TROVE: A DIGITALLY ENHANCED MEMORY BOX FOR LOOKED AFTER AND ADOPTED CHILDREN

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ABSTRACT

For looked after and adopted children, physical objects are often the only remaining link to their past; a portal to stories of birth families, former homes, and significant people. Yet, often these stories can be littered with traumatic events preventing them from moving forward with their lives. Through reminiscence of these stories and attempting to develop narratives of past events, known as 'life story work', we can help children to emotionally process their past. This paper introduces, trove, a digital and physical memory box for storing and curating stories about precious objects. trove creates a safe space for keeping these objects in transient environments and constructing life story narratives.

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KEYWORDS

Children; Life Story Work; Tangible User Interfaces; Social Care

Life Story Books: a great idea poorly executed

Curating life story books is a common approach to Life Story Work, providing a written and photographic account of a child's history and relationships, as a platform for future reflection. The UK DfE (2014) mandates that every child with a plan for adoption must receive a life story book within ten days of the adoption order. But, it does not specify book content or the links between life story books and work. Positive outcomes are tenuous [22, 28].

Research on children's opinions of life story books found they often lacked a narrative or contained a narrative with which the child disagreed [29]. This led to dissonance between the child's current identity and the identity presented in the book. Instead, children believed that including multiple perspectives would be beneficial [29]. It is important that life story work produces a balance between children's agency over narratives and factual narratives presented by adults which challenge any false assumptions [11].

Memory Boxes: useful but under utilized

Memory boxes have been used for preserving precious objects since the origins of society, dating back to the 1500s [1]. For vulnerable children, however, memory box curation enables reflection and demystification of the past, supporting the construction of life story narratives [1]. They represent the deliberate creation of *"a safe space"* to contain the telling of life stories and to keep important artefacts [1, 26]. Unlike life storybooks, however, creating memory boxes are not routinely undertaken by social workers [31]. Moreover, as the self and memory are always changing, being able to record and reflect upon story origins and evolutions is essential to ensure crucial details are not forgotten or distorted by the competing narratives of others [1, 26]. Second-hand versions of events can be so compelling and traumatic that children can begin to accept these perspectives as part of their own remembered past [1, 26].

We describe the initial trove design and conceptual evaluations with 15 looked after and 6 adopted children. Early findings indicate trove's promise in supporting life story work but stipulate future design work on contextually nuanced requirements, privacy prioritisation, and content control.

INTRODUCTION

Supporting the Growing Numbers of Looked After and Adopted Children

Since 2015 the number of looked after children in England has risen more than 4% to 72690 as the number children adopted from care has fallen more than 18% to 4350, placing growing demands on local authorities and care providers [10]. The NSPCC defines 'looked after children' as individuals under 18 years of age who have been in continuous local authority care for more than 24 hours, and who may be living with foster parents or in a residential children's home or school [17]. The circumstances precipitating children entering care vary but are often traumatic [11, 17] but only through reflection and forming a coherent narrative of past events, can children emotionally process trauma and move forward with their lives [29, 32]. Failure to do so can leave children trapped in a state of hyper-vigilance detrimental to their growth and development [20, 29]. With the 2.8 million children in social or alternative care globally [25], their empowerment within the HCI community should be a priority, yet they remain underrepresented [2, 3].

The Importance of Creating Identity Narratives and the Challenges

A child is no longer classed as 'looked after' upon turning 18 years old, returning home, or being adopted [10, 17]. Yet, both looked after and adopted children may struggle to accurately remember their former lives and instead rely on adoptive parents or care providers to record details of their past, plugging gaps in their memory [6]. To establish our sense of self, we must develop a narrative identity: consisting of our internal, evolving 'life story' [16]. For looked after and adopted children, building life story knowledge is *"grounding"* and enables them *"to live more comfortably in the present and to plan for the future"* [19 pp.14]. Using life stories as part of identity formation is effective because people use narratives to present themselves as someone who remains the same but is simultaneously always changing [4]. Hence, identity is both fixed and evolving and we must reconcile these conflicting positions to establish a sense of self [29]. For these children who have experienced change and few enduring attachments, relationships or homes, this can be challenging [30]. Coupled with the greater likelihood of experiencing loss, separation, and abuse [11], these children can often possess complex life stories which are confusing [19].

