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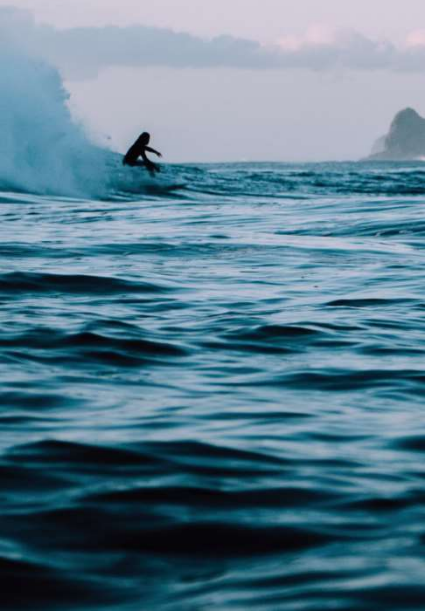

Construction sector performance measurement:
Learning lessons and finding opportunities

Case study
UK construction sector

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Contents

Project background

This case study is part of a BRANZ-funded project which aims to inform the development of a performance measurement framework for the New Zealand construction sector. In this research we analyse a number of international and cross-sectoral performance measurement systems. In each case study we seek to understand why performance is measured, how and what is measured, how the system is implemented, and how effective the system is at monitoring and driving performance improvement in the sector. We have synthesised lessons from across the case studies to develop guidance for the New Zealand construction sector on how to curate and implement an effective construction sector performance management system.

This is one of the case studies that contributes to this project.

The full report is available at https://www.branz.co.nz/pubs/research-reports/er55/.

Acknowledgements

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We are also grateful for the time and insight offered by industry practitioners, peak body representatives, government officials, and researchers that have contributed to this research. We hope that this project contributes toward a more sustainable and resilient future for the construction sector.

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Case study: UK construction sector

1. Introduction

This case study provides a review of construction industry performance measurement in the United Kingdom (UK). A substantial focus is on the *UK Industry Performance Report,* which is a sector-level performance assessment of the construction sector in the UK and has direct links to efforts in the 1990s to instigate a performance measurement system for the sector. The *UK Industry Performance Report* is delivered annually through a partnership of four organisations, with endorsement from the UK Government. This case will set out reasons for the framework's emergence, how the reporting has developed over time, and explores its effectiveness. The findings are based on a detailed review of the annual performance reporting (reviewing available reporting back to 2005), wider related industry reporting and policy in the UK (with reference to several newer initiatives), and a small number of key informant interviews that have helped to provide further depth to the findings. In addition a short summary of emerging sector measurement activities in the UK is also provided.

2. Context

A brief history is provided here to set the context for how and why the annual performance reporting emerged and how it has been maintained over twenty years.

The *Rethinking Construction* report led by Egan (1998) has a direct link to the current annual performance reporting for the sector.[1] *Rethinking Construction* (more commonly known today as the Egan Report) is the report of the Construction Task Force, to the UK Deputy Prime Minister at the time, on the scope for improving the quality and efficiency of UK construction. It proposed ways to improve the performance of the industry through a review of experience at the "the cutting edge of construction and in other industries that have transformed themselves in recent years." (p.3) It highlighted low profitability, limited investment in training, and general client dissatisfaction as key areas to address and concluded that an effective performance measurement framework was needed to foster improvement. The proposed scope for sustained improvement is outlined in Table 1.

Table 1: The 1998 Egan Report proposal for construction industry performance measures

Indicator	Proposed improvement per year
Capital cost – all costs excluding land and finance	↓ 10%
Construction time – time from client approval to practical completion	↓ 10%
Predictability – number of projects completing on time and within budget	↑ 20%
Defects – reduction in number of defects on handover	↓ 20%
Accidents – reduction in the number of reportable accidents	↓20%
Productivity – increase in value added per head	↑10%
Turnover and projects – turnover and profits of construction firms	↑10%

[1] Constructing Excellence (a member-based organisation involved in the annual reporting), provide a more complete review of calls for change in the UK construction industry since the end of the Second World War https://constructingexcellence.org.uk/key-industry-publications/ Accessed 14 April 2020.

Following the publication of the Egan Report, the UK Minister for Construction convened a Key Performance Indicator (KPI) Working Group to respond to the call for a performance measurement framework. Their report set out that the purpose of the KPIs is to:

> *"…enable measurement of project and organisational performance throughout the construction industry. This information can then be used for benchmarking purposes, and will be a key component of any organisation's move towards achieving best practice."* (Department of the Environment, Transport and the Regions, 2000, p.7).

It recognised that companies were already monitoring their own performance against key targets, but not in a way that was consistent for the data to be aggregated. A key goal was to create consistency. The proposed framework comprised seven main groups:

- Time (seven indicators)[2]
- Cost (eight indicators)
- Quality (three indicators)
- Client satisfaction (three indicators)
- Client changes (two indicators)
- Business performance (eleven indicators)
- Health and safety (four indicators)

The indicators are a mix of "headline" indicators (to indicate overall health of a firm), "operational" indicators (specific aspects of activities that help to identify areas for improvement) and "diagnostic" indicators (providing information as to why changes may have occurred in other indicators). They were designed to be applied at either a project or company level (Department of the Environment, Transport and the Regions, 2000). Critically, the Working Group report gave guidance on how to calculate the indicator values. The intention was that the 12 headline indicators would be reported annually at the sector level: Time for construction; Time predictability – design; Time predictability – construction; Cost for construction; Cost predictability – design; Cost predictability – construction; Defects; Client satisfaction – product; Client satisfaction – services; Profitability (company); Productivity (company); Reportable accidents (including fatalities).

The Construction Industry Board (an industry membership organisation no longer in existence) was one of the original organisations tasked with gathering sector-level data (Designing Buildings, 2015). Constructing Excellence was established in 2003 through a merger of other government task forces and best practice groups. It took over the responsibility of managing the framework for industry performance and it remains a key partner responsible for publishing an annual report.

3. Overview of the sector-level measurement system

The annual publication of performance data is now produced through a partnership between Constructing Excellence, Glenigan (involved since 2009), and the Construction Industry Training Board (CITB) (involved since 2014). BRE SMARTWaste also now plays a key role in collecting environmental performance data (following a merger of Constructing Excellence with BRE in 2016). [3] The report is endorsed by the UK

[2] Some indicators proposed were associated with more than one heading. For example, "time predictability – construction (client change orders)" was proposed as a diagnostic indicator for both "time" and "cost".
[3] Glenigan is a specialist market analysis firm; CITB is a levy-collecting training board for the construction sector in England, Scotland and Wales; BRE is an independent research group for the built environment.

Department of Business, Energy and Industrial Strategy. Its intended objective is to track trends and set benchmarks for performance in the construction sector.

