What's causing the damage! The use of a combined solution-based risk assessment and condition audit

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Abstract

The English Heritage Collections Conservation team cares for a mixed collection distributed among 136 sites. The theory of combining a risk assessment and a condition audit was developed into a practical methodology to guide the collection care needs for such a collection. The audit is proving to be a key tool in increasing our knowledge of the risks to our collections and providing prioritised solutions and costs to reduce these risks. In addition, data from the audit is essential for influencing management and guiding research.

Introduction

Imagine that you have 136 historic sites spread across a country, housing collections of various types and sizes ranging from 10 to 10,000 objects. How do you prioritise limited resources to care for such a varied and dispersed collection?

The decision was taken by the Collections Conservation team at English Heritage (EH) to design a database and methodology integrating a risk assessment and condition survey, based on research undertaken by Taylor [1]. Crucially, it would also specify solutions and costs for the identified damage and risks, providing a means for quantifying the actions required to reduce current and future deterioration of the collections.

This paper describes progress on the development of the EH Risk Assessment and Condition Audit originally outlined by Taylor [1]. It focuses on the methodology behind the audit and the refinements made during the completion of over 100 site surveys to produce results that work in the EH context. This has ensured that the database becomes a useful long-term tool for securing and directing resources at collections at greatest risk of damage.

Background

EH Collections are displayed in largely uncontrolled environments, mostly on open display and in many cases in their original context. For historic houses it is rarely an option to move collections to more suitable conditions as the display philosophy is based on the exhibition of the objects in their original setting. The building can also be regarded as an 'object' in itself, often with significant architecture and interiors, limiting environmental control options. EH sites also include small, often un-manned, museums that depend on display cases to provide security and protection against the environment.

Finding the balance between conservation and display is a major challenge for heritage organisations with dispersed collections. We need to know which risks are actively affecting the collections and the solutions required to prevent this damage. We also need a way of objectively prioritising actions and resources at property, regional and national levels. The development of a solutions based risk assessment and condition audit is seen as a key tool for achieving this goal.

1995 Sampled condition audit

In 1995 EH completed a sampled condition survey of collections at 134 sites based on the methodology developed by Suzanne Keene [2]. This was a major undertaking and took four years and considerable expense to complete. It was instigated in response to a 1988 National Audit Office report, 'Management of the Collections of the English National Museums and Galleries', which raised questions about the condition of the nation's collections [3].

This early large scale condition survey of EH collections produced useful information, including the number of sites with collections (for the first time), an estimate on the total number of objects, a breakdown of the collection by category and a percentage of collections in poor and unacceptable condition. Beyond providing useful high level management data for raising the profile of the collections and arguments for additional resources, it could not verify or predict which risks may be causing damage to collections. It was the intention to survey the condition of the EH collection every ten years in order to measure progress. Unfortunately, outdated software and methodology required that a new approach was needed when the audit was to be repeated.

Progress in the application of risk assessment to the conservation field by Waller [3], Ashley Smith [4], Michalski [5] and Taylor [1] meant that the EH team could develop a new audit that combined both a sampled condition survey and a solution based risk assessment.

TURNING THEORY INTO PRACTISE

The EH Risk Assessment and Condition Audit was developed in collaboration with a researcher (Joel Taylor), practising preventive and objects conservators (Halahan Associates: Frances Halahan, Jennifer Dinsmore and Sophie Budden) and a database designer (St Albans Computer Services).

Using external consultants was the only practical way the audit could be carried out, given the size of the task. However, as the process itself is an extremely useful way to increase understanding of a site and its collection, it was essential that a member of the EH Collections Conservation team would accompany the consultants on all audits. In practice this works well as the team gains an increased comprehension of what is happening at a particular site and having someone from outside the organisation brings in fresh ideas for solutions. Additionally, external consultants balance the concerns of time and budget constraints which sometimes influenced the EH members of staff. When new members of the Collections Conservation team have joined the audit they are fully trained to maintain consistency.

For ease of use it was decided to combine the risk assessment and condition audit within a single software package. St Albans Computer Services was involved from an early stage to design a system based on Microsoft Access™. At the time, Microsoft Access™ was mandated by the EH IT Department for the development of small databases. The database is a single computer program, available on an EH shared drive, but with 'slave' laptops, which are used on site, to import data. Drop down menus remind the auditor of the choices and keeps descriptions to a standardised set of pre-agreed terms.