Life Story Work and the Relationship with Meaningful Objects

Assuaging confusion and contributing to narrative identity is the goal of 'life story work' [19] – activities which support the understanding of past realities, develop self-esteem and foster feelings of security [19]. Undertaking life story work, often by creating 'life story books' (Sidebar) is a key responsibility for social workers, yet they often lack the necessary opportunities, strategies, time and training to properly carry it out [31]. Thus, life story books and life story work in general can be inconsistent in quality – one reason behind the limited successful outcomes for practical life story work [22]. One criticism of life story books is their exclusion of physical objects, given their established relationship with memory and identity [21] – helping to shape who we are and

Memory, Storytelling & HCI

Although supporting life story work with looked after and adopted children is undocumented within HCI, using technology to facilitate storytelling and reminiscence is not. A key inspiration for our research was a Hewlett Packard digital memory box built to illustrate the ability of recording and attaching audio stories to memorabilia by using RFID object tags with an integrated box scanner and loudspeaker [8]. Unfortunately, however, the box built was never tailored to any specific user group or problem space, nor researched beyond the creation of the initial prototype. Also notable was the Living Memory Box [23], designed to act as an archival and narration device that families could gather around to tell stories about their physical objects. It comprised a central storage/display screen, a physical box. and a recording device. Users placed an object inside the box to record a story, before the system took a picture of the object to store on the searchable screen-based archive.

Projects have explored the curation of digital content for reminiscence to help parents cherish memories of their children [14], as a therapeutic tool for individuals with degenerative brain diseases [15] and to develop shared family memory narratives [13]. KidKeeper [13] is particularly relevant and involved the development of a cuddly toy frog with integrated digital functionality for encouraging and capturing child-led audio content - later delivered to parents as memory artefacts for curation. KidKeeper's design decision to capture purely audio mementos was based in prior research which found that audio provoked deeper reminiscence and emotional responses compared to other sensory experiences [26].

revealing clues regarding our cultural origins [7]. For looked after and adopted children, objects may be one of the few consistent things in lives commonly full of transience [27]. They present a tangible, and sometimes the only, link to the past – connecting them with birth families and other aspects of their former selves [6, 27, 30]. They can be used transitionally to assist with the challenges of change [32]. The loss of such objects may enact feelings of ongoing loss and instability beyond the loss of family, foster carers and other people in their lives [24]. Ultimately, these special objects may offer young people "*a continuous thread, linking the past to the present and the future"* [27 pp. 2517]. Hence, it is crucial that such objects are preserved by children, their carers and professionals even in the tumultuous and ephemeral environments synonymous with transitioning to, from, and around social care systems [27].

TROVE PROOF OF CONCEPT SYSTEM OVERVIEW

trove emerged from the research of [blank for review], recognizing the relationships between objects, stories and identity in children's life story work [28, 30], and Studio [blank] with their object-oriented digital memory boxes for older adults. Together, they proposed supporting identity building with looked after and adopted children through interactions with meaningful objects and recorded narrative. They applied the concept of memory boxes for the unique challenges of these children by developing trove based on 5 design objectives (DO) inspired by specific literature described in this paper – see the design objectives and literature inspiration in Sidebar Page 4.

trove (Sidebar Page 4) is designed as a physical space to keep objects and memories safe over time. It resembles a multi-sided gem shaped object containing storage space and a technology insert facilitating audio story recording and playback (DO1). Links to recorded stories can be written to RFID tags attached to objects, and later replayed by scanning the tag (DO2). Meanwhile, the physical box provides a personal space for keeping objects while remaining small and light enough to be carriable (DO3, DO4). trove's exterior is intended to appear gender neutral and not age-specific, while its futuristic gem-like shape seeks to reinforce its own value as a meaningful object rather than simply a storage container (DO5).

trove's inbuilt commentary is extensive and assumes a female, humanistic voice, designed to be warm and nurturing [29]. Upon start-up, trove begins a dialog by welcoming the user, *"Hi I'm Trove I'm here to look after your favourite objects and stories, press and hold the red button down to start recording."* After each button press the audio commentary prompts the user on the next stage of the object tagging process, as well as playback. The voice frequently encourages and thanks the user for sharing their stories. There is an archive of everything recorded by trove from which nothing can be deleted, to protect against accidental or malicious story loss. However, stories can be added and removed from object RFID tags. To record a story, the user puts on trove's headphones, presses the red 'record' button and speaks into the headphone microphone. To write a story to an object's RFID tag, the user presses the blue button and is instructed to place the object's RFID tag on the red cross. The yellow button affords story playback by placing an object tag on the cross. Each RFID tag can be associated with multiple stories about that object and the user navigates between the different stories using two small backward and forward buttons. trove also contains a secret compartment with space for small items, a headphone jack and a USB stick

trove Design Objectives (DO) [Contributing Literature Inspiration]:

(DO1) Facilitate the creation of narratives focusing on the connection between meaningful objects and their stories [8, 9, 12, 21, 28]

(DO2) Encourage memory retrieval and reflection [8, 12, 29, 32]

(DO3) Provide a safe physical space to prevent meaningful objects being lost or forgotten [19, 24]
(DO4) Be easily portable during times of abrupt upheaval [27, 30]

(DO5) Remain relevant and usable throughout a child's entire life [8]

insert for story back-up. trove uses a mixture of pre-existing hardware: RFID reader and tags, a Raspberry Pi, a custom sub-board arcade buttons and headphones. All software is written in Java.

TROVE PRELIMINARY EVALUATIONS: RESULTS AND DISCUSSION

Although the rationale for trove was well founded within the literature and prior research of the team [28, 30], exploration of the concept with end-users was essential to understand the extent it addressed its design objectives. In this section we describe and discuss a summary of aggregated findings from two early trove evaluations. The first was undertaken with a group of Adopted Children and their Adoptive Parents (ACAP). The second, with a 'Looked After Young People Participation Group' (LAYPPG). These sessions sought to evaluate trove according to the following research questions: (1) how appropriate was trove within looked after and adopted contexts? (2) to what extent could trove contribute to life story work? (Study design details in Sidebar Page 5).

1. trove Appropriateness for Looked After and Adopted Children

It became clear that looked after and adopted contexts presented individually nuanced requirements for trove. With respect to creating a safe physical space for meaningful objects (DO3), there were different attitudes towards storage - all adopted children described visible locations for storing trove (on a *"bookshelf"* but never under the bed) while the looked after group described different discrete or hidden locations (under the *"bed"* or *"sink"*). For those in looked after contexts then, the portability (DO4) was deemed a valuable attribute but such discretion juxtaposed with trove's gemstone aesthetic, suggesting shortcomings for the device's enduring relevance and usability in all living environments (DO5): *"you wouldn't want this in a public space, you would want to be able to slide this away like under your bed where it would be nice and secure"* (LAYPPG Young Person). All participants agreed, however, that the facilitation and storage of stories was not enough, recorded content must also be secure. Security mechanisms were posited from both groups, including remotely programmable passcodes or a scannable key. One looked after individual highlighted that a user may forget the password or lose the key, so participants made other suggestions using biometric passwords - *"fingerprint"*; *"voice"*; and *"eye recognition"*.

Device autonomy emerged as another key issue for all participants, highlighting that trove must build trust with both end-users and their care givers. The adopted children and young people were ardent and unanimous that trove should be child-directed, allowing them to record stories of their own volition and affording the absolute privacy. For adoptive parents, however, there were mixed opinions. All parents felt children's personal ownership would empower them to take control of their life stories and objects, rather than parents playing a gatekeeping role: *"It's something that the kids actually own. At the moment we own their memories, we keep things safe"* (Adoptive Parent). Nevertheless, some were reluctant to completely relinquish their own access to trove as they felt gaining insight into their child's thoughts and feelings were key to supporting them. Without knowing exact details of the content recorded, one adoptive parent mooted digitally tracking usage patterns rather than specific content, but others felt this would still compromise privacy. The parental apprehension is understandable and not without reason. Granting children control over narratives aids identity formation but left unchallenged their perspective of events may also become one-sided and inaccurate [1, 26]. Thus, trove must support narrative balance [11]. By

Participants
LAYPPG: involved fifteen children and young people (M=10, F=5) aged 14-21 years. The participants who were under 18 years old were currently living in looked-after environments, while those above 18 years were care leavers. The individuals knew each other and were from the same English local authority. *ACAP*: involved six adopted children (M=4, F=2) aged 7-15 years and one of their adoptive parents. Both groups were recruited by their English local authority with sessions supported by a social worker and a family therapist. All participants read information sheets and signed consent forms prior to taking part. Ethics approval was granted by the University ethics committee and had local authority approval.

