ANALYSIS OF SURVEYOR VARIABILITY FROM DATA OBTAINED FROM SURVEYS OF DWELLINGS REPRESENTED ON VIDEO FILM.

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The surveying of houses is not an exact science. A survey is largely based on what are essentially subjective judgements by surveyors. These judgements are based upon the available evidence of the condition of a house, the judgement of one surveyor may well differ from another's, even if the judgement is based on the same evidence. This phenomenon is termed *surveyor variability*. This paper seeks to explore the issue of variability in the field of house condition surveys, from data obtained from a training exercise using video film of dwellings. The exercise was undertaken in 1996.
The results of the analysis of surveyor performance show a wide range of repair costs for both of the dwellings in the video. The findings raise issues for both individual house surveys and large sample size surveys in terms of the accuracy of repair cost estimation for dwellings. The paper concludes that no one technique is likely to significantly improve the consistency of surveyors, and that a reduction in the potential for subjective decisions is the quickest, but not necessarily the best, strategy to reduce variability.

Keywords: decision-making, house survey, repair cost, variability, video, surveyor.

INTRODUCTION

The occurrence of variability in house surveys is not really surprising. In most fields of endeavour where human beings are asked to make judgements and decisions based on varying degrees of subjectivity, some variability is inevitable. The propensity for professionals to be variable in the decision making process has been explored in other areas, notably the medical profession e.g. [Skaner et al, 1998], [Lip et al, 1996], social work [Gordon and Gibson, 1998], psychology [Mcmann and Barnett, 1993] and occupational therapy [Bellini et al, 1996]. The general area of business decision making is also open to the variable tendencies of human beings – the field of accountancy (e.g. the valuation of assets and the calculation of depreciation rates), are particular examples [Zopounidis C, 1999]. Work on assessing the accuracy (and therefore the variability) of other professionals in the construction industry has also been undertaken. Such work has usually been focused towards those professions based on estimating financial values for building projects [Skitmore et al, 1990] and the accuracy of property valuations e.g. [RICS, 1996], [Baum et al, 1996]. The decision making process has been described as an art rather than a science [Taylor 1978].

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This paper discusses the issue of surveyor variability in house condition surveys. It reviews types of variability, before describing video exercises used to assess surveyor variability. The results of the video exercises are discussed and used to draw a number of conclusions.

TYPES OF VARIABILITY

Whilst the term Surveyor Variability has become something of a *de facto* standard in the literature and general discussion, and is a valid description in the context described above, variability manifests itself in two other critical ways.

Surveyor bias

This can be described as a particular surveyor consistently rating the condition of a particular element either strictly or weakly. A hypothetical example might be a surveyor, from an environmental health professional background, consistently marking food-making amenities as inadequate, whereas another surveyor, say from an architectural background marks the same amenities as perfectly adequate.

Surveyor drift

This is the phenomenon whereby a group of surveyors carrying out a survey in one year are shown, as a group, to be raising or lowering the overall average propensity to rate dwelling condition strictly or weakly in another year. ‘Strictly’ would infer that a surveyor has a propensity to take the worst case scenario in terms of specifying building defects and treatments to those defects (and therefore estimating higher repair costs). ‘Weakly’ would infer the opposite i.e. a surveyor shows a propensity to take the best case scenario (leading to correspondingly lower repair costs). A hypothetical example may be surveyors undertaking a house condition survey in 1986 when the general property market was in boom, marked very weakly. Perhaps the general attitude was ‘anything sells’, therefore ‘anything’s OK’. This could be compared to a survey undertaken in 1991 when the market was in recession where, perhaps, the general attitude of surveyors was to mark strictly. The video houses described in Section 3 are used to gauge this phenomenon.

Use of the phrase ‘Surveyor Variability’

Because the phrase ‘surveyor variability’ has become a standard, this will be the term used in this report as meaning the general case of variability. Where the issue is actually particular to either bias or drift those terms will be used specifically.

