

Case study: A fresh approach of the Balanced Scorecard in the Heathrow Terminal 5 project

Ron Basu, Chris Little and Chris Millard

Ron Basu is based at Henley Management College, Henley Business School, Gerrards Cross, UK. Chris Little and Chris Millard are both based at BAA Capital Programmes, Heathrow Airport, Hounslow, UK.

Summary

Purpose – *The purpose of this paper is to present a case study of the Heathrow Terminal 5 project and to illustrate a customised application of the Balanced Scorecard in a major infrastructure project with multiple stakeholders.*

Design/methodology/approach – *The research methodology applied in this work was based on the case study methodology. The focus was on “how” questions and exploratory analysis of primary and secondary data supported in-depth interviews with members from both the project team and suppliers.*

Findings – *The application of the concept of the Balanced Scorecard by Kaplan and Norton in project management is less frequent in comparison with operations management. The study has established a proven application of the Balanced Scorecard in managing quality in a major infrastructure project.*

Practical implications – *For practitioners of major projects the paper gives implications for implementing the theoretical and customising requirements of the Balanced Scorecard involving key stakeholders.*

Originality/value – *The paper illustrates that metrics can be customised for major projects within the framework of the Kaplan and Norton Balanced Scorecard and that suppliers should be empowered to own the monitoring and improvement process using their performance data.*

Keywords *Balanced scorecard, Stakeholders, Suppliers, Partnership, Performance measurement (quality)*

Paper type *Case study*

1. Introduction

Heathrow Terminal 5 opened on 27 March 2008 with high expectations. It represents a major step in the transformation of Heathrow and it is now a major gateway to the UK. From the start T5 was different and it needed to be due to its size, complexity and proximity. Despite some teething problems on opening, T5 was a catalyst for new and improved ways of working. One such initiative is the application of a Balanced Scorecard approach in managing quality in major projects.

For nearly two decades organisations in both the manufacturing and service industries have been working arduously at trying to bring the power, discipline and rigour of performance measurement into their organisations based on the Balanced Scorecard. The concept of a Balanced Scorecard by Kaplan and Norton (1996) is a strategic measurement system organised in four perspectives (financial, customer, internal processes, and learning and growth) that aims to establish tangible performance indicators in all functions of the business. One of the proven virtues of this system is that it proposes a balance between concepts that could be contradictory to managers. For example, it aims to balance between short-term and longer-term objectives, financial measures versus operational measures, internal performance versus external performance, enabling indicators versus results indicators and between leading and lagging indicators.

As might be expected, it is soon recognised (Zagrow, 2003; Project Management Institute, 2004) that the same benefits an organisation as a whole can derive from the deployment of a Balanced Scorecard based performance measurement system can also be acquired by a project's management. Performance measures enable project managers to track whether the projects they are managing are moving in the right direction. Furthermore, projects do not only provide financial benefits: many of the outcomes of a project are intangible in nature. Project leaders are beginning to come out of the box of traditional project objectives, such as time, cost, risk and safety, and are moving towards the softer issues of project quality (Basu, 2008). This also means that many traditional performance measurement tools do not capture these benefits. The Balanced Scorecard approach enables us to identify the intangible drivers and project outcomes. So the application of the Balanced Scorecard in project management is becoming attractive to project managers.

However, a customised application of a performance management system based on the concept of the Balanced Scorecard in Heathrow Terminal 5 Project has created a fresh approach to involve all key stakeholders, including major consultants and contractors, to move towards a project quality culture.

2. Heathrow Terminal 5 project

BAA's Terminal 5 Programme at London Heathrow Airport was one of Europe's largest construction projects. Terminal 5 caters for approximately 30 million passengers a year and provides additional terminal and aircraft parking capacity. There are 42 aircraft stands (in phase one) including stands to cater for the Airbus A380. T5 features a world-class transport interchange connecting road, rail and air transport. The Heathrow Express from London Paddington and the Piccadilly Line have been extended and a new spur road links T5 to the M25 motorway. Passengers move from the terminal to satellite buildings by a driver-less tracked transit system. The new 87-metre control tower will meet the longer term demands of air traffic control at Heathrow. The facility opened to the public on 27 March 2008 and represents a £4.3 billion investment to BAA.