Data Collection Methods
We gathered qualitative insights about trove. The 3rd and 5th authors managed both sessions and asked semi-structured group interview questions, allowing for open-ended discussion. Audio recordings of participant responses were recorded using a digital recorder, before later being transcribed.

Procedure
LAYPPG: 2-hour session at a youth club and began with a PowerPoint about the project history, aims, and the team. Participants were given space to undertake club activities, with playtesting trove as one opportunity available. Afterwards, the group congregated for feedback discussion about trove. *ACAP*: 2-hour session in a local library and began by showing the group a project information video. Children were split into 2 groups. One group playtested trove, the other created customizable trove inserts in another room, before swapping roles. Following playtesting the parents were given a chance to give their own feedback.

Analysis Method
All audio transcripts were collated in Nvivo, deductively creating a series of category nodes based on background literature and the design brief. Inductive nodes were assimilated as patterns emerged in the data. Inter-coder validation was undertaken by the first and second author, targeting Cohen's Kappa reliability of 0.7 coefficient for each node.

letting children become comfortable with personal storytelling, in time, caregivers may be rewarded with increased inclusion. One solution is to encourage co-creation of narratives and the sharing of stories – both essential to nurturing relationships and ensuring emotional health and development [5, 7]. Such ideas were endorsed by several participants with varying degrees of autonomy. Three adopted children felt comfortable sharing some stories with a parent, one wished to share with friends, and one didn't want to share anything. Those willing desired not just to share but to collaboratively record stories, a sentiment echoed by two looked after children who wanted to record stories in partnership with their social workers – creating memories together.

2. trove's Role in Supporting Life Story Work
Participants appeared to validate trove's core design objectives (DO1, DO2) of encouraging storytelling and reflection, alluding to the fact that they do indeed own meaningful objects with associated memories which have faded with time: *"I have loads of things at home that I've forgotten what holiday I got them on but I still really like them, and then I get really annoyed with myself."* (Adopted Child). However, such were the current challenges in maintaining accurate life stories, trove was envisaged by some as extending support for developing narratives beyond the scope of objects alone. Two adopted children suggested that trove could be used as a more convenient diary, *"It's basically like a diary... rather than writing down every day you could just speak into it."* (Adopted Child). Meanwhile, two parents believed trove could be a medium for broaching difficult conversations about the past: *"When you verbalise something, it becomes easier...truth might come out in trove when they're having a conversation..." (*Adoptive Parent). Yet despite seeing the value of trove as a tool for exploring difficult memories, one parent felt unprepared for resulting emotional impacts – paradoxically, dealing with this may create additional demands for social workers time.

The prospect of extending support for life storying had its limits as a box-based, child-directed recording device. For trove to play a more extensive role in addressing life story work challenges, aiding the curation responsibilities of social workers and care givers seemed crucial. For example, two parents spoke of encountering gaps in their child's life stories and one-sided narratives (of previous care givers) which had confused both themselves and their child. Consequently, one parent suggested care givers use portable recording devices for easy documentation of stories, in greater depth than life storybooks alone: *"technology can be used outside of that box to record certain things before it gets into a life storybook, it's done there and then, so putting a life storybook together from that information would be a lot quicker"* (Adoptive Parent). Hence, we may explore assisting trove content curation remotely by letting significant others upload audio files to a child's cloud data repository accessible using trove, providing useful alternative story narratives. To conclude, trove appears to implement its designed objectives well but the appetite for it to impact upon life story work more broadly illustrates the challenges and frustrations of current practices for children and their parents. While trove integration within social care and adoption practice may help to more efficiently document and support life storying, it is not a silver bullet solution, nor should it diminish the importance of social workers in this process. By providing supporting materials or training alongside trove, it may assist children and care givers to get the most out of device usage by instilling trust and the ability to handle any undesired outcomes.

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CONCLUSIONS

With trove, we have attempted to address several current shortcomings of life story work by creating a trustable outlet for looked after and adopted children to verbalize their stories and keep their most precious objects safe. While our initial results are promising for the proof of concept, a more in-depth understanding of different use cases, contexts, cultures, nuanced requirements, is required to improve upon trove's design. It is also vital to understand how trove can remain useful, relevant and an enduring companion through time, to support children as they mature. We will be addressing this with a user-centred redesign of the current prototype which further builds upon the outlined design objectives. Given the early findings, trove has great promise in playing a wider role in contributing to children and young people's life story work and is an instrument for highlighting the challenges faced within social care and adoption which can drive policy change.

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