Grassroots Innovation and the Circular Economy

A Global Survey of Repair Cafés and Hackerspaces

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Contents

Executive Summary

This short report is a summary of the findings of research undertaken by Professor Martin Charter and Scott Keiller of The Centre for Sustainable Design®. Interim data were previously presented at the workshop 'Makers & Fixers: The Circular Economy and Grassroots Innovation' held at the University for the Creative Arts (UCA), Farnham, UK on 3rd June 2014 (http://cfsd.org.uk/sids/fusion/events/circular-economy-and-grassroots-innovation/).

Members of Repair Cafés and Hackerspaces around the world were invited to take part in online surveys between May 2nd and May 30th 2014. Survey questions explored motivations for participation, activities undertaken and expectations for the future. Emphasis was placed on understanding the importance of sustainability as a driver for participation and in relation to the activities undertaken.

Findings suggest that volunteers at Repair Cafés are most strongly motivated to take part because of what they can do for others, namely their desire to help others live more sustainably, to provide a valuable service to the community and to help improve product reparability and longevity. Increasing product longevity is one of the central considerations of Circular Economy thinking and one which the newly emergent Fixer movement clearly supports.

Repair Café volunteers also appear to hold the view that the concept of manufacturer 'in-built obsolescence' is a real issue, across a wide range of electrical/electronic products. Results also clearly suggest Repair Café activities are not limited to just repair. Modification to clothing is offered by most Repair Cafés and modifications to and upcycling of electrical and electronic equipment and components is also undertaken at some cafés.

Hackerspace members, although interested in sustainability are not motivated to be members of Hackerspaces because of this. Their motivations to participate are largely related to meeting others who share their interests, to being intellectually stimulated and to learning new skills. However, the results indicate that activities pertinent to sustainability/Circular Economy include repair, upcycling and specifically projects related to Home Energy monitoring and control.

The example given by Reading Hackspace at the June 3rd workshop of using 3D printing to produce plastic parts to repair a child's cot, demonstrates how such technology can be used at Hackerspaces as a means of extending the lifetime of consumer durables.

Hackerspace survey respondents expected that in the next five years there would be greater links with other Hackerspaces/Makerspaces and that Hackerspace activities will lead to more new business start-ups. Furthermore, forty percent of respondents expect that their Hackerspace will provide space and support for new business start-ups.

1. Introduction

The linear industrial processes of 'take, make, dispose' that have driven economic growth and shaped lifestyles in the developed world are not sustainable. The linear economy has required an easily accessible supply of cheap materials and energy and both are expected to become significantly more expensive during the course of the 21st century. Radical change by business and civil society is needed to enable the transition to a more Circular Economy, which is restorative by nature, where waste is reduced or eliminated entirely through for example, development of new business models, eco-design and product life extension.

The growth of the grassroots Maker movement has been hailed as the new industrial revolution and has the potential to herald a new post-consumer, more sustainable approach to production and consumption through local peer production and the development of innovative products and services that are fit for purpose and longer-lasting (Anderson, 2012).

Repair Cafés and Hackerspaces are two examples of new Places & Spaces that are emerging from a new wave of grassroots organisations where people come together in 'community workshops' to experiment with, modify, make and fix products.

Increasing product longevity is one of the central considerations of Circular Economy thinking (Ellen McArthur Foundation, 2012) and a concept which the newly emergent Fixer movement appears to embrace. The 'fixer economy' has existed for a long time eg car repair, but new organisations are helping product owners to repair and maintain consumer products. The Repair Cafés Foundation, founded in the Netherlands in 2010 provides support to a network of over 500 active Repair Cafés around the world (Martine Postma, *pers comm* 2014). *A Repair Café offers a free meeting place for people to bring products in need of repair and to work together with volunteer fixers, to repair broken products.*

The growth of Hackerspaces has been rapid, increasing from fewer than 20 in 2005 (Baichtal, 2012) to 1035 active Hackerspaces today (Hackerspaces, 2014).

Hackerspaces are physical places where people with an interest in technology can meet and work on their projects. Projects characteristically include software and hardware development but can also include the more traditional 'maker' arts and crafts. Their growth has been facilitated by new and affordable technologies, particularly the advent of cheap computing and digital fabrication devices, such as 3D printers, the use of social media as a means of sharing information and the principles and products of 'open source'.

This research documents the demographics, interests and motivations of members of Repair Cafés and Hackerspaces around the world. It records the activities undertaken in these community workshops and members opinions on how they expect their organisations to change over the next five years. Particular emphasis is placed throughout the work on understanding the importance of environmental, social and economic drivers as motivations for participation and of the activities undertaken.

Research was undertaken through online global survey in May 2014, of members of Repair Cafés (158 respondents from 9 countries) and Hackerspaces (95 respondents from 16 countries). Both Repair Cafés and Hackerspaces are largely undocumented phenomena, indeed the authors believe this work to be the first published research survey on global Repair Cafés.

The implications of the results are discussed in the context of eco-innovation and the move towards a more Circular Economy.

2. Methods

Members of Repair Cafés and Hackerspaces around the world were invited to take part in online surveys (www.survyegizmo.com) between May 2nd and May 30th 2014.

Repair Café organisers and volunteers were invited to participate via email. For Repair Cafes in the Netherlands the invitation was sent direct from Martine Postma, founder of the Repair Café Foundation. Repair Cafés in Belgium and Germany were invited via their respective National Network organiser. Repair Cafés in other countries were invited via email from The Centre for Sustainable Design®.

Hackerspace members were invited to participate via postings on Google discussion groups and via mailing lists available through http://hackerspaces.org/wiki/List_of_Hacker_Spaces

Survey questions explored motivations for participation, activities undertaken and expectations for the future. Emphasis was placed on understanding the importance of sustainability as a driver for participation and in relation to the activities undertaken.

The exploratory data analysis presented in this report is for all (not segmented) responses to each of the two surveys.

3. Repair Cafés Results

158 responses were received from participants at 144 named Repair Cafés from 9 countries (Top five countries by number of responses: The Netherlands 104, Germany 31, UK 9, Belgium 7 and USA 3). Results are presented below for all (non-segmented) Repair Café Survey respondents.