There were discussions about linking the risk assessment and condition audit database with the EH collections inventory database. However, this would have delayed the risk assessment and condition audit as the collections inventory database was not completed when the audit started.

The pilot consisted of carrying out the audit at two sites. However, with hindsight, a longer pilot may have been helpful, as a number of issues which were later highlighted required changes to the database.

METHODOLOGY

The audit involves four phases, viewing locations within a site and counting objects, selecting the sample, conducting the condition survey and carrying out the risk assessment.

LOCATION AND COUNTING

On arrival at a site, the auditors view all areas where collections are displayed and stored. At a site where objects are housed in different locations with substantially different conditions and management systems, for example a basement store and public showrooms, a separate audit is carried out for each location.

Causes of damage	Examples
Dust, dirt and handling	Dust on an object due to insufficient conservation housekeeping; physical damage due to inappropriate handling, such as chips, scratches or losses.
Light	Fading of dyes and paints, yellowing of supports, embrittlement.
Incorrect Humidity	Cracks, splits, distortion due to low and fluctuating RH; corrosion, mould growth due to high RH
Pests	Damage and soiling due to insect pests, birds, rodents and bats.
Display/Storage conditions	Tarnishing of silver due to inappropriate display case materials; crushing due to overcrowding in storage; Abrasion caused by an inappropriate support.
Documentation	Incomplete or missing documentation, no identifying number marked on an object. A lack of documentation for some objects, e.g. archaeology or natural history specimens, can mean a loss of research value. This can be both symptomatic of poor collection care and may result in further neglect.
Disasters	Fire, flood, theft or vandalism.
Inherent Deterioration	Some materials deteriorate due largely to their composition rather than the conditions in which they are kept. Examples include photographs and plastic.

