WILLIAMS LEA
corporate information solutions

Calculating cost savings in the procurement of printed goods and services – Guidance and good practice

PUBLICLY AVAILABLE SPECIFICATION

PAS 1001:2012

BSi

Publishing and copyright information

ISBN 978 0 580 73291 1

ICS 03.100.10; 37.100.99

Publication history

First edition 2012

List of Figures

List of Tables

This Publicly Available Specification (PAS) has been prepared by the British Standards Institution (BSI) in partnership with Williams Lea.

In addition, acknowledgement is given to the following organizations that have been involved in the development of this guidance document:

- BPIF (British Printing Industries Federation);
- CIPS (Chartered Institute of Purchasing and Supply);
- Horizon Associates;
- ISRU (Industrial Statistics Research Unit, Newcastle University);
- Lead technical author: Janice Hailstone (Williams Lea);
- Contributing technical authors: Juliet Crowe and Jo Page (Williams Lea);
- Technical drafting panel members: Laurence Bosshard (Williams Lea), Matt Linsley and Dave McGeeney (ISRU).

This PAS takes the form of guidance and recommendations. It should not be quoted as if it is a specification and particular care should be taken to ensure that claims of compliance with it are not misleading.

This PAS has been prepared and published by BSI, which retains its ownership and copyright. BSI reserves the right to withdraw or amend this PAS on receipt of authoritative advice that it is appropriate to do so. This PAS will be reviewed at intervals not exceeding two years, and any amendments arising from the review will be published as an amended PAS and publicized in Update Standards.

This PAS is not to be regarded as a British Standard.

This PAS does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this PAS does not of itself confer immunity from legal obligations.

The global business process outsourcing industry is valued at approximately $122-154 billion per annum[1]. Whilst the exact nature of the goods and services outsourced can vary significantly, there remains a common challenge for service providers to be able to accurately calculate the cost savings achieved for their clients.

Theoretically, cost savings for procured goods and services can be calculated through direct comparison with historical data. The challenge for service providers, however, is where no historical direct comparison can be made.

This PAS presents guidance on good practice in calculating cost savings in the procurement of printed goods and services, both with and without historical data.

While this PAS has been illustrated with examples specific to the outsourced procurement of printed goods and services, the principles behind the calculation of cost savings translate to any goods and services.

This Publicly Available Specification (PAS) details three approaches for calculating cost savings in the procurement of printed goods and services.

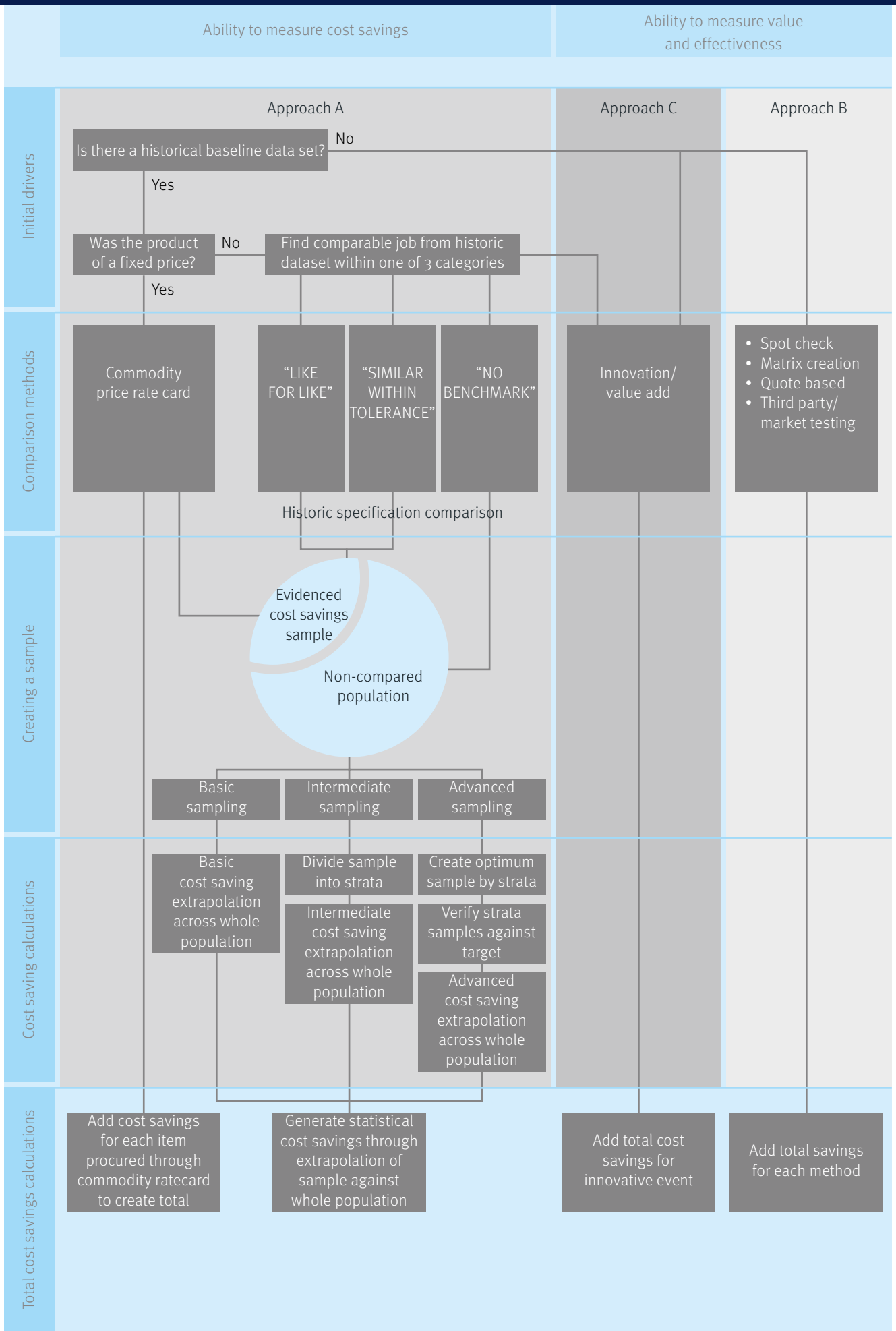
It is applicable to any service provider involved in business process outsourcing (BPO). It could also be of particular interest to client procurement personnel (e.g. category managers).

The PAS specifically addresses calculation methods whereby historical specification comparison can be conducted on a representative sample of the population, the results of which can be statistically used to accurately recognize cost savings against the total population. Other approaches for measuring the value of a service provider are also included.

The PAS is not intended to replace service providers' individual contractual obligations to their clients. Nor is it intended to provide the standard by which the quality of a client's policies, products, processes, programmes or strategies can be measured or judged, or compared with standard measurements, or with similar measurements of "best in class" companies.

Figure 1 represents the areas within the scope of this PAS and how they interact, illustrated using printed materials as the procured goods.

Figure 1 – The various approaches to calculating cost savings and how they interact



For the purposes of this PAS the following terms and definitions apply.

2.1 baseline

original historical data against which newly procured data are compared

2.2 comparison

process by which current procurement activity can be matched against procurement behaviour in the past of a similar nature

2.3 client

organization or individual procuring goods or services

2.4 current data

current information concerning individual job requirements

2.5 data set

historical procurement information contained within the same format

2.6 evidenced cost savings sample

current jobs that have been successfully compared with historical activity to demonstrate calculated cost savings using one of the qualifying methods

2.7 historical matrix rate card

pre-populated template containing specification and historical procurement pricing that can be used as a quick reference against which to compare current pricing

2.8 historical specification comparison

method of accurately measuring cost savings using “like for like” and “similar within tolerance” data, with consideration that there may be no comparison available

2.9 Like for like

job from the historical contractual period that is exactly the same as the current requirement

NOTE “Like for like” is sometimes referred to as exact specification match.

2.10 matrix creation

method by which all information relating to typical procurement information is documented together in one format or database

NOTE Typically, specification information will be detailed alongside quantity bands and budget pricing for each.

2.11 qualifying baseline data set

historical information contained in the same format once it has been agreed and signed off by the client and service provider as being an accurate representation of historical procurement activity

2.12 quote-based

deriving pricing information for a given current job by asking a number of suppliers to respond to RFQ (Request For Quotation)

2.13 representative

sufficient volume and value of included information to warrant effort

2.14 sampling: basic

use of all jobs within the contractual period for which a saving has been successfully identified, to infer the cost savings for the whole population

2.15 sampling: intermediate

categorizing the type of job in the sample, in addition to basic sampling, so as to be representative of the make-up of types of job within the total population

2.16 sampling: advanced

pre-comparison planning of a statistical sample prior to any work being undertaken in the time period, and the subsequent use of a pre-planned evidenced cost savings sample to infer total cost savings for the whole time period

2.17 service provider(s)

organization or individual delivering goods or services

2.18 similar within tolerance

assigning tolerances in relation to certain aspects of specification, jobs that are not "like for like"

NOTE These can still be compared with jobs within the baseline data set widening the search parameters and thus maximizing the opportunity for comparison.

2.19 specification

description or list of the characteristics that can be used to identify an individual sample job to be priced

2.20 specification standardization

grouping or tweaking of a multitude of job specifications so as to create a smaller differential between similar specifications, or even just one type

2.21 strata/stratum

each of the groups in to which a population is divided in the technique of stratified sampling

NOTE The composition of the strata/stratum is to be agreed by the client and service provider at the outset of a project.

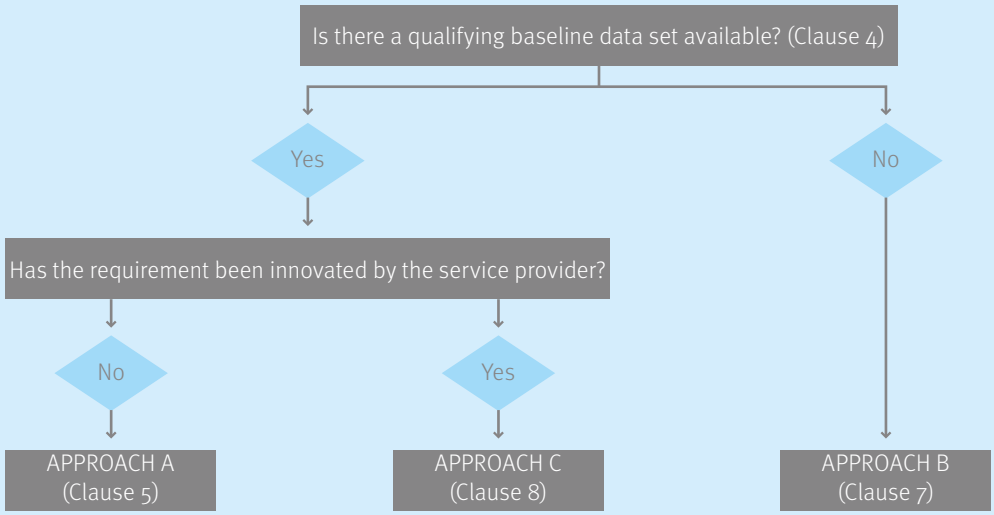
2.22 total population

all activity for the current job that took place, irrespective of whether cost savings were able to be evidenced against each current job or not

There are multiple ways to calculate cost savings with the preferred method determined by the presence, or not, of a historical data set.

Figure 2 shows how the right approach can be identified from simple initial criteria. The type of approach will determine whether cost savings can actually be calculated (Approach A and B). In the case of Approach C, in the absence of data, the procurement effectiveness of a service provider can be evaluated but actual cost savings can not be calculated as there is no comparison data.

Figure 2 – Decision tree to be followed to determine which approach is most suitable



4.1 – Criteria for a qualifying baseline dataset

To calculate cost savings for a current requirement for goods or services, the service provider needs to be able to compare the current requirement with a historical procured requirement, or its equivalent. Historical procurement information is hereafter referred to as a data set.

A number of criteria should be met for historical information to be considered a qualifying data set and therefore fit for purpose in the use of calculating cost savings. These are as follows.

a) a historical comparable period should be pre-agreed, typically this is a calendar year;

b) the amount of data should be representative and should consist of all available data from the agreed historical comparable period;

c) the data should be held electronically (in a format that can be interrogated, as required);

d) the data set should be provided by the client before commencing work with a service provider;

e) the specification variables of high significance, detailed in Table 1, should be present in a qualifying baseline data set as applicable.

NOTE 1 What constitutes representative or sufficient data is very difficult to measure. Even if all historically procured items featured within a qualifying data set, whether an appropriate match can be found also depends on client procurement behaviour in the forthcoming contractual period, which a multitude of internal and external factors can influence. The conclusion of this PAS with regard to the availability of enough baseline data set, is that so long as the baseline data set is an accurate representation of historical procurement behaviour within a comparable historical period, it can be considered sufficient.

NOTE 2 It may be possible to consider creating a data set broken into strata, where one category of print may have more data available to qualify as a baseline data set than another. In this instance it may be possible for the client and service provider to agree to compare the non- or under-represented category of print using an alternative method.

NOTE 3 It may be possible for the client and service provider to create an electronic dataset using information that is held in hard copy form in the first instance. For example taking previous invoices, or previous completed articles or work and translating the specification and pricing information into an electronic form for future use.

Table 1 – Variables with high significance to unit cost of detailed types of print

POINT OF SALE	
Variables analysed	**Significance to cost**
Quantity	HIGH
Product	HIGH
Made up	HIGH
Quantity	HIGH
Per unit	HIGH
Plastic tube	HIGH
Maintain number order	HIGH
Polywrap	HIGH
Shrink wrap	HIGH
Paper tube	HIGH
MARKETING PRINT	
Variables analysed	**Significance to cost**
APPLICABLE TO SINGLE AND BOUND PIECES	
Quantity	HIGH
Finished size – COVER	HIGH
Finished size – TEXT	HIGH
Number of pages – TEXT	HIGH
Number of colours – COVER	HIGH
Number of colours – TEXT	HIGH
Plate changes – TEXT	HIGH
Plate changes – COVER	HIGH
Cover; paper weight	HIGH
Text; paper weight	HIGH
Finishing details Y/N	HIGH
Die cutting	HIGH
Binding	HIGH
Die cut	HIGH
Single piece	

(Table 1, continued)

LABELS	
Variables analysed	**Significance to cost**
Paper and laminates	HIGH (due to high paper content and current paper costs. The same applied to laminate)
Type; coated/uncoated	HIGH
GSM	HIGH
Quantity	LOW/HIGH (lower volumes will generate higher prices)
Low volume	HIGH
Size	LOW/HIGH (dependant on use of standard sizes e.g. address label)
Non-standard form depths and reel widths	HIGH (odd shapes i.e. key format, piggieback format etc)
Number of versions/colours	LOW/HIGH (dependant on volume and number of versions/colours)
High number of low volume versions	HIGH
High number of plate and colour changes	HIGH
Personalised simplex method	MEDIUM/HIGH
Type of glue (peelable/low tack etc)	MEDIUM/HIGH
Reel direction	HIGH
Kiss cut	HIGH
Die cut (number and position)	MEDIUM/HIGH
CONTINUOUS STATIONERY	
Variables analysed	**Significance to cost**
Paper	HIGH (due to high paper content and current paper costs)
Type; coated/uncoated	HIGH
GSM	HIGH
Quantity	LOW/HIGH (lower volumes will generate higher prices)
Low volume	HIGH
Size	LOW/HIGH (dependant on use of standard sizes e.g. 12"×450mm)
Non-standard form depths and reel widths	HIGH
Number of versions/colours	LOW/HIGH (dependant on volume and number of versions/colours)
High number of low volume versions	HIGH
High number of plate and colour changes	HIGH
Finishing and ancillary requirements	MEDIUM/HIGH (dependant on complexity of ancillary requirement)
Personalised simplex/duplex	MEDIUM/HIGH
Labels: number and position of (front and/or reverse)	MEDIUM/HIGH
Perforations: number and position of (horizontal, vertical, pattern)	MEDIUM/HIGH
Suction holes: number and position of (size)	MEDIUM/HIGH
Re-moist glue: position of (front and/or reverse)	MEDIUM/HIGH
Die cut: number and position	MEDIUM/HIGH
Scratch off: number and position of (front and/or reverse)	MEDIUM/HIGH

(Table 1, continued)

DIRECT MAIL	
Variables analysed	**Significance to cost**
Pack style	HIGH
Number of records	HIGH
Number of inserts in pack	HIGH
Finishing (= template within a template / expanded below) YES / NO	HIGH
Data preparation	
Estimated records	HIGH
Quantity	HIGH
Finishing	
Versions	HIGH
Number up	HIGH
Finished size – width	HIGH
Finished size – length	HIGH
Slit / nest	HIGH
Re-moist	HIGH
Label tip on	HIGH
Enclosing	
Pack size	HIGH
Versions	HIGH
Quantity	HIGH
ENVELOPES	
Variables analysed	**Significance to cost**
Quantity	HIGH
Size	HIGH
Format (pocket / wallet)	HIGH
FORMAT – BANG TAIL	HIGH
FORMAT – DEEP FLAP	HIGH
Flap (gummed or self sealed)	HIGH
WINDOW: number, front or back	HIGH
W window type	HIGH
Label Tip on and quality	HIGH
PtIE face total number of colours	HIGH
PtIE face 4 colour process	HIGH
PtIE reverse total number of colours	HIGH
PtIE reverse 4 colour process	HIGH
Print method	HIGH
Paper weight	HIGH
Plate changes	HIGH

NOTE The detail contained within Table 1 has been concluded as a result of significant statistical testing. Please refer to Annex A for further details on the source data, the statistical tests that were performed and the full results including additionally variables with low and medium significance.