About respondents

- Male 60:40 Female
- Most, 35% aged 55-65, and 21% aged over 65
- c. 70% have Bachelors or Post Graduate degree
- 70% describe themselves as Founders and/or Organisers and 23% as Volunteer Fixers

About respondent's Repair Cafés

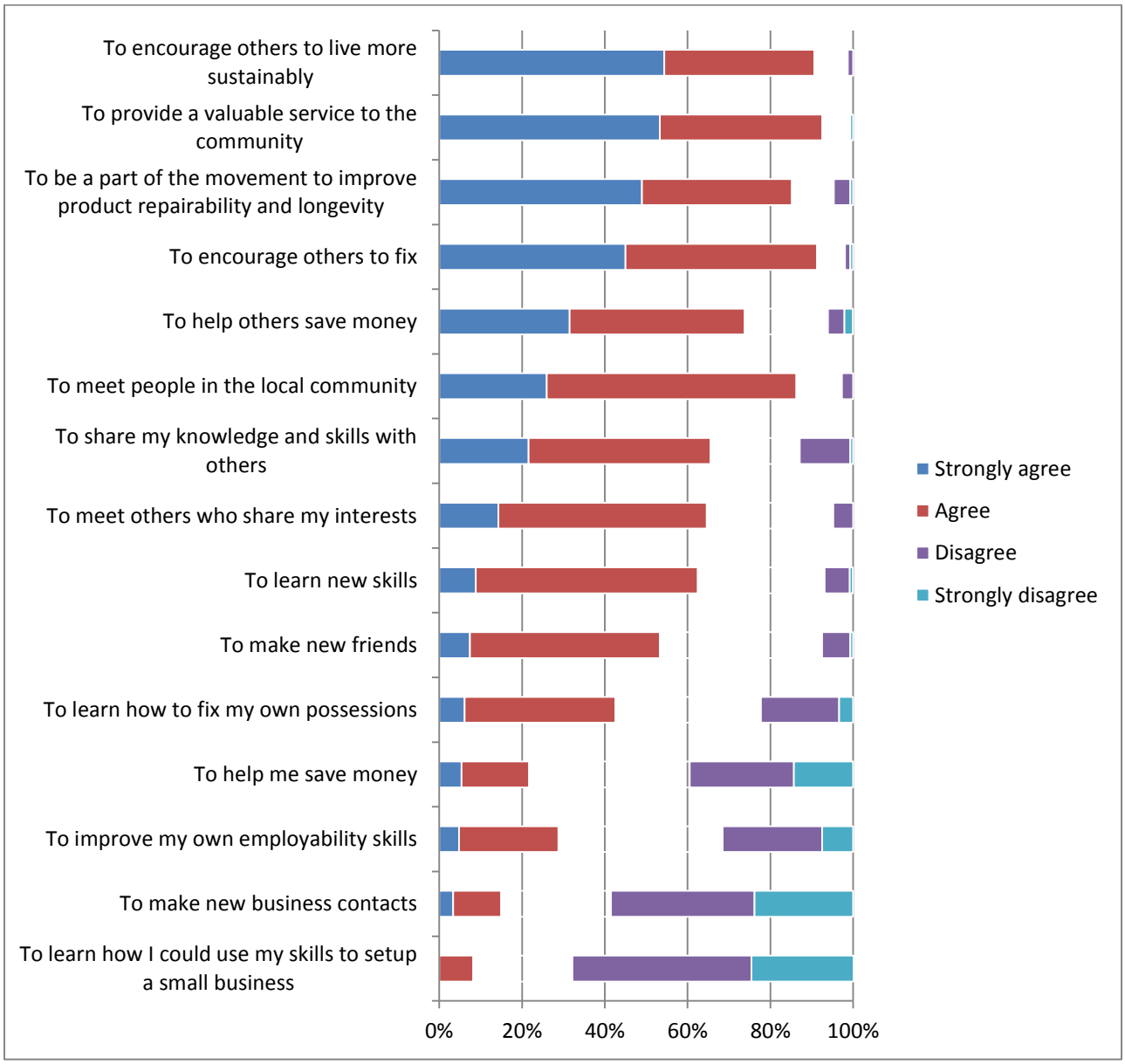
- c. 75% hold sessions at fixed venue
- c. 60% hold sessions once a month
- An average of 9 volunteers attend each session
- c. 95% of Repair Cafés have operated for 2 years or less

3.1 Reasons for participation at the Repair Café

Respondents were asked about their motivations for participation. The top three reasons (more than 80% Strongly agree or agree) why respondents volunteer/participate at Repair Cafés (Figure 1) were:

- To encourage others to live more sustainably
- To provide a valuable service to the community
- To be a part of the movement to improve product reparability and longevity

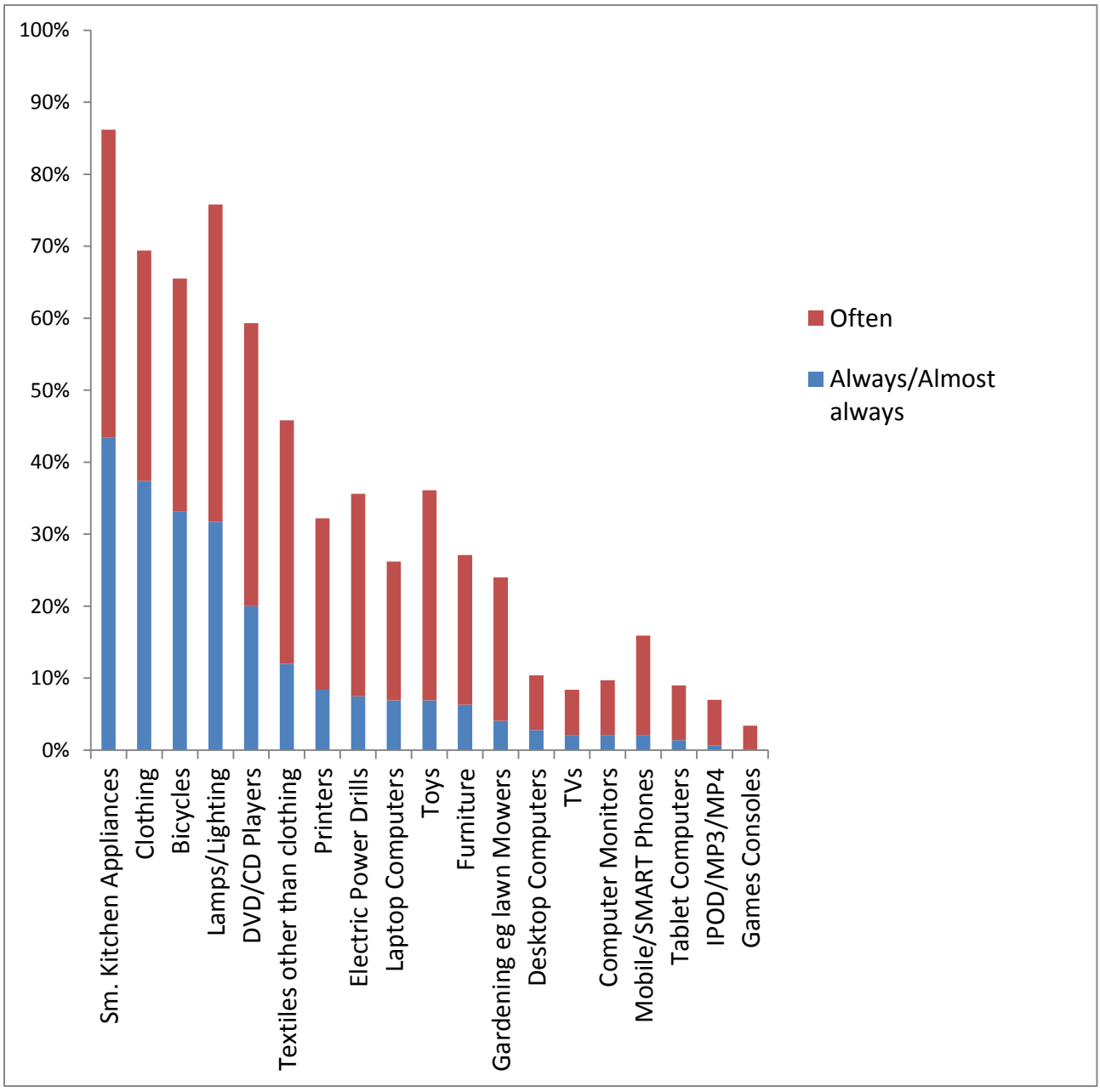
Figure 1. Responses to the question *Why do you participate in the Repair Café?* Responses were given to a list of statements on a five-point Likert scale from *Strongly agree* to *Strongly disagree.*



