Image source: www.moneycrashers.com (last accessed September 2019)

Why Do (W)EEE Hoard? The Effect of Consumer Behaviour on the Release of (W)EEE from Home Entertainment Products into the Circular Economy

A PAPER BY ARIADNE WILKINSON AND IAN WILLIAMS

17th International Waste Management and Landfill Symposium
September 30 - October 4, 2019 • Sardinia, Italy

WEEE (or e-waste)

- Unavoidable, huge waste management challenge for developed and developing countries
- 54+ million tonnes being produced globally every year
- Annual growth rate of 4-5%
- WEEE generated in “throwaway societies” via:
  i) Market forces (e.g. technological advances or fashion)
  ii) Consumer behaviour
  iii) Product features (e.g. material composition, condition, or reusability)
  iv) Lack of infrastructure/services to collect WEEE
- Challenge to promote slower rate of consumption and to increase reuse of EEE

We Need a WEEE Circular Economy!

- Resources within WEEE - plastics, glass, metals - recovered, reducing need for extraction of raw materials
- Modern high-tech EEE rich in metals + critical raw materials; large proportion of anthropogenic stocks
- Secondary resources may be exploited via urban mining
- Ideal locations for urban mining – Distinct Urban Mines - include urban hubs, localised populations, quantifiable anthropogenic (W)EEE stocks and material flows
- Material stocks - in-use and hibernating (hoarded or stockpiled) (W)EEE in society
- Material flows - involve reuse, recycling and discarding of EoL electronics

WEEE Hoarding

- Hoarding - consumers indefinitely store obsolete EEE that are no longer used or wanted
  - Major barrier to releasing exploitable materials into CE
- Average household in USA hoards 4.1 small and 2.4 large EEE in attic or basement
- Europe: hoarding common for (W)EEE with perceived residual value (monetary, functional, sentimental)
- Hoarded items currently unavailable (hibernating stocks) reduce exploitation potential of anthropogenic resources
- (W)EEE should be stockpiled/hoarded with intent of releasing it into CE to ensure access to DUM's stocks

Aim and Objectives

Aim to assess effect of EoL consumer behaviours on release of home entertainment (HE) (W)EEE into the CE

Objectives were to:

- Determine technological advances in HE EEE through time by producing evolutionary timelines;
- Identify and evaluate types and quantities of HE (W)EEE consumers own, use and hoard;
- Establish / analyse reasons behind consumer hoarding;
- Evaluate and critically discuss consumer purchasing, hoarding, gifting, selling and disposing behaviours for HE (W)EEE

Methods

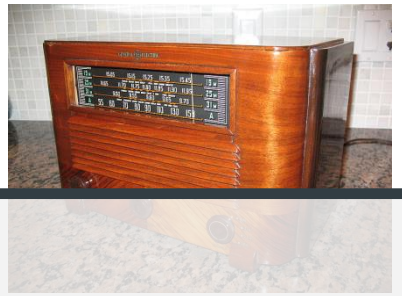
- **Desk study**: Analysis of evolution of HE EEE from 1861 until the present day
- **Postal survey**: Residents of Southampton (Hampshire, UK) during January-March 2018
- 720 questionnaires delivered to 4 pre-selected wards
  - Ensure representative sample
  - Incorporated levels of household affluence (IMD)
- Wards represented high (10% most deprived), average-high (30-40% most deprived), average-low (50% least deprived) and low (10-20% least deprived) deprivation
- 180 questionnaires posted randomly in each ward

Survey

3. a. Which home entertainment products from the following list have you gifted, sold, or disposed of? Please tick all appropriate boxes from the following list:

- ☐ Black and white TV
- ☐ CRT TV
- ☐ Plasma/LCD TV
- ☐ Smart TV
- ☐ DVD Player
- ☐ Blu-ray Player
- ☐ TiVo box
- ☐ Apple TV / Amazon fire/ Google Chromecast
- ☐ Radio / Portable Radio
- ☐ TV Speakers
- ☐ Bluetooth / Portable Speakers
- ☐ Sony PlayStation 1
- ☐ Sony PlayStation 2
- ☐ Sony PlayStation Portable (PSP)
- ☐ Sony PlayStation 3
- ☐ Sony PSP Go
- ☐ Sony PlayStation Vita
- ☐ Sony PlayStation 4
- ☐ Original Xbox of 2001
- ☐ Xbox360 Original (Elite)
- ☐ Xbox360 Slim (launched in 2010)
- ☐ Xbox360 E (launched in 2013)
- ☐ Xbox One
- ☐ Nintendo Wii
- ☐ Nintendo DS
- ☐ Nintendo 3DS
- ☐ Nintendo Gameboy
- ☐ Nintendo 64
- ☐ Nintendo GameCube
- ☐ Other (please specify): .....

Evolution of the radio



- Steady technological advances
- Relatively slow evolution of product with long lifetime
- Slow change in complexity, number of elements in product and number of users
- Relatively minor consequences for waste management
- Move from analogue to digital radio

Evolution of mobile phones

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1980s

1997-2004

2011

- Rapid technological advances
- Rapid evolution of product and functionality with increasingly short lifetime
- Rapid increase in complexity, number of elements used in product and number of users
- Steadily increasing consequences for waste management