The project was delivered by BAA working in partnership with suppliers and the airline operator British Airways. By 2008 around 50,000 people, employees and key stakeholders, have been involved with building T5, working both on and off site. Only about 120 employees were directly employed by BAA. The project has deployed *circa* 100 first-tier contractors and consultancy firms, of which only three contractors (Laing O'Rourke, AMEC and MACE) were designated as principal contractors.

The mission and key objectives of the project included to:

- set new standards in delighting the traveller at T5;
- develop and deliver T5 to new industry standards of health safety and security;
- earn the proactive support and trust of key stakeholders;
- achieve exceptional performance to ensure value for money, on time delivery and an efficient and productive T5; and
- leave behind a legacy of quality.

The need of supplier partnerships in line with the T5 Agreement (Little, 2005) and the complexity of rail, road, construction and systems requirements of the project were additional drivers.

To achieve these audacious targets in money and programme BAA had to consider a novel contracting and procurement strategy supported by a performance management system. Suppliers signing up to BAA agreements are expected to work in integrated teams and display true partnering behaviours and values akin to partnering. Before embarking on the Terminal 5 (T5) programme of works, BAA looked at a number of major UK construction projects to ascertain lessons learned, particularly where they had gone wrong. BAA decided that they had to have an agreement that could deal with an adaptable and dynamic approach dealing with the uncertainties and embracing integrated teams. So BAA wrote its own bespoke agreement or contract. The same conditions of contract applied to all key

suppliers irrespective of type or usual position as a subcontract. And to support the governance of the project in line with this agreement a Balanced Scorecard based performance management system was developed for the T5 project.

3. Drivers of the Balanced Scorecard

It is recognised (Basu, 2004) that the comprehensive approach of a well-designed performance management system is underpinned by three fundamental criteria leading to the success of a performance management system including the Balanced Scorecard. These are:

1. rigour in purpose;
2. rigour in measurement; and
3. rigour in application.

3.1 Rigour in purpose

Depending on the business objective, the metrics would vary in different industries. The metrics should be derived in alignment with company objectives and an emerging area for the four inter-linked perspectives of the Balanced Scorecard. The metrics should be clearly defined, validated and accepted by users during a pilot exercise.

3.2 Rigour in measurement

The success of established metrics will depend on the effectiveness of data collection and monitoring systems. This could vary from a manual process on a spreadsheet to a sophisticated ERP system.

3.3 Rigour in application

The value of a well-designed and monitored Balanced Scorecard will be lost if the data is not used to improve and sustain performance. A review process should be in place to review the metrics continuously and take action for performance improvement. Each measure should have a target both for the current year and the “best in classes” for the future.

In keeping with the above criteria of good practice of performance management there were both generic and specific drivers of adopting a customised Balanced Scorecard approach for the T5 project. No doubt the application of a Balanced Scorecard approach and key performance indicators (KPIs) to T5 were influenced by some traditional primary factors, such as:

- the KPIs give everyone a clear picture of what is important;
- the KPIs enable the project leadership team to view all projects at a glance in a consistent way; and
- the KPIs complement the measurement of financial performance.

However, the need of supplier partnerships and stakeholder management in line with the T5 Agreement and the complexity of rail, road, construction and systems requirements of the project also generated collaborative (Basu, 2001) secondary drivers of customising the Balanced Scorecard in the T5 performance management system. It aimed to address some key management questions:

- Do we have adequate measures to monitor interface arrangements with key stakeholders?
- Do the design solutions have the required technical and functional approvals?
- Have we agreed what to inspect and test and who will verify compliance?
- Have we benchmarked the quality standards?
- Are aiming to do it right first time?
- Is the work complete, reliable and maintainable at handover?

