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Topic (ii): Managing and supporting changes relating to editing and imputation

**MANAGING AND SUPPORTING CHANGES RELATED TO EDITING AND
IMPUTATION IN THE UNITED KINGDOM**

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1. Introduction

1.1 This paper describes how the Business Data Division (BDD) in the Office for National Statistics (ONS) UK has evolved in terms of its data collection and validation structure, to continually meet the challenges of decreasing budgets and financial pressures. It outlines efficiency initiatives such as reviewing editing and response chasing processes, organisational structures and re-engineering programmes. It highlights lessons learnt and includes points of discussion with other NSIs on new initiatives or progress to develop further editing strategies to realise financial benefits.

1.2 The Business Data Division is responsible for the collection and validation of unit level data, from businesses across the UK, for approximately 80 annual, quarterly and monthly business surveys. Over 1.7 million survey questionnaires are despatched to approximately 318,000 businesses each year covering a wide range of surveys, including the Annual Business Inquiry, Producer Price Indices, New Earnings Survey, Monthly Inquiries into the Services, Distribution and Production Sectors and a range of financial, international and innovation inquiries.

The business survey data collected by BDD feeds into the production of the key economic indicators, produced by ONS, used for economic policy making by the UK Government. They are also used by a wide range of users including academics, industry and the public. The data collected by BDD also enables ONS to meet a wide range of EU Regulations.

1.3 The Business Data Division has pursued a programme of change spanning a number of years, realising considerable benefits and savings, but continues to face pressures of further financial constraints. The paper outlines four of the key changes that have taken the Division to its current structure. An organisation diagram of BDD is included at **Annex A**.

2. Key Stage One – Split of Data Validation and Results, Analysis and Publication functions

2.1 1994 saw the creation of the Data Validation Branches (DVBs) and the Results Analysis and Publication (RAP) Division, segregating the functions of micro and macro editing of data. This was the first step towards implementing changes relating to editing and imputation and provided a clear demarcation of responsibilities. (Prior to this, business surveys were conducted as an independent process with the same staff working on the survey from the sample selection to publication of results.)

2.2 This was a move from a vertical structure to a more horizontal approach and the first step towards a functional operation that removed many peaks and troughs. The main driver for this was efficiencies and the programme realised considerable savings as well as quality improvements. This was achieved by process mapping the main business surveys, establishing clear boundaries between the two activities and negotiating Service Level Agreements. The RAP Division subsequently became the immediate customer of the DVBs.

2.3 This was probably the biggest re-engineering programme that transpired in ONS and resulted in a structure that is still in place today. The biggest challenges to manage this change initially were deciding on RAP staff and editing staff, composition of teams, training, re-educating the new RAP staff to edit data at macro level not micro level and ensuring a non elitist culture in that RAP staff were deemed as 'more skilled' than editing staff.

3. Key Stage two – the creation of Business Data Division

3.1 By the end of 1998, the DVBs had been operational for over four years and a further review brought all areas involved in data collection for business surveys under one operational area and a single management command; the Business Data Division (BDD) was created.

3.2 Once again, managing this change took careful planning and effective communication. Each team were to have a mix of monthly, quarterly and annual surveys and where possible would cover the same sectors on all three. It was important that each team member had expertise of at least one of the surveys to share knowledge and gradually build the knowledge of others on the team. Initially, staff had a high allocation of work for their known survey and a smaller allocation of the other surveys, gradually increasing over time. As the structure meant that staff were now working on multiple surveys, new staff were finding it difficult to absorb information. This feedback was the pre-cursor to the creation and implementation of a centralised training team in BDD, which is still in place today.

3.3 The creation of BDD, having the collection of business surveys in one area, made introducing change easier and provided increased flexibility to reallocate resources. It enabled coherent common strategies, and facilitated concentrated effort on the process of collecting and editing data away from results processes. It provided opportunities to review

and streamline processes, the organisation of work as well as exploring the use of statistical methods to automate parts of the data processes.

3.4 In 2001, ONS developed a methodology for selective (or significance) editing to identify validation failures for data expected to make a difference to results. (*Lawrence and McKenzie (2000)*). The methodology developed was: for each case which failed validation, a score was computed to reflect the importance of editing the data, taking the value from the previous period, the returned value, and weighting, as in the estimation procedure. This was in conjunction with traditional micro-editing rules following ideas developed by Hedlin (2001, 2003). The success of this selective editing on the Monthly Distribution of Services Survey resulted in extending selective editing to other surveys. When first introduced, the selective editing only applied to returns which were batch processed; data provided over the telephone did not pass through the selective editing process.