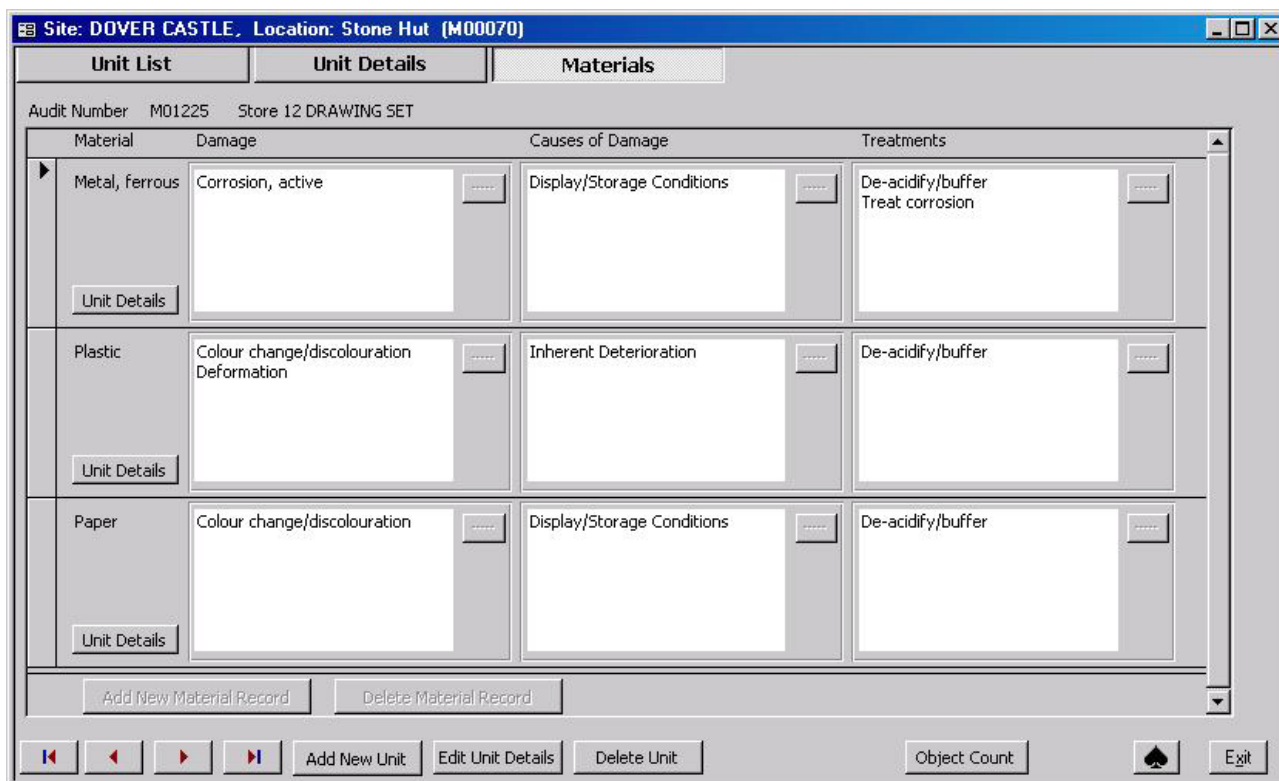Table 1. Causes of damage/ risk factors

Figure 1. Screen from the audit software showing the damage to the different materials, causes of damage and treatments.
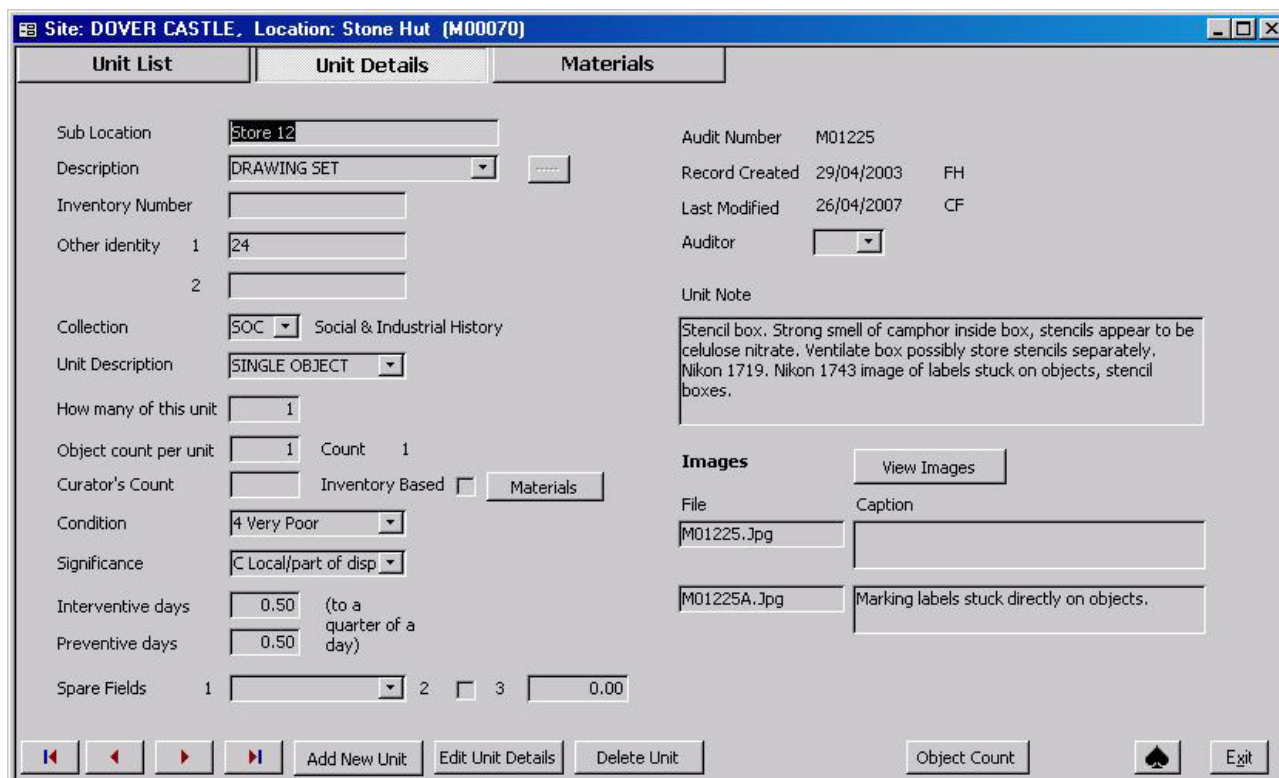

Figure 2. Screen of the audit showing the unit details.