Key Performance Indicators (KPIs) in the report are presented under seven headings:

- Economic - All construction
- Respect for People – All construction
- Environment – All construction
- Economic – Housing (a smaller subset of all economic KPIs)
- Economic – Non-housing (a smaller subset of all economic KPIs)
- Construction consultant (a subset relating only to client satisfaction).

Comparing the emphasis of the indicators with those originally proposed in 2000 helps to shed some light on the challenges of reporting at a sector level and some lessons that have been learnt in the UK. Firstly, all 12 of the original headline indicators proposed by the KPI Working Group have been included in reporting throughout this period, achieving at least a high-level goal of providing a long-term view of performance over time. It is not the purpose of this study to analyse each indicator in-depth, however, we can make a general observation that there has not been a consistent improvement in performance across all KPIs, particularly when compared against Egan's original targets proposed in the 1990s. A full list of indicators and associated measures is provided in Appendix 1. Effectiveness of the framework is discussed further in Section 5.

Secondly, there was no mention of environmental-related performance in the Egan Report or subsequent KPI Working Group recommendations, however, environmental indicators are a key feature in the annual reporting. The nature of the environmental KPIs reported has changed significantly over time. An analysis of changes from 2005 – 2018 (documented in detail in Appendix 2), demonstrates a change in emphasis in environmental KPIs over time. The current eight KPIs include four indicators on energy, water use, waste and vehicle movements, each reported in two ways. These changes reflect some experimentation and review in relation to what data can be feasibly collected and what is deemed relevant for the industry. For example, in 2012, five environmental KPIs were removed. This was part of a major review conducted by Glenigan for the 2012 report in an attempt to create what the report describes as more "quantitative" KPIs (Glenigan; Constructing Excellence; Department for Business Innovation & Skills, 2012). This is reflected in a shift away from measures that estimate wider impact of a project (e.g. impact on biodiversity) on a scale of 1-10, to more direct measures such as energy use and water use, presented as a ratio to per £100k or per 100m^2 gross floor area. However, a question remains over what "good" should look like for the industry beyond establishing current average performance.

Another major difference in the framework compared to the original proposed headline indicators is the extent to which the theme "respect for people" is covered. This theme is now a core part of the annual report, but "Industry safety" is the only original headline indicator within this theme. Several other KPIs such as "working hours", "training" and "investment in people" have been monitored throughout the past decade. Several further indicators related to diversity were introduced in the 2013/14 report (Glenigan; Constructing Excellence; CITB; Department for Business Innovation and Skills, 2014).[4] This is the first report in which the CITB features as a supporting partner; while it is not officially publicised as such, the introduction of these new measures is linked to CITB's support in producing the performance metrics.

[4] A year of reporting was missed due to lack of funding, the support of CITB helped to re-launch the reporting.

Finally, the current reporting framework also presents Contractor satisfaction in addition to Client satisfaction reporting, which is something that was not originally covered in the original Working Group report. It covers a rating of overall performance of the client, provision of information, and payment.

4. Implementation

There are no mandatory requirements for organisations to participate directly in providing data for the annual reporting. Where possible, the assessment draws on information that is otherwise already reported by organisations or collected for other reasons, for example, data collected by Companies House (which is the UK's regulatory body that collects annual returns of businesses) on profitability and productivity, the Health and Safety Executive for industry accident data, and the Office of National Statistics for labour force data. In the early years of reporting the assessment benefited from central government support. This support allowed for supplementary questions to be distributed with the standard collection of company turnover data that companies were required to report by Government. While responding to these extra questions was voluntary, there tended to be a good response rate (due to the close association with standard required reporting from the Government). Government statisticians also helped Constructing Excellence with the collation and analysis of this data. The performance framework maintains endorsement of the UK Government but its production does not have the resourcing support in the collection of data than it enjoyed in the early 2000s.[5]

Economic performance data is now collected by Glenigan, a specialist market analysis firm that otherwise already monitor sector activity as part of their core business of providing market intelligence to their customers. The CITB are the statutory levy body for funding of training in the UK and help to fund the collection of data, on the proviso that the report maintains good coverage of data on people. The BRE separately collect and provide data on the environment measures which the BRE capture through their SMARTWaste initiative.[6] This is linked to a "Smartsite" online tool to benchmark the performance of projects against the rest of the construction industry.[7]

5. Effectiveness

A key basis of the sector reporting was to anticipate where it might be useful to collect data proactively to inform decisions rather than only start to monitor it after major issues arise. This meant considering not just what data would be desirable but also what can be feasibly collected in a relatively consistent way over time.

The sector reporting has seen expansion and contraction over time in the number and type of KPIs reported. Figure 1 presents an analysis of the numbers and types of KPIs included in the performance framework from 2005-2018.[8] The obvious high-level trend here is that the key category areas and overall

[5] This is not the result of lack of interest in the sector. The Construction sector is benefitting from recent Government investment through the Construction Sector Deal. The basis of this deal is to set out "an ambitious partnership between government and industry that aims to transform the sector's productivity through innovative technologies and a more highly skilled workforce." (HM Government, 2018, p.6)

[6] In 2016 BRE took over Constructing Excellence, but Constructing Excellence maintains its own identity.

[7] See https://www.bresmartsite.com/products/smartsite-kpis/

[8] Most of these reports are available directly from: https://constructingexcellence.org.uk/kpi-reports/. The 2005 and 2006 reports were available here: https://www.greenwoodconsultants.com/knowledge/industry-performance-reports/. Earlier reports as they are not readily available.

number of categories and KPIs monitored has reduced. Appendix 2 provides a more detailed review of exactly how the monitoring has changed over time, including the measures for the KPIs.

In the annual sector-level reporting the KPIs are generally lagging indicators, but unexpected changes in performance (such as sharp increase in accidents) would help draw attention to the possible need for investigation. Also, some may be used as leading indicators if managed proactively at a project and company level, (where, for example, unexpected low levels of productivity could be influencing predictability of cost).

Among the changes in reporting over time, the original 12 headline indicators proposed by the KPI Working Group now provide a historical sense of industry performance. While there has not been substantial improvements in all areas (demonstrating the challenge the industry faces in implementing and monitoring change) there is at least now some data to engage with and use to benchmark sector performance. In reflecting on the monitoring of performance over time, Don Ward, former CEO of Constructing Excellence advised in consultation for this case study: "*Do not strive for the most perfect measurement. Strive for a measurement which is accessible, understandable, can be measured and collected easily, and which will lead to the right behaviours if it's used as a basis for a benchmark*."