4. Key Stage three – The introduction of Respondent Relations branch and the split into 3 editing branches in BDD.

4.1 Selective editing was applied to 3 of the short periodicity surveys; the data was processed using the same systems and used a standardised editing strategy

4.2 Because of several challenges to meet continuing monetary constraints, ONS reduced survey outputs which led to a reduction in BDD staffing levels. This compelled us to explore the function based approach further within the boundaries of BDD. Having viewed other organisations with large processing systems, it was evident that further efficiencies could be achieved by having distinct functions.

4.3 In 2007 ONS invested in a new telephony system underpinning another reorganisation of BDD to increase efficiency. The Respondent Relations (RR) branch was created to handle response chasing calls, separating the activity from data editing.

4.4 In 2008, a decision was made to split the short term surveys from the annual surveys. After some years of staff processing surveys of differing periodicities, it was evident there was a tendency to focus on the monthly surveys to the detriment of the annual surveys; feedback from customers substantiated this. The introduction of the first rules of selective editing on all short term surveys and the creation of RR were also pre-cursors to the creation of three separate editing units: a Short Term unit, an Annual unit and a Financial Survey unit.

4.5 It was also agreed that RR staff would be on the ‘front line’ to take incoming calls for the more pressurised monthly surveys, allowing the monthly survey editing staff to concentrate on error clearance without the unscheduled distraction of calls from respondents. The transition of surveys to RR was staggered over a number of months to assess resources and to ensure no detrimental impact on key economic outputs.

5. How we managed this change

5.1 Eighteen BDD staff, mainly at administrative level, attended a Business Simulation Project at ONS Southport site to gain an insight into how they had moved towards a more process based approach. These staff returned enthused by the application of lean principles to implement change and put together a business case to source lean training and facilitator training. They became the driving force behind the creation of a Respondent Relations Team and innovative thinking.

5.2 In developing RR, volunteers were sought at administrative level and line manager level to conduct a Proof of Concept for one monthly survey, with clear aims: To evaluate whether the separation of working practices would work in practice and have the potential to produce benefits.

5.3 The new telephony system aided the evaluation of the pilot in that we now had a suite of management information that showed the number of incoming and outgoing calls, the timing and type of calls, enabling a clearer indication of resource requirements. The customers also reported improved data quality, seeing a reduction in data queries. It was evident that putting concentrated efforts into editing and taking away the distraction of response chasing and incoming calls, improved quality.

6. Key Stage three – new selective editing approach and its impact on the structure

6.1 In 2010, ONS embarked on a stream of work based on the Australian Bureau of Statistics editing model, focusing the editing process on meeting customer needs for data quality. The first was a SAS programme known as Snowdon, developed by ONS Methodology Directorate and enhanced with assistance from Southampton University (*Silva et al 2008*).

6.2 The second followed a visit by Eden Brinkley and Lynn Bismire of the Australian Bureau of Statistics (ABS) in 2007. The ABS rules differed from the ‘old’ editing rules; the ‘new’ approach was for all businesses to pass through selective editing where the ‘old’ rules involved a sequence of auto editing, editing rules and finally the selective editing score calculations.

6.3 By early 2012, the new selective editing rules applied to several short term surveys. This brought about another fundamental change and carried with it some scepticism. The key difference between the ‘old’ and the ‘new’ selective editing was that the entire questionnaire failed rather than certain variables (Hooper and Lewis, 2010) (Silva, 2009).

6.4 For BDD staff it meant they were no longer signposted to the data variable that was causing the error, hence training was essential. For the customers’ perspective, they had concerns about discontinuities. Communication and allaying staff concerns were vital to enable implementation and realise benefits. Regular workshops were held with all staff to explain the methodological approach and the benefits of selective editing. For the administrative staff, it had to be in layman’s terms with explanations of what this would mean to them in processing the data. The staff were also concerned about job losses but BDD’s

high attrition rate, due to movement of staff within other areas of the organisation, meant that this would not be an issue. For RAP customers it was about explaining that more checking did not mean better quality and providing reassurance that there would be no impact on quality of outputs.

6.5 This new initiative also meant that selective editing would no longer just apply to batch take on processes but was expanded to data taken on manually over the telephone, resulting in further efficiencies, particularly in the Short Term Survey Unit.

