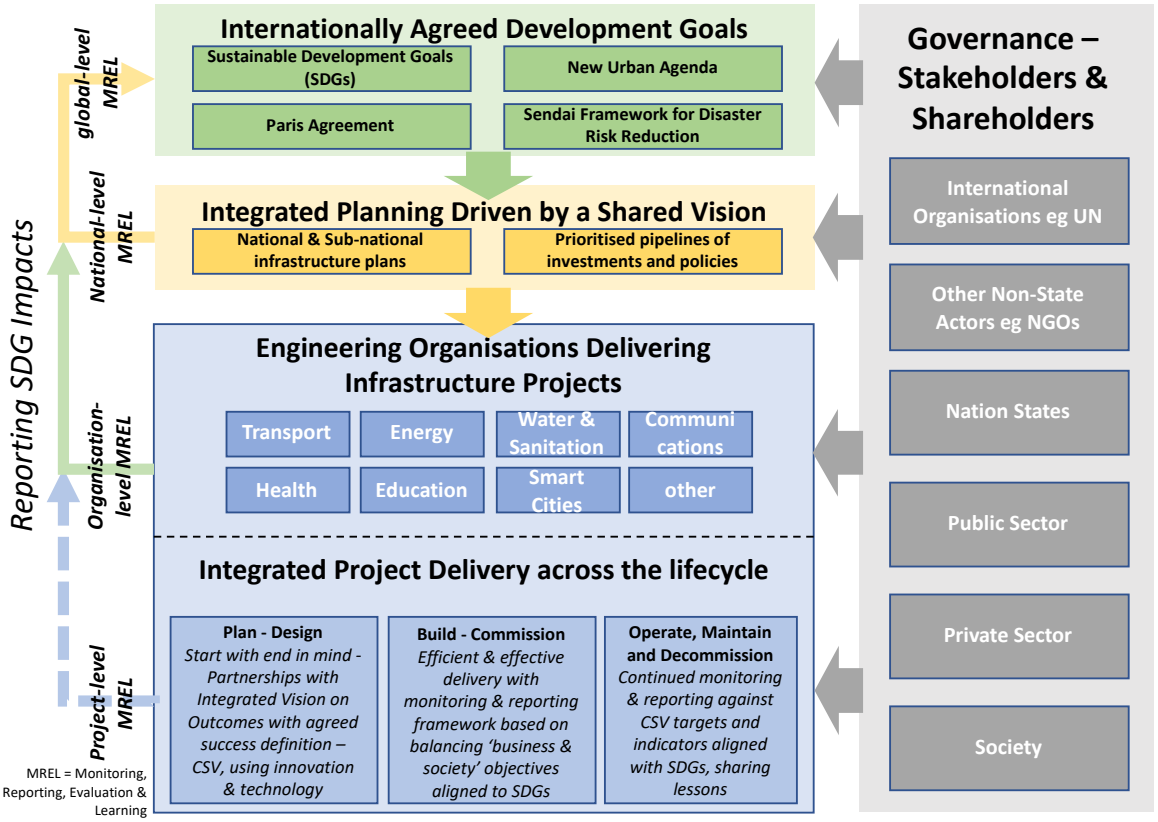
Figure 12. Conceptual framework for next phase of research: Interviews and selection of industry-based case studies.



A second model developed from this exploratory research, aims to develop an improved understanding of the organisational context within which the definition and measurement of infrastructure project success is made. The structures illustrated in Figure 13 examine the leadership and governance theories and relationships that underpin the overall analysis of project success definition and measurement.

These structures are derived from a similar model developed by the ITRC (2018) and uses this as a framework for the analysis of infrastructure-specific projects. This model illustrates the relationships between stakeholders (on the right axis) and the lifecycle of the projects (in the lower part of the diagram). This comprises the value system, responsibilities, processes and policies that allow projects to achieve organisational objectives as well as broader societal related objectives that are in the best interests of all stakeholders, internal and external, and the corporation itself (Muller, 2009 and 2017). It also shows the reporting lines for the Monitoring, Reporting, Evaluation and Learning, on the left side.

Figure 13. Conceptual framework for analysis of SDG measurement - stakeholder and governance relationships.



Source: Adapted from ITRC/UNOPS's *Framework for implementing infrastructure for sustainable development. Sep 2018.*

Conclusions and Future Work

The core argument in this paper is that while the endorsement of the SDGs by all the world's governments is a major step forward, current progress on achieving the SDGs has been limited by a fundamental misunderstanding of the interdependent relationship between business and society. Also, the golden thread from projects to SDG targets appears to be missing.

