

The value of consumer electronics for trade-in and re-sale



This report presents the findings of work which estimates the value of a range of consumer electronics products following their first sale, alongside the estimated cost of recovering those products and preparing them for re-sale. This work informs members of WRAP's Electrical Products Pathfinder Group in exploring the potential for incentivised return and re-sale schemes for consumer electronics.

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Front cover photography: Photograph of laptop in a "green" setting.

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Executive summary

The objectives of the work undertaken and described in this report were identified by WRAP and its Electrical Product Pathfinder Group (EPPG) of industry stakeholders. The aim was to help retailers and manufacturers identify the potential market opportunities for trading used products, incentivising trade-in, repair and service provision. These opportunities might be realised by the retailers and manufacturers themselves, or by working with commercial and other partners to share the value while separating retail from service operations. The project focussed on five products: laptops, TVs, tablet computers, satellite navigation systems and cameras.

This report therefore presents market data on the re-sale values of a range of recent models within each product category, showing how these values change over time. It also quantifies the typical cost of collecting these products from consumers and placing them back on the market. The difference between the re-sale value and the cost indicates the margin available to incentivise consumers and provide a business return.

The project team consisted of Enscape Consulting and Re-Tek – a consortium which has experience of managing global equipment disposals for both electronic and electrical goods, as defined in the WEEE Directive. Re-tek specialises in recovering asset value through reuse of excess or redundant stock from global technology manufacturers.

The value of a product over its lifetime varies depending on age and the specification of the model. There is also a direct correlation between the value of a new model and its residual value. Other elements that influence residual value include the maturity of the market for the product type and the availability of spare parts for repair and replacement which will increase yields for re-use. The cost of refurbishment is also variable and depends on the product type. Logistical, standard refurbishment, cleaning, storage, repair and recycling costs all have a direct impact on the lifecycle value of a product.

Key to maintaining, and maximising, product value is having an in-depth knowledge of the market for quality, refurbished ICT and consumer products. Many of the products are in demand in the export market and in particular from the emerging economies where older technology items are considered adequate and more affordable.

There are many Information Technology Asset Management specialists (ITAMs) that would welcome a commercial partnership with a retailer, manufacturer or reseller for the products presented in this report. Most of the models presented, within the five product categories, have residual value and can be managed within an economically viable asset recovery process.

For ITAMs and owners considering running trade-in programmes or commercial partnerships, the primary and most enduring aspect associated with the success of a business is in the re-use and re-sale of as much product as possible. This mitigates the need for conventional recycling and is the most essential and decisive factor in terms of efficient recovery (for re-use). Additionally, having capable market knowledge of the products involved is also vital to manage commodity pricing in a global market and to maintain expected financial returns while managing the risk of used products depreciating in value while waiting for re-sale.

Summary of results

Below are a range of examples drawn from the full report 'The value of consumer electronics for trade-in and re-sale' that demonstrate the potential value remaining in many products.

Laptops

Mid-range laptop – examples of net residual value:

- £240 for a 2 year old product (26% of original price)
- £170 for a 4 year old product (20% of original price)

Trade in is no longer economic after approximately 7 years (i.e. when the cost of putting the product back on the market exceeds the re-sale value).

PC tablets

Examples of net residual value:

- £100 for a 3 year old premium brand product (20% of original price)
- £70 for a 2 year old product (33% of original price)

Trade-in is expected to be no longer economic after 4-5 years, although as the product category is only 3 years old this is an estimate.

LCD TVs

Examples of net residual value for major brands:

- £40 for a 4 year old 19-22" product (17% of original price)
- £475 for a 3 year old 55" product (15% of original price)

Trade-in is no longer economic after 5-6 years depending on the size of the LCD TV.

Satellite Navigation

Examples of net residual value:

- £50 for a 2 year old product (33% of original price)
- £70 for a 3 year old product (35% of original price)

Trade-in is no longer economic after 3 years for a budget sat nav, 4 years for a mid-range sat nav and 5 years for a high-end sat nav.

Digital Cameras

Examples of net residual value:

- £65 for a 2 year old product (16.5% of original price) (compact)
- £105 for a 2 year old product (12% of original price) (DSLR/bridge)

Trade-in is no longer economic after 5 years for compact digital cameras, and up to and beyond 5 years for DSLR/bridge cameras.

Key factors in developing a successful incentivised return scheme are knowledge of the consumer electronics market, getting as much product back to the market as possible to keep recycling costs down, working with a portfolio of products and having knowledge of the local and global resale networks.

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- Appendix 1.** Commodity (model) specification profile
- Appendix 2.** Logistical Cost
- Appendix 3.** Secondary Market Grading
- Appendix 4.** Average Yields and Fallout
- Appendix 5.** Cost of repair breakdown
- Appendix 6.** WEEE recovery& liability
- Appendix 7.** List of ITAMs

1.0 Introduction

1.1 Overview and objectives

This report has been provided to inform the work of WRAP's Electrical Products Pathfinder Group. The purpose of the work has been to deliver the following:

- To estimate the value of second hand consumer electronic products (TVs, laptops, tablet computers, Satellite Navigation Systems (Sat Navs) and digital cameras) through their sale for re-use
- To estimate the cost of recovering those products and refurbishing them for sale. This will identify the net positive value available to retailers and manufacturers from which they will be able to incentivise returns and gain a second margin on the product.
- In parallel, identify a range of IT asset management (ITAM) companies that offer services in refurbishment and resale markets to demonstrate the size and capability of the sector.

The aim is for the above outputs to help retailers and manufacturers identify the potential market opportunities for trading used products, incentivising trade-in, repair and service provision. These opportunities might be realised by the retailers and manufacturers themselves, or by working with commercial partners to share the value while separating retail from service operations.

The consortium delivering the project, Enscape Consulting and Re-Tek were able to provide in-depth market and processing insights to support the delivery of the project outputs.

1.2 Enscape Consulting Ltd

Since 2008, Enscape Consulting have provided support on a variety of waste and resource research projects for both the public and private sectors, increasingly geared towards research, technical advice (including feasibility studies), policy and procurement support and the delivery of trials to test ideas and innovative solutions for the reuse and recycling of a wide range of products and materials.

1.3 Re-Tek Ltd

Re-tek is a well-established organisation (operating for over 16 years) which manages global equipment disposals for both electronic and electrical goods, as defined in the WEEE Directive. Re-tek specialises in recovering asset value through reuse of excess or redundant stock from global technology manufacturers.

2.0 Methodology

The requirements of the project were to identify key impacts on product value through the different steps required for re-use, presenting a notional lifecycle value in order to consider the viability of income to be generated from the resale of used products – doing so through direct selling or using a commercial partner.

The data have been presented in a graphical format to illustrate lifecycle value (depreciation), along with the cost of recovery of the commodity required to realise residual resale. This cost is plotted on the same graph as the value to allow a comparison of the depreciation impact over the same time period. Life-cycle values, or residual resale values, have been taken from historical data within Re-tek on all of the featured commodities, with the resale values accurate at the time of writing. Projected resale values are derived from historical data/behaviour.

As there are many different costs associated with recovery (for re-use) processes, these were added together, and in some cases averaged, to provide clarity and an ease of comparison on the lifecycle graphical representation. These costs are explained and broken down in more detail outlining how the calculations were derived and are included in the appropriate sections of the report.

Although each commodity has its differences (which include physical size, technology and refurbishment requirements), the approach to the refurbishment and repair process remains the same. Therefore, for consistency of presentation, the same format is used in the appendices for each commodity – these define the key aspects and detail the costs required for the recovery process (which have an impact on product value for that particular commodity). As each key aspect is the same for each commodity, but the cost varies over the different product types, then the variable costs can be identified and compared. These figures are taken from Re-tek's commercial and operational costs and also incorporate their partners' arrangements with freight and recycling vendors for volume processing over the five commodities. This lifecycle and process data, with associated costs, are also complemented by, and can be correlated with, individual schematics that outline process flows for each of the five product types. These outline the process flow from user to the commercial partner (ITAM) or owner (retailer, manufacturer or reseller), summarising all of the key stages of the reverse logistic and refurbishment process – highlighting a high level, summarised version of the products' paths to re-use.

In order for retailers and manufacturers to have the key information which enables them to consider the options, e.g. managing their own programme or using a commercial partner, then the report also includes an explanation, supported by data, that outlines industry standard revenue sharing arrangements between ITAMs and the owners. This is summarised and demonstrated in bar graph format with the layout and information that a retailer, reseller or manufacturer would expect from a disposal in a management report to be issued by their preferred disposal vendor. This report summarises the lifecycle value and costs associated with the recovery process as well as typical revenue sharing arrangements that are standard in the asset recovery industry for trade-in, or recovery, on return programmes. These therefore indicate the financial return as a net value to the owner for each commodity featured.

The report presents each commodity individually and sequentially highlights the impacts that are relevant to its lifecycle value, process cost or residual resale value. It also includes information on where market demand may be for the featured commodity as this is key to maintaining a high net residual value for the item.

This is a simple and comprehensive format, intended to provide WRAP and the Electrical Product Pathfinder Group with the information outlined in the objectives for the project.

It should also be noted that the Appendices also provide a list of ITAMs that offer asset recovery services for end-of-life products based on the Re-tek model which is one of the most experienced and seasoned approaches to recovery.

3.0 Brief overview of the five commodities featured and their value

3.1 Overview

Each of the five product groups featured are considered commodity items. This means that value is determined by market forces, where supply and demand influence pricing significantly although the dominant, determining factor is the introduction of new technology which improves on the specifications/standards of a particular, current product group. As most commodity values fluctuate up or down the product groups featured in this report only show a depreciating value over time as the demand for entry level technology follows the introduction of new technology with the launch of new models with new features. This usually manifests itself with significant price depreciation or the loss in demand for a given technology specification, and this is usually an annual event.

The product groups have various lifetime expectancies, but the market demand for used goods is optimised from about 1 month to 3 years old. However, the bulk of the volume processed and sold is around 3 years old and is in line with business technology refresh cycles as well as being when individual consumers “trade up” in technology. Products that are older than 3 years old have varying demand, depending on the product type and are vulnerable to becoming obsolete as a saleable item when there is a technology improvement in its product category.

Therefore the pricing values presented are accurate at the time of writing the report, but are sensitive to ever more frequent technology improvements and sometimes other factors, such as the entry of new market players or the availability of a large volume of unsold new stock on a global or regional basis.

3.2 The key aspects that affect Lifecycle value for all five product groups.

The lifecycle impacts for each product value are presented in graphical format, with the support data shown in an accompanying table - providing a breakdown of refurbishment costs. These are calculated in the supporting appendices where some of the data is fixed (e.g. labour and re-packaging cost) and some is variable (e.g. freight, recycling and repair costs) across the different product types.

The format of the data presented for key impacts on lifecycle value is the same across all of the products and supported by the Appendices mentioned below, provided in Excel format:

- Appendix 1 – Commodity (model) specification profile
- Appendix 2 - Logistical cost
- Appendix 3 - Secondary market grading
- Appendix 4 - Average yields and fallout
- Appendix 5 - Cost of repair breakdown
- Appendix 6 - WEEE recovery& liability

The following section provides an explanation of the detailed information/calculations in the appendices – information which is generic and applicable to all of the products covered by this project. Where there is product-specific, non-standard data, issues, impacts etc information is provided in the section of this report covering this product. Differences between products are further described (in each product/commodity section) with the inclusion of schematic/flow diagrams outlining the process flow.

Revenue sharing arrangements for the net residual lifecycle value are presented at the end of each product section - these outline and describe typical revenue share arrangements between ITAMs and owners.

3.3 Breakdown of the refurbishment cost table and explanation of Appendices

The following descriptions are provided to explain how the data in the appendices has been determined – this subsequently used in each of the commodity sections of this report.

Logistical cost: This compares two methods of returning used product from the consumer to an ITAM or owner, and is supported in detail by the cost information in Appendix 2. These are represented in the graphs provided for each product as “A” and “B”, as defined below:

- A: Pick up from owner's address-single unit pick up in packages no larger than L300x W210x H10mm and insured.
- B: Pick up from regional storage depot with 255 units per pallet in packages of no larger than L300x W210x H10mm and insured.

Each commodity is presented separately as cost varies by commodity type because of the size and weight of the item. Freight costs for each commodity type are typical for the models represented in Appendix 1.

Standard refurbishment cost: This is an average cost for performing a refurbishment step on a unit that needs no repair. This includes the receipt and sort of the product as well as a standard functionality test and the associated labour cost for that process. This cost is applied to all units going through the refurbishment process and is standard and accurate for most asset management vendors. The cost is calculated based on the labour rates for both technical and warehouse personnel performing this task at Re-tek UK and associated with the models outlined in Appendix 1.

Cleaning, storage and dispatch: This is an average cost for preparing the unit for dispatch. Cleaning costs can be variable depending on product type and have limited impact on older models - these are based on labour and storage rates at Re-tek to prepare the item for resale. Industry standards of *Grading* are used to define the condition and to represent the product accurately for resale. The standards of grading for the product types are outlined in Appendix 3 and are the de facto standard for used product in the secondary market.

Repackaging cost: This is a fixed cost and is the material cost for an unmarked brown cardboard box for a particular product type, and is variable.

Average repair cost: This is averaged and supported from the data outlined in Appendices 4 and 5. As no single batch of the same product will have the same repair requirements then these have been averaged. Plotting every single repair type would be impractical for presentation purposes. The averages have been calculated as follows.

- Appendix 4 outlines the average yields and *Fallout* of units being processed based on actual item batches processed at Re-tek. The total cost of a repair is calculated as an average over a quantity of units processed - and then using the fallout average to calculate a final unit cost. The average repair figure from this worksheet is calculated from the data outlined in Appendix 5.
- Appendix 5 summarises the various repairs that are typically carried out with the relevant product, based on the representative models shortlisted Appendix 1. It tables the frequency of the type of repair as well as the cost associated with replacement of the spare part. Replacement spare parts are costed at trade pricing,

as used and new, and only list items that are bought in. It does not consider any spare parts harvested from faulty units. The cost of labour is also built in to account for the time and then an average repair cost for the relevant commodity is fed into Appendix 4 to arrive at the average repair figure for that product.

Recycling cost: This is an average calculated from the information tabled in Appendix 6. A typical unit, which cannot be resold, is broken down by weight and represented by its spare parts. Depending on the product, each spare part has either a recycling liability or a financial return based on its metal and chemical content - usually determined by its weight. Using current recycling costs and returns from conventional recyclers for WEEE a unit may yield a positive or negative financial return. The labour cost associated with the pre-treatment for recycling is also factored into the equation, based on time taken to break the unit down to its spare parts. When the average fallout figures (Appendix 4) are then applied to this an average recycling cost can be calculated for every single unit processed. This cost could be further offset by employing spare parts harvesting from faulty units, however although this is utilised at Re-tek there is no available complete data to factor this in. The time for shredding any data bearing devices associated with the product type is included in the labour cost, for the teardown time for the item.

3.4 Revenue sharing arrangements based on the net residual value of all products

There is significant potential for a manufacturer or retailer to realise an income from an in-house asset recovery service from the net residual value on returned products, with the values illustrated in the lifecycle graphs of this report for each product type. The decision to use experienced commercial partners to provide such a service would not only utilise tried and tested processes, but more importantly would result in engagement with organisations which have in depth market knowledge and whose commercial competence extends worldwide for used technology. Therefore the basis of a contractual relationship between an asset recovery vendor and the owner of the product is usually based on a revenue sharing arrangement where the ITAM provides a unique service to include both process and resale. These arrangements are usually agreed on splitting the net residual revenue value - after all key costs have been taken into account. The detail associated with this reporting should be consolidated into a management report which provides a comprehensive account of all items received, processed, resold and recycled. The management report should also confirm that all legislation (environmental and data) has been adhered to, therefore guaranteeing that the items have been processed professionally.

Sections of this report describe a product group, outlining an excerpt from a typical management report in graphical and tabular format (this is presented after the lifecycle/value/cost data) which demonstrates some of the detail that should be expected when reconciling a disposal for a given period or batch of product.

The revenue sharing arrangement illustrated, for all products, is a 70/30 % split on the residual value, but this arrangement varies depending on the service requirements expected of the ITAM. The management report excerpt provided in this document is included to demonstrate how net residual revenue is split after process costs are evaluated and it is usually made up of a variety of consumer and ICT products. It may also have specific information relevant to the owner of the product to aid easy reconciliation of the data and facilitate a fully auditability process.

All of the stages outlined above can be followed in the process flow diagrams which are included for each product group in this report.

4.0 The key aspects of Lifecycle value and recovery for Laptops, PC Tablets, TVs, Sat Navs and Digital Cameras

4.1 Laptops

4.1.1 Product lifecycle depreciation cost/value

Many classifications (categories) can be used to illustrate the large profile of machines that are available in both the new and secondary (used) market. For the purpose of this report these have been divided into the following to summarise their lifecycle value:

- Business Model
- Mid-range Model
- Consumer/Budget Model

The classification is determined by build quality and therefore cost, although sometimes brand and specification may influence cost. In general, a business model laptop from a Tier 1 manufacturer (Hp, Lenovo and Dell) will be the most expensive when purchased as new and consumer/budget laptops (Tier 2 Manufacturer Acer, Asus and Gateway) the least expensive in this classification.

The data presented takes account of the most popular manufacturers and models across the three classifications outlined above for this period of time. A typical range of laptops which currently sell on the secondary market is outlined in Appendix 1 (listing their manufacturers, models and technical specifications). These models and manufacturers are representative of the most popular units refurbished at Re-tek UK in the last 5 years and correspond with the market share of the manufacturers for the three classifications used in this report. Also illustrated is the cost of these units at new and their current residual value in the secondary market.

The residual value is expressed as % value against the new sale values in the last column to reinforce depreciation value. Appendix 1 also summarises the key specifications associated with this product type that determine its used lifecycle value - a laptop maintains a residual resale value for around 6-7 years after manufacture.

Depreciation is variable from year to year with the most value lost in the first year followed by a more consistent loss in value over subsequent years. This is illustrated in both Figures 1 and 2 which outline depreciation and refurbishment cost over two different periods of time. Figure 1 and the supporting data show three classifications of machine manufactured in 2011 and their subsequent residual resale values after each year with the projected resale into 2014. Figure 2 illustrates the same data as Figure 1 except it portrays the depreciation value over the lifetime of a unit for all categories (the supporting data is shown in tables below the graphs). The average refurbishment cost is also plotted on the same graph and takes account of the two possible transport options outlined in Appendix 2.

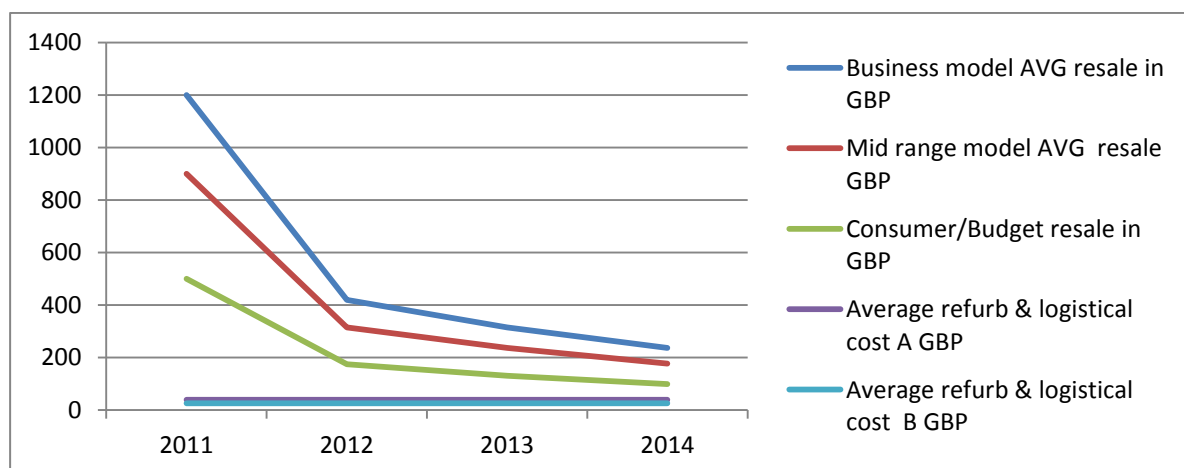


Figure 1. Depreciation and refurbishment cost for three types of classification, for products manufactured in 2011 – with subsequent residual resale values projected into 2014.

