

Article

# Delivering UN Sustainable Development Goals' Impact on Infrastructure Projects: An Empirical Study of Senior Executives in the UK Construction Sector

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**Abstract:** Achievement of the United Nations' 2030 Sustainable Development Goals (SDG) is of paramount importance for both business and society. Across the construction sector, despite evidence that suggests 88% of those surveyed want to measure the SDG impact at both the business and project levels, there continues to be major challenge in achieving this objective. This paper shares the results of a qualitative research study of 40 interviews with executives from the United Kingdom (UK) construction industry. It was supported by a text-based content analysis to strengthen the findings. The results indicate that SDG measurement practices are embraced in principle but are problematic in practice and that rarely does action match rhetoric. While the research was completed in the UK, the findings have broader applicability to other countries since most construction firms have extensive global business footprints. Researchers can use the findings to extend the current understanding of measuring outcomes and impact at project level, and, for practitioners, the study provides insights into the contextual preconditions necessary to achieve the intended outcomes of adopting a mechanism for the measurement of SDGs. The international relevance of this research is inherently linked to the global nature of the SDGs and therefore the results could be used outside of UK.

**Keywords:** sustainability; project success; business–society; business models; Sustainable Development Goals (SDGs); sustainable development; infrastructure project

## 1. Introduction

The establishment of any society rests on the development of a number of integrated areas, including industrial, social and economic systems [1], while consuming vast amounts of resources that often negatively impact the environment that they depend on. Many of these developments can be aligned directly or indirectly with projects delivered across infrastructure categories within the construction industry. Indeed, recent projections in the sector indicate that an estimated USD \$94 trillion [2] of investment in infrastructure projects is required globally by 2040. This represents a massive opportunity to stimulate economic prosperity, reduce poverty and raise standards in health, education and gender equality. However, there are also risks that the infrastructure project investment is squandered ineffectively or, worse, damages the environment and society that the economic development is dependent on. According to Morris [3], given the critical role that the project management community play, there is an urgent need for further research to ascertain more effective strategies to ensure balanced sustainable development to counter the threats of climate change and other global goals. Such global goals have been codified through the UN's Sustainable Development Goals (SDGs).

In 2015, the international community responded to the sustainable development challenge with their report *Transforming Our World: The 2030 agenda for sustainable development* [4]. The SDGs are the United Nations' blueprint, with 193 nations signatories, to address the global challenges, such as poverty, inequality, climate change, environmental degradation, prosperity, peace and justice [5]. The concept of sustainable development acquired its most cohesive definition in the United Nations' 1987 Brundtland Commission report, which described it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [6]. Using the "triple bottom line" [7–9], Ochieng, Price and Moore [10] took the definition further by placing it in the context of global construction projects and describing it as the balance of economic, social and environmental aspects. In their book [10], they identify a number of systemic issues, "hard and soft" in nature, that provide new challenges for global construction projects in relation to sustainable development.

There is a continuing need to understand how sustainability and, specifically, performance against the SDGs can be measured for infrastructure projects from the construction sector. Recent research [11–14] has indicated that linking infrastructure project success to SDG targets is problematic. Also, evidence has indicated that, at the project manager level, whilst the appetite for action is very strong, especially by millennials [14], there do not appear to be the tools, methods, leadership or business-society-environment framework to carry out meaningful measurement of SDG success at project level. This represents a knowledge gap that results in weaker investment decisions since SDG lessons are not being learned from project delivery successes and failures. According to this development, the objectives of this research study are to (1) identify the challenges and opportunities of SDG measurement for construction-industry projects and (2) understand how the SDGs and more generally sustainability are viewed in the context of the corporate strategy of construction sector enterprises.

The following section provides the literature review, which includes a brief overview of the concept of SDGs and their linkage to sustainability theory as well as a review of challenges and opportunities for measuring SDGs in the construction industry. The literature review is used to synthesise a series of theory-driven propositions. This is followed by the methods section and subsequently the findings and discussion sections. The final section concludes the paper with evaluation of the propositions and proposals for critical success factors that might inform the development of a prototype model for the measurement of SDGs. This section also recommends areas for further studies. In summary, the objective of this research is to explore the contextual issues that affect the linking of global goals to local delivery on infrastructure projects. The specific research question is "How do senior leaders in the construction sector rate and use global UN SDGs for infrastructure investment decisions at the local level?" Several propositions are derived from the literature review and they explore the research question further. Importantly, whilst the research is based on interviews with senior executives of UK firms, they were representative of firms that mostly had a global or regional footprint (57%), had staff levels mostly in the range of 10–25,000 (62%) and were mostly at, or above, senior executive level (defined as having "director" in their role title), including nearly a third at CEO or board level who reflected individuals who could represent their firm's views. It is therefore considered that the value of this research has international relevance because of the inherent global nature of SDGs and the global footprint of the organisations interviewed.

## 2. Literature Review

In order to address the aforementioned objectives, five key themes were identified that impact the context of the use of SDGs in infrastructure projects.

### 2.1. Sustainable Development Goals

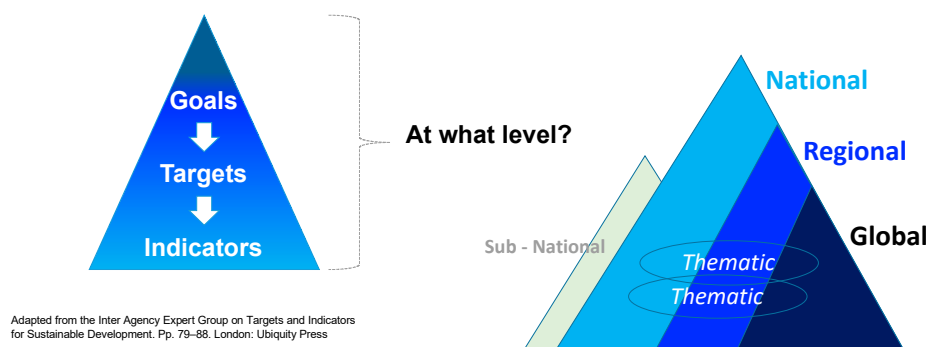
The most significant global response to the planetary boundary challenge was in 2015, when all governments ratified the UN's 17 Sustainable Development Goals [4] (as shown in Figure 1), to be

achieved by 2030 (with 169 targets and 244 indicators also agreed in 2017). This represented a major step change in the implementation of the sustainability agenda and effective responses to the planetary boundary challenge. Although the SDGs build on the earlier Millennium Development Goals (MDGs) [4] 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 [15]. 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 the delivery of project-level impacts that can be assessed against the national and global targets and indicators. The research presented later shows this cannot currently be achieved, and the evidence [16,17] illustrates that the golden thread from project measurement to national/global level is missing. There is a gap between theory and practice [11,13].



**Figure 1.** The United Nations 17 Sustainable Development Goals [4] (full details can be accessed at <https://sustainabledevelopment.un.org/>). (Usage of graphic agreed by UN).

In order to understand why there is a perceived gap, it is helpful to analyse the structural build of the SDG performance framework. In this regard, the SDG delivery targets are understandably ambitious and needed a reporting framework that would drive meaningful and verifiable progress towards the 2030 targets. In 2017, the UN’s Inter-agency Expert Group on Targets and Indicators for Sustainable Development designed a mechanism that linked goals, targets and indicators across the geographic and governance boundaries at national, regional and global levels [18]. Within this framework, shown in Figure 2, the Expert Group designed thematic areas that could also be used at the subnational level, but, because the targets and indicators were originally designed to be used at the global, regional and national levels, they had reduced applicability at organisational or project levels. Considering the aforementioned literature, it is possible to synthesise the first proposition related to the Sustainable Development Goals as follows. Based on this discussion, the first proposition was developed, shown below.



**Figure 2.** The Sustainable Development Goal (SDG) target and indicator framework developed by the UN subcommittee [18].

**Proposition 1 (P1).** *There is currently a gap in the knowledge base in regard to understanding how to measure SDG performance at the project level.*

### 2.2. SDGs in the Context of Infrastructure Projects in the Construction Sector

Most of society's developments in recent times can be connected to infrastructure projects [19,20] and the UN recognise that the development of infrastructure represents a massive opportunity to stimulate economic prosperity, reduce poverty and raise standards in health, education and gender equality [21]. It is apparent that ameliorating many of the risks associated with grand challenges, such as climate change, can only be achieved through investment in appropriate and resilient infrastructure and engineering [22].

A growing area of research has been in the comparison of construction projects' impacts on sustainable development from different angles. For example, Shen et al. [23] highlighted the role of projects to impact across the triple bottom line of people, profit and planet [7–9]. In this regard, construction projects are acknowledged as making an impact on the economic and social development of nations. Increasingly, recognition is given that these dual aims of economic development and social development can be achieved in harmony and, indeed, provide competitive advantage for firms [24,25]. Other studies have delved deeper into the changing nature of how project sustainability has changed within the construction industry. For example, Edum-Fotwe and Price [26] highlighted the issues that affect the assessment of social factors of construction projects, which this article suggests can be combined with the environmental and economic requirements of projects.

Defining infrastructure project success is central to understanding how to link global-national level SDGs with local infrastructure projects because it allows stakeholders to align their expectations against shorter-term outputs as well as the longer-term outcomes and SDG impacts. More recent research into project success definition [27] has consistently identified benefits and outcomes as being a critical determinant for the assessment of project success. Considering the aforementioned literature, it is possible to synthesise the second proposition related to SDGs in the context of infrastructure projects in the construction sector as follows.

**Proposition 2 (P2).** *The definition of infrastructure project success should be viewed from a systemic perspective, where there is a broader consideration of the overall performance of the project.*

### 2.3. Challenges and Opportunities for Measuring SDGs in the Construction Industry

As discussed above, there is evidence of an increasing interest, and in some cases demand, for promoting SDG measurement in the construction industry [19,20], with one report [14] that surveyed 325 engineers having a 95% demand from practitioners, who said that this was "very important" to them, with only 30% stating that they had adequate tools, processes and systems to measure them at project level. The survey [14] indicated four primary shortfalls for measuring SDGs on infrastructure projects, namely, leadership (1), tools and methods (2), engineers' business skills in measuring SDG impact (3) and how project success is too narrowly defined as outputs (such as time, cost and scope) and not outcomes (longer-term local impacts and stakeholder value) (4). This highlights that there are several challenges that impede the practical measurement of SDGs on projects, which need to be fully acknowledged.

