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Citation: Harrison, Daniel, Banks, Richard, Regan, Tim and Grayson, Martin (2017) Presenting Physical Things Digitally: New Collecting Practices. In: Proceedings of the 3rd Biennial Research Through Design Conference, 22-24 March 2017, Edinburgh, UK. RTD, pp. 389-405.

Published by: RTD

URL: <https://doi.org/10.6084/m9.figshare.4747006> <<https://doi.org/10.6084/m9.figshare.4747006>>

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Presenting Physical Things Digitally: New Collecting Practices

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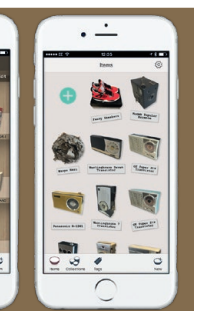
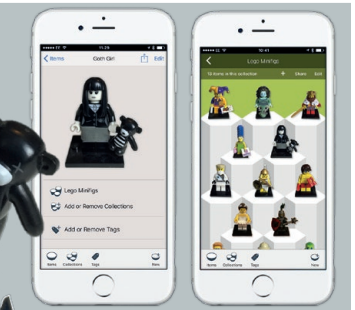
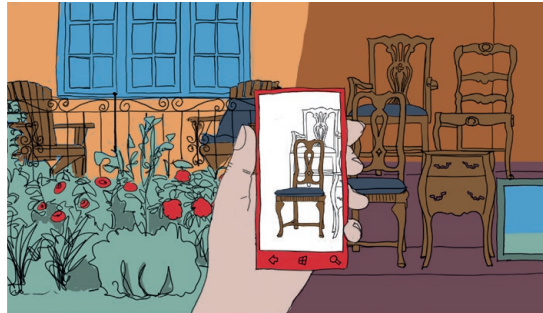
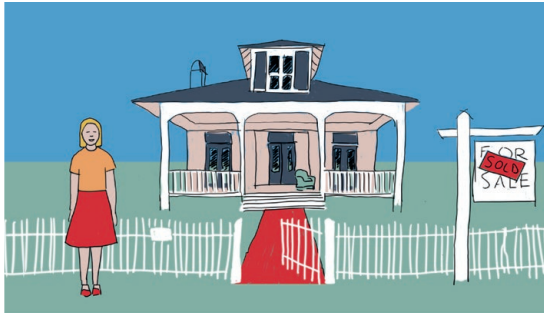
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Keywords: Collecting; Visual; Skeuomorphism; Materiality; App; Uncanny

Abstract: The motivations for collecting and the idiosyncrasies of physical and digital collections have been long studied. However, how they are presented in the digital space is an unresolved challenge. To help better understand this problem from a design perspective, we built Thinga.Me. Thinga.Me is a system which allows users to capture photographs of physical objects and then cut them out, place them into digital collections, and share them. By segmenting the object from the background the interface creates the illusion of a physical item, giving a sense of carrying your stuff with you in your pocket. Following two years

of development, iteration and feedback, we discuss uses of the app and the implications it can have for changing the way we reflect on physical things in our lives. In particular, we focus on how digital collection are presented and displayed in a realistic way as a way of providing more meaning and helping shape users' identities. Demonstrating the importance of visual design choices, our results lead to considerations on how to most appropriately display physical objects in the virtual world, whilst avoiding the uncanniness some might experience when interacting with skeuomorphic collections.





RTD2017

Harrison, Banks, Regan, Grayson | Thinga.Me Storyboards.





Context

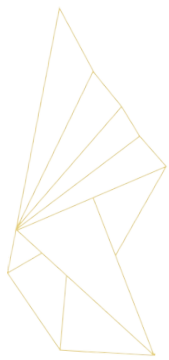
Collecting is an activity that most of us have engaged in at some point in our lives, usually in a physical manner, but sometimes also digitally. A long history of collecting-related literature exists, particularly in fields such as Material Culture, Consumer Research, and Anthropology. However, much debate of the exact definition of collecting remains. A commonly used definition is provided by Russell Belk (1995), an anthropologist specialised in collections, who defines collecting as, “*the process of actively, selectively, and passionately acquiring and possessing things removed from ordinary use and perceived as part of a set of non-identical objects or experiences*” (ibid, p.66). Beyond this definition, people often talk about their ‘collections’ of physical objects, such as photographs and keepsakes (Kirk and Sellen, 2010), which may not strictly be considered collections within the social sciences. Despite this, many people clearly accumulate, and perhaps even hoard, a wide variety of different physical objects such as these and desire tools and mechanisms to help better organise and ‘keep track’ of them, and even catalogue or inventory them.

More recently, a greater amount of attention has been paid towards collecting in a digital space, especially in the field of HCI. One such example was presented by Rebecca Watkins et al. (2015), who interviewed 20 collectors of a variety of digital objects, from eBooks to digital cars in videogames. In their paper they propose a taxonomy

for digital collections that distinguishes between pursued, evolving and emerging collections, but acknowledge that achieving a ‘meaningful’ digital collection can be problematic. Similar to hoarders of physical objects, when people talk about their digital ‘collections’ they are often referring to other types of archive or amassing of digital files and items, rather than collections *per se*. A further distinction highlights digital collections as curated, and digital stuff as accumulated. Without the space-constraints of collecting physical objects, digital collections have the potential to easily become considerably larger and more unmanageable than their physical contemporaries. Their digital nature also means they can be more easily archived or disposed of, potentially leading to hidden or forgotten collections. Furthermore, because digital collections are generally not showcased or presented in a meaningful way (cf. Watkins et al., 2015), they are perhaps easily forgettable. However, this is also true of many physical collections, which are often displayed in a quiet corner of one’s home, hidden away in boxes, or even archived in the cellars of a museum. Yet despite the fact that digital collections are not subject to the same constraints as physical ones, allowing them to be showcased in different and creative ways, little work has been dedicated to this area.