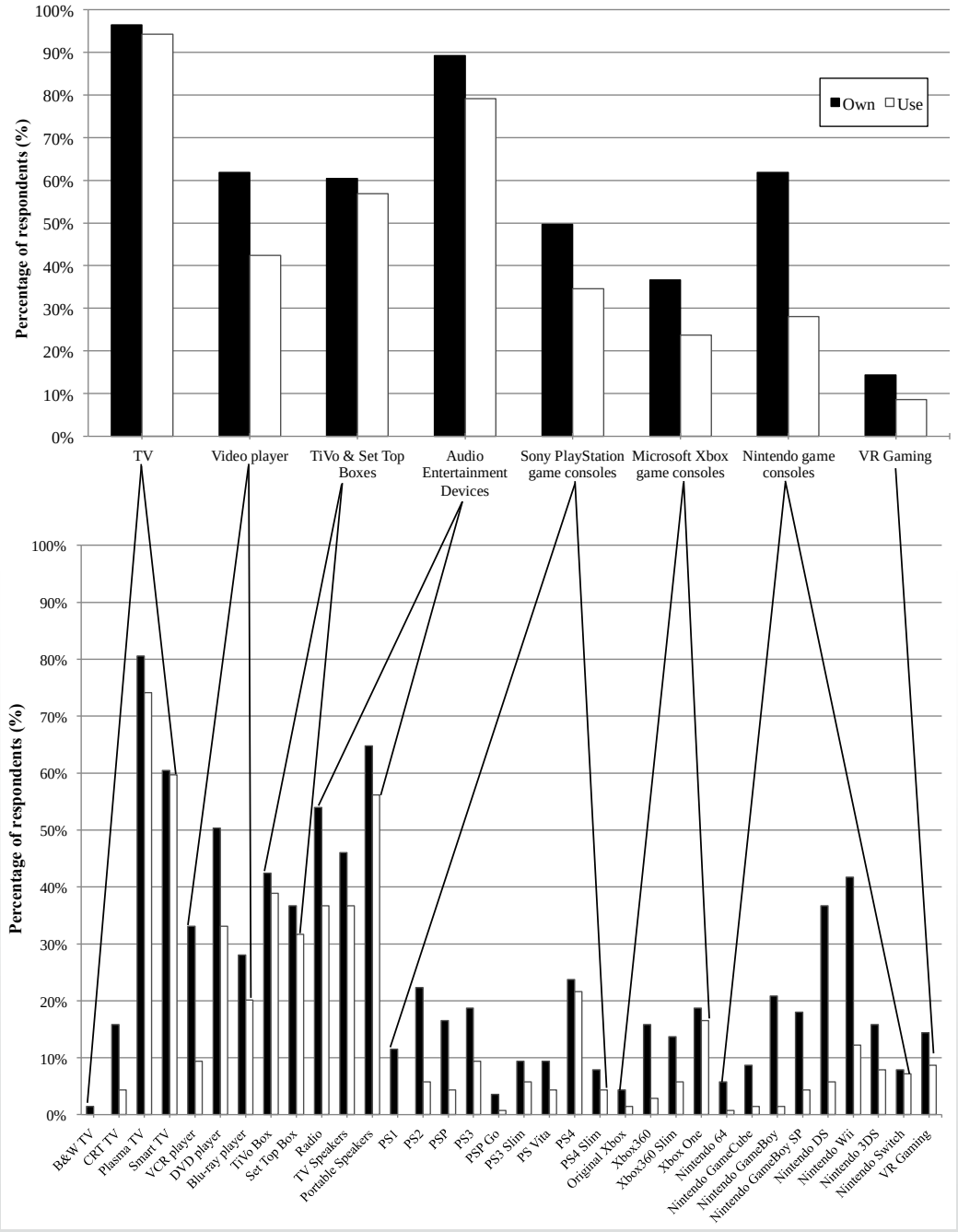
1991

2007

2019

Results: Evolutionary Timelines

- Very rapid technological advances
- Very rapid evolution of product and functionality with increasingly short lifetime
- Huge increase in complexity, number of elements used in product and number of users
- Very significant consequences for waste management



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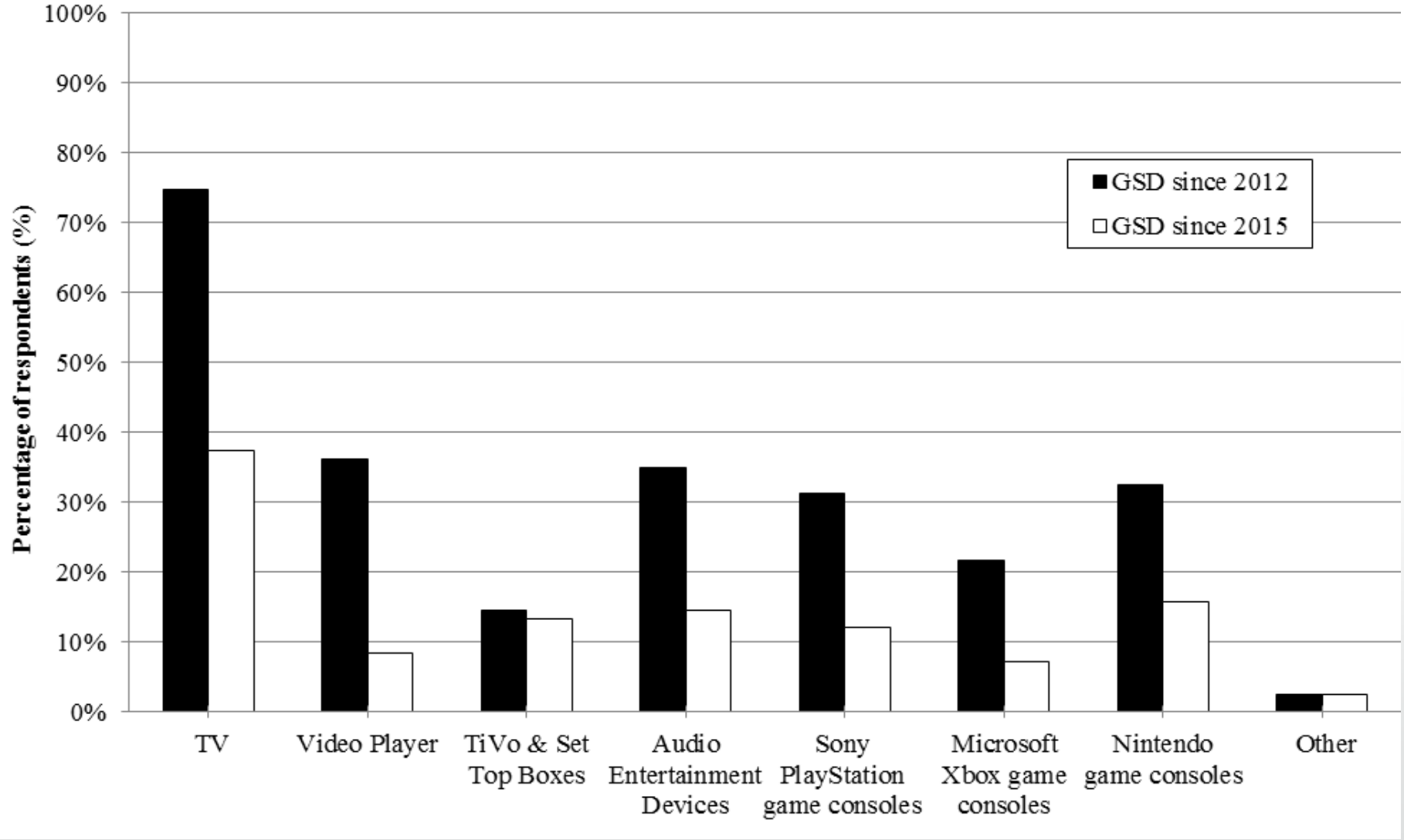
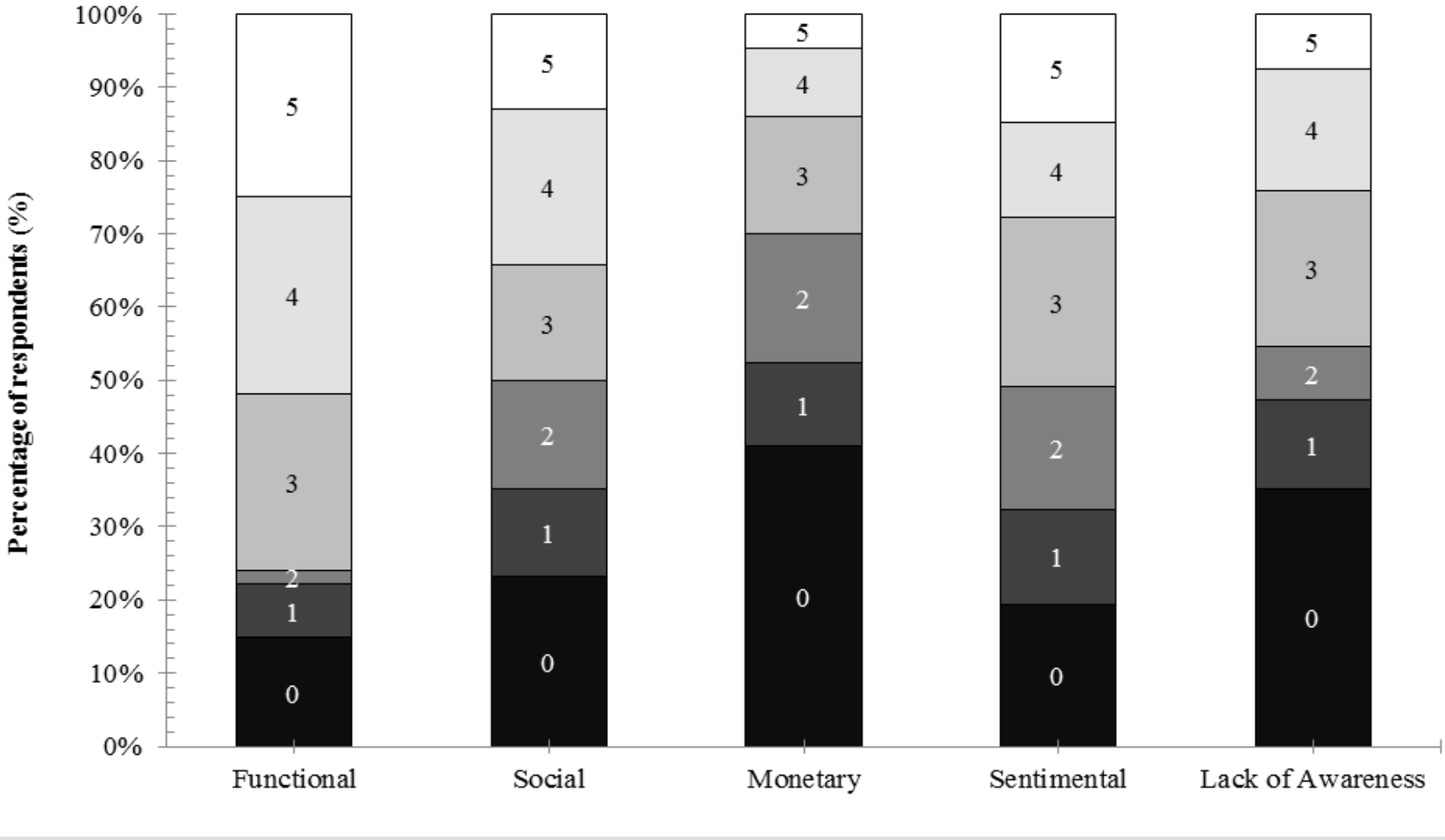
Proportion of respondents owning and using at least one home entertainment electronic product in Southampton in 2018 (n=139).

