

# The application of “Value Engineering” tools to risk assess the outputs of an NSI

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## Abstract

The ONS was faced with the problem that there was no basis to determine the relative strengths or weaknesses of the full range of statistical outputs which it produced. To remedy this situation, the continuous improvement team borrowed a measurement tool from “Value Engineering” to enable a structured self-assessment of all ONS outputs.

By applying the approach, the ONS was able to produce a broad picture of where the highest risks were in ONS statistical systems by allocating a Red/Amber/Green status to each statistical system/output. By applying a simple scoring mechanism, outputs were ranked for each of the seven dimensions measured (Data sources, Methods, Processes, Systems, European Quality dimensions, User feedback/Reputational risk, and People).

The risk assessment provides:

- a broad picture of where the highest risks to outputs are to assist in prioritising / directing resources for improvements
- a basis for the prioritisation of quality and methods reviews
- a top down approach to planning/bidding for any future systematic programme of improvements
- a strategic approach to identifying process improvement initiatives

Having carried out the risk assessment in November 2012, the exercise has been repeated annually, providing an opportunity to reassess priorities and identify progress made.

**Keywords:** Continuous Improvement; Value Engineering, Key performance indicators.

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## 1. Background

The Office for National Statistics (ONS) uses a number of methods for assessing the quality of statistical outputs. Further analysis is carried out on specific outputs where issues are identified which need to be addressed. Risk assessment tools are also in place, but risk was not traditionally considered consistently for all statistical outputs.

The senior management team at the ONS wanted to create a model which would address, in a consistent way, the risks associated with the outputs which the ONS produces. The structured risk assessment would be carried out for the following reasons:

- The ONS needs to have a broad picture of where the highest risks are in terms of its outputs to assist in prioritising / directing resources for improvements in methods, processes and systems
- To inform the prioritisation of quality and methods reviews
- To provide a top down approach to planning/bidding for any future systematic programme of improvements
- To provide a strategic approach to identifying process improvement initiatives.

Work commenced in August 2012 to create the model and to analyse the results.

## 2. The model

The requirements of the model were that it should provide an overall score for the risk associated with each output, assessment should be made against a number of dimensions and the reasons for the score should also be provided.

Following consultation with Divisional Directors, and through refinement since introducing the model in 2012, the current list of dimensions is as follows:

- Quality of data sources (administrative and survey data)
- Methods (robustness/appropriateness)
- Systems (robustness and functionality)
- Processes (efficiency of data acquisition, results processing and analysis)
- Quality (EU dimensions: relevance, accuracy, timeliness & punctuality, accessibility & clarity, comparability & coherence)
- User feedback (the extent to which the outputs provided support the decision making process)
- Reputation (includes the degree of challenge or media coverage)
- People (sufficient skilled and trained resource working on the output)

Each of the dimensions is further split into sub-elements, each to be assessed and scored to allow a drill down capability from a high level score.

The Continuous Improvement Zone (CIZ) was asked to develop the required model, arrange for the data to be collected and to analyse the results. This team has the responsibility for developing the Continuous Improvement (CI) capability of ONS and has experience of a number of CI methods. One of the team members, a Lean Six Sigma black belt, had experience of using a model derived from Value Engineering in industry. Value Engineering can be defined as “a systematic method to improve the ‘value’ of goods or products and services by using an examination of function” [1].

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[1] SAVE International Value Standard, 2015 edition

In industry, such a model would look to identify how a function could be optimised to reduce cost but still provide the required “value” to the customer. The model, adapted for our purposes, provides a systematic assessment of risk, allowing results to be analysed to identify how the risk could be mitigated.

To deliver simplicity in the model, red, amber and green statuses were defined and scores were allocated (Table 1). The selected weightings were based on those commonly used in Quality Function Deployment, a lean six sigma tool for design.