4.2 – Acceptance of a qualifying baseline data set

It is necessary for both the client and service provider to find a mutually acceptable method of agreeing to and signing off the data set as being accurate and fulfilling the criteria outlined in **4.1**. This may be in the form of a contractual annex, or other formal agreement. Following mutual acceptance of the accuracy of the historical data set it can thereafter be described as the "qualifying baseline data set."

These are cost-influencing drivers that may be unique to circumstances surrounding the historical requirement and importantly may, or may not, be present and comparable within the new requirements. Such cost influencing drivers can often generate premium pricing and can include the following examples:

- Time-restricted requirements (e.g. premiums paid for a quick turnaround);
- Quality-restricted requirements (e.g. premiums paid for a specific end result);
- Client-driven manufacturer choice (e.g. premium paid for a specific supplier, not best price);
- Freight (e.g. multiple deliveries or national/international destinations for finished goods).

For these reasons, it is essential that the full cost breakdown for each job within the data set is present and historical data is only used for comparison to the present day requirement is the circumstances are the same or similar to ensure savings are not over stated. A good example of this is where a premium has been paid in the past to meet a tight deadline, and such deadline is not valid in the present requirement. If the premium price was used to compare to the present day regular price an over inflated saving would be recorded.

NOTE The cost-influencing drivers are not limited to this list. Other factors that may distort accurate calculation of the service provider's cost savings performance can include fluctuations in commodity prices and macro-economic factors. Full details and the recommended means of mitigating the distorting impact of these key factors are detailed in Annex B.

4.3 – Annual evolving baseline data set

To maximize the relevance of the comparison data set to the profile of work undertaken in any given period, the client and service provider may agree that during the course of a contractual period the baseline should be reset periodically (usually each year), with matching taking place against the current data set.

The qualifying baseline data set should evolve in line with the contractual period, to ensure comparison with the most relevant historical data. Usually, for a new contractual period the client would provide the baseline data set for the service provider to use initially. When a new contractual period is entered (usually after a year), the data gathered during this first initial period would be presented (in accordance with the guidance in **4.1**) by the service provider as the baseline data set for the subsequent period (usually Contract Year 2).

The client and service provider should agree at the outset of the contractual relationship how cost savings should be measured over the duration of the contractual period with an annual evolving baseline dataset. One common method is described below:

Worked example:

Cost savings in Year 1 measured at 10%. Year 1 purchases become the current baseline.

Year-on-year cost savings may then be measured at a further 10%. This represents a cumulative 19% saving versus the pre-contract baseline, being:

{100 × (1 - 10%) × (1 - 10%)}

This PAS recognizes two different types of data sets, which can be categorized by their characteristics and use.

1) Historical specification baseline data set

A data set of this nature has the following characteristics:

- It contains specification information in full;
- It conforms to all the requirements detailed in **4.1** (highly significant variables).

It should be used where a matrix data set is not applicable due to the restricted characteristics of a matrix.

2) Historical matrix rate card data set

A historical matrix rate card data set takes on exactly the same principles as a historical specification baseline data set except for the following key differences:

- Matrix rate cards are suited for listing the cost of similar jobs with fixed specification procured on a regular basis, or jobs that will not materially change in specification year on year;
- The procured quantity for matrix jobs can vary and, as such, all costs can either be calculated from a unit cost or listed in quantity bands within the matrix;
- The current matrix will hold the historical baseline cost for each job together with the current cost incorporating the cost savings targets;
- The jobs and costs are often listed by name without the need to detail and filter out full specification information (specification information can be held separately);
- The need for full quotation process to procure the goods is negated and, as such, procurement administration can be reduced;
- The goods detailed on a rate card do not necessarily need to have been procured previously but the client and service provider can agree to include them in the baseline data set;
- Typically, the service provider will pre-agree suppliers against matrix rate card items to secure and hold costs for a fixed period;
- Items are often held or requested in (electronic) catalogue form;
- Typical matrix examples can include, but are not limited to envelopes, 2D POS, leaflets, stationery and business cards.

NOTE 1 Comparison for matrix jobs can be simplified through acceptance of the data set with cost and cost savings percentage already built in. A report of all jobs produced from the matrix rate card, identifying the total quantity purchased and the cost savings delivered, should be run by the service provider to generate the total cost savings.

NOTE 2 Due to the similarities of pricing and specifications on a historical matrix, together with "like for like" historical specification comparisons it may be possible for cost savings evidenced from matrix procurement to form part of a sample.

NOTE 3 It is possible for the service provider to create a new matrix rate card based on client requirements and work profile.

4.5 – General data set considerations

In addition to any specific considerations when using or producing a historical specification or matrix data set, the following should be taken into account:

- The service provider and client should formalize acceptance of the data set;
- Jobs produced in conjunction with another job are permitted to stay within the data set; however, they should be clearly signposted for an accurate comparison to be made;
- Circumstances which may impact the price should be recorded as detailed in **4.2**;
- It may be prudent to invest in data cleansing services to ensure the data set is as robust and accurate as possible.
- The client and the service provider should ensure the data is provided in a consistent format.

NOTE 1 Table 2 shows the various ways in which the specification element "colours" may be recorded in any one data field.

Table 2 – Examples of variances in specification data

Example 1	Example 2	Example 3	Example 4	Example 5
4c	Four Colours	4 Colours	4col	4COL
2c	Two Colours	2 Colours	2col	2COL
Black	+ Special			

NOTE 2 Even with the presence of a comprehensive historical data set, it is impossible to find a comparison match (either "like for like" or "similar within tolerance") for every job the client wishes the service provider to procure. Typical reasons can include, but are not limited to:

- *A new product design;*
- *Changing quantity or specification significantly for a repeat job so as to fall outside of tolerances;*
- *Innovative specification enhancements;*
- *A critical prioritization on price/time or quality.*

Critically, the reason for not being able to compare a job should be recorded.

4.6 – Use of a historical comparison tool

Some historical specification data sets may contain significant data. Hence, speed and accuracy are key, and every effort should be made to automate the search process.

A historical comparison tool should be used to assist in the identification of historical jobs to match against current requirements within a historical specification data set. Use of such a tool has a number of potential benefits. It can:

- Make the matching process more efficient;
- Reduce administration and resource;
- Increase the potential to find a comparison match ("like for like" or "similar within tolerance");
- Reduce bias;
- Reduce the potential for human error through oversight or misinterpretation of the data set.

5 – Approach A: Comparison methods for calculating cost savings in the presence of a data set

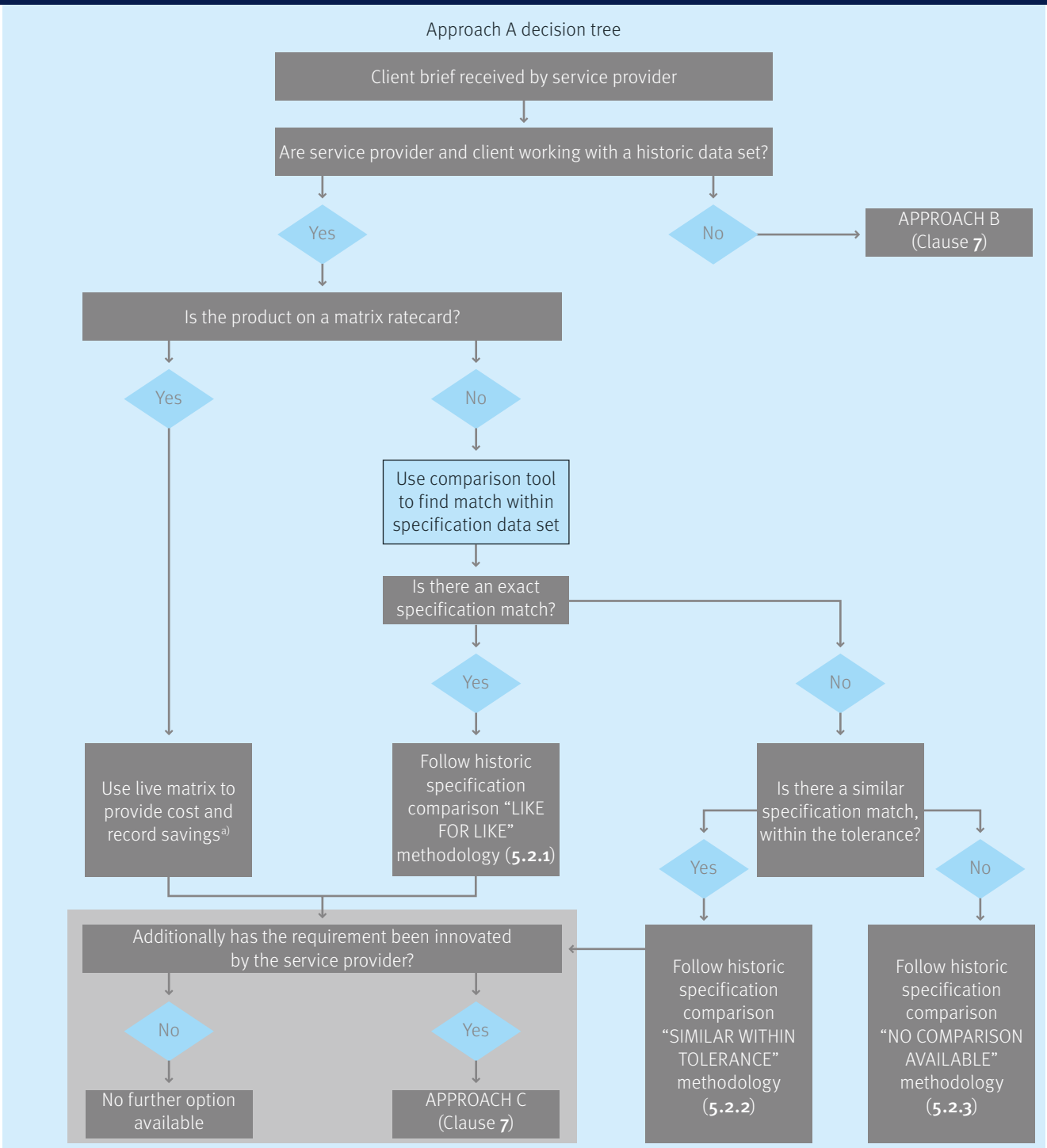
5.1 – General

Once the presence of a qualifying dataset has been established and agreed between the service provider and client, the method to which cost savings can now be calculated needs to be considered and agreed. This approach details the options and provides guidance to their use

The decision tree (Figure 3) illustrates the various options available with the presence of the qualifying baseline dataset and each job may follow a different route dependent on the circumstances. Alternatively the service provider and client may agree from the outset of a contractual relationship that one or two specific options will be valid.

The remainder of Clause 5 will explore each option in detail.

Figure 3 – A decision tree detailing the multiple options available within Approach A



a) *See 4.2. For live matrix follow same process as "Like for Like" substituting historical data set for historical matrix if applicable*

5.2 – Historical specification comparison

Whilst acknowledging that not all jobs can possibly be compared, this PAS will look at the methodology behind historical specification comparison in detail due to its significant advantages to both the client and service provider as a method of accurately measuring cost savings using a data set. There are three types of historical specification comparison:

1) "Like for like"
   In this category, the specifications of the current job are exactly the same as those of a match within the historical data set. A +/- 10% quantity tolerance is permitted providing the production method is consistent.
2) "Similar within tolerance"
   In this category, the specifications of the current job are outside the quantity tolerance in "like for like" but are within the specification tolerances of the material variables for the job, so the job can still be regarded as technically similar to an equivalent match within the data set.
3) "No comparison available"
   In this category, the specifications of the current job are outside both the quantity and specification tolerances of the previous two categories such that the job is regarded as materially and technically different from any other job available within the data set and, as such, no comparison is possible.

5.2.1 – "Like for Like"

The principles behind "like for like" historical comparisons are fairly straightforward. By searching the historical specification data set, the service provider will be able to locate a job from the historical contractual period that is "like for like". Reprints of a historical job are typical of "like for like" matches.

The specification of variables with high significance, as listed in Table 1, for each type of print should be matched exactly.

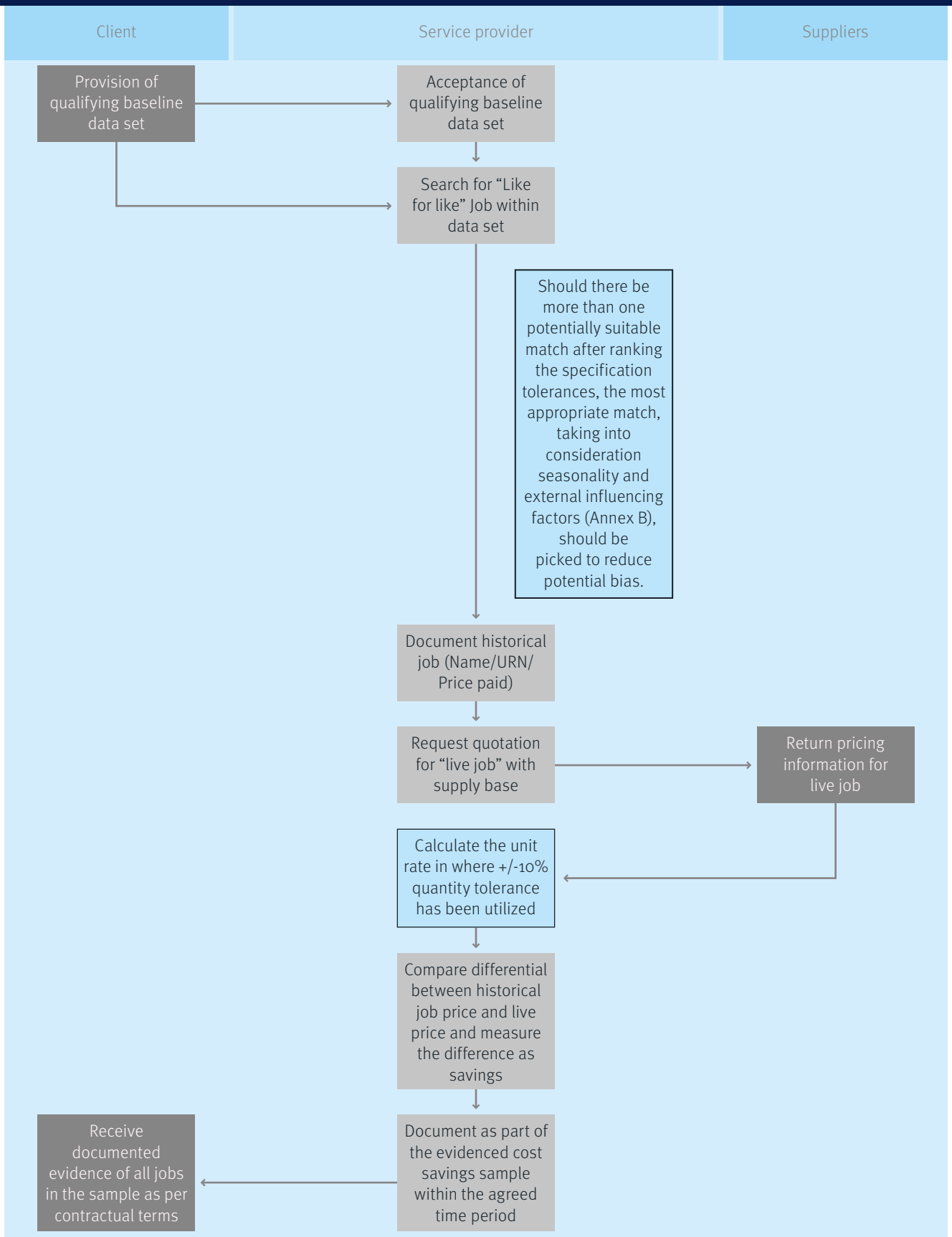
In a current job, +/- 10% quantity tolerance of an otherwise exact match for all other specification variables is allowed. This is due to the ability to calculate an accurate unit price that can be simply calculated using run-on / run-back theory. In this instance, a unit price from the baseline match is calculated by dividing the total cost by the number of units. This is then multiplied by the current job quantity to establish a '"like for like"' baseline, including an exact quantity match as well as the other specification variables.

If the quantity variance falls outside the +/- 10% tolerance, the job is not considered a "like for like" match and therefore a "similar within tolerance" methodology should be applied. It is essential, however, where a +/- 10% quantity tolerance is utilized, to find an otherwise exact comparison match; the production method of the historical job and the present job should be the same.