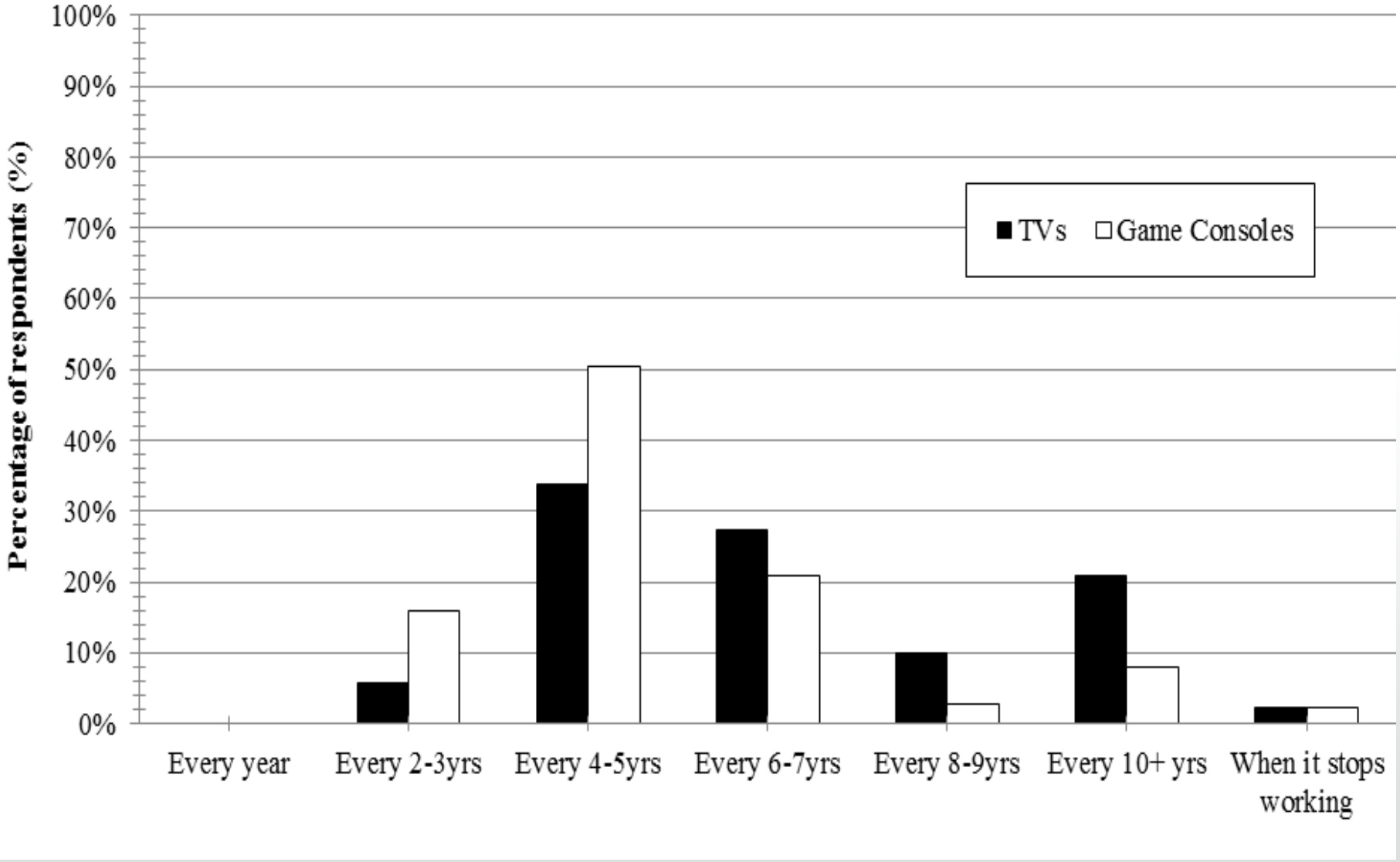
Proportion of respondents who gifted, sold or disposed of home entertainment electronics of since 2012 and 2015.