4. T5 performance management system

4.1 Key performance indicators and measures

The performance management system of T5 is underpinned by well thought out key performance indicators and measures. As shown in Figure 1, there are five key performance indicators (KPIs), ten key measures and 37 performance data.

The KPIs are selected as high-level quality indicators to steer the major project objectives and requirements, ensuring that stakeholders are identified, requirements and benchmarks agreed, inspections and tests are planned to get them right first time and work is complete. The KPIs, supported by linked key measures, provide overall snapshots to direct the project through enablers, monitoring progress or assuring results. The performance data are the metrics that are measured for each part of the project by team members, including suppliers, to monitor performance as a target or planned versus actual. The key measures are the chosen ten measures to report and publish regularly.

As shown in Table I, as an example of metrics for the manufacturing and assembly stage of the project, each KPI is linked to relevant key measures and each key measure is supported by a number of performance data.

4.2 Guidance notes

It is important to recognise that all metrics must be tried and tested with worked out examples and also validated by collecting trial data under different conditions before communicating to the project team. It was helpful to provide a guidance note for each metric which are then explained to team members in workshops to gain their understanding and acceptance. A similar process was followed for T5 performance metrics and a Quality KPI Workbook was prepared. The workbook contained description and definition of each indicator and measure supported by guidance notes and individual or team responsibilities. For example each key performance indicator and performance measure (also called Data Table Heading) was supported by guidance notes for data collection and reporting as shown in Table II for the KPI, "Verifications Planned & Work Supervised". An example of how a description is presented is shown in Table III.

In order to clearly assign responsibility and accountability for each KPI a simple RACI (responsible, accountable, consult and inform) format was used. Each team member or

Figure 1 T5 metrics triangle

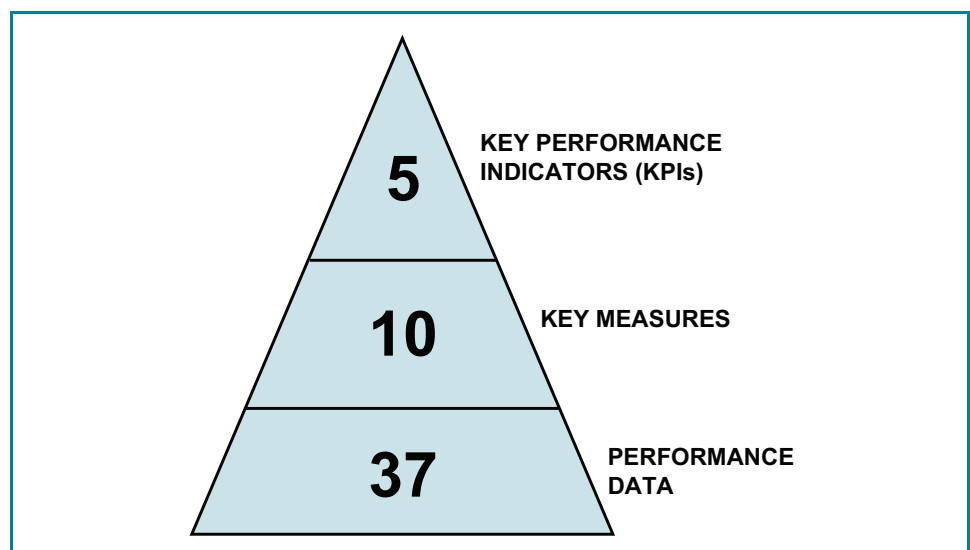


Table I The relationships between key performance indicators, key measures and performance data