The phrase ‘surveyor variability’ has been found by the author to give certain people the message that they should equate it with ‘surveyor error’. This is not necessarily the case; readers should regard variability as a difference in opinion, but not necessarily an error of judgement. This issue will be explored later in the paper.

VIDEO EXCERSICE ON SURVEYOR VARIABILITY

Introduction

The analysis in this paper is based on data collected from an exercise to test surveyor variability by the use of two houses represented on video film, known as *video calibrations.* The exercise was undertaken in 1996.

The houses were filmed specifically for this exercise. An in-depth study of the use of the videos was undertaken in 1985 [Nicol 1986], and the utility assessed. Nicol found that the videos did achieve their initial primary objective, which was to allow surveyors to make judgements of house condition. The main advantage is that all surveyors could 'see' the same dwelling, at the same time, in the same condition of repair. The video calibration is undertaken in a classroom environment, and is used mainly as a mechanism for surveyors to gain familiarity with a survey form and survey methodology, before undertaking surveys 'in the field'. The video calibrations can also be used to identify surveyor drift. The videos capture the condition of a dwelling at a certain point in time. To represent this in reality would mean that a dwelling would need to be sheltered from any outside factors that may influence its condition, such as the weather. This would be extremely difficult and expensive.

The main author had access to the original survey forms of 38 surveyors, relating to two video houses, known as Brompton Mount, and Walker Road. Copies of the videos of both Brompton Mount and Walker Road were also available.

Descriptions of the dwellings
To orientate the reader, photographs of Brompton Mount and Walker Road are shown in figures 1 and 2 below. Brompton mount is a 'back-to-back' terraced house (with only one 'face'), while Walker Road is a traditional 'through' terrace.

Front View

Front View Back View

Figure 1: Brompton Mount **Figure 2**: Walker Road

DATA COLLECTION AND MANAGEMENT

The survey methodology.
The video survey methodology was based on a paper based data collection form. A 'tenths' methodology is employed, whereby the surveyor mentally splits an element into tenths of area and makes judgements as to the quantities of repairs required to an element based on this. The surveyor also splits a dwelling into two 'views', i.e. back and front. This is to try and make the task of surveying a dwelling easier.

The 38 original survey forms for each video dwelling (i.e. 76 forms in total) were collated, identification numbers checked for each surveyor, and the required data was entered into databases set up in the statistical analysis software package SPSS. Each form was entered twice to ensure that no errors were introduced by the author's inaccurate punching of the data. The variability of data punchers has been identified as a source of error in survey data analysis [Larham 1997] and the problem of coder variability has been the subject of previous studies [Kalton and Stowell 1979]. The negation of the potential variability in data entry increases the reliability of the measurement of the actual surveyors variability.

Selection of elements for analysis

The surveyors taking part in the video calibration exercise were required to complete the video surveys for both Brompton Mount and Walker Road for interior and exterior elements. For the purposes of this report, however, only the following exterior elements were included.

Chimneys; Roof Structure; Roof Covering; Wall Structure; Wall Finish; DPC; Windows; Doors and Frames

DATA ANALYSIS.

From the surveyors judgements as to the treatments required for each element the resulting file was aggregated to give an overall cost (i.e. the sum of all treatments) for each dwelling. For example, if Repair wall finish =£X, Paint wall finish =£Y; then Total cost for wall finish = £X + £Y.

A breakdown of the mean, range, minimum, maximum and standard deviation for each element (for all surveyors) investigated, as well as the total cost, for each dwelling is given in Tables1-3 below.

Table 1: Breakdown of Elements Overall - Brompton Mount.

Element	Range	Minimum	Maximum	Mean	Std. Dev
Total Cost	3168.25	150.51	3318.76	1371.85	680.94
Chimneys	669.47	0.00	669.47	302.50	188.26
Roof Structure	459.13	0.00	459.13	81.90	136.94
Roof Covering	1210.62	0.00	1210.62	318.56	295.73
Wall Structure	0.00	0.00	0.00	0.00	0.00
Wall Finish	458.64	0.00	458.64	60.51	106.47
DPC	139.84	0.00	139.84	37.79	62.96
Windows	2072.10	104.60	2176.70	537.41	440.89
Doors/Frames	109.32	0.00	109.32	51.83	43.94

Table 2: Breakdown of Elements Overall (Front View) -Walker Road.

