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**WORKING/DISCUSSION PAPER**

## **From mirrors to selfies: protecting children's data for personalised learning and future growth**

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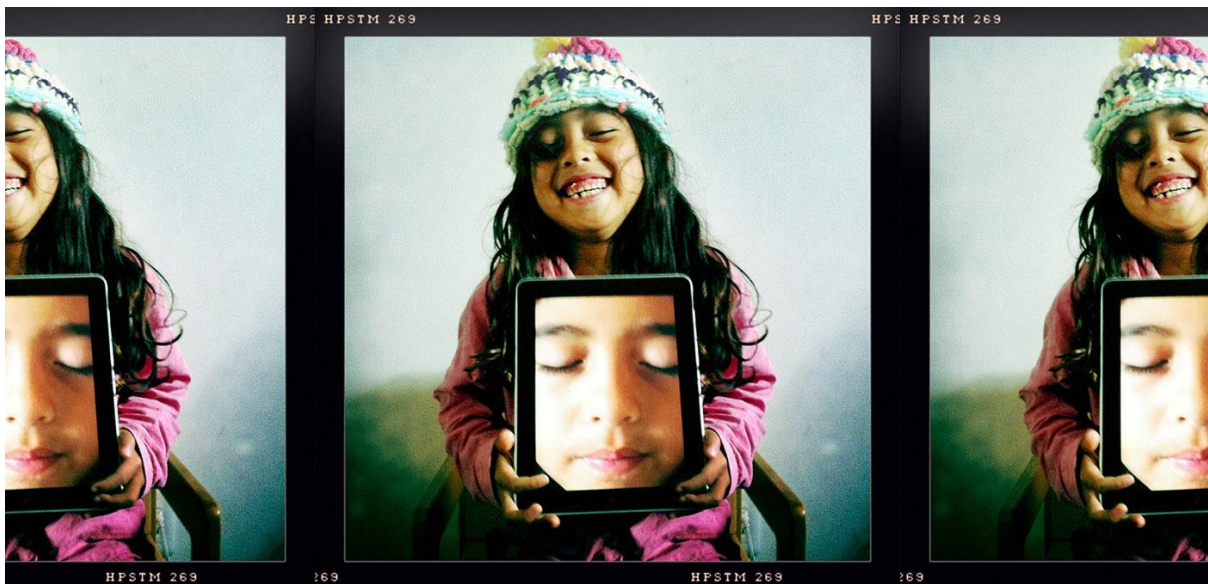


Image: adapted from [iPad dream #3](#), by [Lance Shields](#) via Flickr

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## Table of Contents

1. Opportunities .....	4
1.1. What is personalisation? .....	4
1.2. Personalisation in children’s reading.....	4
1.3. Personalisation options in children’s books and digital stories .....	5
1.4. Research on personalised reading .....	5
1.5. Commercial personalisation in children’s reading products.....	6
2. Challenges .....	8
2.1. Design challenges .....	8
2.2. Moral challenges .....	8
2.3. Financial challenges .....	9
2.4. Educational challenges.....	9
2.5. Ethical challenges.....	10
2.6. Legal challenges.....	11
3. A technological solution.....	11
3.1. Private Data Accounts .....	11
3.2. HAT Private Microserver Data Accounts.....	12
3.3. Addressing legal challenges with HAT PMDAs .....	12
3.4. Addressing ethical challenges .....	13
3.5. Addressing moral challenges: individuals as data controllers.....	13
3.6. Addressing financial challenges: integration with Internet services .....	14
3.7. Addressing education challenges: personalisation of learning and reading with child HAT PDMA’s .....	14
3.8. Advantages of microserver containers for children’s publishers and digital personalisation: summary.....	15
3.9 Disadvantages and Limitations.....	15
4. Conclusion .....	17

## **The purpose of this white paper**

This white paper presents a concise overview of the educational opportunities in children's personalised reading, and provides guidance on best practice concerning the use, storage and sharing of children's personal data. Its aim is to inform children's designers, publishers and developers, highlighting the potentials and limitations to using children's data to personalise their reading experiences. More broadly, it aims to meaningfully contribute to the rising debate about the need to regulate this industry and educate the public about the use of children's personal data.

## **Executive Summary**

There is an increased interest in personalised products worldwide, particularly in the children's reading and children's publishing industry. This growing interest mirrors the rise of technologies that facilitate the personalisation of generic products such as cosmetics, clothes or household items, and broader socio-cultural and economic phenomena like increased urbanisation, globalisation, and multiculturalism in the 21<sup>st</sup> century.