The literature review analysed whether the CSR approach to governance and project decision-making is sufficient to ensure infrastructure projects' investments maximise their positive impacts on the UN SDG 2030 targets. The paper suggests that the scale and urgency of the SDG challenge necessitates radical rethinking at project level, where the majority of the SDG targets are delivered. Consequently, CSR requires updating by placing socially aware priorities, such as the SDGs, at the heart of core business thinking and strategies. CSV was offered as a theoretical model to do this, but it requires practical engagement to implement CSV's ambitions. In particular, CSV is dependent on businesses ensuring that there are four key success criteria in place: the leadership, tools, business skills, and a common understanding of the broader definition of success beyond the 'iron triangle' of time, cost and scope.

In this initial research phase, the evidence from a survey of 325 engineering project managers indicates that the 'call to action' by the engineering community on the SDGs is now compelling for business-success reasons, and not just moral ones. It has utilized exploratory data analysis techniques to ascertain how they value the measurement of the impact of their infrastructure projects on the United Nations' SDGs. This research identifies that there is a gap between their perceived importance of measuring SDG impact, contrasted with their current capabilities (such as skills, knowledge, leadership, tools and approaches) to do so.

The limitations of this exploratory research are that it has not provided definitive findings, especially for understanding the views of organisations. While it has helped to narrow the scope of future research by establishing priorities for the final research design of the ongoing doctoral studies, the sample size of the survey does not generate findings 'without doubt'. It should therefore be viewed as a sign-post for further analysis, that deepens the research. The key area of further research is to evaluate the governance framework that shapes the selection and reporting of projects' SDG priorities. This has commenced with the development of governance models and analytical frameworks that have been used for 40 interviews of engineering organisations' CEOs and Heads of Sustainability (ongoing analysis of this new data is underway) and potentially using a case study approach to build more detailed qualitative and quantitative data that the findings of this paper's exploratory research can be tested against. In this way, future research will provide more meaningful insights into how governance of projects will determine whether future infrastructure investment can increase impact across SDGs.

Infrastructure projects have always been an essential underpinning component for society, but today's global business context gives new weight to infrastructure's importance, and this approach of measuring SDG impact at the project level thereby provides a golden thread to link the projects' delivery outcomes with national and global SDG targets. However, if projects' do not widen the definition of success to incorporate SDG impacts (i.e. going from outputs to outcomes), they will likely fail to accommodate the unique enabling role of engineering and infrastructure, inadvertently weakening the resilience and wellbeing of both business and society.

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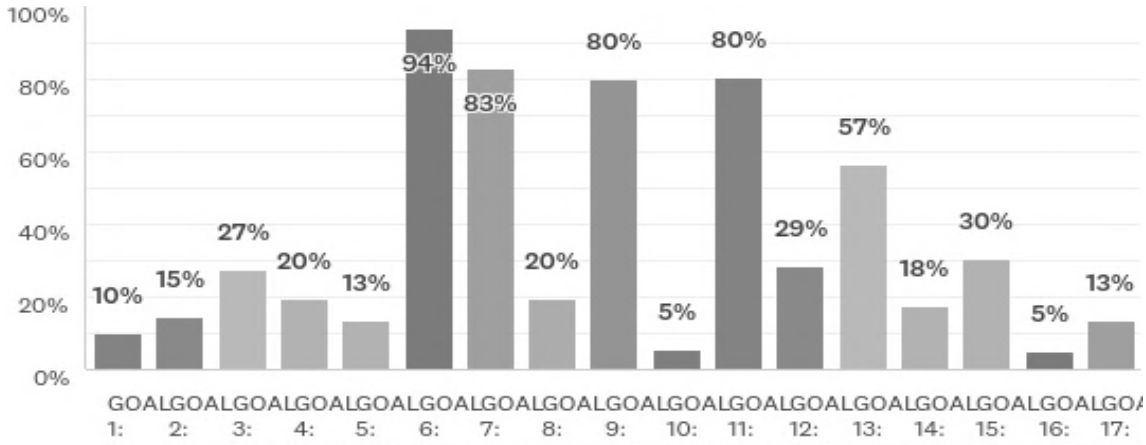
Appendix 1: Survey questions and selection of the type of question and metric to align with analysis requirements for measuring engineers' views on projects' SDG impact