Element	Range	Minimum	Maximum	Mean	Std. Dev
Total Cost	2531.63	301.08	2832.71	1310.42	580.12
Chimneys	2023.12	0.00	2023.12	551.56	474.90
Roof Structure	0.00	0.00	0.00	0.00	0.00
Roof Covering	253.16	0.00	253.16	6.66	41.07
Wall Structure	0.00	0.00	0.00	0.00	0.00
Wall Finish	332.98	0.00	332.98	34.73	61.96
DPC	148.58	0.00	148.58	75.11	74.67
Windows	1190.55	96.57	1287.12	545.00	316.87
Doors/Frames	295.71	0.00	295.71	112.76	91.57

WHY DOES VARIABILITY OCCUR?

The results of the analysis show a wide spread of repair costs to the same dwellings. However, is this due to actual ‘error’ by surveyors? Or are other issues causing the apparent discrepancy?

Table 3: Breakdown of Elements Overall (Back View) – Walker Road.

Element	Range	Minimum	Maximum	Mean	Std. Dev
Total Cost	3823.01	80.00	3903.01	1525.41	964.59
Roof Structure	0.00	0.00	0.00	0.00	0.00
Roof Covering	0.00	0.00	0.00	0.00	0.00
Wall Structure	340.88	0.00	340.88	62.79	133.92
Wall Finish	2208.53	0.00	2208.53	818.51	632.54
DPC	404.30	0.00	404.30	283.01	185.27
Windows	1381.62	0.00	1381.62	263.85	282.28
Doors/Frames	254.32	41.39	295.71	149.39	115.80

The highest, lowest and middle ranking surveyors (Surveyor ID: 35, 20, 31 respectively) for Brompton Mount in terms of repair costs for elements are analysed in more depth in the following section. Roof structure, wall finish and windows have been selected for illustrative purposes.

Roof structure (see Table 4)

Two of the surveyors recommended a repair i.e. strengthen the roof, although a 1/10th difference between the quantity of repair is evident. Both these surveyors thought that the roof structure would last for 50 years after the strengthening had been done. Surveyor #35 recommended no repair, but gave a shorter lifetime of 30 years.

Table 4: Roof Structure

Surveyor Number	Roof Type	Tenths	Faults Identified	Cost £	Replacement Period
20	Pitched	10	Strengthen 2/10	91.38	50
31	Pitched	10	Strengthen 1/10	45.91	50
35	Pitched	10	No Faults	0	30

Wall Finish (see Table 5)

A difference of 2/10ths exists between two of the surveyors, with one stating that no repair is required. The impact of the repairs suggested do not seem to tie in with the replacement period (lifetime). The most comprehensive repair has the lowest lifetime associated with it (10 years). The recommendation of surveyor #31 states no repair but he specifies a long lifetime (25 years).

Table 5: Wall Finish.

Surveyor Number	Wall finish Type	Tenths	Faults Identified	Cost £	Replacement Period
20	Masonary Pointing	10	Renew/Repoint 1/10	45.86	30
31	Masonary Pointing	10	No Faults	0	25
35	Masonary Pointing	10	Renew/Repoint 3/10	137.59	10

Window (see Table 6)

All three surveyors identified the four main sash windows to the dwelling. The ‘windows’ above the front door and the roof light have also been included. Surveyor #31 appears to have identified the roof light to be metal, while the other two identified it as wood casement.

The identification of a metal window against another surveyor’s judgement that the same window is wood casement is quite a rare observational issue. The main impact is in the recommended repairs. Surveyor #31 recommended simply repainting a couple of the sash windows, surveyor #20 also recommended repairing two of the sash windows in addition to surveyor #31's treatment. Surveyor #35 recommended complete renewal of all the windows. This variability in decisions has resulted in a large difference in terms of repair costs for the dwelling.

Table 6: Windows.