Table 1. Data used to populate the graph in Figure 1

Resale and Cost Descriptions	2011	2012	2013	2014
Business model avg resale in GBP	1,200	420	315	236
Mid-range model avg resale GBP	900	315	236	177
Consumer/Budget resale in GBP	500	175	131	98
Average refurb & logistical cost A GBP	39	39	39	39
Average refurb & logistical cost B GBP	26	26	26	26

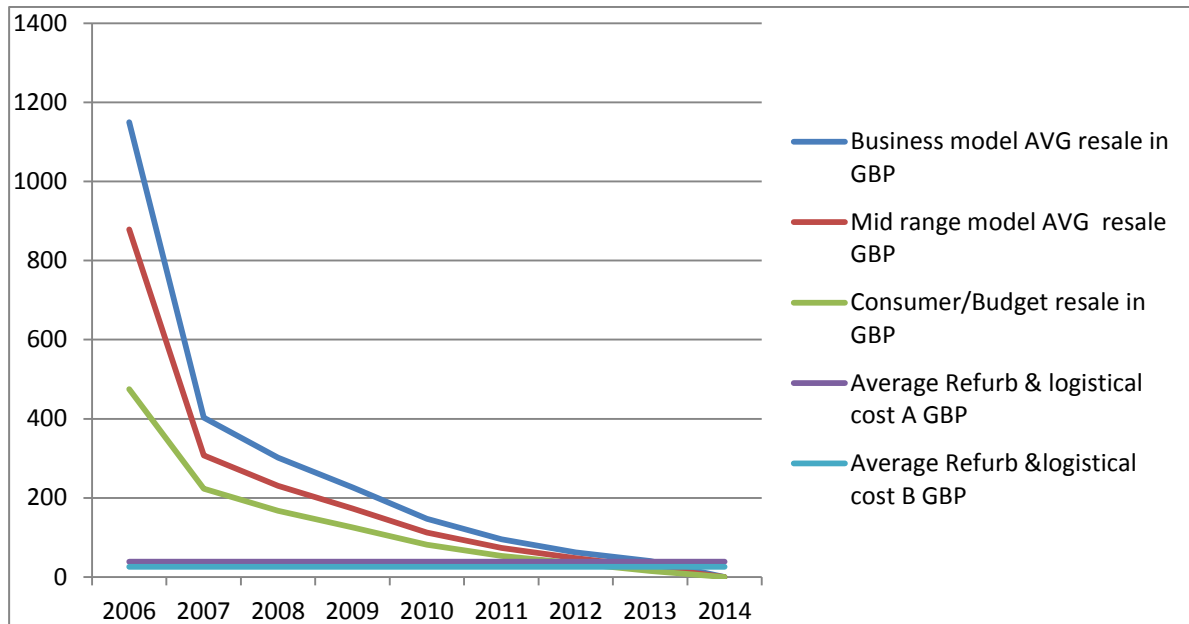


Figure 2. Depreciation and refurbishment cost for three types of classification, for products manufactured in 2006 – with subsequent residual resale values over a product’s full lifetime.

Table 2. Data used to populate the graph in Figure 2

Resale and Cost Descriptions	2006	2007	2008	2009	2010	2011	2012	2013	2014
Business model avg resale in GBP	1,150	403	302	226	147	96	62	40	0
Mid-range model avg resale GBP	879	308	231	173	112	73	48	25	0
Consumer/Budget resale in GBP	475	223	167	126	82	53	34	15	0
Average Refurb. & logistical cost A GBP	39	39	39	39	39	39	39	39	39
Average Refurb & logistical cost B GBP	26	26	26	26	26	26	26	26	26

4.1.2 Specific key aspects impacting lifecycle value in Laptops.

As Laptops are data bearing products and the Hard Disc Drive (HDD) is key to maintaining the residual resale value then the data has to be wiped effectively from the HDD. This requires a licensed product, there are various available and Tabernus LAN software product, which erases 6GB (Gigabyte) of data per min from a hard disc drive, is included as an additional cost in the table below and represented in Figure 3.

This software is also CESG (Communications-Electronics Security Group) approved and is part of Re-tek’s Information Security Management System which is accredited to ISO27001.

Laptops are now manufactured modular and many parts are interchangeable. This combined with a large volume installed and a mature product type makes spare part availability highly accessible and therefore the units are relatively easy to repair. This in turn produces higher yields of units for re-use.

The various stages of the cost process detailed above can also be correlated to the process flow outlined in Figure 4.

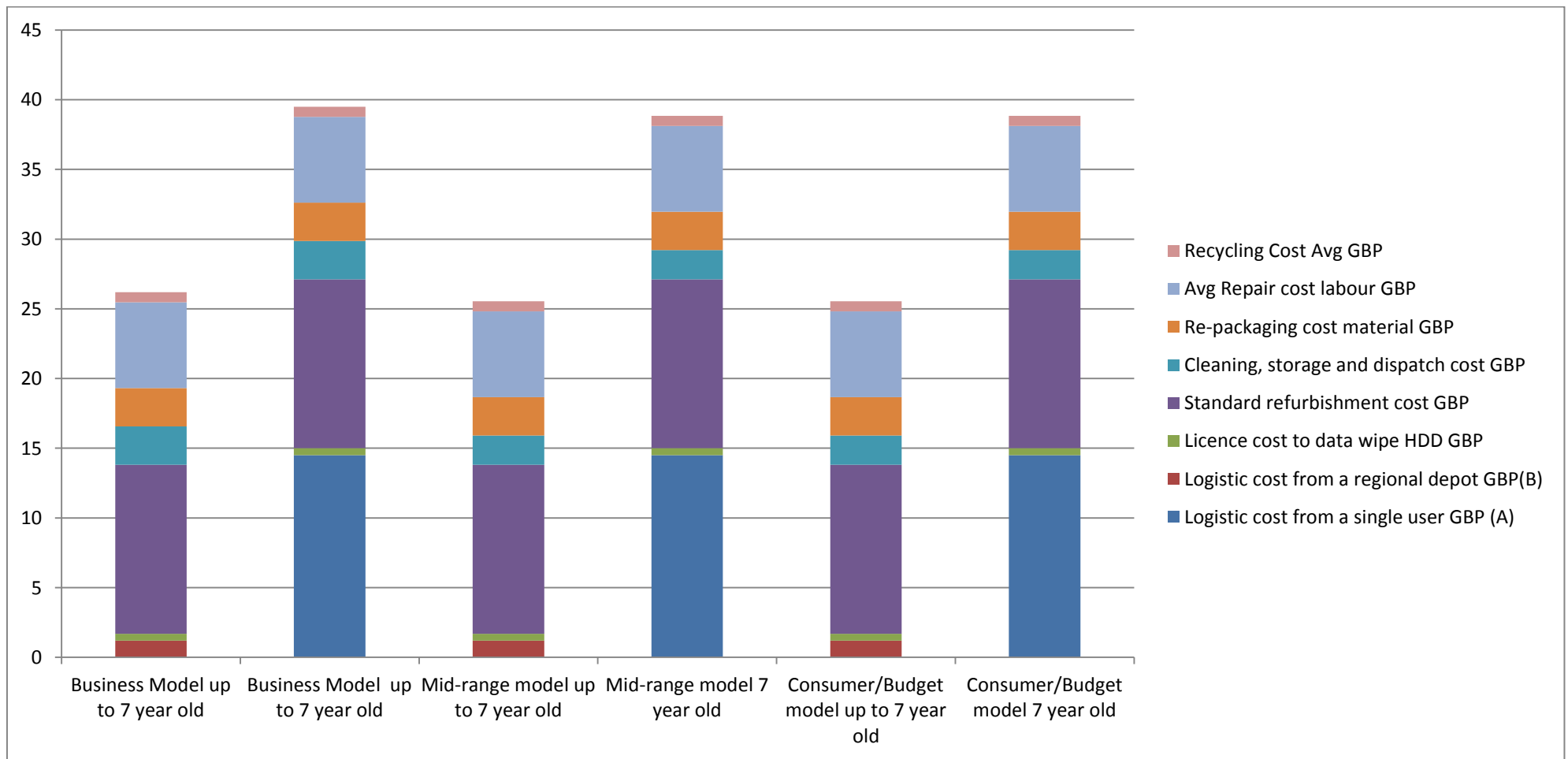


Figure 3. Breakdown of refurbishment cost for laptops

Table 3. Breakdown of refurbishment cost for Laptops (data used for previous figure)

Product description	Logistic cost from a single user GBP (A)	Logistic cost from a regional depot GBP(B)	Licence cost to data wipe HDD GBP	Standard refurbishment cost GBP	Cleaning, storage and dispatch cost GBP	Re-packaging cost material GBP	Avg Repair cost labour GBP	Recycling Cost Avg GBP	Total GBP
Business Model up to 7 year old	0	1.2	0.5	12.11	2.75	2.75	6.16	0.72	26.19
Business Model up to 7 year old	14.50	0	0.5	12.11	2.75	2.75	6.16	0.72	39.49
Mid-range model up to 7 year old	0	1.2	0.5	12.11	2.1	2.75	6.16	0.72	25.54
Mid-range model 7 year old	14.5	0	0.5	12.11	2.1	2.75	6.16	0.72	38.84
Consumer/Budget model up to 7 year old	0	1.2	0.5	12.11	2.1	2.75	6.16	0.72	25.54
Consumer/Budget model 7 year old	14.5	0	0.5	12.11	2.1	2.75	6.16	0.72	38.84

Figure 4. Laptop Refurbishment/Resale Flow Diagram

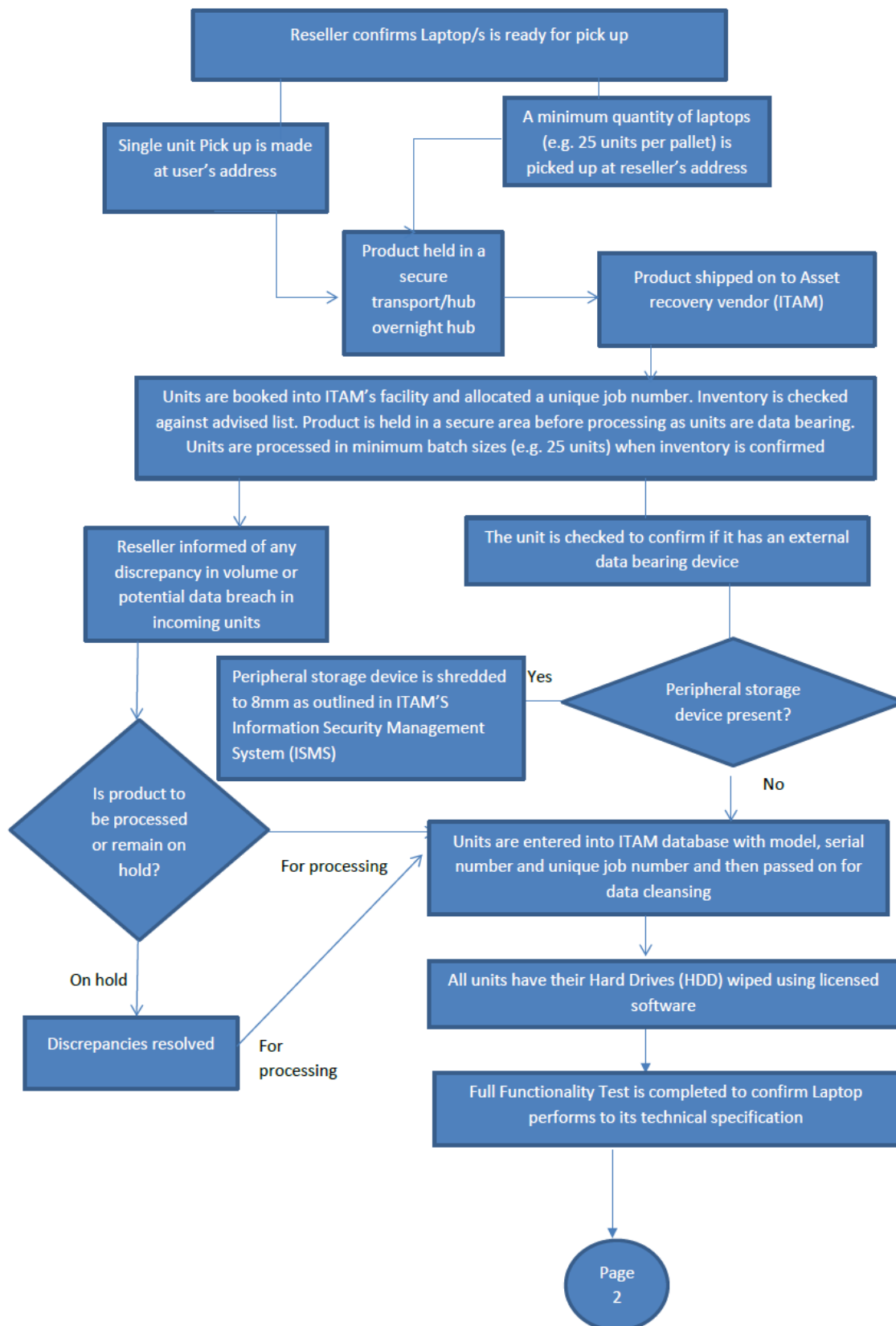




Figure 4 (Cont/...). Laptop Refurbishment/Resale Flow Diagram

4.1.3 Revenue sharing arrangements with an ITAM and conclusions for Laptops

If the owner chooses to use a commercial partner to manage a full return, refurbishment and resale process, then visibility throughout every stage of the disposal should be expected in order to manage and understand the business and value chain effectively. This data should be presented in the form of a management (or disposal) report and should include how the commodity maintains value, the full refurbishment cost, as well as how the residual revenue is split from the resale of the product. The format may vary from ITAM to ITAM and the information produced may be dependent on the contractual arrangement between the owner and ITAM.

Within Figure 5 and the supporting table is a typical excerpt from a Re-tek management report.

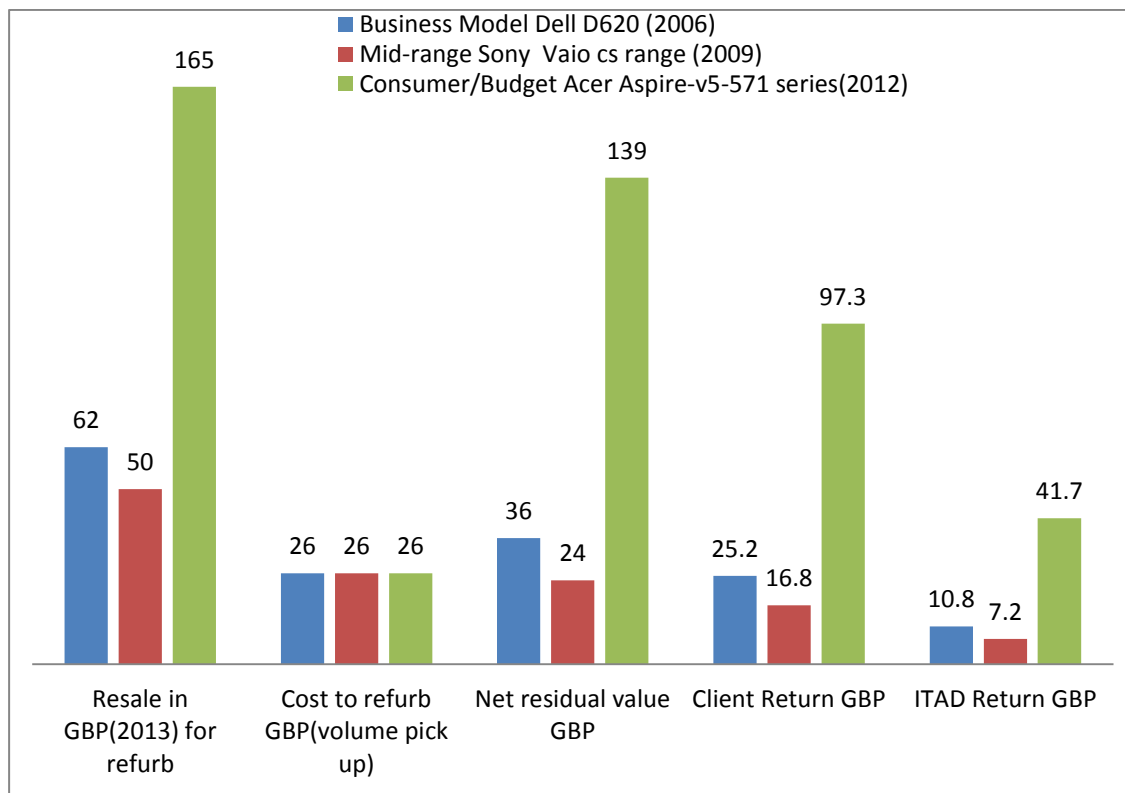


Figure 5. Excerpt from Re-Tek management report

Table 4. Support data for Figure 5

Market Type	Manuf	Model Type	Market type	Processor specification	Hard Drive GB	Memory GB	Screen size inches
Business Model	Dell	D620	Business	Intel Core Duo T7600E 2.16GHZ	80GB	1GB	14
Mid-range	Sony	Vaio cs range	Mid-range	Intel Core 2 Duo T6400, 2.0GHZ	320GB	4GB	14
Consumer/Budget	Acer	Aspire-v5-571 series	Consumer-budget	Intel Core-i5 1.8ghz	500GB	6GB	15.5

Table 5. Resale value and cost information for different market range products

Market Type	Manuf	Model Type	Resale in GBP (2013) refurbished	Cost to refurbish GBP (volume pick up)	Value for revenue share in GBP	Client Return GBP	ITAM Return GBP
Business Model	Dell	D620 (2006)	62	26	36	25.2	10.8
Mid-range	Sony	Vaio cs range (2009)	50	26	24	16.8	7.2
Consumer / Budget	Acer	Aspire-v5-571 series(2012)	165	26	139	97.3	41.7

4.1.4 Conclusion on laptops

The data presented demonstrates the viability of an asset recovery process for laptops. Not surprisingly, newer technology is more viable for resale. The conclusions drawn from the difference between Figure 1 and 2 are that residual resale values in the first four years of a unit's lifecycle are sufficient enough to present the best opportunity for a revenue sharing arrangement between the reseller and the asset management vendor. This is true across all categories of laptops, with resale value easily covering refurbishment costs. In Figure 2, from year 4 to 7 of a product's lifecycle the diminishing feasibility of a revenue sharing arrangement is shown, but this still does not exclude the possibility for continued recovery and resale in the latter years of a product's life.

Recovery and resale can still be viable if a contract is constructed on a "material cost neutral" basis with an ITAM. In this situation, recovery is still feasible for end of life units, but a financial return to the owner of the product is excluded. The positive aspect of this for the owner is that there is no recycling liability, or unnecessary recycling, as most of the residual resale value is used to offset the recovery costs by the asset management company whilst delivering a small profit. This provides the owner with the option to maintain a low cost trade-in programme for a larger range of "aged" machines. Material cost neutral arrangements are common in the asset recovery industry for lower cost items or aged products.

Keeping the logistical and refurbishment costs low is key to the capability of a managing ITAM or owner, however, this can only be maintained if volume processing is involved. Using a seasoned and reputable vendor will not only result in the recovery of more volume of aged laptops, but will help reduce the extent of conventional recycling. The most significant benefit of having a commercial partnership for such commodities is the immediate access to global markets which opens up volume demand - increasing the sustainability of the process as a whole. This is particularly relevant as users are currently working to extend the lifecycle of laptops due to the economic climate.

4.2 PC Tablets

4.2.1 *Product lifecycle depreciation / cost*

Many classifications can be used to illustrate the large range of machines that are now available in both the new and secondary (used) market for this product type. It would have been too simplistic to classify on current market share between Apple and non-Apple products. As this sector's market share is changing so rapidly and the commodity is relatively new (many being introduced in the last 18 months), then it is more appropriate to present a shortlist of the most popular models and feature their lifecycle data individually rather than classify them at this stage. As this technology evolves, and market share between tablet types become less variable, then a classification approach may be more relevant.

The cross section of products presented for this report are Apple, Android and Windows based tablets – with the most popular models described, from budget units through to higher performance models. A tablet is expected to maintain some residual resale value for around 4-5 years after manufacture, although the product type is really only 3 years old. As these products are still relatively new to the refurbishment sector and asset recovery companies have only seen reasonable volumes in recent years, the data presented in this report takes account of the most popular models and manufacturers introduced in that period (to allow meaningful data to be used).

A typical range of tablets (with data on manufacturers, models and technical specifications) which currently sell on the secondary market is outlined in Appendix 1. These models and manufacturers are representative of the most popular models refurbished at Re-tek UK in the last 3 years – these are also representative in terms of market share, both current and projected, of the manufacturers competing in this sector. The appendix also illustrates the cost of these units at new and their current residual value in the secondary market. The residual value is expressed as a percentage of the new, or entry sale values, giving a summary of the depreciation. Appendix 1 also summarises the key product specifications that determine used lifecycle value for this product type.

Depreciation is variable from year to year, but like most new consumer items most value is lost in the first year with depreciation slowing over subsequent years. This is outlined in Figure 6 and the supporting table. Figure 7 goes on to account for repairs added through the refurbishment process and plots the same models as Figure 6 to illustrate the impact that average repair costs have on the lifecycle value.