Whilst there is still a limited body of research on the limitations of SDG measurement, there is much that can be learned from the measurement of sustainability on projects, and this is transferable to the SDG research. For example, Arif et al. [28] identified that there is often limited sustainability knowledge, especially amongst senior leaders, and this results in weaker understanding and impact assessments of related themes, such as poverty, environmental issues, supply chain adherence to sustainability best practice, cultural evaluation, technological deficiencies and limitations of research in depth and breadth, all of which have a negative influence on the valuation of sustainability, both as an

investment lens and a delivery approach. A further barrier to the use of SDGs, which potentially mirrors sustainable construction, is what some authors have suggested is a lack of capacity and capability to implement effective and efficient sustainability [29]. Considering the aforementioned literature, it is possible to synthesise the third proposition related to SDGs in the context of the challenges and opportunities for measuring SDGs in the construction industry as follows.

**Proposition 3 (P3).** *Although there is knowledge of the importance of sustainability on infrastructure projects, there is a lack of awareness of how to measure the performance of infrastructure against the SDGs.*

#### 2.4. The Concept of the Triple Bottom Line in Relation to SDGs

A contribution to the growing literature on the measurement of infrastructure projects on sustainability is provided by Ding and Shen [30], who focus on the balance needed between benefits to society whilst protecting the environment and still achieving the economic benefits envisaged in the project business case. The linkage across the three areas in the construction industry is further defined by Kibert [25], who suggests that the interrelationship between a project's outputs and the society that is impacted is a central component of defining the sustainability success of an infrastructure project. This introduces the concept that project success definition needs to consider success against the triple bottom line (TBL) [7–9] of social, environmental (or ecological) and economic (or financial) effects, otherwise noted as the “three pillars” concept of “people, profit and the planet” [7–9]. However, the overemphasis on the last of the TBL criteria, namely finance, brings us to the root of the problem of measuring projects' SDG impact [16,17].

This is because the crux of the project reporting problem lies with the dominance of accounting tools, which have been the preeminent business method of reporting business success for over 500 years since Luca Paccioli first published his papers on double entry bookkeeping [31]. It has largely remained unchanged until the past 10 years. As evidence of this widening to cover the three pillars of TBL, there has been a proliferation of mechanisms and economic models to track different elements of TBL, for example, environmental, social and governance (ESG) [7], which introduces these three core areas into the business investments decisions that measure the ethical and sustainability impacts of a company. The contention of this current research study is that the proliferation of project success measurement theories, tools and concepts, which are mostly finance-driven, causes confusion and often leads to suboptimal action [32] and that a TBL perspective needs to be integrated from the start of any business case development (see later section on business cases). Considering the aforementioned literature, it is possible to synthesise the fourth proposition related to SDGs in the context of the concept of the triple bottom line in relation to SDGs as follows.

**Proposition 4 (P4).** *Measurement of SDG performance should accommodate the perspective of the triple bottom line (i.e., social, environmental and economic performance).*

#### 2.5. The Concept of Theory of Change in Relation to SDGs

There is a wide use of the Theory of Change (ToC) across many academic disciplines, including environmental and organisational psychology, but it has also increasingly been connected to sociology and political science. ToC emerged from the field of programme theory and programme evaluation in the mid-1990s as a new way of analysing the theories motivating programmes and initiatives working for social and political change. It is focused not just on generating knowledge about whether a programme is effective but also on explaining what methods it uses to be effective. The original work in the 1980s has been developed further by the work of notable methodologists, such as Huey Chen's work on theory-driven evaluations [33,34], Peter Rossi's systematic approach to theory-driven evaluation in social sciences [35], Michael Patton's focus on integrating the theory with practice [36,37] and Carol Weiss' seminal work that takes a stakeholder-centric perspective [38–42] to find more effective ways of evaluating complex community programmes.



Weiss suggests [38] that complex community programmes had not sufficiently aligned local stakeholders on the change process and what the outcomes will be. She noted that the logic chains are particularly weak in the midsection of the causal chain, without which the longer-term goals are weakened. Weiss uses the term “Theory of Change” to describe the causal links across the inputs–outputs–outcomes pathway. She also focused attention on what users could claim in terms of impacts, separating claims of “attribution” from a wider, less direct, “contribution”. Based on her work [38–42], ToC has been applied extensively across international development, public health and human rights and has since become a central theory that underpins the approach to project benefits management [43–46].

The literature review has highlighted the potential benefits and tensions of linking global goals to local delivery on infrastructure projects. As a result of these findings, the derived research question is the following: how do senior leaders in the construction sector rate and use global UN SDGs for infrastructure investment decisions at the local level? The sub-questions that flow from this are as follows.

- What issues influence the successful use of an SDG measurement mechanism to achieve the desired outcomes? (This represents the context).
- What mechanism (for measuring SDG impacts) is in place to achieve the outcomes? (This represents the mechanism).
- What are the expected outcomes of successfully using the SDG measurement mechanism? (This represents the outcome).

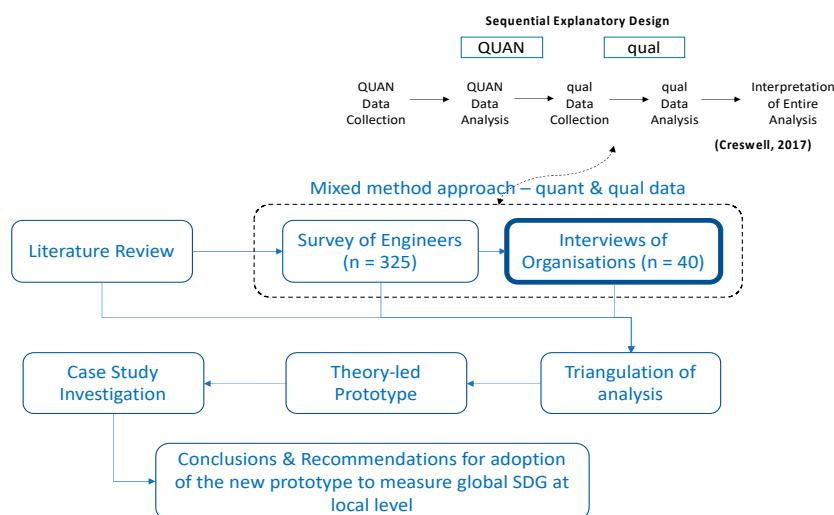
Considering the aforementioned literature, it is possible to synthesise the fifth proposition related to the concept of the Theory of Change in relation to SDGs as follows.

**Proposition 5 (P5).** *Measurement of SDG performance should include a full project lifecycle perspective and take account of longer-term project outcomes and wider impacts.*

### 3. Methodology

The broader research design involved a three-way data collection approach (Figure 3). At its core, the research design built on the triangulation of qualitative and quantitative datasets, which is well recognised as a method for informing theory-led research development [47,48]. In what Creswell [47] describes as a sequential explanatory design, the literature review informs the survey questions and analysis that has informed the structure and approach of the interviews discussed in this article. In this way, Merriam and Grenier [49] suggest that “the interviews help the researcher understand the responses to the survey [14] as well as provide additional insights into the phenomenon of interest”.

As shown in Figure 3, the development of a prototype SDG measurement model was to be based on the triangulation of learning from the literature review, the survey of 325 engineers and the subsequent interviews of 40 senior executives. Only the interview stage is shared in this paper. A primary advantage of the semi-structured interview method is that it allows an adaptive–responsive approach to ensure the best improvisation to delve deeper into relative areas of importance based on the participants’ responses [50] and it also allows for participants’ verbal expressions to be captured [51].



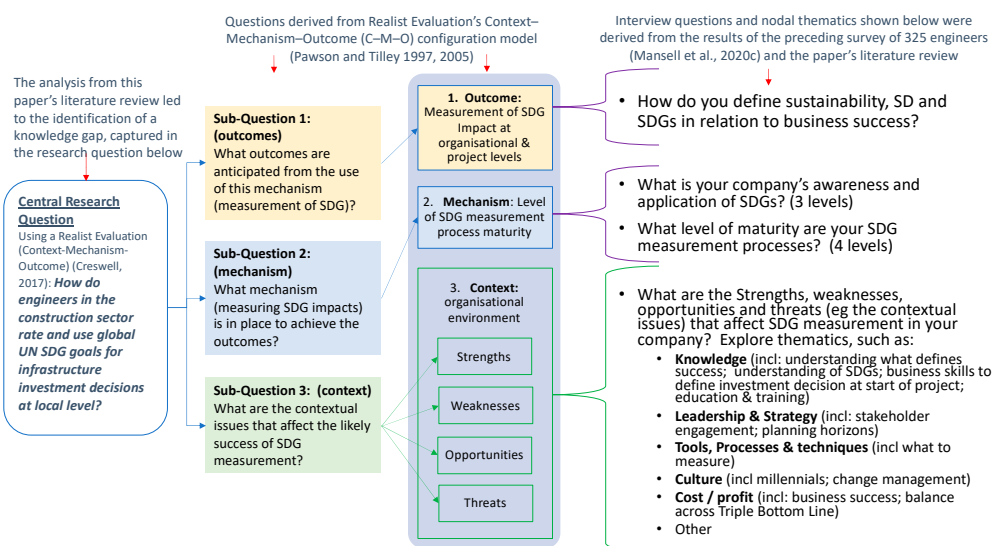
**Figure 3.** The research design of mixed-method sequential explanatory design, adapted from Creswell [47].

### 3.1. Using the Realist Evaluation Methodology to Structure the Survey

The study adopted the critical realism perspective of ideological philosophers, such as Bhaskar [52], to inform the choice of the realist evaluation approach primarily because of its practical utility and widespread use in social science research [53]. Taking Bhaskar’s view [52], critical realism assumes that certain events exist and people then apply different perspectives and meaning to their interpretation of the truth.