The process flow for "like for like" (as shown in Figure 4) can be described as follows:

a) Search for "like for like" from the historical data set using the comparison tool.
b) Should there be more than one potentially suitable match after ranking the specification tolerances, the most appropriate match, taking into consideration seasonality and external influencing factors (Annex B), should be picked to reduce potential bias.
c) Record the historical job unique reference/name and price from the historical contractual period (see **5.6**).
d) Where +/- 10% quantity tolerance is utilized, calculate the unit price for the current quantity.
e) Determine and record the current cost for the same job.
f) The difference between the historical price and the current price can be recorded as the saving for the job.
g) This job will form part of the sample for the current contractual period.

Figure 4 – "Like for Like" process flow



By assigning tolerances in relation to certain aspects of the specification, jobs that are not exactly "like for like" can still be compared with jobs within the baseline data set.

The principles behind "similar within tolerance" historical comparisons are an extension of those behind "like for like". By searching the data set, the service provider is able to locate a match which is sufficiently similar materially and technically to the current requirement that it can be used to make a historical comparison cost savings calculation.

Variances in the specification are only accepted within certain tolerances and in relation to certain aspects of the specification. If the variances between historical and current specifications fall outside these parameters, the jobs will not be considered similar enough for comparison purposes.

This PAS recognizes the following tolerable variances ranked in the following order:

1. Variance in the quantity produced: maximum 25% variance allowed dependent on job category and within bandings.
2. Variance in number of colours: maximum of two.
3. Reasonable variance in type and weight of substrate used.

NOTE 1 There will be different tolerances for different categories of goods and services procured. The tolerances must be mutually agreed between the client and service provider and a mechanism developed to accurately measure. For example, marketing print and direct mail require different tolerances.

The "similar within tolerance" process (as shown in Figure 5) can be described as follows:

a) Search for potential "similar within tolerance" matches in the historical data set.

NOTE 2 Table 3 demonstrates typical results returned when using a comparison tool to find historical jobs within specifications similar within agreed tolerances.

b) There should be no more than three variances in specification, and these can only vary within the tolerances agreed between the client and service provider.

NOTE 3 See 1-3 of this clause for finite list of specification variables.

All other specifications should match.

c) If more than one suitable match is found then the ranking of the specification tolerances should be applied in order (See 1-3 of this clause) to ascertain the best match for use.

d) Should there be more than one potentially suitable match after ranking the specification tolerances, the most appropriate match, taking into consideration seasonality and external influencing factors (Annex B), should be picked to reduce potential bias.

e) Record the applicable historical job unique reference/name and cost from the historical contractual period (see **5.6**).

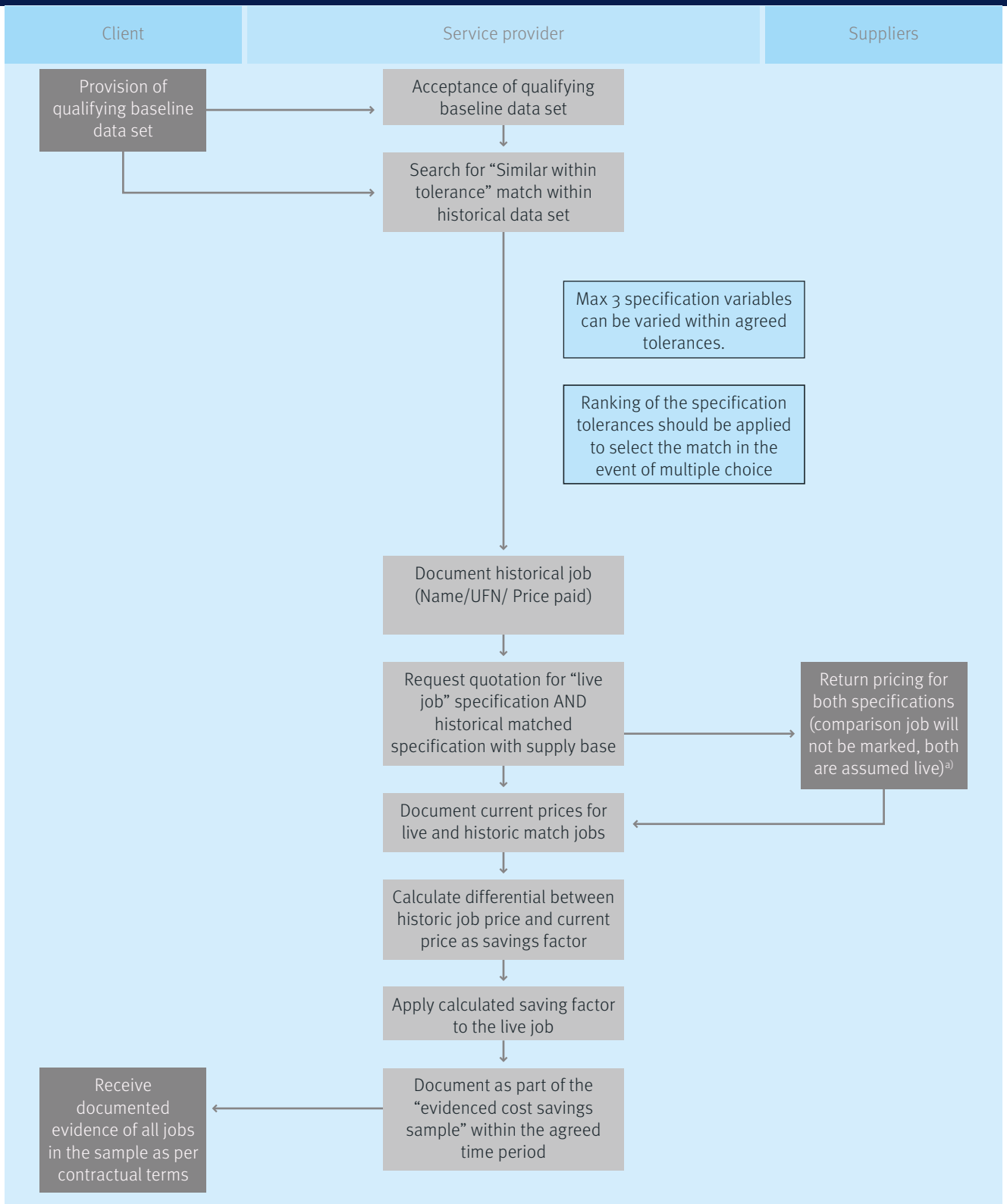
f) Request supplier quotations through the service provider procurement technology for both the current job and the applicable historical matched job. Please see note below.

g) Record the current cost for the live current job.

h) Record the historical cost for the historical matched job from the dataset, and the current day pricing for the same specification.

i) The difference between the historical cost for the matched job and the live current cost for the same job can be recorded as the cost savings for this job.

j) The job forms part of the evidenced cost savings sample within the total population.



a) *The service provider's suppliers should not know which is the current job and which one is the historical comparison job to ensure real costs are submitted for both jobs. To allow for production variances as identified in (Table 2) between the current job and the historical comparison job, the print supplier should be asked to quote for:*

- *the quantity actually required and the quantity purchased for the historical comparison job, to account for the cost variance caused by varying quantities (if applicable);*
- *both the paper specification required and the historical paper specification, to account for the price variance caused by varying paper type (if applicable);*
- *both the number of colours required and the historical number of colours, to account for the price variance caused by varying colour specification (if applicable);*
- *any other materially different specification variables.*

Table 3 demonstrates the typical results returned through use of a comparison tool in an attempt to find a match for the current specification. In this instance there are three possible matches, but only the match with quantity variance within tolerance should be selected to use to compare with the live specification.

Table 3 – Typical results returned using a comparison tool to find suitable matches within specification tolerances

Comparison examples							
Item	Size	Paper	Print	Finishing	Qty	Explanation	Result
Leaflet – Live specification	148 × 210 mm	150 gsm matt coated	4/4	Trim to size	10,000		
Leaflet example 1	148 × 210 mm	150 gsm matt coated	4/4	Trim to size	12,000	Same specification quantity within tolerance	**Within tolerance**
Leaflet example 2	148 × 210 mm	150 gsm matt coated	4/2	Trim to size	10,000	Similar specification colour is different to live spec but within tolerance and all other details match	**Within tolerance**
Leaflet example 3	148 × 210 mm	170 gsm matt coated	4/4	Trim to size	10,000	Similar specification paper is different to live spec but within tolerance and all other details match	**Within tolerance**
Leaflet example 4	148 × 210 mm	200 gsm matt coated	4/1	Trim to size	17,000	Specification is outside tolerance – material weight and colour are outside of tolerance, quantity is outside of volume tolerance	Outside tolerance
☐ Matches specification exactly ☐ Within tolerance ☐ Outside tolerance							

5.2.3 – "No comparison available"

The service provider should attempt to compare every job; however, in the event a match cannot be found as either "like for like" or "similar within tolerance", the service provider should document the reasons the job was not compared.

Common reasons for jobs not to be compared include:

- current job is too urgent (e.g. a production tprourn-around of less than 3 days);
- no comparable job was printed in the historical data set period (i.e. new job);
- historical cost not comparable (e.g. product batched in multiples);
- restricted (client specified supplier);
- historical or current co-production;
- cost, time or quality override by the client either in the quotation or the production process;
- client does not require a comparison of items (e.g. deliveries, mail sorting, overtime, freight or couriers fulfilment);
- specification changed (e.g. production of similar job where the specification has changed beyond contractual allowances through service provider innovation);
- matrix prices agreed (e.g. for items that have been signed off by the client).

NOTE The service provider and client should agree on a method by which to record the client's consent to remove the current job from comparison qualification in the event that price, time or quality are overridden by the client either in the quotation or the production process, or in the event that a specific supplier is required to be used by the client.

The service provider should keep an accurate record of the following data (as a minimum) on a job-by-job basis as the products are procured:

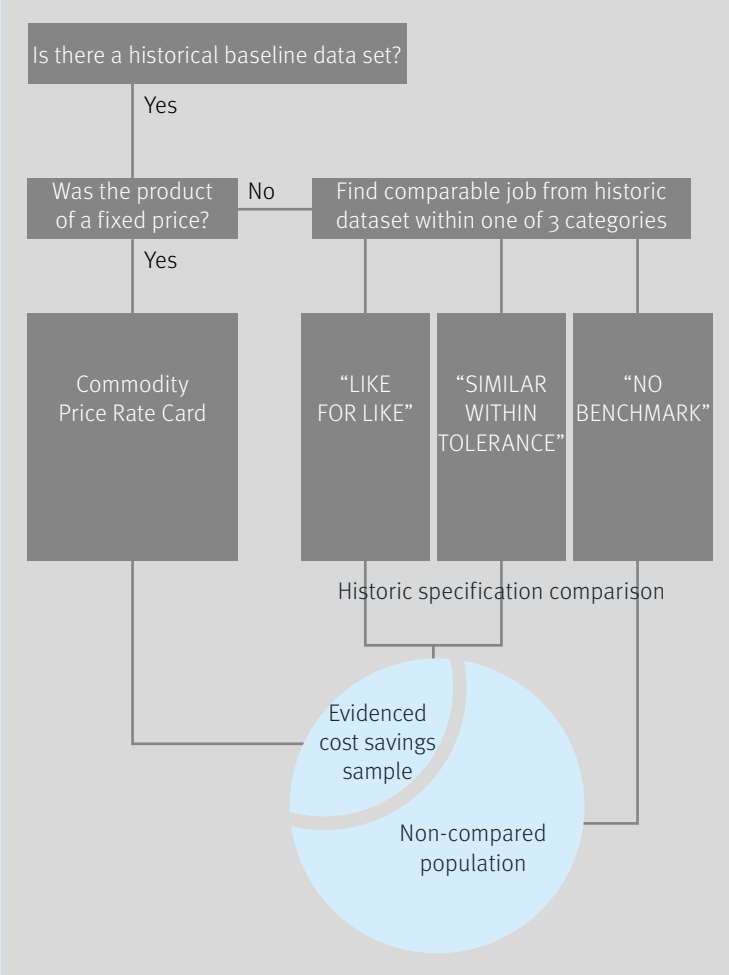
- complete job specification;
- job identifier/Unique Reference Number (URN);
- project/campaign identifier/name;
- date procured;
- category of job (i.e. marketing print, direct mail);
- quantity procured;
- actual cost as paid by the service provider;
- method of comparison undertaken;
- the identified historical matched job and cost (if the historical specification comparison route is followed);
- the comparison cost for each job (if different from the actual cost paid, if applicable);
- reason job not compared (if applicable);
- innovation/value add cost savings category (if applicable).

Retrospective recording of procurement activity and specification information is not recommended due to the importance of accurate record keeping.

5.4 – Using the evidenced cost savings sample – the next steps

Historical specification comparison in which the service provider attempts to compare every job results in the creation of an evidenced cost savings sample of current jobs. These jobs have a historical match from a qualifying baseline data set, either "like for like" or "similar within tolerance". Where a historical specification comparison has been undertaken but jobs cannot be compared (as outlined in **5.5**), these jobs form the "non-compared population". The non-compared population and the evidenced cost savings sample combined form the total population for which cost savings should be calculated. Figure 6, which is an extract from Figure 1, outlines this process.

Figure 6 – Extract from Figure 1 to highlight the stage in the process once cost savings have been evidenced

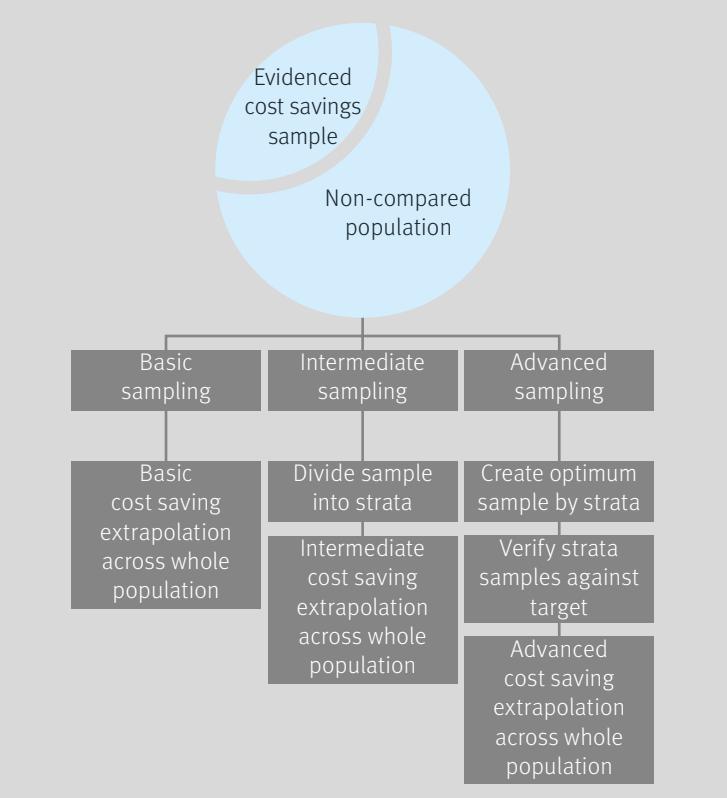


In summary, at this stage of Approach A, an evidenced cost savings sample has been created from jobs for which it was possible to find a historical comparison match. This evidenced cost saving sample can now be used to calculate the cost savings for the total population for a given period of time using one of three methodologies detailed in Clause **6**.

6.1 – General

There are three methods of calculating cost savings: Basic, Intermediate or Advanced, as illustrated in Figure 7.

Figure 7 – Various methods for calculating cost savings using the evidenced cost savings sample



The main difference between these three methods relates to the quality and characteristics of the sample in proportion to the total population. The more representative the evidenced cost savings sample is of the total population, the more reliable the cost savings calculations results will be.