Reasons influencing respondent hoarding practices (Proportion of respondents who disagree: 0, to completely agree: 5, n=104).



Appropriate replacement time for home entertainment electronics (years) (n=139).



Summary

- Effect of consumer behaviour on release of HE (W)EEE into the CE assessed
- Established, presented and analysed previously unavailable data on:
  - Ownership
  - Use
  - Hoarding levels

  of HE EEE in a typical city DUM
- Established reasons behind their hoarding
- Soon-exploitable and hibernating stocks within an urban area quantified – possible to predict product and material yields that could yielded from a DUM

Conclusions

- Ownership of HE EEE very high: av. 12 items HH^{-1}
- Makes urban areas extremely plausible as DUMs
  - Estimated >1 million HE devices owned and ~440,000 HE devices hoarded in Southampton
  - Estimated >150 million HE EEE owned and ~61 million HE devices hoarded in UK households
  - Numbers probably under-estimated
- Hoarding common, especially for smaller or older equipment, due to perceived residual value
- HE product lifecycles averaged 4-5 years
- Most common EoL routes: donating to relatives, friends or charities; hoarding; recycling via HH Recycling Centres; discarding items in general refuse.

Conclusions

- To ensure recovery of used EEE and WEEE, waste management efforts should:
  - Promote recycling and reuse through awareness campaigns on collection schemes for consumer electronics
  - Establish convenient and accessible used EEE and WEEE collection points to encourage regular (periodic) harvesting
  - Establish incentives.to encourage reuse / recycling behaviour, with potential monetary incentives
  - Target recovery of items that take up more space in consumer households
  - Encourage faster reuse of EEE via donations to charities, relatives or friends in order to gradually stimulate consumers to view EoL WEEE differently

Let's Donate: Charity Begins at Halls

A PAPER BY LANRE SHITTU, PETER SHAW, IAN WILLIAMS, NATALIE MONTIERO, JEMA GREEN & RHIANNON CREFFIELD

5th Symposium on Urban Mining and Circular Economy

November 18-20, 2020 • Virtual Event

End-of-Year Clear-out

- At end of summer term in UK university towns, 100s of thousands of students move out of their rented homes, generating large quantities of waste.
- Consequences:
  - Overflowing bins: concern about litter, vermin, odour, H&S
  - Tension between transient students and permanent residents
  - Leads to tension between local council and university
  - Negative news stories on media
- Students feel unfairly criticised:
  - Social pressure to consume (fast fashion, promotional items)
  - Bin sizes a problem for HMOs and lack of access to HWRCs

Charity Reuse Schemes

Reuse schemes in higher education institutions can play an important role in alleviating problems associated with student clear-out:

- Divert waste from disposal
- Create space in bins so reduction in overflow
- Reduce pressure on local collection authorities
- Reduce tension between permanent residents and students
- Generation of goodwill, income for charities and positive news stories

Halls Reuse 2019

- Collecting, sorting & processing donations
  - Branded bags
  - Drop-off points at campuses
  - Sort, categorise, weigh, log, photograph
  - Removal of some items (dirty, dangerous, broken, open food)
  - Collection of sorted items by charities
- Charities collect sorted items for sale
  - British Heart Foundation
  - Scratch
  - Debra

British Heart Foundation

PACK FOR GOOD

MAKE PACKING EASIER
BY DONATING UNWANTED STUFF

2018 University Campaign

Evaluation & Impact Report

Southampton City

University of Southampton | Southampton City Council | Southampton Solent University

INTRODUCTION

The BHF University campaign has grown significantly since its launch in 2011 with just one University on board, to over 100 in 2018. Pack for Good is also run with over 40 companies, in over 35 cities, at 220 properties and with 14 Councils across the UK.

The campaign continues to be a great success in terms of providing much needed stock for our network of over 740 shops, as well as providing a free collection service to Universities, Local Authorities and landlords.

The BHF campaign aims to reduce complexity whilst actively contributing to University waste diversion, carbon reduction targets and CSR targets including charitable giving within your communities.

In 2016 we rolled out a microsite for our partners to have faster access to a range of digital tools and assets for their on campus promotion, as well as a comprehensive toolkit to run a successful campaign year on year.

In 2017 we were selected as Unite Students official charity stock donation partner; we continue to have a successful national partnership across the country.

In 2018 the BHF University Executives have had a social media presence bringing the campaign to life digitally. Most commonly used is twitter, the team have been working in conjunction with new and existing partners to help promote, raise awareness and thank students. Tweets are picked up using the #packforgood and there have been occasions where the main @TheBHF has retweeted.

PAST CAMPAIGN ACTIVITY

The British Heart Foundation has been working with the University of Southampton since the start of the Pack for Good programme in 2012, since then we have taken on Southampton Solent in 2014 and private providers in 2018.

University	Student numbers	YTD 2018	2017 Total	2016 Total	2015 Total	2014 Total	2013 Total	2012 Total
University of Southampton	24875	2501	1196	1530	2868	1871	1094	734
Pride Halls (Host / Riverside)		685						
Southampton Solent University	11285	426	525	321	311	323	0	0

The University of Southampton saw its campaign donations peak in 2015 and whilst there was a drop in 2016 & 2017 the numbers have recovered this year.

Southampton Solent has remained fairly consistent since joining the campaign achieving their best result in 2017.