One form of digital collection that has received much attention in the literature over the past years, is that of lifelogging systems or personal informatics (Li et al., 2010). These can come in a variety of forms: from





those that promise to passively log data without any input, such as steps taken each day (Rooksby et al., 2014; Harrison et al., 2014); to those such as digital diaries (Elsden et al., 2016) and food journaling systems (Cordeiro et al., 2015) that require users to actively input data. Despite the very personal nature of these systems, some social functionality is usually present, and may be beneficial for engagement and support (Fleck and Harrison, 2015). Although enabled by some popular social platforms such as Pinterest (Hall and Zarro, 2012), logging and recording physical objects, such as possessions, collectables, or mementos, is an area of personal informatics which has thus far received little attention. Furthermore, systems like Pinterest are mostly used by sharing and appropriating existing posts, almost in an aspirational way, rather than producing original content (Gilbert et al., 2013) that is more personal and can better reflect one's identity. Nonetheless, these digital records or lifelogs produce some form of personal collection.

Odom, Zimmerman and Forlizzi (2011) argue that the way in which material possessions are usually organised in people's homes (e.g. books, pictures, trophies) has a significant role in constructing their identity. They found that this also applied to some forms of digital possession, especially for things like music files, phones, and background images. Their digital nature allows users to experiment their preferences in a playful way. Others have discussed how social networks like Pinterest, among other digital environments, can help co-construct personal

identity (Graham, 2015). Daniel Miller (2012) warns us of the potential consequences, whereby digital instruments such as social media, can lead to global homogenization where cultural diversity and specificity come to die, unless their adoption becomes a new form of cultural diversity. With individual and regional appropriations, people's identities can be preserved and showcase even in the digital context, especially when presenting personal items like collections.

Beyond the separate worlds of physical and digital collecting, which are made up of physical or digital items respectively, examples of what, in this paper, we characterise as 'physical-digital' collecting also exist, i.e. digital collections made up of physical items. These types of collection are the primary focus of our paper, and are made up of virtual representations of physical objects, and may be used for: archival, organisation, sharing, or purely for collecting. Physical-digital collecting distinguishes itself from purely physical collect by allowing objects to be collected countless times, without the need for physical copying or purchase, and by allowing collections of 'physical' objects to easily be shared and stored digitally. The broadly unexplored nature of this practice creates many social and practical questions, such as the types of physical-digital collection people wish to create, how people will treat ownership of these collections and the items therein, how these collections should be interacted with and displayed, amongst others.





Few examples of physical-digital collecting exist. One notable case in the academic world is O'Hara et al.'s (2007) system that allowed children to 'collect' content during a zoo visit, using 2D barcodes scanned by a mobile phone app, though this system did not allow for the capture of original images. Examples can also be witnessed in consumer applications such as Delicious Library (www.delicious-monster.com), which allows users to create a library, or inventory, of physical objects by either manually entering their attributes or scanning their barcodes. Similarly, collaborative platforms (e.g. www.catawiki.com) allow users to create digital catalogues of items such as comic books or stamps and may also be considered digital collections of sorts, but allow little in the way of a personal collection – relying upon stock or crowdsourced imagery.

Outside of the personal collections space, one can also witness the increasing digitisation of scientifically and historically important physical items, such as the vast collections held in the archives of the Natural History and Science museums. These digital catalogues offer various benefits, such as: allowing people to research and view items without needing to visit a particular place; easily share items or collections, thus raising awareness; and, preserving delicate or valuable objects whilst still allowing access to them, amongst others. The Google Art Project (www.google.com/culturalinstitute) is another example, initially released in 2011, it has already attracted over 1,000 partners, each sharing all or part of their curated historical artefacts or works of art (Sood, 2016). 'Digital

museums', such as these, are receiving record-high levels of engagement, despite their relative recency and often simple presentation compared to physical exhibitions, which have long been the focus of considerable efforts to improve experience and engagement (cf. Simon, 2010).

How to display objects: a physical-digital tension

In this paper we primarily focus on one important aspect of interest to the RTD community and that has yet received little attention: the capture and display of physical items in a digital collections space. Considering appropriate ways of presenting digital collections of physical items adds an additional challenge for those producing interactive systems in this space and more work is needed to explore this design problem. Because little work has been done in this area, we will build our argument drawing from examples of digital displays for physical objects, as well as physical representations of digital collections.

Prior work has focused on visualisation of personal informatics data (e.g. Lee et al., 2015) and the display of items in virtual museums (e.g. The Museum of Me: www.intel.com/museumofme/l/index.htm). For example, Khot et al. (2014) created physical representations of digital data, using 3D-printed abstract and edible shapes, which became a tangible collection of users' physical activity and a medium for self-expression. However, having abstract shapes may not create a meaningful experience for everyone, especially if the design is not determined by the





end-user. Some people may prefer to have more realistic display of their personal collections.