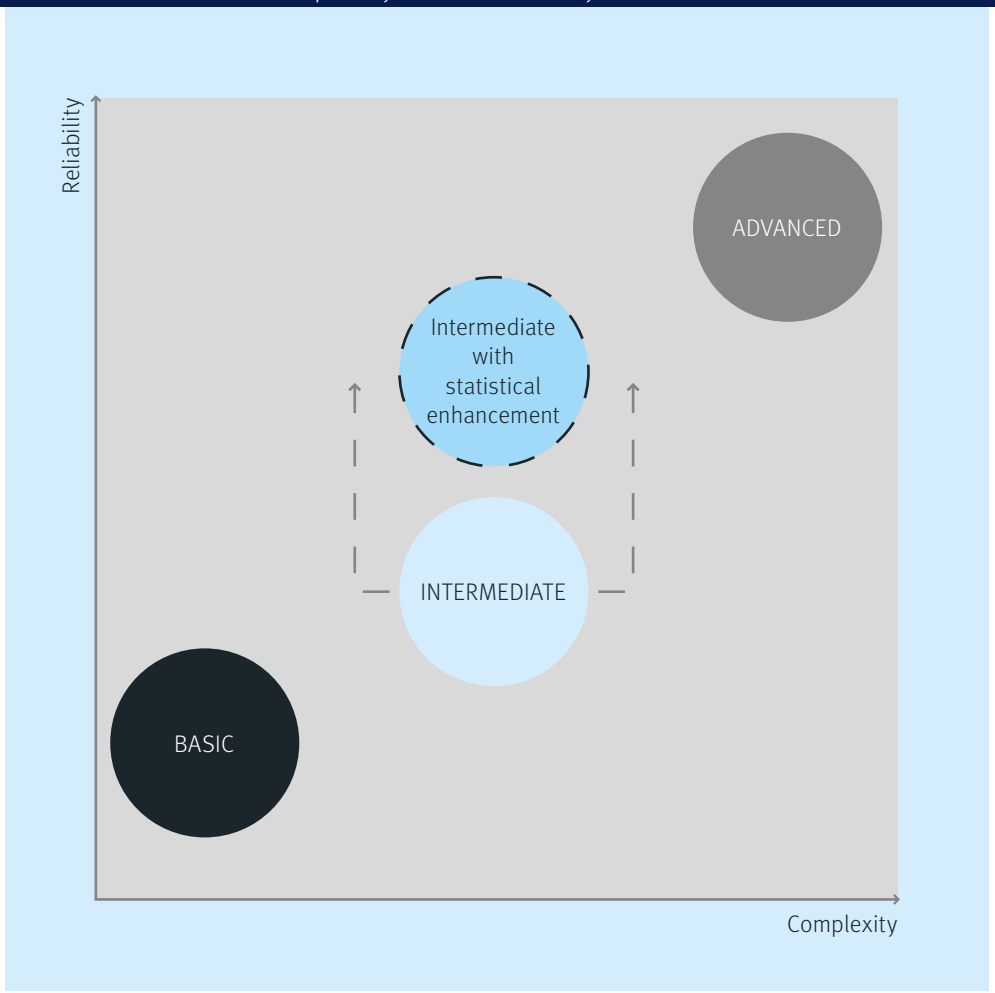
The following factors influence the precision and accuracy of the total cost savings estimate:

a) the sample size;
b) the total number of jobs completed in a given time period (i.e. in the total population);
c) the degree of variability of the cost savings from job to job in the sample;
d) the representation of the work profile in the sample, compared with the total population.

The general principle is that if there is a relatively low number of jobs, a high variability in the cost savings between jobs or an under/over-representation of the work profile in the evidenced cost savings sample (stratification), the total cost savings can be estimated with only limited precision.

If there are a relatively high number of jobs and/or low variability in the cost savings of jobs, with a reasonable statistical representation of the work total population profile in the evidenced cost savings sample, the total cost savings can be estimated with more precision. Figure 8 illustrates these methods graphically.

Figure 8 – Graphic representation of the three sampling methods plotted in terms of complexity versus reliability



6.2 – Comparison of sampling methods

The sampling method chosen will be driven by a number of factors and varying degrees of complexity and ability to control. These factors may include:

a) how much historical data is available and the quality of the data for use to evidence cost savings and create a sample;

b) the ability of the service provider and client to accurately forecast activity (number of jobs) for the next time period that is suitably reflective of the comparable time period to which the data set relates;

c) current client procurement activity and job requirements being sufficiently similar to those within the historical data set to find sufficient matches to create an evidenced cost savings sample, both in numbers and category of print and to specification, within tolerance;

d) the ability of the client and service provider to pre-determine the acceptable level of precision for calculation of cost savings;

e) the need for the client and service provider to mutually accept the nature of the requirements;

*NOTE This may have a detrimental effect on the desired results. For example, if, for one or more accepted reasons (detailed in **5.5**), the number of jobs that are unable to be compared is higher than predicted, this will have an impact on the confidence interval (see Annex C.2) of the calculated cost savings. This does not mean the results are inaccurate, but rather that they are less precise, or not as precise as desired.*

f) in respect of Intermediate and Advanced sampling, it is possible to correct for over-representation (**6.6.2.2**) post-comparison process; however, it is not possible to correct for under-representation if the reasons for not being able to compare the job in the first instance are genuine.

Table 4 compares Basic, Intermediate and Advanced sampling.

Table 4 – Comparison of Basic, Intermediate and Advanced sampling

BASIC SAMPLING	
Advantages	**Considerations**
Low complexity	Higher potential for bias
Provides a good starting point for new clients / service providers	No reduction in comparison activity within the contractual period (will have to attempt to compare every job)
Data readily available	No stratification process to categorize print
Minimal data analysis required at the end of the contractual period	
Relatively simple	
INTERMEDIATE SAMPLING	
Advantages	**Considerations**
Medium complexity	No reduction in comparison activity within the contractual period (will have to attempt to compare every job)
Use of readily available data to achieve more accurate results	Target optimum sample remains unknown before any comparison activity takes place
Less potential for bias	Stratification takes place post-comparison, so limited ability to control the optimum sample
Comprehensive analysis of significant quantities of data to aid stratification and enhance calculated cost savings	
Detailed consideration of evidenced cost savings sample to promote proportionate representation in the inferred cost savings	
ADVANCED SAMPLING	
Advantages	**Considerations**
Less potential for bias	Highly complex
Reduction in comparison activity once optimum evidenced cost savings sample is reached for each strata	Significant data required upfront, prior to any activity being carried out by the service provider in a current contractual period
Stratification takes place pre-comparison so maximizing the ability to control the optimum sample	Dependent on client portfolio of procurement behaviour being consistent year on year
Comprehensive analysis of significant quantities of data has taken place to provide tools to aid stratification and as such enhance inferred cost savings results	Agreement required between client and service provider on key factors to accurately use the statistical calculator prior to any work being carried out by the service provider
Detailed consideration of evidenced cost savings sample to promote proportionate representation in the inferred cost savings	Theoretical utopia hard to achieve with so many dependent factors

6.3 – Bias

Statistical analysis of historical data has demonstrated that the characteristics and mixture of jobs represented in an opportunity evidenced cost savings sample does not always well represent those of the whole population. Where the characteristics of the evidenced cost savings sample is disproportionate to that of the whole population, there is potential for a statistically biased calculation of total cost savings if the sample were to be used as such.

*NOTE This conclusion has been drawn through statistical analysis of data, with the results proving that evidenced cost savings show a significant relationship with the category of print. Therefore, inference of total cost savings from an evidenced cost savings sample without stratification (Basic sampling) is potentially more biased than using the Intermediate stratified sample method (**6.5**). See Annex D for further details.*

6.4 – Sampling output

Irrespective of the sampling technique deployed, the output is derived in the same manner. As a result of completing the calculations process for any type of sampling, a 95% confidence interval will be determined around the total cost savings figure. In broad terms, the greater the size of the range, the less precise the total cost savings figure will be. A wide range does not mean the calculation is statistically incorrect, but it does mean the range into which the 'true' total cost savings lie is relatively wide.

The client and service provider should agree on target precision relative to the total anticipated spend within a given time period. For example, if the estimated spend for the year was £1 million; it would be unlikely the client would accept a confidence interval for the total cost savings of between £100,000 and £900,000. The service provider and client can use a combination of the estimated cost savings against the estimated spend within a given time period to agree a realistic precision target whilst keeping in mind the advantages and considerations detailed in **6.2**.

The calculations process relating to each of the three sampling techniques will provide both the method to determine the confidence interval and worked examples.

NOTE 95% confidence is widely accepted as a statistical norm. See Annex C for further details.

6.5 – Acceptance of total cost savings calculated using an evidenced cost savings sample

The various techniques of using the evidenced cost savings sample to calculate cost savings all follow statistically verified processes. The client and service provider should accept, in principle, the total calculated cost savings calculations derived as long as the methodology is followed correctly (**6.6.1**, **6.6.2**, **6.6.3**).

In addition, the specific principles in **6.5.1** to **6.5.3** should be acknowledged when using a specific method either:

6.5.1 – Basic sampling

This approach is the least complex however has the highest potential for bias through the simpler calculation process of total cost savings. The client and service provider should agree the evidenced cost savings sample in comparison to the total population has been generated fairly and without any intentional bias in favour of the client or service provider.

However, the client and service provider should acknowledge the potential statistical limitations of this method and accept them when drawing inferences for total cost savings for the whole contractual period.

6.5.2 – Intermediate sampling

This approach provides a balance between complexity and reduced risk of bias through a more detailed calculation process. The client and service provider should agree the evidenced cost savings sample in comparison to the total population has been generated fairly and without any intentional bias in favour of the client or service provider, and that effort has been made by both parties to reduce bias following the creation of the opportunity sample. Hence both the client and the service provider should accept the total calculated costs savings for the whole contractual period calculated from the opportunity sample, as per the process described in **6.6.2**.

6.5.3 – Advanced sampling

The risk of bias in the calculation of the total cost savings is further reduced through the increased complexity of this approach. In addition, time and resource cost savings can be identified due to a potential reduction in the number of jobs to be compared. The client and service provider should agree the evidenced cost savings sample in comparison to the total population has been generated fairly and without any intentional bias in favour of the client or service provider, and that effort has been made by both parties to reduce bias following the creation of the statistical evidenced cost savings sample. Hence both parties should accept the estimate of the total cost savings for the whole contractual period inferred from the statistical sample, as per the process described in **6.6.3**.

This PAS recommends that the Intermediate sampling methodology should be followed where possible due to practical constraints with Advanced sampling and the potential increased risk of bias to cost savings in Basic sampling.

NOTE It should be the objective of both the service provider and the client to move away from Basic sampling by management of the influencing factors, such as quality of data set and ability to match historical jobs to evidence cost savings. However, Basic sampling is often unavoidable until contract Year 2 onwards, when the baseline data set can be managed by the service provider rather than provided by the client.

6.6.1 – Basic sampling

Basic sampling is the use of all jobs within the contractual period for which a saving has been successfully identified, to calculate the cost savings for the whole population. In this respect, the stratification of the evidenced cost savings sample is not taken into consideration when calculating the costs for the whole population. Basic sampling may also be referred to as Opportunity Sampling given the characteristics of this methodology.

NOTE 1 Opportunity sampling is a form of non-probability sampling that involves the sample being drawn from the part of the population that is close to hand, readily available or convenient. In some cases, the sample might not be truly representative of the whole population as a result of the sample not being a probability sample. Ideally, where possible, it is preferable to use a probability sampling approach, such as simple random sampling.

*NOTE 2 Simple random sampling allows every item in the population to have a chance (greater than zero) of being selected in the sample. The subsequent inference to the whole population in this case is statistically more robust. However, **5.5** details why it is impossible for some jobs to be compared, resulting in some items in the population not having any chance of being included in the sample. For this reason, an opportunity sample is utilized in Basic sampling.*

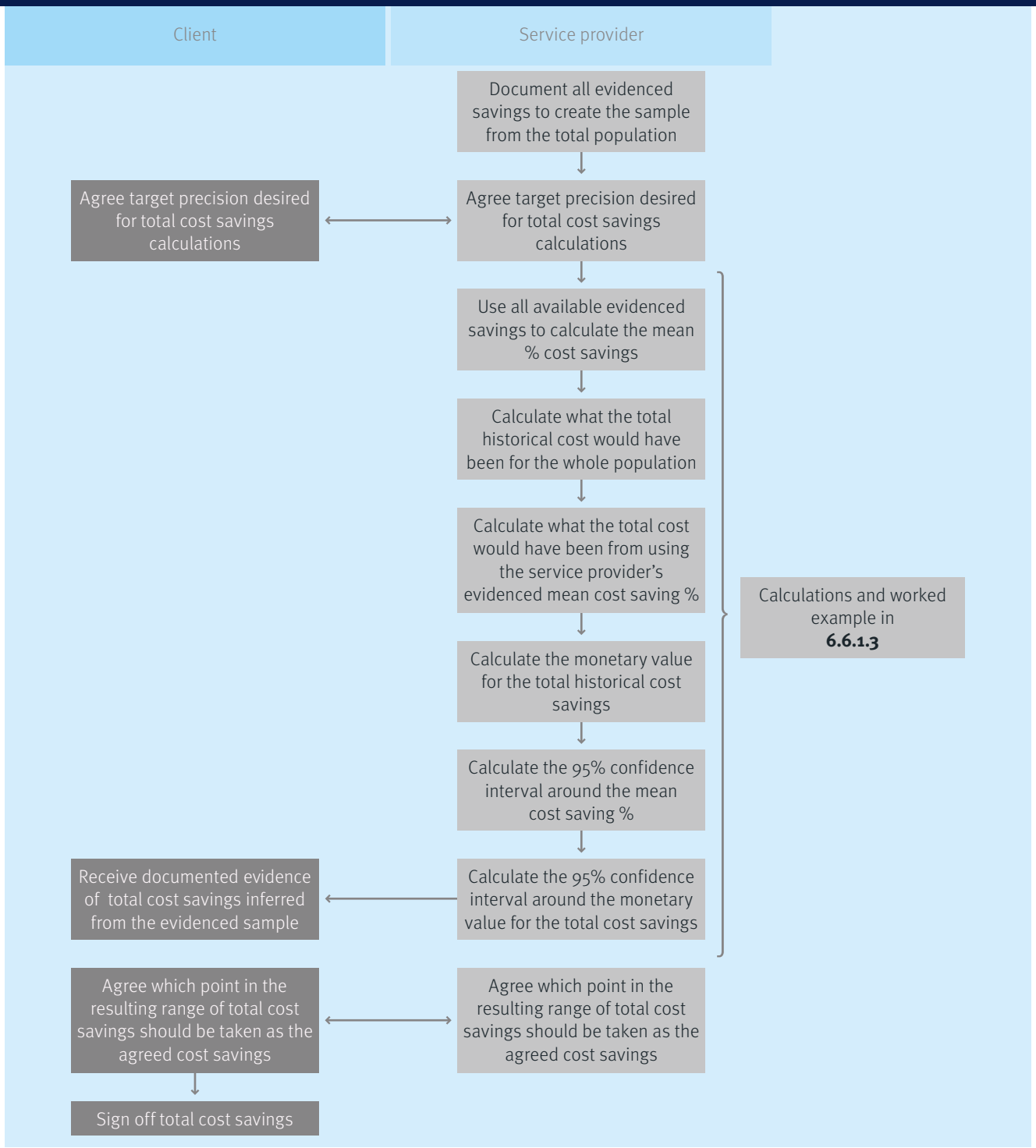
6.6.1.1 – Sample size

Due to the nature of Basic sampling, the evidenced cost savings sample will be used in its entirety and as it is. As such there is no optimum minimal evidenced sample size and proportional representation to the rest of the total population in the whole contractual period cannot apply. It should be recognized that, due to limitations of a Contract Year 1 qualifying baseline data set, Basic sampling is often the only method available.

NOTE Limitations of qualifying baseline dataset in Contract Year 1 can be due to limited recorded information around the jobs procured before the service provider was engaged.

The process steps that need to be taken for Basic sampling are described in Figure 9.

Figure 9 – Basic sampling process flow



The process given in this clause should be followed by the service provider and evidence of the calculations should be provided to the client by the service provider, for the total cost savings calculated to be mutually acceptable.

For reference, the following key definitions will be used to illustrate the calculations, lifted from the total population.

Table 5 – Key definitions and calculations for use in the Basic sampling worked examples

N	Total population (the total number of jobs in the period)	918
n	Sample (the number of evidenced cost savings jobs in the sample)	243
Σx_i	Sum of the entire evidenced sample cost savings (as %)	5242%
THC	Total historical cost of the evidenced cost savings sample	619,911.82
s	Standard deviation (the % variation of cost savings within the sample)	16.02
√n	Square root of the sample (square root is the number when multiplied by itself equals 243, which is n)	15.59

NOTE The data in the above table is derived from live data between a client and supplier during a contractual period of one year, in which there were 918 jobs; 243 of which savings were able to be evidenced. The data is shown in this format so as to simplify the calculation process to follow, the actual live data is recorded in electronic form. In order to perform the following calculations it is recommended the above key numbers are identified before the calculation process commences. Total cost savings for a specific time period can be inferred from the evidenced cost savings sample within a total population using the following calculation process:

STEP 1 Calculate the mean cost savings (%) of the evidenced cost savings sample:

$$\bar{x} = \frac{\Sigma x_i}{n}$$

where:

$\bar{x}$ = sample mean percentage

What is the service providers mean cost savings?

$\bar{x}$ = 5242/243 = **21.57% (or 0.2157)**

For the remainder of these calculations answers will be produced in the form of percentages

STEP 2 Calculate the total historical cost for the time period (THCTP) using the total historical cost from the evidenced cost savings sample (THC):

THCTP = THC × (N/n)

What would the total historical cost have been if a historical cost was available for every job? (i.e. what would the client have paid without using the service providers) =

£619,911.82 × (918/243) = **£2,341,889.10**

STEP 3 Calculate what the service providers total historical cost for the time period (SPTHCTP) would have been using the sample mean percentage:

SPTHCTP = THCTP × $(1 - \bar{x})$

What would the total historical cost have been using the service provider average savings rate?

£2,341,889.10 × (1 - 0.2157) = **£1,836,743.62**

STEP 4 Calculate the monetary value for the total cost savings (TCS):

TCS = THCTP - SPTHCTP

Using the difference of what the client paid historically, less the service provider's total cost, monetary savings can be calculated:

£2,341,889.10 - £1,836,743.62 = **£505,145.48** (or 21.57%)

STEP 5 Calculate a 95% confidence interval for the mean cost (%) saving for the whole time period:

$$\bar{x} \pm \frac{1.96 \times s \times \sqrt{\frac{N-n}{N-1}}}{\sqrt{n}} = (LB, UB)$$

where:

1.96 is a standard coefficient associated with a 95% confidence interval;

s is the standard deviation of the sample (LB, UB) is the lower and upper bound for the 95% confidence interval.