<i>Key performance indicators</i>	<i>Objectives</i>	<i>Key performance measures</i>	<i>Number of performance measures</i>
1. Verifications planned and work supervised	Plan to get it right first time	1. Inspection and test plan agreed	6
2. Benchmarks agreed	Making quality standards visible and achievable	2. Supervisors RFT trained	
3. Inspected and protected	Keep work free from error and damage	3. Samples/benchmarks agreed	4
4. Compliance assured	Provide team assurance that the brief is met	4. Inspections meeting benchmarks and quality standards	2
5. Handover agreed and work complete	Ensure that assets are fully integrated and maintainable	5. Checks showing that work and assets are protected	
		6. Non-conformance resolution and cost (NCRs)	13
		7. Team certificates of compliance issued	
		8. Handovers accepted	12
		9. O&M manuals accepted	
		10. Maintenance work plans accepted	

Table II Guidance notes for the “Verifications Planned & Work Supervised” KPI

<i>Performance measures (data table heading)</i>	<i>Guidance notes</i>
Inspection & test plans scheduled	Enter the total number of plans required
Inspection & test plans due	Enter the cumulative number of plans due to date
Inspection & test plans agreed	Enter the cumulative number of plans agreed by team. Refer to CP4 and T5- XXX-QA-00002 for details
Supervisors mobilised	Enter the cumulative number of supervisors mobilised
Supervisors RFT trained	Enter the cumulative number of supervisors right-first-time-trained
Verifications planned & work supervised RAG status	R: ITP or Training >6 weeks late A: ITP or Training 0-6 weeks late G: ITP & Training Meeting Target for Work in Progress

Table III Description of a KPI

<i>Quality KPI</i>	<i>Description</i>
Verifications Planned & Work Supervised	<i>Objective:</i> Plan to get it right first time <i>Measures:</i> Inspection and test plans agreed prior to start of work. Supervisors have participated in right-first-time training

leader either as an individual or as a team was aware of the role as a sponsor (responsible), owner (accountable), contributor (consult) or participant (inform). Table IV shows an example of RACI for key performance indicators.

5. Performance monitoring and improvement

5.1 Embedding performance management in the T5 project

The roll out and implementation of the Balanced Scorecard based performance management for the T5 Project were enabled and enhanced by two major initiatives of the project:

Table IV RACI for KPIs

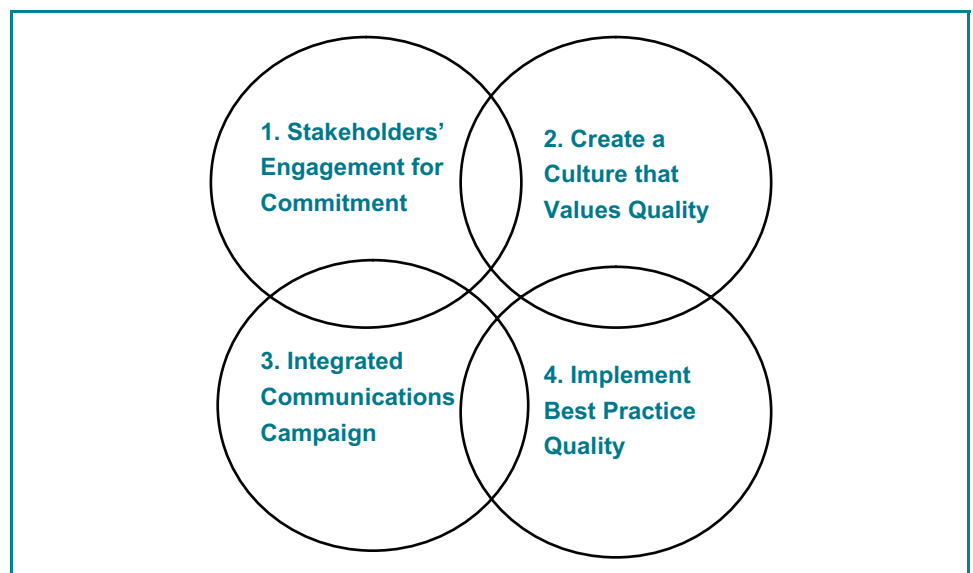
	<i>Verification planned and work supervised</i>	<i>Benchmarks agreed</i>	<i>Inspected and protected</i>	<i>Compliance assured</i>	<i>Handover agreed and work complete</i>
Responsible	Production leader				
Accountable	Project leader				
Consult	Design manager Technical manager Supplier				
Inform	Principal point of contact (PPOC) Programme office Quality leadership Group leaders				

1. the T5 Agreement; and
2. a four-tiered approach of quality culture.