### 3.2. Interview Question Design

The semi-structured interviews were designed to measure attitudes in relation to the research question and its subsidiary three sub-questions (shown in Figure 4). The sub-questions focused on three areas: the perceived value and importance of measuring SDGs (i.e., the outcomes), their current approach and capability (i.e., the mechanism) and their identification of the challenges and opportunities (i.e., the context), such as skills, tools, processes, structures and methods [54]. NVivo© was chosen as the web-enabled data collection tool.



**Figure 4.** The nodal evaluation framework for the sequential explanatory design from which the semi-structured interview questions were derived.

### 3.3. Derivation of the Questions

The questions that are shown in Figure 4 have been derived from a variety of sources, both inductively and deductively. The central research question was informed by the literature review, which highlighted a knowledge gap. The importance of understanding why the gap existed and how to close the gap had also been identified by a previous survey of 325 engineers [14], in which 88% of responses affirmed that stakeholders wanted to increase their ability to measure SDGs on projects. This was strengthened by a response rate of only 34% stating that they had a “fit-for-purpose” mechanism to measure the SDG impacts [14]. The sub-questions 1–3 shown in Figure 4 were derived from the adoption of the realist evaluation’s context–mechanism–outcome (C–M–O) configuration [55,56], which is widely used across clinical research (Pawson et al. 2005) and increasingly also across the social sciences [53]. Pawson and Tilley specifically recommend the C–M–O strategy so that “programme theories can be tested for the purposes of refining them” [55,57]. In this regard, the investigation is not about what works but asks instead “what works for whom in what circumstances and in what respects, how?” [55,57]. The third level of questions for the interviews (shown in the right column of Figure 4) combines the Pawson and Tilley C–M–O framework [55,57] with the survey results [14]. For example, the four contextual questions that were derived from the SWOT analysis were all topical responses from the surveys that engineers had identified as either “blockers” or opportunities [12].

### 3.4. Access

The interviews aimed to gain access to 40 CEOs or heads of sustainability. Given the GDPR issues around accessing the names of the senior executives of global companies, the research partnered with the Institution of Civil Engineers (ICE). The ICE vetted the research scope and agreed to provide the personal data on the basis of the work aligning with GDPR legalities. The lead researcher contacted a total of 85 organisations at the level of CEO and heads of sustainability, of which 40 agreed to be interviewed.

### 3.5. Sample Size

Sampling was achieved purposefully by partnering with UK’s leading construction standards body, the Institution of Civil Engineers (ICE), to identify and select leaders in construction companies who had demonstrated a willingness to be involved in innovative knowledge development. All the interviewees had significant knowledge of the infrastructure sector but often did not have the detailed knowledge of their sustainability, SDG and CSR approaches. For this reason, the sample included 30% that were heads of sustainability, who had the requisite knowledge.

## 4. Data Analysis

### 4.1. Descriptive Statistics

The 40 interviews were conducted between July and September 2018, although two of the interviews had to be cancelled and the participants submitted their answers in writing. The descriptive statistical data are shown in Table 1.

The interviewees were representative of firms that mostly had a global or regional footprint (57%), as shown in Figure 5, had staff levels mostly from 1–25,000 (62%), and they were mostly at, or above, senior executive level (defined as having “director” in their role title), including nearly a third at CEO or board level who reflected individuals who could represent their firm’s views.



Table 1. Profiles of participants.

Participant ID	Role in Company	Size of Company (Number of Employees)	Geography of Business	Length of Interview
1	Board	Other	Other	45
2	Senior executive	10–25k	Global	55
3	Head of sustainability	25–50k	Global	61
4	CEO	1–5k	Regional	42
5	CEO	1–5k	Regional	53
6	Senior executive	1–5k	Regional	53
7	CEO	>50k	Global	40
8	CEO	1–5k	National	42
9	Head of sustainability	1–5k	National	36
10	Senior government or UN policy director	1–5k	National	52
11	Senior executive	1–5k	National	36
12	CEO	5–10k	National	35
13	Senior executive	<1k	National	42
14	CEO	<1k	National	52
15	Head of sustainability	5–10k	Global	56
16	Board	5–10k	Global	56
17	Senior executive	>50k	Global	21
18	Senior government or UN policy director	Other	Other	36
19	Head of sustainability	10–25k	Global	75
20	Head of sustainability	10–25k	Global	55
21	Board	5–10k	Regional	45
22	Head of sustainability	1–5k	Regional	45
23	Head of sustainability	10–25k	Global	45
24	Senior executive	1–5k	Global	39
25	Senior executive	10–25k	National	43
26	Senior government or UN policy director	<1k	Global	38
27	Senior government or UN policy director	other	National	47
28	Senior executive	10–25k	Global	36
29	Head of sustainability	10–25k	National	46
30	Senior government or UN policy director	other	Other	65
31	Senior executive	<1k	National	59
32	Senior executive	<1k	National	59
33	Head of sustainability	10–25k	Global	43
34	Head of sustainability	10–25k	National	44
35	Board	10–25k	National	44
36	Senior executive	other	Global	65
37	Board	5–10k	Global	57
38	Head of sustainability	5–10k	Global	57
39	CEO	other	National	Written
40	CEO	other	Global	Written
			Total	1820
			Average	48

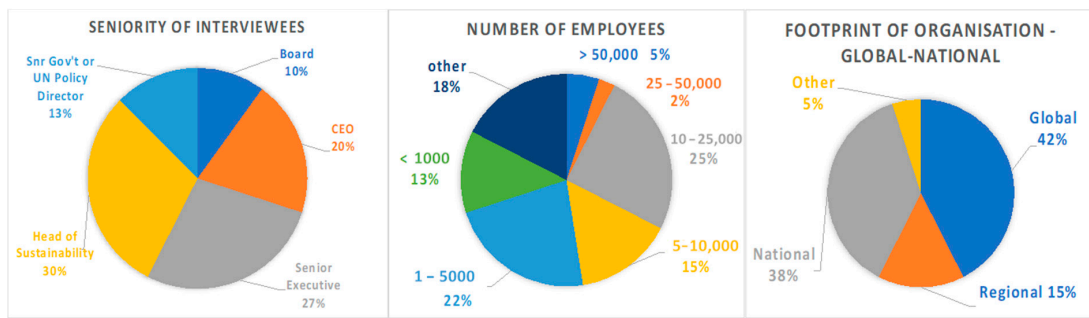


Figure 5. The attributes and values of the 40 interviewees.

4.2. Development of the Twin-Track Analysis Protocols, Balancing Qualitative with Quantitative Data Collection

As discussed in paragraph 3.3, the preferred approach was aligned to Frels and Onwuegbuzie [56], who had proposed that even within a specific method choice, such as interviews that are qualitative-dominant, it is appropriate to collect quantitative data during the qualitative interview process. The practical application of the “qualitative-dominant crossover” is shown below in Figure 6, which illustrates a twin track analysis method, which complemented the use of quantitative and qualitative data collection.