3.2 Activities undertaken at the Repair Café

The five categories of Items most frequently brought (Always or Often) to the Repair Cafés for repair (Figure 2) include Small Kitchen Appliances (86% of respondents), Lighting (76%), Clothing (69%), Bicycles (65%) and DVD/CD Players (59%).

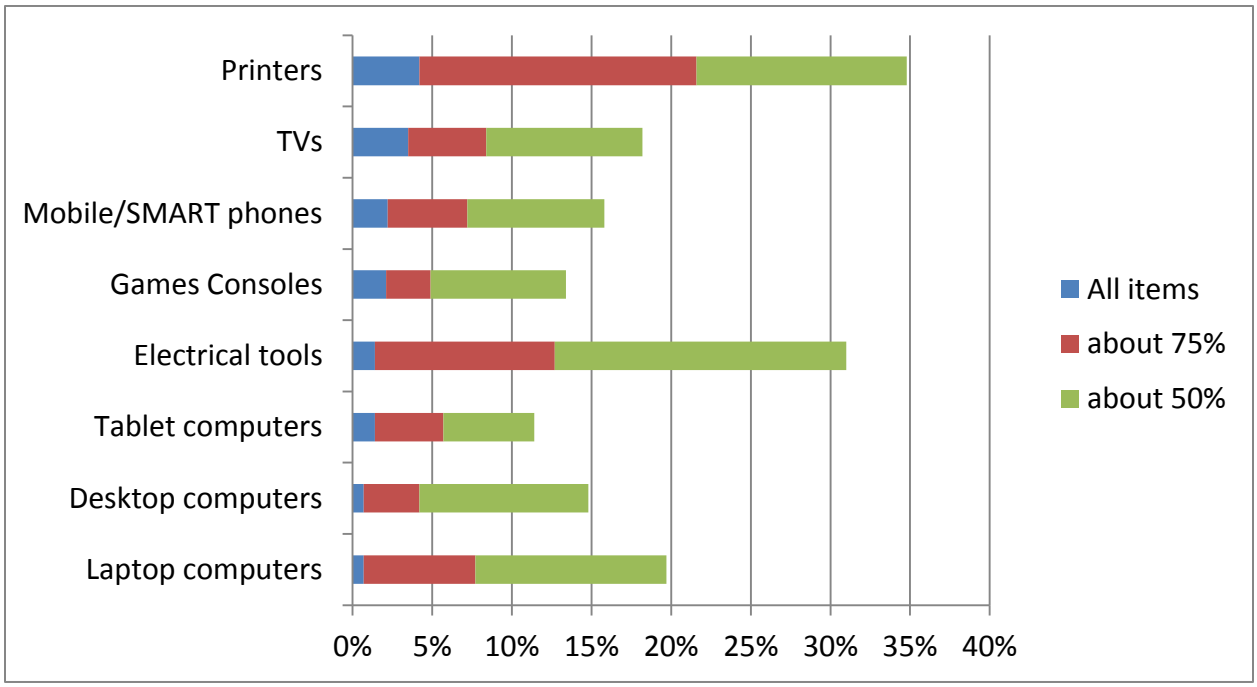
Figure 2. Responses to the question *How frequently are the following items brought to your Repair Café for repair? Responses were given on a five point Likert scale from Always to Never.*



3.3 Views on planned or in-built obsolescence

Of the electrical/electronic items brought to Repair Cafés, Printers and Electrical tools are considered to be the most frequently in need of repair, because of what respondents believe to be 'planned or in-built obsolescence' (Figure 3)

Figure 3. Responses to the question *In your opinion what proportion of electrical / electronic items are brought to the Repair Café because of what you believe to be 'planned or built-in obsolescence'*?



3.4 Modification and upcycling activities

Repair Cafés do more than repair, product modification and upcycling are also undertaken. Respondents were asked how often the Repair Café helps people to modify or upcycle items. For example, c. 40% of respondents' state that modifications to clothing to improve fit are undertaken Always or Often at their Repair Café and c. 10% (Always or Often) undertake upcycling of waste electrical equipment or reuse of sub-assembles into new applications.