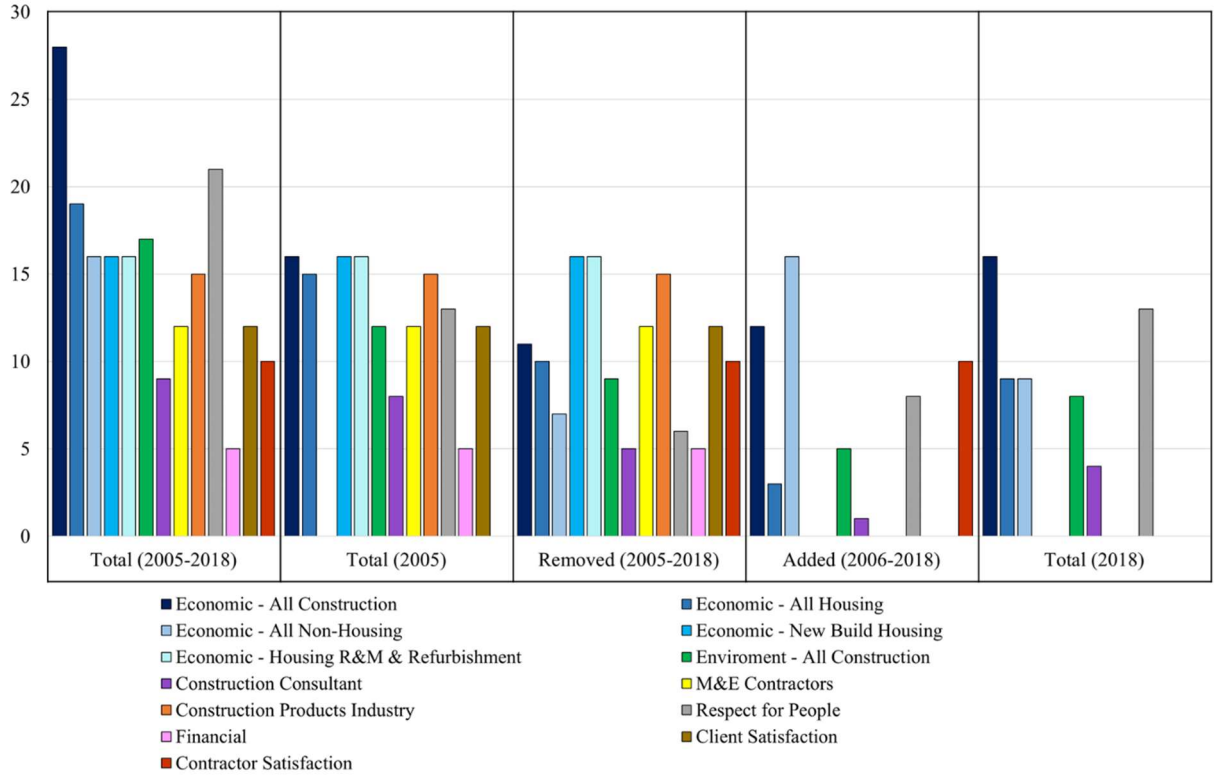

Figure 1: Analysis of change in KPIs over time in the *UK Industry Performance Report*. Supporting data provided in Appendix 2

If viewing effectiveness for driving change at sector-level, the stand-out KPI has been in the sector's safety performance. The mean accident rate has dropped from 1354 incidences per 100,000 employees in 1999 to 399 in 2018, following a general downward trend throughout this time. However, the annual reporting only provides visibility of this trend, rather than the motivation for it. The motivation was driven by a major Construction Safety Summit convened by the Deputy Prime Minister in 2001, in light of concerns in an increase in fatality rates in the industry. The Minister challenged the industry to dramatically improve its poor safety performance record, threatening heightened regulation if the industry continued to fail to

perform. The Government then required the collection of data to report on the industry's response. This has been a key indicator tracked in the performance framework.

Identifying clear success stories for other KPIs is less clear. The attempts to capture environmental performance data, however imperfect, may at least be providing a starting point for monitoring change and informing policy following more recent Government and societal focus on reducing carbon emissions.

As a more general observation of this framework: it is not transparent how all the data is collected and the extent to which is representative of the wider industry. There are varying sources of data for different indicators, but it is not possible to determine just how much data is supporting the reported figures. There is an element of trust that is required that the organisations involved in collating and reporting the KPIs are adopting robust methods for doing so, particularly as many indicators rely on voluntary reporting through mechanisms such as surveys or online reporting tools hosted and managed by the partnering organisations.

6. Potential alternative measurement approaches

This section covers some more recent developments and discussions on performance measurement for the UK construction sector, suggesting new initiatives for capturing data, expanding beyond the core areas covered in the *UK Industry Performance Report.* There have been recent calls for increased/different levels of reporting in housing, offsite construction and major projects across government departments.

Housebuilding is the only sub-sector to be singled out in the annual performance reporting to date. In addition to current reporting for the overall sector, "economic" indicators are also disaggregated to a housing versus non-housing level for client satisfaction and predictability in cost and time. In 2018 the Construction Leadership Council commissioned a report on *Innovation In Buildings Workstream Housing Industry Metrics*, which was prepared by BRE. It describes a set of proposed KPIs for the housing sector. The aim of this report was to: a) specify a system that would support a Housing Industry Metrics Management Dashboard, and b) identify sources of information to set benchmarks (BRE, 2018). It is similar in nature to the KPI Working Group report from 2000, but with a focus on proposing data collection specifically for the housing sector, including how the KPIs should be calculated. The KPIs proposed by this report for benchmarking the performance of housing projects go beyond the generic KPIs that have been reported to date, with more emphasis on the output and nature of the outputs. The document outlines where data already exist via other surveys and industry reporting mechanisms. One baseline Housing Smart Construction Dashboard was produced alongside the publication of the report, which is presented as a one-page dashboard (Construction Leadership Council, 2018). No updates are currently available. Key headline areas of reporting are: capital cost (£/m^2); prelims cost per home built (%); homes completed per year (number); sustainability (embodied carbon, energy performance certificate rating, waste generated); quality (quality rating, ISO 9001 certification); time (time on site in days/m^2); smart (interpreted as how efficiently human labour is used, measured through pre-manufactured value (%)); productivity (in £/man hour); BIM Level 2+ (%); safety (injuries per million hours worked). Here, output-oriented KPIs include homes completed per year, the energy performance certificate rating, and the quality rating.

In March 2020 CIRIA, in partnership with the Laing O'Rourke Centre for Construction Engineering and Technology at the University of Cambridge, published a *Methodology for quantifying the benefits of off-site construction* (Jansen van Vuuren and Middleton, 2020). The development of this methodology follows recent commitment from the UK Government in giving preference to off-site construction methods. The proposal for metrics was based on a review of academic and industry literature, and testing on buildings in the educational sector. The main issue experienced was the general lack of quantified data, and difficulty in identifying the data that would best demonstrate project performance. This framework is oriented at

collecting data at the project level, but with a view also to understanding broader project impacts and wider societal impacts. Many of the project-level KPIs are similar to those already covered in the current annual performance reporting, with additional measures in attempt to compare where off-site construction may impact delivery (e.g. on-site versus off-site labour requirements).