For each location the first part of the process it to count the individual objects and/or 'units'. Units are used to simplify the counting of similar material, for example, a library full of books may be counted as shelves of books instead of individual books. The units or objects are counted as different collection types, archaeology, books and archives, decorative arts, ethnography, fine art, natural history and social and industrial history to enable the data to be subsequently analysed by these groups.

SAMPLE SELECTION METHOD

When the count is entered into the audit software, it will then calculate the number of objects or units in each collection type to be examined. A sample of 5% was chosen for a mixed collection and 2% for a store of similar material, for example, architectural stone fragments. Although it is understood that this sample is not statistically high enough to produce completely reliable and repeatable results, the cost and time implications of carrying out a condition audit on a larger sample across the 136 sites, would make the process too long and too expensive to undertake. Furthermore, the auditors' experiences of other condition surveys demonstrated that this sample size does produce useful information that is representative of the collection as a whole. If the audit identifies that damage has been seen on similar materials in a collection, it will recommend a 100% audit of that part of the collection is carried out.

The selection of objects/units to be audited is carried out by a random number generator incorporated into the software. A consistent method of counting is used to aid identification of the objects in the sample.

CONDITION SURVEY

The condition audit records basic identifying information about each object plus the material(s) from which it is made. The presence of damage to each material is then assessed and recorded. Only damage caused by the present conditions is considered, as the audit seeks to identify and address causes of current damage. For example, scratches to a table caused by historic use are not recorded, but scratches caused by a recent hospitality event would be. It can sometimes be difficult to determine what is current damage, but we rely on the judgement of highly experienced conservators. Damage types for each material are then selected from drop down lists. For example, for iron, damage types include active corrosion and flaking; for paper, tears and fading are among the options. New damage types can be added if there is no appropriate term, but this is only done when absolutely necessary to keep changes to a minimum and to ensure that terminology is used consistently.

The causes of damage are then identified from a list that is the same as the risk factors used in the risk assessment. These are listed in Table 1.

For each type of damage noted, either preventive or remedial treatment, or both, is specified. For example, insect damage found on a piece of wooden furniture is caused by the risk factor, 'pests'. The treatments might include, treat infestation and improve integrated pest management. Although perhaps only one object in a room might be selected as part of the sample to be audited, a finding such as pest activity would highlight the need for further assessment and appropriate action for the whole area.

The decision was taken to use the causes of damage listed above rather than the nine or ten agents of decay, developed by Michalski [6] [7] and Waller [8], because these categories relate to the collection care systems and training provided by the Collections Conservation team [9]. If, for example, the highest risk at a site was identified as 'dust, dirt and handling', then an initial solution may be to send at least one member of staff on the Conservation Housekeeping course, run by English Heritage, Centre of Sustainable Heritage, UCL, which trains people how to handle and appropriately clean historic collections. However, having different causes of damage under one heading has proved difficult when carrying out the risk assessment, as will be discussed later.

The time needed for preventive and remedial conservation is given. Although the audit cannot give the precise amount and details of all remedial conservation needed at a site, as this would require a 100% audit, a very rough but still useful estimate can be gained from the sample audited.

A condition score is recorded, ranging from 1, meaning very good condition to 4, very poor condition. As a means of helping to prioritise the use of resources the significance of the object is also assessed. This can range from internationally significant to something with little or no significance, that might be considered for disposal. Although the auditors use their knowledge and judgement to assess significance, this field can be edited later by the curators, whose knowledge and understanding

of the collections allows them to make a more informed evaluation of significance.

A notes field allows additional information on the object to be recorded. A photograph is taken of each object audited to aid future identification, illustrate damage and, in some cases, to help monitor its condition.

The condition audit, even at 5%, can take several days to complete for a large site, but by the end, the auditors have examined a variety of materials in the collections and have a sound understanding of the damage occurring within the collection. This knowledge can be used as a basis for the risk assessment.

RISK ASSESSMENT

Before the risk assessment can be carried out, a thorough inspection of the site is made and a member of the site staff is asked a set of questions relating to maintenance of the site and the collection care systems in place. These questions correspond to the headings of the causes of damage/risk factors listed above. For example, for humidity, the questions include whether the site staff have been on the Light and Humidity course, if there is appropriate monitoring in place, if there is a control method in place e.g. heating, dehumidification, silica gel or a controlled case and if there are written procedures in place for checking data or replacing silica gel.