What is the range under which we can be 95% statistically confident in the mean savings percentage? Working this formula through, and using the answers in Table 5, the lower and upper boundaries around the sample mean (%) are as follows:

1.96 × (s)16.02 = 31.40

√(918 - 243)/(918 - 1) = 0.86

31.40 × 0.86 = 27.00

27.00/15.59 = 1.73

The lower bound therefore is the mean less 1.73

21.57% - 1.73% = 19.84%

The upper bound therefore is the mean plus 1.73

21.57% + 1.73% = 23.3%

STEP 6 Calculate the 95% confidence interval around the total cost savings (TCS), using the lower bound and upper bound calculations and the calculation of the total historical cost for the time period (THCTP):

(THCTP × LB), (THCTP × UB)

95% Confidence interval for the total cost savings:

2,341,889.10 × 0.1984 = **£464,630.80**

2,341,889.10 × 0.233 = **£545,660.16**

Worked example summary:

The mean cost savings (%) of the evidenced cost savings sample is 21.57%

The total cost savings using this mean is £505,145.48

There can be 95% statistical confidence in the (%) mean cost savings range being from 19.84% to 23.3% for the total population based on the evidenced cost savings sample

This means that there can be 95% statistical confidence in the total cost savings ranging from £464,630.80 to £545,660.16

6.6.2 – Intermediate sampling

Intermediate sampling differs from Basic sampling through the process of post-historic comparison stratification of the evidenced cost savings sample. This is the process of categorizing the type of job in the sample so as to be representative of the make-up of the types of jobs within the total population. Doing this reduces the risk of bias by ensuring the calculation process takes into consideration the correct proportion of jobs in the evidenced cost savings sample compared with the total population.

The evidenced cost savings sample should be divided into categories, or "strata", before performing any calculations. The following strata for print, for example should be used:

a) Continuous forms;

b) Direct mail;

c) Envelopes;

d) Labels;

e) Marketing print;

f) Merchandise;

g) Point of sale.

It should be noted this is not an exhaustive list and no restriction is placed on how many strata or how the definition of the strata should be placed. For other goods and services strata as most relevant should be selected. The strata, as shown in Tables 7-15, have been selected to be typical of the different types of printed material and have been used in the worked examples to follow within this clause for consistency.

NOTE 1 During the creation of this PAS, significant statistical research has been conducted into data, held by the sponsor/client, spanning the period July 2008 – December 2009, across a wide range of blue-chip clients with multiple procurement requirements. The key results of this analysis enabled types of print to be categorized as having materially similar properties. Throughout this PAS, worked examples have been used and these again are based on results of statistical analysis. Further details of all the statistical tests performed are referenced in Annex A.

NOTE 2 Annex D provides evidence that different strata can yield varying levels of cost savings; hence an appropriate calculation process has been developed to account for strata differences in average cost savings. Theoretically, using a stratification approach, the sample is proportionally stratified (categorized) to match the proportion of jobs in the whole population (i.e. the contractual period). Practically, where an opportunity sample is created, the proportions of the strata in the sample will rarely match the proportions of the strata in the whole population exactly. Some strata will be over-represented in the sample compared with the contractual period, whereas some strata will be under-represented. For this reason, statistical scaling is applied to the calculations when inferring total costs savings in an attempt to account for the differences between the sample and contractual period proportions.

6.6.2.1 – Sample size

Unlike Basic sampling, Intermediate sampling focuses on the proportional representation of jobs per strata in the evidenced cost savings sample against the total population. Therefore the size of the evidenced cost savings sample is not as relevant as the make up in relation to the total population.

It is possible to have no, or under-representation of strata in the evidenced cost savings sample; in the same way, it may be possible for one or more strata to be over-represented. In all of these examples, action should be taken to remedy this disproportionality as part of the course of Intermediate sampling.

NOTE 1 The client and service provider should agree from the outset the way in which over, under or no representation should be addressed. Statistical scaling is the recommended approach.

1) Under-representation

EXAMPLE: 18.7% (172/918) of jobs in the time period are envelope jobs (a stratum), whereas the percentage of envelope jobs in the sample is 15.6% (38/243). If calculated cost savings for the total period were derived using 15.6% then this would under-represent the number of envelope jobs in the whole time period and thus bias total inferred cost savings.

The calculation of the inferred cost savings for the total contractual period should take into account the proportion of each type of job in the whole time period rather than the sample. This action is especially critical if the proportionality in the sample is significantly different from the proportionality in the whole time period.

2) Over-representation

EXAMPLE: 33% of jobs in the time period are marketing print jobs (a stratum), whereas the percentage of marketing print jobs in the sample is 41%. If calculated cost savings for the total period were derived using 41% then this would over-represent the number of marketing print jobs in the whole time period and thus bias total inferred cost savings.

In instances of over-representation the evidenced cost savings sample can be adjusted to better represent the total population, in mutual agreement between the client and the service provider to ensure the results are not manipulated in favour of either party.

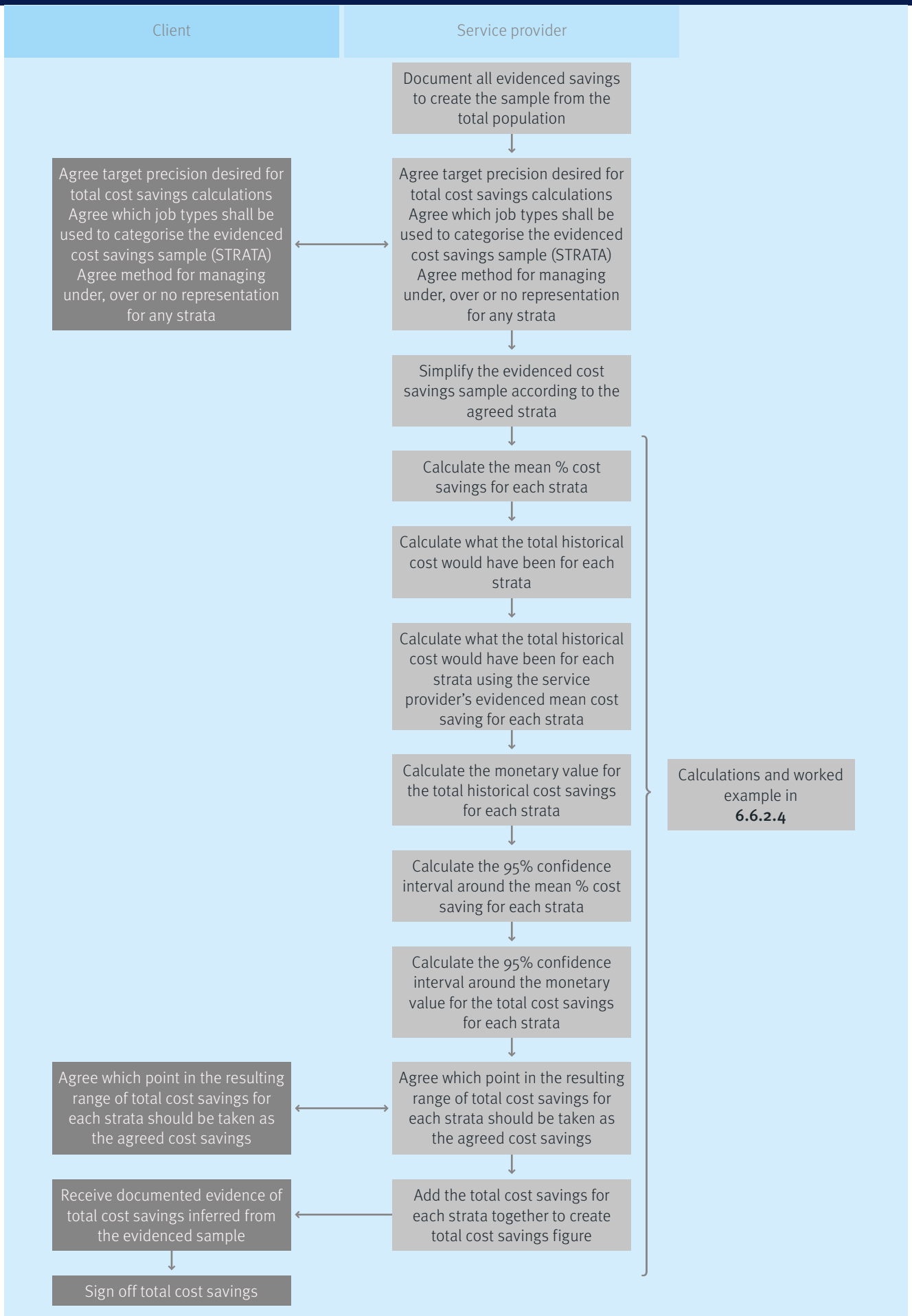
3) No representation

In cases where the number of jobs in the evidenced cost savings strata sample is less than five, or even zero, the calculation process will need to use an average taken from the other strata categories as an estimate for the under or non-represented strata. This is due to the nature of Intermediate sampling whereby stratification analysis takes place retrospectively to the actual process of comparing jobs in a current environment. As such there are limited options available to remedy any disproportionality.

*NOTE 2 The service provider and the client may agree a different course of action for strata that are commonly or repetitively difficult to evidence in the cost savings samples. Typically, remedial action may include comparing these strata using one of the other approaches in the clauses of this PAS and adding to it the cost savings total as outlined in Clause **9**. Other courses of action for one-off examples of this nature may include a retrospective comparison using market sampling or re-investigating the qualifying baseline data set as a second opinion.*

6.6.2.3 – Process for Intermediate sampling

The process steps that should be taken for Intermediate sampling are described in Figure 10.


Client
Service provider
Document all evidenced savings to create the sample from the total population
Agree target precision desired for total cost savings calculations Agree which job types shall be used to categorise the evidenced cost savings sample (STRATA) Agree method for managing under, over or no representation for any strata
Agree target precision desired for total cost savings calculations Agree which job types shall be used to categorise the evidenced cost savings sample (STRATA) Agree method for managing under, over or no representation for any strata
Simplify the evidenced cost savings sample according to the agreed strata
Calculate the mean % cost savings for each strata
Calculate what the total historical cost would have been for each strata
Calculate what the total historical cost would have been for each strata using the service provider's evidenced mean cost saving for each strata
Calculate the monetary value for the total historical cost savings for each strata
Calculate the 95% confidence interval around the mean % cost saving for each strata
Calculate the 95% confidence interval around the monetary value for the total cost savings for each strata
Agree which point in the resulting range of total cost savings for each strata should be taken as the agreed cost savings
Agree which point in the resulting range of total cost savings for each strata should be taken as the agreed cost savings
Receive documented evidence of total cost savings inferred from the evidenced sample
Add the total cost savings for each strata together to create total cost savings figure
Sign off total cost savings
Calculations and worked example in 6.6.2.4

The process in this clause should be followed by the service provider and evidence of the calculations should be provided to the client by the service provider, for the total cost savings measured to be mutually acceptable in the process of Intermediate sampling.

For reference, the key definitions in Table 6 will be used to illustrate the calculations, lifted from the total population.

Table 6 – Key definitions and calculations for use in the Intermediate sampling worked examples

n1	number of continuous forms print strata within the sample	1
n2	number of direct mail strata within the sample	51
n3	number of envelopes strata element within the sample	37
n4	number of label strata within the sample	1
n5	number of marketing print strata within the sample	97
n6	number of merchandising strata within the sample	15
n7	number of point of sale strata within the sample	41
N1	number of continuous forms print strata within the total population	6
N2	number of direct mail strata within the total population	193
N3	number of envelopes strata within the total population	124
N4	number of label strata within the total population	6
N5	number of marketing print strata within the total population	290
N6	number of merchandising strata within the total population	112
N7	number of point of sale strata within the total population	187
Σ×1	Sum of all evidenced cost savings sample within the continuous forms print strata	14.6%
Σ×2	Sum of all evidenced cost savings sample within the direct mail strata	971.0%
Σ×3	Sum of all evidenced cost savings sample within the envelopes strata	716.0%
Σ×4	Sum of all evidenced cost savings sample within the label strata	-3.0%
Σ×5	Sum of all evidenced cost savings sample within the marketing print strata	2392.0%
Σ×6	Sum of all evidenced cost savings sample within the merchandising strata	203.0%
Σ×7	Sum of all evidenced cost savings sample within the point of sale strata	948.0%
THC1	Total historical cost of the evidenced cost savings sample within the continuous forms print strata	£9,430.49
THC2	Total historical cost of the evidenced cost savings sample within the direct mail strata	£157,278.67
THC3	Total historical cost of the evidenced cost savings sample within the envelopes strata	£40,351.20
THC4	Total historical cost of the evidenced cost savings sample within the labels strata	£518.92
THC5	Total historical cost of the evidenced cost savings sample within the marketing print strata	£145,045.08
THC6	Total historical cost of the evidenced cost savings sample within the merchandising strata	£215,937.24
THC7	Total historical cost of the evidenced cost savings sample within the point of sale strata	£51,350.21
s1	Standard Deviation (the variation of savings within continuous forms print strata sample)	0.00
s2	Standard Deviation (the variation of savings within direct mail strata sample)	30.56
s3	Standard Deviation (the variation of savings within envelopes strata sample)	23.64
s4	Standard Deviation (the variation of savings within labels strata sample)	4.10
s5	Standard Deviation (the variation of savings within marketing print strata sample)	24.84
s6	Standard Deviation (the variation of savings within merchandising strata sample)	16.88
s7	Standard Deviation (the variation of savings within point of sale strata sample)	21.68
√n1	Square root of the continuous forms print evidenced cost savings sample (1)	1.00
√n2	Square root of the direct mail evidenced cost savings sample (51)	7.14
√n3	Square root of the envelopes evidenced cost savings sample (38)	6.08
√n4	Square root of the labels evidenced cost savings sample (2)	1.00
√n5	Square root of the marketing print evidenced cost savings sample (97)	9.85
√n6	Square root of the merchandising evidenced cost savings sample (13)	3.87
√n7	Square root of the point of sale evidenced cost savings sample (41)	6.40

NOTE The data in the above table is derived from live data between a client and supplier during a contractual period of one year, in which there were 918 jobs; 243 of which savings were able to be evidenced. The data is shown in this format so as to simplify the calculation process to follow, the actual live data is recorded in electronic form. In order to perform the following calculations it is recommended the above key numbers are identified before the calculation process commences.

Total cost savings for a specific time period can be inferred from the Intermediate evidenced cost savings sample within a total population using the following calculation process.

STEP 1: The sample is to be stratified via job type;

where:

St = Strata type;

i = number of different types of strata.

In this PAS the following seven types are used:

- St1 = Continuous forms;
- St2 = Direct mail;
- St3 = Envelopes;
- St4 = Labels;
- St5 =Marketing print;
- St6 = Merchandise;
- St7 = Point of Sale.

STEP 2: Calculate the mean cost savings (%) for each strata level sample (as exemplified in Table 7) using the following formula:

$$\bar{x} = \frac{\Sigma x_i}{n_i}$$

where:

$\bar{x}$ = sample mean percentage;

x_i = the (%) cost saving for the ith job in the ith strata level in the evidenced cost savings sample;

n_i = the number of jobs in the sample.

Table 7 – Calculating the mean cost savings for each strata

	(x_i) sum (%) cost savings	/	total number of jobs in sample	=	Mean (%)
Continuous forms	14.6	/	1	=	14.6
Direct mail	971.0	/	51	=	19.0
Envelopes	716.0	/	37	=	19.4
Labels	-3.0	/	1	=	- 3.0
Marketing print	2392.0	/	97	=	24.7
Merchandising	203.0	/	15	=	13.5
Point of sale	948.0	/	41	=	23.1

STEP 3 Calculate the total historical cost (as exemplified in Table 8) for the time period (THCTP) for each strata level using the total historical cost from the evidenced cost savings sample (THC):

$THCTP = THC \times (N/n_1)$

Table 8 – Calculating the total historical cost for each strata level (i.e. what the total cost would have been for the client pre-using the service provider).