However, the proposed method goes beyond the focus of the current sector reporting in terms of its wider outcome focus. Proposed areas of impact are presented at three levels: direct project impacts, broader project impacts, and wider societal impacts (see Table 2 for detail). Determining appropriate measurement of wider societal impacts remains problematic due to the difficulty in identifying a standard set of quantifiable metrics that provides meaningful measurement of wider outcomes. But, the proposed methodology attempts to provide at least a more general description of social impacts and makes some suggestions for proxy measures, such as drawing on existing approaches to measuring social value. There is interest among the industry to further test the methodology, and a hope that adoption by clients will help to promote data collection, but it is too early to make any judgement on effectiveness.

Table 2: Summary areas of impact from the Methodology for quantifying the benefits of offsite (sourced from Jansen van Vuuren and Middleton, 2020)

Level	**Metric group (measures)**
Direct project impacts	Cost (construction cost; prelims, risk, financing cost; cost certainty; design cost; tendering cost; design change cost) Time (total programme; time on-site; weather related delays; programme certainty; design time; productivity) Quality (cost of rework; energy efficiency; user satisfaction; air permeability; emergent defects; planned maintenance requirements) Labour requirements (on-site labour required; off-site labour required; trades and interfaces (peak workforce)) Health and safety (accident frequency rate; health and wellbeing)
Broader project impacts	Environmental considerations (waste generated; embodied carbon; construction water usage; water pollution; construction energy usage) Life-cycle considerations (longevity/durability; future adaptability; end-of-life recyclability; re-use potential) Local disruption (noise; voice movements; air quality)
Wider societal impacts	Workforce quality of life (job security; permanent work location; comfortable work environment; less manual labour; stability for family and community; opportunity for diversity in workforce) Industry benefits (replicability and standardisation; scalability; supply chain partnerships; risk management) Community benefits (investment in local community; social licence; regional economic uplift)

At the end of 2017 the Infrastructure and Projects Authority[9] (IPA) released its *Transforming Infrastructure Performance* Report. The IPA sees itself as being uniquely positioned to coordinate across government for all major infrastructure project delivery. It is leading the Government's Transforming Infrastructure Performance Programme. This report again sites Egan's 1998 review, and there remains a lack of data on

[9] Considered as the UK government's centre of expertise for infrastructure and major projects.

which to benchmark cost performance of public investment. The goal of *Transforming Infrastructure Performance* work is: "Over the next 10 years, our ambition is to ensure all major projects and programmes are selected and prioritised using benchmarked data on costs and performance"(Infrastructure and Projects Authority, 2017, p.19) and it aims to establish new metrics for *assets* in operation. It recognises that while cost and scheduling benchmarking is widely done, project sponsors do not always have access to data of sufficient granularity, for example, determining what a reasonable expected cost for tunnelling and under what conditions. The intention is to cover both project delivery and of Whole of Life Performance. Reference is made to off-site construction and the concept of smart infrastructure – reflecting broader government support for these areas. In parallel, the National Infrastructure Commission[10] is consulting on measures to consider performance of infrastructure at a system level (i.e. how it contributes to wider economic, business, social and environmental objectives of the government).

In March 2019 the IPA released a follow-up document on *Best Practice in Benchmarking* and there is a dedicated team within the organisation now leading the benchmarking initiative. They are exploring three ways to structure the metrics: input-output-performance-outcome model; system-network-asset-project model; balanced score-card model. This will likely build on the existing Crown Commercial Service Balanced Scorecard system for procurement launched in 2016. The strategic themes of the Balanced Scorecard approach are: solution quality, cost, supply chain, employment and skills, environmental sustainability, health and safety and outcome benefits. This system is designed to be applied to all works, infrastructure and capital investment greater than £10 million, but this has not yet led to a database of information that can be fed back to the industry. The IPA have an intention to hold a library of benchmark information for the sector (Infrastructure and Projects Authority, 2019). Designing this system is a work in progress (as at May 2020).

Finally, the European Construction Sector Observatory runs a comparative assessment of the construction sector across the 27 European Union Countries at the United Kingdom. This is run through the European Union programme for the Competitiveness of Small and Medium-Sized Enterprises and runs from 2014 – 2020. Their assessment is policy oriented. It covers typical common indicators such as productivity, profitability and employment, but with emphasis on economic indicators such as access to finance and business confidence. Much of the analysis is oriented on drivers and barriers to the sector, with a section on innovation and on the regulatory framework. This is covered in more depth in a separate Case Study.

7. Conclusion

In summary, the UK has been experimenting with construction industry performance benchmarking for 20 years. The *UK Industry Performance Report* demonstrates experimentation and refinement over time. While supported by Government, it has not been obviously driven by Government since the Health and Safety focus of the early 2000s. As a result, the influence in change in behaviour and practice has had mixed success.

Data collection has been most comprehensive and effective when it is sourced from existing industry-wide datasets (such as from the Office of National Statistics) or has been a requirement to report set by Government. Other data has been seen as worthwhile to collect, but with no obvious industry-wide commitment/remit/capacity to address performance issues.

[10] The National Infrastructure Commission was set up to provide impartial, expert advice to the government on long-term infrastructure challenges.

New efforts have been emerging to promote more comprehensive datasets that cover both traditional project and company data (such as profitability and productivity), but with bolder attempts to capture data on outcomes and quality. Critical to this will be the Government's maintained focus on ensuring data is reported consistently and that it is used to promote change in behaviour (as evidenced in the Health and Safety example).

8. Study participants

Nick Raynsford, UK Minister for Housing and Planning 1999 – 2001. Currently Deputy Chairman of Crossrail Ltd.

Don Ward, CEO Constructing Excellence UK 2001 – 2018

Andrew Shepherd, CEO Mid Group – a high growth UK construction company established in the UK

Joanne Geddes – Lead Engineering Capability Manager, Network Rail

Prof. Campbell Middleton, University of Cambridge – co-author of CIRIA 2020 report *Methodology for quantifying the benefits of offsite construction*

Aleister Hellier – Head of Benchmarking at Infrastructure and Projects Authority, UK

Note – all errors remain the responsibility of the authors. The content of this report has collated information from different locations and does not necessarily represent the opinions of the interviewees.

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Appendix 1: Full list of key performance indicators (KPIs)

A full list of the measures per KPI proposed is presented below. Please refer to the tables in Appendix 2 to cross-reference which measures are currently reported.