With the rising popularity of personalised reading experiences, the responsibilities of children's publishers are growing beyond those of traditional publishing houses: they are also data owners, responsible for the privacy and confidentiality of children's data. Because it is so easy for individual data points to lead to pattern recognition and user profiling, which can result in positive innovation and more refined end-products, the personalised publishing industry faces significant design, moral, financial, educational, and ethical challenges.

A solution to the challenges of personal data management in the publishing industry that complies with forthcoming regulations like General Data Protection Regulation is required. HAT technology, a user-owned private data account solution, offers children's publishers a long-term and sustainable means of addressing the predictable future challenges facing this sector. A child's private data account (which could be a HAT Private Microserver Data Account) could hold their personal data-at-rest in a containerised, self-owned database. This would give the child, or his/her trustee, the legal right and ability to integrate their personal data within that database with services on the Internet. This solution emulates physical life; by using HAT Private Microserver Data Accounts (PMDAs), children and their guardians would be able to own their personal database in the same way they own physical assets, and share the data within it on terms they control.

Children's personal data, once it has been collected by corporations, becomes ensnared in a web of complex legal and technical challenges if it is ever reused, consolidated, or organised. This paper suggests a straightforward means of effectively leveraging this valuable resource, both economically and technically, to improve the reading experiences of children.

# 1. Opportunities

## 1.1. *What is personalisation?*

Personalisation is an overarching term used to describe a nexus of practices, products and processes that have been tailored to a single human being. Personalisation can refer to individualised contexts as well as contents. For example, personalised mass emails have the same content but a different personalised opening sentence for each recipient. Personalised contexts are physical or virtual spaces adjusted to individual needs, preferences and/or history of use. Personalisation runs across media and can take different forms in different formats. For instance, on touchscreens, digital personalisation takes the form of personalised texts, images or photographs, drawings, videos or audio-recordings.

The level or extent of personalisation varies from product to product. Some commercially produced personalised products are based on a template with only a few features adjusted to a specific group of customers (e.g., shoes designed for young girls or mugs designed for boys named Nicholas). Products that follow a lower level of personalisation are more accurately described as customised rather than personalised. At the other end of the spectrum are products that are produced uniquely for an individual, such as a handmade portrait painted for a specific occasion. Because of the time and effort that it takes to produce a fully personalised product, they are typically more expensive and more difficult to acquire. They carry a higher intrinsic value which is reflected in their price and scarce availability.

Following a rise in technologies that facilitate the personalisation of generic products (e.g., cosmetics, clothes or household items) and broader socio-cultural and economic phenomena (e.g., increased urbanisation, globalisation and multiculturalism) in the 21<sup>st</sup> century, there has been an increased interest in personalized products worldwide. This is particularly the case for children's reading and the children's publishing industry.

## 1.2 *Personalisation in children's reading*

Decades of educational research have established that children who are good readers enjoy increased academic achievement, better job opportunities, and improved creativity and empathy skills. Yet only 20% of children in England read at the expected level when they leave primary school<sup>1</sup>. A recent UK survey by the National Literacy Trust<sup>2</sup> confirmed well-reported gender and age-related differences in children's reading enjoyment, in which 82.8% of girls and 72.4% of boys reported that they enjoy reading at ages 8 to 11, but only 53.3% of girls and 35.7% of boys said the same aged 14 to 16. Research and design interest in the use of personalisation for children's reading applies to all ages, but our particular interest is in children of pre-school and primary school age. Publishers, educators and researchers have been trying to find a way to increase these children's interest in

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<sup>1</sup> Read On Get On Campaign,

[http://www.literacytrust.org.uk/assets/0003/6217/Read\\_On\\_Get\\_On\\_Strategy.pdf](http://www.literacytrust.org.uk/assets/0003/6217/Read_On_Get_On_Strategy.pdf)

<sup>2</sup> [http://www.literacytrust.org.uk/research/nlt\\_research/7858\\_celebrating\\_reading\\_for\\_enjoyment-findings\\_from\\_our\\_annual\\_literacy\\_survey\\_2016](http://www.literacytrust.org.uk/research/nlt_research/7858_celebrating_reading_for_enjoyment-findings_from_our_annual_literacy_survey_2016)

written stories and literary texts, and motivate young readers to engage in reading for pleasure or enjoyment.