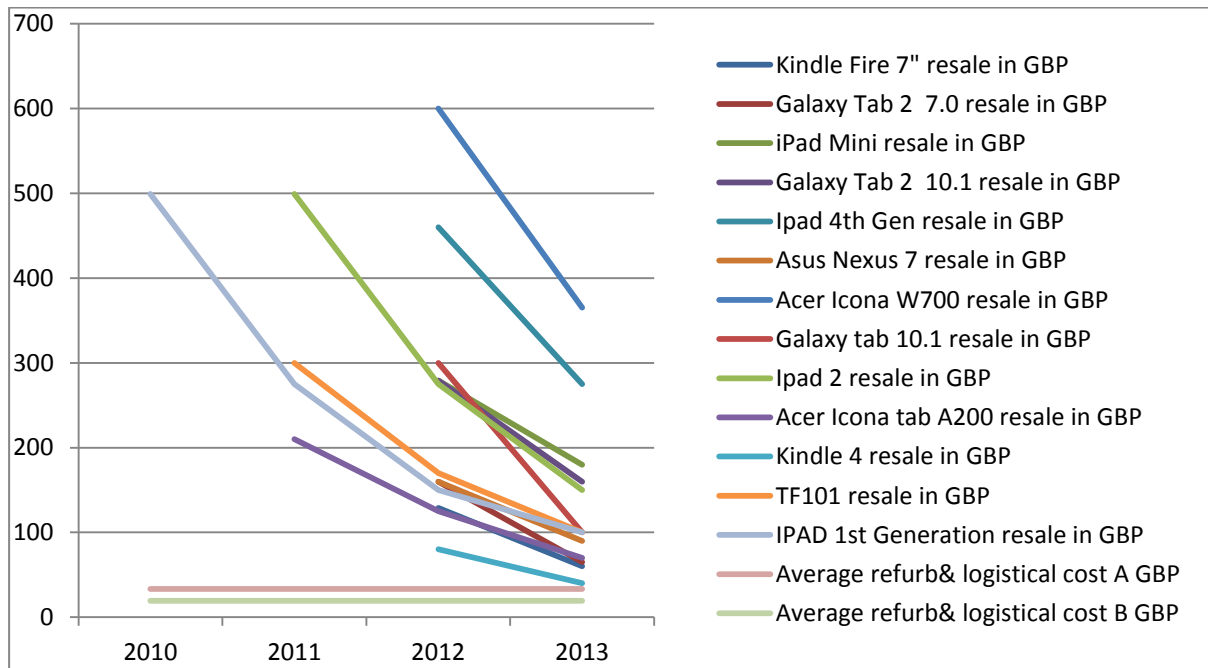


Figure 6. Depreciation of tablets from year to year (with most value lost in the first year then slowing)

Table 6. Support data for Figure 6.

Residual return and avg refurbishment cost	Year			
	2010	2011	2012	2013
Kindle Fire 7" resale in GBP			129	60
Galaxy Tab 2 7.0 resale in GBP			160	65
iPad Mini resale in GBP			279	180
Galaxy Tab 2 10.1 resale in GBP			279	160
Ipad 4th Gen resale in GBP			460	275
Asus Nexus 7 resale in GBP			160	90
Acer Icona W700 resale in GBP			600	365
Galaxy tab 10.1 resale in GBP			300	100
Ipad 2 resale in GBP		499	275	150
Acer Icona tab A200 resale in GBP		210	125	70
Kindle 4 resale in GBP			80	40
TF101 resale in GBP		300	170	100
IPAD 1st Generation resale in GBP	499	275	150	100
Average refurb& logistical cost A GBP	33.38	33.38	33.38	33.38
Average refurb& logistical cost B GBP	19.35	19.35	19.35	19.35

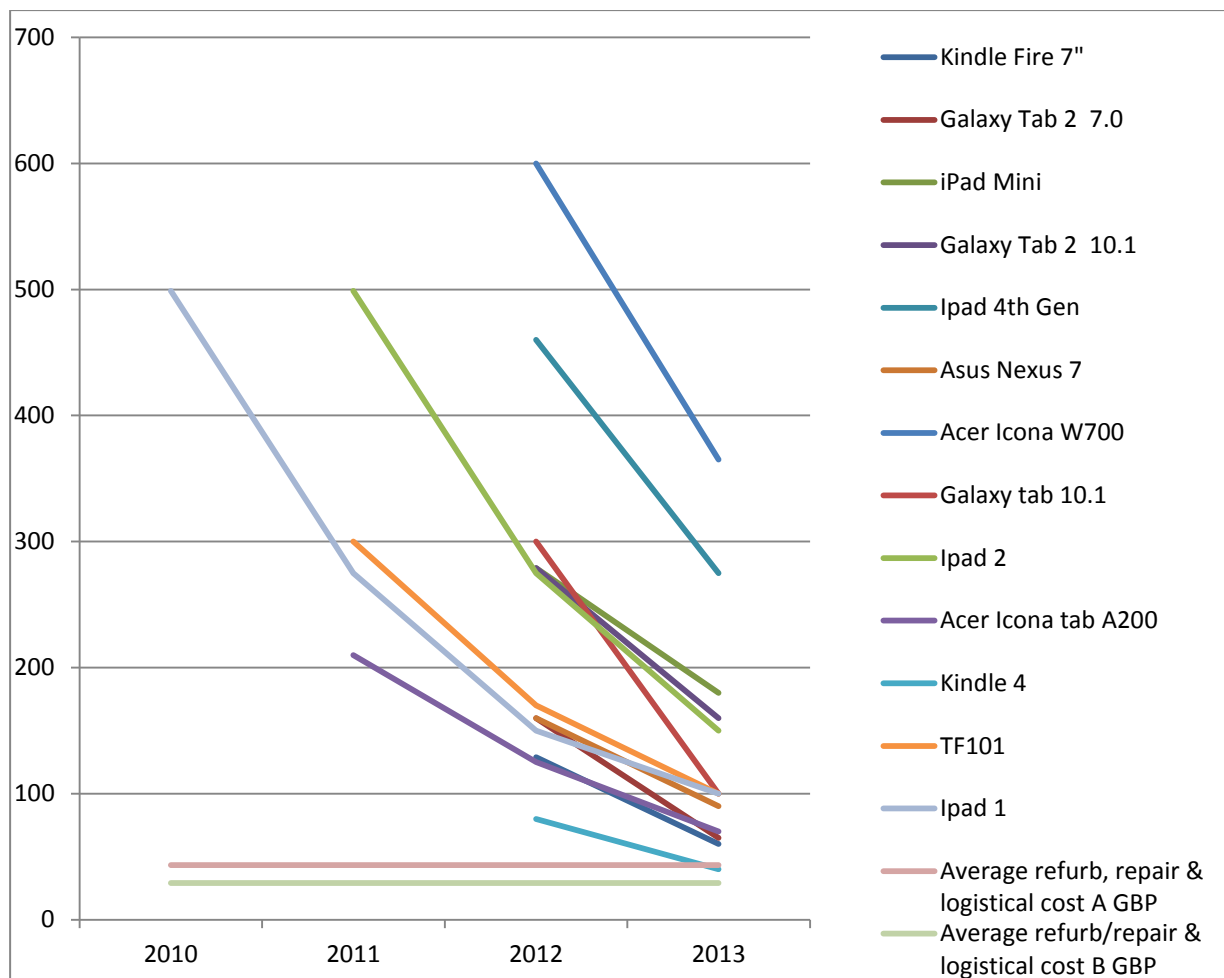


Figure 7. Tablets - the impact that average repair costs have on the lifecycle value (average repair cost added to avg refurbishment cost)

Table 7. Support data for Figure 7

Product Types	Year			
	2010	2011	2012	2013
Kindle Fire 7"			129	60
Galaxy Tab 2 7.0			160	65
iPad Mini			279	180
Galaxy Tab 2 10.1			279	160
Ipad 4th Gen			460	275
Asus Nexus 7			160	90
Acer Icona W700			600	365
Galaxy tab 10.1			300	100
Ipad 2		499	275	150
Acer Icona tab A200		210	125	70
Kindle 4			80	40
TF101		300	170	100
Ipad 1	499	275	150	100
Average refurb, repair & logistical cost A GBP	43.22	43.22	43.22	43.22
Average refurb/repair & logistical cost B GBP	29.19	29.19	29.19	29.19

4.2.2 Specific key aspects impacting lifecycle value in PC Tablets

Tablet PCs have two different forms of permanent storage - Apple and Android use Solid State Drives (SSD) and Windows based models use HDD. SSDs are used in devices which currently have the largest share of the market and the preferred method of data erasure is restoring the factory default settings - this in effect cleanses the data.

The windows based models, which use low profile HDD, need to have data wiped using licensed software, which ensures the HDD can be re-used within the device (as this feature is key to maintaining lifecycle value). Therefore a product called Tabernus LAN software, which erases 6GB (Gigabyte) of data per minute from a HDD, is used for data erasure. This has not been included as an additional cost in Figure 8 and the supporting data table, as this is too low to make an impact on so few of the Windows models featured. However, awareness of the cost is key to future consideration as it is expected that Windows based models will take more market share in the future with the implications this has for owners, or ITAMs, in terms of the responsibility for effective data management on storage bearing products.

As the market is evolving fast for this product type there are many different standards from device to device which currently makes repair difficult as parts are not easily available or interchangeable. This may improve as the market matures and only a few product types become the norm. Repair costs are high, relative to residual value, because of the high volume of screen damage that is incurred over all the model types.

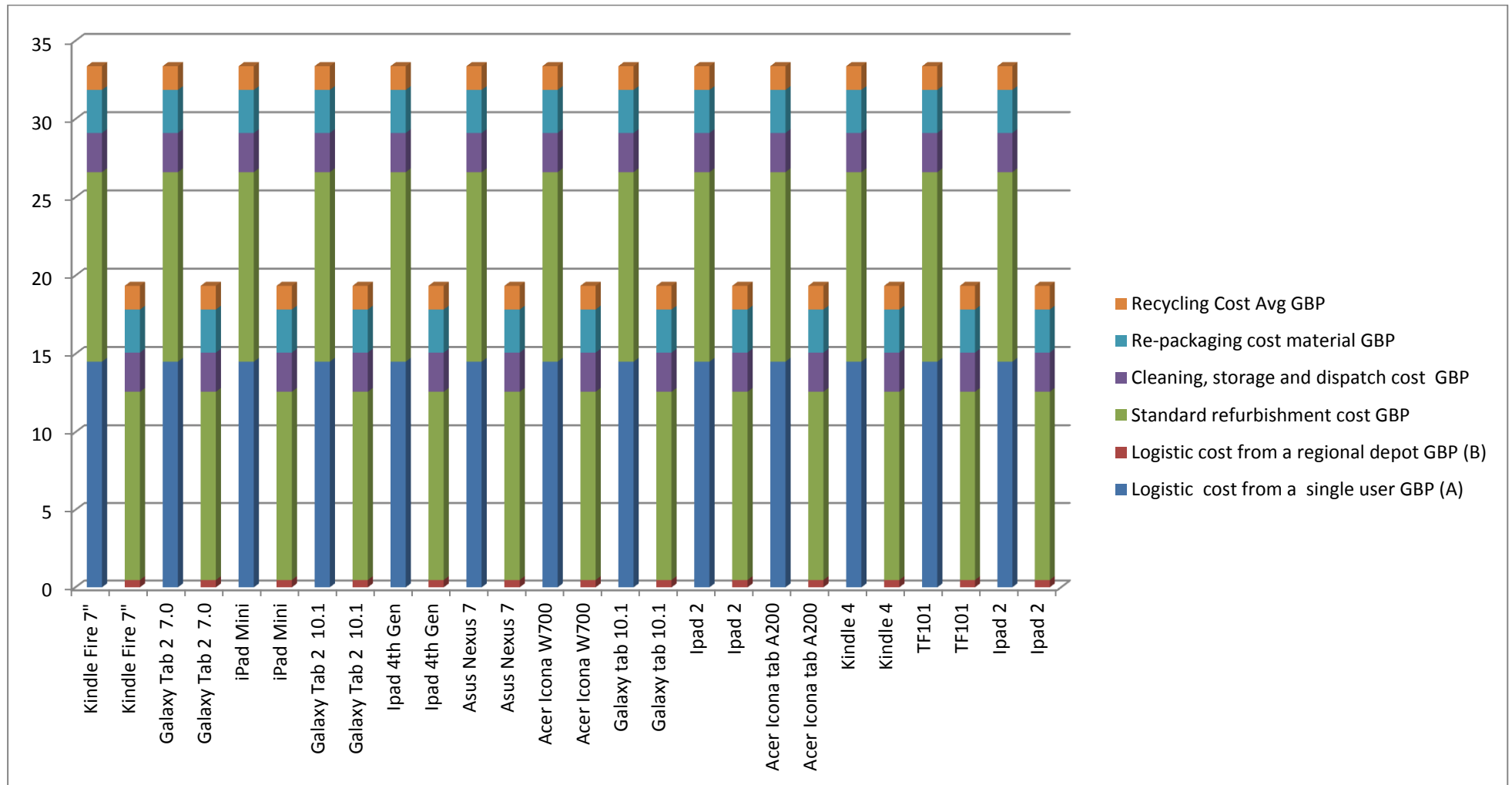


Figure 8. Breakdown of refurbishment cost for PC Tablets

Table 8. Support data for Figure 8

Product Type	Logistic cost from a single user GBP (A)	Logistic cost - regional depot GBP (B)	Standard refurb cost GBP	Cleaning, storage and dispatch cost GBP	Re-packaging cost material GBP	Recycle Cost Avg GBP	Total GBP
Kindle Fire 7"	14.5		12.11	2.5	2.75	1.52	33.38
Kindle Fire 7"		0.47	12.11	2.5	2.75	1.52	19.35
Galaxy Tab 2 7.0	14.5		12.11	2.5	2.75	1.52	33.38
Galaxy Tab 2 7.0		0.47	12.11	2.5	2.75	1.52	19.35
iPad Mini	14.5		12.11	2.5	2.75	1.52	33.38
iPad Mini		0.47	12.11	2.5	2.75	1.52	19.35
Galaxy Tab 2 10.1	14.5		12.11	2.5	2.75	1.52	33.38
Galaxy Tab 2 10.1		0.47	12.11	2.5	2.75	1.52	19.35
Ipad 4th Gen	14.5		12.11	2.5	2.75	1.52	33.38
Ipad 4th Gen		0.47	12.11	2.5	2.75	1.52	19.35
Asus Nexus 7	14.5		12.11	2.5	2.75	1.52	33.38
Asus Nexus 7		0.47	12.11	2.5	2.75	1.52	19.35
Acer Icona W700	14.5		12.11	2.5	2.75	1.52	33.38
Acer Icona W700		0.47	12.11	2.5	2.75	1.52	19.35
Galaxy tab 10.1	14.5		12.11	2.5	2.75	1.52	33.38
Galaxy tab 10.1		0.47	12.11	2.5	2.75	1.52	19.35
Ipad 2	14.5		12.11	2.5	2.75	1.52	33.38
Ipad 2		0.47	12.11	2.5	2.75	1.52	19.35
Acer Icona tab A200	14.5		12.11	2.5	2.75	1.52	33.38
Acer Icona tab A200		0.47	12.11	2.5	2.75	1.52	19.35
Kindle 4	14.5		12.11	2.5	2.75	1.52	33.38
Kindle 4		0.47	12.11	2.5	2.75	1.52	19.35
TF101	14.5		12.11	2.5	2.75	1.52	33.38
TF101		0.47	12.11	2.5	2.75	1.52	19.35
Ipad 2	14.5		12.11	2.5	2.75	1.52	33.38
Ipad 2		0.47	12.11	2.5	2.75	1.52	19.35