KPI	Measure
Economic related KPIs	
Client Satisfaction - Product	% scoring 8/10 or better
Client Satisfaction - Service	% scoring 8/10 or better
Defects	% scoring 8/10 or better
Safety - Industry	Accident incidence rate
Safety - All Companies	% achieving zero accident incidence rate
Safety - Companies over £10M T/O	% achieving zero accident incidence rate
Predictability Cost - Design	% on target or better
Predictability Cost - Construction	% on target or better
Predictability Cost - Project	% on target or better
Predictability Time - Project	% on target or better
Predictability Time - Design	% on target or better
Predictability Time - Construction	% on target or better
Profitability	Median % profit before interest & tax
Productivity (VAPH Current Values)	Median value added/employee (£000)
Construction Cost	% change compared with one year ago
Construction Time	% change compared with one year ago
Client Satisfaction - Value for Money	% scoring 8/10 or better
Contractor Satisfaction - Performance - Overall	% scoring 8/10 or better
Contractor Satisfaction - Provision of Information - Overall	% scoring 8/10 or better
Contractor Satisfaction - Payment - Overall	% scoring 8/10 or better
Defects - Impact at Handover	% scoring 8/10 or better
Productivity (VAPE Constant 2000 Values)	Median value added/FTE employee (£000)
Gross Productivity (TOPH)	Median turnover/ FTE employee (£000)
Return on Value Added (ROVA)	Median % PBIT/ value added
Return on Capital Employed (ROCE)	Median % PBIT/capital employed
Safety - Contractors - All Companies	% achieving zero accident incidence rate
Repeat Business	Median % turnover from companies worked with previously
Productivity (VAPE Constant 2011 Values or previous year)	Median value added/FTE employee (£000)
Respect for People	
Employee Satisfaction	% scoring 8/10 or better
Staff Turnover - All Companies	Median % staff turnover
Sickness Absence - All Companies	Median number of days lost
Safety – Industry	Accident incident rate (HSE)
Safety – All Companies	% achieving zero accident incidence rate
Safety - Companies over £10M T/O	% achieving zero accident incidence rate
Working Hours	Median usual hours worked / week (hrs)
Travelling Time	Median travel time to work / day (mins)
Qualifications & Skills	Median % of direct employees qualified to NVQ Level 2 or higher
Equality & Diversity	% scoring 8/10 or better
Training	Median annual training days / full-time equivalent employee (days)
Pay	Median gross weekly earnings (£)
Investors in People	Mean % of direct employees covered by IiP recognition
Safety – Contractors / Contractors & Subcontractors	% achieving zero accident incidence rate
Staff Loss	Median % direct employees who left employment
Construction Skills Certification Card	Median % direct employees that hold a CSCS
Make-up of staff-women	Median % women employed & Mean % women employed
Make-up of staff-women - People from BME	Median % people from black or minority ethnic backgrounds & Mean % people from black or minority ethnic backgrounds
Make-up of staff-women - Aged under 24	Median % people employed aged under 24 & Mean % people employed aged under 24
Make-up of staff-women - Aged over 55	Median % people employed aged over 55 & Mean % people employed aged over 55
Make-up of staff-women - Disabled People	Median % people employed who are disabled & Mean % people employed who are disabled

Environment	
Impact on the Environment (Product Performance)	% scoring 8/10 or better
Impact on the Environment (Construction Process Performance)	% scoring 8/10 or better
Energy Use (Designed) (Product Performance)	Median energy use kgCO2 / 100m2 gross floor area
Energy use (Construction Process Performance)	Median energy use kgCO2 / £100k project value
Mains Water Use (Designed) (Product Performance)	Median water use m3 / 100m2 gross floor area
Mains Water Use (Construction Process Performance)	Median water use m3 / £100k project value
Waste (Construction Process Performance)	Median waste removed from site m3 / £100k project value
Commercial Vehicle Movements (Construction Process Performance)	Median movements onto site / £100k project value
Impact on Biodiversity (Product Performance)	% scoring 8/10 or better
Impact on Biodiversity (Construction Process Performance)	% scoring 8/10 or better
Whole Life Performance (Product Performance)	% scoring 8/10 or better
Energy Use (Designed)- Housing SAP Rating (Product Performance)	Median SAP rating
Area of Habitat - Created/Retained (Product Performance)	Median change in area of habitat as % of site area
Energy Use (Constant previous year's Values) (Construction Process Performance)	Median energy use kgCO2 / £100k project value
Mains Water Use (Constant previous year's Values) (Construction Process Performance)	Median water use m3 / £100k project value
Waste (Constant previous year's Values) (Construction Process Performance)	Median waste removed from site m3 / £100k project value
Commercial Vehicle Movements (Constant previous year's Values) (Construction Process Performance)	Median movements onto site / £100k project value
Construction Consultant	
Client Satisfaction - Overall Performance	% scoring 8/10 or better
Client Satisfaction - Value for Money	% scoring 8/10 or better
Client Satisfaction - Quality of service	% scoring 8/10 or better
Client Satisfaction - Timely delivery	% scoring 8/10 or better
Client Satisfaction - H&S awareness	% scoring 8/10 or better
Training	Median annual training days per FTE employee
Profitability	Median % profit before interest & tax
Productivity (Current Values)	Median value added per UK FTE employee (£000s)
Productivity (Constant 2002 Values)	Median value added per UK FTE employee (£000s)
M&E Contractors	
Client Satisfaction - Design	% scoring 8/10 or better
Client Satisfaction - Installation	% scoring 8/10 or better
Client Satisfaction - Service	% scoring 8/10 or better
Client Satisfaction - Quality O&M Manuals	% scoring 8/10 or better
Defects	% scoring 8/10 or better
Predictability - Cost	% on cost or better
Predictability - Time	% on time or better
Profitability	Median % profit turnover
Productivity (Current Values)	Median value added / M&E operative (£000)
Productivity (Constant 2001 Values)	Median value added / M&E operative (£000)
Safety - M&E Contractors - All Companies	% achieving zero accident incidence rate
Safety - M&E Contractors - All Companies with 60 staff or more	% achieving zero accident incidence rate
Construction Products Industry	
Product Quality (Customer Satisfaction)	% scoring 8/10 or better
Delivery Reliability (Customer Satisfaction)	% scoring 8/10 or better
Sales Advice (Customer Satisfaction)	% scoring 8/10 or better
After Sales Service (Customer Satisfaction)	% scoring 8/10 or better
Value for Money (Customer Satisfaction)	% scoring 8/10 or better
Energy (Environment)	Median energy consumed KgCO2 / 10 tonne of production output
Water (Environment)	Median water used m3 / 10 tonne of production output or
Waste (Environment)	Median tonnes of waste leaving site as a % of total production output
Transport (Environment)	Median number movements / 10 tonne of production output
Packaging (Environment)	Median tonnes of packaging bought as a % of total production output
Safety at work (People)	Mean accident incidence rate
Sickness Absence (People)	Median number of days lost per employee
Training (People)	Median annual training days / full-time equivalent employee
Qualifications (People)	Median % of full-time employees qualified to NVQ Level 2 or higher
Equality & Diversity (People)	% scoring 8/10 or better