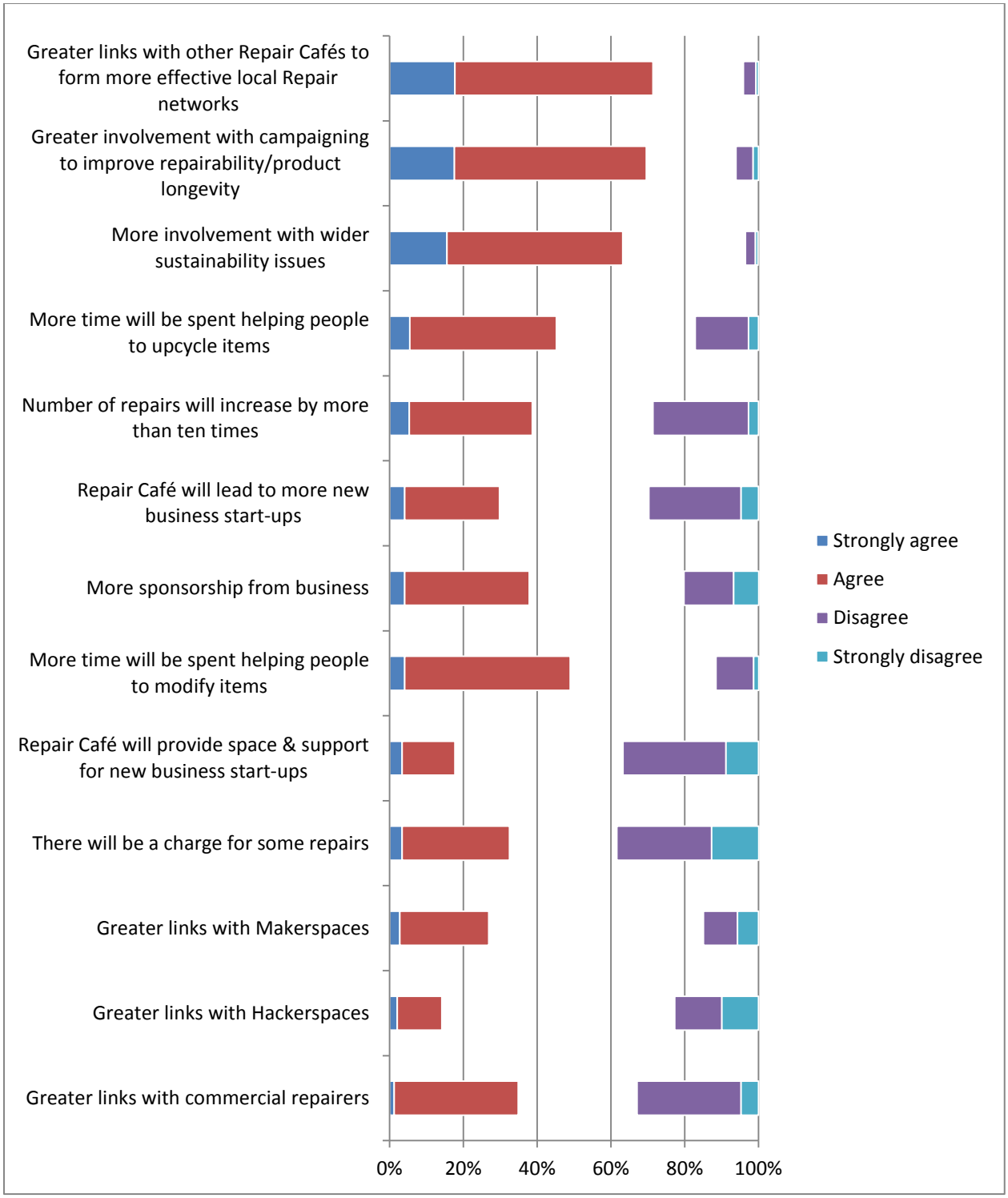
Around 10% (Always or often) undertake modifications to computers to improve performance, including adding additional memory and 9% (Sometimes) undertake modifications to mobile phones including unlocking units for use on alternative networks.

3.5 Expectations for the future

The top three expectations (more than 60% Strongly agree or agree) of how Repair Cafés might change over the next five years (Figure 4) were:

- Greater links with other Repair Cafés to form more effective local Repair Networks
- Greater involvement with campaigning to improve product reparability/longevity
- More involvement with wider sustainability issues.

Figure 4. Responses to the question *Do you agree or disagree with the following statements about how you expect your Repair Café to change over the next five years?*



4. Hackerspace Results

95 responses were received from participants of 45 named Hackerspaces from 18 countries (Top five countries by number of responses; UK 29, USA 20, Australia 10, Netherlands 6 and Germany 4). Results are presented below for all (not segmented) Hackerspace Survey respondents.

About respondents

- Male 90:10 Female
- Most (40%) aged 25 – 34
- c. 70% have Bachelors or Post Graduate degree

About respondents' Hackerspaces

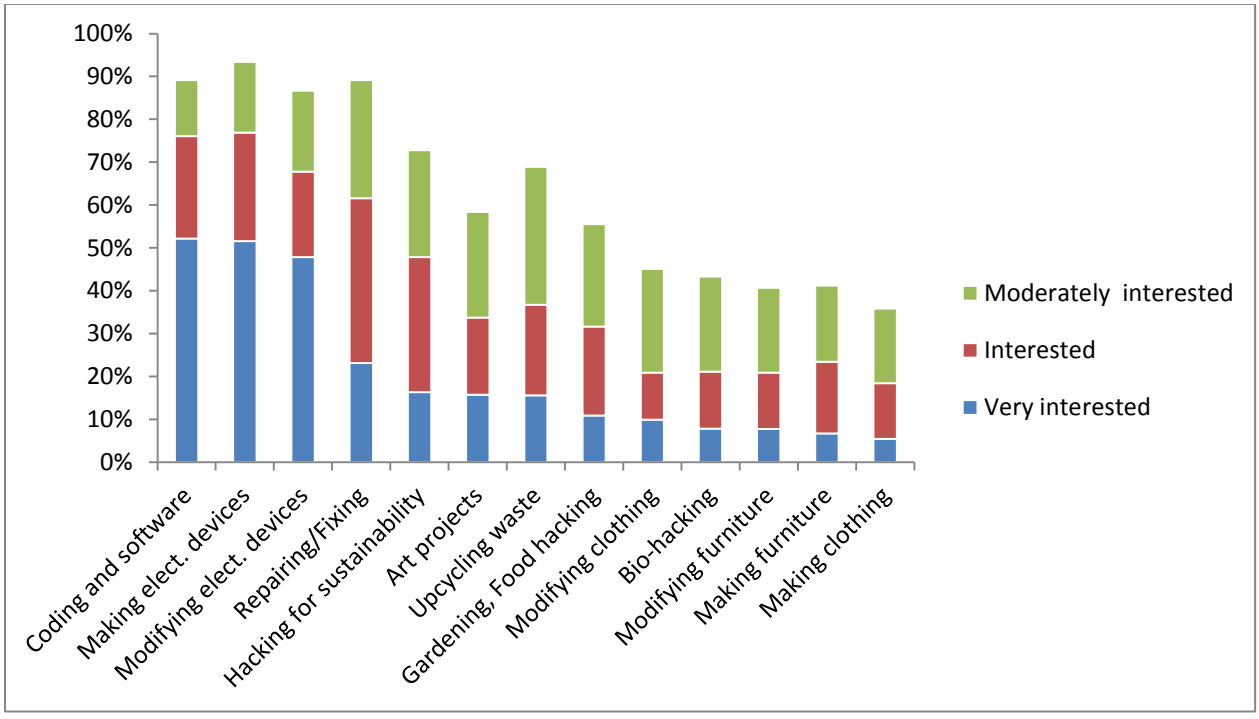
- c. 95% meet always at same, fixed venue
- c. 70% of
- c. 55% existed for 4 or more years open all/most days