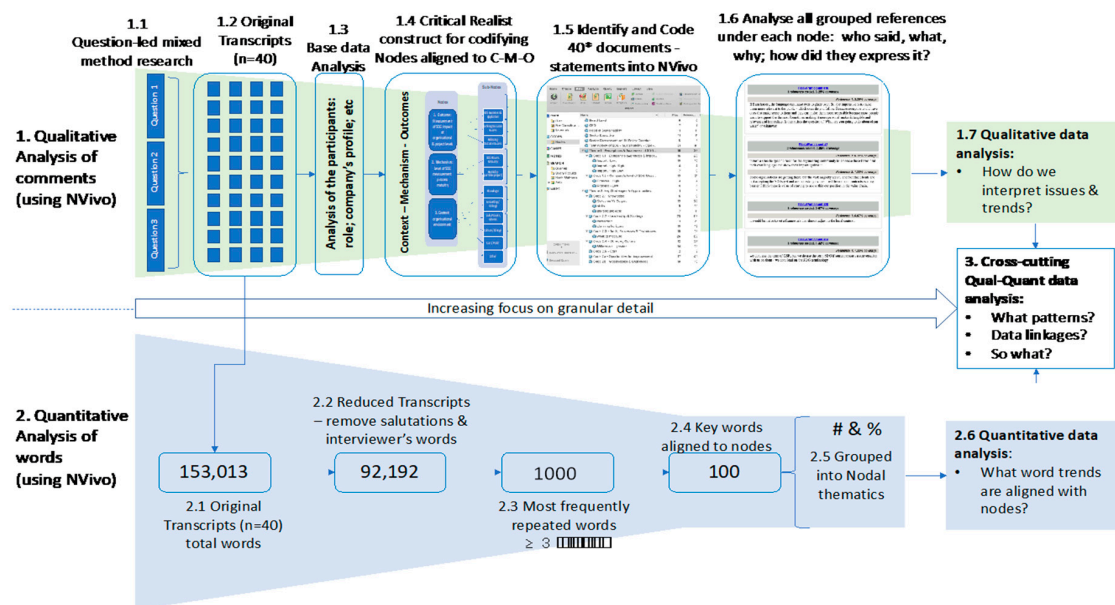


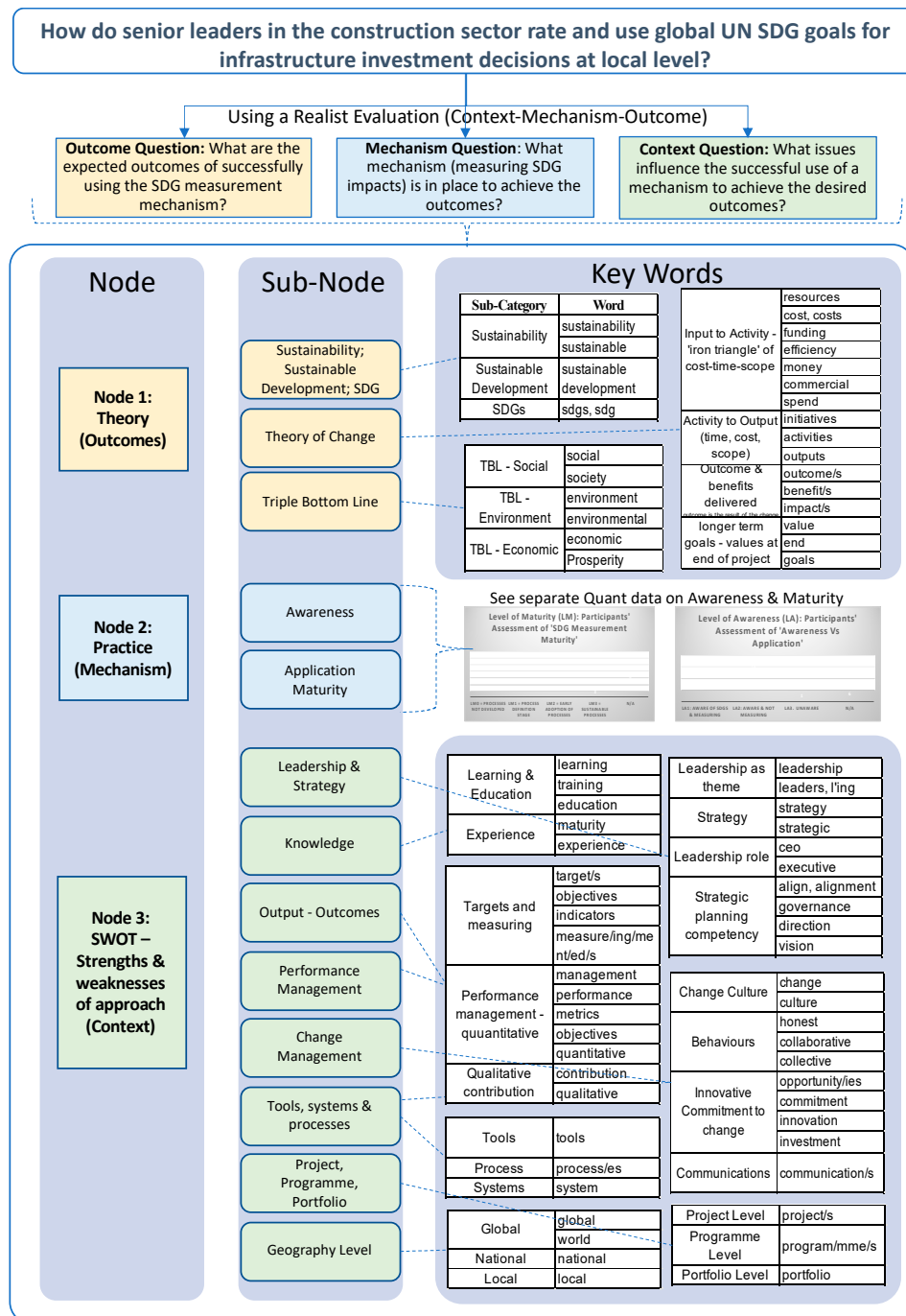
Figure 6. The twin-track analysis protocols approach: qualitative and quantitative.

4.3. Interview Analysis Process

All interviews were conducted in person and lasted an average of 48 min (min = 36; max = 75 min). With the participants’ agreement, interviews were recorded using a digital recorder supplemented with hand-written notes. Later, the transcriptions, using the Trint© software tool, were uploaded onto NVivo© and were then compared and coded using the qualitative data analysis software.

The data were analysed at two levels, firstly analysed using textual analysis and then “made sense of” by using themes and pattern interpretation. Based on the nodal structure described earlier and using the parent-child branching technique (Figure 4), this provided an efficient and effective mechanism to capture and link themes but did not in itself provide any analysis. The nodal coding was aligned to the three research sub-questions, based on the realist evaluation C–M–O thematics [56,57], and each transcript was coded at three levels: first, second and third level coding (Figure 7). The frequency of

participants’ statements that were selected for coding, and also the relative frequency of nodal use. These groupings of statements under each node were then analysed for similarities and aligned with emerging themes.



**Figure 7.** The nodal framework used for identification of key words aligned to context–mechanism–outcome (C–M–O) [55,56].

In addition to the primary analysis approach discussed above, the researchers complemented this with text mining analysis. This is a commonly used methodology for social scientists [58] because it enables the researchers to manage and quantify huge amounts of data in a very short time.

#### 4.4. Verification

The verification was completed after the interpretation of the data analysis. This involved presenting the findings in workshops to leading practitioners within the confines of the standards body knowledge team at the Institution of Civil Engineers.

### 5. Results

The results and discussion are structured in three sections that relate to the three sub-questions, as shown in Figure 4, that stem from the primary research question: how do senior leaders in the construction sector rate and use global UN SDG goals for infrastructure investment decisions at the local level? The subsections are therefore as follows.

- Thematic area 1: outcome. What are the expected outcomes of successfully using the SDG measurement mechanism?
- Thematic area 2: mechanism. What design criteria enable the mechanism (for measuring SDG impacts) to achieve the outcomes?
- Thematic area 3: context. What issues influence the successful use of an SDG measurement mechanism to achieve the desired outcomes?

Using the twin track analysis approach (Figure 6), which includes both the qualitative and quantitative data, results are derived from the combined findings. All participants were asked for their views on the strengths, weaknesses, opportunities and threats (SWOT) of the employment of the mechanism. Given the semi-structured interview approach, their responses did not take a standard route and the interviewer used the funnelling technique [58] to increase subject specificity where depth of answer was required.

#### 5.1. Thematic Area 1: Outcome. What Are the Expected Outcomes of Successfully Using the SDG Measurement Mechanism?

The “Outcome” section is the first of three thematic areas that focuses on the broader organisational ambitions of sustainability, sustainable development and SDGs. The results are collated under the following headings: the challenge/problem, the opportunities and the imperative for change. This thematic collected the second highest (out of 23 nodes and sub-nodes) number of references (n = 81) in NVivo for business views on the expected outcomes.

##### 5.1.1. The Challenge/Problem

The essence of the problem was articulated by participant 10: “The weaknesses of the impact measures relate to some of the quantification of it in that there is no standard way of doing it and therefore quantifying impact is very difficult . . . . The leadership is not fully bought into it. It could be you have not got good sufficient tools for learning and education behind it. There is a lack of consistency in the data of how you measure it and the people measure it in different ways and people will have different perspectives of what good looks like”. These views are similar to those of participant 26, who also noted the level of complexity, especially when positioned in a global context with the inherent cultural variations, which is potentially why so many participants only claimed to measure the SDGs at a high level: “This is so complex and it is so different if we are doing things in different countries with different organisations across different environments”.

##### 5.1.2. Overarching Opportunity

There were many participants that identified opportunities for improvement, and these are mostly captured under section three on “Contexts”. The ambition, noted by many, was summed up by participant 26, who was from an international organisation and who gave this insight into his global organisation’s aim: “In three years’ time we would like to be in a position to have enough information

based on evidence and frameworks in place so that we can have better conversations earlier on with clients about what the potential benefits are for the project and why we should be doing projects possibly in a different way than given to us by donors and others.” He continued by anticipating the broader causal impacts of having this mechanism in place: “So, if we understand the linkages contribution projects can have across several SDGs, and how that impact could be measured, then we can have better conversations to understand where people should be investing their money and how, and what other aspects to bring into our project to ensure long-term sustainability”. This places emphasis on using the SDGs to make better investment decisions, which becomes one of the critical success factors of the employment of this mechanism.

### 5.1.3. Imperative for Change and Commitment to Measure SDGs

Participant 13 explained the key part that SDGs contribute to the company’s approach to the broader sustainability agenda: “The SDGs and our impacts on them are of huge relevance to our industry. We are already fully committed to measuring our impact across the triage of economic, social and environmental sustainability themes. Our leadership is fully committed to owning delivery success against these targets, which we jointly assess with our tier 1 contractors. It is now considered core business to ensure the right levels of scrutiny and governance to manage sustainable development performance. In future, this will include measurement against SDG targets but, for now, we need to find a practical method for doing this well.” The final comment in the extract highlights the difficulty of moving from “knowing to doing”.

Many commented on the link between SDG measurement and their company’s values. For example, participant 5: “because our purpose is far more than simply generating revenues for shareholders . . . for us, it is about influencing those solutions to provide the right long-term infrastructure for society. So, we provide jobs and the right training and we provide the infrastructure we need to connect life together; everything we do depends on it—to try to capture the way we go about doing that in more modern ways for future societies”. Although many were better able to relate progress stories with their sustainability measurement, there were others, such as participant 28: “the whole world has decided how it can be rapidly made better, so the 169 SDG targets are a compass for humanity”.

The theme of creating shared value [59,60] was commented on by a number of participants (2, 5, 8, 10, 11, 13 and 19), one of whom, a CEO, commented, “Since becoming Responsible Business of the Year, we have been working hard to show others how sustainability makes good business sense.” This quote emphasises that the notion of creating shared value (CSV) [59,60], whilst not always using the specific language of CSV, is a growing reason to engage with SDGs and sustainability more generally.

The global context and the relationship of the global SDG goals to businesses was a common theme, as indicated by participant 24, head of infrastructure for his company, who said “in a world where populations are increasing, cities are expanding and the effect on our environment is more apparent than ever before, the need for infrastructure that is affordable, sustainable and effective is vital. Engineers have a pivotal role to play in designing infrastructure that is not only effective but does not harm the environment in which we live”.

The first major finding derived from this analysis is as follows.

Findings #1: to achieve the outcomes of measuring SDG impacts at subnational level, business priorities can be aligned across economic, environment and society ambitions, and it can make good business sense to do this.