Surveyor Number	Window Types Wood Casement	Wood Sash	Metal	Faults Identified	Cost £	Replacement Period
20	2	4	0	Repair 2 Wood Sash	408.52	N/A
				Repaint/Reputty 2 Wood Sash		N/A
31	1	4	1	Repaint/Reputty 2 Wood Sash	104.6	25
35	2	4	0	Replace all Windows	2176.7	25

The task of the surveyor

The preceding analysis raises the question - What is the task of a surveyor? An indication of the stages of thought processes a surveyor goes through when determining the condition of an element may be helpful in seeing where and why variability can occur (see also [Hall, 1999]). The task of the surveyor can be broken down into four main sub-tasks as follows:

<u>Observation – What is it?</u>

The first task the surveyor is required to undertake is that of observation. Put in its simplest form this means answering questions like 'what is the element constructed from?'; 'what is the construction method?'.

<u>Diagnosis- What's wrong with it?</u>

The second task involves the surveyor making a diagnosis of the problem from his observations, for example, determining the origin of damp affecting internal walls; or whether slipped slates indicated a wide spread 'nail sickness'.

<u>Prognosis- What will happen to it?</u>

The third undertaking is to assess the nature of the problem if it were not treated. For example, if a serious looking crack is observed, and the diagnosis is that the crack is due to historic movement, the prognosis may be that no further damage will occur in the future. Taking the example in diagnosis above, the prognosis for damp internal walls may be that, if untreated, damage will occur to superficial parts of the dwelling in the short term e.g. internal decoration, with more serious damage to the dwelling's fabric in the longer term.

<u>Treatment - What will we do about it?</u>

The selection of the appropriate remedial treatment is linked with the prognosis of the defect. For instance, the surveyor may recommend filling in the crack outlined above (but mainly for aesthetic reasons). Similarly, in the case of the damp, a chemical injection may be recommended to halt the advance of the problem.

The level of subjectivity

As already stated, it has been found that human decision making increases in variability with a corresponding increase in the level of subjectivity the decision is based on. The four main decision making processes that the surveyor goes through in reaching the final 'treatment' recommendation have varying degrees of subjectivity. This is shown diagrammatically in Figure 3 below.

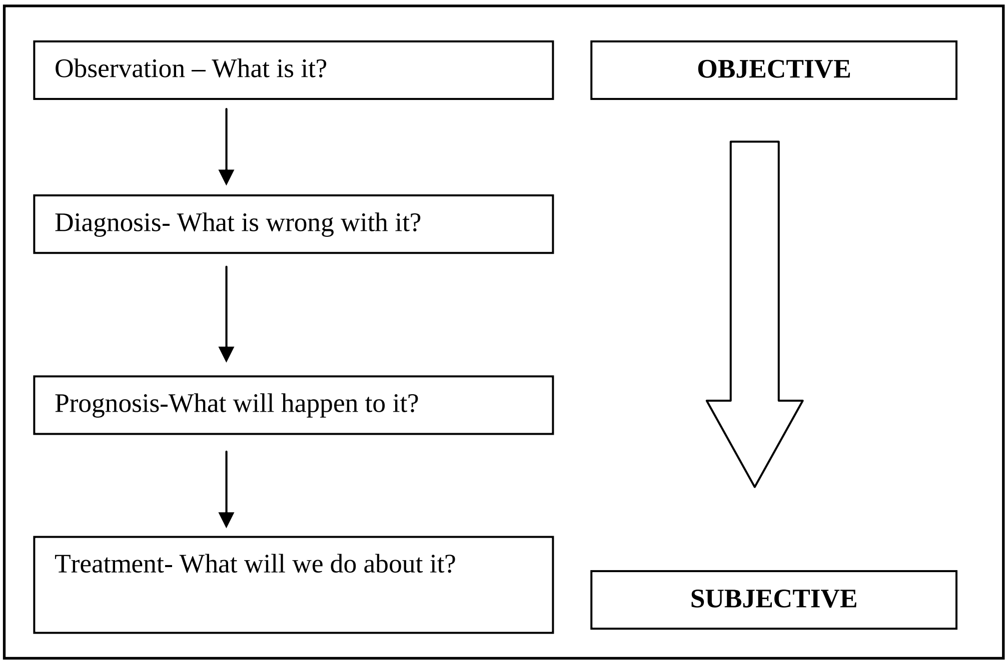

Figure 3: Subjectivity Scale.