The T5 Agreement was agreed between BAA and the major consultants and first tier contractors. Under the terms of this T5 Agreement, BAA took a single insurance policy to cover the multi-billion pound project. And because BAA had shouldered the risk, it expected the consultants and suppliers to work together. People from all stakeholders were encouraged to raise issues at the earliest opportunity. This helped the reporting and discussions on performance and non-conformance issues. “ When you align people’s objectives, stuff happens. The agreement has allowed us to work with our consultants and suppliers in a refreshing new way”, says Andrew Wolstenholme, T5 Project Director.

As shown in Figure 2, an inter-related four-tier approach (Millard, 2005) of embedding quality culture to project team members and suppliers was introduced in 2005.

This four-tier approach is an on going process and is primarily driven by focussed discussion groups and workshops. The stakeholder engagement and commitment process is supported by the project executive’s commitment to engage with project leadership and suppliers (principals) to introduce a right first time quality concept and get their buy-in and commitment. The culture and behaviour change process has been iterative, comprising

Figure 2 Four-tiered approach

regular workshops, briefing, awareness and feedback on quality KPIs and right first time behavioural change programme. This is further supported by the third-tier communication campaign, which includes quality logo branding, quality commitment workshops, quality booklets, quality walkabout, quality awards and posters. The fourth tier on quality best practice started with research and interviews with experts to establish best practices and align them with quality KPIs. This was followed by supervisor training and workshops to ensure understanding and ownership from supervisors.

5.2 Monitoring and Improvement

Each project team (such as airfield, baggage, rail, TTS, etc.) record, measure and monitor each performance measure, and on a monthly basis the ten key performance measures are reported as a Balanced Scorecard. Table V shows an example of a Balanced Scorecard.

The overall T5 results for Key Performance Measures are also presented graphically as the quality management profile shown in Figure 3.

The key performance measures provide a snapshot of the performance of each project team, which are also highlighted by RAG (red, amber, green) colour codes according to their status with regard to targets. However improvement projects are acted upon more by individual performance measures at the specific project level. The most significant contributors to improvement projects are non-conformance reports (NCRs). There are nine performance measures related to NCRs as part of one KPI, viz. compliance assured. These measures enable the quantification of a part of COPQ (cost of poor quality) given by estimated cost of NCRs. Root cause analyses by type of non-conformance and supplier lead to continuous improvement in design and processes and savings. Figure 4 shows an example of NCR report analysis.

Overall, *circa* 6,000 non-conformance reports were raised on T5 and the cumulative cost of non-conformance was only 0.6 per cent of the budget. Analysis of the data showed that 70 per cent of the total cost of non-conformance resulted from just 150 reports. A no-blame culture resulted in speedy and effective resolution of all issues.

6. Comparison with aspects of the Balanced Scorecard

As discussed in sections 3 and 4, key performance indicators and key measures of the T5 project were customised to meet the requirements of the T5 Agreement and the complexity of the project, spanning rail, road and air infrastructures. The key balancing principles of the four aspects (financial, customer, internal processes, and learning and growth) of Kaplan and Norton's Balanced Scorecard have been incorporated into the T5 KPIs as shown in Figure 5.

In Kaplan and Norton's Balanced Scorecard the enabling or leading indicators are provided by learning and growth. In the T5 Balanced Scorecard, the enabling indicators are "Benchmarks Agreed" (which also include some financial benchmarks) and "Verifications Planned & Work Supervised" (containing "Supervisor Training"). As regards the lagging or results indicators, "Handover Agreed & Work Complete" in T5 relates to the customer aspect of Kaplan and Norton, while the T5 KPIs "Inspected & Protected" and "Compliance Assured" relate to the internal process aspect of Kaplan and Norton.