4.1 Hacker interests

Hackerspace survey respondents were asked to select their areas of interest from a predefined list (Figure 5). The top five Hacker interests (50% or more Very interested or interested) are:

- Coding and software development
- Making electronic devices
- Modifying electrical /electronic devices
- Repairing/fixing electrical/electronic devices
- Hacking for sustainability

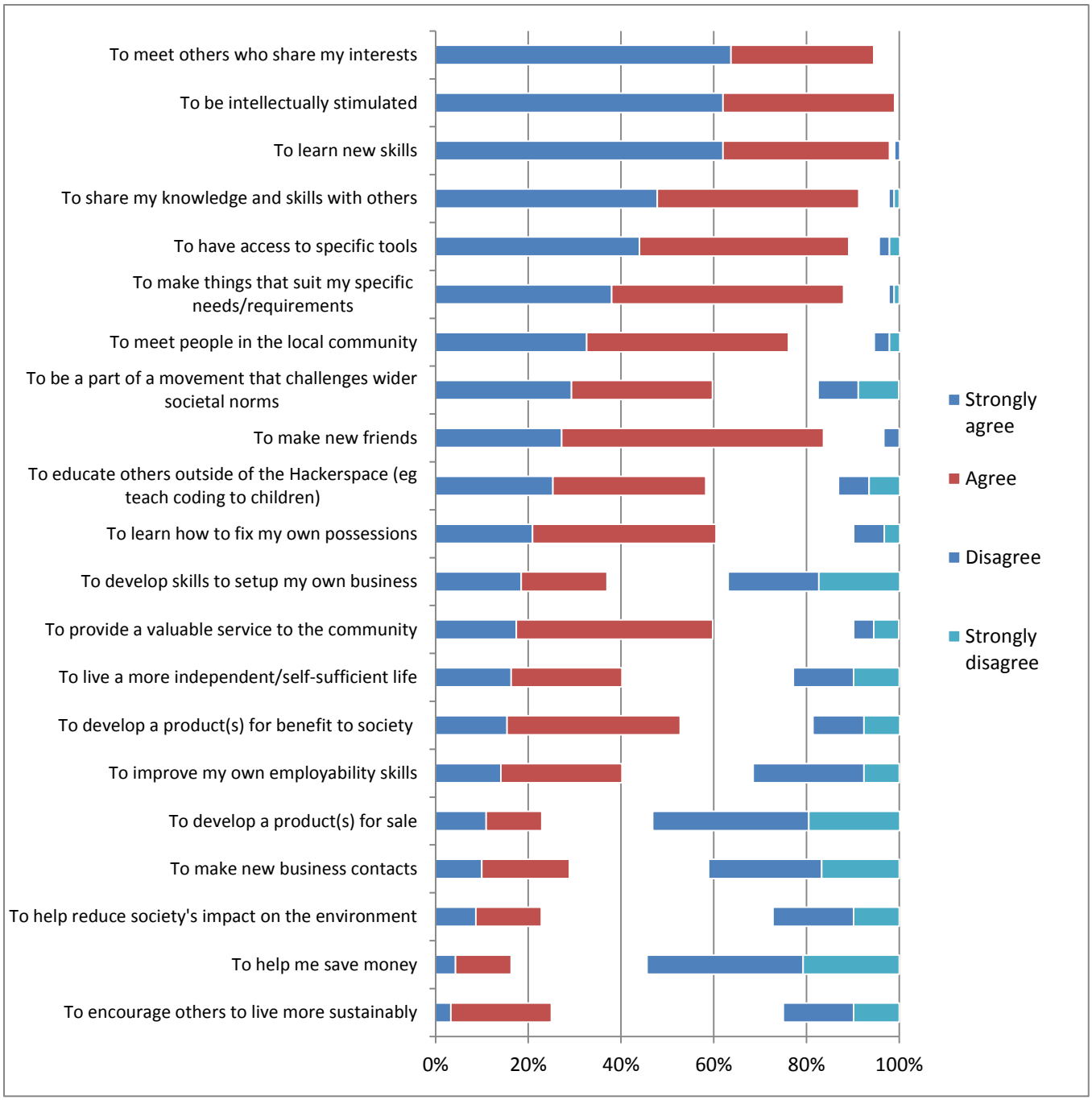
Figure 5. Responses to the question about Hacker interests, *How interested are you in the following activities?*



4.2 Reasons for Participation at the Hackerspace

The top three reasons (more than 90% Strongly agree or agree) why respondents participate at their Hackerspace (Figure 6) are *To meet others who share my interests*, *To be intellectually stimulated* and *To learn new skills.*

Figure 6. Responses to the question *Why do you participate in the Hackerspace?* Responses were given to a list of statements on a five-point Likert scale from *Strongly agree* to *Strongly disagree*