Q#	Theme	Question	Measuring Value				
			Y / No	1 to 6	text	List	option
	Opening Page	With ICE and GEC logos. Thank the respondent for their time. Explain the purpose of the survey. Who is it for? How long will it take (10 mins)? What will happen with the data? Who is the POC at ICE.					
a		**Are you completing this survey as an individual or for an engineering firm?**					allow single choice for either individual or as engineering firm
1a	Engineering Organisation - General Data on your organisation						
1.1		**Q: What is the name of your organisation.**					complete text
1.2		**Q: In which country is your organisation based?**					text for country and list for continets
1.3		**Q: Name of person completing Survey for firm**					complete text
1.4		**Q: Your role/grade**					complete text
1.5		**Q: Contact details (email)**					complete text
1.6		**Q: Number of Engineers in your firm**					options include 1-49; 50-99, 100 +etc
1.7		**Q: Number of current engineering projects underway (from design through to completion)**					options include 1-20; 20-49; 50-99, 100 +etc
1.8		**Q: In which countries do you deliver projects?**					just home country; 2-5 countries; 6-20 countries; 20+ countries
1.9		**Q: Who is the company's SDG or CSR lead?**					complete text
2	Engineering Organisation - SDG Data on your organisation						
2.1		**Q. How do you plan to assess your impact on the SDGs?** 1 We have no intention to assess our impact on the SDGs 2 We plan to assess our impact on the SDGs but have not thought through how 3 We plan to assess our impact on some of the SDGs and indicators relevant to our business 4 We plan to assess our impact on all the SDGs and indicators relevant to our business 5 We plan to assess our impact on all 17 SDGs and indicators 6 Don't know					select one of the six choices
2.2		**Q. We fully understand the SDG priorities of the governments in our key markets and countries of operation.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
2.3		**Q. Our company has fully defined the tools that will help it to assess its impact against the SDGs.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
2.4		**Q. We can comprehensively report to governments and other key stakeholders on how our company is contributing to SDGs.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
1b	General SDG Data - as a member of the engineering community						
1.1b		**Q: What is the name of your organisation?**					complete text
1.2b		**Q: In which country is your organisation based?**					text for country and list for continets
1.3b		**Q: Contact details (email) - optional**					complete text
1.4b		**Q: Years of experience as qualified engineer**					options incl eg 1-5; 5-10; 10-15; 15+; n/a
1.5b		**Q: Are you a millenial (born 1980-2000)?**					select Y or N; this allows to filter data to assess any difference between them and others
1.6b		**Q. As an engineer I want to know more about UN's Sustainable Development Goals,and what we are doing to measure our impact against them.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
3	SDG-Engineering specific Questions						
3.1		**Q. From the list below, please rank the five SDGs where you believe engineers have the greatest impact and opportunity.**					list of all 17 Goals with titles
3.2		**Q. Having read the UN's Sustainable Development Goals, do you agree it is important that engineering business' sign up to these goals?**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
3.3		**Q. There is strong evidence that we have a 'fit for purpose' SDG measuring approach to track our contribution from our projects.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
3.4		**Q. Commercial realities dictate that you should cherry pick the best SDGs for your business instead of the best ones for the planet.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
4	GEC related Questions: Engineering Community – Sharing Best Practice	*The Global Engineering Congress is being hosted at the ICE from 22-28 Oct 18 (please see details at: Global Engineering Congress Info*					Global Engineering Congress Info
4.1		**Q. I/we are planning to actively engage with the GEC discussions and support plans to agree and implement a global engineering response roadmap to the SDGs?**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
4.2		**Q. As an engineer, I/we support the Global Engineering Congress' objective to unite the engineering community to agree and mobilise a response roadmap to the UNSDG?**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a
4.3		**Q. We should look to engineering associations and standards bodies for advice, support and guidance on measuring project contribution to specific SDGs.**					1=strongly agree; 2=agree; 3= neither agree or disagree; 4=disagree; 5=strongly disagree 6=n/a

<u>Appendix 2</u> – Data capture from survey: Select the six SDGs that you believe that engineers have the greatest impact and opportunity.



