REUSE IN PRACTICE

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ABSTRACT: Ongoing efforts to seek more resource-efficient production and consumption, reuse have high potential to assist progress towards systems that are orientated to circular economy thinking. In order to achieve this aim, the motives, means and opportunities for reuse need to be understood such that best practice can be identified and decision-making consequently made more effective. This study compares and contrasts reuse within the car and car components sector with the clothing sector as a means to identify commonalities and differences, and seek facets of effective practice. The car sector is found to align more with financial motives than the clothing sector, the latter providing more marked social benefits. At the same time, three key aspects appear common to both sectors. First, whole lifecycle – cradle to cradle – approaches to enhancing reuse are emerging and have considerable merit from a circular economy perspective. Secondly, the internet has become a key tool for the facilitiation of reuse and is likely to grow further in this regard. Thirdly, decisions regarding the end-of-use of consumer products are critical and need to be better understood. We conclude that whilst some sector-specific adjustments may have to be implemented in future initiatives to promote and enhance reuse activities, overarching principles and optimum methods of reuse facilitation may well be common for several sectors.

Keywords: reuse circular economy waste hierarchy cars clothing

1. INTRODUCTION

There is little doubt that an urgent need exists for humankind to seek and implement methods to utilise resources more efficiently and more sustainably. Few could argue against approaches to resource use that recognise and respond to the call for due consideration of the environmental, social and economic facets of the production and consumption. Indeed, The United Nations has called for "responsible production and consumption" at a global scale their 12th *Sustainable Development Goal* (UN, 2015). With regard to the more efficient utilisation of resources, the waste hierarchy (EC Waste Framework Directive 2008/98/EC; Williams, 2015) and the concept of the circular ecomony (Ellen MacArthur Foundation, 2017) both highlight the role and contribution of reuse as a contributor to greater sustainability. In the case of the waste hierarchy, reuse is generally considered the second most preferred option, the first being "reduce" while less preferred options are, in descending order of preference, being "recycle", "recover" and "landfill" (Williams, 2015; EC Waste Framework Directive 2008/98/EC). In terms of circular economy thinking (Ellen MacArthur Foundation,

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2017; WRAP, 2018a), reuse offers a means to exploit more fully the durability of a product or possession by extending its use beyond the point at which the owner considers it to cease providing her or him with the utility of function that they personally desire.

Although the aims and principles of reuse are well established (Williams and Shaw, 2017, 2018), research concerning reuse in terms of what takes place, how it is achieved and what it achieves has been rather less than extensive. By contrast, recycling has been the focus of extensive research and targets for recycling across various sectors are enshrined in policy and legislative frameworks on a global basis; targets for reduction of waste disposal to landfill are also enshrined in policy and law (e.g. EC Waste Framework Directive 2008/98/EC, Household Waste Recycling Act 2003). Recycling and landfill share a common feature, however; both (provided that suitable infrastructure and recording methods are in place) are readily measured. We suggest that the notion "You cannot manage what you cannot measure" applies in this context. The preponderance of targets orientated towards recycling enhancement (e.g. EC Waste Framework Directive 2008/98/EC, Household Waste Recycling Act 2003) and landfill avoidance (e.g. EC Landfill Directive 1993/31/EC) are driven of course by a rational ambition to achieve desirable outcomes; the facility to measure performance in relation to specified targets is arguably a further motivation in this respect. Reuse, in contrast, appears less readily measurable and is, we believe, a less common feature of waste management or resource efficiency targets in consequence (Williams and Shaw, 2018).

Notwithstanding the inherent challenges in setting meaningful targets for reuse and measuring rates achieved, it remains that reuse comprises an integral and critical contributor to actions orientated towards resource efficiency and associated benefits. In view of this importance of reuse, this paper seeks to exemplify, by means of a sector-by-sector review, current practice in reuse with focus on:

- Motives: drivers and benefits;
- Means: structures and methods to facilitate reuse; and
- Opportunities: where, why and how reuse might be enhanced or extended.

2. REUSE IN PRACTICE: MOTIVES, MEANS AND OPPORTUNITIES

2.1 Key terms and approach

For the purposes of this study, the term "reuse" will accord with definitions stated in the European Community (EC) Waste Framework Directive 2008/98/EC (Table 1). Whilst other various definitions of reuse exist, the EC terminology broadly represents and aligns with the spirit and meaning of other definitions (Williams and Shaw, 2018).