In computing, the term skeuomorphism refers to the properties of a digital object that mimics those of its physical counterpart (<https://en.oxforddictionaries.com/definition/skeuomorph>). Delicious Library (www.delicious-monster.com) and Apple's iBooks (www.apple.com/ibooks/) are two examples of this design trend which is also found in other commercial applications. The two examples both display 2D images of objects (e.g. books and photos) in a realistic 3D environment: a wooden shelf. Delicious Library displays physical objects, and iBooks displays digital object, but both ways of displaying the collections are pre-defined by the developers and designers. The use of skeuomorphism in digital interfaces has often been criticised for drawing too strongly from real-world metaphors. However, if delivered appropriately, it can increase engagement, in our case, with the collection.

Given these premises, and taking a research through design approach, we designed and built a system, Thinga.Me, that offers new interfaces, features and visual content to help us better understand what characterises physical-digital collections and explore different ways in which physical objects could be represented in a virtual space. Stemming from user suggestions in initial workshops Thinga.Me allows users to digitally collect physical objects from the real world - "removing them

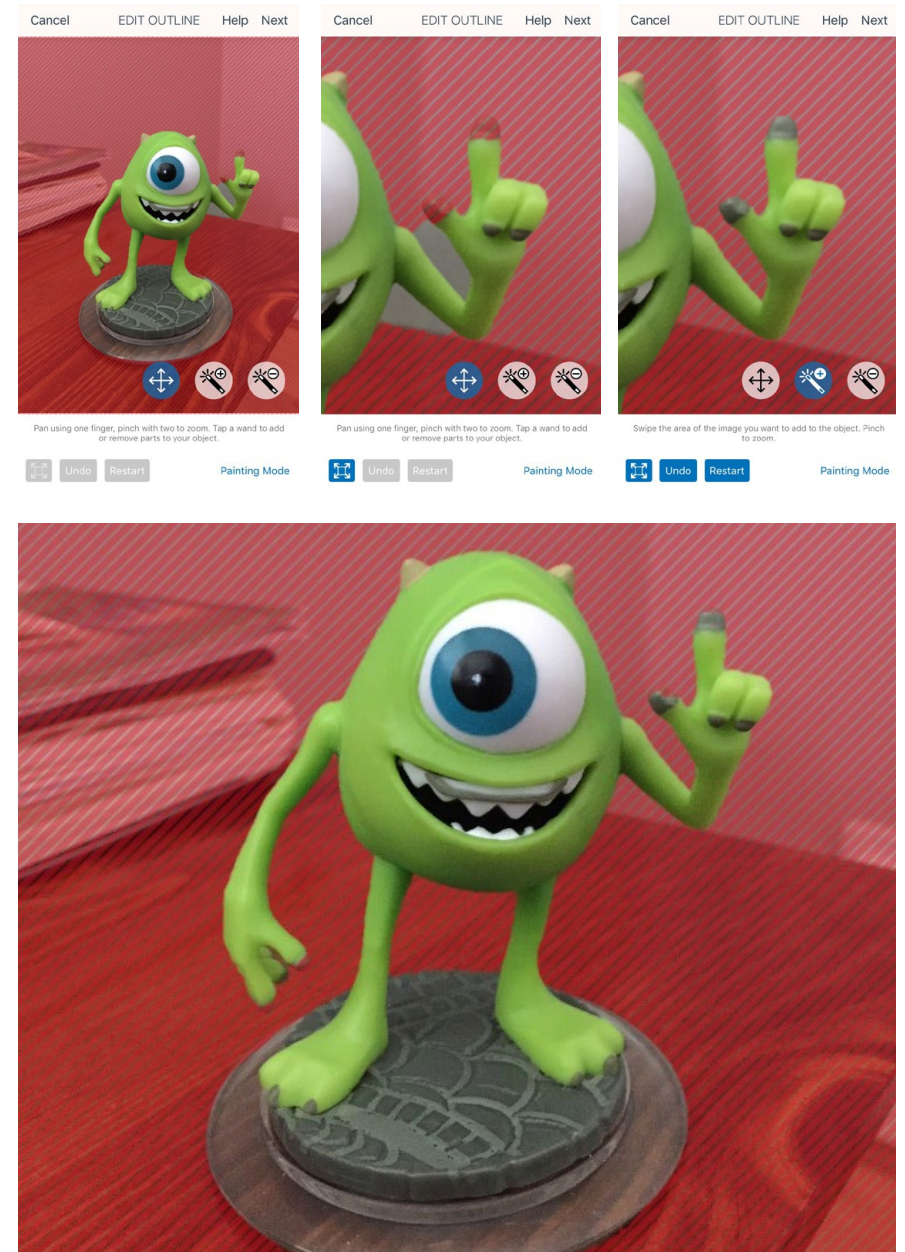


Figure 1. Example of an item being segmented from the background. Photo: the authors.