The risk assessment is carried out by discussion with all of the auditors who have worked on assessing that location. The yes or no answers to the questions are entered onto the audit database. Initially, the answers were weighted so that a negative answer, usually indicating that a collections care system was not in place, would cause the risk score for that risk factor to increase. However, as each risk factor had a different number of questions and it proved impossible to make the questions equal, the weighting was removed after the pilot run. The questions help the auditors evaluate the risks by clarifying which collections care systems are in place and whether they are working. For example, if insect pests are considered a risk, as the environment suggests that an infestation is possible, but the site has an effective integrated pest management system in place, this will be taken into account when entering the risk data. The second advantage of answering the questions is that when the audit is complete, the database will be able to reveal the number of sites with particular collection care systems in place. This has already proved useful for determining how many sites have trained staff and which courses are most needed. The third, and biggest, advantage of answering the questions is that for every 'no' answer, the software forces the auditor to enter a solution, with a cost. The solutions are not pre-determined, so a solution specific to the site can be given.

The risk assessment is divided into the headings of the risk factors/ causes of damage listed in Table 1. The first question is the probability of damage. Will that risk cause damage in 1 to 3 years, in 4 to10, 11 to 30 or 31 to 100 years? The second issue to consider is how much of the collection will be affected by that risk, few, some, most or all. Finally, the loss of significance to the collection if that risk causes damage is defined as minor, significant or major. The significance is judged by the value of the object to English Heritage. This can be historical, research potential, importance to display/ interpretation of the site and financial. The loss to the significance has to be carefully considered for each risk and type of collection. For example, the loss of documentation for a well known object, such as the Rembrandt at Kenwood, would not be as much of a risk to the significance of the object as loss of documentation for an archaeological soil sample. Without documentation, the Rembrandt would still be identifiable and can be displayed as a work of art, keeping its significance. However, without knowledge of which site and context the soil sample comes from it loses its research potential and therefore its significance.

As mentioned earlier, if a risk factor heading is broad, the risk assessment can be problematic. For example, dust, dirt and handling comprise a combination of risks that have different impacts. Damage from dust compared with poor handling could occur in a shorter timescale, affect more of the collection, but result in less damage; however, both types of damage may need to be considered in the same risk assessment. This was a particular issue for carrying out the risk assessment for disaster as every event from a school child drawing on an object in pencil, to a major fire comes under this heading. To overcome this, the auditors decide what is the most likely disaster based on the questionnaire and inspection of the property and the risk assessment is carried out for the selected disaster only.

USING THE AUDIT

The software produces two scores for each cause of damage/risk factor (listed in table 1), the damage

score and the risk score. The damage score was initially the percentage of the units showing deterioration caused by the damage factor. However, when it was decided to combine the risk and damage scores into an overall score, the damage score was changed to the percentage of units showing damage from a risk factor, out of the total number of units which contain materials susceptible to that damage factor. This was to take account of the quantity of collection at risk, referred to as the fraction susceptible, as this is part of the risk assessment. Previously information would be lost as, if only half the collection was sensitive to light, but all of those susceptible objects were deteriorating, the damage for light would still only be 50% maximum. In addition, only condition scores three and four are counted, as these record significant damage.

The risk score is calculated as:
Probability of damage x Quantity of Collection at Risk x Loss of Value

If there is more than one location at a site, the score for that location will be weighted by the number of objects at that location and the significance of the collection displayed or stored there. Although it would be ideal to treat all of the collections equally, with limited staff time and budgets this is unrealistic and priorities must be made.

A report is produced for each site and once auditing is completed, for each territory. A final national, 'State of the Collections' report will also be produced. The site report, after summarising the damage and risks, concludes with a prioritised table of solutions, with costs, and which department is responsible for undertaking the work. This could be the Collections Conservation Team, the Curatorial team, the Visitor Operations staff who run the site or Facilities, responsible for the maintenance of the building and services. A time scale was added, then had to be rethought as the predicted workload was unrealistic for the Collections Conservation team. Solutions are now described as needing to be carried out urgently, in the short-term or the long-term. The solutions are prioritised by using the damage/risk scores. However, some solutions to one risk will help reduce others. Cleaning of a chimney will reduce the source of insect pests, but may also reduce dust levels around the fireplace and aid ventilation and therefore improve the environment in the room. This is taken into consideration when ranking the solutions.