Donate Here
If you have any of the below items and would like to donate them to charity, please place them into a coloured bag and leave them in the van
Homeware & Cosmetics
Crockery, Craft Materials, Cosmetics, Books, Pots & Pans, Toiletries (unused), Stationery, Jewellery, Ornaments, Luggage, Utensils, Bric-a-Brac
Is there anything I can't donate here?
We are unable to reuse broken crockery, used cosmetics, loose knives, medication, food, washing/cleaning products or used toiletries so please don't leave them here.
Soft Furnishings
Duvet Covers, Bed Linen, Cushion Covers, Throws, Blankets, Rugs, Towels, Sleeping Bags, Yoga Mats
Is there anything I can't donate here?
We are unable to reuse duvets, pillows, mattresses, mattress toppers, cushions or airbeds so please don't leave them here.
Electrical Items
Kettles, Toasters, Blenders, Rice Cookers, Humidifiers, Fans, Heaters, Coffee Machines, Grills / Kitchen Appliances, TVs, Laptops, PC Equipment, Fairy Lights, Irons, Hairdryers, Printers, Lamps / Lights
Is there anything I can't donate here?
We are unable to reuse broken electricals, items without a CE marking / BSI kitemark or badly scratched items so please don't leave them here.
Clothing & Shoes
Hats, Scarves, Shoes, T-Shirts, Trousers, Skirts, Dresses, Accessories, Handbags, Jumpers, Shorts, Pyjamas, Underwear
Is there anything I can't donate here?
We are unable to reuse protective sports equipment so please don't leave any here.



b&cs


Which items can be recycled?


b&cs


b&cs


Clothing & Shoes
Hats
Scarves
Shoes
T-shirts
Trousers
Skirts
Dresses
Accessories
Handbags
Jumpers
Shorts
Pyjamas
Underwear
Protective Sports Equipment


Homeware & Cosmetics
Electrical Items
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Is there anything I can't donate here?


Fans
Heaters
Kettles
Toasters
Blenders
Rice Cookers
Humidifiers
Coffee Machines
Grills/appliances
Lamps/Lights
Laptops
PC Equipment
Fairy Lights
Irons
Hairdryers
Printers
TVs
Broken Electricals
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king/BSI kitemark
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Clothing & Shoes
Hats, Scarves, Shoes, T-Shirts, Trousers, Skirts, Dresses, Accessories, Handbags, Jumpers, Shorts, Pyjamas, Underwear
Is there anything I can't donate here?
BUSH
24" Smart TV with DVD Player
hp
Affordable printing from your mobile devices
Technika
EPSON

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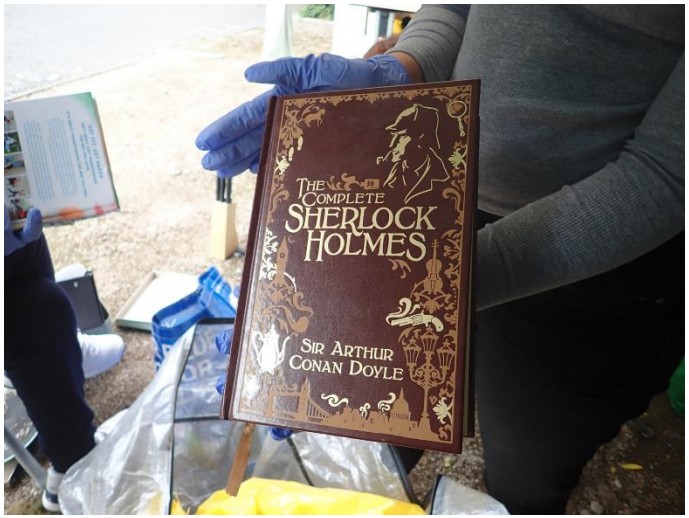

Key results

Category	Number of bags	Number of items	Weight
Clothing	271	5033	1354.9
Homeware	265	3318	1084
Soft furnishing	123	1238	526.5
WEEE	128	447	447.7
Total	**787**	**10036**	**3413.1**

Reuse rates

- Clothes: 93.8%
- Homeware: 92.9%
- Soft furnishings: 98.9%
- WEEE: 97.4%

Conclusions

- Universities viable for urban mining
- Demonstration of a reuse-based recovery system
- 3rd sector bodies e.g. charities helpful with reusable product redistribution

Child's Play: The horror of toy waste in the UK

A PAPER BY
IAN WILLIAMS and YANNAN ZHENG

5th Symposium on Urban Mining and Circular Economy
November 18-20, 2020 • Virtual Event

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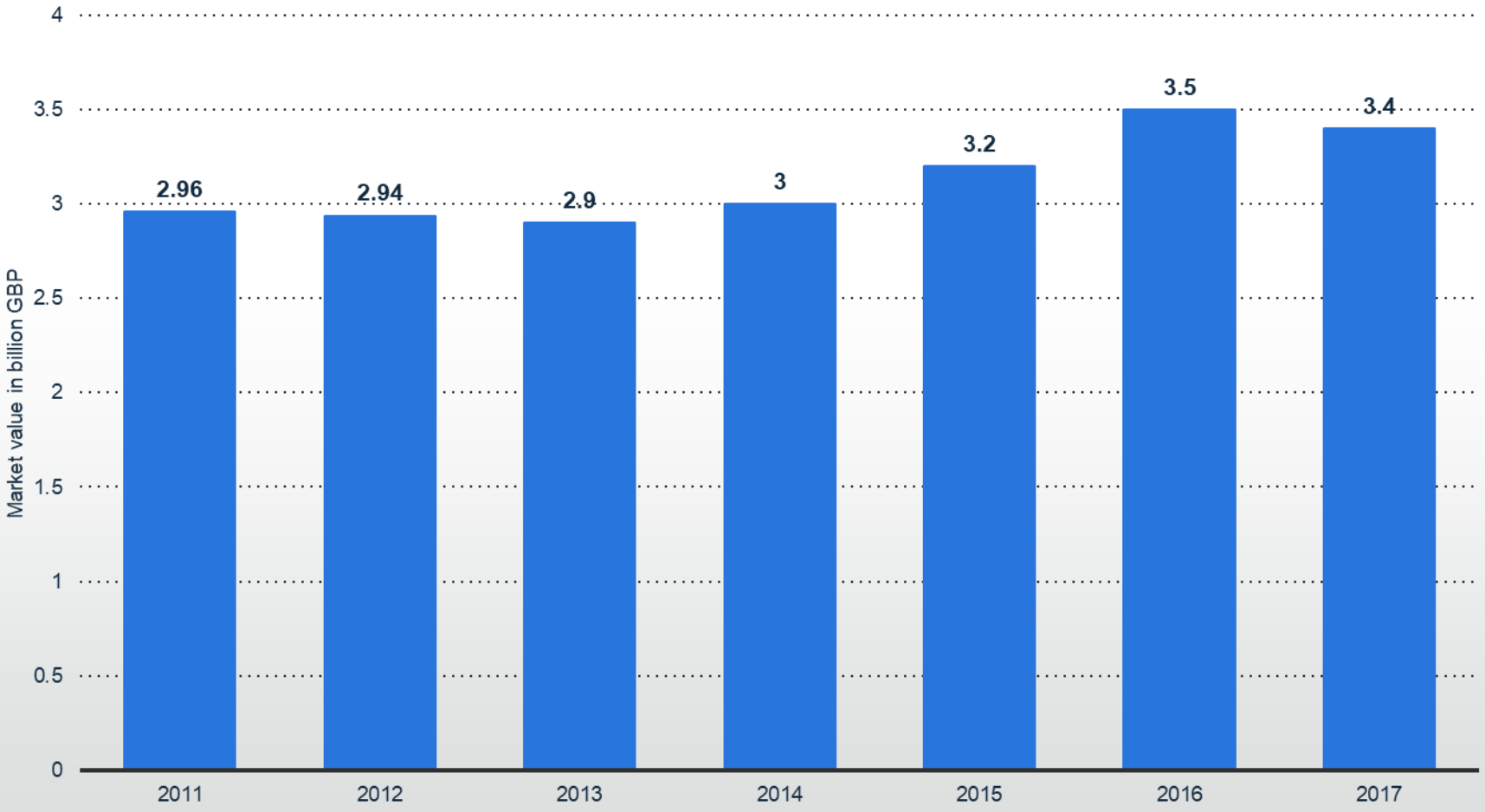
Value of toy market in UK (2011 to 2017)