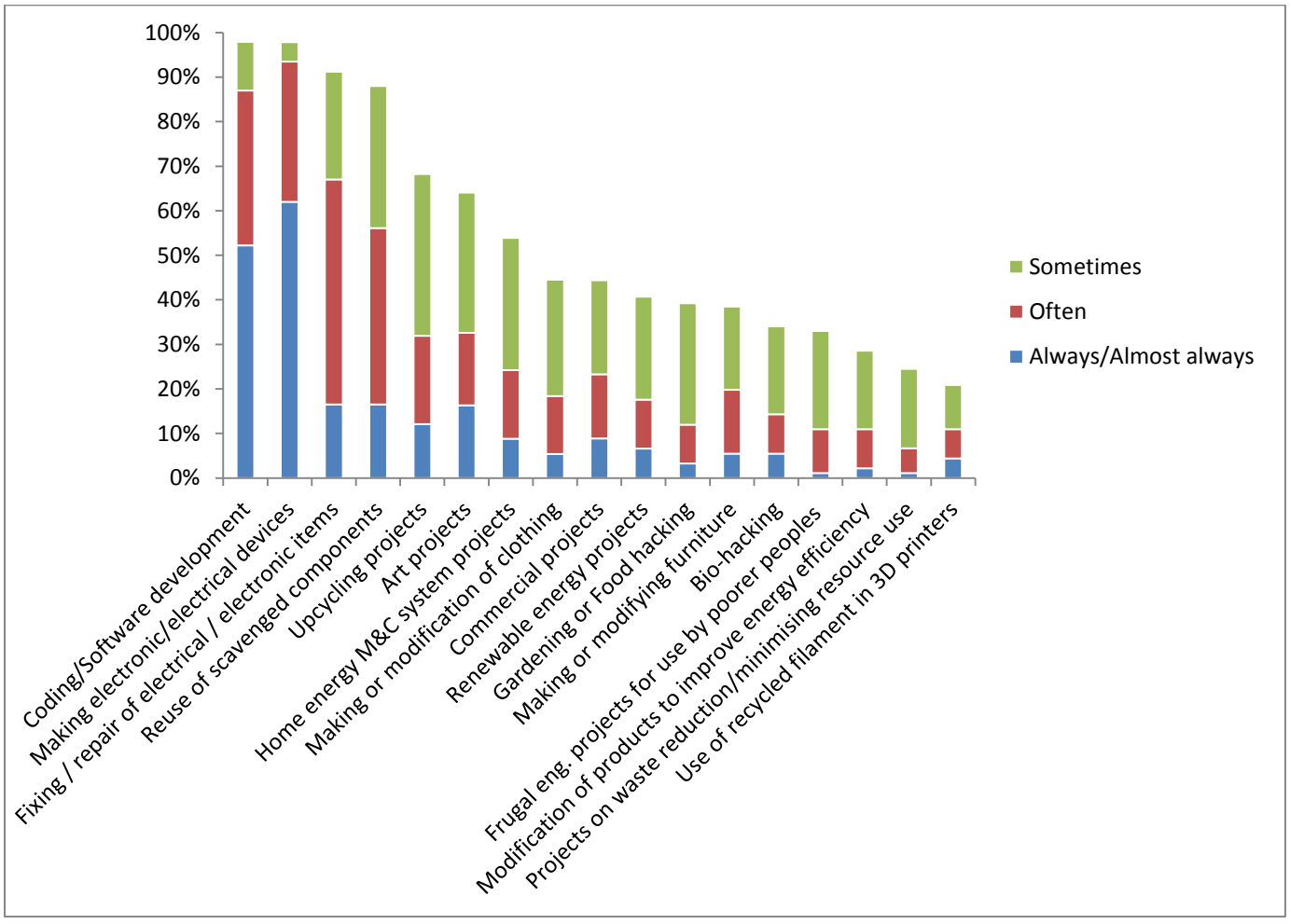


4.3 Activities undertaken at the Hackerspace

Respondents were asked how frequently specific activities are undertaken at their Hackerspace. *Coding*, *Making electrical/electronic devices* and *fixing electrical/electronic products* were given (more than 60% Always or often) as the most frequently undertaken activities (Figure 7).

Other frequent activities included; Reuse of scavenged components (more than 50% Always or often), Upcycling projects (over 30%), Art projects (over 30%); and Home energy monitoring/control systems (over 25%).

Figure 7. Responses to the question *how frequently are the following activities undertaken at your Hackerspace?* Responses were given to a list of statements on a five-point Likert scale from Always to Never.