Table 1. Definitions of key terms appertaining to reuse, as set out in the EC Waste Framework Directive (2008/98/EC).

Term	*Definition*
Reuse	"…any operation by which products or components that are not waste are used again for the same purpose for which they were conceived."
Preparing for reuse	"…checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing."

In order to illustrate and exemplify current practice in reuse, this study presents a comparison of two contrasting sectors with primary focus on the UK. The intention in this instance is to compare and contrast current practice rather than to present a comprehensive review or to scrutinize and report upon discrete reuse initiatives or case studies (e.g. WRAP, 2011; Beasley and Georgeson, 2016), providing a means to illustrate the extant motives and means of reuse, and thereby explore opportunities for enhancement. The sectors selected for focus are outlined in Table 2. These two sectors selected are both major contributors to consumer-orientated economic activity in the UK, and both are substantial in terms of the volume of sales and consumption of primary resources. At the same time, there is a key contrast in that clothing consumption is characterised by large volume sales of relatively inexpensive items, whilst the car industry is characterised by quantitatively lower sales volumes but contributes substantially in economic terms due to the much higher purchase costs of individual units. These contrasting profiles lead to contrasting profiles in terms of the practices and potential for reuse.

Table 2. Sectors selected for the purposes of the study.

Sector	*Notes*
Cars and car components	In 2016 and estimated 72 million cars were produced globally 2016 (Statstica, 2018). Reuse of automobiles (second-hand/used) and components ("spares") is common and extensive.
Clothing	The global clothing industry accounted for an estimated $2.4 trillion in 2016 (MacKinsey & Co., 2017). Items of clothing may be deemed "end-of-use" for reasons other than loss of utility; options for reuse are numerous and offer opportunities for altrusim (Diop and Shaw, 2018) and financial gain (Morley *et al.*, 2009).

2.2 The car and car components sector

2.2.1 Cars

As noted (Table 2) there is a high rate of global production of cars (*ca*. 72 million in 2016; Statstica, 2018). As a generalization, the economic cost of cars is sufficiently high that owners (private or traders) seek economic gain by selling or trading a vehicle when no longer needed or wanted. In the case of traders, there is a clear profit motive to hand. At the same time, there is a well-established market in "used" cars, driven by demand from, for example, private buyers who cannot afford or do not wish to pay for a new vehicle, and trade buyers who seek to profit through buying and selling. For 2014, it has been estimated that sales of used (reused) cars in the UK amounted to a market value of £4.3billion (Statistica, 2018).

The means to sell or trade cars are numerous; opportunities exist for exchanges between private individuals, between traders, and between private individuals and traders. Reused cars for sale may be advertised through online social media, printed copy in local newspapers (free and paid for) and magazines (specialist or general), whilst auctions, dealerships and associated marketing also offer information. Just over half of used car sales were accounted for by sales from dealers in 2014 (Statistica, 2018).

Reuse of cars is widespread and commonplace, if not routinely or widely considered in terms of "reuse" *per se*. Statistics for the UK car market demonstrate the extent of reuse. In 2017, just over 2.5 million new cars were registered (SMMT, 2018a); over this same year, 8.1 million used cars chaged hands in (SMMT, 2018b). Purchases of used – reused –

cars thus outnumber new car purchases at a ratio of *ca.* 3.25:1. When considered over a longer period, available data again illustrate the contribution of reused cars to the whole UK-wide stock of registered cars. By the end of 2016, some 7.8 million cars registered in the UK (24.5% of the total) were recorded as having had a single "keeper" (Figure 1). The remaining 75.5% of all registered cars have been previously registered to another keeper, implying that ¾ of UK-registered cars at the end of 2016 were effectively reused vehicles (Figure 1). Around 3 out of 10 UK-registered cars at this time had had one former keeper (i.e. reused once since first purchase) and 2 out of 10 had had two former keepers (i.e. reused twice since first purchase). In extreme cases, usually for cars first registered before 1979, records show that some cars have been registered by 20 or more keepers, inferring that, albeit rarely, some cars had changed hands 19 times or more.

We note that measures are in place in the UK (and elsewhere) regarding the fitness-for-purpose of reused cars in terms of tests for their roadworthiness. UK MOT (Ministry of Transport) certification is provided for vehicles that meet the minimum standards as set (UK Government, 2018) which broadly concern (1) legalities regarding identification and registration of vehicles, and (2) checks and inspections made to ensure that the vehicle is of a roadworthy condition. The MOT system also makes available some facets of a vehicle's history (e.g. MOT history, recorded mileage) to a potential purchaser but does not cover some of the major mechanical systems: engine, clutch and gearbox are excluded. Further assurance that a reused car is sound with respect to these mechanical systems may be gleaned by independent inspections, but usually at additional cost.