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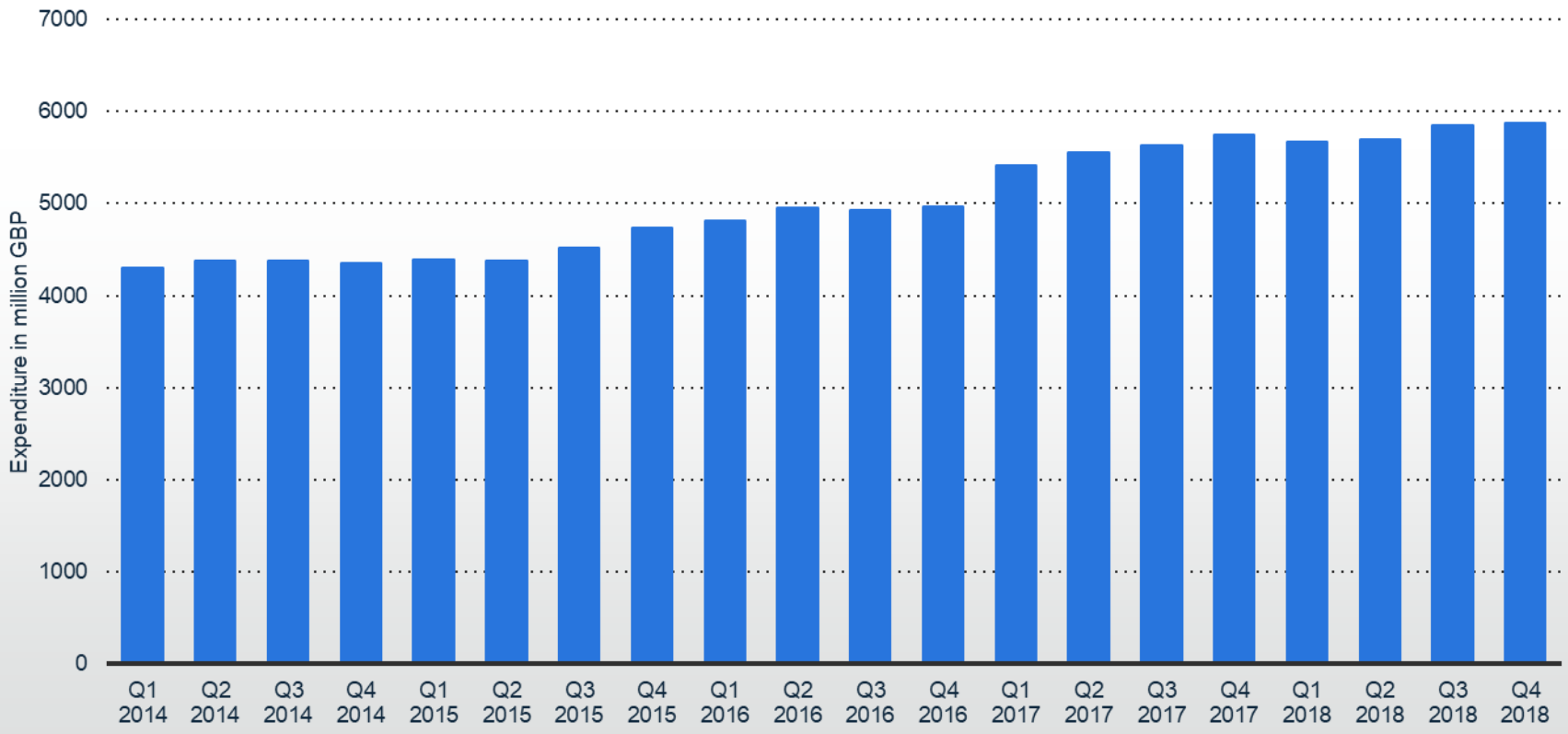
Consumer spending on games, toys and hobbies in UK



Aims

- Identify, categorize and evaluate the performance of children's toys collection and recycling system in the UK
- Assess consumers' consumption and disposal habits using an illustrative case study (city of Southampton)

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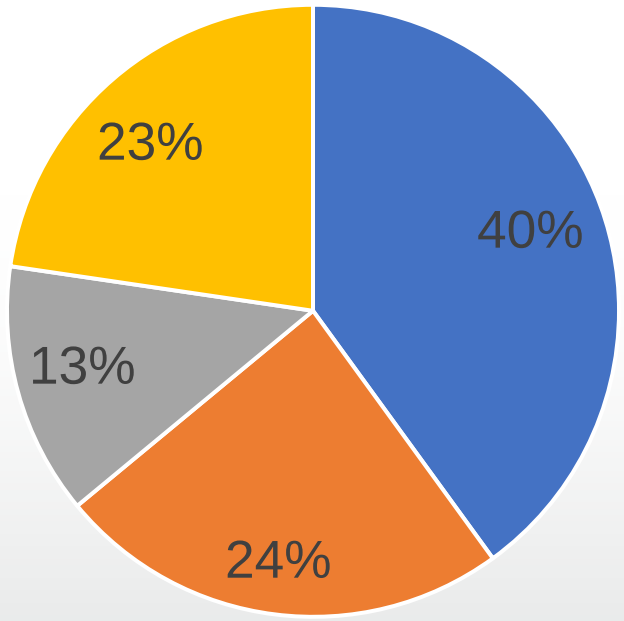
Why respondents disposed of unwanted e-toys (n=75)