**Table 1 – Definitions and ratings**

Status	Definition	Score
Red	In need of attention	9
Amber	Some improvements possible	3
Green	No issues or not applicable to the output	0

The model also had to cope with the situation that some of the sub-elements would not apply to all outputs e.g. an output may use survey data, administrative data and census data to compile results. In many outputs, only one sub-element was applicable. In order that outputs could be compared equitably, the model took the highest scoring sub-element as the summary score for that dimension. Each of the dimensions could then be summed to provide a composite score for the output. Details of the sub-elements of each of the dimensions are set out in the Appendix.

Recognising that some outputs are more important than others to users, an additional weighting was applied to the composite score. The weighting reflects the relative importance of the output to users and the impact to ONS reputation if results were erroneous (1 – low; 2 – medium; 3 – high). The application of the weighting resulted in a weighted composite score.

### **3. Data collection process**

The first task was to determine a list of all statistical outputs. A statistical output is defined as those for which a statistical release exists, as listed annually by the UK Statistics Authority for ONS, under the terms of the Statistics and Registration Services Act 2007. The entire GSBPM was considered in terms of sources/methods/systems and processes used to produce the outputs.

Having agreed the list of outputs with Divisional Directors, facilitated workshops were held for a sub-set of the outputs to ensure that the template could be understood. After fine tuning the content, blank templates were provided to Divisional Directors to be completed, with instructions that the assessment should be completed by the statistician responsible for the published output. The statisticians were asked to populate the template and provide reasons for the red or amber assessment to justify their assessment. Once the template had been completed for all dimensions, the Divisional Director was then asked to check the data for their division for reasonableness and to allocate the importance weighting for each output.

The completed results for the whole of the office were shared with data collection, methodology and systems support areas to challenge anything they felt appeared incorrect. Once any differences were agreed, the full results were analysed. The first set of results was collected during November 2012.

#### 4. Analysis and presentation of results

Once the data had been collected and validated, analysis was carried out to identify the risk profile of each statistical output. Data was sorted in descending order of weighted composite scores to identify the highest risk outputs. A simple percentage count of the red, amber and green scores in all dimensions provided a useful overview of risk (Table 2).

**Table 2 – Overall percentage scores**

	2012	2013	2014	2015*
<b>% red overall</b>	21.4%	18.7%	17.0%	15.6%
<b>% amber overall</b>	46.6%	48.1%	51.9%	45.8%
<b>% green overall</b>	32.0%	33.2%	31.1%	38.6%

\* Change in methodology to increase number of dimensions from 7 to 8; Results show a similar picture to 2014 on adjusted series.

The ONS repeats the data collection exercise every year in November, providing the opportunity to identify the change in the risk profile as a result of improvements introduced between evaluations. Boxplots were used to show the distribution of weighted composite scores in each division, allowing comparisons to be drawn between divisions and also comparisons between years. Figure 3 shows the distribution of scores for the divisions of the National Accounts and Economic Statistics (NAES) directorate in the ONS in November 2015. This can assist the director in deciding which division should be the main focus for improvement initiatives.