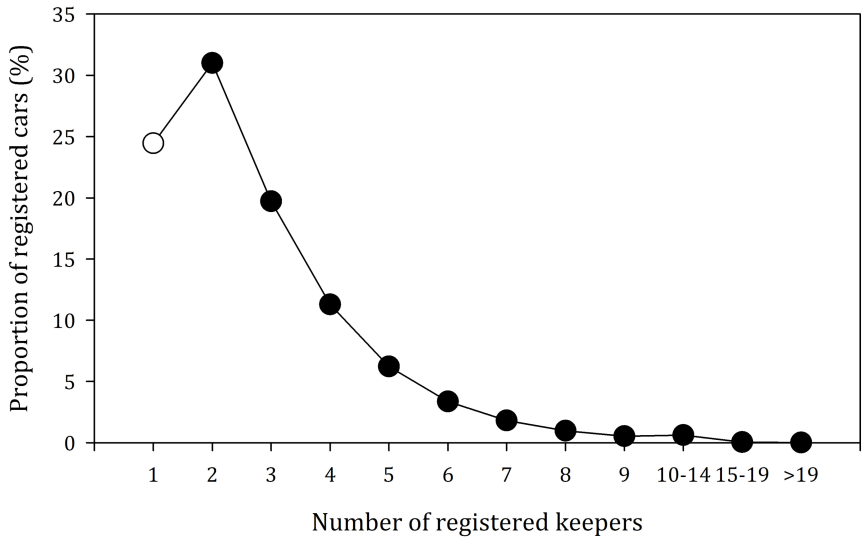

Figure 1. The proportions of UK-registered cars and corresponding number of keepers as recorded for 2016. The registered keeper is not necessarily the owner of the car; change of keeper usually signifies change of ownership. Open symbol represents new cars, closed symbols represent reused. Data from DfT (2017).

2.2.2 Car parts and components

Whilst formal targets for the reuse of whole vehicles do not appear to exist, there are policies intended to ensure that reuse is embedded in the fate of end-of-life vehicles (ELV). The EU ELV Directive (2000/53/EC) for example, challenged manufacturers "to factor in the dismantling, reuse and recovery of the vehicles when designing and producing their

products." Two targets were set within the ELV Directive for new vehicles in terms of (1) the percentage by weight per vehicle that should be reusable and/or recyclable (85%), and (2) the percentage by weight per vehicle that should be reusable and/or recoverable (95%).

Innovations within the car manufacturing industry have included "easy to dismantle" vehicles, for which manufacturers claim to have made less onerous the process of dismantling a vehicle such that most of the value of components and materials is not lost. The Toyota Motor Manufacturing Company, for example, promote "the four Rs" (Reduce, Reuse, Recycle, Recover) and have implemented a range of associated initiatives. With specific regard to reuse of vehicle parts and materials, key areas of activity are highlighted (Table 3). We note that, in this instance, remanufacturing parts constitutes "preparing for reuse" according to EC definitions (Table 1), whilst the stated reuse of hybrid and traction batteries (Table 3) does not necessarily lead to reuse in the same way as the components were used in the vehicle as initially produced.

Table 3. Reuse initiatives promoted by the Toyota Motor Manufacturing Company (Toyota, 2018).

Inititative	*Notes*
Remanufacturing parts	Remanufacturing programme for the European retailer network. Returned parts are inspected and reconditioned; worn elements are replaced, and the part reassembled and packaged for sale to customers. Major items remanufactured include air conditioning compressors, automatic transmissions, power steering racks, cylinder heads, engines and clutch kits.
Reusing hybrid batteries	Nickel and lithium-based batteries used in hybrids may outlast the vehicles they power. Ongoing investigation into how these might be remanufactured for repeat use in vehicles and/or be reused for other purposes; use for stationary or emergency power storage units is being considered.
Stationary storage; traction batteries	Traction batteries for end-of-life hybrid vehicles, if in good working order, can be removed and used as a stand-alone, stationary power storage unit. Applications may include co-ordinated energy-saving systems, or emergency back-up supply.