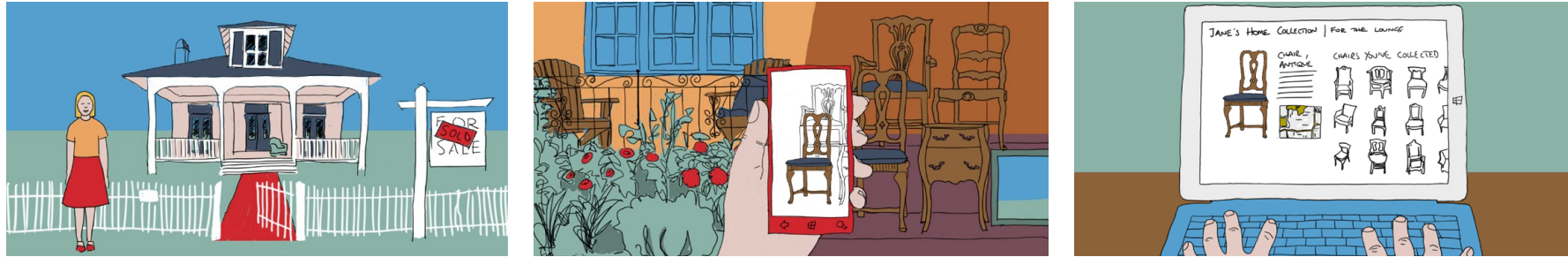
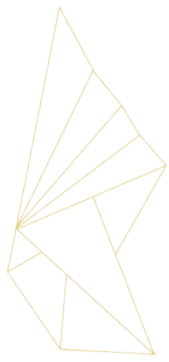


Figure 2. Storyboard from original computer vision workshop. Photo: the authors.

from the ordinary" (Belk, 1996, p.66). This is achieved by users quickly and easily segmenting the object from the background of the photograph (as shown in Figure 1), thus creating the illusion of a 'real' object. They then add these objects to digital collections stylised in a variety of different ways, that allow for a more personal and meaningful expression of one's collection and, ultimately, identity.

Design Process

Thinga.Me was developed from a scenario presented in a September 2014 workshop that imagined the future role of computer vision in our everyday lives (Figure 2). Users in this workshop liked the idea of having a system that would allow them to quickly and easily digitally capture real-world objects with their smartphone, for later use. Developing an app allowed us to further develop this idea, by getting feedback from real-world use. The first version of the app allowed users to: quickly capture and cut out objects; add them to collections; tag them; and share collections through a simple web interface. This early version included a simple method of cutting out objects from photographs which partially relied upon users manually tracing objects with a finger, and offered a

small range of 2D backgrounds on top of which users could present their items (Figure 3).

The concept and app were developed for over one year, before a trial with 24 users took part in Autumn 2015. These participants were given access to the app for at least 2 weeks each, during which they collected over 450 individual items, ranging from vinyl records to wild flowers. From the analysis of this real-world usage data, we recognised that participants were using the app in two ways: either cataloguing physical collectables (such as Amiibo figurines or vinyl records); or for more functional uses (such as creating shopping or holiday packing lists). After the two-weeks, we asked participants about their experiences with the app.

Generally, participants did not consider the visual quality of their collected objects to be good enough: *"what really bothers me about this image is the weird border around it – that blurriness. Whereas if you were to do it in real life it would be nice and crisp"*; *"the quality of images put me off, like, why would I want to capture this when it looks really off?"*. Crucially, this feedback was not received only from those who were collecting loved or special objects, but also from those who were



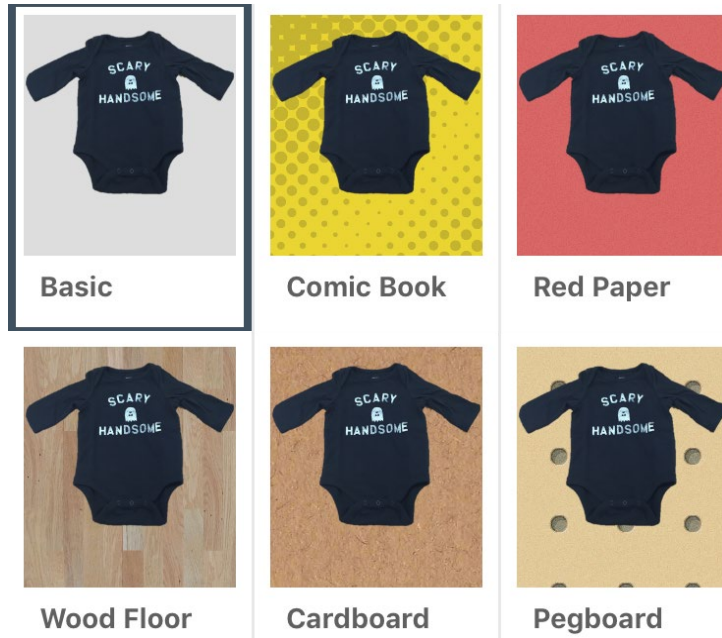
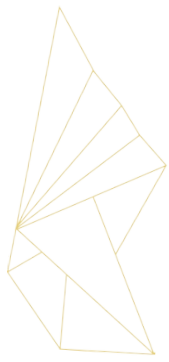


Figure 3. Original '2D' background themes. Photo: the authors.

capturing items for pragmatic collections, where the segmented images were still easily recognisable and the importance of high visual quality might not be so immediately obvious.