GOAL 6: Clean Water and Sanitation - Ensure availability and sustainable management of water and sanitation for all (6)	93%	158
GOAL 7: Affordable and Clean Energy - Ensure access to affordable, reliable, sustainable and modern energy for all (7)	83%	140
GOAL 8: Decent Work and Economic Growth - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (8)	19%	32
GOAL 9: Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation (9)	80%	135
GOAL 10: Reduced Inequality - Reduce inequality within and among countries (10)	5%	9
GOAL 11: Sustainable Cities and Communities - Make cities and human settlements inclusive, safe, resilient and sustainable (11)	80%	136
GOAL 12: Responsible Consumption and Production - Ensure sustainable consumption and production patterns (12)	28%	47
GOAL 13: Climate Action - Take urgent action to combat climate change and its impacts (13)	56%	95
GOAL 14: Life Below Water - Conserve and sustainably use the oceans, seas and marine resources for sustainable development (14)	17%	29
GOAL 15: Life on Land - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (15)	30%	51
GOAL 16: Peace and Justice Strong Institutions - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels (16)	5%	8
GOAL 17: Partnerships to achieve the Goal - Strengthen the means of implementation and revitalise the global partnership for sustainable development (17)	15%	25
Total Respondents: 169		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	17.00	9.00	8.86	3.76

Appendix 3 – Data capture from the survey's Chi-Square Tests (with continuity correction, likelihood ratio, and linear-by-linear association).

Are you a millennial (born between 1980-2000)? * q0023_0001 Crosstabulation

			q0023_0001		
			Agree	Strongly Agree	Total
Are you a millennial (born between 1980-2000)?	Yes	Count	21	2	23
		Expected Count	17.7	5.3	23.0
	No	Count	22	11	33
		Expected Count	25.3	7.7	33.0
Total		Count	43	13	56
		Expected Count	43.0	13.0	56.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.615[a]	1	.032		
Continuity Correction[b]	3.337	1	.068		
Likelihood Ratio	5.087	1	.024		
Fisher's Exact Test				.052	.031
Linear-by-Linear Association	4.533	1	.033		
N of Valid Cases	56				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.34.

b. Computed only for a 2x2 table

Are you a millennial (born between 1980-2000)? * q0024_0001 Crosstabulation

			Total
Are you a millennial (born between 1980-2000)?	Yes	Count	65
		Expected Count	65.0
	No	Count	95
		Expected Count	95.0
Total		Count	160
		Expected Count	160.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.564[a]	5	.128
Likelihood Ratio	9.474	5	.092
Linear-by-Linear Association	4.358	1	.037
N of Valid Cases	160		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is .81.

Are you a millennial (born between 1980-2000)? * q0024_0001 Crosstabulation

			q0024_0001		
			Agree	Strongly Agree	Total
Are you a millennial (born between 1980-2000)?	Yes	Count	24	9	65
		Expected Count	21.4	6.2	65.0
	No	Count	28	6	93
		Expected Count	30.6	8.8	93.0
Total		Count	52	15	158
		Expected Count	52.0	15.0	158.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.150[a]	4	.128
Likelihood Ratio	7.372	4	.117
Linear-by-Linear Association	3.358	1	.067
N of Valid Cases	158		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.17.

Are you a millennial (born between 1980-2000)? * q0022_0001 Crosstabulation

			q0022_0001		
			Agree	Strongly Agree	Total
Are you a millennial (born between 1980-2000)?	Yes	Count	23	39	62
		Expected Count	27.7	34.3	62.0
	No	Count	39	38	77
		Expected Count	34.3	42.7	77.0
Total		Count	62	77	139
		Expected Count	62.0	77.0	139.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.553[a]	1	.110		
Continuity Correction[b]	2.034	1	.154		
Likelihood Ratio	2.567	1	.109		
Fisher's Exact Test				.125	.077
Linear-by-Linear Association	2.535	1	.111		
N of Valid Cases	139				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 27.65.

b. Computed only for a 2x2 table

Question 2. We conducted SPSS analysis to ascertain Chi-Square between the two age groups (millennial and non-millennial) and their responses. There were 159 answers that gave a p-value (Pearson Chi-Square) of 0.136. This was not fully statistically significant but indicates a viable trend that might justify further analysis. However, when the optionality of questions was condensed, combining the agree and strongly agree as well as then separately combining the disagree and strongly disagree, then the results became more statistically significant at p-value of 0.110.

Question 3: There was initially a p-value of 0.001, suggesting that the non-millennials were not having any markedly different opinions on the answers to this question. However, when further analysis was conducted by combining agree and strongly agree, the p-value was 0.032, indicating that the Millennials had similar numbers agreeing but a much higher proportion of millennials were strongly agreeing. It is difficult to interpret what this categorically means but it could indicate that there is likely to be a stronger viewpoint from a generation that prefer to give higher ratings for an issue that has such catastrophic impacts if it is not dealt with effectively.