In practice, the requirements of the EU ELV Directive and industry reuse innovations (e.g. Table 3) represent re-casting of well-established and long-practiced activities. In particular the reuse of vehicle parts has long existed in the form or "scrap yards", "breakers' yards" or "auto dismantlers", i.e. businesses providing a source of replacement car parts from ELVs. Such businesses commonly operate in contrasting modes. The "self-service" approach operates by customers being able to access ELVs and remove desired parts from vehicles themselves. Other businesses dismantle vehicles and salvage usable and saleable parts, creating a stock of off-the-shelf parts and components. Inspection and reconditioning of parts (*cf.* Table 3) may be necessary for some components obtained from dismantlers or scrap yards; components of a cosmetic nature (e.g. decorative body trim) may require only visual inspection. The authors are not aware of any standards relating to parts salvaged or obtained in this manner.

We note that issues of supply and demand present challenges in, and possible barriers to, reuse of ELV components. In principle, a car owner seeking a specific replacement part for their own vehicle needs a like-for-like part from a donor vehicle that is suitably compatible (e.g. with respect to model, variant and age). Matching of parts may be easier in some instances than others. Where engines are used commonly for several different models of car from a single manufacturer, for example, components will more likely be engine-specific than model-specific. In contrast, other parts (e.g. body trim, interiors,

lighting and body panels) will necessitate location of a more precise match of donor vehicle. The task of locating suitable parts for specific models has been made easier by the advent of searchable online databases of available parts and vehicles; this facility enhances opportunities to locate suitable parts by opening up access to a high number of dismantlers distributed over a wider geographical area.

2.3 The clothing sector

2.3.1 Overview

The retail textile industry contributes much to economic activity; estimates of the global market range from $1.2trillion in 2014 (Resta and Dotti, 2015) to $2.4 trillion in 2016 (MacKinsey & Co., 2017). In the UK, consumers spend around £53billion per year on around 1.1million tonnes of clothing, accounting for 5% of household expenditure (data for 2014; WRAP, 2016). Volumes of textiles destined for landfill at their end-of-use have exceeded a million tonnes per year (WRAP, 2013). Consumer demand for clothing products (largely orientated to "fashion") is increasing (Pookulangara and Shepard, 2013) and may be linked to increases in textile waste arisings (Birtwistle and Moore, 2007).

The fate of end-of-use clothing is clearly of concern in the context of environmental impacts and sustainability. If items of clothing that retain utility are destined for landfill or incineration, for example, the value of the resources used in their production will not be fully realised. Whilst there are uncertainties regarding the destinations and ultimate fates of end-of-use clothing with regard to their resuse or recycing, prior research has given some indication of the relative quantities in this regard (Figure 2). Substantial quantities of clothing are evidently exported out of the UK for reuse or recycling (368,000 tonnes in 2007; Morley *et al.* 2009), whilst quantities of textiles intended for reuse are considerably higher than for recycling, for export and within the UK (Figure 2). Indeed, the ratio of reuse: recycling on weight basis is 4.6:1 for the UK and 6.1:1 for exported textiles.

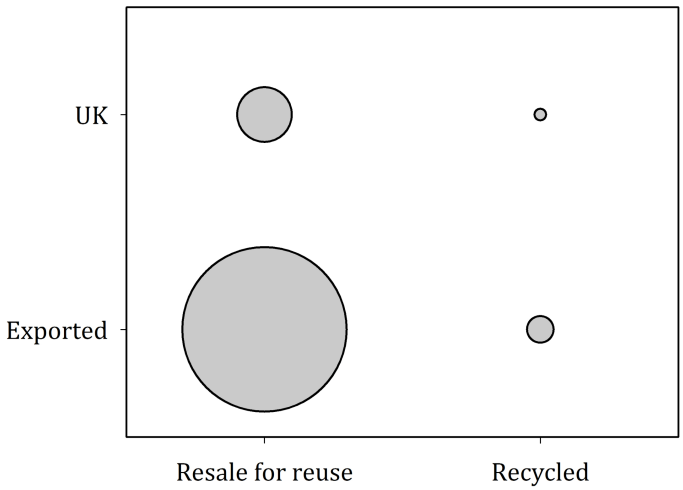

Figure 2. The relative quantities (by weight) of textiles sent for reuse or recycling in the UK in 2007. Data from Morley *et al.* (2009). Areas of symbols are proportional to total weight for 2007.