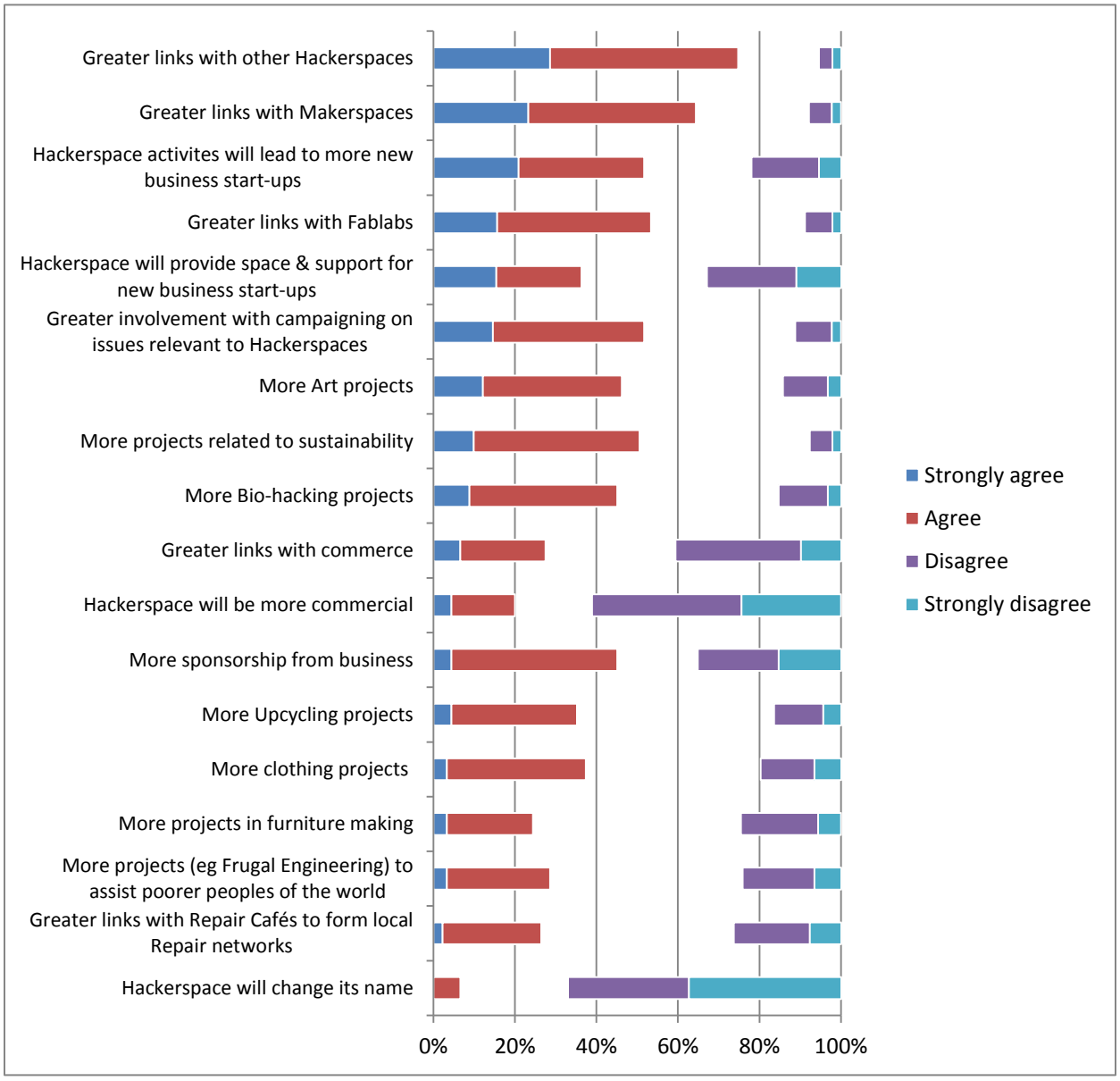


4.4 Expectations for the future

The top three expectations (more than 50% Strongly agree or agree) of how respondents' Hackerspace might change in the next five years were *Greater links with other Hackerspaces, Greater links with Makerspaces* and *Hackerspace activities will lead to more new business start-ups* (Figure 8). Nearly 40%

of respondents Strongly agreed or agreed that they expect their Hackerspace *will provide space and support for new business start-ups.*

Figure 8. Responses to the question *Do you agree or disagree with the following statements about how you expect your Hackerspace to change over the next five years?*



5. Discussion

'Consumer culture' fuelled by cheap credit and low cost products is driving the consumption of materials in Western Economies. The prevailing Linear Industrial Model of 'take, make, waste' is unsustainable. Indeed, in Europe alone, of the 16 tonnes of material used by each person in a year, 6 tonnes becomes waste (European Commission, 2014). There is an urgent need to move toward a more Circular Economy, which is focused on 'closing material loops' through the more efficient use of materials and extending the life of products, thereby reducing the embodied materials at manufacture and energy use

throughout the product lifecycle. The need for change is now firmly on the policy agenda with the European Commission's Circular Economy paper published on 2nd July 2014. Increasing focus on repair (or fixing) is an important part of 'closing material loops' and is a key element in moving towards local sustainable consumption and production models. Grassroots activity is emerging in relation to the repair of products. Initiatives like the Repair Cafés Foundation are presenting a means whereby motivated individuals and communities are working together on a local level: to extend the useful life of a wide range of products; to teach repair skills; and also to communicate the value of product repair rather than replacement to the wider community.

Citizen-driven 'grassroots innovation' is being enabled by increased access to information, the growth of social networking, the products and principles of 'open source' and the adoption of new technologies like 3D printing. Participants at Hackerspaces as well as developing and improving new open source products, are developing innovative approaches to product repair, modification and upcycling. Some Hackerspaces may also start to emerge as labs and/or incubators for new product or enterprise development. The range of projects related to sustainability being undertaken at respondent's Hackerspaces suggests some might develop into eco-innovation incubators.

5.1 Repair Cafés

The Repair Café Foundation (to which all of the Repair Cafés surveyed are members) was founded by Martine Postma in the Netherlands in 2010 to enable people to repair products that would otherwise end up as waste. Repair Cafés provide a place for people to socialise, to share and learn new skills and address issues related to sustainable consumption in very real 'hands-on' way. The founders, organisers and fixers at each Repair Café are volunteers who have elected to give up their time to offer this community service. As one might expect therefore, the most common reasons for participation at Repair Cafés are altruistic; *to encourage others to live more sustainably*, to *provide a valuable service to their community*, *to be a part of the movement to improve product reparability and longevity* and to help *others to learn how to fix their own products.* It follows that personal gain from participation is not important to most Repair Café volunteers. In particular, *making new business contacts, improving ones employability skills* or *learning how to use skills to set up a new business* are amongst the least important motivators across all respondents. The time commitment, effort and resources required to set-up and organise a Repair Café are significant. This might explain why the age profile of respondents is skewed towards relatively 'time-rich' older generations with 35% of respondents aged 55 to 65 and 21% aged over 65. The high proportion of volunteers either approaching retirement or retired might also explain the low interest in personal gain regarding business opportunities and employment prospects.

The types of products brought to Repair Cafés for repair are those which on the most part are of a size and weight that makes transporting them relatively easy. Small Kitchen Appliances were the most common (86% always or often brought to the Repair Cafés) followed by clothing and bicycles and a wide range of consumer electrical and electronic equipment, but also furniture and gardening equipment, like lawn-mowers. The products brought to Repair Cafés are also likely to be dependent upon the skill-sets of volunteers. For example, when it was communicated that a volunteer with skills in consumer electronics had joined Brighton Repair Café (Victoria Jackson, *pers comm*), there was a significant increase in attendees with electrical and electronic products and this increased local interest in the Repair Café.

It has been estimated (WRAP, 2014) that just 7% of the waste electrical and electronic equipment (WEEE) collected at UK Household Waste Recovery Centres goes on to be reused, but that 23% could be reused, following minor repair. The Restart Project, a London-based social enterprise that runs 'Repair Party' events claims that over 750kg of electrical and electronic equipment has been diverted from the waste stream from 55 events since 2012 (Restart, 2014). Repair Cafés offer real, but currently small scale opportunities for repairing electrical and electronic equipment and other products to prolong use and delay or avoid disposal into many of the current recovery facilities where handling results in damage and loss of value and resources.

Repair Cafes do not just facilitate repair, product modification is also a common activity at Repair Cafes. Alteration is one way to extend the useful life of clothing and it is practised always or often at 40% of respondent's Repair Cafés.

The notion that some products are designed and manufactured to fail prematurely - planned or built-in obsolescence - is widely believed by Repair Café volunteers. Over one third of respondents believe that more than a half of all computer printers are brought to the Repair Café because of in-built or planned obsolescence. There are many online discussion groups regarding 'repair' methods for resetting counters or 'kill chips' in some printers which cause failure when a set number of prints are reached. The increased sharing of information on repair for perceived or actual in-built obsolescence could influence manufacturers to change product designs for greater longevity and also inform policy makers on developing guidance to discourage design that is considered by many to have the intention of reducing product lifespan. It is noteworthy that over the next five years almost 70% of respondents expect their Repair Café to be more involved in campaigning to improve product reparability and longevity.