On a closer analysis, not all the key measures as a group in each of T5 KPIs conform to specific aspect of Kaplan and Norton Balanced Scorecard as shown in Figure 5. For example "Total Estimated Cost of NCRs", which is a key measure of the KPI "Compliance Assured", also relates to the financial aspect. The matching of T5 metrics is more appropriate at the level of key measures as shown in Table VI.

It is arguable that there are some gaps in T5 key performance indicators and key measures related the financial and growth (innovation) aspects but the manufacturing and assembly stage KPIs would not be expected to address this.

Table V T5 Balanced Scorecard for December 2007

Project team	Inspection and test plan agreed	Supervisors RFT-trained	Samples/benchmarks agreed	Inspections meeting quality standards	Checks showing that work is protected	NCRs closed	Team certificates of compliance issued	Handover accepted	O&M manuals accepted	Maintenance integration work plans accepted
Airfield	100	100	100	98	98	97	100	100	84	100
Land campus	93	74	86	87	78	92	86	100	29	100
Completions	100	100	100	88	72	92	100	100	51	0
Baggage	100	100	100	76	100	83	67	100	84	100
Rail	100	100	100	100	100	100	100	100	100	100
TTS	98	100	100	73	71	62	100	0	0	0
Overall T5	99	99	99	87	86	92	99	100	66	100

Note: Figures shown are percentages

Figure 3 T5 quality management profile

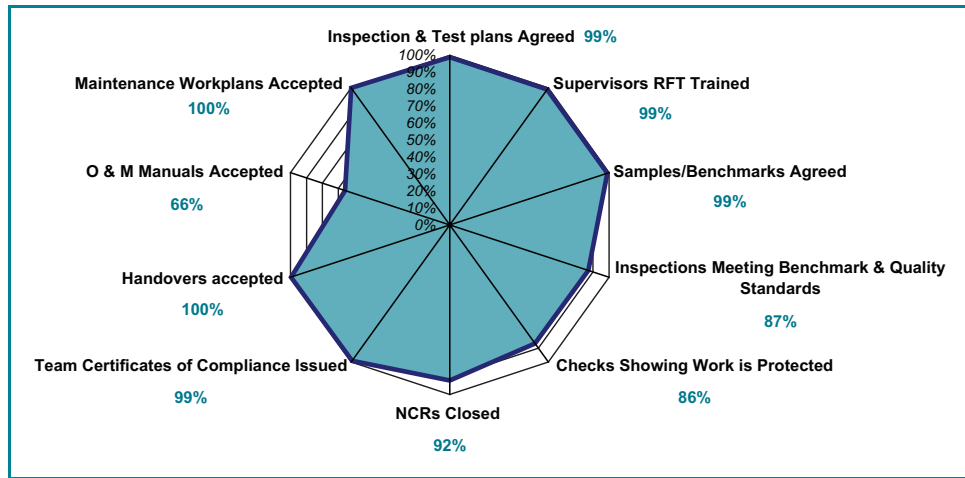
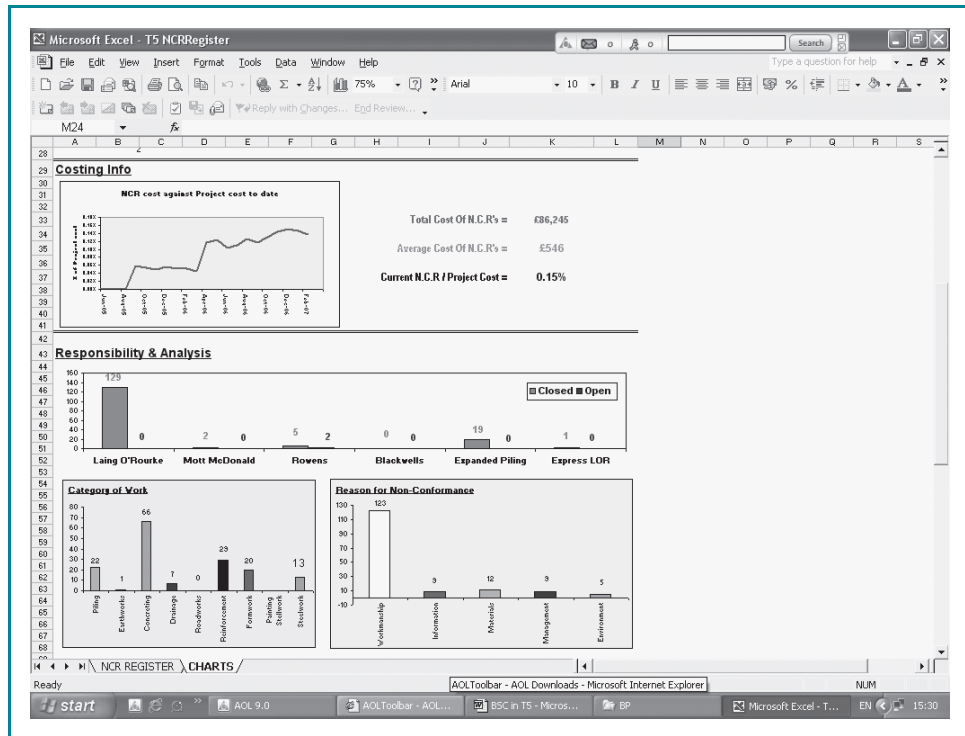