Personalisation is an important motivating factor that has been confirmed to influence children's interest in learning<sup>3</sup>. Many publishers seem to know intuitively that personalisation can draw children to a book. In fact, the history of children's book publishing can be traced back to authors writing for their own children, i.e. producing highly personalised books. With modern technologies and algorithmic production strategies, several aspects of a children's book can be personalised, minimising the burden on the author or publisher, and maximising the potential benefit for the child.

### **1.3. Personalisation options in children's books and digital stories**

The options for personalisation can be classified in various ways. Here, for simplicity, we categorise them according to the purpose and format of the personalisation. If the purpose is educational and the intention is to teach children to read, then personalisation is typically algorithmic and based on a child's performance history. For example, in the iRead project<sup>4</sup>, children's linguistic competence (which is based on their performance over a set of language tests) is taken as a key data point and matched with books that correspond to the child's reading level.

If the purpose is to encourage children's love for books and intrinsic motivation to read, then the personalisation options tend to be more agentic. For example, children can choose their own story ending in the *Choose Your Own Adventure* books by R. A. Montgomery & E. Packard, or they can choose a happy, sad or funny story ending when reading the digital book *Collins Big Cat: It Was a Cold, Dark Night Story Creator*. If the purpose is to draw children's attention to a book and maintain their attention, publishers can use interactive personalisation, most notably interactivity that includes the children's own input.

There are various forms of personalisation. They include textual personalisation (e.g. adding a child's name to the book), pictorial personalisation (e.g. adding a child's photograph), audio personalisation (e.g., recording the parent's voice for a digital bedtime storybook), verbal personalisation (e.g., changing the parent's language to link the book content to the child's life), and interactive personalisation (e.g., designing a story character for a story set).

For young children, some publishers include the children's own faces as part of the reading experience. For example, in the board book *Peekaboo Zoo* by Mandy Ross (author) and Kate Merritt (illustrator), there is a mirror on the book's last page so that toddlers can see their own face as part of the reading experience. For digital books, children can activate the touchscreen front camera and not only see their faces but also insert a selfie inside a specific book page. In some digital books, for example those developed by *Made In Me Ltd.*, children (or adults reading with their children) can audio-record their own voiceovers to accompany individual stories.

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<sup>3</sup> <https://link.springer.com/article/10.1007/s11423-012-9253-6>

<sup>4</sup> <https://iread-project.eu/>

## **1.4. Research on personalised reading**

The body of research that is specifically dedicated to children's personalised reading is small and has so far focused on textual personalisation. One of the first studies in this field was conducted in the USA by Bracken in 1982<sup>5</sup>. In the study, forty 9 to 10 year old children of lower or average reading ability were asked to read either a personalised or a standard (non-personalised) story. The findings showed that children of a lower reading ability who read the personalised story had better story comprehension scores than those who read the standard story. The children who had an average reading ability did not. In a UK study conducted by Kucirkova, Messer & Sheehy (2014)<sup>6</sup>, three-year-old children were read either a personalised or non-personalised book by an adult, with some new words embedded in each version of the book. Children learnt more new words if these appeared in books that were personalised to them than they did in non-personalised stories. A follow-up study<sup>7</sup> to this research found that children speak more when they read personalised books as opposed to non-personalised books, and that their speech centres mostly on themselves (i.e. children frequently mention personal pronouns and talk about what happened to them in the past as if reminiscing over personal photographs). There is thus a caveat to increased personalisation in children's books: it is possible that the personalised content changes the nature of a reading activity, possibly increasing children's focus on self rather than on fictional characters and wider issues.

Digital books, such as interactive story apps and ebooks are often designed for a child's individual engagement. Yet, personalisation possibilities in digital books, such as the option to create a story, might be used for shared reading and could encourage children to focus on others rather than on themselves. This is because children's stories often include their friends and family members, as well as memories of what the child has experienced with their family. Moreover, thanks to the multimedia recording possibilities of touchscreens, children can extend their stories not only with past references to a shared experience, but also through taking new pictures or recording new sounds as they read. Small-scale observation studies<sup>8</sup> from homes suggest that digital personalisation can positively influence parent-child shared reading on screen.

## **1.5. Commercial personalisation in children's reading products**

Researchers have thus far been focused on personalised books that are specifically produced for research. There are, however, many commercially produced personalised books that enjoy high popularity amongst young children worldwide. To illustrate this, we profiled two UK publishers who focus specifically on printed and digital personalised books. Please note that the selection of these two examples is highly arbitrary, and provides only a snapshot of current developments in an industry that is changing rapidly.