**Figure 3**

### Box plots – NAES divisions in 2015

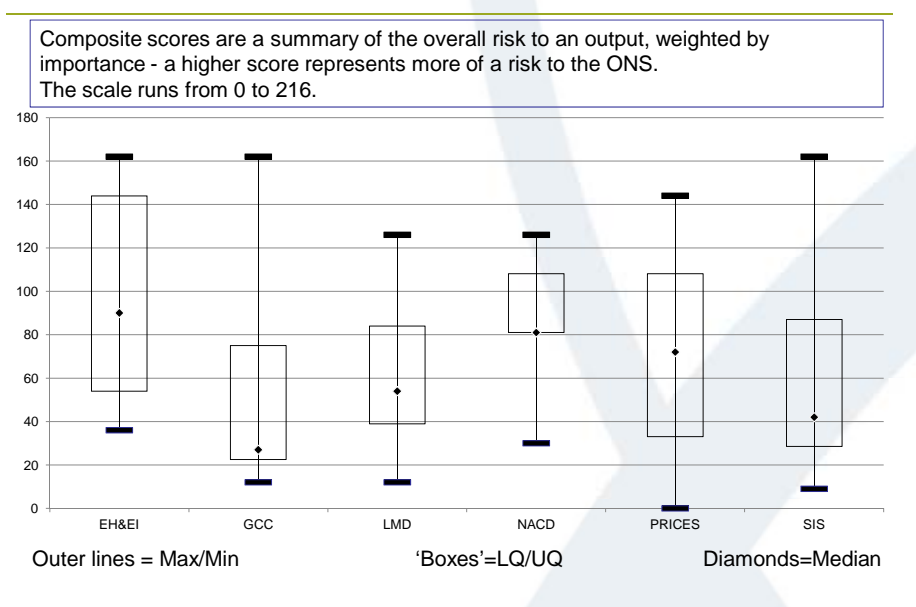
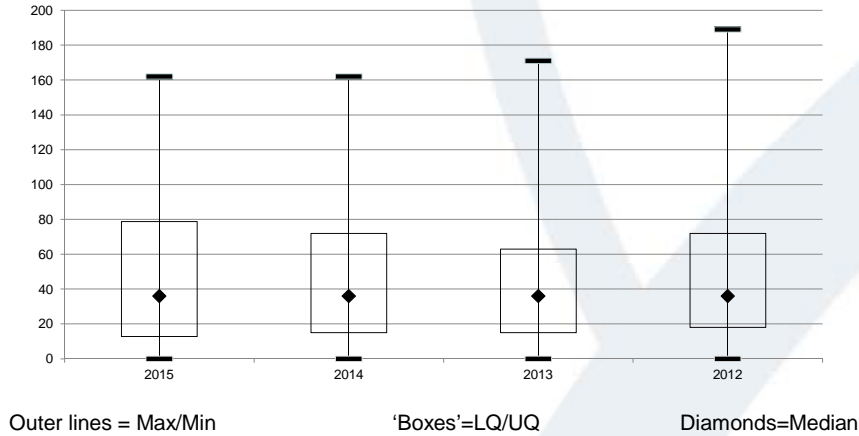


Figure 4 demonstrates the value of building a time series of results. Although the median score remains fairly constant over the four years, good progress has been made on the higher scoring outputs since 2012 and the lower value of the interquartile range continues to drop. The area of concern is the increasing upper interquartile range value since 2013 which will be closely monitored.

**Figure 4**

## Box plots of composite scores

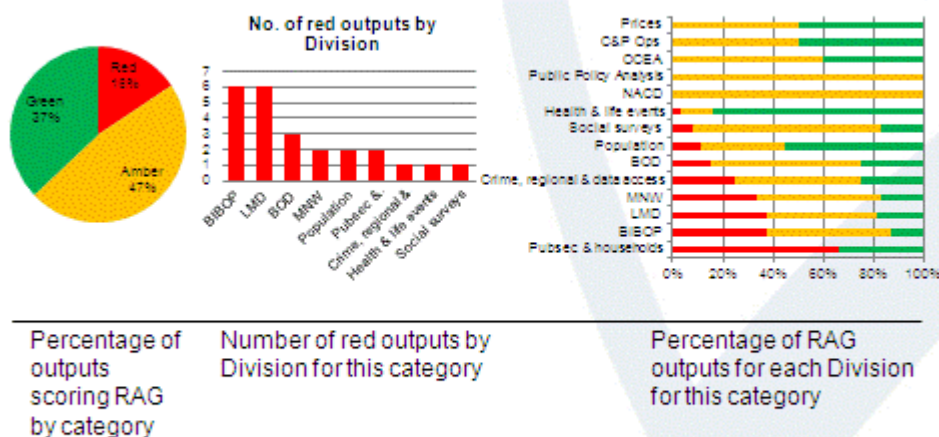
Composite scores are a summary of the overall risk to an output, weighted by importance - a higher score represents more of a risk to the ONS. The scale runs from 0 to 216.



Further analysis was carried out for each of the dimensions assessed, showing the relative risk exposure of the 14 divisions that produce outputs in the ONS. This analysis was completed for the whole office, but also for each directorate, allowing further drill down on areas of concern. Comparisons could also be made between subsequent years of assessment for each of the dimensions for each division. Figure 5 shows the analysis for the Processes dimension for the whole office.