	Total historical cost (THC)	×	(Total number of jobs in whole strata population	/	Total number of jobs in strata sample)	=	Total historical cost for specific time period
Continuous forms	£ 9,430.49	×	6	/	1	=	£ 56,582.94
Direct mail	£ 157,278.67	×	193	/	51	=	£ 595,191.83
Envelopes	£ 40,351.20	×	124	/	37	=	£ 135,231.05
Labels	£ 518.92	×	6	/	1	=	£ 3113.52
Marketing print	£ 145,045.08	×	290	/	97	=	£ 433,639.93
Merchandising	£ 215,937.24	×	112	/	15	=	£ 1,612,331.39
Point of sale	£ 51,350.21	×	187	/	41	=	£ 234,207.06

STEP 4 Calculate what the service providers total historical cost for the time period (SPTHCTP) would have been for each strata level (as exemplified in Table 9) using the sample mean (%) cost savings:

$SPTHCTP = THCTP \times (1 - \bar{X}_1)$

where:

$\bar{X}_1$ = sample mean (%) cost savings

Table 9 – Calculating what the total historical cost for each strata level would have been using the service providers mean evidenced cost savings

	Total historical cost for specific time period	×	(1	-	Mean (in decimal points)	=	Total historical cost with service provider cost savings
Continuous forms	£ 56,582.94	×	1	-	0.1460	=	£ 48,321.83
Direct mail	£ 595,191.83	×	1	-	0.1904	=	£ 481,871.97
Envelopes	£ 135,231.05	×	1	-	0.1935	=	£ 109,062.01
Labels	£ 3,113.52	×	1	-	-0.0300	=	£ 3,206.93
Marketing print	£ 433,639.93	×	1	-	0.2466	=	£ 326,705.22
Merchandising	£ 1,612,331.39	×	1	-	0.1353	=	£ 1,394,129.21
Point of sale	£ 234,207.06	×	1	-	0.2312	=	£ 180,053.81

STEP 5 Calculate the monetary value for the total historical cost savings (TCS) for each strata level (see Table 10) using the following formula:

TCS = THCTP - SPTHCTP

Table 10 – Calculating the monetary value for the total historical cost savings for each strata level

	Total historical cost for specific time period	-	Total historical cost with service provider cost savings	=	Total cost savings per strata		
Continuous forms	£ 56,582.94	-	£ 48,321.83	=	£ 8,261.11	or	14.6%
Direct mail	£ 595,191.83	-	£ 481871.97	=	£ 113,319.86	or	19.0%
Envelopes	£ 135,231.05	-	£ 109,062.01	=	£ 26,169.04	or	19.4%
Labels	£ 3113.52	-	£ 3206.93	=	-£ 93.41	or	-3.0%
Marketing print	£ 433,639.93	-	£ 326,705.22	=	£ 106,934.71	or	24.7%
Merchandising	£ 1,612,331.39	-	£ 1,394,129.21	=	£ 218,202.18	or	13.5%
Point of sale	£ 234,207.06	-	£ 180,053.81	=	£ 54,153.24	or	23.1%

STEP 6 Calculate a 95% confidence interval for the mean cost savings (%) for each strata level (see Table 11) using the following formula:

$$\bar{X}_1 \pm \frac{1.96 \times s_1 \times \sqrt{\frac{N_1 - n_1}{N_1 - 1}}}{\sqrt{n_1}} = (LB, UB)$$

where:

1.96 is a standard coefficient associated with a 95% confidence interval ;

S_i is the standard deviation of the ith strata level;

(LB, UB) is the lower and upper bound for the 95% confidence interval.

Table 11 – Calculating a 95% statistical confidence interval around the mean cost savings (%) for each strata level

	(1.96 × (s) Standard deviation	×	√N-n/N-1)	/	√n	=	Confidence Interval
Continuous forms	£ 0.00	×	1.00	/	1.00	=	0.00
Direct mail	£ 59.90	×	0.86	/	7.14	=	7.21
Envelopes	£ 46.33	×	0.84	/	6.08	=	6.41
Labels	£ 8.04	×	1.00	/	1.00	=	8.04
Marketing print	£ 48.69	×	0.82	/	9.85	=	4.04
Merchandising	£ 33.08	×	0.93	/	3.87	=	7.99
Point of sale	£ 42.49	×	0.89	/	6.40	=	5.88

STEP 7 Calculate the 95% confidence interval (see Table 13) around the total cost savings (TCS) using lower bound and upper bound calculations (see Table 12) and calculate the total historical cost for the time period (THCTP) for each strata:

(THCTP × LB), (THCTP × UB)

Table 12 – Creating the lower and upper bounds around the mean (%) saving for each strata level

	Mean	-	Confidence interval	=	LOWER BOUND	Mean	+	Confidence interval	=	UPPER BOUND
Continuous forms	14.60%	-	0.00	=	14.60%	14.60%	+	0.00	=	14.60%
Direct mail	19.04%	-	7.21	=	11.83%	19.04%	+	7.21	=	26.25%
Envelopes	19.35%	-	6.41	=	12.95%	19.35%	+	6.41	=	25.76%
Labels	-3.00%	-	8.04	=	-11.04%	-3.00%	+	8.04	=	5.04%
Marketing print	24.66%	-	4.04	=	20.62%	24.66%	+	4.04	=	28.70%
Merchandising	13.53%	-	7.99	=	5.55%	13.53%	+	7.99	=	21.52%
Point of sale	23.12%	-	5.88	=	17.24%	23.12%	+	5.88	=	29.00%

Table 13 – Calculating a 95% statistical confidence around the total cost savings for each strata

	Total historical cost for specific time period	×	LOWER BOUND as a decimal	=	Lower total cost savings range	Total historical cost for specific time period	×	UPPER BOUND as a decimal	=	Upper total cost savings range
Continuous forms	£ 56,582.94	×	0.1460	=	£ 8,261.11	£ 56,582.94	×	0.1460	=	£ 8,261.11
Direct mail	£ 595,191.83	×	0.1183	=	£ 70,388.48	£ 595,191.83	×	0.2625	=	£ 156,251.24
Envelopes	£ 135,231.05	×	0.1295	=	£ 17,505.68	£ 135,231.05	×	0.2576	=	£ 34,832.39
Labels	£ 3,113.52	×	-0.1104	=	-£ 343.61	£ 3,113.52	×	0.0504	=	£ 156.80
Marketing print	£ 433,639.93	×	0.2062	=	£ 89,416.86	£ 433,639.93	×	0.2870	=	£ 124,452.56
Merchandising	£ 1,612,331.39	×	0.0555	=	£ 89,447.93	£ 1,612,331.39	×	0.2152	=	£ 346,956.43
Point of sale	£ 234,207.06	×	0.1724	=	£ 40,382.94	£ 234,207.06	×	0.2900	=	£ 67,923.54
Totals					£ 315,059.39					£ 738,834.07

STEP 8 Calculate the total cost savings for the whole time period (see Table 14) by adding together the total cost savings for each strata using the following formula:

$T = T1 + T2 + T3 + T4 + T5 + T6 + T7$

where:

T = total cost savings for each strata

Table 14 – Calculating the total cost savings for the whole time period

	Total cost savings			
Continuous forms	£ 8,261.11	+		
Direct mail	£ 113,319.86	+		
Envelopes	£ 26,169.04	+		
Labels	-£ 93.41	+	=	£ 526,946.73
Marketing print	£ 106,934.71	+		
Merchandising	£ 218,202.18	+		
Point of sale	£ 54,153.24	+		

The total cost savings conclusions drawn as a result of calculating total cost savings return a different result from the calculations completed using the Basic sampling. The Intermediate sampling can be considered to be more accurate. Table 15 compares the key information.

Table 15 – Worked example conclusions

	95% confidence lower bound mean	mean	95% confidence upper bound mean	95% confidence lower bound cost savings	Total cost savings	95% confidence upper bound cost savings
Continuous forms	14.60%	14.60%	14.60%	£ 8,261.11	**£ 8,261.11**	£ 8,261.11
Direct mail	11.83%	19.04%	26.25%	£ 70,388.48	**£ 113,319.86**	£ 156,251.24
Envelopes	12.95%	19.35%	25.76%	£ 17,505.68	**£ 26,169.04**	£ 34,832.39
Labels	-11.04%	-3.00%	5.04%	-£ 343.61	**-£ 93.41**	£ 156.80
Marketing print	20.62%	24.66%	28.70%	£ 89,416.86	**£ 106,934.71**	£ 124,452.56
Merchandising	5.55%	13.53%	21.52%	£ 89,447.93	**£ 218,202.18**	£ 346,956.43
Point of sale	17.24%	23.12%	29.00%	£ 40,382.94	**£ 54,153.24**	£ 67,923.54
Total				**£ 315,059.39**	**£ 526,946.73**	**£ 738,834.07**

NOTE In the illustrated example, the results of the Intermediate sampling procedure are different from those indicated from the same data from the Basic sampling calculations. This is due to the consideration of strata (i.e. the actual job make-up of the contractual period) in the intermediate method, typically resulting in more accurate results. Also, with Intermediate sampling, exists the ability to construct precision confidence intervals around individual strata as opposed to just the total cost savings as in Basic Sampling.

The impact and subsequent ways of managing the results generated under, over or no representation of Strata needs to be considered by the Client and Service provider in relation to the conclusions calculated through using this method.

As the above results clearly show the impact to the range between the Lower Bound and Upper bound 956 confidence interval. The individual results per strata vary from being very precise but with potential under representation (Continuous Form) to fairly precise with fair representation (Envelopes, POS) to wider ranges of confidence intervals due to the nature of the data in categories such as Merchandising and Direct Mail.

6.6.3 – Advanced sampling

The third option for the client and service provider is the pre-comparison *planning* of a statistical sample prior to any work being undertaken in the time period, and the subsequent use of a pre-planned evidenced cost savings sample to infer total cost savings for the whole time period.

Advanced sampling will potentially allow significant time and resource cost savings to be made due to the targeted nature of creating an evidenced cost savings sample; not all jobs will need to be compared once the sample size target has been reached. The characteristics of the evidenced cost savings and the optimum sample size are determined by the service provider and agreed by the client using a relative historical data set from an agreed period of time and the Statistical Calculator (see **6.6.3.1**).

NOTE The requirement of the historical contractual period qualifying data set can also be viewed as one of the main reasons why this method is considered complex and out of reach for a number of clients and service providers. It is also a requirement that the optimum sample size for each stratum is reached and this is dependent on client procurement behaviour bearing significant similarity to the historical contractual period for sufficient historical matches to be found.

6.6.3.1 – Statistical calculator

Accurate use of the Statistical calculator requires the following criteria to be agreed in **advance** between the client and the service provider:

a) an approximation of the standard deviation(s) of cost savings from job to job in a contractual period typical of the client;

b) an estimation of the total number of jobs (N) expected in the contractual period;

c) the choice of a suitable precision (P) to the confidence interval around the inferred total cost savings.

NOTE 1 A statistical calculator is detailed in Annex E.

It is potentially difficult to achieve agreement on this information for the following reasons:

- the information may not be available;
- the forthcoming contractual period procurement behaviour of the client may need to vary due to business or economic restrictions or specific requirements;
- innovation activity may alter specifications outside comparison tolerances, thus meaning there is no match within the historical specification data set;
- the client may have a requirement to procure a significant proportion of brand new work where no historical data would be available;
- the estimation of the total number of jobs for the forthcoming contractual period may be inaccurate;
- in practice, the value of the approximate standard deviation may be inaccurate.

In such instances, the initial assumptions would be potentially inaccurate together with the possibility of the optimum sample sizes for each strata not being achieved in practice.

It is recommended that this approach only be used with at least one year of contractual data held electronically within the service provider's systems.

NOTE 2 This PAS is not able to recommend a generic methodology for all contractual periods across all clients because historical statistical data analysis has demonstrated that there are considerable differences from client to client in the observed variability (standard deviation) of cost savings on a job-by-job basis, and also in the total number of jobs in each contractual period. However, long term it is potentially more viable to set an estimate for the total number of jobs in a contractual period and standard deviation and agree on a required precision on a client-by-client basis. This method also assumes that the client produces a similar portfolio of jobs year on year.

6.6.3.2 – Sample size

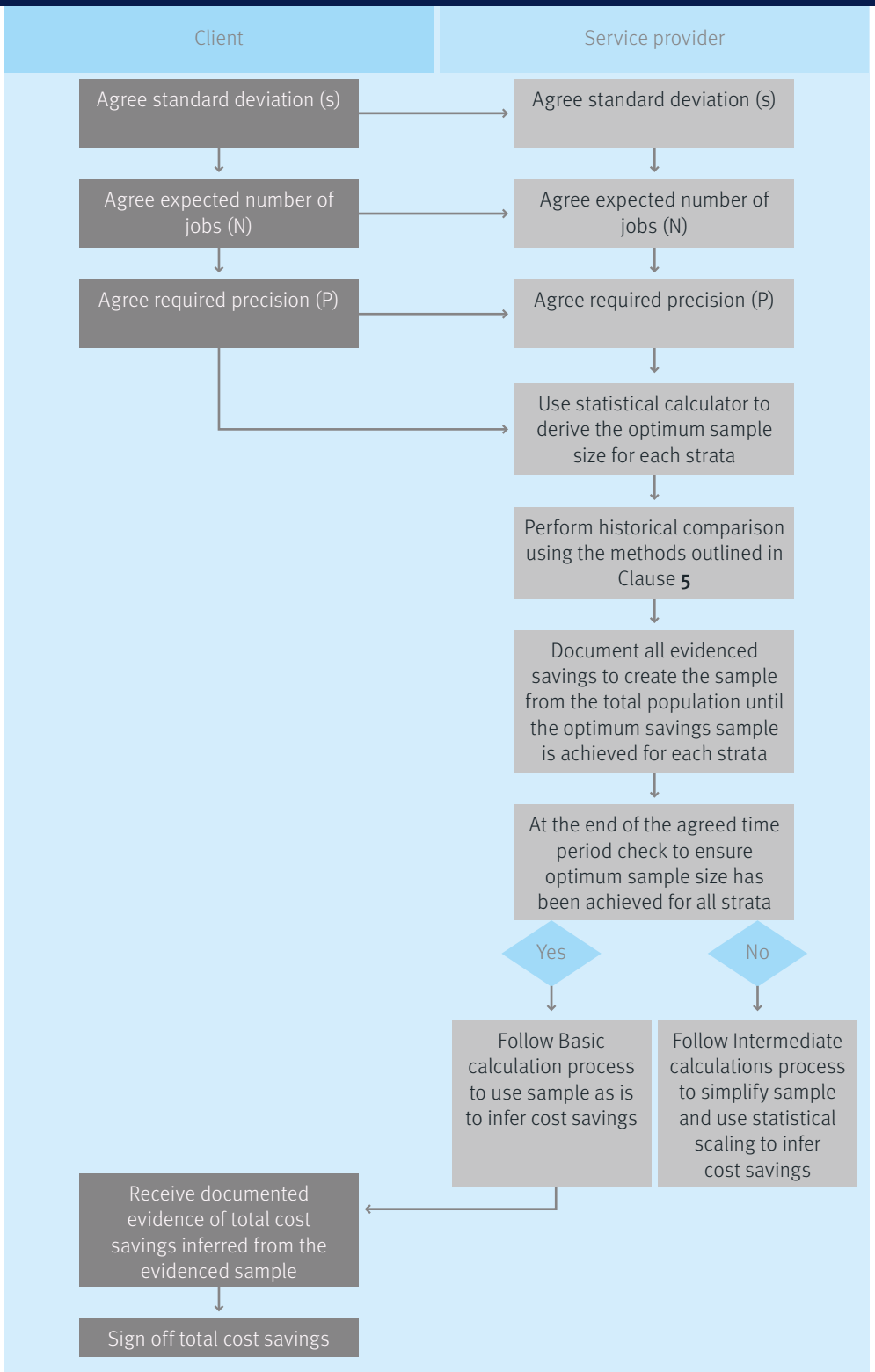
Advanced sampling stratification differs to Intermediate significantly in the respect all issues are considered and planned before any benchmarking or comparison or calculations take place. An optimum sample size is calculated and following an agreement on strata types between the client and service provider, the required number of jobs for each strata in the sample is derived using an estimate of the proportion expected in the contractual period for each job type.

The process of evidencing cost savings through historical specification comparison activities then aims to achieve the required number of jobs in each strata to obtain an identical proportion to job types in the contractual period. If the exact optimum sample size as planned is achieved within the contractual period for each strata the principles of basic sampling can then be followed; ie the evidenced cost savings sample can be used in its entirety as a proportionately accurate in relation to what the total cost savings would have been for the total population.

If for any reason an exact proportion match cannot be achieved, statistical scaling should be applied to the calculations when inferring total costs savings, and thus the calculation process for Intermediate sampling should be adopted.

The process steps that need to be taken for Advanced sampling are described in Figure 11.

Figure 11 – Advanced sampling process flow



STEP 1 Agree on standard deviation(s), estimated number of jobs in the time period and the required precision of the inferred total cost savings:

Worked example

For the purposes of this exercise the following values will be used:

the variation between jobs can be estimated using a standard deviation of 20;

the expected number of jobs in the contractual period is 1000;

the required precision (P) of the inferred total cost savings is 2.5%.

STEP 2 Use the Statistical Calculator in Annex E to derive the optimum sample size (n*). The statistical calculator uses the following formulae to derive n*:

$$n_0 = \left(\frac{1.96 \times s}{P}\right)^2$$

$$n^* \geq \frac{n}{1+\left(\frac{n_0}{N_0}\right)}$$

where:

1.96 is a standard coefficient associated with a 95% confidence interval;

s is the estimated standard deviation;

P is the required (%) precision of the confidence interval, where P is half the range of the confidence interval;

N_0 is the optimum sample size that considers the population size.

Worked example

$$n_0 = \left(\frac{1.96 \times 20}{2.5}\right)^2 = 245.86$$

$$n^* \geq \frac{245.86}{1+\left(\frac{245.86}{1000}\right)} = 197$$

STEP 3 Determine the strata and calculate the number of jobs to target in each strata based on expected and agreed proportions (p_i) for each job between the service provider and client. The number of jobs to target in each strata (n_i) is calculated using the following formula:

$$p_i \times n^* = n_i$$

Table 16 provides a worked example of this calculation.