Though the app offered various options for displaying items in collections (see Figure 3), our participants desired greater flexibility. Participants often asked for different backgrounds and layouts: *“you have to add more ability to layout collections as you want them [...] I want it exactly right, because that is what knolling is all about. Beautiful right-angles if you like”*, and, *“that’s the main thing – we need more control over what the collection looks like. And I’d like more backgrounds as well”*. As some participants recognised, the app was designed with the idea of ‘knolling’ in mind, defined in Wikipedia as “the process of arranging related objects

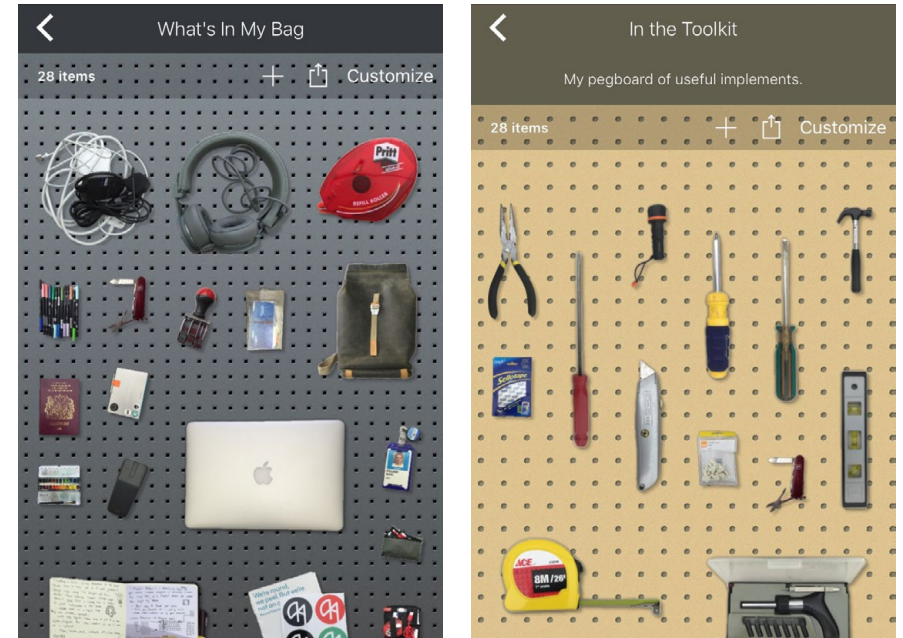


Figure 4. “What’s in my bag?” and “In the toolkit” knolling attempts. Photo: the authors.

in parallel or 90-degree angles as a method of organisation”. These participants purposely tried to recreate ‘knolled’ collections (e.g. Figure 4), photographing items with a flat, top-down, perspective and placing them at 90° angles on the background canvas. However, the majority of participants instead appropriated the backgrounds in their own way, adding items shot at different angles and with different perspectives.

Conversely, some participants actively photographed their items in such a way that they retained some of their physicality – shooting objects with some perspective, to keep their 3D properties rather than being a 2D scan. One participant, who added his vinyl record collection into Thinga.Me (Figure 5), explained: *“I think having a view where it makes it trapeze-looking is quite nice. I quite like the semi-3D effect you get*



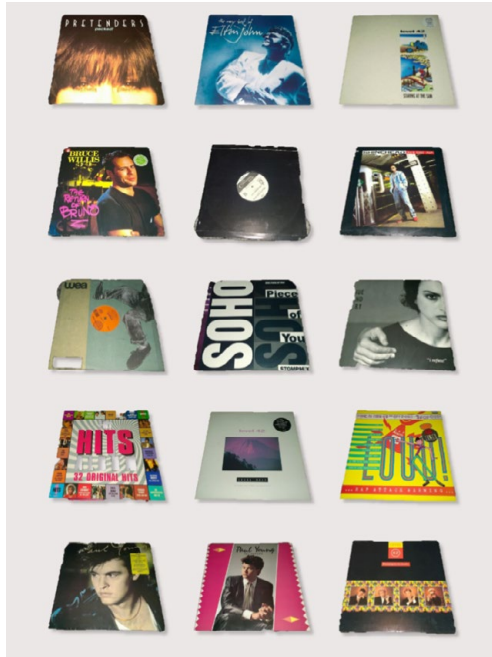


Figure 5. Vinyl Record collection, deliberately shot with perspective so the items would retain some physicality. Photo: the authors.

from that, it kind of makes it more realistic opposed to some downloaded cover art. It seems a bit more real”.

This quote illustrates this participant’s longing for his physical-digital collection to be more representative of his physical belongings, rather than a simple library. Other participants claimed they would only be

comfortable if the overall aesthetic of the collection was near-real, with one participant desiring an on-screen guide to keep consistent results when photographing items with a 3D perspective: *“it would be interesting having a translucent cube or something on the screen so that you can align that to your object, so that you know that all of the objects that you have taken are at the same angle”*. These results provided us with further insight into people’s desires for presenting collections, and allowed us to further refine our designs in later iterations of the app.

App Release

The app was further iterated to incorporate the feedback and the lessons we learned from testing Thinga.Me with users during the design process. This improved version of the app included better usability, but more importantly it focused on the visual elements of the app to increase the sense of ‘realness’. The following features were added or ameliorated:

Higher resolution. The image resolution of items in collections was increased from a maximum of 640 x 640, to 1900 x 1900, taking advantage of the capability of high resolution screens in our mobile devices. This change improved the general visual quality of items and collections, resulting in considerably more detail in individual items, with decreased pixilation and blurriness.

Segmentation. The experience of cutting objects from the background was changed significantly, resulting in a quicker segmentation process, as well as sharper and cleaner edges. This made the items in collections look more realistic against backgrounds.