### 5.2. Thematic Area 2: Mechanism. What Mechanism (for Measuring SDG Impacts) Is in Place to Achieve the Outcomes?

The second area of discussion was for the participant to self-assess their company’s “awareness and application” and also, if they were applying SDGs, what the level of process maturity of their SDG measurement was. The data in Figure 8 show the feedback from the participants when they were asked to score themselves against a Likert-style scale, as shown in the first row in columns c and d.

a	b	c	d	e	f	g	h
Participant ID	Role in Company	Awareness Vs Application (1= aware & doing; 2= aware & not doing; 3= unaware & not doing)	Your Company's Level of Maturity in SDG Measurement (0= process not developed; 1= definition developing; 2= early processes in place; 3= using sustainable processes)	Participant ID	Role in Company	Awareness Vs Application	Level of Maturity
1	Board	n/a	n/a	21	Board	2	1
2	Senior Executive	1	2	22	Head of Sustainability	2	1
3	Head of Sustainability	1	3	23	Head of Sustainability	2	0
4	CEO	2	1	24	Senior Executive	2	0
5	CEO	1	2	25	Senior Executive	1	1
6	Senior Executive	1	2	26	Senior Government or UN Policy Director	2	1
7	CEO	3	0	27	Senior Government or UN Policy Director	1	n/a
8	CEO	2	0	28	Senior Executive	1	2
9	Head of Sustainability	1	2	29	Head of Sustainability	2	1
10	Senior Government or UN Policy Director	2	1	30	Senior Government or UN Policy Director	2	0
11	Senior Executive	1	2	31	Senior Executive	n/a	n/a
12	CEO	1	2	32	Senior Executive	n/a	n/a
13	Senior Executive	2	0	33	Head of Sustainability	2	1
14	CEO	1	1	34	Head of Sustainability	2	0
15	Head of Sustainability	2	1	35	Board	2	2
16	Board	1	1	36	Senior Executive	2	n/a
17	Senior Executive	1	2	37	Head of Sustainability	2	1
18	Senior Government or UN Policy Director	n/a	n/a	38	Head of Sustainability	2	1
19	Head of Sustainability	1	3	39	CEO	n/a	n/a
20	Head of Sustainability	1	3	40	CEO	n/a	n/a

**Figure 8.** Results of the self-assessed level of awareness-application and process maturity (colour representation shown in columns c and d in titles row).

### 5.2.1. Company's "Awareness and Application" of SDG Measurement in Construction Projects

As part of the interviews, all participants were asked to describe their awareness of sustainability, sustainable development and SDGs. They were then asked to describe their current level of SDG measurement maturity. The data on these are shown in Figure 9.

At the lower end of the spectrum (level 3 = unaware and not doing it), participant 37 admitted that, regarding "the United Nations Sustainable Development Goals, I had never heard of them—a request for an interview came through and [name withheld] only heard of them through a bid we were working on that included an SDG question. The SDGs have no current place in our business". As this was a board member, this was surprising because it was expected that senior staff would have some level of SDG knowledge.

In the middle range, which was "aware and not doing", representing 47% of the participants, participant 4's answer was typical: "Awareness is that we are doing some discrete things but not in any depth". The reasons for this varied, but a common theme was that there was not a requirement from governments or clients, as participant 21 shares: "We do not have a demand from our clients or from our communities that we work to measure against the SDGs. Like many in our industry, these are not common terms that we use ... we do not have as much benefit from embedding them as much as a large global company that perhaps needs to demonstrate SDG impact more visibly. A lot of the things we do implicitly encompass the SDGs, but we are not explicitly measuring against them".

In the higher range, which was "aware and measuring", represented by 38% of the participants, there were some examples of significant progress, such as that shared by participant 7: "Every single project in the organisation will feed into SDG number 11—'sustainable cities and communities'—and every project in the organisation will address at least 4–5 of the SDGs".



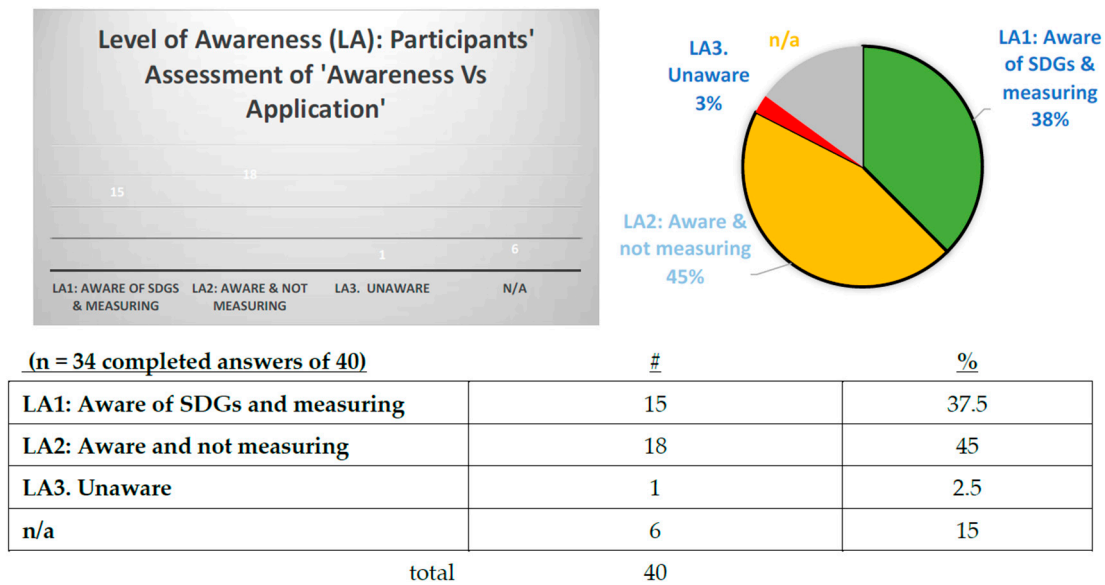


Figure 9. Graphical representation of results from the self-assessed level of “awareness-application”.

5.2.2. Company’s Level of SDG Measurement Process Maturity

As part of the interviews, the second quantitative question all participants were asked was to describe their current level of SDG measurement maturity. The data on these are shown in Figure 10. The banding levels for this question were: 0 = no SDG processes, 1 = currently defining processes, 2 = early processes in place and 3 = sustainable SDG processes. Overall, the quantitative data showed that nearly half (49%) were at level 0 or level 1, which meant that no effective processes were in operational use. Only 23% stated that they were at level 2, the early adoption stage of processes, with a very small group (8%) stating that they had repeatable processes in place.

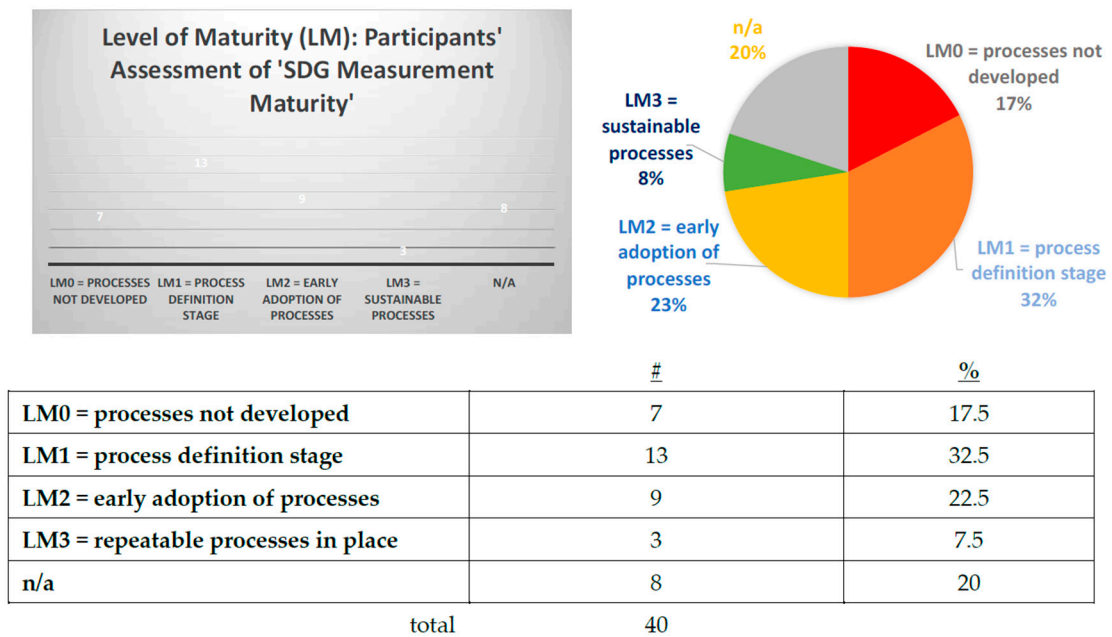


Figure 10. Graphical representation of results of the self-assessed level of “SDG measurement maturity” (colour representation shown in Figure 8 in column h in the titles row).

One of the best, participant 13, stated: “We are at Level 3, we have managed processes, metrics and quality management”, which was similar to participant 23: “we have some consistent ways we do

things that are aligned to SDGs, but we do not look at every SDG and answer how they contribute to the goals. But we do cover a lot of the issues at project level.”

In reality, many of the participants only conducted measurement at a high level, such as participant 34: “In the past we have done a review to see how our strategy fits with the SDGs. We found that the SDGs were impacted by our work, some more than others, in terms of the goals and targets; they are not particularly relevant to the work that we do so our priorities have been elsewhere and therefore our resources have been focused elsewhere”. About a third of the participants said that they could, at a high level, link their SDG priorities to the formal sustainability reporting that they did on the Global Reporting Index (GRI), such as participant 26, who stated: “Well, we are all aware and starting to do it. We started using the Global Reporting Index framework on sustainability three years ago and we started reporting on our corporate results yearly on that but, at the project level, we have been a bit slower pushing up to that”. Amongst the lowest performers was participant 9, who stated: “in terms of SDG reporting processes we are close to 1. Our maturity is still low, although our sustainability reporting is much higher. We have not yet made it integrated to SDGs and have not yet generated a report against them. That is what we are talking about now and what we want to achieve”.

The second major finding derived from this analysis is as follows.

Findings #2: only a small percentage of companies have a repeatable process as an operational “mechanism” for measuring SDG impacts at company and project levels. Most have an aspiration to do so but believe that the government and their clients need to require its implementation.