Table 16 – Worked example

Strata (i)	Proportion (p_i) expected in the contractual period	Number of jobs required in the sample (n_i)
Continuous forms	0.3	59
Direct mail	0.3	59
Envelopes	0.1	20
Labels	0.1	20
Marketing print	0.1	20
Merchandising	0.05	10
Point of sale	0.05	10
Total	1	197

e.g. for continuous forms jobs: $P_1 \times n^* = 0.3 \times 197 = 59$

STEP 4 Follow the historical specification comparison process (Clause **5**) until the optimum sample size for each stratum is achieved. Document all evidenced cost savings jobs within the time period.

STEP 5 If the required number of jobs in each stratum can be achieved and the expected size of the contractual period (N) approximately matches the expectation, follow the calculation process as outlined for Basic sampling (see **6.6.1**).

If the required number of jobs in each stratum cannot be achieved or the expected size of the contractual period does not approximately match the expectation, follow the calculation process as outlined for Intermediate sampling (see **6.6.2**), which applies statistical scaling to the calculation process.

6.6.4 – Results and conclusions

Basic sampling provides a good starting point for new clients and service providers. Minimal data analysis is required. The calculated cost savings using this methodology total cost savings and associated confidence range of the total cost savings can be found in the worked example summary in **6.6.1.3**.

Stratification is not used in this methodology therefore the result is potentially more biased than the other methods.

The Intermediate sampling method provides more accurate results for clients and service providers due to the use of stratification. The calculated total cost savings, using this methodology, are found in Table 14. It is also possible to construct confidence intervals around each individual strata, evidenced in Table 15.

In this methodology, an optimum sample size for each strata is unknown prior to activities.

The Advanced Sampling method is the least biased and can result in a reduction of activity due to the derivation of an optimum sample size for each strata prior to activities. An optimum sample size for each strata can be calculated as shown in Table 16 and then either the methodology for Basic or Intermediate sampling is applied in order to calculate total cost savings.

This methodology is complex and can be hard to achieve with so many dependent factors.

7 – Approach B: Comparison methods for measuring cost savings in the absence of a data set

7.1 – General

In the absence of a historical qualifying baseline dataset to measure actual cost savings the following methods can be used to measure buying effectiveness by mutual agreement of the client and service provider.

Any cost savings derived and recorded as a result of any of the following methods should be added to the service provider's cost savings pot only at the end of the reconciliation period and should clearly demonstrate the route from which the total cost savings were derived.

All the various alternative methods detailed in **7.2** to **7.6** present differing pros and cons, but only a "spot check" will demonstrate historical cost savings against specific jobs that may not even be required to be procured in the current contractual period, meaning the cost savings returned should be considered indicative rather than actual.

These options should be considered valid in Contract Year 1 only. After this time, the service provider will have built up a data set for use in contract Year 2 onwards and historical specification comparison methodology should take precedence.

NOTE 1 This PAS includes reference to all available alternative comparison methodologies in the absence of a qualifying baseline data set; however, these have been included in brief and for the sake of completeness. The focus of this PAS remains the process of measuring savings in the presence of a historical qualifying baseline data set.

NOTE 2 The only way to accurately measure and prove cost savings is to compare current jobs with an equivalent historical match (exactly or within a given tolerance). In the absence of a qualifying baseline data set, methods can be followed to generate values that should be considered as sufficient to verify the purchasing effectiveness of the service provider for the client rather than as an accurate figure for deliverable cost savings.

7.2 – Spot check

On the provision of a small sample (the larger the better) of historically procured jobs where an invoice can be produced, the service provider requests current prices for the exact jobs, as per the exact specification of the historical job. The difference between the live quotes returned by the service provider's suppliers and the historical cost paid by the client can be considered as the typical saving.

Often a spot check measure can take place without the need for the item to be procured in the current environment. For this reason this methodology can measure the service provider's leverage and procurement practices leverage and process cost savings only.

NOTE The number of invoices obtained should be carefully considered against the data set criteria in Clause 4. It may be possible for sufficient data to be gathered to create a qualifying baseline data set, at least for some strata.

7.3 – Matrix creation

Typically, procured jobs are presented to the service provider to derive and plot specification data into a matrix. The client then obtains costing from its existing supplier base, using this matrix. The costing results from the client's supply base are then considered as the historical price and naturally form the matrix data set. There are then two options for calculation of cost savings:

a) The prices paid by the service provider can be measured, in accordance with the historical matrix comparison process, against the matrix prices to calculate the cost savings.

b) The supplier can undertake the exercise outlined in **7.2** to determine the cost savings.

NOTE Once a matrix is in place and is able to record prices year on year the process and methodology in Approach A can be followed to measure actual costs savings in this way.

7.4 – Quote-based

This can be used as a mechanism to demonstrate the buying effectiveness of the service provider and the typical prices of the service provider's suppliers.

For each work request the service provider obtains a number of quotes from its suppliers. Based on rules agreed between the service provider and the client, a "base" quote value will be calculated and compared with the price paid by the service provider, to provide some measure of the buying effectiveness. Rules upon which the "base" quote value should be calculated can include:

a) value of highest quote received less the value of the lowest quote received or price provided by the supplier the work is placed with;

b) simple average value of all quotes received;

c) average of quotes received, excluding outlying values (i.e. +/- 25% from average);

d) average of quotes received, excluding the highest and lowest quotes.

This mechanism is not practical in many common situations, including:

- short lead times for which an insufficient range of suppliers are able to provide quotes due to availability of capacity;
- specialist items for which there are an insufficient range of available suppliers capable of undertaking the work.

It is important to note that this method may not be used to determine any cost savings, either historical or versus the market place. It is only useful as an illustration of the variance in the service provider's pricing; all quotes are provided to the service provider and therefore cannot be viewed as representing "general market" prices

Quote-based or market negotiation can be used as a further mechanism to demonstrate the buying effectiveness of the service provider and the typical prices of the service provider's suppliers.

For each new job the service provider should obtain a number of quotes from its suppliers. Based on rules agreed between the service provider and the client, an "opening" quote value should be calculated and this should then be negotiated by the service provider to a "closing" price, which should be paid by the service provider. The difference between "opening" and "closing" price should be calculated as the saving to provide some measure of the buying effectiveness. Rules upon which the "base" quote value can be calculated include:

a) minimum numbers of suppliers requested to quote for work;

b) cheapest quote to be used as "opening" price;

c) one or more suppliers should then be negotiated with to reduce work price. No supplier quote exceeding outlying values (i.e. + 25% from the lowest quote) should be allowed to proceed to a further round of negotiation;

d) "closing" price should be placed with cheapest supplier;

e) the supplier selected to complete the work should have been included in the "opening" price quotation.

This mechanism is not practical in some situations, such as:

- where jobs changing in terms of specification, or quantity beyond the "closing" price, have been agreed and with a supplier set. A full repeat of the process will be time consuming and commercial leverage compromised;
- for specialist items or unique project scope for which there are an insufficient range of available suppliers capable of undertaking the work;
- utilizing this model for extra costs incurred once work has been placed (i.e. deliveries, overtime costs and extra finishing). These activities cannot be quoted to the market, so additional cost savings cannot be obtained in the quote-based market negotiation model.

It is important to note that this method focuses solely on the service provider's ability to negotiate in the market from an "opening" to a "closing" price. The price itself has no bearing on, and does not offer an insight into, historic cost savings or price competitiveness in the current market place. Risks associated with this model include "price creep" as suppliers become aware of the market-based negotiation method and increase the "opening price" over a period of time.

NOTE Market-based negotiation is linked to service provider leverage within the market place. Prices returned from the same supplier may differ for each service provider and client, depending on, for example, quantity, spend, contractual terms, length and nature of relationship.

The client appoints an independent third-party to select a random sample of work undertaken by the service provider from a specified period. The third-party then selects a range of suppliers from which to request pricing on a "blind" basis (i.e. the supplier should not be made aware of the name or nature of the client, nor should the supplier be aware that there is no intention to proceed with the work they are quoting for). The pricing received from the third-party should then be compared with the prices paid by the service provider to determine the leverage cost savings delivered.

This method will indicate only the value of leverage delivered by the service provider, as the specifications will be "like for like". Innovation cost savings cannot be determined, and as the quotes obtained by the third-party cannot be matched to historical costs paid by the client, historical cost savings cannot be calculated.

It is important to consider how the environments in which service providers achieve current quotations differ from those in which a third-party may obtain comparative quotes. These differences should be recorded and acknowledged. Such examples where adverse conditions may exist can include, but are not limited to:

a) paper prices;

b) supplier capacity at a given moment;

c) supplier knowledge of the comparison process;

d) currency.

8 – Approach C: Comparison methods for measuring innovation cost savings

8.1 – General

Innovation cost savings provide an additional mechanism to support cost savings targets for service providers and clients. There are several possible categories under which additional cost savings can be recorded. Some or all may be relevant and the service provider and client should agree which types will be formally recognized within their contractual relationship. This PAS recognises the methods in **8.2** to **8.8**:

8.2 – Value engineering

Value engineering is the process by which alternative specifications, with a lower production cost (to those originally requested by the client) are provided by the service provider. Typically, the service provider should suggest, and the client should agree to, an alternative creative output to the initial suggestion requested by the client, either in the entirety or in the component parts of the required item. In this instance the cost savings is the difference between the original client request and the lower value engineered option suggested by the service provider.

8.3 – Specification standardization or job rationalization

An initiative for Service Providers to take existing repeat jobs and rationalize the number of different specifications to achieve longer production runs with fewer plate changes or formats, resulting in lower unit costs for the client.

8.4 – Reduction of obsolescence

Where service providers can create opportunity to save costs through avoiding wastage and therefore avoid costs such as print on demand, or reduced quantity printing or amount of stock held.

8.5 – Concept cost savings

The service provider can suggest alternative specifications for a product that retains its functional use exactly. Thus the concept of the product does not change but the material of the product, for example, may differ completely.

NOTE 1 An example could be the production of a display that, under client control, was manufactured in metal for a higher cost and, under service provider guidance, may now have identical specification and use, except the material has changed to acrylic, thus a cost reduction.

NOTE 2 The ability to offer cost savings in this area is normally dependent on the service provider being involved in the creative stages of a campaign to ensure the concept is understood.

NOTE 3 This approach can be used in conjunction with, or stand alone from, the value engineering approach.

8.6 – Quantity cost savings or co-production

The service provider has been able to identify and action a bulk purchase across countries/sectors, resulting in a lower total cost than if the requirements were executed individually.

8.7 – Job set-up cost savings

Where another department, division or market within the same client organization can make use of tools or guides, etc. already in place from historical procurement by an alternative department, division or market as initiated by the service provider.

8.8 – Missed cost savings opportunities/conceded cost savings

If suggestions for lower cost alternative specifications or suggestions in line with the above typical methods are rejected but deemed valid by a client contract manager, a missed opportunity or conceded saving can be recorded.

In each of the elements it is essential that the service provider is able to document the details and cost of the initial job requirement/design as requested by the client, together with the new lower cost of production and the alterations suggested by the service provider.

NOTE An example of this may be where use of a clients preferred supplier is mandated over an above an alternative supplier of the service providers' who provides a lower costs for exactly the same result. Other examples can include the client wishing to continue to work with more expensive material rather than utilise a lower cost option.

8.9 – Innovation savings conclusion

Innovation cost savings can be complementary to historical comparison, where a data set is present, as well as the alternative route measuring buying effectiveness in the absence of historical data. It is imperative, however, that the service provider and client are clear on which distinct route the contract is being compared against before innovation cost savings can be accurately calculated. Where a data set is present, the innovation cost savings should be compared with the historical data set, thus demonstrating the monetary value of the cost savings made by moving from the original specification to the new service provider-suggested specification.

Where client and service provider accept any method in Approach B as the contractual method for measuring buying effectiveness, the original specification price should be compared against pricing for the new innovated specification to calculate potential savings.

Whichever of the calculation of cost savings approaches is followed, it is critical that the total cost savings using each method are calculated in isolation to each other. Only at the end of the given time (contractual period) can the total cost savings concluded from any of the methods detailed in this PAS be added together to describe the overall total cost savings achieved by the service provider.

The service provider may use a combination of any of the Approaches (A,B,C) detailed in this PAS, as is most suitable for the individual circumstances of a client or the type of goods or service procured for a client. It should also be noted that the approach chosen may be dictated by the quantity and quality of historical data available.

Where there is insufficient historical data available, the client and service provider should seek to agree an alternative method for measuring cost savings as detailed in Approaches B and C, in an effort to reduce bias during the total cost calculation process. Typically, a different approach may be adopted for specific strata where historical information is not readily available due to the nature of the job. In the print industry, such examples may include the procurement of permanent POS which by its nature is likely to be unique with smaller production runs. It is important to ensure cost savings calculations are finalized in isolation on an approach-by-approach basis. Only when there is a total cost savings figure for each type of approach can these totals be added together to demonstrate total cost savings for the client by a service provider.

In conclusion, this PAS is intended to promote the process of historical comparison in the presence of a qualifying historical data set to calculate total cost savings from an evidenced cost savings sample. More specifically, this PAS is intended to promote Advanced sampling to generate total cost savings calculations with less potential for bias and with greater precision.

However, due to the nature of the BPO industry, it is unlikely the pre-conditions of Advanced sampling can always be met, and as such Intermediate sampling is considered a robust compromise with sufficient accuracy to be deemed good practice in the measurement of cost savings.

In terms of approaches, Approach A should be followed in the first instance for as many strata as possible. If this is not possible due to the constraints of access to sufficient historical data, then Approach B should be adopted. Innovation cost savings derived through the methods in Approach C, can and should be used to compliment both approaches given their progressive objectives.

Statistical variables analysis

A.1 – General

Data from the period July 2008 – December 2009 across a number of sample clients has been subject to detailed statistical analysis to investigate the specification variables that have a material impact on the cost of production. Through the statistical analysis, the relationship between the Gross Product Invoice Value (total cost) and a number of potential variables was tested using the Moods median test, Mann-Whitney test and correlation test. The full results of these tests are shown in Table A.1.

Table A.1 – Full test results

POINT OF SALE	
Variables analysed	**Significance to cost**
Quantity	HIGH
Product	HIGH
Wetproofs	MEDIUM
Wetproof number of proofs	MEDIUM
PDF	LOW
PDF number of proofs	LOW
Cromalin matchprint	LOW
Cromalin matchprint number of proofs	LOW
Laser	LOW
Laser number of proofs	LOW
Match to proof supplied	MEDIUM
Match to proof number of proofs	LOW
Made up	HIGH
Made up number of proofs	MEDIUM
Digital	MEDIUM
Digital number of proofs	LOW
Contract proof	LOW
Contract proof number of proofs	LOW
Changes to proof	LOW
Changes to proof number of proofs	LOW
Drawdown	LOW
Drawdown number of proofs	LOW
Proof details	MEDIUM
Quantity	HIGH
Per unit	HIGH
Max weight	MEDIUM
Belly band	LOW
Plastic tube	HIGH
Box in quantity	MEDIUM
Rubber band	LOW
Maintain number order	HIGH
Dividers in box	LOW
Polywrap	HIGH
Shrink wrap	HIGH
Paper tube	HIGH
Ram bundle	LOW
Rolls	LOW

(Table A.1, continued)

ENVELOPES	
Variables analysed	**Significance to cost**
Quantity	HIGH
Size	HIGH
Format (pocket / wallet)	HIGH
FORMAT – BANG TAIL	HIGH
FORMAT – DEEP FLAP	HIGH
Flap (gummed or self sealed)	HIGH
Opaque (standard or custom design)	LOW
Window finished size 1	MEDIUM
Window finished size 2	MEDIUM
Window finished position left	MEDIUM
Window finished position bottom	MEDIUM
Window front or back	HIGH
Window type	HIGH
Label tip on YES / NO	HIGH
Label tip on inside outside	LOW
Label tip on label quantity	HIGH
PtIE face total number of colours	HIGH
PtIE face 4 colour process	HIGH
PtIE reverse total number of colours	HIGH
PtIE reverse 4 colour process	HIGH
Print method	HIGH
Paper weight	HIGH
Flap size	LOW
Plate changes	HIGH
LABELS	
Variables analysed	**Significance to cost**
Paper and laminates	HIGH (due to high paper content and current paper costs. The same applied to laminate)
Type; coated/uncoated	HIGH
GSM	HIGH
Quantity	LOW/HIGH (lower volumes will generate higher prices)
High volume	LOW
Low volume	HIGH
Size	LOW/HIGH (dependant on use of std sizes e.g. address label)
Standard form depths and reel widths	LOW
Non-standard form depths and reel widths	HIGH (odd shapes i.e. key format, piggieback format etc)
Layout	LOW
Number across	LOW
Number down	LOW
Sprockets	LOW
Bleed	LOW
Single/double cut	LOW
Number of versions/colours	LOW/HIGH (dependant on volume and number of versions/colours)
Low number of high volume versions	LOW
High number of low volume versions	HIGH
Low number of plate and colour changes	LOW
High number of plate and colour changes	HIGH
Process colours	LOW
Spot colours	LOW
Coatings/varnish	MEDIUM