Financial	
Profitability (ROS)	Median % profit before interest & tax
Productivity (VAPH)	Median value added/employed (£000)
Gross Productivity (TOPH)	Median turnover/employed (£000)
Return on value added (ROVA)	Median % PBIT/value added
Return on capital employed (ROCE)	Median % PBIT/capital employed
Client Satisfaction	
Client satisfaction - Product	% scoring 8/10 or better
Client satisfaction – Service	% scoring 8/10 or better
Client satisfaction - Defects	% scoring 8/10 or better
Environment Impact - Product	% scoring 8/10 or better
Environment Impact - Process	% scoring 8/10 or better
Client satisfaction - Consultants	% scoring 8/10 or better
Client satisfaction - Contractors	% scoring 8/10 or better
Value for money - Consultants	% scoring 8/10 or better
Value for money - Contractors	% scoring 8/10 or better
Value for money - Project	% scoring 8/10 or better
Client would use consultants again	% answering Yes
Client would use contractors again	% answering Yes
Contractor Satisfaction	
Contractor Satisfaction – client	% scoring 8/10 or better
Contractor Satisfaction - consultancy team	% scoring 8/10 or better
Provision of Information - client	% scoring 8/10 or better
Provision of Information - consultancy team	% scoring 8/10 or better
Payment - accuracy of interim valuations	% scoring 8/10 or better
Payment - overall satisfaction	% scoring 8/10 or better
Payment - accuracy of interim valuations	% scoring 8/10 or better
Payment - timeliness of valuation of change orders and inclusion in interim valuation	% scoring 8/10 or better
Payment - timeliness of release of retention monies	% scoring 8/10 or better
Payment - timeliness of agreement and payment of final account	% scoring 8/10 or better

Appendix 2: Review of key performance indicators (KPIs)

Review of the *UK Industry Performance Report 2005-2018*

This Appendix presents a review of KPIs (and their associate measures) over time, using available reporting (initial reporting from the early 2000s was not available). KPIs have covered 13 categories over the period 2005-2018:[11]

1. Economic All Construction (2007-2018)
2. Economic Housing (2007-2018)
3. Economic non-Housing (2007-2018)
4. Economic Housing R&M and Refurbishment (2005-2006)
5. Economic KPIs - New Build Housing (2005-2006)
6. Respect for People (2007-2018)
7. Environment (2007-2018)
8. Construction Consultants (2007-2018)
9. M&E Contractors (2007-2011)
10. Construction Products Industry (2007-2009)
11. Financial (2005-2006)
12. Client Satisfaction (2005-2006)
13. Contractor Satisfaction (2006).

Figure 2 shows that the total number of KPIs tends to reduce over the years across all categories. Currently, only six categories are used. In 2005, the report consisted of 140 KPIs in total, whilst in 2018 it was 60. Although there is an obvious tendency to reduce the total number of KPIs, new KPIs have been introduced during this period. Despite a few exceptions, most of the time the reasoning behind the addition or removal of KPIs is not explicitly reported. A more detailed overview of the KPI changes is presented below.

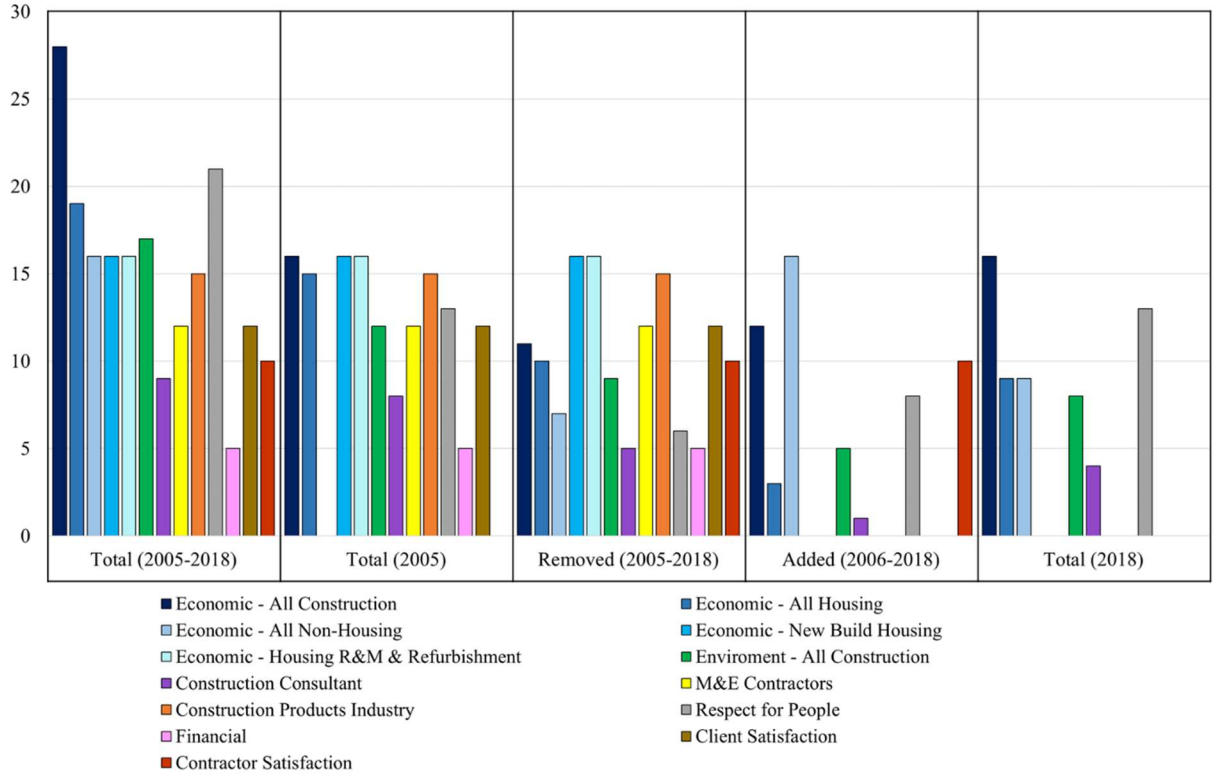

Figure 2: Changes of number of KPIs collected over the period 2005-2018.

[11] Note that this analysis excludes a comparative category called "Demonstration projects – comparisons with all construction" which was reported from 2005 to 2009.