Backgrounds. We added further display options, including themes that take advantage of the 3D perspective some participants were already using to photograph their items. In total we now offered 9 themes in two formats: we designed 7 to be used with items photographed with a 2D perspective (pegboard, wood floor, cardboard, etc.), and 2 to be used



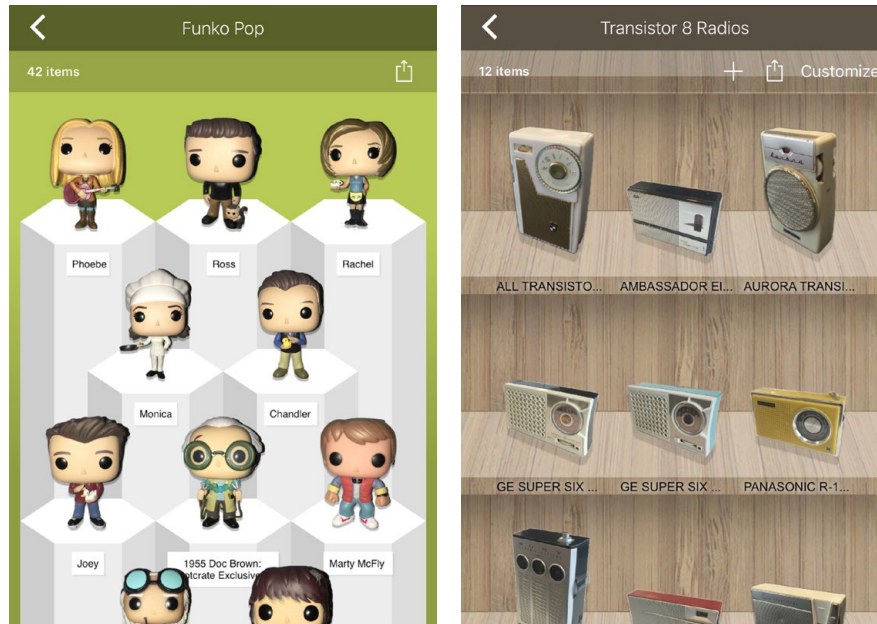


Figure 6. Additional 3D background themes. Photo: the authors.

with items photographed in a 3D perspective (shelves, columns) (Figure 6). These 3D designs were made to increase the realism of the overall collections for those users who wanted a 3D perspective of their items.

Layouts. As well as additional background options, we added four different object layouts options (knolling, tidy rows, grid and basic), as suggested by literature and feedback from participants (Figure 7). These different layouts give participants more flexibility when creating their

digital collections, and potentially allow them to recreate a layout which they may have made in the real-world.

A restricted public beta release of this new improved app was released to the public in July 2016. Potential users had to request access by stating their intention of use. By October 2016, there were over 500 active users who had collectively added over 5,000 items in 650 collections.

Real-World Use

More than 6,000 potential users applied to test the app, answering the question “*How Will You Use Thinga.Me?*”. Applicants provided responses ranging from short (“*Inventory my workshop*”), to more detailed (“*I want to use thinga.me to create collections of things that are important to me such as my ‘toys’ like figurines, my children’s artworks and hi-fi equipment*”). On analysis, we noted a discrepancy between intended and actual use - real use often focused less on the pragmatic, and more on visual cataloguing uses, in particular for digitising existing collectables.

Although the majority of collections in Thinga.Me were made up of manufactured collectables, we did see a wide range of uses. Some participants created collections with the purpose of later disposing of the item once it had been captured and segmented (e.g. with children’s artwork). We also saw participants take up a new and previously unintended collecting practice, whereby they would create physical-



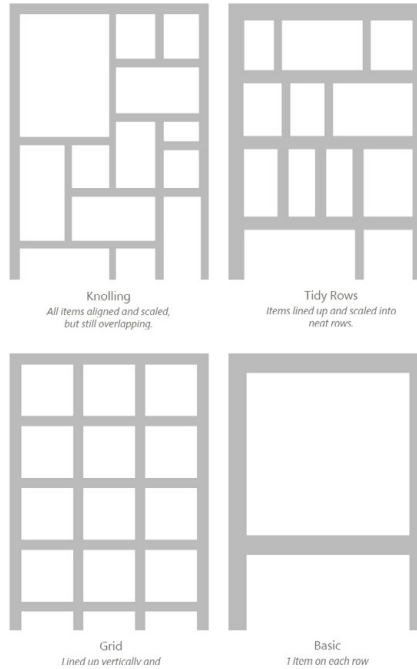


Figure 7. The different options for participants to layout their collections. These are available independent of theme, with all 2D collections. Photo: the authors.

digital collections either of things they witnessed in the real world (e.g. flowers), or of memories from a particular occasion. This practice is quite unlike traditional collecting in either the sole physical or digital sense, and is instead more akin to lifelogging or personal informatics. Examples of these collections included one participant who logged their “breakfast bananas”

each day, and another who created a collection of items seen at an agriculture fair (Figure 8). These examples are not simply catalogues of real-world collections, but instead physical-digital collections curated, organised and displayed in a digital space, representing a new form of collection.