(Table A.1, continued)

Finishing and ancillary requirements	MEDIUM/HIGH (dependant on complexity of ancillary requirement)
Delivery reel or sheet	LOW
Sheet, boxed, ream wrapped paper/film	LOW
Personalised simplex method	MEDIUM/HIGH
Type of glue (peelable/low tack etc)	MEDIUM/HIGH
Reel direction	HIGH
Kiss cut	HIGH
Die cut (number and position)	MEDIUM/HIGH
CONTINUOUS STATIONERY	
Variables analysed	**Significance to cost**
Paper	HIGH (due to high paper content and current paper costs)
Type; coated/uncoated	HIGH
GSM	HIGH
Quantity	LOW/HIGH (lower volumes will generate higher prices)
High volume	LOW
Low volume	HIGH
Size	LOW/HIGH (dependant on use of standard sizes e.g. 12"×450mm)
Standard form depths and reel widths	LOW
Non-standard form depths and reel widths	HIGH
Layout	LOW
Number across	LOW
Number down	LOW
Sprockets	LOW
Bleed	LOW
single/double cut	LOW
Number of versions/colours	LOW/HIGH (dependant on volume and number of versions/colours)
Low number of high volume versions	LOW
High number of low volume versions	HIGH
Low number of plate and colour changes	LOW
High number of plate and colour changes	HIGH
Process colours	LOW
Spot colours	LOW
Coatings/varnish	MEDIUM
Finishing and ancillary requirements	MEDIUM/HIGH (dependant on complexity of ancillary requirement)
Delivery reel or sheet	LOW
Sheet, boxed, ream wrapped paper/film	LOW
Personalised simplex/duplex	MEDIUM/HIGH
Labels, number and position of (front and/or reverse)	MEDIUM/HIGH
Perferations, number and position of, horizontal, vertical, pattern	MEDIUM/HIGH
Suction holes, number and position	MEDIUM/HIGH
Re-moist glue position of, front and/or reverse	MEDIUM/HIGH
Die cut, number and position	MEDIUM/HIGH
Scratch off, number and position of, front and/or reverse	MEDIUM/HIGH
DIRECT MAIL	
Variables analysed	**Significance to cost**
Quantity	LOW
Pack style	HIGH
Number of records	HIGH
Number of inserts in pack	HIGH
Data preparation (= template within a template / expanded below) YES / NO	LOW

(Table A.1, continued)

Finishing (= template within a template / expanded below) YES / NO	HIGH
Data preparation	
Estimated records	HIGH
Quantity	HIGH
Finishing	
Versions	HIGH
Number up	HIGH
Finished size – width	HIGH
Finished size – length	HIGH
Perforation	MEDIUM
Slit / nest	HIGH
Re-moist	HIGH
Label tip on	HIGH
Enclosing	
Pack size	HIGH
Versions	HIGH
Quantity	HIGH
MARKETING PRINT	
Variables analysed	**Significance to cost**
APPLICABLE TO SINGLE AND BOUND PIECES	
Quantity	HIGH
Finished size – COVER	HIGH
Finished size – TEXT – size 1	HIGH
Orientation	MEDIUM
Number of pages – COVER	MEDIUM
Number of pages – TEXT	HIGH
Number of colours – COVER	HIGH
Cover side 2 total Number of colours	HIGH
Number of colours – TEXT	HIGH
Text side 2 total number of colours	HIGH
Plate changes – TEXT	HIGH
Plate changes – COVER	HIGH
Cover; paper category	MEDIUM
Cover; paper weight	HIGH
Text; paper category	MEDIUM
Text; paper weight	HIGH
Finishing details Y/N	HIGH
Folding trimming	MEDIUM
Die cutting	HIGH
Binding	HIGH
Label tip on	MEDIUM
Label tip on label size	MEDIUM
Die cut	HIGH

NOTE Variables not represented in the above table have not been tested. This may be due in part to insufficient data available to draw an accurate conclusion. The potential significance of any specification variable should not be assumed. The process in A.2 should be followed to draw conclusion for future reference.

Each analysis features a dependent variable and an independent variable. The independent variable is typically the variable representing the value being manipulated or changed, and the dependent variable is the observed result of the independent variable being manipulated. For this process, the dependent variable is Net Unit Price, calculated by dividing the Net Buy by the Delivered Quantity.

Where the dependent variable is normally distributed (symmetric and bell-shaped), a parametric form of analysis should be conducted. In other situations, a non-parametric form of analysis should be used. Net Unit Price is not normally distributed, so non-parametric forms of analysis should be used.

When the independent variable is qualitative (categorical) and there are only two categories, a Mann-Whitney test is an appropriate methodology.

When the independent variable is qualitative (categorical) and there are more than two categories, a Mood's Median test is an appropriate methodology.

When the independent variable is quantitative (numeric), a correlation test is an appropriate methodology.

NOTE References[2,3] related to the procedures of applying the Mood Median Test, the Mann-Whitney Test and the Correlation test can be found in a number of statistical text books and in statistical software packages (see bibliography).

Influencing factors outside baseline data set control

Various factors outside the service provider's control may have material impact on the baseline data set and the subsequent calculated cost savings measurement. These factors may include:

1) Paper price:

   The baseline costs should be adjusted by relevant movement in paper costs in the time since the baseline period, based on a recognized industry standard index (e.g. RISI) in proportion to the estimated proportion of the total costs that are paper costs.

2) Inflation:

   The client and service provider may agree that the baseline costs should be adjusted by the movement in the prevailing inflation measure (e.g. RPI, CPI, AEI) in the time since the baseline period.

3) Currency impact:

   To eliminate the distorting effects of movements in currency exchange rates, the data set should contain details of purchases made, in the committed currencies. For the purposes of determining the historical cost for comparison, the historical cost should be converted to the local currency based on the prevailing exchange rate, to allow a true comparison.

4) Force majeure events:

   The client and service provider should agree on the severity of the issue and come to mutually acceptable terms to move forward.

5) Energy prices:

   Significant spikes in energy prices can have an immediate adverse effect on production costs and the impact of this should be acknowledged.

Minimum sample size for statistical validity of total calculated cost savings

C.1 – General

In this PAS, statistical principles have been theoretically adhered to where practically feasible. The methodology used to derive the calculation of cost savings is based on normal distribution theory using specifically the central limit theorem as a core principle. The application of the normal distribution is most relevant when the data under analysis is normally distributed. There is also plentiful evidence to suggest that it is appropriate to apply normal theory when the size of a sample size is greater than 30. When sample sizes are small (a rule of thumb is less than 30) and the data is not approximately normally distributed, the resulting calculations involving normal theory become less valid. The authors of this PAS recognize that there will be times when data sets under analysis are of a small sample size and hence the validity of such calculations can be theoretically questionable. In such cases, where small sample sizes are very frequent, the authors of the PAS would advocate the use of a statistician to identify a more appropriate statistical theory to apply (e.g. a non-parametric test) to calculate total cost savings.

C.2 – Normal distribution theory and the central limit theorem

The confidence intervals in this Annex have been established using normal distribution theory and the central limit theorem. If a population mean is estimated using the sample mean from n observations from a distribution with variance σ^2, then if n is large enough the central limit theorem can be applied to obtain an approximate 95% confidence interval of the form:

where:

$\bar{x}$ is the sample mean;

1.96 is a standard coefficient associated with a 95% confidence interval;

s is the standard deviation of the sample;

n is the sample size;

N is the population size.

30 is a general rule of thumb used by statisticians to ensure that the application of the central limit theorem leads to greater statistical validity; hence the evidenced cost savings sample should always include a minimum of 30 jobs to ensure greater statistical validity of the total calculated cost savings.

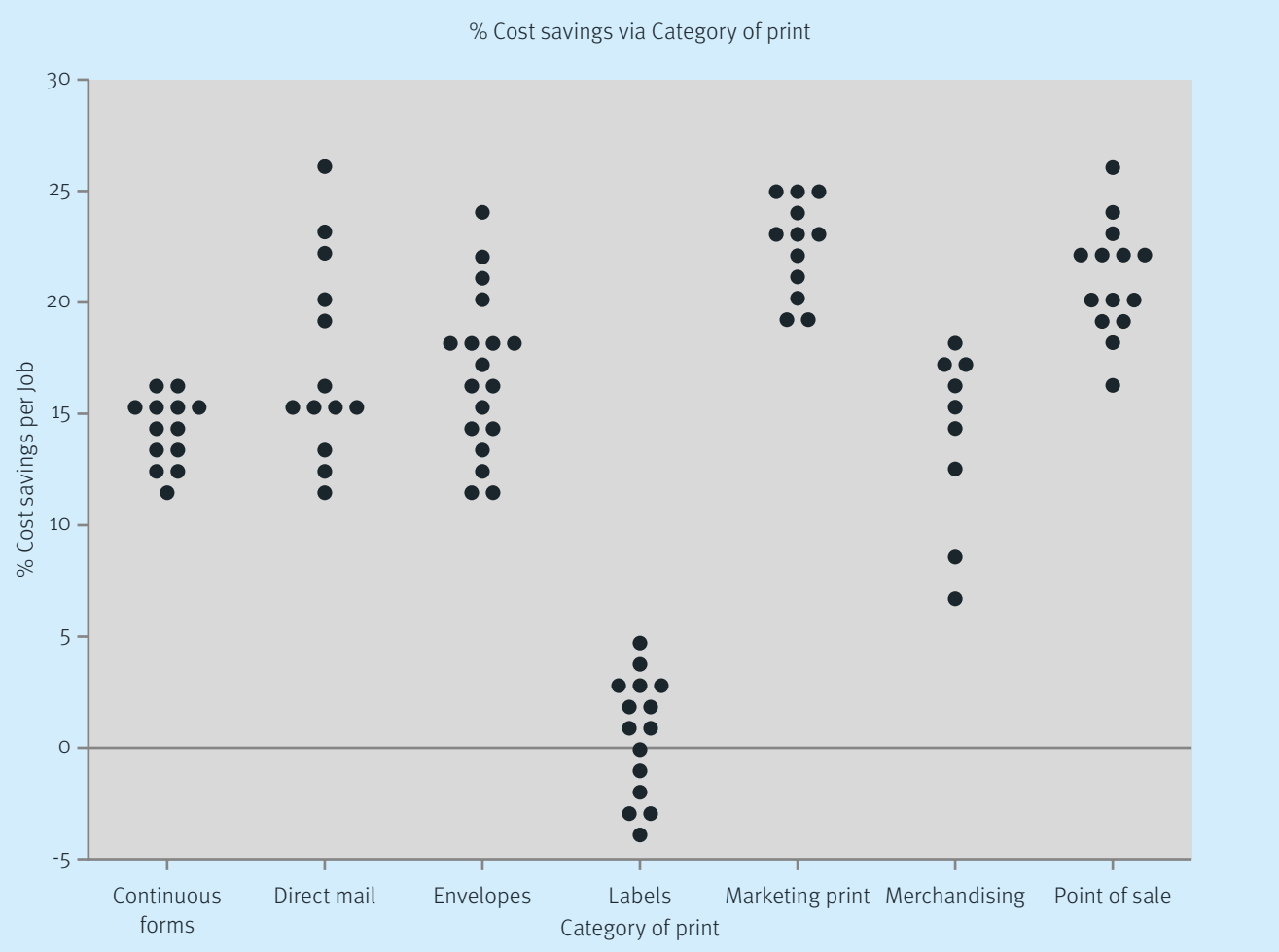
NOTE As the sample size increases beyond 30 towards infinity, the statistical inference of total cost savings becomes increasingly valid due to the central limit theorem.

Statistical evidence of stratification results

This Annex describes how differences between the make-up of jobs in any given time period, compared with the make-up of the sample, can bias the calculation of total cost savings, demonstrating the advantage of sampling approaches other than Basic sampling.

Statistical analysis of the database of the authoring sponsor of this PAS has shown that different types of job (i.e. strata) are associated with different levels of cost savings (see Figure 12). In the Basic sampling approach, strata are not considered; as such, the calculation of total cost savings has an increased risk of bias. In the Intermediate and Advanced approaches, strata are considered, and the calculation process takes into account the make-up of the overall contractual period rather than just the sample. Statistical scaling is applied to the calculations when calculating total costs savings in an attempt to account for the differences between the sample and contractual period proportions.

Figure 12 provides evidence that different types of job are associated with different levels of cost savings (hence, demonstrating the advantage of using strata). Jobs related to labels, for this particular contractual period, do not, on average, generate cost savings for the client. The dots in Figure 12 represent cost savings values for jobs, with the “average of the dots” approximately zero for labels. However, it can be seen that jobs related to marketing print and point of sale generally provide a higher level of cost savings to the client (the “average of the dots” is greater than zero). For this particular time period, a much higher proportion of jobs related to labels was contained within the sample, compared with the actual proportion of labels jobs in the whole contractual period. Therefore, if only the Basic sampling procedure were to be adopted, total cost savings for the whole contract inferred from the sample would be statistically biased towards a lower total cost savings estimate; more labels jobs were in the sample compared with the actual proportion in the whole contractual period. In this case, the bias is in favour of the client.


% Cost savings via Category of print
% Cost savings per Job
30
25
20
15
10
5
0
-5
Continuous forms
Direct mail
Envelopes
Labels
Marketing print
Merchandising
Point of sale
Category of print

Statistical Calculator detailed workings

The Statistical Calculator is used predominantly for the Advanced sampling methodology.
It is used to calculate an optimum sample size for the comparison sample and subsequently to calculate the number of jobs required in the sample for each stratum. The Advanced methodology is discussed in **6.6.3**, and the formulae for calculating the sample sizes and strata sample sizes are detailed in steps 2 and 3 in **6.6.2.4**.

Users of the Statistical Calculator should:

a) input the standard deviation(s) in terms of percentage (in the corresponding black cell);

b) input the number of jobs expected in the contractual period (N);

c) input the required precision (P) of the confidence interval (half-width of the CI) in terms of percentage;

The number of jobs required in the sample, n* is to be calculated. Users of the statistical calculator should then:

d) Input the expected proportion of jobs (pi) for each stratum into the corresponding black cells.

The number of jobs required in the sample for each type of job (ni) is then calculated.

Standard deviations	20.00%	n	245.86
No. of jobs in the contractual period (N)	1000	Number of jobs required in the sample (n*)	197
Required precision (P) of the CI (half width of the CI)	2.50%		

Strata (i)	Proportion (p_i) expected in the contractual period	Number of jobs required in the sample (n_i)
Continuous forms	0.3	59
Direct mail	0.3	59
Envelopes	0.1	20
Labels	0.1	20
Marketing print	0.1	20
Merchandising	0.05	10
Point of sale	0.05	10
Total	1	197
Need to input data into black cells		

[1] McKinsey and Nasscom, 2006, Benchmarking India's Business Process Outsourcing.

[2] Dr. Graham Currell, Dr. Antony Dowman, Essential Mathematics and Statistics for Science: 2nd Edition, ISBN 978-0-470-69448-0.

[3] Prem S. Mann, Introductory Statistics Seventh Edition International Student Version, ISBN 978-0-470-50583-0.

[4] MINITAB Statistical Software (www.minitab.com)

British Standards Institution (BSI)

BSI is the independent national body responsible for preparing British Standards and other standards-related publications, information and services. It presents the UK view on standards in Europe and at the international level.

BSI is incorporated by Royal Charter . British Standards and other standardization products are published by BSI Standards Limited.

Revisions

British Standards and PASs are periodically updated by amendment or revision. Users of British Standards and PASs should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using British Standards would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Similary for PASs, please notify BSI Customer Services.

Tel: +44 (0)20 8996 9001 Fax: +44 (0)20 8996 7001

BSI offers BSI Subscribing Members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of British Standards and PASs.

Tel: +44 (0)20 8996 7669 Fax: +44 (0)20 8996 7001
Email: plus@bsigroup.com

Buying standards

You may buy PDF and hard copy versions of standards directly using a credit card from the BSI Shop on the website **www.bsigroup.com/shop.** In addition all orders for BSI, international and foreign standards publications can be addressed to BSI Customer Services.

Tel: +44 (0)20 8996 9001 Fax: +44 (0)20 8996 7001
Email: orders@bsigroup.com

In response to orders for international standards, BSI will supply the British Standard implementation of the relevant international standard, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Knowledge Centre.

Tel: +44 (0)20 8996 7004 Fax: +44 (0)20 8996 7005
Email: knowledgecentre@bsigroup.com

BSI Subscribing Members are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.

Tel: +44 (0)20 8996 7002 Fax: +44 (0)20 8996 7001
Email: membership@bsigroup.com

Information regarding online access to British Standards and PASs via British Standards Online can be found at **www.bsigroup.com/BSOL**

Further information about British Standards is available on the BSI website at **www.bsigroup.com/standards**

Copyright

BSI

389 Chiswick High Road London W4 4AL UK

Tel +44 (0)20 8996 9001
Fax +44 (0)20 8996 7001
www.bsigroup.com/standards

raising standards worldwide™

BSI 389 Chiswick High Road London W4 4AL United Kingdom
www.bsigroup.com