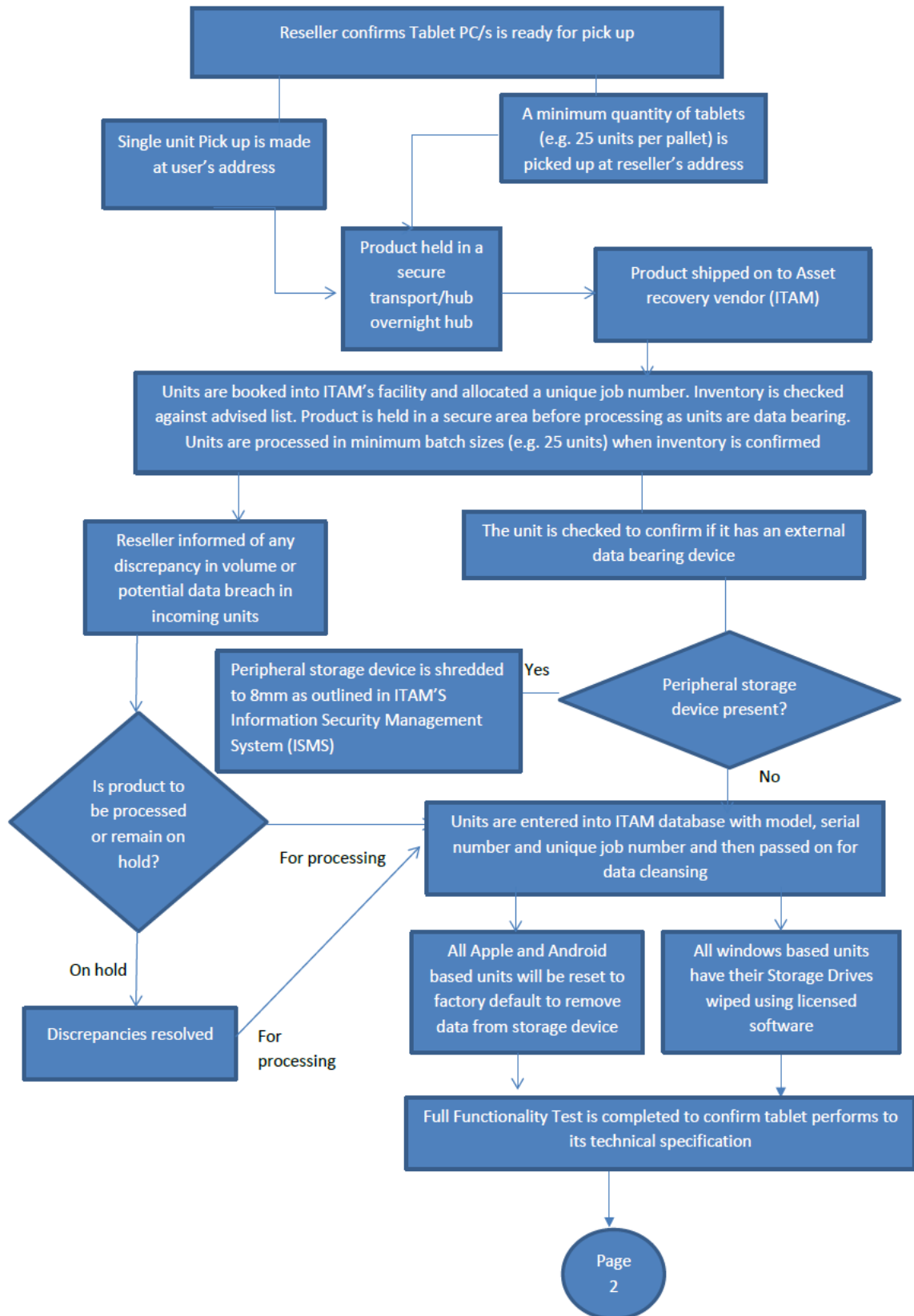


Figure 9. PC Tablet Refurbishment/Resale Flow Diagram

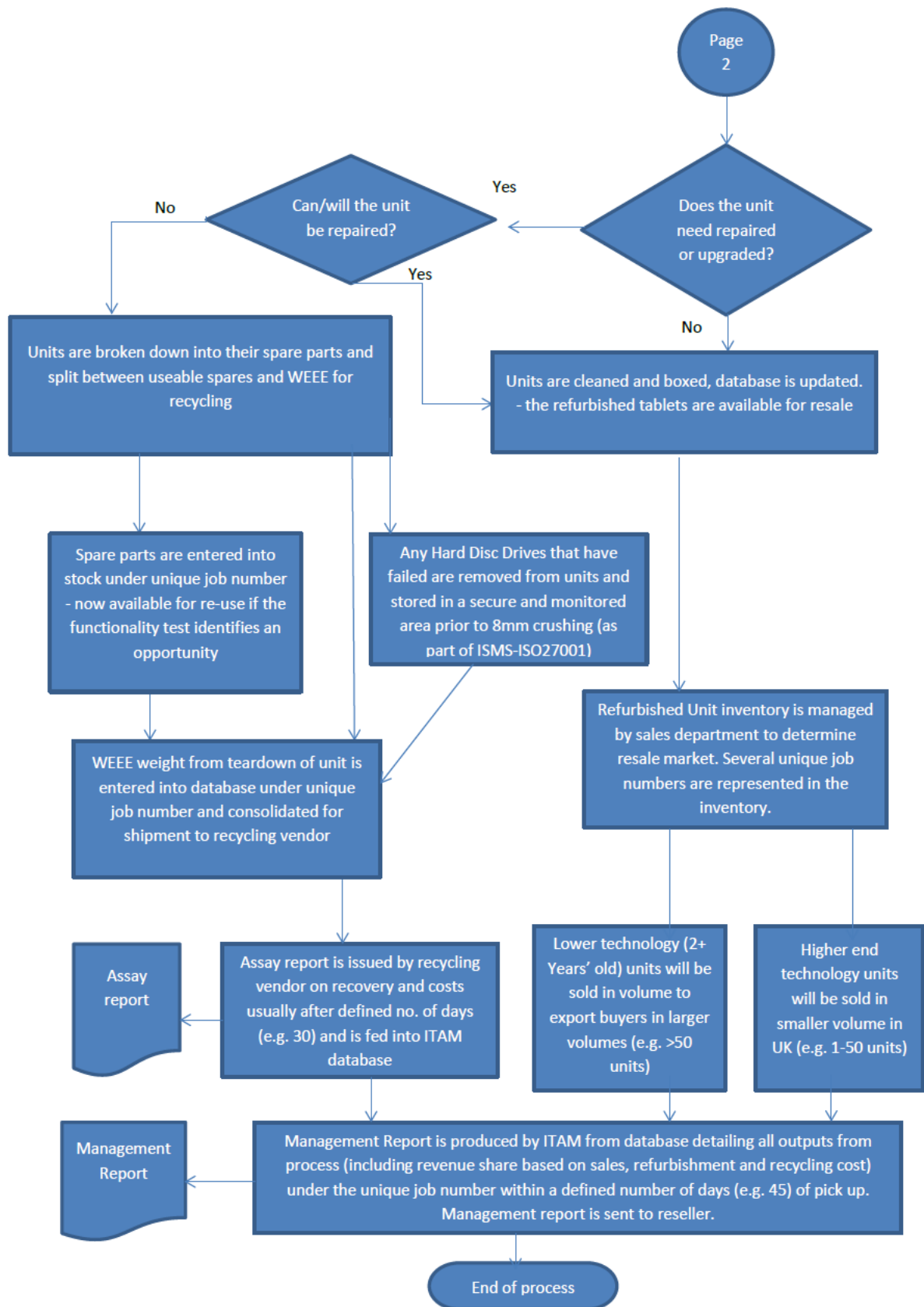


Figure 9 (Cont/...). PC Tablet Refurbishment/Resale Flow Diagram

4.2.3 Revenue sharing arrangements with an ITAM and conclusions for PC Tablets:

The following table is a typical excerpt from a Re-tek management report for PC Tablets illustrating revenue share between an owner and ITAM. Higher end specification products provide the best revenue sharing arrangement and when average repair is factored in it can be seen that residual value is reduced per item - although total revenues will increase because more items have been recovered for resale. If the residual value falls to a point where it is equal to the repair cost then "material cost neutral" arrangements should be factored in to prevent conventional recycling and cost, as outlined in the previous section on laptops (Conclusion section).

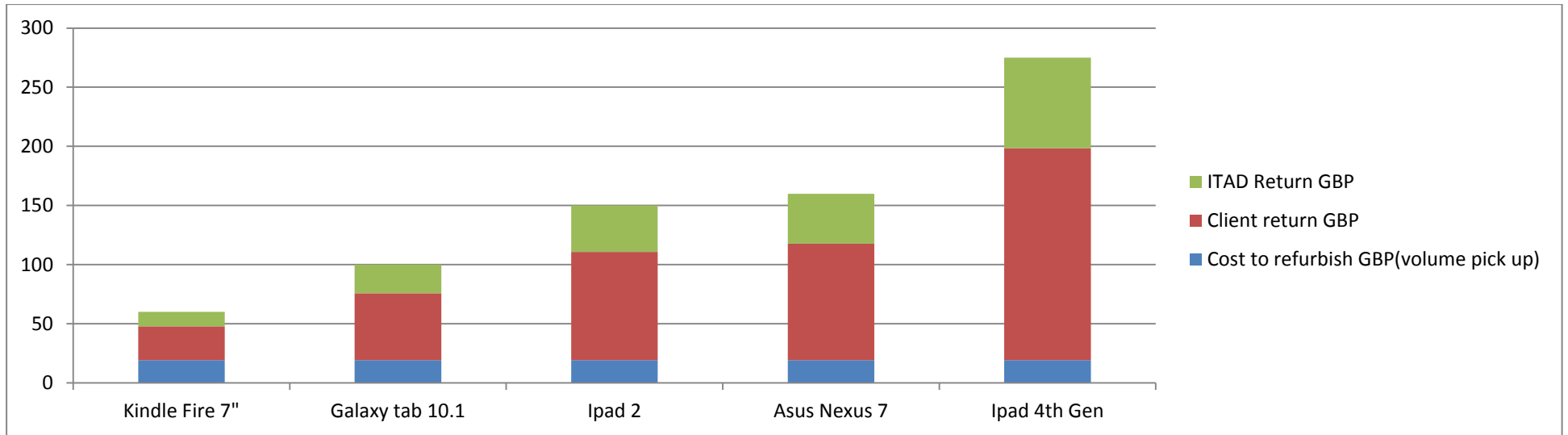


Figure 10. Data excerpts from Re-tek management report for PC Tablets illustrating revenue share between owner and ITAM

Table 9. Support data for Figure 10

Model	Manuf	Processor	Hard Drive	RAM	Screen size	Resale in GBP 2013 refurbished	Cost to refurbish GBP (volume pick up)	Value for revenue share in GBP	Client return GBP	ITAM Return GBP
Kindle Fire 7"	Amazon	n/a	0GB	8GB	7	60	19.35	40.65	28.46	12.20
Galaxy tab 10.1	Samsung	1Ghz	16GB	1GB	10.1	100	19.35	80.65	56.46	24.20
Ipad 2	Apple	A5 1Ghz	16GB	0.5GB	9.7	150	19.35	130.65	91.46	39.20
Asus Nexus 7	Asus	Tegra 3 QC	16GB	16GB	7	160	19.35	140.65	98.46	42.20
Ipad 4th Gen	Apple	A6 1.4Ghz DC	16GB	16GB	9.7	275	19.35	255.65	178.96	76.70

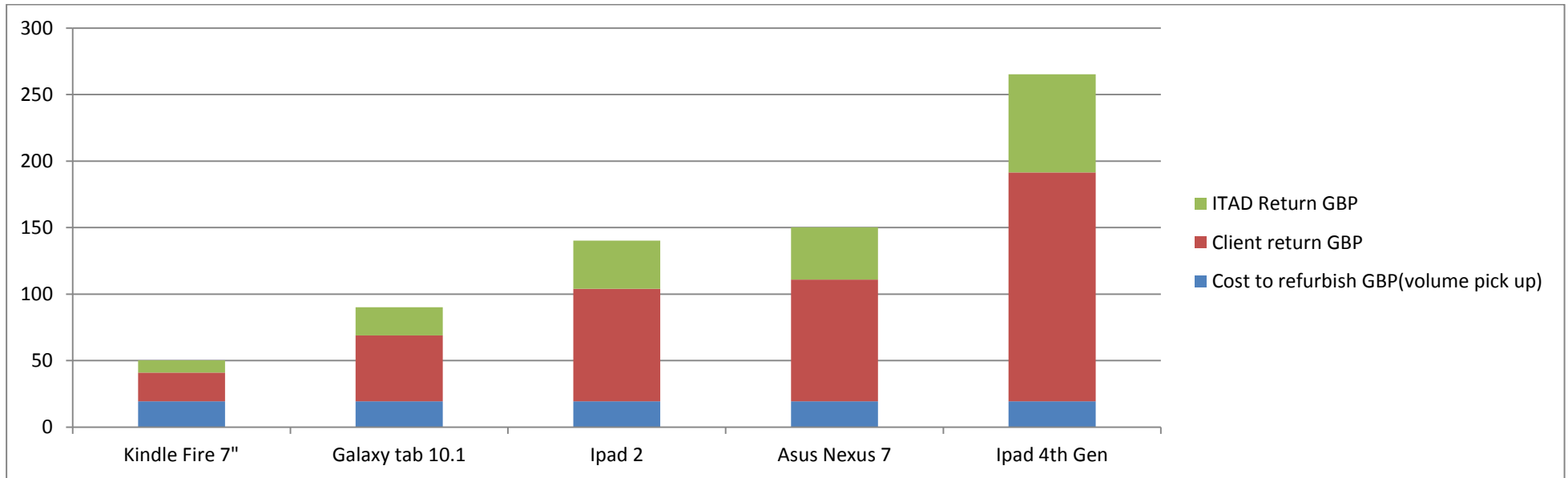


Figure 11. Data plotted from Re-tek management report for PC Tablets illustrating revenue share, with average repair cost added, between owner and ITAM

Table 10. Support data for Figure 11

Model	Manuf.	Processor	Hard Drive	RAM	Screen size	Resale in GBP (2013) refurb.	Cost to refurb GBP (volume pick up)	With average repair added	Value for revenue share in GBP	Client return GBP	ITAM Return GBP
Kindle Fire 7"	Amazon	n/a	0GB	8GB	7	60	19.35	9.84	30.81	21.57	9.24
Galaxy tab 10.1	Samsung	1Ghz	16GB	1GB	10.1	100	19.35	9.84	70.81	49.57	21.24
Ipad 2	Apple	A5 1Ghz	16GB	0.5GB	9.7	150	19.35	9.84	120.81	84.57	36.24
Asus Nexus 7	Asus	Tegra 3 QC	16GB	16GB	7	160	19.35	9.84	130.81	91.57	39.24
Ipad 4th Gen	Apple	A6 1.4Ghz DC	16GB	16GB	9.7	275	19.35	9.84	245.81	172.07	73.74

4.2.4 Conclusion on PC Tablets

PC tablet lifecycle data is limited to the last few years and it is therefore difficult to predict an accurate life expectancy in terms of resale value - 4-5 years is the best estimate.

As this product is relatively new it means most of the models in use today will have a sufficient resale value to justify the cost of the asset recovery process, which may not be the case as more players enter the market. As this market evolves then specific standards and brands will become dominant and repair will become less costly (with the availability of spare parts and the compatibility between models). However, process costs must remain low to deal with the competition now arising in the market which will lower entry prices for this product type and have a knock on effect for residual value and lifetime expectancy. Again, the key factor to realising the maximum return will be the resale value achieved in the used market sector, in both the UK and Overseas, for placing large volumes of used PC tablets.

4.3 LCD (Liquid Crystal Display) TVs

4.3.1 Overview

Again, there are many classifications that can be used to illustrate the product in question here, in this case TVs in both the new and secondary (used) market. The overriding, determining factor that influences lifecycle value is screen size. Therefore, for the purpose of this report, these have been divided into size, as well as by the "Budget/Major" category. There are many budget manufacturers in the smaller screen size category and these have been accounted for to distinguish their residual value against the major manufacturers, with the distinctions as shown below:

- 19-22" Major
- 19-22" Budget
- 27-32" Major
- 27-32" Budget
- 40" Major
- 42" Major
- 46" Major
- 55" Major
- 60" Major

The models listed in the specification worksheet of Appendix 1 are representative of the categories above. They include the main manufacturers, with the largest market share and who have been dominating the LCD TV market since 2008. Although the primary, determining factor for lifecycle value is screen size as mentioned above, other key specifications have been included which have some, but minimal influence on value. The appendix also illustrates the cost of these units with both new and current residual value in the secondary market.

The residual resale value is also expressed as a percentage against the new sale values (in the last column of the worksheet) to summarise and compare depreciation for the time period under consideration. The extent of the depreciation was more considerable pre-2008, after which technology development meant that LCD screens became lower cost. TVs were priced as a luxury item before then, and as they became more commoditised the lifecycle value followed a depreciation gradient of a typical commodity consumer item. These have been plotted and separated into two graphs for clarity to outline all of the categories. Figure 12 shows the resale value of LCD TVs, ranging from 19" to 32" (the information for major and budget manufacturers is plotted separately, in Figure 13). The average

refurbishment and logistical cost is also plotted, which does not include a cost of repair, as the residual resale value of these smaller/budget screens makes this unviable. Figure 13 illustrates 40" to 60" lifecycle values for majors as they dominate this sector of the market.

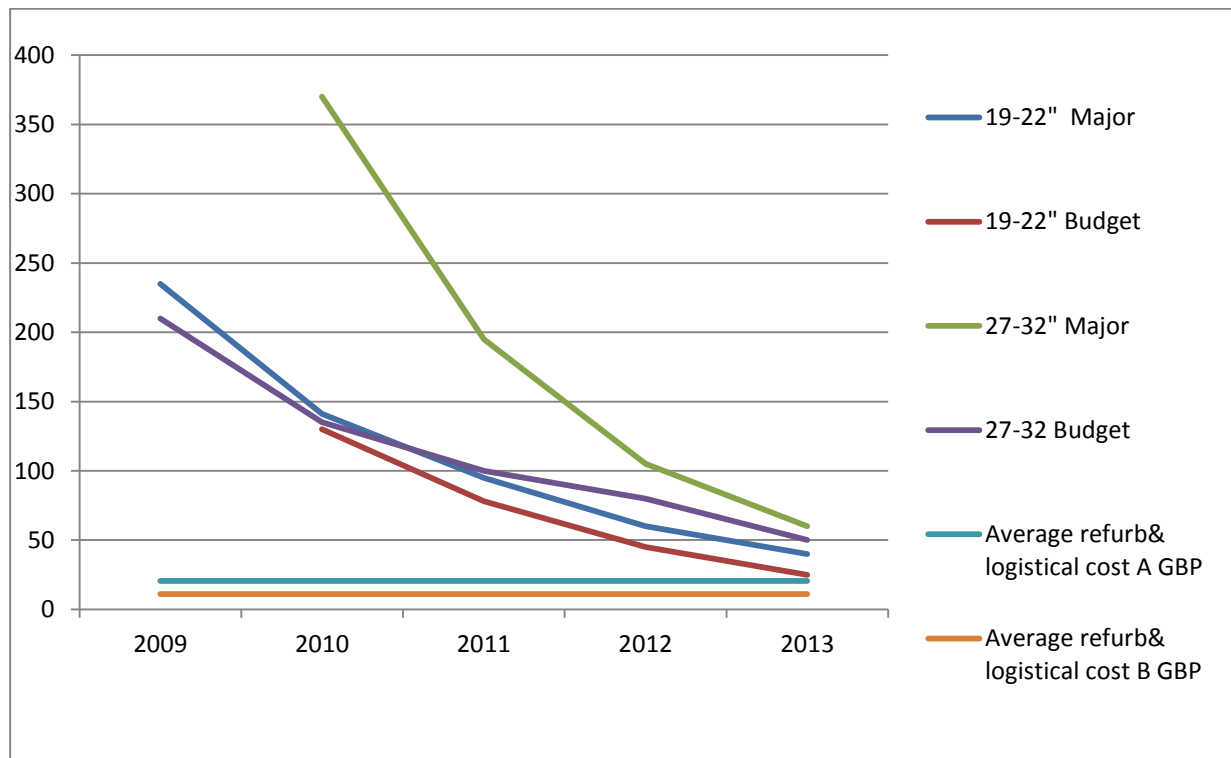


Figure 12. Resale values of LCD TVs ranging from 19" to 32" (major and budget manufacturers plotted in Figure 13)

Table 11. Support data for Figure 12

Products	2009	2010	2011	2012	2013
19-22" Major	235	141	95	60	40
19-22" Budget		130	78	45	25
27-32" Major		370	195	105	60
27-32 Budget	210	135	100	80	50
Average refurb& logistical cost A GBP	20.46	20.46	20.46	20.46	20.46
Average refurb& logistical cost B GBP	10.96	10.96	10.96	10.96	10.96

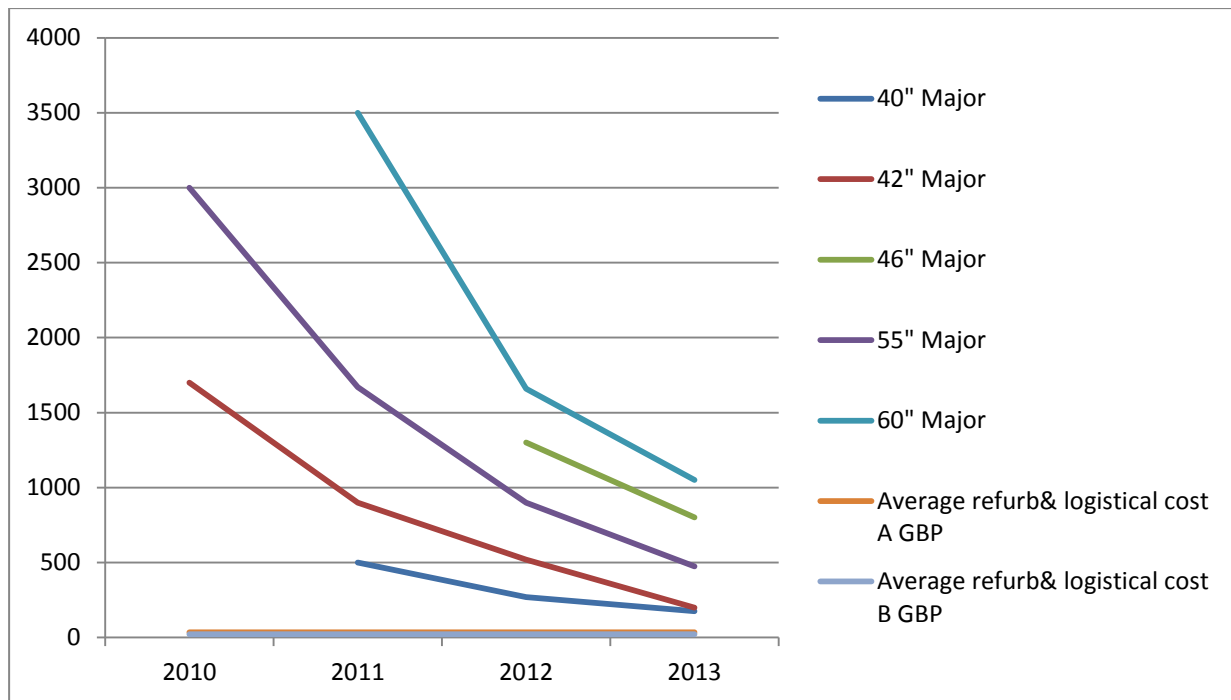


Figure 13. LCD TVs ranging from 40" to 60" for major manufacturers

Table 12. Support data for Figure 13

Products	2010	2011	2012	2013
40" Major		500	270	175
42" Major	1700	900	520	200
46" Major			1300	800
55" Major	3000	1670	900	475
60" Major		3500	1660	1050
Average refurb & logistical cost A GBP	35	35	35	35
Average refurb & logistical cost B GBP	21.08	21.08	21.08	21.08

4.3.2 Specific aspects impacting lifecycle value in TVs

Just as the LCD size influences lifecycle value the same feature has the biggest impact on recovery and repair cost. The cost of transporting an item of this size is considerable as compared to other consumer products. Additionally average repair costs are high, this is due mainly to the high frequency of the faults which are screen related and the cost of a new LCD screen is significant. Also important is the incompatibility of the other spare parts between varying models of the same size of screen. Repair is still viable for higher sized models, information on which is summarised in the following table and illustrated graphically in Figure 14.

Although repair costs are averaged for this product type (just as they have been for all the products) the repair and refurbishment costs are significantly higher than the average for the higher specification models (found in the cost of refurbishment table). This cost has been accounted for in the revenue share illustration section as it details individual model numbers and not a general category for the product type - to make the point that the larger screen size models come with more costly repairs.

The various stages of the cost process are outlined in the flowchart in Figure 15.