Uncertainties regarding the fate of exported items have been reported (Morley *et al.* 2009); exports are deemed beyond the scope of this study. There is clearly benefit in ensuring that the value of items clothing is retained and that costs of disposal are thereby reduced.

Estimates suggest, for example, that the reuse of clothing and textiles in England could save the tax payer £35million per year and that the resale value of reusable items could be over £140million (LGA, 2014). Recycling and reuse of clothing have differing merits. Whilst avoidance of disposal has benefits in economic and environmental terms, the motivation for promotion and enhancement of reuse of clothing is additionally orientated to social benefits (LGA, 2014).

Opportunities for reuse of clothing mainly occur in two modes: donations or sales. The means for reuse contrast, although some (e.g. internet-based means) are more widely used. It is noted that in all cases the expense of purchasing new items and the need for production of new products are avoided (Table 4).

Table 4. Examples of main clothing reuse opportunities for consumers and their associated benefits.

Inititative	*Recipient*	*Benefit(s) – examples*
Donate to a personal acquaintance.	Friend, neighbour, family, colleague etc.	Avoided expense of purchasing new items; avoided need for production of new items "feel-good" factor for donor; reinforcement of social relationships.
Donate to an unknown person through reuse group.	Reuse group member	Avoided expense of purchasing new items; avoided need for production of new items.
Donate to a charity or third sector organisation (TSO).	Charities with UK and/or international remit.	Avoided expense of purchasing new items; avoided need for production of new items "feel-good" factor for donor; provision of low cost items through charity shops/outlets; employment.
Direct resale via websites, local newspapers, car boot sales.	Purchaser	Avoided expense of purchasing new items; avoided need for production of new items; income for vendor.

2.3.2 Donation to a personal acquaintance

Donation and exchange of clothing items between friends, neighbours, family and other acquaintances is, for obvious reasons, not formally recorded. Estimates have been made, however: together with items sold or exchanged on-line, direct reuse in this form may account for *ca.* 100,000 tonnes per year (WRAP, 2016a). While such figures are encouraging, there are no doubt more opportunities in this regard: reusable items may be placed by a householder into kerbside-collected refuse bins rather than given to near others living in close proximity or in regular contact with the same householder. Local authorities, for example, have noted the placement of reusable items in kerbside-collected refuse bins, including clothing, and taken steps to encourage householders to reuse rather than dispose of suitable items (e.g. SCC, 2018). Anecdotally, donation and exchange of clothing items appear well-developed amongst families with young children. In this context, two observations may be made: (1) clothing items are often outgrown by children before they become excessively worn, and (2) social networks and contacts are readily available in the form of social media and informal encounters through school-related activities. We note that donations in this manner comprise "giving" of clothing items as opposed to "gifting", which comprises donations to a charity for example (Diop and Shaw, 2018).

2.3.3 Donation through a reuse group

As with direct donations to known individuals, donation and exchange of clothing items through the use of reuse groups remains largely unrecorded. In essence, reuse activity within this domain has largely arisen and expanded by virtue of the internet. Website-based organisations such as *freecycle* offer, in principle, facility for the exchange of clothing items, whilst perusal of currently-available good and products tends to reveal bias towards household items, garden equipment, toys and suchlike. There are website-based initiatives becoming available that are focusing more specifically upon clothing (e.g. *myfamilyclub.co.uk*).

"Swap Shops" for clothing appear to be a more suitable forum for exchange of clothing items, notably since these usually involve physical contact with items, permitting fuller evalution of quality, size and suitability for a potential new owner. So-called "Swishing Events" are now well-established in the UK and are well-served by guidance and promotion (e.g. Love Your Clothes, 2018; WRAP, 2018b).

2.3.4 Donation to a charity or third sector organisation (TSO)

Donations of clothing to charities and TSOs are widely considered the main route for clothing reuse in the UK (WRAP, 2016a). Such donations may be considered "gifting" (*see* Diop and Shaw, 2018) since the items are gifted to an organization for resale. Activities of this ilk are widespread and common: estimates suggest around 200,000 tonnes per year are reused via sales through charity shops (WRAP, 2016a). As noted (Table 4), the donor may well value the "feel-good" aspects of such donations through the expected benefit(s) the receiving charity, whilst those entities supported by the sale of such items also benefit. Moreover, employment is created within the charity/TSO sector (LGA, 2014) and products are made available for purchase by those who seek low prices, out of desire or necessity; both these outcomes are important social benefits of clothing reuse. As noted by the LGA (2014), the low price of secondhand items is in general the biggest motivator for their purchase. Donations to charities and TSOS are actively promoted: local authority messages intended to dissuade householders from placing items of clothing in residual waste bins suggest using charity shops and textile banks, for example (SCC, 2018).