### 5.3. Thematic Area 3: Context. What Issues Influence the Successful Use of an SDG Measurement Mechanism to Achieve the Desired Outcomes?

The analysis of the contextual issues that affect companies’ ability to measure SDG impacts successfully were captured using a strength, weakness, opportunity and threat (SWOT) approach. The eight themes are shown in the nodal framework in Figure 7 and include: leadership and strategy; knowledge; outputs-to-outcomes; tools, processes and systems; change management; performance management; project-to-portfolio levels; and geographic issues. These were all derived from the preceding survey of 325 engineers, as shown in Figure 3. The qualitative analysis shared below is complemented by using the twin-track approach described in Figure 6, which includes the text-analysis software-enabled word-count data. The approach was to identify key words and relate their frequency of use to the qualitative findings to assist the understanding of the emerging issues. For example, in this first context thematic, “leadership and strategy”, as shown in Table 2, the key words associated with this thematic are: leadership (and its derivatives, such as leader), strategy, CEO/executive and align/governance/direction/vision, which are all words associated with leadership capabilities and actions.

**Table 2.** Text analysis (NVivo) on key words’ frequency: context of leadership.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %
Leadership	Context	Leadership as theme	leadership	83	0.16%	0.29%	0.80%
			leaders	30	0.06%		
			leading	20	0.04%		
			leads	15	0.03%		
		Strategy	strategy	75	0.14%	0.18%	
			strategic	23	0.04%		
		Leadership role	CEO	26	0.05%	0.12%	
			executive	37	0.07%		
		Strategic planning competency	align	25	0.05%	0.21%	
			governance	25	0.05%		
			alignment	18	0.03%		
			direction	18	0.03%		
			vision	28	0.05%		

### 5.3.1. Leadership and Strategy

For the leadership and strategy node, there were high levels of relevant statements coded ( $n = 63$ ) from the 40 participants (using the NVivo software), reflecting the importance of this thematic. In terms of key word usage, this thematic was the fifth most frequently used ( $n = 584$ ) across the 40 interviews, which equates to once every 120 words. Within this category, the frequency of use of “align”, “governance”, “direction” and “vision” were noted since these words are all associated with leadership capabilities.

The most impactful statements collected were the frequent references to a “greater value” beyond profit. This sentiment sits well with creating shared value and the triple bottom line discussed earlier. This viewpoint was personified by participant 11: “a key part of leadership is doing the right thing because it is the right thing to do, not because of a box-ticking exercise”. The same participant also focused on the difficulty of making the change stick: “It is 50% belief and 50% belligerence when you start something like this; that is, holding yourself and others to account. That is what I mean by belligerence. In other words, ‘seeing it through’ and what we wrote down as a mantra: ‘Don’t you understand’”. In his view, as a senior executive, he stressed the important role of his CEO and board: “Leadership is the most important critical success factor, both internally and externally, to align and galvanise our employees, our communities and the supply chain. It was about getting us all to be more collaborative in finding novel, innovative ways of delivering sustainable solutions. It is about the leaders capturing the hearts and minds of the stakeholders to champion changed behaviours to achieve big, bold strategic outcomes.”

In terms of strategy, one organisation noted the importance of the “ends, ways, means” logic similar to the Theory of Change concept [38–42]. Participant 9 stated: “you must start with the end in mind, even if you have not got a detailed route map to deliver at every stage of the journey. Part of the mantra is to set big audacious goals and then adopt an attitude of ‘I have started so I will finish’ and, by the way, you never actually finish, because the end goal is moving, it is like you achieve one peak but realise it is a false horizon, and so you continue your climb to the next summit”. The value of having clarity of the strategic ends is noted, albeit with a caution that the identification of targets for tracking performance must not become a “box-ticking” exercise that distorts clarity of outcomes. Participant 11 stated: “if you actually begin with the end in mind of the outcome you are seeking and how you wire your DNA to achieve that, you are far more likely to achieve those outcomes and, in so doing, the boxes get ticked. But if you predicate your thinking with thoughts about just filling the boxes, you have constrained yourself”.

Finding #3: strong leadership plays a significant part in inculcating SDG measurement as an ambition and core value into an organisation.

Finding #4: the more advanced businesses in SDG measurement noted the need to have a clearly defined strategy that can guide the prioritisation of SDG goals using the “ends, ways, means” model. This requires clarity of the “ends” prior to defining project success (in-project and post-project).

### 5.3.2. Knowledge

For the “knowledge” node there was a relatively smaller incidence ( $n = 19$ ) of relevant statements coded from the 40 participants (using the NVivo software). In terms of key word usage, as shown in Table 3, this thematic was also one of the least frequently used, with “learning”, “education” and “experience” being used only 140 times across the 40 interviews, which equates to once every 400 words.

The qualitative analysis identified a strong preference for using education and training to improve their staff’s SDG impact skills and business skills, especially in the wider definition of success, which is related to the later discussion of outputs-to-outcomes. An indication of the importance of this was provided by the CEO of one global engineering company, participant 7: “So, how do we galvanise our community, how do we tell our story better against the SDGs and how do we galvanise our community to be able to share best practices, and what does that mean for education and training?”

**Table 3.** Text analysis (NVivo) on key words' frequency: context of knowledge.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %
Knowledge	Context	Learning & Education	learning	30	0.06%	0.15%	0.26%
			training	22	0.04%		
			education	29	0.05%		
		Experience	maturity	30	0.06%	0.11%	
			experience	29	0.05%		
						140	

Skills covered a number of areas, including the skills to be able to define success definitions, business skills to be able to build performance frameworks and sustainability/SDG skills that helped understand the SDG framework and how they relate at sub global-national levels and at organisational and project levels. Participant 3 stressed its import: "I think the skills piece is the second most important area because we cannot expect our people to deliver on these KPIs if they do not know what they mean and if they do not know how to measure them and improve them, so investing in how to calculate social value and improve upon them and investing in training in social value RoI is very important; it gives us an opportunity to benchmark and improve on it".

Overall, participants seemed to accept that, despite the current supposed level of SDG measurement awareness, there is also a shortage of trained personnel to support the implementation of SDG measurement on their construction projects. The closing of this gap reflects the views of Reffat [61] on the insufficient number of human resources with the required skills to perform sustainable development on construction operations.

Finding #5: learning and education plays a critical role in increasing capability and, specifically, in understanding how to better share lessons on SDG measurement for the good of all.

### 5.3.3. Outputs-to-Outcomes

The "outputs-to-outcomes" node had the fifth highest incidence ( $n = 30$ ) of relevant statements coded from the 40 participants (using the NVivo software). In terms of key word usage, this thematic was also one of the most frequently used (shown in the "Theory of Change" key word table, Table 4), with the first half of the causal chain (input, activities and outputs) being cited as frequently as the second half of the value chain (outcome to impacts). This was significantly less than the general reference to longer-term benefits that were synonymous with key words such as "value", "ends" and "goals", which were used only 339 times across the 40 interviews, equating to once every 175 words.

Within this subcode, most recognised the challenge of differentiating between outputs and outcomes. Too few knew how to do this well and, as a result, the wrong "targets indicators" were sometimes being used to measure success. Participant 8, a CEO of one of the UK's largest infrastructure programmes, said: "programme and project people are sometimes less aware of how we are doing strategically if you are not careful. So, they can often have a bias for cost and schedule focus and lose focus on other priorities we have set". Another way of expressing the inappropriate focus on outputs came from participant 3: "we know that, if we just design to code, we end up with projects that are great for today but absolutely do not meet the future that we are expecting".

Some organisations have fully embraced the strategic aim of better aligning with outcomes, such as participant 11: "So we thought long and hard not just about the goals that we created but about how they fitted with a set of outcomes in our region and what that would look like in terms of implementation. This was our way of meaningfully connecting the strategy with outcomes that our stakeholders recognised." The same person described the need to look at the end first to better understand ambitions: "you must start with the end in mind, even if you have not got a detailed route map to deliver at every stage of the journey". One of the most common reasons for the overemphasis on "outputs" was shared by participant 26: "So, the measurables are very weak in terms of linking the

engineering and the infrastructure impacts to the higher programme. It is just about ‘have you built the hospital’ as an output”.

**Table 4.** Text analysis (NVivo) on key words’ frequency: mechanism/context of the Theory of Change.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %		
Theory of Change, (causal logic chain from inputs to impacts)	Mechanism	Input to Activity ‘iron triangle’ of cost-time-scope	resources	20	0.04%	0.33%			
			cost	57	0.11%				
			costs	17	0.03%				
			funding	16	0.03%				
			efficiency	16	0.03%				
			money	18	0.03%				
			commercial	17	0.03%				
			spend	17	0.03%				
			initiatives	27	0.05%			0.12%	1.26%
			activities	15	0.03%				
		outputs	19	0.04%					
		Outcome and benefits as result of change derived from project’s outputs.	outcomes	60	0.11%	0.17%			
			outcome	34	0.06%				
			benefits	23	0.04%				
			benefit	19	0.04%				
			impact	219	0.41%				
		longer term goals—values at end of project	impacts	19	0.04%	0.64%			
			value	101	0.19%				
			end	73	0.14%				
				goals	165	0.31%			

Finding #6: the use of the log-frame and Theory of Change provides a means to link outputs to outcomes and better identify SDG impacts.

#### 5.3.4. Tools, Processes and Systems

The “tools, processes and systems” node had one of the lowest incidences ( $n = 18$ ) of relevant statements coded from the 40 participants (using the NVivo software). This suggests that senior executives and CEOs have less interest in, or place lower value on, specific tools or methodologies, which might indicate why this is an underinvested area. In terms of key word usage, this thematic was also one of the least frequently used, shown at Table 5, with “processes” being cited twice as frequently as “tools” and “systems”. In total, they were used only 177 times across the 40 interviews, which equates to once every 300 words.