Table 3 shows the changes of the Economic All Construction KPIs. This category focuses on economic related key performance indicators for the entire sector. During the period 2005-2018, the Economic All Construction category consisted of 28 KPIs in total. Of them, 11 were removed, whilst 12 new were added. The total number of active KPIs is 16. There is often no clear indication why some KPIs were removed. However, some changes can be tracked through closer reading. For example, Safety-related indicators have been moved to another category. The basis of reporting the Productivity indicator reporting has also changed. This indicator is either measured based on the median value added per employee per year or based on constant values of previous years in order to remove the effect of inflation.

Table 3: Economic all construction KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/ 14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#2	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#3	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#8	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#9	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#10	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#11	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#12	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#13	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#14	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#15	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒
#16	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒
#17	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#18	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#19	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#20	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#21	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#22	-	-	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒
#23	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#24	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#25	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#26	-	-	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#27	-	-	-	-	-	-	-	☑	☒	☒	☒	☒	☒
#28	-	-	-	-	-	-	-	-	☑	☑	☑	☑	☑

KPI	*#*	*KPI*	*#*	*KPI*	*#*	*KPI*	*#*
Client Satisfaction - Product	**1**	Predictability Cost - Project	**9**	Client Satisfaction - Value for Money	**17**	Return on Capital Employed (ROCE)	**25**
Client Satisfaction - Service	**2**	Predictability Time - Project	**10**	Contractor Satisfaction - Performance - Overall	**18**	Safety - Contractors - All Companies	**26**
Defects	**3**	Predictability Time - Design	**11**	Contractor Satisfaction - Provision of Information - Overall	**19**	Repeat Business	**27**
Safety - Industry	**4**	Predictability Time - Construction	**12**	Contractor Satisfaction - Payment - Overall	**20**	Productivity (VAPE Constant 2011 Values or previous year)	**28**
Safety - All Companies	**5**	Profitability	**13**	Defects - Impact at Handover	**21**		
Safety - Companies over £10M T/O	**6**	Productivity (VAPH Current Values)	**14**	Productivity (VAPE Constant 2000 Values)	**22**		
Predictability Cost - Design	**7**	Construction Cost	**15**	Gross Productivity (TOPH)	**23**		
Predictability Cost - Construction	**8**	Construction Time	**16**	Return on Value Added (ROVA)	**24**		

Tables 4, 5, and 6 show the KPIs changes of four categories: Economic All Housing, Economic non-Housing KPIs, Economic New Build Housing, and Economic Housing R&M and Refurbishment. These categories share the same KPIs as the Economic All Construction category. The only difference is that the total KPIs of these 4 categories is smaller than the total of the Economic All Construction KPIs. During the period 2005-2018, the Economic All Housing category consisted of 19 KPIs, the New Build Housing category and the Housing R&M and Refurbishment of 16, and finally, the non-Housing KPIs category that appeared during the period 2007-2018 consisted of 16 in total. As Table 6 shows the New Build Housing and Housing R&M and Refurbishment categories were used only for two years (2005-2006). From all 4 categories, only 18 in total are currently used (based on the 2018 report).

Table 4: Economic housing KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#2	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#3	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#8	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#9	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#10	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#11	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#12	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#13	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#14	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#15	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#16	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#17	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#18	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#19	-	-	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒

KPI	#
Client Satisfaction - Product	1
Client Satisfaction - Service	2
Defects	3
Safety - Industry	4
Safety - All Companies	5
Safety - Companies over £10M T/O	6
Predictability Cost - Project	7
Predictability Cost - Design	8
Predictability Cost - Construction	9
Predictability Time - Project	10

KPI	#
Predictability Time - Design	11
Predictability Time - Construction	12
Profitability	13
Productivity (Current Values)	14
Construction Cost	15
Construction Time	16
Productivity (Constant 2003 Values)	17
Defects Impact at Handover	18
Safety - Contractors - All Companies	19

Table 5: Economic non-housing KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#2	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#3	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#4	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#5	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#6	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#7	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#8	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#9	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#10	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#11	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#12	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#13	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#14	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#15	-	-	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#16	-	-	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒

KPI	#	KPI	#
Client Satisfaction - Product	1	Predictability Time - Construction	9
Client Satisfaction - Service	2	Construction Cost	10
Defects - Impact at Handover	3	Construction Time	11
Predictability Cost - Project	4	Profitability	12
Predictability Cost - Design	5	Productivity (Current Values)	13
Predictability Cost - Construction	6	Productivity (Constant 2003 Values)	14
Predictability Time - Project	7	Safety - Industry	15
Predictability Time - Design	8	Safety - Contractors - All Companies	16

Table 6: Economic new build housing/housing R&M and refurbishment KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#2	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#3	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#8	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#9	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#10	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#11	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#12	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#13	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#14	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#15	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#16	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#
Client Satisfaction - Product	**1**
Client Satisfaction - Service	**2**
Defects	**3**
Safety - Industry	**4**
Safety - All Companies	**5**
Safety - Companies over £10M T/O	**6**
Predictability Cost - Project	**7**
Predictability Cost - Design	**8**

KPI	#
Predictability Cost - Construction	**9**
Predictability Time - Project	**10**
Predictability Time - Design	**11**
Predictability Time - Construction	**12**
Profitability	**13**
Productivity (Current Values)	**14**
Construction Cost	**15**
Construction Time	**16**

Table 7 shows the changes of the Respect for People KPIs. This category focuses on employees. During the period 2005-2018, the Respect for People category has covered 21 KPIs in total. Since 2005, 6 were deleted, whilst 9 new were added. There are currently 14 active KPIs. During the period 2007-2011, the Safety Industry, and Safety Contractors indicators of this category were also part of the Economic All Construction related categories. This was reviewed to avoid confusion. It is not reported why some indicators such as Safety, Pay (median gross weekly earnings), and Travelling Time (median travel time to work / day) were deleted. While the equality and diversity indicator in 2012 was deleted, it was replaced by 5 new indicators in 2013/2014.

Table 7: Respect for people KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒
#2	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#3	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#4	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#8	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#9	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#10	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#11	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#12	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#13	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#14	-	-	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒
#15	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#16	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#17	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#18	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#19	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#20	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑
#21	-	-	-	-	-	-	-	☑	☑	☑	☑	☑	☑

KPI	#	KPI	#	KPI	#
Employee Satisfaction	1	Qualifications & Skills	9	Make-up of staff-women	17
Staff Turnover - All Companies	2	Equality & Diversity	10	Make-up of staff-women - People from BME	18
Sickness Absence - All Companies	3	Training	11	Make-up of staff-women - Aged under 24	19
Safety - Industry	4	Pay	12	Make-up of staff-women - Aged over 55	20
Safety – All Companies	5	Investors in People	13	Make-up of staff-women - Disabled People	21
Safety - Companies over £10M T/O	6	Safety - Contractors & Subcontractors	14		
Working Hours	7	Staff Loss	15		
Travelling Time	8	Construction Skills Certification Card	16		

Table 8 shows the changes of the Environment KPIs during the period 2005-2018. This category has covered 17 KPIs over time. Of them, 9 were deleted, and 6 new were added. Many of the initial KPIs were not reported after 2011, following a review of how to best report performance in this category. Although the total number of currently reported KPIs of this category is equal to 8, the real total is 4. Each indicator is measured in two ways: the first is based on each year's values, whereas the second relies on constant values of previous years in an effort to remove inflation effects.