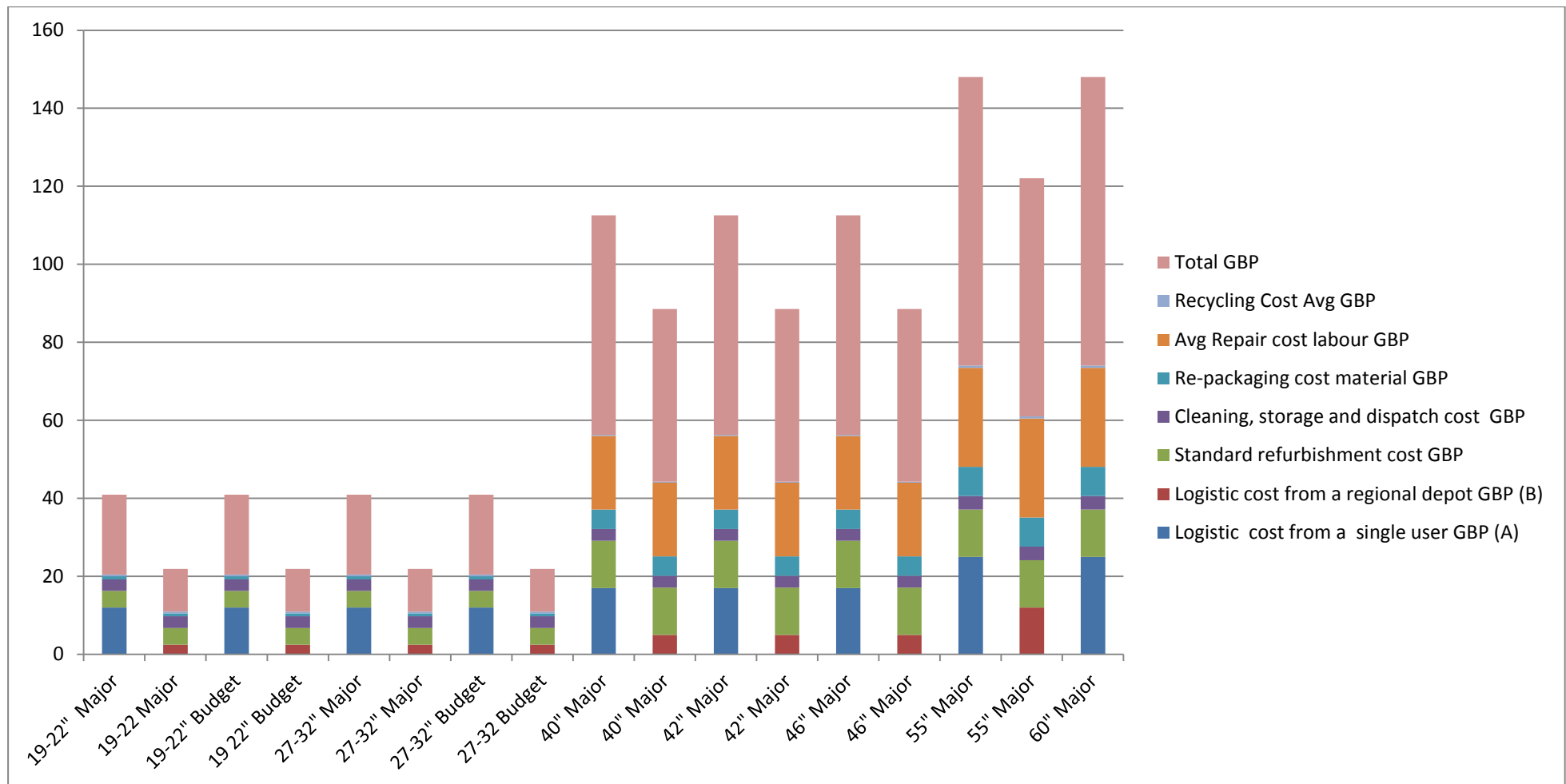


Figure 14. LCD TV breakdown of refurbishment cost table

Table 13. Support data for Figure 14

Product	Logistic cost from a single user GBP (A)	Logistic cost from a regional depot GBP (B)	Standard refurbishment cost GBP	Cleaning, storage and dispatch cost GBP	Re-packaging cost material GBP	Avg Repair cost labour GBP	Recycling Cost Avg GBP	Total GBP
19-22" Major	12	0	4.25	3	0.75	0	0.46	20.46
19-22 Major	0	2.5	4.25	3	0.75	0	0.46	10.96
19-22" Budget	12	0	4.25	3	0.75	0	0.46	20.46
19 22" Budget	0	2.5	4.25	3	0.75	0	0.46	10.96
27-32" Major	12	0	4.25	3	0.75	0	0.46	20.46
27-32" Major	0	2.5	4.25	3	0.75	0	0.46	10.96
27-32" Budget	12	0	4.25	3	0.75	0	0.46	20.46
27-32 Budget	0	2.5	4.25	3	0.75	0	0.46	10.96
40" Major	17	0	12.11	3	5	18.92	0.25	56.28
40" Major	0	5	12.11	3	5	18.92	0.25	44.28
42" Major	17	0	12.11	3	5	18.92	0.25	56.28
42" Major	0	5	12.11	3	5	18.92	0.25	44.28
46" Major	17		12.11	3	5	18.92	0.25	56.28
46" Major	0	5	12.11	3	5	18.92	0.25	44.28
55" Major	25	0	12.11	3.5	7.5	25.38	0.53	74.02
55" Major	0	12	12.11	3.5	7.5	25.38	0.53	61.02
60" Major	25	0	12.11	3.5	7.5	25.38	0.53	74.02
60" Major	0	12	12.11	3.5	7.5	25.38	0.53	61.02

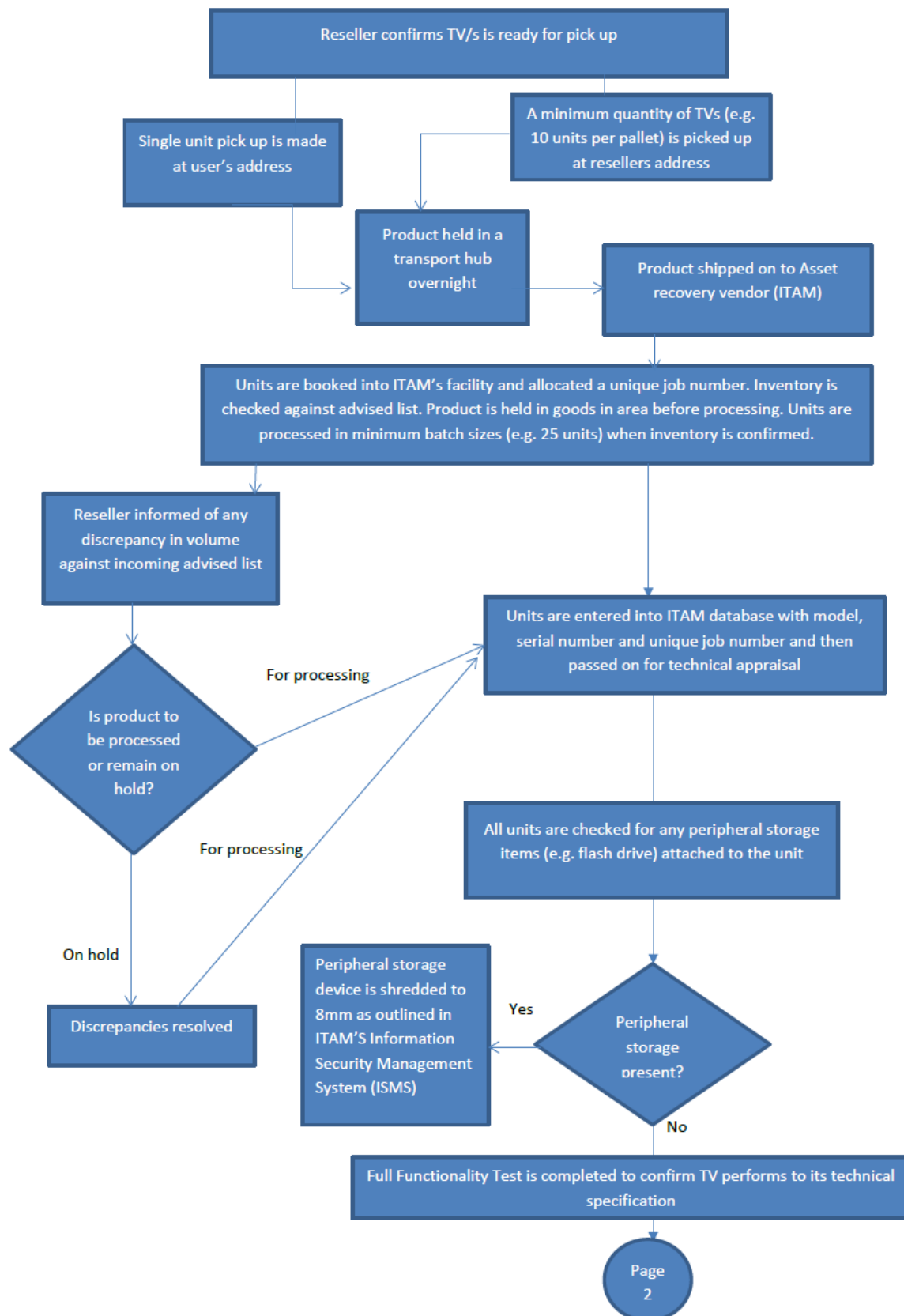


Figure 15. TV Refurbishment/Resale Flow Diagram

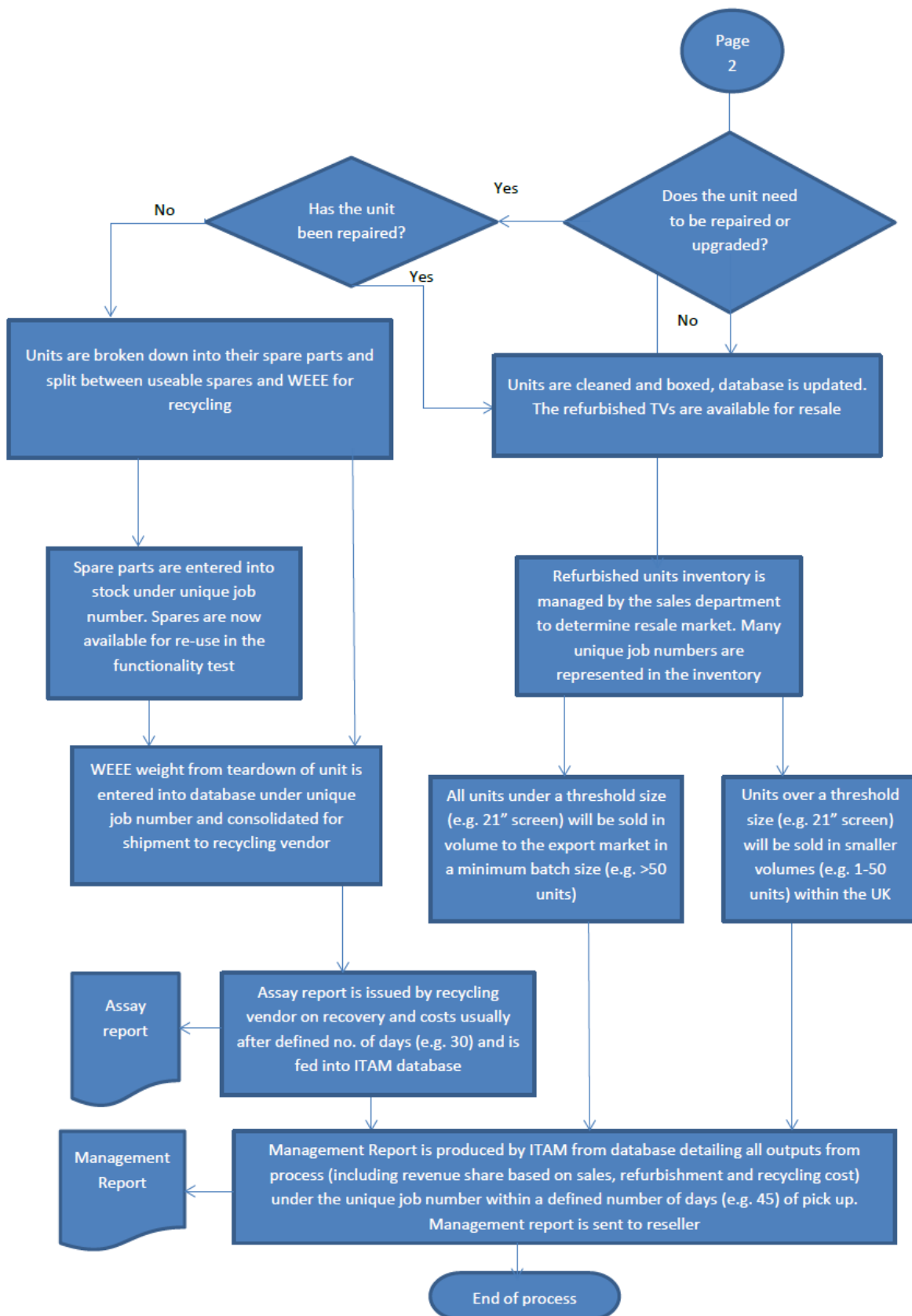


Figure 15 (Cont/...). TV Refurbishment/Resale Flow Diagram

4.3.3 Revenue sharing arrangements with an ITAM and conclusions for LCD TVs

Figure 16 is an illustration of a typical excerpt from a Re-tek management report for LCD TVs, showing the revenue share between an owner and ITAM. Not surprisingly, higher screen sizes provide the best revenue sharing arrangement even with average repair costs factored in.

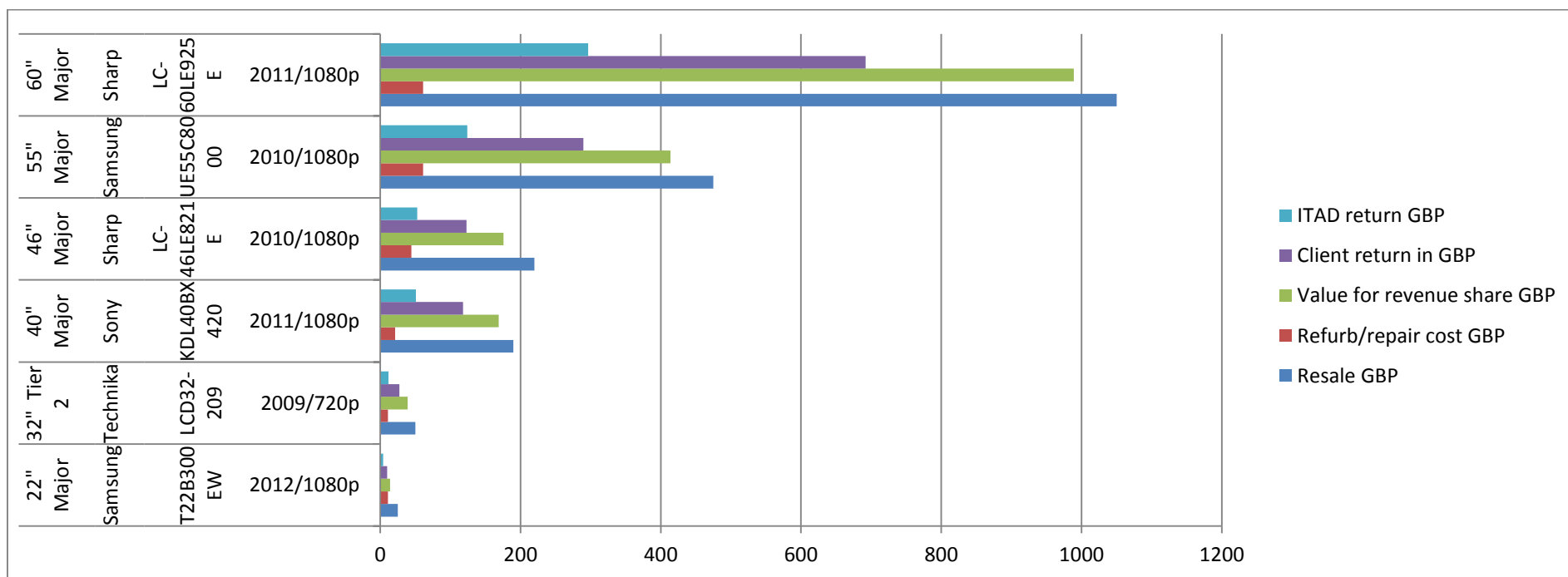


Figure 16. Presentation of data from a Re-tek management report for LCD TVs illustrating revenue share between owner and ITAM

Table 14. Support data for Figure 16

TV size	Manuf	Model	spec	Resale GBP	Refurb/repair cost GBP	Value for revenue share GBP	Client return in GBP	ITAM return GBP
22" Major	Samsung	T22B300EW	2012/1080p	25	10.96	14.04	9.83	4.21
32" Tier 2	Technika	LCD32-209	2009/720p	50	10.96	39.04	27.33	11.71
40" Major	Sony	KDL40BX420	2011/1080p	190	21.08	168.92	118.24	50.68
46" Major	Sharp	LC-46LE821E	2010/1080p	220	44.28	175.72	123.00	52.72
55" Major	Samsung	UE55C8000	2010/1080p	475	61.02	413.98	289.79	124.19
60" Major	Sharp	LC-60LE925E	2011/1080p	1050	61.02	988.98	692.29	296.69

4.3.4 Conclusions for LCD TVs

The LCD TV lifecycle data is limited, but comprehensive enough to provide meaningful information on the lifetime expectancy, estimated to be as follows:

- 19-32" up to 5 years
- 32"- 46" 5-6 years
- 46"- 60" 6 years

The commodity is currently highly volatile to pricing as many new players have entered the market and subsequently the lifecycle value has already changed since the first raw data was submitted for this product type in the month prior to writing this report e.g. a refurbished Sony 40" LCD TV was selling for £240.00 in early March 2013 and the price has fallen to £190.00 a month later. Repairs remain expensive and limited because of the scale of the incompatibility of parts and would appear to only be feasible for models greater than 32".

As the commodity becomes more readily available it is crucial that process costs remain low to maintain reasonable yields for high volumes of small screens heading for the export market. Larger screens need much more technical expertise to produce reasonable yields and a dedicated sales force, or sales portal, to move the available stock at the required market price. This requires expertise in both product knowledge and sales, which can be provided by an experienced commercial partner.

An experienced ITAM should also be able to deliver an owner with the benefit associated with being able to maximise a higher return on the major products placing these items into the market which provides the highest returns – considering that the volume export market will not differentiate on price in terms of Major versus Budget products. It should be noted that there could be challenges in maintaining good residual value on higher sized screens (>40") if the budget manufacturers enter this market place.

4.4 Satellite Navigation

4.4.1 Overview

All the models featured in this report are dedicated models and not integrated – meaning that they are mobile and not fixed. As this market is dominated by three major players (Tom-Tom, Garmin and Navman) then the Lifecycle and key impact data features present these major brands separately while representing their model profile under the following headings:

- Budget
- Mid-range
- High end

Appendix 1 outlines the popular models that relate to the above categories. It also lists the key product specification features that maintain lifecycle value including the year they were introduced and at what price – as well as comparing this to their current residual value. Although screen size is a significant consideration for residual value, map coverage and the other features listed also are key contributors.

The lifecycle values of the models have been presented from 2010 as this is when it is considered that this commodity became mainstream. It is also when Re-tek entered the market for refurbishing used units of this kind.

As can be seen from the Lifecycle data in Figures 17, 18 & 19 depreciation for this product type follows the same trend as a reasonably established consumer/commodity item. Most net residual value is maintained in the higher end models across all of the manufacturers. Market awareness of resale conditions for the budget models would be prudent because of their popularity and the impact this may have on overall returns.