Item and Collection Aesthetics

Throughout the development process we received positive feedback on the concept of the app, with particular regard to cutting out objects. This feature was particularly appreciated by those using the released app, many of whom saw the segmented items in their phone as objects: *“these things, they’re objects, they’re not photos of the objects, they’re the flipping objects! I don’t just have a folder of photos, this is specifically*

Figure 8. A participant’s collection of items from an agriculture fair. The collection uses the 3D pedestal theme, though one might consider this inappropriate as it ‘breaks’ the illusion. Photo: the authors.

the objects [...] they’re just objects now, they look like objects... I’ve got objects in my phone!”

The released app allowed users to not only capture items, but also display them in a 3D manner, enhancing the sense of ‘realness’. We anticipated that participants would use the 2D and 3D backgrounds differently, as we felt they better lent themselves to particular items, photographed with a particular perspective. For example, the pegboard or wood floor styles were thought to best suit items shot straight-on, with a 2D perspective. Whereas the shelf and column themes have a 3D effect, and are therefore better suited for items that have been shot with some perspective, so that the resulting collection looks more like a real-life scene (see comparison in Figure 9).

The 3D themes proved to be popular amongst participants, being used in over one third (37%) of all collections, followed by the coloured 2D themes which were used in 23% of collections. Almost half (40%) of collections were using the default option with a plain-white background. Of all the individual themes, the shelf was the most popular, it alone being used in 26% of collections.



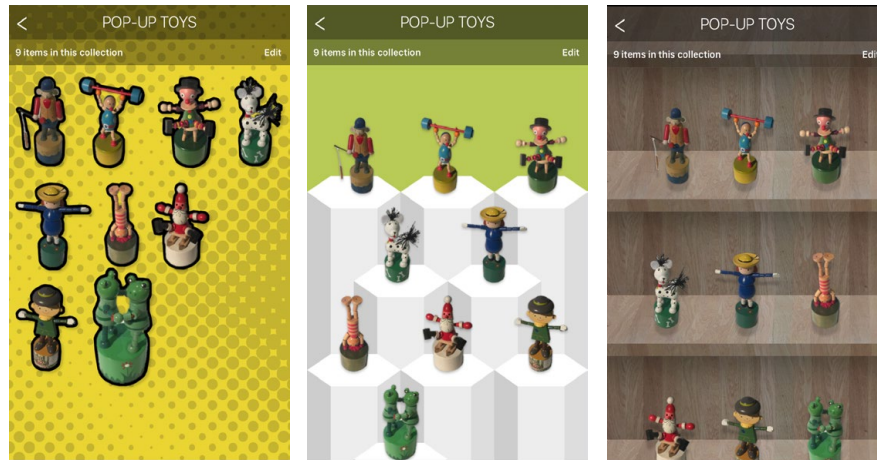


Figure 9. The same collection is displayed on a 2D background (left), the 3D columns (centre), and the 3D shelves (right). Photo: the authors. Given the 3D perspective of the pop-up toy pictures, the 3D backgrounds help give a more realistic feel. Comparing the two, however, the shelves give this particular collection a more real-life representation.

The majority of participants chose the collection theme they felt best presented their items. However, this meant different things to different people – some participants felt that the plain background was the most appropriate, as there was maximum contrast and nothing else to distract the eye: *“I tried different themes and I thought the one I used brought my collection best to the foreground [...] I thought that a white background, no background at all, was the best”*. Others felt quite differently, instead firmly believing that the background should somehow *“support”* the item: *“the shelves are nice. I think because they’re all uniform, they’re*

all plain, so they look nice like that [...] I think it would look more realistic if you had a bit of the support there [...] otherwise it’ll look like it’s floating!”. Ultimately, the majority of participants felt that offering some choice was for the best: *“I think it depends on what kind of collection you have, and what kind of items you want to show, and how to show them”*.

Whilst to the designers of the app, and with a critical eye, it might be obvious which photographic approach is best suited for each theme, our users did not always follow these expected trends. For example, the participant who collected items from the agricultural fair (see Figure 8) photographed these with a 2D perspective, but then used the 3D columns theme, thus breaking any ‘real-life’ illusion that might have been created, as the items on the plates would have fallen on the floor. The reason for this inappropriate-seeming choice is unclear: the collector may have simply not cared about breaking the illusion; they may have not noticed the problem; or, they may have simply focused on the individual items rather than the collection as a whole, akin to Belk’s (1995) definition of “bad” collectors.

Skeuomorphism and 3D themes

Whilst some participants immediately appreciated the 3D themes and saw potential in a new way of collecting others were less positive, some questioned their appropriateness in a digital world, and others found them uncanny due to an effect of ‘floating’ objects and improper





shadows. The subject of skeuomorphism was often brought up by participants, who would compare the shelves theme to Apple's iBooks app, *"It looks like iBooks really, doesn't it?"*. These participants almost universally disliked existing skeuomorphism interfaces where they related to purely digital items, such as eBooks: *"I hate the whole thing that the iPhone does with skeuomorphism, I really don't like it"*. However, some of these participants had an entirely different opinion when instead considering digital-physical items: *"the whole thing with skeuomorphism is that it makes me feel more connected to the real world on a digital device – I don't need that. I'm quite happy knowing that my device is digital. But what you've done is actually use it in a clever way to bring things back the other way – you've brought things back into the real world again, because they are real world objects. This really is my jacket. Whereas an eBook isn't really a book. So I'm quite happy with that being a list, I don't need that to look like a book because it's not a book"*. This seems to suggest that there is indeed some difference in how these participants relate to physical-digital and digital items in collections.