6.6 The staff reductions in this unit highlighted some concerns further down the line and issues were identified, such as: staff feeling under pressure, conflicting customer demands and increasing historic errors because of time constraints. At the same time, although RR had been successful in achieving response targets and implementing improved response chasing strategies (applying the principles of selective editing to response chasing using a weighted approach which resulted in less calls being made to achieve response targets), they also experienced a high turnover of staff and increased workload. It was also more difficult to define the boundaries between the RR teams and the editing units as RR staff were now taking data over the telephone which was not within their original remit. RR had become a success story in terms of achieving response targets more efficiently but they had also taken on responsibility for handling incoming calls for the majority of ONS business surveys with no additional resource.

6.7 In August 2012, RR began piloting a new response chasing strategy using the principles of selective editing and a colour coded approach. This has now become the standard approach for the Monthly Business Survey. The targeted response chasing is broken down into Supply Use Table (SUT) types of industries and four key areas and colours: red - intensive response chasing; orange - response chase if necessary, depending on the effectiveness of response; yellow - optional response chasing if red and orange have not achieved targets; green - no response chasing required. This approach reduced the volume of response chasing calls by approximately 50% with no impact on targets or quality. This strategy could potentially be applied to other surveys with the aim to reduce calls and realise additional savings as a result of extending the principles of selective editing to response chasing.

7. Key Stage five– Data Flow Project

7.1 During 2012, a strategic review of two monthly surveys (Monthly Construction and Producer Prices) was commissioned to understand the data flow in BDD and identify where improvements could be made in terms of quality, efficiencies and delivery. Although the review followed the data flow of only two surveys, it was evident there was value in reviewing some BDD areas individually. In particular, the interrelationship between RR and

Editing Units where additional processes were being carried out to move data through the flow, which often caused time delays and bottlenecks.

7.2 The existing BDD workflow process for surveys had not been reviewed since its implementation. The findings from the Data flow project, the implementation of 'Eden' (the new selective editing approach following the collaboration with Eden Brinkley from ABS) and the problems RR and the short term survey unit were experiencing, indicated that it was time to conduct a review of the interaction between the editing and RR units. The pre-requisite of the project was not to deliver efficiencies but was more focused on addressing the problems in RR and the Short Term Survey validation unit with the aim of improving quality and delivery to customers.

8. How we managed this change

8.1 The Senior Management Team at ONS endorsed the use of Lean Six Sigma as a preferred method to process improvements. A Continuous Improvement Zone was created in 2012 to develop a capability to allow the Office to apply a structured approach to process improvement, improve quality and demonstrate value for money. A number of staff achieved certified Lean Six Sigma accreditations, namely Yellow and Green Belt and all staff attended White Belt training, the aim being to establish and embed a lean philosophy to create a lean culture within BDD.

8.2 The expansion of the Data Flow Project became a 'Green Belt' Project using Lean tools. This approach allowed staff to feel engaged in the process and to have input to solutions.

The key findings from the project were that:

- Some survey calls routed to RR were resulting in failure demand; due to their complexity and the irregularity of the survey, there was no first time resolution e.g. annual and financial survey. For these surveys, no data was taken over the telephone.
- RR were taking data over the telephone for the short term surveys which was now going through selective editing. However, the data that failed was being picked up by the editing staff at a later date resulting in delays, re-contact and a build up of historic errors.
- Resource reduction in the short term survey unit following selective editing savings resulted in them being on a constant treadmill, under pressure and often having to juggle resources to meet diverse customer demands.

The following solutions were implemented and are currently being evaluated:

- Incoming calls for the more complex surveys were re-routed directly to the areas of expertise
- Two units (RR and editing) were merged into one for the short term surveys, enabling maximisation of resources.

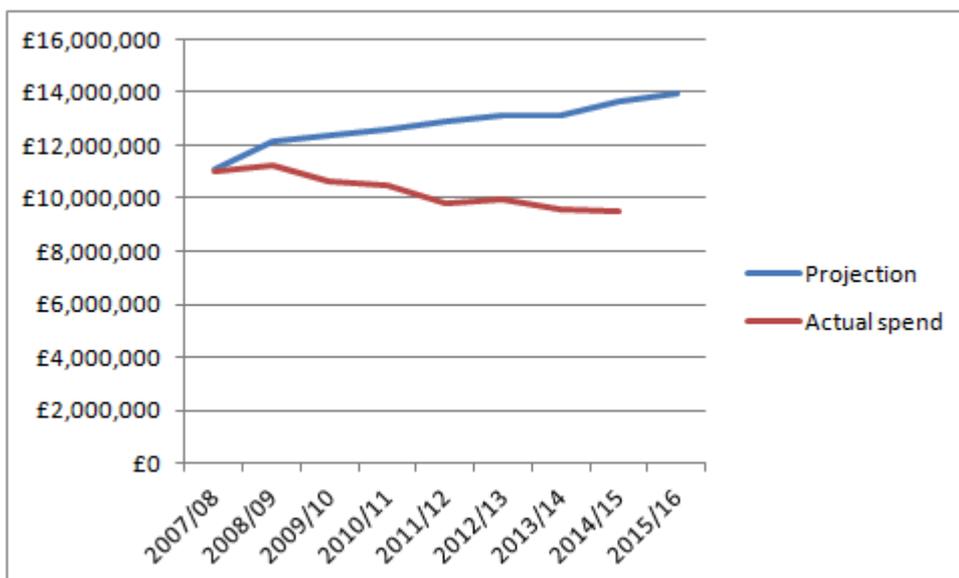
- RR staff were upskilled to take data over the telephone for the short term surveys which have minimum variables and were given a small allocation of industries to build and maintain knowledge.
- RR staff continued to response chase for all business surveys.