Figure 4 Sample NCR charts



7. Learning points

It is evident from the preceding analysis that the fundamental principles of the Balanced Scorecard have been gainfully adopted and customised to the performance management systems of T5 meeting the specific requirements of this complex major project. The best practices of project performance management arising from this case study include:

- encouraging supplier partnership and proactive involvement of contractors in monitoring and improving project quality and conformance to standards;

Figure 5 Aspects of the Balanced Scorecard

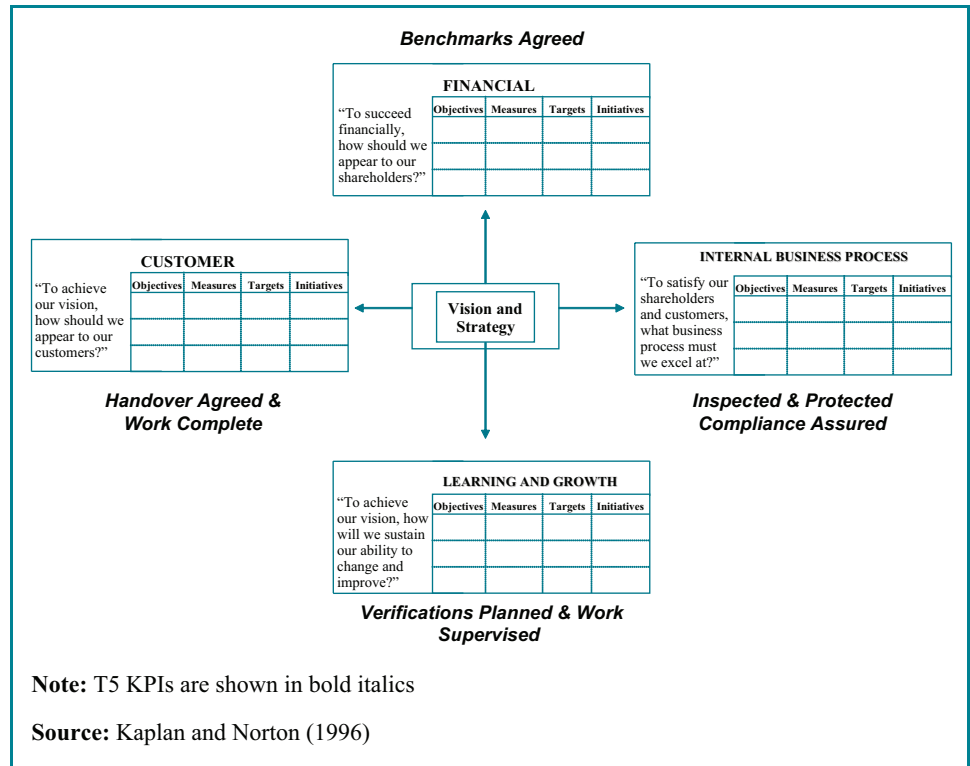


Table VI T5 key measures in the aspects of the Balanced Scorecard

<i>Kaplan and Norton's Balanced Scorecard aspects</i>	<i>T5 Balanced Scorecard examples of key measures</i>
Financial	Samples/benchmarks agreed
Customer	Total estimated cost of NCRs
	Handovers accepted RFT
	Outstanding work items closed
	O&M manuals accepted
Internal processes	Maintenance work plans accepted
	Inspections meeting benchmark & quality standards
	Checks showing that work is protected
	NCRs raised
	NCRs closed
Learning & growth	Team certificates of compliance issued
	Inspection & test plans agreed
	Supervisors RFT-trained

- providing indicators and measures in three main themes as enablers, monitoring progress and showing results along the project life cycle right up to the handover and completion of work;
- the metrics and processes are validated and then embedded by extensive discussions with stakeholders followed by documentation, communication campaign and training workshops; and
- the ongoing reporting of non-conformance reports (NCRs) supported by the estimation of cost of non-conformance and improvement projects based on root cause analysis is a strong point of the process and opens the opportunities for Six Sigma and innovation.

The application of the T5 Balanced Scorecard over a few years has also focused on areas of further refinement. These include:

- incorporate Six Sigma training and methodology in the project quality strategy and link them with NCR-related measures;
- explore and then extend a Balanced Scorecard approach and metrics to the design phase (including conceptual and preliminary engineering) of a major project (this is now in place for BAA major capital projects); and
- align the key performance indicators and measures to a formal self-assessment of EFQM (European Foundation of Quality Management) type excellence process.