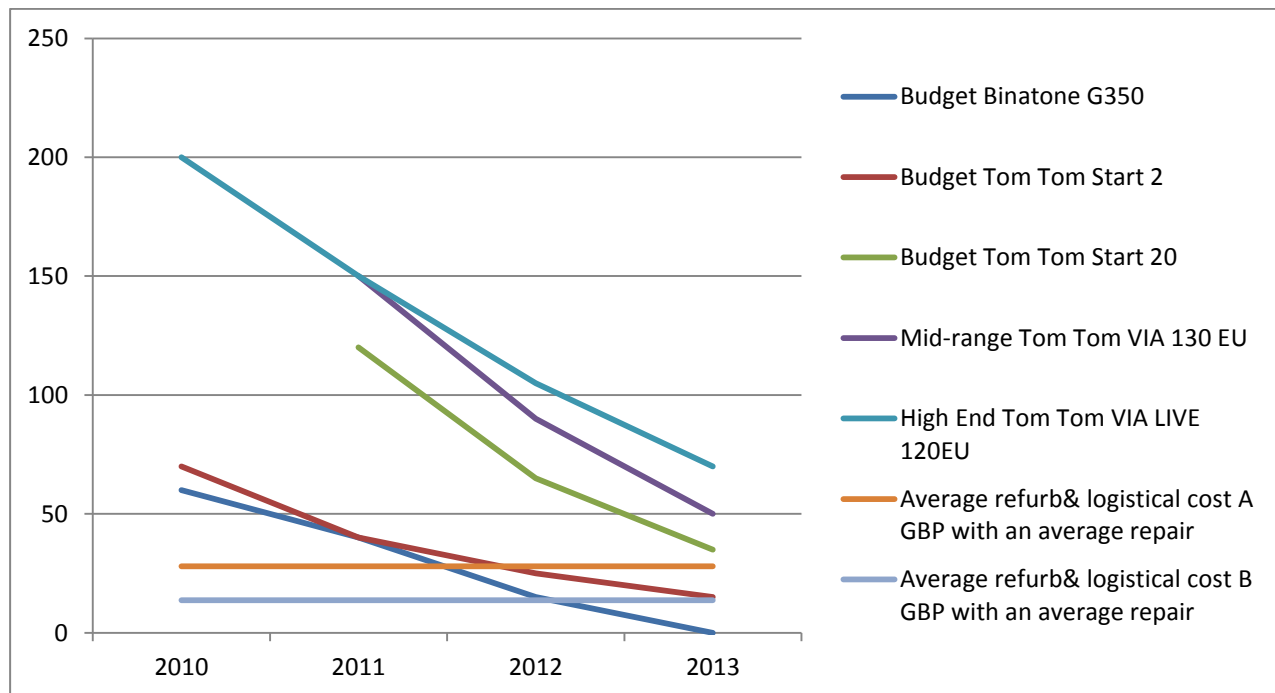


Figure 17. Depreciation of Sat Nav Binatone and Tom Tom products

Table 15. Support data for Figure 17

Description	Product	ID	2010	2011	2012	2013
Budget	Binatone	G350	60	40	15	0
Budget	Tom Tom	Start 2	70	40	25	15
Budget	Tom Tom	Start 20		120	65	35
Mid-range	Tom Tom	VIA 130 EU		150	90	50
High End	Tom Tom	VIA LIVE 120EU	200	150	105	70
Average refurb& logistical cost A GBP with an average repair			27.96	27.96	27.96	27.96
Average refurb& logistical cost B GBP with an average repair			13.7	13.7	13.7	13.7

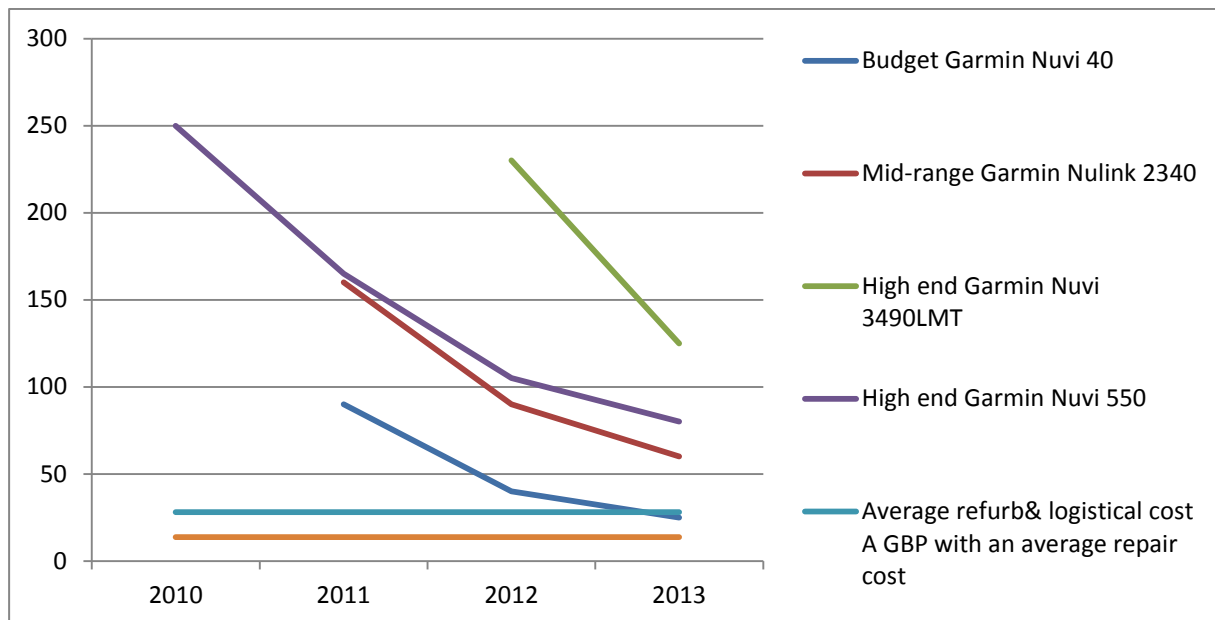


Figure 18. Depreciation of Garmin Tom Tom products

Table 16. Support data for Figure 18

Description	Product	ID	2010	2011	2012	2013
Budget	Garmin	Nuvi 40		90	40	25
Mid-range	Garmin	Nulink 2340		160	90	60
High end	Garmin	Nuvi 3490LMT			230	125
High end	Garmin	Nuvi 550	250	165	105	80
Average refurb. & logistical cost A GBP with an average repair cost			27.96	27.96	27.96	27.96
Average refurb. & logistical cost B GBP with an average repair cost			13.7	13.7	13.7	13.7

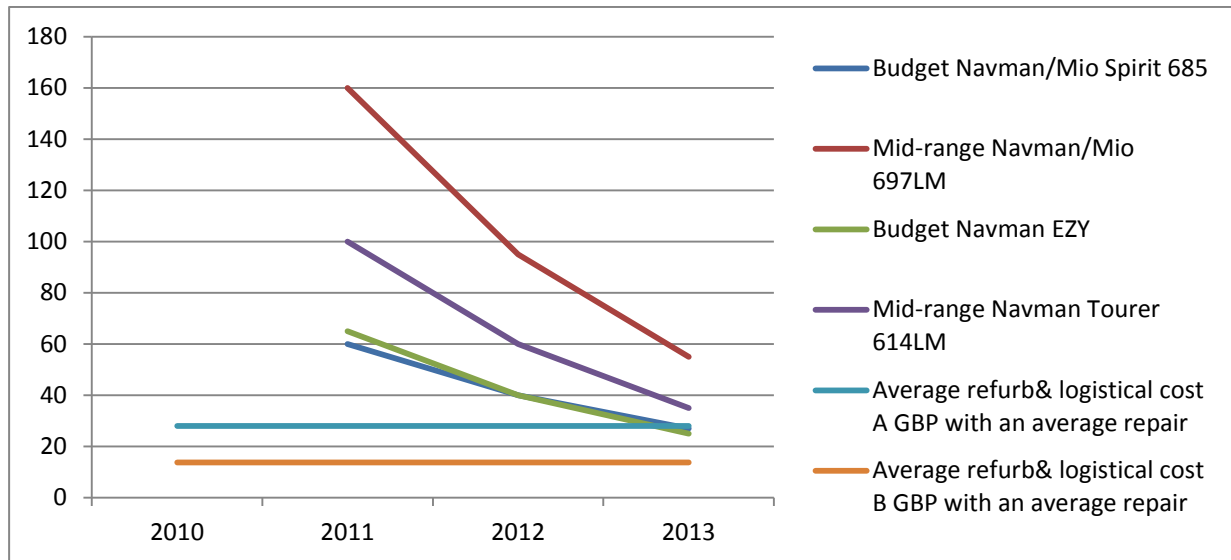


Figure 19. Navman/Mio lifecycle value

Table 17. Support data for Figure 19

Description/Category	Product	ID	2010	2011	2012	2013
Budget	Navman/Mio	Spirit 685		60	40	27
Mid-range	Navman/Mio	697LM		160	95	55
Budget	Navman	EZY		65	40	25
Mid-range	Navman Tourer	614LM		100	60	35
Average refurb& logistical cost A GBP with an average repair			27.96	27.96	27.96	27.96
Average refurb& logistical cost B GBP with an average repair			13.7	13.7	13.7	13.7

4.4.2 Specific aspects impacting lifecycle value in Satellite Navigational Systems.

The main considerations associated with maintaining lifecycle value for this product group is the volume of budget items processed versus mid-range and higher end items as a whole. The screens are the most expensive replacement part and like so many other consumer products, are the part most likely needing replaced or repaired. As the lifecycle value and key impact data illustrates, this may become cost prohibitive for re-use. The full lifecycle impact is shown in the "Cost of refurbishment" graph (Figure 20) and table - features all of the models in Appendix 1.

Because the mapping feature is specific to a region then most export markets (typically emerging markets) are off limits, and therefore the demand for used refurbished product is limited to the region the device covers. However, emerging markets are showing more interest in this product type and it is expected that cheap software will be vital to making this key feature less limiting for multiple regions and markets.

Lastly, new features, that only exist in higher-end models, such as lifetime map updates, voice recognition and Bluetooth features, may have an influence on value as they become more common throughout all model categories.

The various stages associated with creating a re-use opportunity for this commodity are outlined in Figure 21 demonstrating the process flow from user to ITAM/owner.

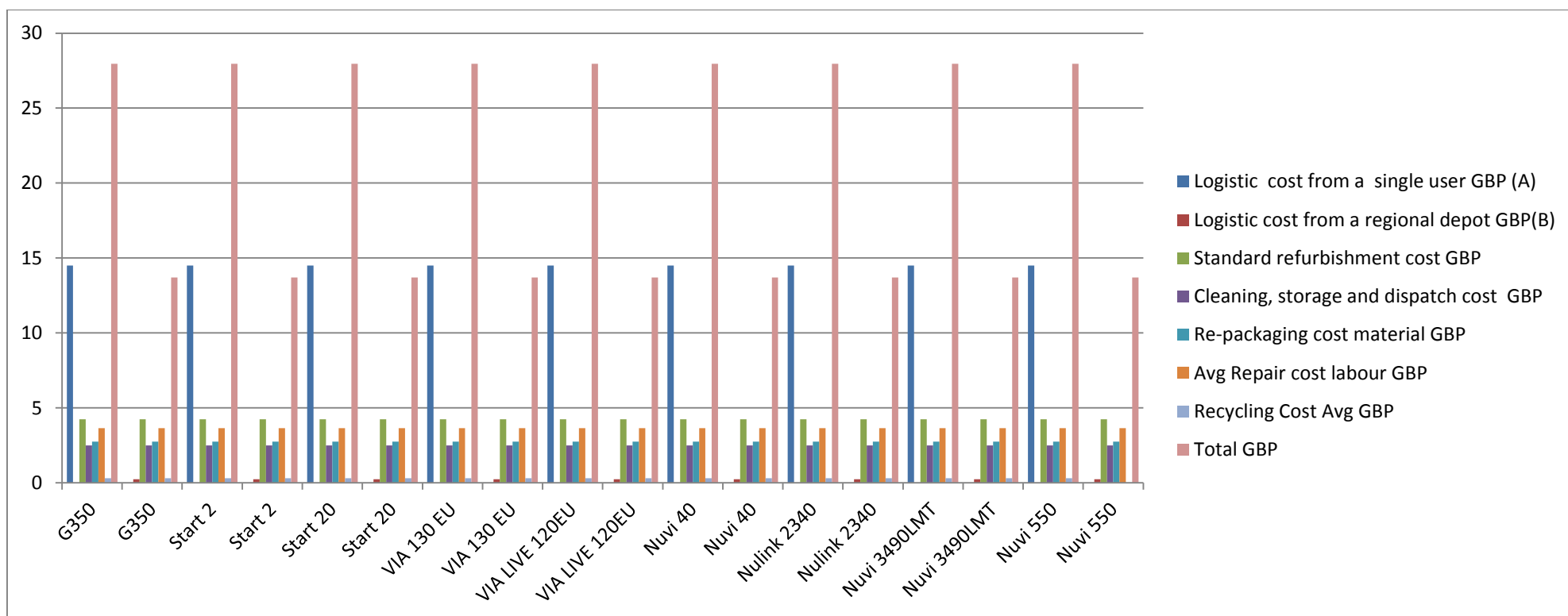


Figure 20. Sat nav systems – reuse process steps and costs from user to ITAM/owner

Table 18. Support Data for Figure 20

Make	Model	Logistic cost from a single user GBP (A)	Logistic cost from a regional depot GBP(B)	Standard refurbishment cost GBP	Cleaning, storage and dispatch cost GBP	Re-packaging cost material GBP	Avg Repair cost labour GBP	Recycling Cost Avg GBP	Total GBP
Binatone	G350	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Binatone	G350	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Tom Tom	Start 2	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Tom Tom	Start 2	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7

Tom Tom	Start 20	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Tom Tom	Start 20	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Tom Tom	VIA 130 EU	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Tom Tom	VIA 130 EU	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Tom Tom	VIA LIVE 120EU	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Tom Tom	VIA LIVE 120EU	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Garmin	Nuvi 40	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Garmin	Nuvi 40	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Garmin	Nulink 2340	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Garmin	Nulink 2340	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Garmin	Nuvi 3490LMT	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Garmin	Nuvi 3490LMT	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Garmin	Nuvi 550	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Garmin	Nuvi 550	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Navman/Mio	Spirit 685	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Navman/Mio	Spirit 685	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Navman/Mio	697LM	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Navman/Mio	697LM	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Navman	EZY	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Navman	EZY	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7
Navman Tourer	614LM	14.5	0	4.25	2.5	2.75	3.65	0.31	27.96
Navman Tourer	614LM	0	0.24	4.25	2.5	2.75	3.65	0.31	13.7

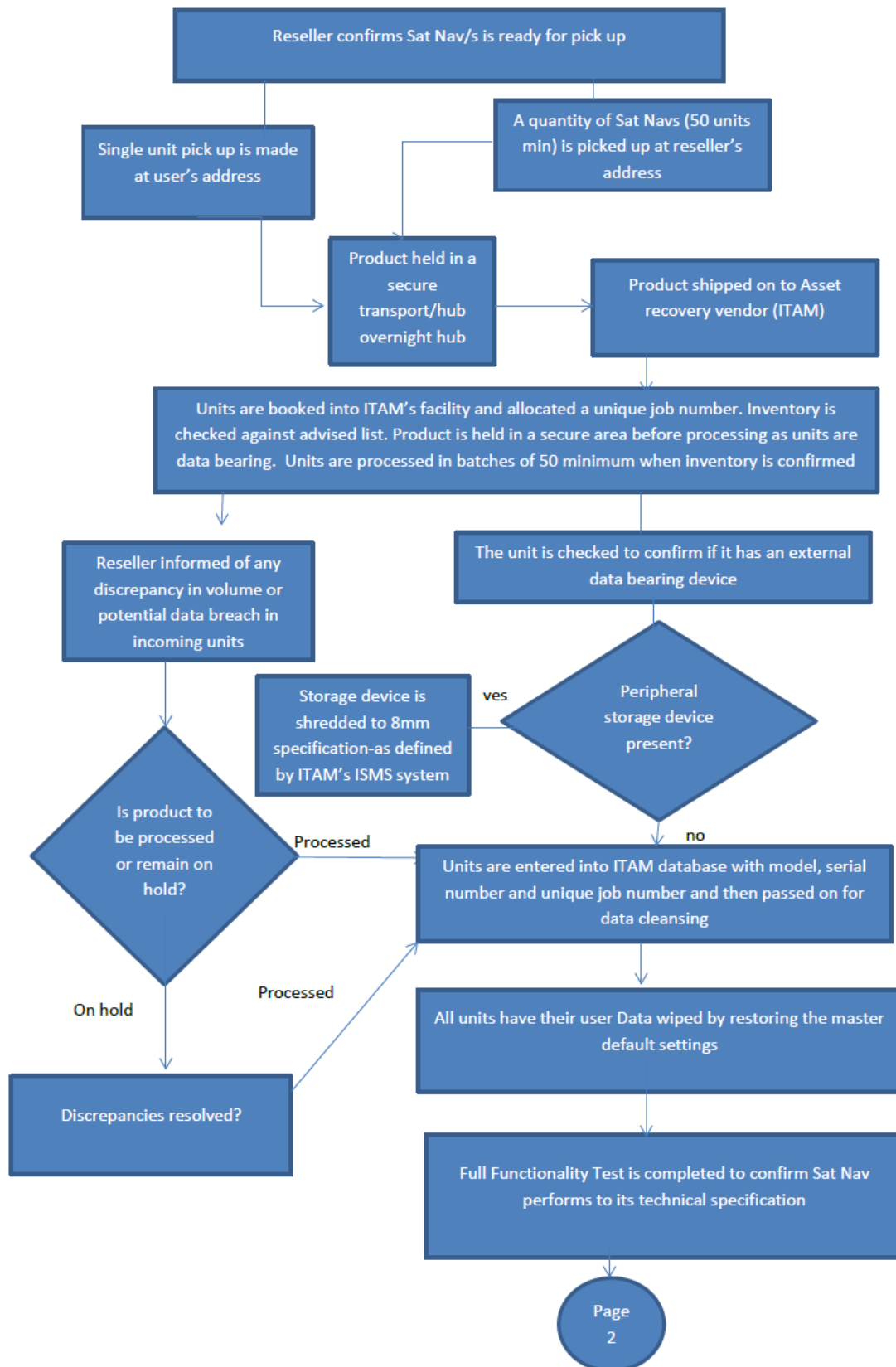


Figure 21. Sat Nav Refurbishment/Resale Flow Diagram

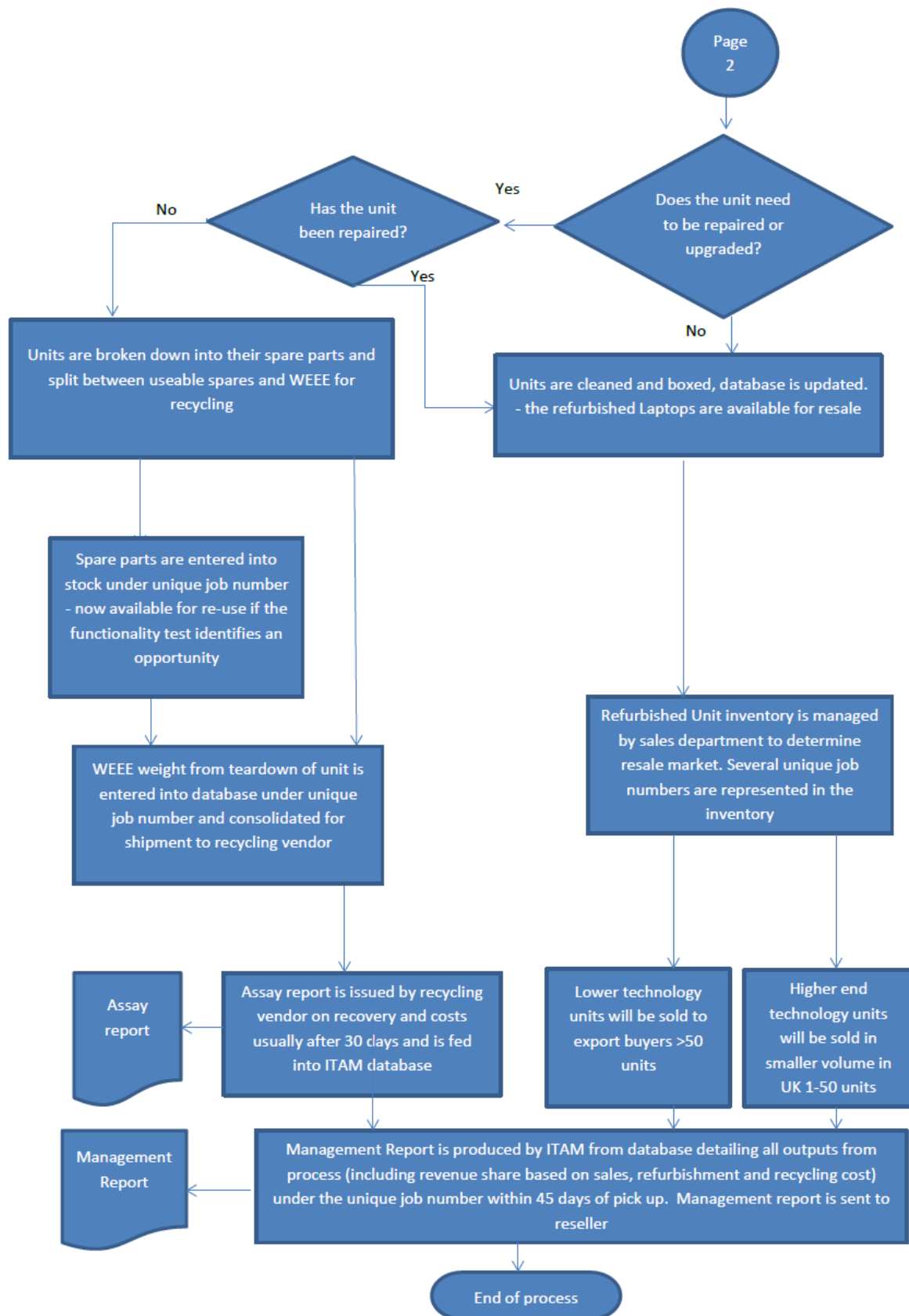


Figure 21 (Cont/...). Sat Nav Refurbishment/Resale Flow Diagram

4.4.3 Revenue sharing arrangements with an ITAM and conclusions for Sat Navs

Figure 22 presents a typical excerpt from a Re-tek management report for Sat Navs illustrating revenue share between owner and ITAM. Not surprisingly, higher-end models, with enhanced features, give the best revenue sharing arrangement even with average repair factored in. The Binatone budget model illustrates the point made previously, regarding the impact that budget or low end models will have on lifecycle value – with a large volume being traded-in (or entering the secondary market in a short period of time) and how this could result in a net negative return or charge. This cost can be offset by maintaining good resale levels with the other mid-range and higher end models. However, there should be caution in this respect, as an overall batch return cannot be confirmed as a charge, cost neutral or positive value until individual volume batches are assessed for their re-use potential.