Other participants liked the idea of 3D themes, but were uncomfortable with our implementation, which, despite the improvements made since the first version of the app, they felt lacked some realism: *"I would like shelves in certain contexts where I have mugs or I have some books, the thing is, the shelves just aren't real enough for some reason and that really bothers me"*; *"You don't really have any depth apart from*

the shadows, and this is like a fake depth really"; and, *"that bugs me – the fact that they're not sitting properly on their shelves. And also this perspective breaking thing, where it's the same view of the shelf as you're going down. It's something that I just can't get into"*. Interestingly, the negative feedback we received from these participants was related to our implementation of these themes, rather than idea of collecting these digital representations in a 3D theme. Their issues were perhaps caused by the collections' uncanny resemblance to their real-world counterparts. With further work, the issues they mention could be addressed, making the digital collections look more real, perhaps suggesting something similar to an uncanny valley (cf. Mori et al., 2012) in relation to digital representation of physical items, similar to what has been observed in other areas (cf. Kontaris et al., 2012).

The inconsistent scale of the items was a problem in some participants' eyes, particularly when using the skeuomorphic themes, *"putting that on a shelf is a bit harder [...] it inherently gives things scale"*. However, some participants were accepting of the inconsistencies, *"my mind's not processing that those are the wrong size, I'm quite comfortable with that. I'm seeing objects on a shelf, and even though they're the wrong size, they look ok, in my mind they just look normal"*.

Despite many participants having criticisms of the 3D themes, some were universally positive about them, believing they added something beyond the 2D versions. This perhaps highlights differences in visual perception





and standards between us all. *“I’m surprised at how well it works. I think you’ve taken it to the next level with this. Cutting things out is boring. But when you arrange it in a collection, even a 2D collection, that’s when it gets fun [...] because you could imagine how it would actually look if it was on your desk. I think you’ve actually taken it to the next level now, where you’ve really made it look like it’s on a desk [...] **you’ve taken something from the real world, you’ve moved it into the digital world and then you’ve improved it”.***

Conclusions

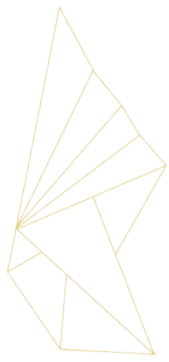
In this paper we have described the development and in the wild evaluation of Thinga.Me, an app designed to explore our relationship with collecting in a digital world. Throughout our research we witnessed the importance of appropriate visual presentation of physical-digital items, ranging from the quality and resolution of objects and the accuracy of their segmentation, to issues surrounding their appearance when presented in 3D themes.

We find that the ways in which physical-digital collections are displayed have strong implications for creating personal meaning of the collection and users’ identities. In contrast to Watkins et al. (2015), who suggested that digital stuff is accumulated, our app allows users to curate their

digital collections, just as they would with physical ones. Thinga.Me can thus become a digital instrument for individuals to curate the world around them, whilst also being appropriated to showcase cultural differences, each with its own idiosyncrasies, just as other social networks allow (Miller, 2012). This is especially true in the context of identity. Graham (2015) has discussed how social networks like Pinterest are used to curate online personas and shape digital identities. However, one of the main characteristics of Pinterest is the ability of users to pin any image found on the Internet or present on other users’ boards, effectively allowing them to create and manage an online persona, without any space for discussion of relationships. Our app, instead, forces users to upload their own images, adding an additional personal layer to the digital identity the app is curating. While users are still able to curate and personalise their digital collections, the idiosyncratic nature of the collection can allow for more in-depth discussion of relationships and identity when the collections are shared on social networks.

Physical-digital collections have many variations, which Thinga.me has only started to uncover. We found that the app encouraged some participants to undertake a different type of collecting practice, creating digital collections of physical things in the real world. This was not an anticipated use of the app, but instead arose from participants having access to the tools embedded within the app and looking to find *personal* uses for it.





Our main findings surround the visual representation of physical-digital items. From this work, we have not only learnt a lot about how digital collections could be displayed, but we can point towards interesting areas for future research, particularly with the advent of new augmented and virtual reality systems which may offer similar functionalities by bridging the gap between physical and digital. Some of our participants felt uncomfortable with the way in which Thinga.Me presented digital 3D facsimiles of physical objects, thinking they seemed strangely unreal, echoing general criticism against skeuomorphism. Others, though, had no problem with the representations of their items. Some users seem happy to accept poor-quality representations of their items as accurate copies, whereas others have considerably higher aesthetic standards and want something that looks perfectly formed in order to accept the illusion of the digital item standing in for the physical. This may perhaps be related to the content and use of the collections. People might have higher standards if it is to be shared, and perhaps lower ones when considering a collection of loved possessions.

Physical and digital worlds can be blended in many ways. In this paper we have presented one approach, bringing them together in the form of physical-digital collections. In particular, this paper offers insights on how these collection should be displayed and organised, as well as opening the floor for future research in this direction. One possible direction is given by burgeoning tech such as virtual and augmented reality, which

blur the lines between physical and digital items. We believe that the findings and implications presented in this paper, which are by no means exhaustive, also apply in these cases. As we demonstrate, there is still more to be explored around the relationship between reality and its digital representation in the light of content with which users are very familiar.

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