In Kaplan and Norton's Balanced Scorecard the enabling or leading indicators are learning and growth. In the T5 Balanced Scorecard the enabling indicators are "Benchmarks Agreed" and "Verifications Planned & Work Supervised".

8. Summary and conclusions

This case study is an important first step in providing support towards measuring, improving quality standards in major projects. Initial research work (Basu, 2008) indicates that in spite of formal quality plans supported by PRINCE 2 and ISO 9000 many projects managed to "tick many boxes" but failed to deliver expected quality criteria. The performance management system of the T5 project, having learned from other major projects, has established a "best practice" of the application of a Balanced Scorecard approach in major projects by involving major stakeholders and contractors.

The metrics of the T5 Balanced Scorecard have been designed to reflect specific requirements of the project as enablers as well as showing results leading to continuous improvement. The experience of the project team indicates that NCR (non-conformance resolution) related data have been most effective in identifying the cost of poor quality, to improve design and processes by analysing root causes by task or supplier and also to attract the attention of the project board.

There are variations of performance metrics depending on variable quality requirements and expectations of stakeholders and therefore among many learning points two key pointers emerging from the T5 Balanced Scorecard are:

1. that metrics can be customised for major projects, showing the value of customising measures within the framework of Kaplan and Norton's Balanced Scorecard; and
2. that suppliers should be empowered to own the monitoring and improvement process using their performance data.

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About the authors

Ron Basu is currently a Visiting Executive Fellow at Henley Business School and also a Visiting Professor at ESC Lille. Previously he held functional and executive roles in Unilever and GlaxoSmithKline. Ron Basu is the corresponding author and can be contacted at: basurn@aol.com

Chris Little is BAA Capital Programmes Quality Assurance Leader. Previously he worked for Stanger Science and Environment (Tarmac Professional Services), providing advice on quality assurance for highway structures and building projects.

Chris Millard is a Programme Director for BAA. Previously he was BAA Technical Director, Head of Engineering for Terminal 5 and held senior programme and technical appointments in the automotive industry.

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