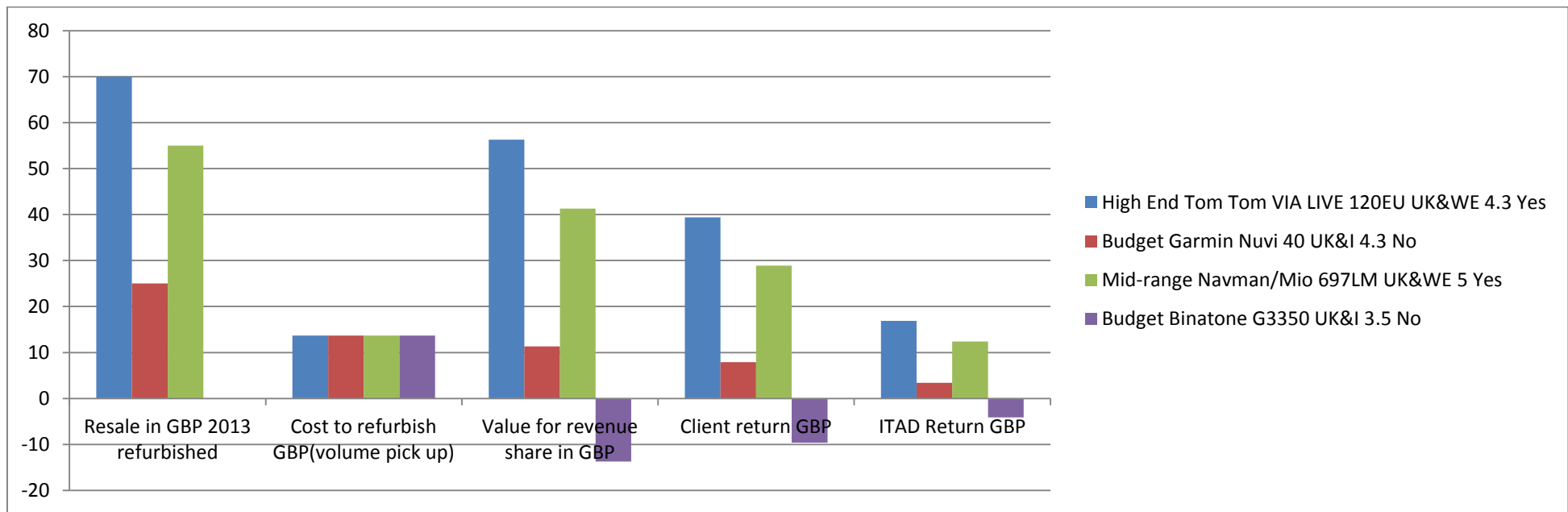


Figure 22. Management Report Data

Table 19. Support Data for Figure 23

Type	Manuf	Model	Map coverage	Screen size in inches	Lane Guidance	Resale in GBP 2013 refurb.	Cost to refurbish GBP (volume pick up)	Value for revenue share in GBP	Client return GBP	ITAM Return GBP
High End	Tom Tom	VIA LIVE 120EU	UK&WE	4.3	Yes	70	13.7	56.3	39.41	16.89
Budget	Garmin	Nuvi 40	UK&I	4.3	No	25	13.7	11.3	7.91	3.39
Mid-range	Navman / Mio	697LM	UK&WE	5	Yes	55	13.7	41.3	28.91	12.39
Budget	Binatone	G3350	UK&I	3.5	No	0	13.7	-13.7	-9.59	-4.11

4.4.4 Conclusions for Sat Navs

Life expectancy for Sat Navs is variable, depending on the categories but can be estimated as follows:

- Budget – 3 year lifespan
- Mid-range - 4 year lifespan
- Higher end -5 year lifespan

Budget models are manufactured with what could be considered as a reasonably short lifecycle (e.g. it is anticipated that they are likely to be replaced after 3 years) and the large volume of end-of life budget models being processed could have a negative impact. Therefore efficient volume processing and effective market placement will make considerable difference on the returns realised for this product type. The most effective way of ensuring there is minimum recycling and maximum reuse, to maintain a financial return, is to work with a commercial partner that can process a number of other products. Therefore the yields and subsequent financial return will be measured across all of the commodities processed by such a partner.

4.5 Digital Cameras

4.5.1 Overview

This market is very mature with the first very basic models, for volume consumption, entering the market in 2001/02. There are therefore many market players delivering multiple new models every single year. For simplification this product group has been separated into two distinct categories that assist with distinguishing between products by price and hence indicate the quality variation across devices. The categories used are as follows:

- Compact Digital or Point and Shoot
- DSLR and Bridge Cameras

Canon, Sony, Nikon, Samsung, Kodak, Fuji, Casio and Panasonic have around 80% of the market share worldwide for this commodity. Therefore the models featured in Appendix 1 reflect market share and are also representative of the models processed by Re-tek over the past 7 years. The same Appendix also shortlists the product features that determine lifecycle value, defining the entry price as well as making a comparison of the current residual values. Please note that the categories outlined above are separated into two different tables in Appendix 1 because their residual values have a considerable value gap. For both categories the lifecycle value has been presented from 2005. This is when the first of the 5 and 6 Megapixel Compact digital cameras were introduced that still hold some, although minimal, residual value. Compact cameras older than this, and below this specification, have no value in terms of re-use.

The DSLR/Bridge category is less of a commodity than the Compact models and the data is much more limited for this type. However, for consistency of comparison, and using the information available, the lifecycle for these is also presented from 2005. The graphs and supporting tables (see Figures 23,24 and 25) describe the models featured in Appendix 1 for both Compact and DSLR/Bridge models respectively - allowing for higher specification models, through technology improvements, entering over subsequent years. The data shows that on compact models from 2005 there is still resale value, and that the newer the item then resale value improves. On the DSLR/Bridge models it is the same trend but because the item has a much higher new value then the residual value is also much higher.

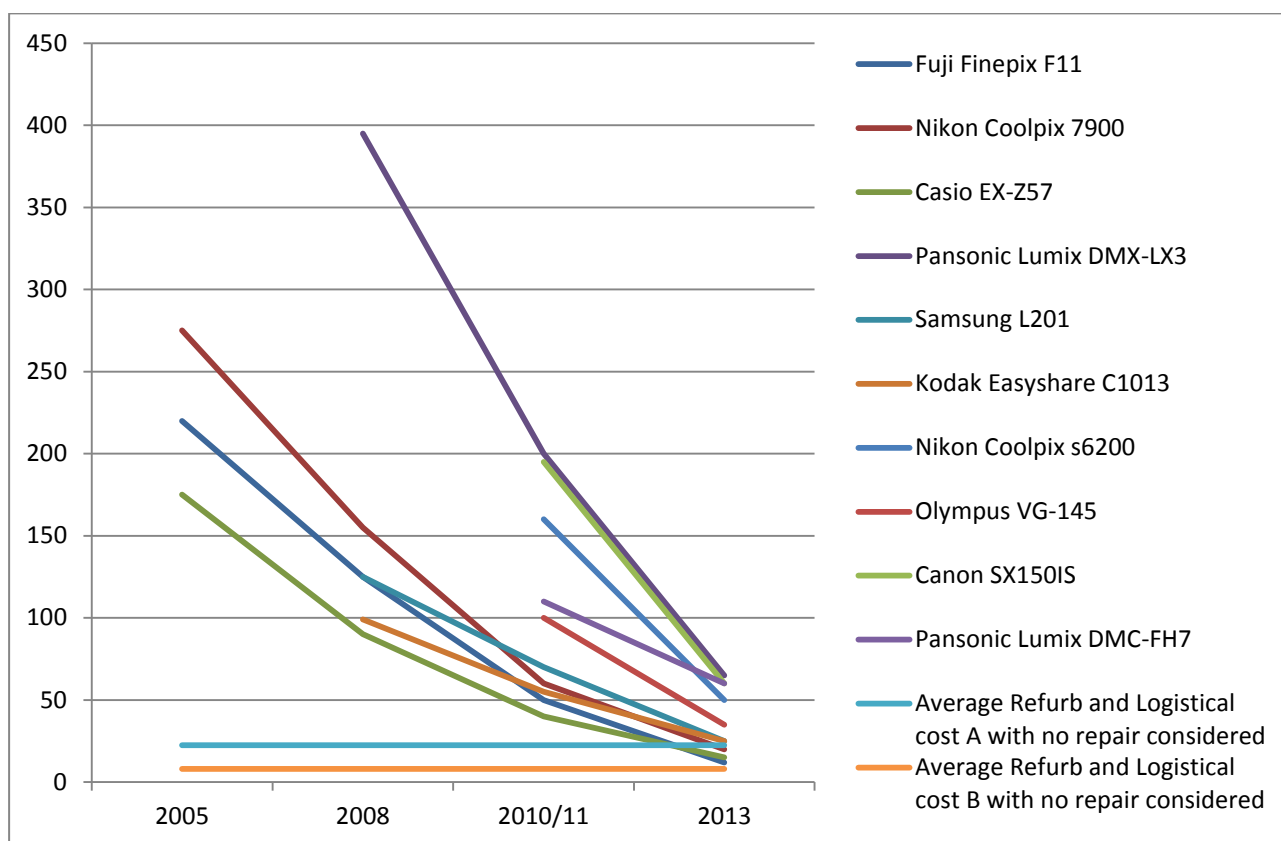


Figure 23. Depreciation of various **compact** camera products

Table 20. Support data for Figure 24

Type	Manuf	Model number	2005	2008	2010/11	2013
Compact	Fuji	Finepix F11	220	125	50	12
Compact	Nikon	Coolpix 7900	275	155	60	20
Compact	Casio	EX-Z57	175	90	40	15
Compact	Panasonic	Lumix DMX-LX3		395	200	65
Compact	Samsung	L201		125	70	25
Compact	Kodak	Easyshare C1013		99	55	25
Compact	Nikon	Coolpix s6200			160	50
Compact	Olympus	VG-145			100	35
Compact	Canon	SX150IS			195	60
Compact	Panasonic	Lumix DMC-FH7			110	60
	Average Refurb and Logistical cost A with no repair considered		22.37	22.37	22.37	22.37
	Average Refurb and Logistical cost B with no repair considered		8.11	8.11	8.11	8.11

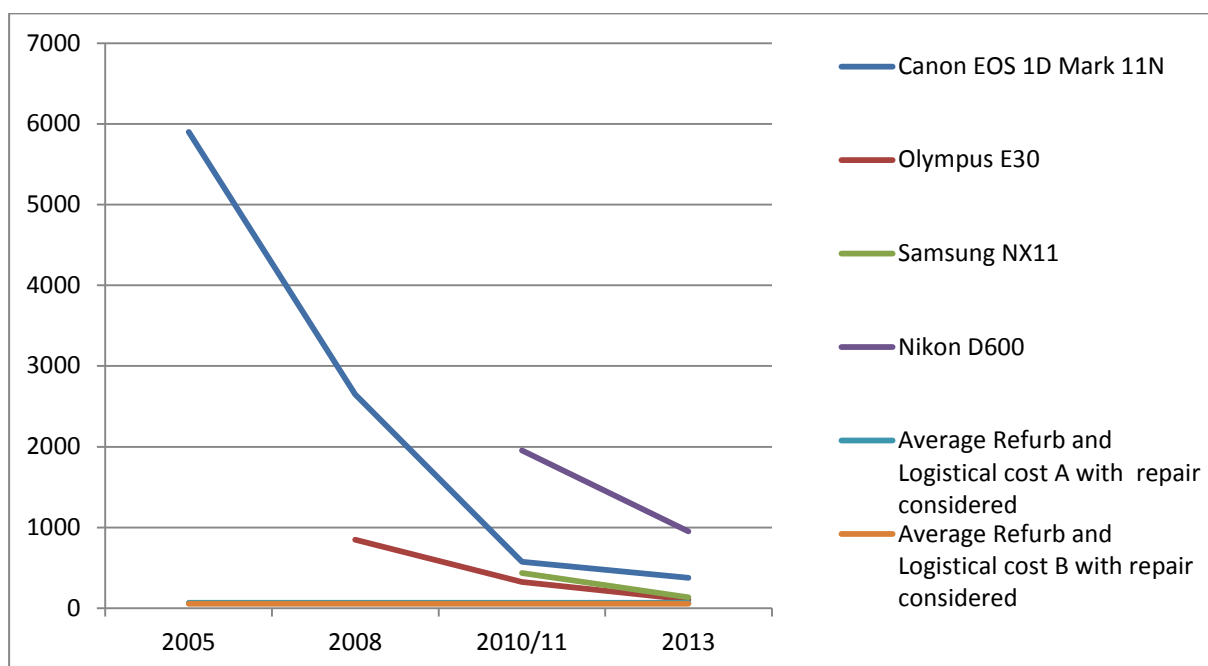


Figure 24. Depreciation of various DSLR/Bridge camera products (see figure below for more details on sub £1,000 values/costs)

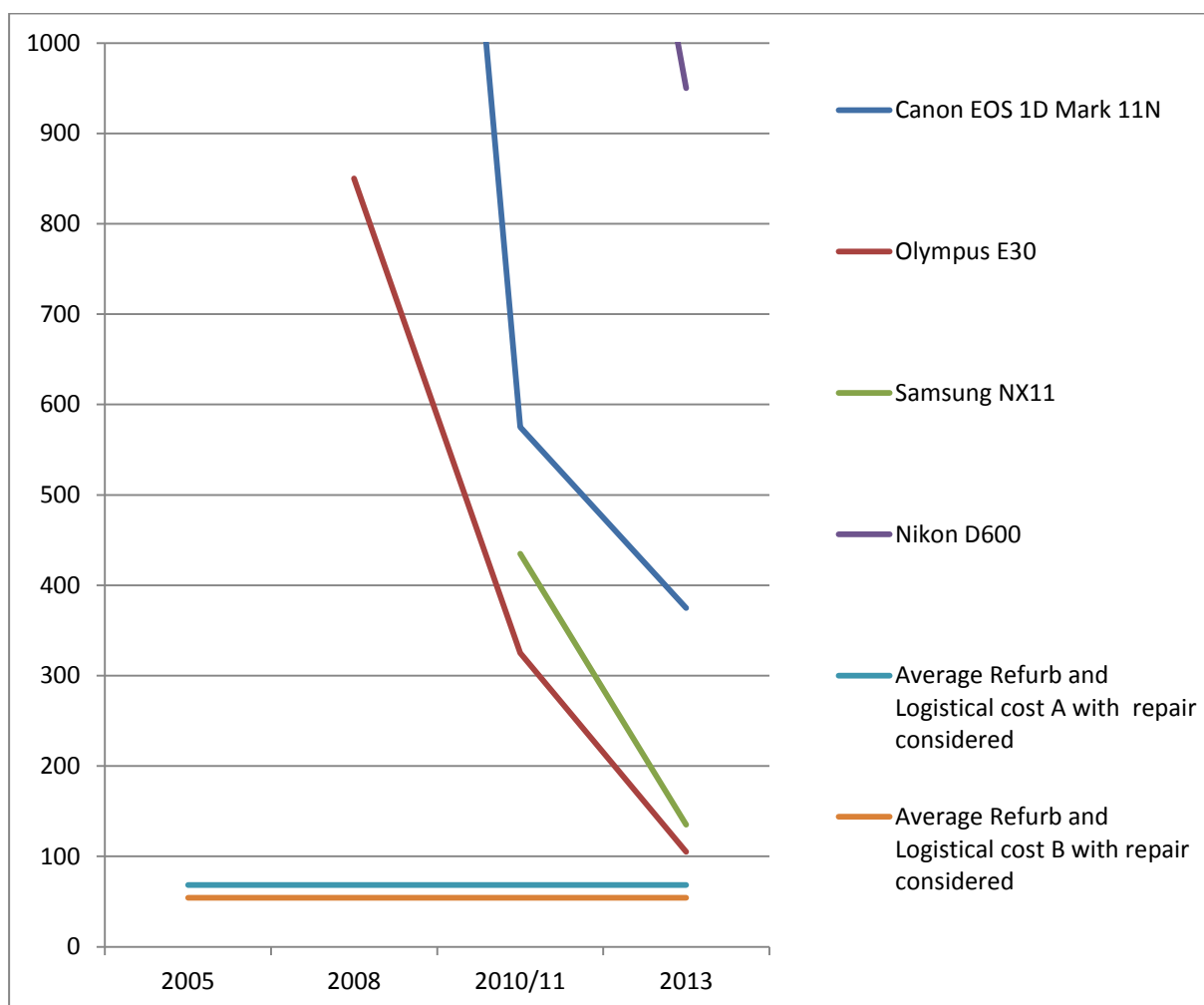


Figure 25. Depreciation of various DSLR/Bridge camera products – based on Figure 24, this looks at the costs below £1,000 only, to provide more detail.

Table 21. Support data for Figure 25

Type	Manuf	Model	2005	2008	2010/11	2013
DSLR/Bridge cameras	Canon	EOS 1D Mark 11N	5900	2650	575	375
DSLR/Bridge cameras	Olympus	E30		850	325	105
DSLR/Bridge cameras	Samsung	NX11			435	135
DSLR/Bridge cameras	Nikon	D600			1955	950
	Average Refurb and Logistical cost A with repair considered		68.24	68.24	68.24	68.24
	Average Refurb and Logistical cost B with repair considered		54.3	54.3	54.3	54.3

4.5.2 Specific aspects impacting lifecycle value in Digital Cameras

Compact digital cameras can only sustain a standard refurbishment process (some cosmetic deficiencies can be repaired through standard refurbishment) as a repair is not viable because of the cost of parts and labour.

DSLR and Bridge cameras are a very specialist products made from high quality components. Repair is viable, but there needs to be the necessary investment in expertise and specialised equipment that would be required to repair and calibrate the lenses and sensors, which are very intricate, to the original factory settings. This is a device that is made up of a combination of mechanical, electronic and optical systems/features. In addition, part removal is very time consuming and requires a number of dedicated tools. Re-tek's experience, and therefore data, on repair is minimal for this category, but there is some knowledge of the spare parts and resale value, which is presented.

The key aspects affecting the lifecycle value are presented below in Figure 26 and support table – for the cost of refurbishment. As there is no economical viable repair that can be applied to a Compact digital camera the table provides a summary for the Category only and not the individual models. Additionally, as the data for repair is limited for the DSLR/Bridge cameras they too have been presented as a category - with an average repair cost rather than for individual models. All the other costs are consistent with the methodology used throughout the report.

The various stages of the process for re-use for this commodity are outlined in Figure 27 demonstrating the process flow from user to owner/ITAM.