It should be clear from Figure 3 that the degree of subjectivity, and therefore the potential for variability, increases with each subsequent element of the surveyors overall task.

THE VIDEO CALIBRATIONS AS A CONTROLLED EXPERIMENT.

As described above, variability increases with the level of subjectivity. There are also more pragmatic reasons for surveyor variability. The possibility that some surveyors may be negligent, unmotivated, not paying attention, not being able to access certain elements to survey them properly, or simply a surveyor ‘having a bad day’ [Elsbach, 1999] are some of the potential reasons. The potential for surveyors to be negligent was highlighted in two recent television broadcasts [Channel 4, 1999], [BBC2, 2000], where a small sample (N=<10) of surveyors were filmed ‘surveying’ a house - missing important defects and simply not doing the job effectively.

The video calibration exercise seeks to reduce the number of opportunities for the introduction of variability, in the following ways:

It gives the opportunity for all the surveyors to ‘see’ the same dwelling;

It makes sure that all the pertinent aspects of the dwelling elements are seen;

The classroom provides a consistent environment for the viewing of the houses i.e. it negates the impact of the weather and other external factors.

Even when these factors are taken out of the ‘variability equation’, variability is still seen to exist. While all the surveyors ‘see’ the same dwelling, it is clear that they do not ‘observe’ the same things and/or do not hold a common view on what is wrong with elements. This could be referred to as the ‘residual’ variability, although there is, of course, still potential for negligence even with videos in a classroom environment.

DISCUSSION AND CONCLUSIONS.

Variability is inherent in human endeavour, and, like variability in medical decision making [Ravitch 1989], [Jeyaseelan L et al 1992]**,** may never be entirely eliminated from the surveying of buildings. What we should hope to achieve is a reduction in variability to try and make the condition survey a more accurate and reliable tool for the overall objectives for which it was carried out. There seem to be two main ways in which variability can be controlled. The first is in reducing the opportunity for the introduction of variability in the field. This may be undertaken by several methods, such as redesigning survey forms, question phrasing and sequencing, surveyor training etc. The interpretation of results at the data analysis stage of the survey can also be subjected to appropriate statistical and other modelling techniques to try and account for any anomalies in the data. Both the field survey variability reduction and post survey statistical methods could also be combined. It is unlikely that any one 'tool' will be adequate in itself to make significant impact in reducing variability, a quote from Watts [Watts 1989], discussing physician variability in relation to the technique of decision analysis, sums this up as

> *'To suggest that this is the only tool [Decision Trees] clinicians need would be a little like suggesting that a balanced diet could consist exclusively of broccoli'.*

What has become clear from the research is that variability is not necessarily associated with error *per se*. The key issue surrounding the variability of surveyors is one of attaining *consistency*. It is clear that surveyors need to be thoroughly briefed in the objectives, desired outcomes in terms of data collected, and in the definitions of survey forms if variability is to be reduced and consistency increased. They need to be aware of the parameters of a particular survey methodology (e.g. they need to consider whether a repair is required to make say, a roof watertight for 20 years, but not for 70 years). Similarly, the option of short term patching should be clearly allowed or disallowed. The clear message is that increased subjectivity leads to increased variability. The problem is one of deciding where to draw a line between removing the opportunity for subjectivity and, therefore, reducing the input of a surveyor in terms of his professional judgement, and allowing the surveyor to use his training and experience to inform his judgements – is this, after all, what is being paid for?

The research project on which this paper is based seeks to develop more appropriate mechanisms for reducing surveyor variability. Early work has focused on variability in construction and other disciplines. Further work will involve the development of tools and techniques for improving consistency in house condition surveys.

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