Table 8: Environment KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#2	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#3	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☒	☒
#4	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#5	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☒	☒
#6	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#7	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#8	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#9	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#10	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#11	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#12	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑	☒	☒
#13	☑	☑	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒
#14	-	-	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑
#15	-	-	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑
#16	-	-	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑
#17	-	-	-	-	☑	☑	☑	☑	☑	☑	☑	☑	☑

KPI	#	KPI	#	KPI	#
Impact on the Environment (Product Performance)	1	Waste (Construction Process Performance)	7	Area of Habitat - Created/Retained (Product Performance)	13
Impact on the Environment (Construction Process Performance)	2	Commercial Vehicle Movements (Construction Process Performance)	8	Energy Use (Constant previous year's Values) (Construction Process Performance)	14
Energy Use (Designed) (Product Performance)	3	Impact on Biodiversity (Product Performance)	9	Mains Water Use (Constant previous year's Values) (Construction Process Performance)	15
Energy use (Construction Process Performance)	4	Impact on Biodiversity (Construction Process Performance)	10	Waste (Constant previous year's Values) (Construction Process Performance)	16
Mains Water Use (Designed) (Product Performance)	5	Whole Life Performance (Product Performance)	11	Commercial Vehicle Movements (Constant previous year's Values) (Construction Process Performance)	17
Mains Water Use (Construction Process Performance)	6	Energy Use (Designed) - Housing SAP Rating (Product Performance)	12		

Table 9 shows the changes of the Construction Consultant KPIs. During the period 2005-2018, this category has covered 9 KPIs in total. From then, 5 were deleted, whilst 4 KPIs remain active up to present. This category focuses on different aspects of client satisfaction. However, it is observed that during the period 2007-2011 several non-client related KPIs such as Training, Profitability, and Productivity were also reported.

Table 9: Construction consultant KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#2	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#3	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#4	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
#5	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#6	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#8	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#9	-	-	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#
Client Satisfaction - Overall Performance	1
Client Satisfaction - Value for Money	2
Client Satisfaction - Quality of service	3
Client Satisfaction - Timely delivery	4
Client Satisfaction - H&S awareness	5

KPI	#
Training	6
Profitability	7
Productivity (Current Values)	8
Productivity (Constant 2002 Values)	9

Table 10 shows the changes of the M&E Contractors KPIs. During the period 2005-2011, this category consisted of 12 KPIs in total. Since 2012 this category stopped from being used.

Table 10: M&E contractors KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#2	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#3	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#4	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#5	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#6	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#8	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#9	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#10	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#11	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒
#12	☑	☑	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒

KPI	#
Client Satisfaction - Design	1
Client Satisfaction - Installation	2
Client Satisfaction - Service	3
Client Satisfaction - Quality O&M Manuals	4
Defects	5
Predictability - Cost	6

KPI	#
Predictability - Time	7
Profitability	8
Productivity (Current Values)	9
Productivity (Constant 2001 Values)	10
Safety - M&E Contractors - All Companies	11
Safety - M&E Contractors - All Companies with 60 staff or more	12

Table 11 category consisted of 15 KPIs in total. Since 2010, this category ceased being reported. Besides some of the customer satisfaction related KPIs, all the rest were also reported more generally in the Environment, Economic All Construction/Housing/non-Housing, and Respect of People KPIs categories.

Table 11: Construction products industry KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#2	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#3	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#5	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#8	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#9	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#10	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#11	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#12	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#13	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#14	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒
#15	☑	☑	☑	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#
Product Quality (Customer Satisfaction)	1
Delivery Reliability (Customer Satisfaction)	2
Sales Advice (Customer Satisfaction)	3
After Sales Service (Customer Satisfaction)	4
Value for Money (Customer Satisfaction)	5
Energy (Environment)	6
Water (Environment)	7

KPI	#
Waste (Environment)	8
Transport (Environment)	9
Packaging (Environment)	10
Safety at work (People)	11
Sickness Absence (People)	12
Training (People)	13
Qualifications (People)	14
Equality & Diversity (People)	15

Table 12 shows the changes of the Financial KPIs. It consisted of 5 KPIs in total. Although this category stopped from being reported since 2007, financial KPIs remained active in the integrated in the Economic - All Construction category.

Table 12: Financial KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#2	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#3	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#
Profitability (ROS)	1
Productivity (VAPH)	2
Gross Productivity (TOPH)	3
Return on value added (ROVA)	4
Return on capital employed (ROCE)	5

Table 13 shows the changes of the Client Satisfaction category. It consisted of 12 KPIs in total. Similar to the previous Financial category, although it has stopped being reported since 2007 most of its KPIs were integrated in other categories such as the Economic - All Construction and Environment categories.

Table 13: Client satisfaction KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#2	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#3	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#5	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#8	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#9	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#10	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#11	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#12	☑	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#	KPI	#
Client satisfaction - Product	1	Client satisfaction - Contractors	7
Client satisfaction – Service	2	Value for money - Consultants	8
Client satisfaction - Defects	3	Value for money - Contractors	9
Environment Impact - Product	4	Value for money - Project	10
Environment Impact - Process	5	Client would use consultants again	11
Client satisfaction - Consultants	6	Client would use contractors again	12

Table 14 shows the KPIs of the Contractor Satisfaction category. The indicators presented in this table were implied as KPIs for the first time in 2006 (this may have been a typographical error). The same indicators were presented as APIs (additional performance indicators) in 2005. This stopped existing as a category after 2006 and some Contractor Satisfaction indicators were incorporated into the main Economic category in 2007.

Table 14: Contractor satisfaction KPIs during the period 2005-2018

#KPI	2005	2006	2007	2008	2009	2010	2011	2012	2013/14	2015	2016	2017	2018
#1	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#2	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#3	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#4	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#5	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#6	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#7	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#8	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#9	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
#10	☒	☑	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

KPI	#	KPI	#
Contractor Satisfaction – client	1	Payment - overall satisfaction	6
Contractor Satisfaction - consultancy team	2	Payment - accuracy of interim valuations	7
Provision of Information - client	3	Payment - timeliness of valuation of change orders and inclusion in interim valuation	8
Provision of Information - consultancy team	4	Payment - timeliness of release of retention monies	9
Payment - accuracy of interim valuations	5	Payment - timeliness of agreement and payment of final account	10