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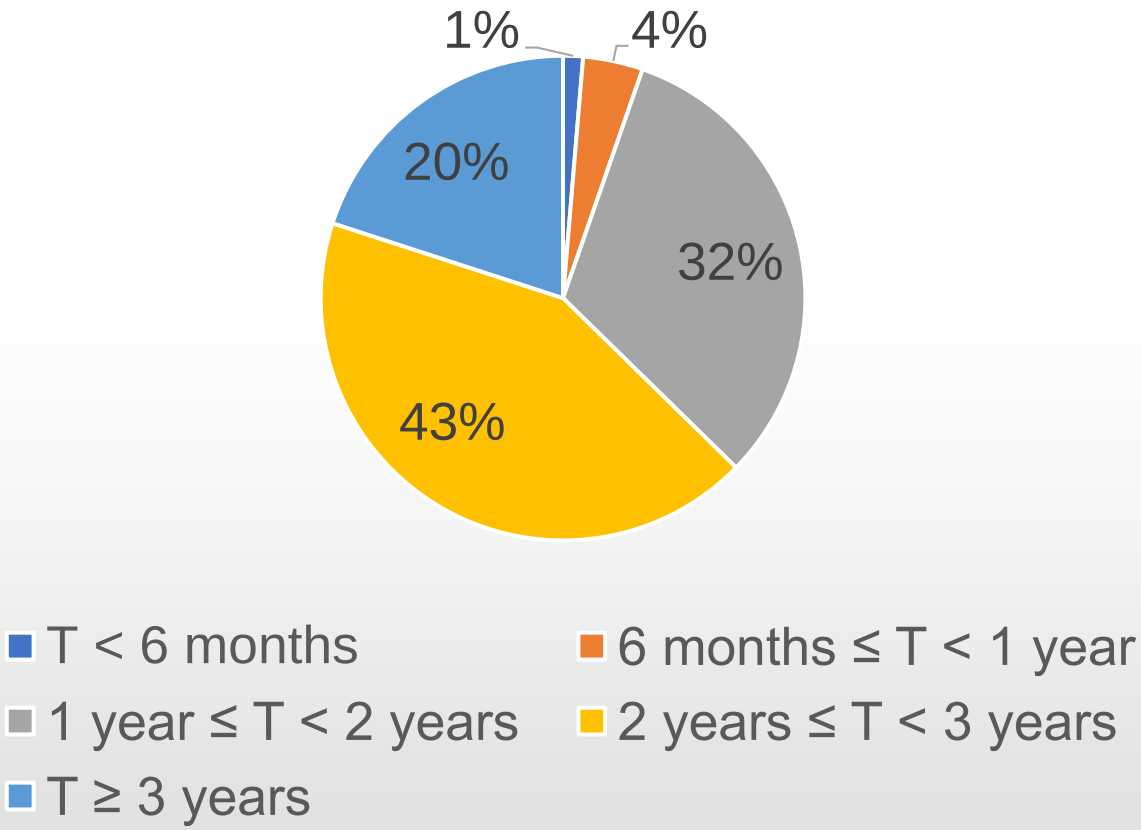
How long respondents kept e-toys (n=75)



Recommendations

- Government guidance needed to local authorities on management of unwanted/broken children's toys
- Manufacturers should make individual toys from single types of plastic and use eco-design principles, alongside effective implementation of producer responsibility
- Ban on distribution of "free" plastic toys to sell products
- Improved information on disposal of unwanted/broken children's toys on local authority websites
- Provision of specific services at recycling centres for unwanted/broken children's toys
- National communication campaign to raise public awareness (similar to WRAP food waste campaign)

During the study ……

- Government guidance needed to local authorities on management of unwanted/broken children's toys
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BBC
Sign in
Home
News
Sport
Weather
iPlayer
Sounds
NEWS
Image source: www.bbc.co.uk (last accessed October 2019)
Home | Coronavirus | US Election | UK | World | Business | Politics | Tech | Science | Health | Family & Education
• Southampton sisters Ella and Caitlin McEwan started a petition to scrap non-recyclable toys in Summer 2019.
• They wanted ban on readily disposed, non-recyclable plastic toys.
• 1.2 billion Happy Meals sold annually ……..
bbc.co.uk/news/av/uk-england-bristol-47731725

19 September 2019

- McDonald's and Burger King announced they are clamping down on plastic children's toys in effort to protect the environment
- From this day, all plastic toys offered in children's meals at UK branches of Burger King will be removed
- BK estimated this will save ~320 tonnes of plastic waste a year
- From October 2019, McDonald's customers can swap plastic toys given in Happy Meals for a fruit bag, and from 2020, for a book

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Free Happy Meal Toys are valuable!!