Repair Cafés currently make up a growing but nevertheless small part of the product Repair 'Eco-system', along with commercial repairers, online repair guidance and tool and parts retailers. There are over 200 Repair Cafés in the Netherlands and virtually all large cities have at least one Repair Café. For example, Amsterdam has fifteen Repair Cafés and Rotterdam has eight. In these cities, communication and sharing of volunteers and skills between Repair Cafés helps to provide a network for community repair, where for example, attendees can be referred to other Repair Cafés depending upon specific needs. Over 60% of respondents agreed that over the next five years their Repair Café would have greater links with other Repair Cafés to form more effective Repair Networks. Furthermore, almost 40% strongly agree or agree that their Repair Café will increase the number of repairs undertaken by more than ten times. These expectations together suggest that Repair Cafés could soon play a far greater role in the Repair 'Eco-system'. In addition, over 60% of respondents expect their Repair Café to have greater involvement in wider sustainability issues over the next five years, perhaps then Repair Cafés might not only be connected to other parts of the Repair 'Eco-system', but also to other organisations focused on local environmental and social issues. The Citizens Committee for New York's Neighborhood 2.0 programme might provide some guidance on how to integrate Repair Cafés into a sharing community network. Under Neighborhood 2.0 people from all backgrounds and parts of New York City share their talents and creativity to improve the quality of life in local neighborhoods.

5.2 Hackerspaces

Hackerspaces have been described very simply 'as places for people to meet and work on their projects' (Hackerspaces 2014). They are a very diverse collection of 'community workshops'. One Hackerspace Survey respondent commented that '*every (Hacker) space has its own taste, so no two are exactly alike*'. One of the key features of most if not all Hackers at Hackerspaces is their support for 'open source' through the use and development of license free peer-produced software and hardware and the philosophy of openness and sharing of information.

Unlike Repair Cafés, Hackerspaces are very rarely established specifically to address issues related to sustainability. Of the 1035 active Hackerspaces around the world today (Hackerspace, 2014) there are only a small number of exceptions, such as *The Warehouse* in Colorado that describes itself as a green Launchpad Hackerspace (www.greenhackerspace.com).

Hackerspace members, although interested in *Hacking for Sustainability* (48% very interested or interested) are not motivated to be members of Hackerspaces because of this. Indeed only around 20% of respondents strongly agreed or agreed that *encouraging others to live more sustainably* was a reason for participation, while slightly more strongly disagreed or disagreed. The strongest motivations for participation are related to intrinsic drivers that included *meeting others who share my interests, to being intellectually stimulated* and *learning new skills*. There is however a clear motivation to *share knowledge and skills with others* which fits with the sharing philosophy of 'open source' and almost 60% of respondents are motivated to participate *to educate others outside of the Hackerspace, eg through teaching coding to children.*

The most frequent activities undertaken at respondent's Hackerspaces are *coding/software development, making electrical and electronic devices* and *repair of electrical and electronic products.* This last point is of note for its relevance to activities undertaken by Repair Cafés. Hackerspaces are generally equipped with the tools and spare parts scavenged from redundant equipment and Hackers with the technical knowledge and skills to repair. There are also links with Repair Cafés, with around one third of respondents stating that one or more of the Hackers at their Hackerspace are also volunteers at Repair Cafés. Furthermore, the authors are aware of instances where Hackers have used 3D printers to print replacement plastic parts for products that would otherwise be costly or difficult to procure. The example given by Reading Hackspace at the June 3rd workshop of using 3D printing to produce plastic parts to repair a child's cot, demonstrates how such technology can be used at Hackerspaces as a means of extending the lifetime of consumer durables.

Other activities undertaken always or often, like *upcycling projects*, *Home energy monitoring and control projects* and *renewable energy projects* are directly pertinent to sustainability and Circular Economy thinking.

Over 20% of respondents stated that *commercial projects* were undertaken always or often at their Hackerspace. This finding and the result that over a third of respondents participate at their Hackerspace *to develop skills to set up my own business* suggests that Hackerspaces support the

development of new business. It follows, particularly in light of some of the project activity undertaken that Hackerspaces could provide a space for eco-innovative entrepreneurs.

Hackerspace survey respondents expected that over the next five years there would be greater links with other Hackerspaces and Makerspaces, and that Hackerspace activities will lead to more new business start-ups. Furthermore, Forty percent of respondents expect that their Hackerspace will provide space and support for new business start-ups. More than half agree that there will be more projects at their Hackerspace related to sustainability over the next five years.

6. Implications for stakeholders

Policy makers

- Circular Economy is moving up the policy agenda, Repair Cafés (RC) are an interesting civil society response to a motivation to repair products amongst some individuals and groups
- As a result of new repair activities, there is a possible need to review the relevance of reuse definitions within the waste hierarchy and for local waste authorities to provide information to the public on local repair opportunities
- Increased resource efficiency might be actioned through policy changes that enable re-use through design (for dismantlability, etc) amongst energy using products in appropriate product categories through amendments to the Energy-related Product Directive (Eco-design Directive)

Civil society

- Repair or fixing happens amongst individuals (as evidenced by the existence of companies like IFixit and espares) and is now emerging in collaborative groups through Repair Cafés (RC)
- There is continued growth in the numbers of RCs
- As a result of the increase in repair or fixing activity amongst individuals and within RCs and HS there will be increased knowledge over the workings of products and the issues that drive products to end-of-life
- Potential civil society campaigns may emerge against built-in product obsolescence
- There are opportunities for better coordination and mapping of repair (fixer) organisations in local communities eg computers, cars, watches, shoes, clothing, apparel, etc to enable individuals to extend the life of products

SMEs

- Some Hackerspaces (HS) may increasingly act as incubators for new products or enterprise development
- 3D printing is being used in some HS to print replacement components to enable to product repair and therefore product life extension (this might be to solve personal product problems but might lead to business opportunities for others)

Large businesses

- Repair Cafés (RC) and Hackerspaces (HS) are emerging outside the traditional sphere of interest of large companies
- Potential learning collaborations might be established with RC and HS - however this might not be acceptable for some RC and HS
- A number of large companies have concerns over invalidation of warranties and potential safety issues resulting from an increase in individual and/or collective repair or fixing activity

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