8.3 The benefits to date are:

- Increased variation of work for ex RR staff; ability to validate at source and answer queries relating to questionnaires
- Historic errors are decreasing
- There is more flexibility to utilise resource effectively.

9 BDD savings achieved since 2007

9.1 The graph below highlights savings that BDD has made over an 8 year period. If we hadn't successfully implemented a series of cost cutting measures we estimate that the cost of funding BDD would have been over £13.6M in 2014/15 - £4M in excess of our actual budget allocation of £9.6M.



9.2 In summary, how we achieved these savings can be broken down into 4 broad categories:

- Creation of a Respondent Relations team in early 2007. There was significant investment in a new telephony system to facilitate this change, but we estimate that after full implementation the savings to BDD were around £1m per annum;
- By dividing Editing and Validation activities into Annual and Monthly Units. This initiative has continued to reap benefits over time, with initial savings supplemented by further savings associated with process refinement as staff have adjusted to a new way of

working. We estimate that the savings associated with this initiative are around £1.5m per annum;

- Corporate validation initiatives such as ‘Eden’ and Selective Editing. These initiatives came after many resource savings had already been implemented - thus limiting the scope of their impact. We estimate that the savings associated with implementation to be around £200k per annum.
- Adoption of LEAN procedures/process reviews. BDD staff have used a variety of LEAN tools to rationalise activity in their business areas e.g. Rapid improvement sessions, process mapping etc. We estimate that the savings associated with this are in the region of £600k per annum.

10. Conclusion

10.1 This paper outlined how we have met the challenges of economic pressures and how we have handled change when new initiatives have been introduced such as splitting functions (micro and macro editing, response chasing and editing) together with the introduction of selective editing. We have understood that when organisational strategies change, structures, roles and functions should be re-aligned with the changes that have been introduced - importantly structuring for effectiveness and efficiency.

10.2 There were common themes associated with these large scale changes and we have learnt some key lessons:

1. Be very careful when separating functions – a functional culture can turn elitist and this was very evident in the first programme of change segregating the micro and macro editing functions. This also had to be managed carefully when creating the Respondent Relations branch.
2. Strong communications between the different functional areas is vital – implement regular communication events such as ‘Pause and Review’ meetings, job shadowing and secondments. These promote a coherent understanding of each areas role and help address any concerns promptly.
3. Agreeing boundaries between areas, at the outset, for clarity of roles and responsibilities.
4. Take a staged approach and regularly evaluate.
5. Take care not to take it too far e.g. the Respondent Relations taking incoming calls for all surveys where they became ‘Jack of all trades, master of none’ resulting in the introduction of additional processes between the distinct areas.
6. Involve staff in the change through focus groups and work streams – ensure they understand the reasons for change – change will bring about uneasiness and scepticism.
7. Select good leaders who believe in the new structure and will enthuse others.

10.3 We are continually striving to have a divisional structure that increases efficiency and gives us more flexibility to respond to future changes and challenges and would be interested

to hear how other NSIs have organised their processes. Some specific points of interest to us are listed below:

- What is your selective editing review process? What is your approach? How frequent? What have other NSIs found?
- Do you use selective editing on those businesses surveys that are using administrative data to supplement samples or for quality purposes?
- On what surveys do you implement selective editing? Any financial surveys such as International Trade in Services (ITIS)?
- Structures – have resources been cut back too much due to selective editing? What have you learnt from structure changes?
- ONS is working towards online data collection and as part of that process is looking to implement validation at source i.e. as the respondent enters their data online and before submission. Do you implement any validation on online data collection? How effective is it? Did it bring about any efficiencies? If it did not, was that because significant savings had already been made with selective editing?

ANNEX A

Organisation Chart of Business Data Division in ONS