The survey [14] that preceded these interviews had identified a common reference to the lack of tools, systems and methodologies. This was not proven in the interviews, although a number of the heads of sustainability (3, 9, 15, 20 and 29) were more likely to mention this as a factor. On the ability of the sector to galvanise and align with a consistent approach, participant 18 highlighted that there were bigger issues to deal with prior to designing a tool: “I think it is essential. I have very little confidence in our ability to do it now. Even if you had a decent methodology now, I suspect very few people would use it and you probably have a number of competing methodologies, which is typical in this sector.”

However, others, such as participant 20, said: “for me the tools and processes underpin the delivery because, without them, you cannot possibly know where you are or where you need to go”. But a key element of the design of a tool was to get the balance right between being too complex and being at the other end of the scale—being too high level and therefore superficial—as noted by participant 10: “I think, in most cases, a consistent framework or reporting approach would be helpful; that gets the balance right between having something that is consistent but watered down to such a high level that it loses meaning, versus having too much detail that is too granular, loses the users in

too much complexity and is difficult to fit with your business model and the way you report things into that”.

**Table 5.** Text analysis (NVivo) on key words’ frequency: tool, processes and systems.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %
Tools, Systems; Processes	Mechanism	Tools	tools	32	0.06%	0.06%	
		Process	processes	26	0.05%	0.23%	0.34%
			process	93	0.18%		
		Systems	system	26	0.05%	0.05%	

Finding #7: the use of tools, systems and processes to measure SDGs is not a priority for CEOs and board members but it is for senior executives and heads of sustainability. These tools need to be simple enough to understand but robust enough to capture detailed evidence that leads to improved performance.

### 5.3.5. Change Management

The “change management” node had an average level of incidence ( $n = 27$ ) of relevant statements coded from the 40 participants (using the NVivo software). In terms of key word usage, this thematic (shown in Table 6) tracked “change culture”, “behaviours”, “innovation” and “communications”, all of which provided a large number of insights from participants. In total, they were used 410 times across the 40 interviews. However, the quantification of the data does little to indicate that this contextual issue was one of the best sources of insightful knowledge.

There was general recognition from the participants that the single most important area for ensuring SDG measurement success is having a successful change programme that ensures a practical approach is made to work for the “users”, with the added value of what they are doing. The starting point for this approach was ensuring the right culture in the organisation, characterised by openness and honesty about the difficulties of measuring SDGs and also closing the gap between superficial statements of intent without having the evidence to back up what they say they do. For example, participant 15 stated: “[name of company removed] say that they measure against SDGs, but there is a gap between what they say they do and what they actually do”.

Innovation was a frequently referenced benefit of getting the change culture right and, in doing so, having the means to address the SDG targets more effectively. For example, participant 11 noted the effect of building long-term supplier relationships that enabled more innovative solutions to be developed: “We wanted to establish meaningful change across the supply chain, and we recognised that, to do this, we had to develop long-term relationships; hence, we contracted on a five, plus five, plus five-year basis. This built longevity into our thinking and allowed true innovation to develop solutions to the bigger sustainable development issues across the environment, driving efficiency and effectiveness.”

Communication was also a dominant theme of culture change. Participant 1 noted: “you do not communicate it once, you communicate it nearly every day through many, many different vehicles. You bring people in”. Participant 24, a leader of a North American national civil engineers institution, highlighted the value of leaders who can tell stories that resonated with stakeholders: “people with success stories become your spokespeople and they start to influence others, saying ‘hey, you know this works for us’ rather than just trying to sell the methodology. It is more, you know, encouraging peers, e.g., peer-to-peer”. The main focus for this stakeholder engagement for participant 11 was: “Our starting point is understanding what is important to our clients, who want to see us make improvements, and where our staff and employees want to make a difference”.

An unexpected but often-quoted issue was on the context of gender influence on SDG measurement. Eight participants (1, 5, 10, 17, 21, 24, 31 and 37) made specific reference to gender impact: “the younger generation really do want to change the world. Interestingly, particularly the female part of that



[company name removed] has more than 50% of its membership as female and I pondered why that should be, and I think it is because it appeals to the values of certainly the younger, but actually to the female, side of our institution, who really want to make a difference to the world that they live in. Probably, they are more driven by that than they are by financial reward”.

There were nearly half the participants that promoted the positive effects of harnessing the power of the millennial generation to promote change and thereby help champion the uptake of SDG measurement, which was shared by participant 1: “So, if we can find a way of linking into the power of the younger generation”. This attitude was further explored by participant 10, who noted the obvious fact that millennials are tomorrow’s leaders: “I think millennials have a role here as new project leaders where often they are the people who are most energised”.

**Table 6.** Text analysis (NVivo) on key words’ frequency: context of change management.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %
Change Management	Context	Change Culture	change	129	0.24%	0.28%	0.78%
			culture	23	0.04%		
		Behaviours	honest	22	0.04%		
			collaborative	14	0.03%		
			collective	14	0.03%		
			opportunity	54	0.10%		
		Innovative Commitment to change	opportunities	20	0.04%		
			commitment	42	0.08%		
			innovation	32	0.06%		
			investment	32	0.06%		
		Communication	Communication /s	28	0.06%	0.06%	

Finding #8: change management. One of the largest positive impacts for SDG measurement is about engaging, communicating and energising the delivery teams. This involves the internal teams and suppliers. The millennials have a key role to help build and sustain this change momentum.

### 5.3.6. Performance Management

The “performance management” node had the highest level of incidence ( $n = 82$ ) of relevant statements coded from the 40 participants (using the NVivo software). In terms of key word usage, this thematic, shown in Table 7, tracked “targets”, “measuring”, “performance management”, “quantitative”, “metrics”, “qualitative” and “contribution”. In total, they were used 1003 times across the 40 interviews, which equates to once every 50 words and represents the most referenced thematic.

The highest frequency of coding on NVivo was using the node for “what to measure”, reflecting the importance of this thematic. There were many references to what is measured, and the general theme was that the selection of targets becomes critical in a business environment that is already awash with data collection. Many asked whether they should collect quantitative data or qualitative and also asked what the balance between too little data collection and too much is. Almost all participants accepted that this was an extremely difficult area to resolve and that there were no easy answers. For example, participant 34 stated: “I think we are quite confused. It sounds like we are much more advanced than we are in the way we monitor, report and evaluate. Most of our work is about getting the basics right and ensuring we are complying with legal requirements—getting stuff done. We know we need to do more work on understanding sustainability outcomes and how we can develop detailed KPIs that feed into that for measuring our impact. We do not have outcome frameworks in place yet”.

There was a consistent recognition amongst those that had more advanced levels of SDG measurement process maturity (participants 3, 19 and 20) that you had to start by selecting a manageable number of goals (from 17) and targets (from 169). This was explained by participant 31, who said: “It is an enormous challenge. I think, out of those 232, the fact that you found 20 that can

be measured is actually pretty good if I think about the magnitude of the problem". Amongst the nine participants that were at the "early processes in place" stage, most were trying to establish hard metrics that could be quantified, such as participant 15: "We want hard targets to test our performance. Generally, as a business, qualitative is not very compelling. When we set up our strategy, we did some serious baselining to get some better referenced data."

One of the key problems, mentioned earlier, is the level of complexity in measuring 169 SDG targets. It was frequently explained that this was too complicated for the construction sector, as stated by participant 2: "But the indicators are far too detailed and big and sometimes not applicable as well. Therefore, it is better to work at a higher level for the projects. I have more interest in the goals and not the indicators".

The emphasis on quantifiable targets was countered by participant 25: "telling the story of the success against the sustainable development goals, as an example; a lot of the time, it cannot be quantified very easily and therefore telling the story around an outcome perhaps provides more impact and value than just putting a meaningless quantitative score against something". This viewpoint was backed by participant 2: "In the beginning, I wanted quantification to have numbers that I can use to understand the measurement data. This created a big pushback because engineers tend to want perfect solutions. The assessment was causing some culture issues, so the qualitative aspects have been preserved but not the quantitative. So, we still look for the holy grail but, at this stage, we are going to produce stories. In future we would like more quantitative that can be assessed at corporate level."

**Table 7.** Text analysis (NVivo) on key words' frequency: performance management.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %		
Performance Management	Mechanism	Targets and measuring	target	31	0.06%	1.36%			
			targets	208	0.39%				
			objectives	26	0.05%				
			indicators	76	0.14%				
			measure	142	0.27%				
			measuring	72	0.14%				
			measuring	72	0.14%				
			measurement	54	0.10%				
			measured	17	0.03%				
			measures	21	0.04%				
		Performance management - quantitative			management	83	0.16%	0.43%	
					performance	54	0.10%		
					metrics	46	0.09%		
					objectives	26	0.05%		
		Qualitative contribution			quantitative	18	0.03%	0.11%	
					contribution	40	0.08%		
					qualitative	17	0.03%		

Finding #9: select a few targets relevant to the construction organisation or project. Keep it simple and build knowledge progressively.

### 5.3.7. Project-to-Portfolio Levels

The "project-to-portfolio" node had the eighth highest level of incidence (n = 21) of relevant statements coded from the 40 participants (using the NVivo software). In terms of key word usage, this thematic (shown in Table 8) tracked "projects", "programmes" and "portfolios". In total, they were used 677 times across the 40 interviews, which equates to once every 80 words. There was wide recognition that the approach needed to be adapted but linked across the project, programme and portfolio levels, as noted by participant 27: "I think there is no 'one size fits all'. So, I think it will vary from programme to programme and be dependent on the country as well".

Special interest and importance were aligned with the node on “starting projects”. The preceding survey [14] had not highlighted the importance of “starting projects well”. This node was added during the interviews stage because it was often referred to as the need to use the SDG lens at the “key investment decision point”, as noted by participant 26: “based on evidence frameworks, you can frame your project in a much better way to make sure the impact you get is maximized.” The emphasis of getting stakeholder alignment was also mentioned by participant 19: “They want to demonstrate that their projects contribute to sustainability development goals and develop tools that make sure projects embed sustainability development at the outset, e.g., at their project inception phase”.

There were some, such as participant 9, the head of sustainability for a utility company, who suggested that the SDG measurement had more relevance at the larger scale of programmes and at the organisational strategic level, represented by the portfolio office: “Thus we do it more at programme and portfolio level and less at project level. So, we have a mapping process at the portfolio level and align across project and programme SDG targets”.