Pop! Vinyl McDonald's Grimace Funko Pop! Vinyl

£9.99

see it

Pop In A Box

McDonald's Bundle 7 Minions Rise of Gru 2020 Happy Meal

£12.99

see it

ebay

Funko 45722 POP Ad Icons Ronald McDonald Collectible

£19.98

see it

amazon.com Marketplace

Pop! Vinyl McDonald's Officer Big Mac Funko Pop! Vinyl

£9.99

see it

Pop In A Box

McDonald's Happy Meal UK 2020 SCOOB! Toys & Books

£10.00

see it

ebay

BeebeeRun 39 PCS Play Food Toy Sets for Children,Toys for

£9.99

see it

amazon.com Marketplace

Pop! Vinyl McDonald's Ronald Mcdonald Funko Pop! Vinyl

£9.99

see it

Pop In A Box

McDonald's Happy Meal UK 2020 SCOOB! Toys & Books

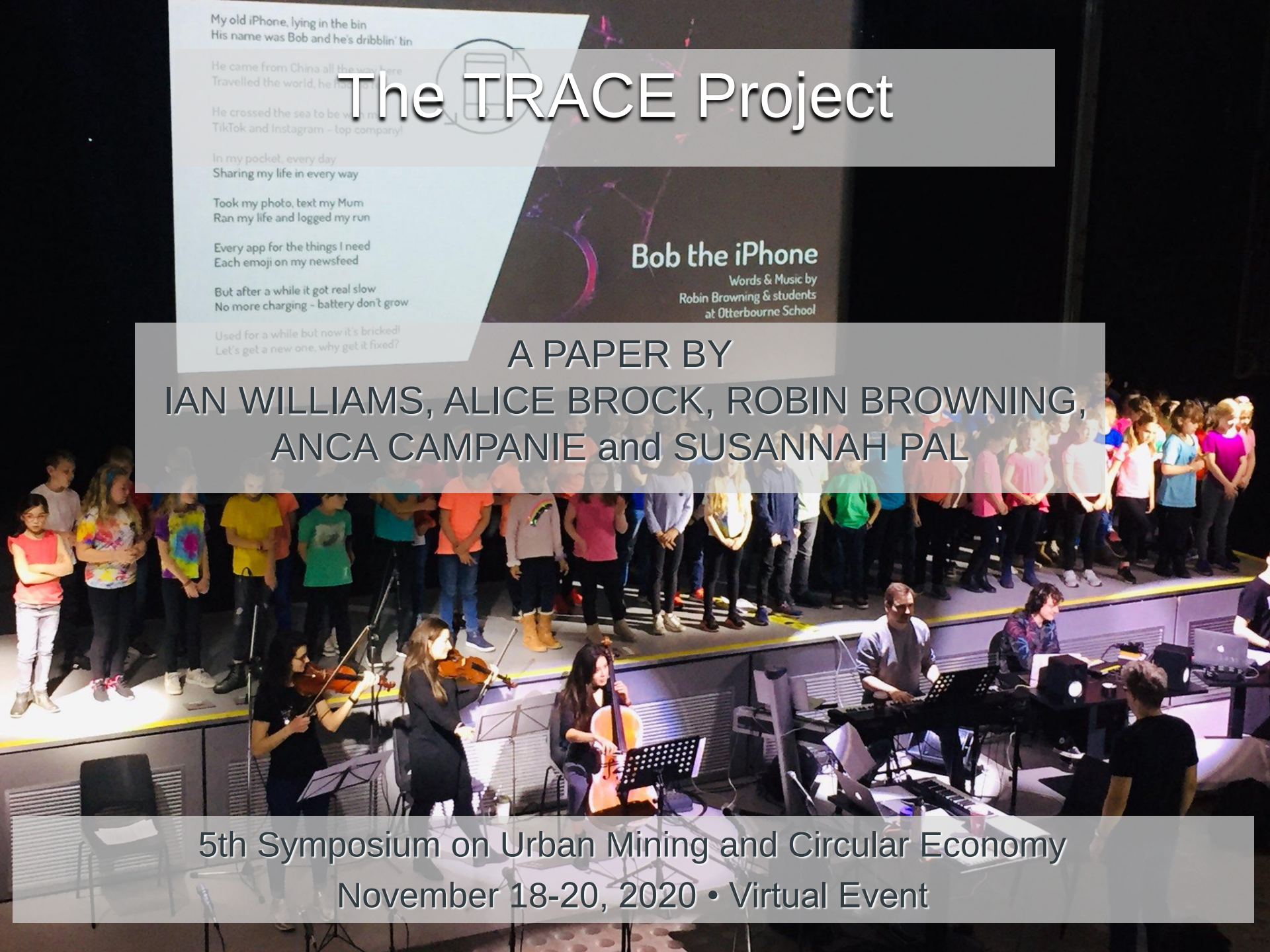
£8.50

see it

ebay

Conclusions

- Number of toys purchased in the UK continues to increase and this is likely to continue
- Rapid obsolescence means the unwanted toy mountain continues to grow
- Public generally don't know what to do with old toys - especially e-toys – hoarding (compulsively buying without any plan to use items or discard) is common
- Local authorities provide limited public information
- Government guidance is necessary to public and manufacturers
- Inter-generational influence starting to impact on companies' business models – becoming more sustainable



The TRACE Project

A PAPER BY
IAN WILLIAMS, ALICE BROCK, ROBIN BROWNING,
ANCA CAMPANIE and SUSANNAH PAL

5th Symposium on Urban Mining and Circular Economy
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Introduction

- E-waste one of fastest growing global waste streams
- Scientists struggle to communicate scientific findings / concepts effectively
- **TRA**nsitioning to a **C**ircular **E**conomy with creative artists
- TRACE project conceived to:
  - Raise public awareness of need for sustainable waste management
  - Use art and music to portray socio-economic & technical challenges of e-waste management and potential solutions generated by research
  - Change attitudes and behaviour

Concepts

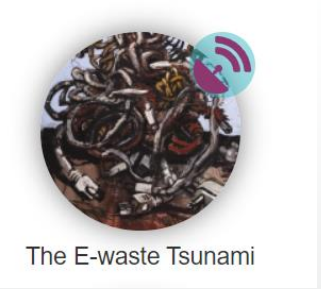
- **Intergenerational influence**
  - Educational influence of children on adults, often their families
  - Children speak directly to audience through song and verbal pieces
  - Children discussing e-waste with their caregivers
- **Anthropomorphism of environmental concerns**
  - Create personality / empathy to discarded objects
  - Evoke emotional responses - creative artists reach public better than scientists with key messages
  - Personification of e-waste by children via song lyrics and performances

Collaborators

- Scientists (Ian Williams (PI) and Alice Brock, University of Southampton)
- Primary schoolchildren and their teachers (Otterbourne School, Hampshire)
- Professional musicians (including members of the SÓN orchestra, led by Robin Browning)
- Professional artist (Susannah Pal)

Activities

- School educational workshops (led by scientists)
- School musical workshops (led by musicians)
- Two musical performances (7 March 2020)
  - During UK Science & Engineering Week
  - An associated art exhibition
- Art exhibition (8-15th March 2020)
- Online presence



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Sarah Fletcher @mrssfletch · Mar 21

This was so incredible. I am so proud to send my children to this school just pleased they got to perform @unisouthampton before this Coronavirus outbreak. #ewaste #recycle

> **SÓN** @SONOrchestra · Jan 30
>
> Introducing 'Bob the iPhone' - one of the stories in our new eWaste Project with 85 youngsters at Otterbourne Primary. We've been working super hard with these brilliant youngsters: look out for a Robot Rap & more, coming soon!
>
> #TRACE #SONeWaste
> @UniSouthampton
>
> Show this thread

1 3 3

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Conclusions

- TRACE project successful in raising awareness of e-waste issues
- Intergenerational influence and anthropomorphism of e-waste highly effective in creating emotional responses
- Creative artists able to portray socio-economic & technical challenges of e-waste management and potential solutions very effectively with help of scientists
- Quantitative and qualitative analysis of project currently being undertaken (in final stages)

The TRACE Project

THANK YOU FOR YOUR ATTENTION

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