2.3.5 Selling for personal gain

Direct resale of personal possessions is far from new. Small ads (i.e. newspaper advertisements), notes on display in shops and in specialist publications (e.g. *Exchange and Mart*) were commonly used to advertise a wide variety of possessions; when clothing was advertised in this manner, items were frequently of higher value (e.g. wedding attire, formal wear and men's suits) or as new (unworn). Car boot sales have also offered opportunities for resale and reuse of clothing of lower value, amongst a wide range of household possessions (e.g. Greson and Crewe, 1994). As recently as 2009, further use of internet-based technologies was proposed as means to enhance sale/donation/swapping of clothing (Morley *et al.*, 2009). Sales of used clothing have been particularly affected by activities in this regard, notably through the launch the ebay internet site in 1995. The advent and wide ownership of smart 'phones and internet-enabled handheld devices have no doubt amplified the role and impact of ebay. The advent of other internet-based businesses has also offered individuals greater opportunities for resale of clothing: there is a plethora of such websites including *preloved.co.uk*, *vinted.co.uk*, and *whowhatwear.com*. It is notable that in many instances the primary focus of such initiatives is personal financial gain, e.g. "6 ways to make money from your closet clearout" (Foreveramber, 2017).

2.3.6 Clothing reuse in the broader context

Enhancement of opportunities for reuse focus not only on the donation and sale of used items (Table 4) but also adopt a broader view of reuse in the more general context of clothing production, use, resale and recycling. The UK-based *Sustainable Clothing Action Plan* (WRAP, 2017a) for example, advocates "… using collective action to minimise the environmental impact of our clothes." The key foci of this initiative (Table 5) set a wide-ranging agenda that recognises the independencies and interconnections between the themes to hand. The resources used, designs and materials used are important facets that can, in principle, enhance the durability of clothing products. If combined with suitable adjustments of consumers' behaviour (WRAP, 2018b), the overall impact associated with the production, use, reuse and final destination of end-of-use clothing can be much reduced.

Whilst initiatives such as SCAP (WRAP, 2017a) offer the prospect of more and better with regard to clothing reuse, there remain challenges. There is, for example, the prospect that urban mines (Ongondo *et al.*, 2015) represent an unexploited resource. Estimates suggest that around 30% of the clothes in UK wardrobes have not been worn by their owner for at least one year, and around 80% of individuals own clothes that no longer fit them or need altering in order to be worn (WRAP, 2018b). At the same time, extending the useful lifespan of clothing can be achieved by design and fabric/fibre selection (Table 5), repair can also contribute in this regard, constituting "preparing for reuse" (Table 1). It is arguable if speculative that repair skills in the 21st Century are less widespread than hitherto, but there is at least some appetite for learning more about repairing clothes, albeit lower for men (*ca.* one in four) than for women (over 50%)(WRAP, 2018b). We note that skills with regard to the repair of clothing will likely contribute to extending the utility of items, but the role of repair in terms of reuse remains largely unknown. Mending an article of clothing may, for example, extend its utility for the existing owner, which has obvious merit in terms of avoided expense of purchasing new items and avoided need for production of new items. Alternatively, repair skills could be employed to mend or alter secondhand bought at low cost.

Table 5. Initiatives promoted via the WRAP (2017a) *Sustainable Clothing Action Plan* (SCAP). Fuller details (reports, support and guidance) are provided via the SCAP website (*see* WRAP, 2017b).

Inititative	*Reuse context: notes*
Resource efficient business models	Intended to help: create commercial value from sustainable business practices; develop new revenue streams and products from resources previously considered waste.
Design for extending clothing life	Improved durability of clothing to increase rates of reuse through extended life and increased desirability for consumers.
Fibre and fabric selection	
Consumer behaviour and sustainable clothing	Intended to provide pratical tips to householders with respect to: reducing environmental impacts of clothing laundry, dealing with unwanted clothes, and making the most of their wardrobe (WRAP, 2018b).
Reuse and recycling	Voluntary agreement intended to enable re-use organisations, reprocessors and local authorities to increase collection rates through partnerships, schemes, and advice on good practice.