**Table 8.** Text analysis (NVivo) on key words’ frequency: projects-to-portfolios.

Category	C-M-O	Sub-Category	Word	Count	f1 Word %	f2 Sub-Cat %	f3 Cat %
Project; Programme; Portfolio	Context	Project Level	project	278	0.52%	0.87%	1.27%
			projects	185	0.35%		
		Programme Level	program	65	0.12%	0.35%	
			programme	65	0.12%		
			programmes	31	0.06%		
			programs	27	0.05%		
		Portfolio Level	portfolio	26	0.05%	0.05%	

Finding #10: there was evidence that SDGs can be measured at all three levels: projects, programmes and portfolios. There was special value in using the SDG lens at the start of the project to help align stakeholders around the longer-term outcomes and impacts.

## 6. Discussion

This section builds on the 10 core findings and culminates with generalisations across the three sub-questions that guided the design of this research into SDG measurements. The three sub-questions, as shown in Figure 4, stem from the primary research question: how do senior leaders in the construction sector rate and use global UN SDG goals for infrastructure investment decisions at the local level? The empirical research study, including aforementioned qualitative findings and supporting quantitative data, also allows an evaluation of the theory-driven propositions to be undertaken, which is provided according to the following areas of outcome, mechanism and context.

### 6.1. Outcome Discussion: What Are the Expected Outcomes of Successfully Using the SDG Measurement Mechanism?

The results showed that participants have the appetite and resolve to employ SDG measurement at business and project levels (Finding #2) in order to achieve outcomes that benefit people, the planet and profit. At the same time, they were frustrated by their inability to do so for reasons discussed in the following sections. Most participants were optimistic that their organisation would achieve the broader outcomes by making SDG measurement more usable, consistent and verifiable across the construction sector, with increasing balance to their investment decisions across environment, economic and societal factors (Finding #1). There was almost unanimous conviction that the “ends” of achieving the desired “outcomes” was good for business (Finding #4).

Although the results emerged from a different thematic, some of the participants (2, 3, 17, 19, 20, 26 and 27) recognised the value of using Carol Weiss’ seminal work [38–42] that uses the logframe and Theory of Change approach to take a stakeholder-centric perspective to assist the definition of

longer-term impacts and outcomes. They acknowledged that this helps rebalance from an overemphasis on output definition, which is typically used in project management and too often judges success in terms of delivering the infrastructure asset to time, cost and scope (Finding #6).

The findings from the research study allow evaluation of the propositions synthesised from the literature review as follows.

Proposition 2 was supported through inference from the analysis.

Proposition 5 was supported.

### *6.2. Mechanism Discussion: What Design Criteria Enable the Mechanism (for Measuring SDG Impacts) to Achieve the Outcomes?*

The views were consistent (with the four exceptions mentioned in the preceding paragraph) in stating that this was an important area for the construction sector to get right but that there was no best practice established for how to deliver an effective mechanism. Therefore, despite the strong support for its adoption, the depth of knowledge on SDGs was mostly superficial, and only 8% of the organisations interviewed self-assessed their SDG measurement processes as repeatable (Finding #2), with only a further 23% having processes at an “early adoption stage”. The majority had not yet defined the SDG measurement processes. Unsurprisingly, there were many, especially at board and CEO level (with notable exceptions, such as 5, 7, 8 and 12), who showed some confusion in their knowledge of SDGs, sustainability and sustainable development. This was reflected in having relatively consistent and well-informed views on specialist areas, such as carbon management, but this was less evident in the details of what the SDGs represented.

The low level of uptake of the SDG measurements at the project level was attributed to the following reasons. (a) The complexity of the SDG framework, with the scale of ambition understandable at a high level but made excessively complicated when examining the 17 goals, 169 targets and 232 indicators. (b) The lack of adoption of SDGs by clients did not mandate SDG measurement (Finding #2). There was therefore no incentive to dedicate finite resources to a complicated task that might not deliver any value; indeed, it might even identify their weaknesses, which only a few explicitly opined was a good way of learning and developing.

A further design criterion that emerged, to enable the mechanism for measuring SDG impacts to achieve the outcomes, was the ability to find a golden thread from enterprise portfolio level to project level (Finding #10). This was most clearly explained by the participants that were most developed in their SDG measurement processes (2, 3, 11 and 20) but also included others who were actively developing SDG processes (8, 9, 14, 19, 27, 28 and 36). Whilst there was confidence in their self-assessed ability to achieve the golden thread from project to portfolio level (Finding #10), this was mostly not substantiated by any evidence (except 2, 3 and 11).

The findings from the research study allow evaluation of the propositions synthesised from the literature review as follows.

Proposition 1 was supported.

Proposition 4 was supported through inference from the analysis.

### *6.3. Context Discussion: What Issues Influence the Successful Use of an SDG Measurement Mechanism to Achieve the Desired Outcomes?*

As part of the discussions on strengths and weaknesses, the participants identified a number of contextual issues that affected the likely success of the mechanism achieving the desired outcomes. These “context” issues included leadership (Finding #3), outcome-output definition (Finding #4), knowledge (Finding #5) and change management (Finding #8) capabilities. There were more optimistic discussions than pessimistic ones about the ways they could improve the contextual issues identified. However, a few had little incentive for, or perceived little value in, adding what they considered a burdensome task onto the shoulders of busy project managers.

Given the seniority of the participants, it was not surprising that leadership and strategy was a dominant theme in discussions. This led to Finding #3, which states that strong leadership plays a significant part in inculcating SDG measurement as an ambition and core value into an organisation. This was most clearly stated by a senior executive (11): “Leadership is the most important critical success factor, both internally and externally, to align and galvanise our employees, our communities and the supply chain”. Others (2, 10, 17, 19 and 29), none of whom were CEOs or board members, stated that the strategic nature of organisational change had to be driven from the top [62]. There was recognition that, in reality, this meant that leaders at all levels were needed as champions, which, for SDG measurement, needed to be aligned with success stories that would make sense to the target audience, expressed in their language and justifying “why” followed by explaining clearly “how”.

Linking to the models developed by Kotter [62] on leading change, the eighth finding was related to the contextual issue of change management (Finding #8). One of the most significant ways to influence the take-up of SDG measurement across organisations is engaging, communicating and energising the delivery teams. Research has shown that this is critical to achieving the right organisational cultures [63].

The findings from the research study allow evaluation of the propositions synthesised from the literature review as follows.

Proposition 3 was supported.

The contextual issues identified above are a small insight into broadening our understanding of factors that influence construction companies’ decisions on whether to use SDGs as a lens for defining success and, if so, how they might use them effectively. Other studies delve deeper into construction sustainability benefits [64] or, for example, the evaluation of modern methods of construction based on wood (as aligned to SDG 12 on responsible consumption and production) [65]. Equally important areas that are not addressed in the thematics discussed above relate to green financing; some authors [66] have provided insights into public–private partnerships as a mechanism for financing sustainable development. This highlights the breadth of relevant thematics and keeps the focus of this paper on just the restricted areas considered most important to the executives interviewed.

## 7. Conclusions and Future Work

This comprehensive research study has provided empirically grounded insights from the 40 senior leaders on their perceptions of how their organisations rated and used SDGs as a measurement lens. The 10 findings have provided a rich and deep insight into answering the question of how to measure SDG performance on infrastructure projects. The empirical research has also validated the theory-driven propositions that were synthesised from the literature. Furthermore, this research study identifies that, whilst SDG measurement practices on infrastructure projects are embraced in theory, they are problematic in practice: rarely does action match rhetoric.

Although the 40 interviews described in the study specifically identified a primary stakeholder group, the senior executives of construction firms, there were a number of other stakeholders included, viz. two senior government experts in the infrastructure sector, one financial advisor, one from the United Nations and three from standards bodies. Consequently, the study seeks to include the considerations of wider stakeholders involved in project decision-making. The research team have also consulted with the UK’s Institution of Civil Engineers to ensure this broader perspective is adequately captured.

There is evidence that, although the study was completed in the UK, the results may be applicable to a wider international group because most of the firms have extensive global footprints. It is therefore considered that the inherent global nature of SDGs and the global footprint of the organisations interviewed results in the broader international value of this research. The specific benefit to researchers is that the findings extend knowledge on the theory of measuring outcomes and impact at project level, and, for practitioners, the study provides insights into the contextual preconditions necessary to achieve the intended outcomes of adopting a mechanism for the measurement of SDGs. In this way,

the article offers learning that has significant implications for investment decisions, where being able to systematically identify SDG impacts, from the start, is helpful for achieving local impact against global targets, with broader benefit for people, profit and the planet. The broader SDG research programme that this paper is part of has worked closely with many international organisations, such as UNOPS, which also signifies that this is an area that has wide relevance and can be added to the growing literature across the world on how we are addressing the grand challenges of the SDGs.

One of the primary characteristics of this qualitative research is that the researcher “is the primary instrument for data collection and data analysis” [49]. However, there is a paradox that, despite this strength, it is also a potential weakness since, unlike a survey or scientific experiment, this allows the “human instrument” to adjust to evolving changes. For example, the lead researcher allowed the interview questions to evolve in a free-flowing discussion when he noted that a different line of enquiry might provide unexpected new insights. There is thus a need to apply some caution to the potential hazard of bringing the researchers’ own bias [49], since “it is important to identify them [bias and subjectivity] and monitor them as to how they may be shaping the collection and interpretation of data” (p.13). Another limitation of this study was the research approach. Further research could be expanded to include case studies that test the relevant SDG mechanisms to assess whether the outcomes can be achieved.

In regard to future research, there was a lack of evidence given by participants on their ability to achieve the golden thread of SDG measurement from project to portfolio level (Finding #10) because, often, it was not available at any credible depth or backed up by verifiable evidence. It is therefore proposed that this is an area for further research to test whether aspirations to achieve this linkage are realistic. There is also the need for further research outside the UK since, while the findings from this study have broad global application due to the regional and global footprint of the participants’ organisations, the complexities and challenges in some areas require further SDG measurement research.

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