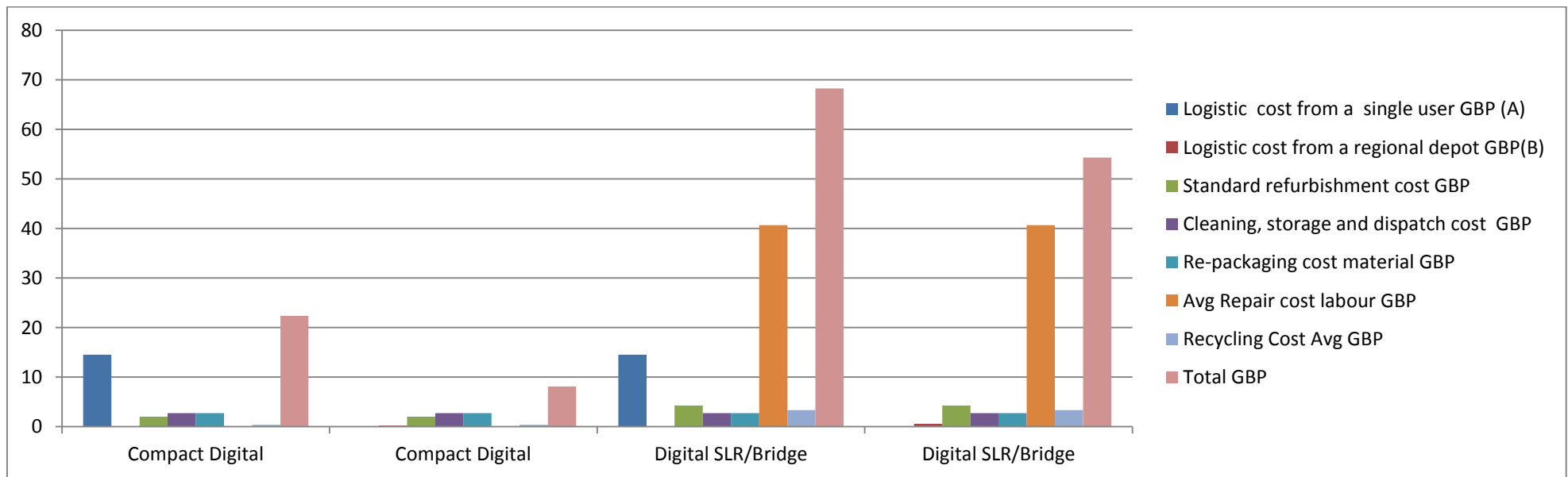


Figure 26. Lifecycle value and cost of refurbishment

Table 22. Support data for Figure 26

Camera Type	Logistic cost from a single user GBP (A)	Logistic cost from a regional depot GBP(B)	Standard refurbishment cost GBP	Cleaning, storage and dispatch cost GBP	Re-packaging cost material GBP	Avg Repair cost labour GBP	Recycling Cost Avg GBP	Total GBP
Compact Digital	14.5	0	2	2.75	2.75	0	0.37	22.37
Compact Digital	0	0.24	2	2.75	2.75	0	0.37	8.11
Digital SLR/Bridge	14.5	0	4.25	2.75	2.75	40.66	3.33	68.24
Digital SLR/Bridge	0	0.56	4.25	2.75	2.75	40.66	3.33	54.3

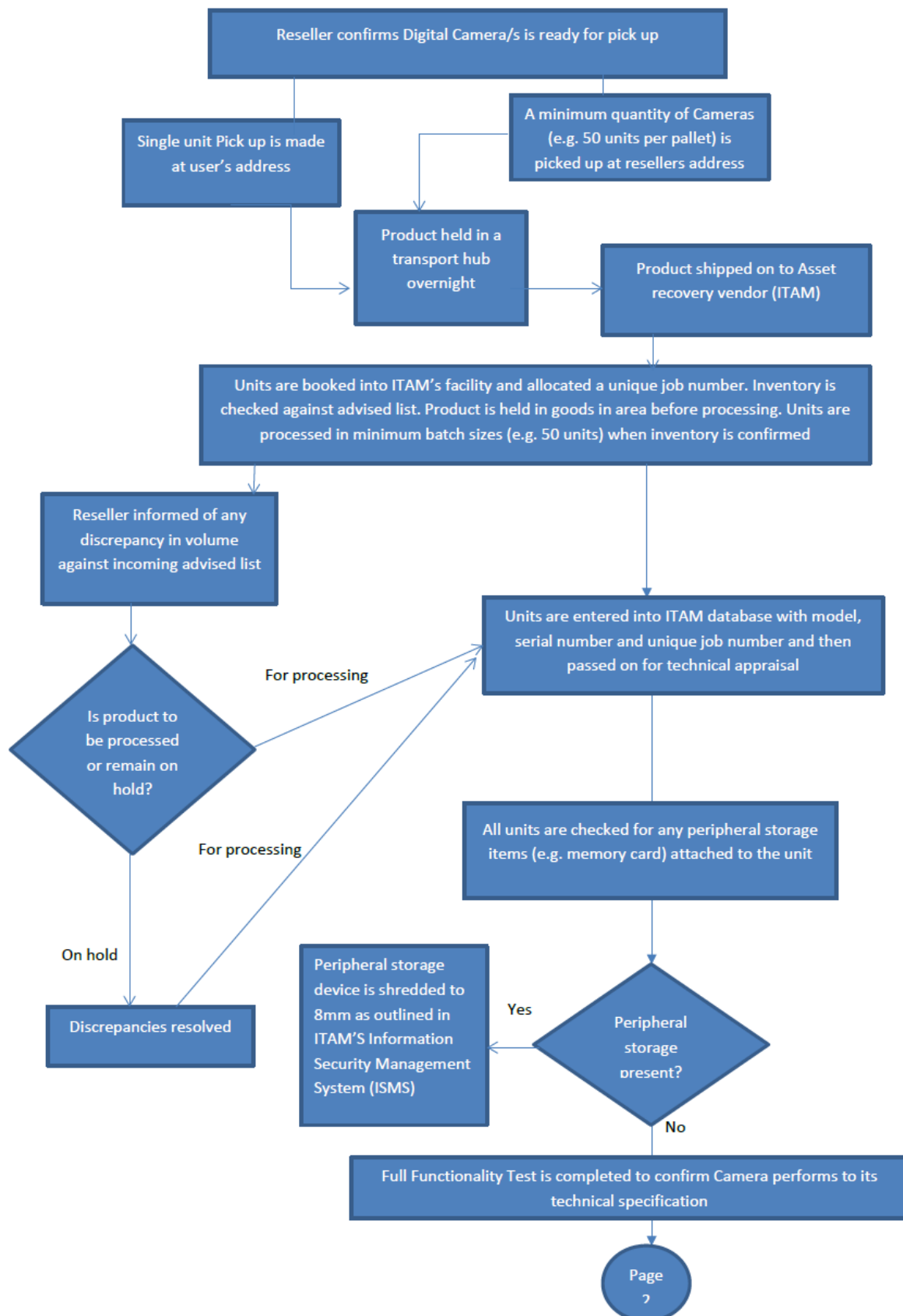


Figure 27. Digital Camera Process Flow

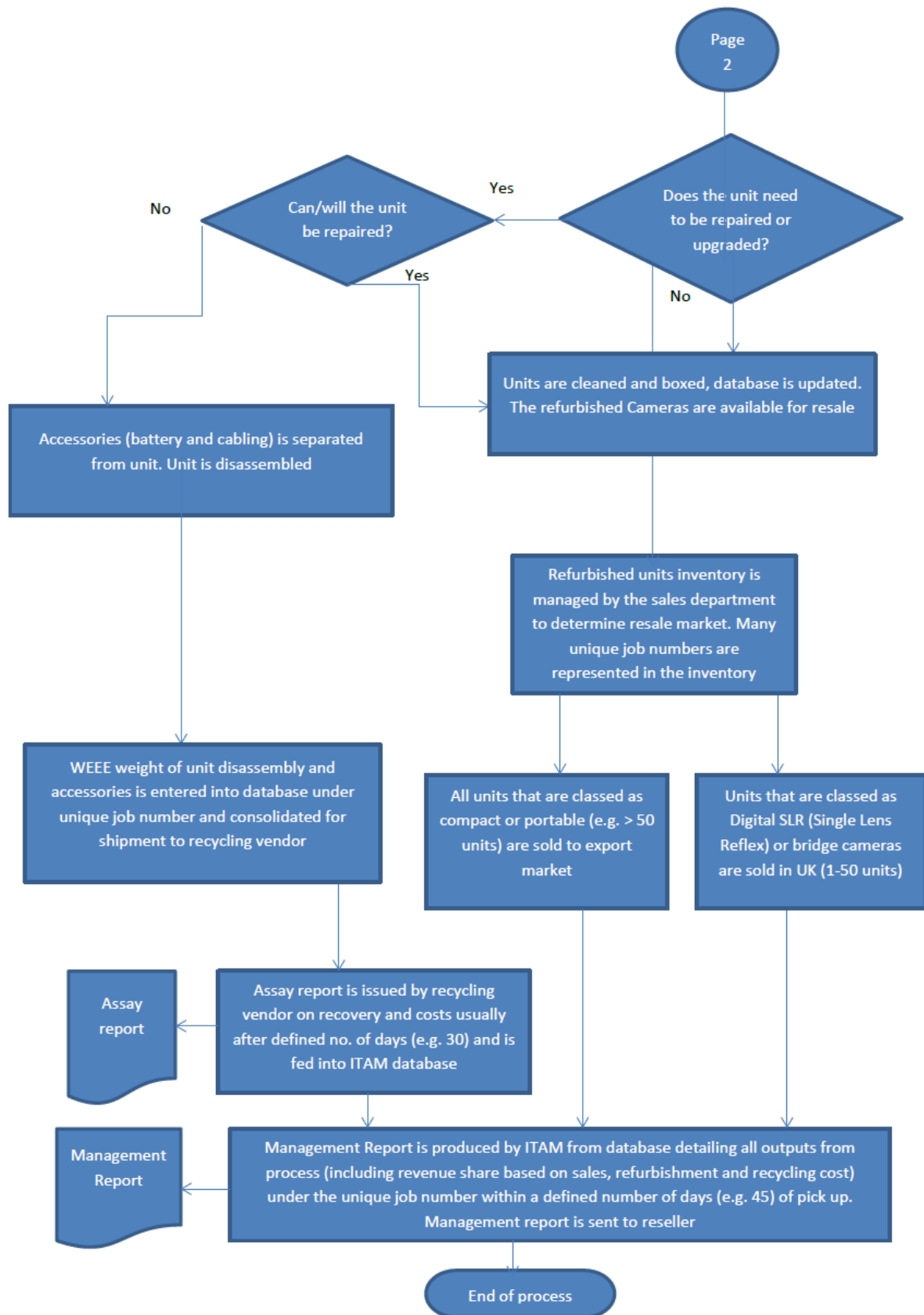


Figure 27 (Cont/...). Digital Camera Process Flow

4.5.3 Revenue sharing arrangements with an ITAM

Figure 28 presents a typical excerpt from a Re-tek management report for Compact Digital Cameras with Figure 29 demonstrating the same for DSLR/Bridge Cameras - featuring all the models presented in Appendix 1 and illustrating a revenue share arrangement between owner and ITAM.

For the Compact category, newer models that have a high Megapixel (MP) rating maintain significant value to present a revenue sharing opportunity, whereas older models with standard specifications, for their entry year, have less of an opportunity. However, the figures show that they can sustain standard refurbishment costs. Models which are 3-5 years old, that have an above average specification (e.g. enhanced optical zoom), depreciate less than the standard specification models. It is likely that models which have the 4-7 Megapixel range will be replaced by the 7-10 MP as the new entry level specification for used refurbished digital cameras later in 2013.

For the DSLR/Bridge category the life expectancy is much higher than compact digital cameras, as these are a luxury item and the revenue sharing, or net return opportunity is significantly higher even with large repair costs added. However, repair is specialised and many of the spare part availability is still controlled by the manufacturers through authorised repair centres.

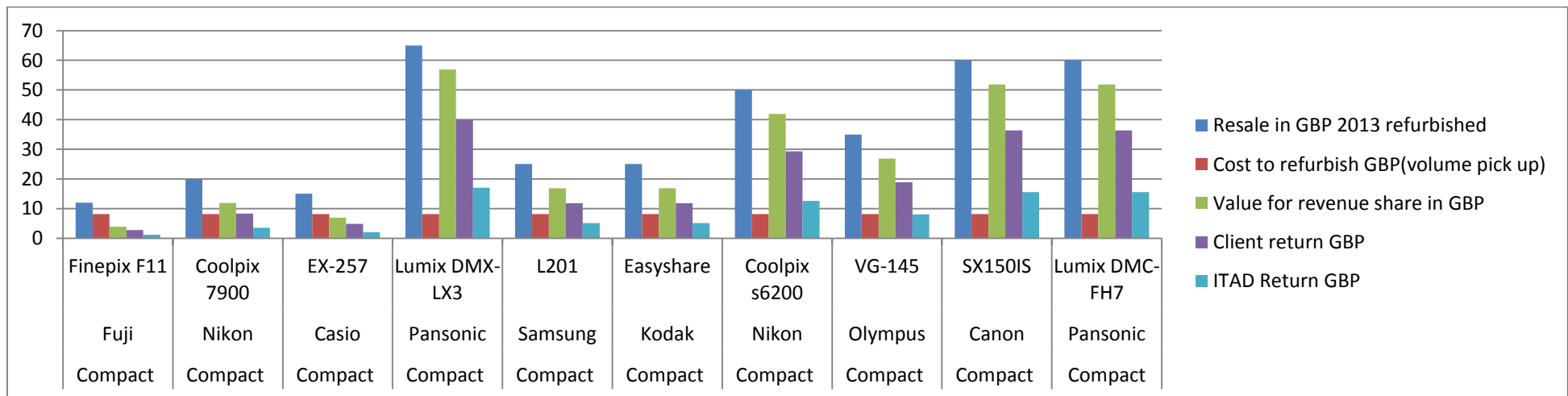


Figure 28. Management report data for compact cameras

Table 23. Support data for Figure 27

Type	Manuf	Model number	Resale in GBP 2013 refurbished	Cost to refurbish GBP (volume pick up)	Value for revenue share in GBP	Client return GBP	ITAM Return GBP
Compact	Fuji	Finepix F11	12	8.11	3.89	2.72	1.17
Compact	Nikon	Coolpix 7900	20	8.11	11.89	8.32	3.57
Compact	Casio	EX-257	15	8.11	6.89	4.82	2.07
Compact	Panasonic	Lumix DMX-LX3	65	8.11	56.89	39.82	17.07
Compact	Samsung	L201	25	8.11	16.89	11.82	5.07
Compact	Kodak	Easyshare	25	8.11	16.89	11.82	5.07
Compact	Nikon	Coolpix s6200	50	8.11	41.89	29.32	12.57
Compact	Olympus	VG-145	35	8.11	26.89	18.82	8.07
Compact	Canon	SX150IS	60	8.11	51.89	36.32	15.57
Compact	Panasonic	Lumix DMC-FH7	60	8.11	51.89	36.32	15.57

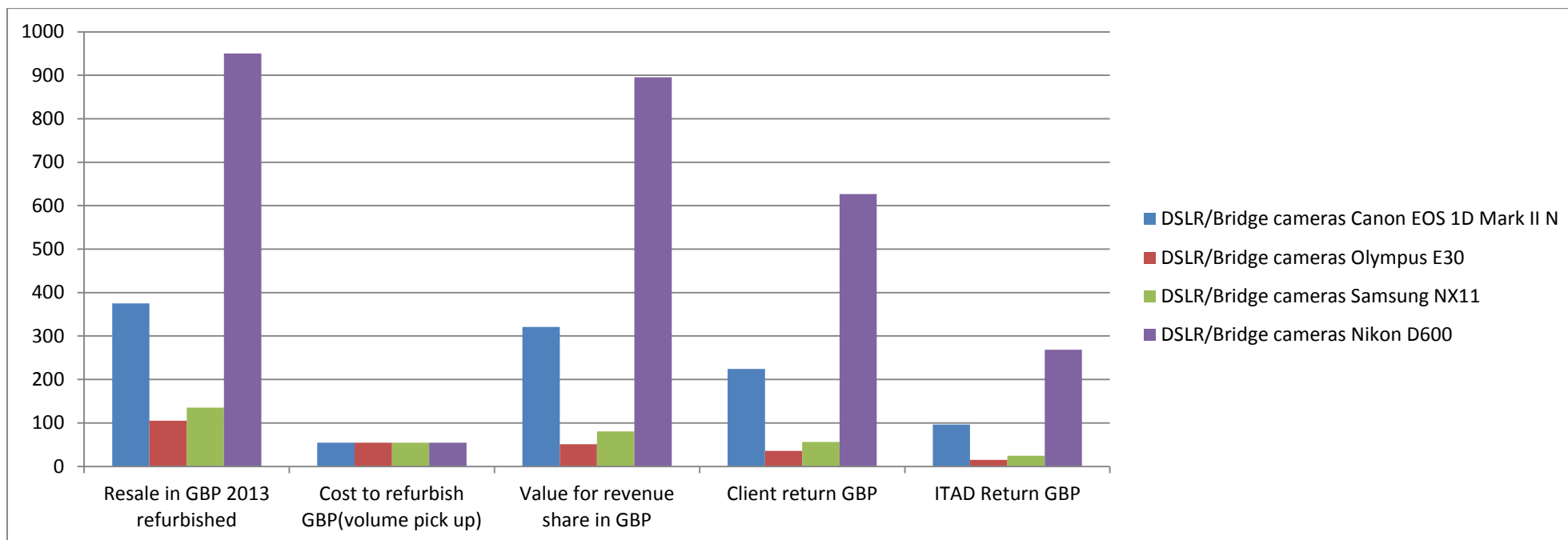


Figure 29. Management report data for DSLR/bridge cameras

Table 24. Support data for Figure 28

Type	Manuf	Model number	Resale in GBP 2013 refurbished	Cost to refurbish GBP (volume pick up)	Value for revenue share in GBP	Client return GBP	ITAM Return GBP
DSLR/Bridge cameras	Canon	EOS 1D Mark II N	375	54.3	320.7	224.49	96.21
DSLR/Bridge cameras	Olympus	E30	105	54.3	50.7	35.49	15.21
DSLR/Bridge cameras	Samsung	NX11	135	54.3	80.7	56.49	24.21
DSLR/Bridge cameras	Nikon	D600	950	54.3	895.7	626.99	268.71

4.5.4 Conclusions on Digital Cameras

Life-expectancy can be summarised as follows:

- Compact Digital - up to 5 years for standard models.
- DSLR/Bridge - beyond 5 years.

An ITAM with volume availability will have the commercial expertise, through existing sales channels, to move the volumes required and to keep the cost of refurbishment for compact models as low as possible. There will be bigger challenges to an ITAM achieving efficient recovery values on DSLR/Bridge models because of the expertise associated with the repair and availability of spare parts as they are usually only made available to authorised repair centres. However, if the volumes are reasonable (2 - 300 per month minimum) and with investment in expertise, combined with the availability of volume product, then this challenge could be overcome.

Alternatively, specialist repair companies could be considered to join the commercial partnership with the ITAM and owner. There are many specialist companies that can do the DSLR/Bridge repair and they often sell some of the repaired units through their own websites or shop-fronts. However, their business model is built on generating income through repair and not from selling the volume required to make a volume, trade-in programme viable. This is where the role of the ITAM would be crucial for developing new volume markets and maximising the resale of this higher value product.

5.0 Overall Conclusions

Each section of this report has concluded with details related to the commodity in question, with a number of additional, general considerations made associated with the management process or partnering, with an economically viable trade-in and recovery programme described for the used products.

A trade-in programme with the general public will generate the disposal of a large number of obsolete items that will have no re-use demand in the secondary market and will have to be recycled. This may be compounded as the condition associated with the product being traded may be below grading standards increasing the number that would have to be recycled rather than finding a reuse market. Therefore recycling costs (mainly labour plus pre-treatment) could be significant and would need to be kept to a minimum through efficient pre-treatment and/or harvesting of spare parts.

Market pricing for used goods can move quickly down and anticipation of that movement has the advantage of not getting caught short with large stock volumes of product that may become obsolete or lose significant lifecycle value. Market information about new technology launches is crucial as awareness can help correlate price movements to the commodity being managed for re-use and resale. Most ITAMs work with resellers or manufacturers and this can provide the key market intelligence necessary for managing stock on-hand or incoming.

Although the results for net lifecycle values presented in the report can be interpreted as a strong business opportunity (on the models presented) for re-use many trade-in programmes run by ITAMs, or retailers, usually do not manage individual product types but tend to deal with a variety of ICT or consumer electronic products. The variety of products managed for re-use tends to assist with managing some of the key challenges in making a recovery program efficient and profitable. The economy of scale, over a number of different

product types, keeps the cost of refurbishment as low as possible and the efficient use of spares parts harvesting results in lowering the purchase costs associated with these as part of the refurbishment and repair process – as well as helping to deal with the problems associated with manufacturers' controls on the distribution of spare parts for more specialist items (e.g. DSLR/Bridge cameras).

Lastly, when the process is streamlined, the costs are known and the product yields have been made as efficient as appears to be possible, then the most significant differentiating factor, in terms of the magnitude of success for a refurbishment/re-use programme, will be the resale value obtained for as much of the unwanted product as possible. Global and local resale networks are fundamentally important in ensuring there is the demand for consistently high quality, refurbished ICT and consumer goods, and on a scale that supports the lifecycle values and findings outlined in this report.

GLOSSARY

CESG	Communications-Electronics Security Group, a government body that protects the vital interests of the UK by providing policy and assistance in the security of communications and electronic data. www.cesg.gov.uk
ISO27001	An international standard that measures a company's ISMS.
ITAM	Information Technology Asset disposal – an asset recovery specialist.
DSLR CAMERA	Digital Single Lens Reflex Camera
EOL	End of life when referring to a product
ISMS	Information Security Management System
ICT	Information and Communication Technology

**Waste & Resources
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