3. DISCUSSION AND CONCLUSION

The clothing and car sectors clearly differ in terms of reuse practice. As a broad generalization, the reuse of cars and their components is orientated primarily to resale for financial gain, although some the manufacturer-level initiatives (Toyota, 2018) align with motives of resource efficiency (*see* Tables 3&5). In contrast, reuse of clothing is orientated around acts of altruism, whether to organisations (charities or TSOs) or indivduals (§2.3.2 to §2.3.4), although involvement of clothing-related businesses is clearly aligned with and complementary to existing reuse activities (WRAP, 2017a,b). It is likely that this difference in orientation reflects the financial value of clothes *cf.* cars; donating an item of clothing may well be financially viable for an individual whilst the value of a used (reused) car would be too high to be lost through its donation. The impact of this difference is that whilst donations or clothing contribute to the well-being of others (e.g. through income raised by charity shops and/or benefits of free or low cost clothing), the sale of cars or car components has a relatively limited benefit in that reuse supports an extensive markets in which cars or components are available at lower cost then the equivalent new products. The social value of car and components reuse is thus, arguably, lower than for clothing.

We note that commonalities between car and clothing reuse are also apparent. Notably, lifecycle ("cradle to cradle"; Braungart and McDonough, 2009) approaches are evident. Within the car sector, the ambition to produce "easy to dismantle" vehicles (e.g. Toyota, 2018; Table 3) signifies the importance of design and production in enabling and enhancing the potential for reuse of components. Similarly, the *Sustainable Clothing Action Plan* (WRAP, 2017a) recognises the role and importance of product design in improving durability of products as a means to support reuse (Table 5). In both these cases, ongoing intitiatives accord well with the aims and principles of the circular economy (Ellen MacArthur Foundation, 2017; WRAP, 2018a).

A futher commonality is also evident in that the internet provides a means for reuse to take place for clothing, cars and car components. Whether allied with donations (to acquaintances or persons unknown) or sales, internet-based initiatives offer access to products at a scale that arguably surpasses all foregoing means and opportunities. For accessing reused products for sale, internet technologies provide searchable and conveniently-accessed databases for prospective buyers. This facility is broadly and commonly available for the purchase of reused cars and car components (*see* §2.2.1 and §2.2.2), and for the sale or donation of clothing (*see* §2.3.2-§2.2.2). Searchable internet-based databases permit access to a wide range of items for sale over a large geographic area, providing insight to the range and costs of items being sought. From a purchaser's perspective, the ease of access is perhaps counteracted in part by the inability to inspect closely items of interest. For clothing, size, fit, condition and texture will not be readily assessed. For cars, potential purchasers will frequently arrange a viewing prior to deciding whether to purchase a vehicle; for parts or components located on internet databases, scrutiny is likely less common. Given the ongoing reliance of human society on digital and mobile communications, we suggest is is likely that internet will continue to facilitate reuse activities and grow in this regard.

Finally, the decisions regarding why and how end-of-use decisions are made merits consideration. Whilst the foregoing review identifies and evaluates examples of current practice, it must be bourne in mind that reuse is of lower preference than "reduce" in relation to the objectives of the waste hierarchy (Williams, 2015; EC Waste Framework Directive 2008/98/EC). An individual's decision that a possession is no longer wanted or needed is critical in this regard; arguably, the differentiation between "want" and "need" is subjective. Moreover, continued use of products – particularly cars or clothing – is contingent on

maintaining their utility. In this regard, repair may be of importance. In the case of cars, the issue of economic viability of repairs is critical, i.e. the cost of repair(s) relative to the value of the vehicle. Availability of reused components offers a means to reduce the cost of replacement parts and thereby favourably alter the balance of repair costs in relation to vehicle value, provided that the vehicle owner has necessary and sufficient skills to carry out the repair or can locate a technically-trained mechanic willing to use reused replacement parts. For clothing, carrying out repairs and alterations relies on skills, and if carried out by the owner, may incur little in terms of cost.

As noted by Williams and Shaw (2017), it is clear that reuse has a critical and central role in progressing towards more sustainable use of resources orientated to circular economy thinking; it is crucial that reuse continues to serve and contribute to our ambitions to achieve responsible production and consumption (UN, 2015). If we are to achieve this ambition, sector-specific adjustments may have to be implemented in future initiatives to promote and enhance reuse activities. Overarching principles and optimum methods of reuse facilitation may well, however, be common for different sectors.

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