The Swiss Cottage Museum located in the grounds of Osborne House on the Isle of Wight, is an example of how the audit results have helped improve collection care. Osborne House is a large site composed of a mansion house and various small buildings. The audit was therefore divided into 3 locations with separate risk assessments. Interpretation of the data allowed for the prioritisation of collection care solutions across multiple locations pinpointing the collections at greatest risk and the appropriate action required (Appendix A). Insect pests in the Swiss Cottage collections were deemed the greatest risk due to the open nature of the built structure and the fact that many of the objects displayed there are made of organic materials. This was reinforced by a high damage score for pests, indicating a large number of the condition audits had identified active insect infestations. The risk was addressed by assembling a team who carried out a deep clean of the building and the collections. Many active insect infestations were discovered, verifying the results from the audit.

CONCLUSION

The EH combined Risk Assessment and Condition Audit is close to completion with all the major sites surveyed. Focus is moving from data gathering to the writing, promotion and implementation of site and regional reports. The audit results will guide the work of the Collections Conservation team for the next 10 years. In addition to the data in the site reports, the software has four further types of analysis report. Therefore, further interpretation of the data is possible, allowing any combination of the results. This is already being used to plan research into rates of deterioration. Other areas in which the audit results have already made significant changes include helping to make the case for regional conservator posts, emphasising

Figure 3. Cleaning cases in the Swiss Cottage Museum.

the need for improved emergency planning within EH and helping to identify training needs. The audit was also used to guide the collections care work at Apsley House, which became the responsibility of English Heritage in 2004.

Once the audit is completed, one version will be archived as a snapshot of the collection at this time. A second version will be updated as solutions are implemented to track progress and aid ongoing collection care plans.

Investing in the design and implementation of a combined Risk Assessment and Condition Audit is proving to be a key tool towards improving our understanding of the influence of the environmental conditions on the rates of deterioration and how to address these risks in a systematic way. It is also providing a convincing independent assessment used to influence management of the priorities and investment required to safeguard the collections.

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9 The five courses the Collections Conservation team run in partnership with the Centre of Sustainable Heritage, UCL are: Conservation Housekeeping, Surviving a Disaster, Light and Humidity, Integrated Pest Management and Hospitality and Filming.

Risk	Location	Solutions	Est. Cost	Lead	Timescale
Pests	Swiss Cottage & Museum	Visit by Insect pest consultant	£400	DL	Urgent
		Deep clean.		CS, MH	Urgent
Light	House	Light plan		DT	Urgent
		Blinds in Duchess of Kent's Suite	£180	MH	Urgent
		Check UV absorbing film and replace if necessary	Approx £10000	DT	Urgent
		Improve monitoring	£200	DT	Urgent
Display/ Storage Conditions	Basement	Move store (too small, bad environment and risk of flooding)	£2000	MH, CMT	Urgent
		OR Re-fit store	£2000	MH, CMT	Urgent
		Purchase new packing material	£1000	MH,CS	Urgent
Disaster	Swiss Cottage & Museum	Check fire detection system is up to date		David L	Urgent
		New salvage equipment.	£1000	AL	Urgent
		Update salvage list.		MH	Urgent
Dust/Dirt & Handling	Basement	Include in housekeeping schedule		SC,CS	Short-term
		Reorganise		MH	Short-term
		Deep clean		CS, MH, SC,VH	Short-term
		Cover collection	£500	MH	Short-term
Pests	Basement	Increase monitoring	£10	David L	Short-term
Humidity	Basement	Move store			Short-term
		OR monitor and control	£400+	DT	Short-term
Light	Swiss Cottage & Museum	Review blinds	£400	DT	Short-term
		Check UV absorbing film, replace if necessary	Possibly £500	DT	Short-term
		Introduce monitoring	£500	DT	Short-term
Documentation	Swiss Cottage & Museum	Ensure all objects are labelled with an inventory number and entered, along with the label information into HOMS		MH, TR	Short-term
Dust/Dirt & Handling	Swiss Cottage & Museum	Include on housekeeping schedule		VH,SC, CS	Short-term
		Purchase housekeeping equipment	£500	CS	Short-term
		Dust proof cases?		DT	Short-term