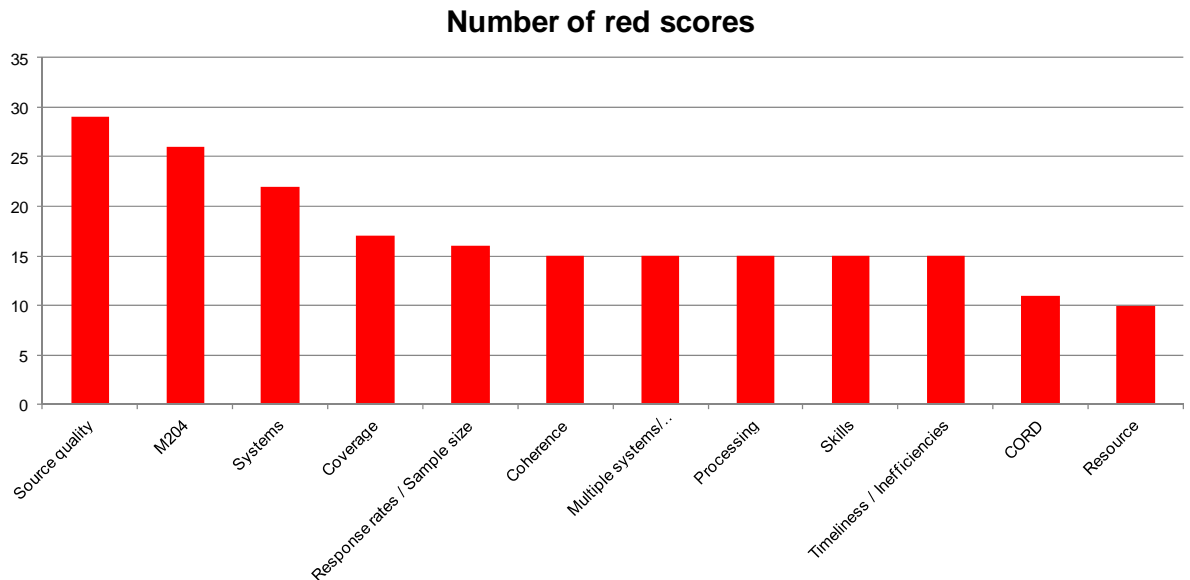
**Figure 5**

## Findings by Dimensions - Processes



Cross-cutting themes, common to a number of outputs, can also be determined to provide the opportunity to tackle improvements which would impact a number of statistical outputs. (figure 6)

**Figure 6**



Note: M204 and CORD are specific databases/systems used in ONS

The cross-cutting themes were taken from the commentary provided to explain the reason that outputs scored red for a particular element within each of the dimensions. By grouping key words together, common cross-cutting themes were established.

## 5. How the tool is being used

The tool and the resulting analysis have delivered to the objectives of the brief. The output allows a high level view of the risk exposure of our statistical outputs and a drill down capability exists to understand the reasons for the risk exposure.

The overall percentage of “red” scores was adopted as a Key Performance Indicator for the office. The analysis is also used to prioritise the outputs selected for National Statistics Quality Reviews, (a structured assessment of the quality of a National Statistical output in the UK), and the information from the analysis is used for:

- Prioritisation of National Statistics Quality Reviews
- Input to survey action plans - identifying and prioritising key improvements required
- Identifying local continuous improvement initiatives
- Prioritising developments and influencing budget allocations (current & planned)
- Deploying our skilled people to reduce risks in key areas
- Improving communications on outputs, highlighting where we need careful stakeholder handling

The tool will continue to be used to assess the risk of ONS outputs on an annual basis and will form an integral part of our risk management strategies.

## **6. Lessons learned**

Self assessment can be subjective but we do what we can to minimise this through senior staff sense checking outputs in their own division and through other business areas challenging the self-assessed scores. It is likely that the scores could be sensitive to staff changes. The ONS has had a high degree of staff movement, due to a large development agenda, and risk averse staff are likely to score higher in areas less familiar to them. With robust challenge in place, this can be mitigated.

The tool needs to be used alongside other measures of risk and quality but is a good broad assessment of risk on a consistent basis across the output portfolio, supporting the selection of appropriate process improvement initiatives.

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### **References**

1. SAVE international Value Standard, 2015 edition. [http://www.value-emg.org/pdf\\_docs/monographs/vmstd.pdf](http://www.value-emg.org/pdf_docs/monographs/vmstd.pdf)

## Appendix - Dimensions and definitions

SOURCES	Census data	Admin data	Survey data		
	Is any census data you use of sufficient quality to deliver high quality statistics, analysis and advice?	Is any census data you use of sufficient quality to deliver high quality statistics, analysis and advice?	Is any census data you use of sufficient quality to deliver high quality statistics, analysis and advice?		
METHODS	Data Acquisition/ Questionnaire design	Coverage of data (inc. Sample design & estimation)	Processing, Edit & Imputation	Analysis	Disclosure
	Is the data collection instrument fit for purpose; collecting only the data items required and providing sufficient instructions to obtain the correct data? Are admin data clearly defined and is ongoing supply of data secured?	Does the sampling frame and sample design allow sufficient coverage of required population? Are design and calibration weights effective? Does the admin data provide sufficient coverage and will this be stable over time?	Are data editing, validation, imputation and outliering methods effective? Processing also includes classification and coding, deflation, seasonal adjustment, calculation of weights and modelling.	Are analysis methods employed meeting user needs? (This includes time series, small area, index numbers and demographics)	Are disclosure control methods appropriate given the needs of the user?
SYSTEMS	Name of system	Reason for rating			
	<p>Please enter a rating for any ONS system which is in need of improvement in terms of:</p> <ul style="list-style-type: none"> <li>- functionality not meeting business need</li> <li>- performance/stability</li> <li>- Longer term sustainability of the systems</li> </ul> <p>Enter the name of the system and the reason for the required improvement in the comments section. Include data collection, results processing and publication systems. Also include "spreadsheets" if used, as a system.</p>				
PROCESSES	Data Collection & preparation Processes	Results & Analysis Processes			
	Assessment of all processes in support of data acquisition, validation and editing to the point that received data is clean, ready for results to be run.	Assessment of all processes which create results from the collected data and support subsequent analysis. This will include modelling.			



<b>QUALITY</b>	<b>Relevance</b>	<b>Accuracy</b>	<b>Timeliness &amp; Punctuality</b>	<b>Accessibility &amp; Clarity</b>	<b>Comparability &amp; Coherence</b>
	To produce relevant outputs with up to date metadata. The degree to which the statistical product meets user needs for both coverage and content.	The closeness between estimated results and the (unknown) true value.	Timeliness is the length of time between the actual event and the publication of results. Punctuality is the time lag between the release of data and the target for publication.	The ease with which users can access the data (including accessibility using website); format in which data is available and supporting information. Clarity - quality and sufficiency of the metadata, illustrations and accompanying advice.	Comparability - Where statistical outputs refer to the same data items so that they can be combined to make comparisons over time, or across regions, or across other domains Coherence - The degree to which data that are derived from different sources or methods, but which refer to the same phenomenon are similar.
<b>USERS &amp; REPUTATION</b>	<b>User Feedback</b>	<b>Future user needs</b>	<b>Reputation</b>		
	Assessment of the extent to which the output meets the user need, based on information received from end users of the output. (Evidenced from user survey, user group meetings, or assessments)	Assessment of the extent to which the output is capable of meeting future legislative/other unavoidable changes which will require process and systems amendments to meet user needs.	Risk of negative or adverse media or other public commentary regarding the output, impacting ONS reputation		
<b>PEOPLE</b>	<b>Resource</b>	<b>Skills</b>			
	Are there sufficient numbers of staff working on the output? Consider the whole process from collection through to publication.	Do staff have the necessary skills and capabilities to deliver high quality statistics, analysis and advice? Are they curious? Are there any staff who would leave a skills gap if they left?			