The UK-based *Wonderbly Ltd.* is one of the biggest global publishers specifically dedicated to creating personalised children's books. *Wonderbly* was founded as a

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<sup>5</sup> <http://www.sciencedirect.com/science/article/pii/S0361476X82900157>

<sup>6</sup> <http://journals.sagepub.com/doi/abs/10.1177/0142723714534221>

<sup>7</sup> <http://www.sciencedirect.com/science/article/pii/S0378216614001428>

<sup>8</sup> <http://onlinelibrary.wiley.com/doi/10.1111/1467-9817.12030/full>

startup in 2012 by two fathers, Asi Sharabi and Tal Oron, and in May 2017 claimed more than \$13 million USD (£9 million) in available funding and sales of more than 2 million copies of their personalised books in 135 countries. They have published three titles to date. From the company:

*'The company's first product entitled "The Little Boy/Girl Who Lost His/Her Name" was the best selling picture book of 2015 in Spain, Italy, and Australia and the top grossing one in the UK and the US. Their second book, "The Incredible Intergalactic Journey Home", is currently only available in the UK and the US but it is due to launch across other European countries later in the year<sup>9</sup>.'*

*Wonderbly's* third title, released in May 2017, is titled *Kingdom of You*. To get a book personalised for their child, parents can choose from a set of characters (sub-categories are dinosaurs, superheroes, animals or princesses), and a 'treat that will get a royal approval' (sub-categories include pizza, pasta, ice cream and chicken), and they can also write their own personal message at the end of the book.

The company's success to date lies in combining sophisticated technology with a 'quiet' printed product and a bespoke resource that has the feel of being uniquely personalised for an individual child. The books represent a radical departure from the tradition of printed personalised books that used to merely replace main story characters with children's names. *Wonderbly* personalises the storyplot according to the individual letters of a child's name, which increases the books' perceived uniqueness and value.

A much smaller UK-based publisher of personalised books is *Mr Glue Stories*. Founded by two mothers, Amelia Thorne and Carrie Gregory-Hood, in an effort to give their own children a digital book that the children could co-author and embellish according to their own aesthetic preferences. They offer one application, where children can replace the main story characters with their own names, and the new names then appear automatically in the digital story. Children can also add their own drawings to some selected pages, which are then saved as part of the story illustrations. There is a further option to order a paperback copy of the final personalised story, which contains both the original illustrations and the children's own drawings.

Unlike many other publishers and designers of personalised books, these products do more than just insert a child's selfie into a story. They offer children authorship possibilities and their parents an affordable bespoke gift. They illustrate the different faces of personalisation: personalisation can run in the background and lead to a neat product ready for a child to use or it can run on the surface and give children creative possibilities.

Although not formally evaluated by independent research, it is possible that children might be more motivated to read *Lost My Name* and *Mr Glue Stories* than they would comparable non-personalised stories. It is also foreseeable that if these stories contained new concepts, children would be more likely to learn them because of their increased attention to the books.

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<sup>9</sup> [http://uk.businessinsider.com/lost-my-name-raises-4-million-2016-6?utm\\_source=yahoo&utm\\_medium=referral](http://uk.businessinsider.com/lost-my-name-raises-4-million-2016-6?utm_source=yahoo&utm_medium=referral)

Possible limitations could be that through the focus on personalisation, publishers of personalised books encourage more self-focused experiences for these child readers, a concern which is raised by some UK teachers and practitioners. In a recent focus group interview with UK primary school teachers, the need for combining personalised books with traditional, non-personalised books was highlighted by one teacher as follows:

*'So that personalisation is a two-way thing, so that it's not simply just a name or setting that is known to the child. And I think there is a concern that if personalisation does just become an egoistical sort of invitation it needs to be part of a process that we engineered to ensure that children are becoming individual readers and writers<sup>10</sup>.'*

But before the educational impact of this opportunity can be addressed, the publishers of children's personalised books need to face the major civic, moral and legal implications regarding how to handle children's personal data.

The use, storage, and sharing of children's data has been present in academic discussions about personalised publishing, and has played a part in publishers' everyday business for decades, but they have recently been brought to the fore by prominent cases of data misuse<sup>11</sup>, rising opportunities in the digitally connected economy and forthcoming regulations in the UK and EU such as GDPR. Publishers' use of children's data has also been a hot topic of debate in recent focus group interviews, which were conducted as part of Kucirkova's ESRC project<sup>12</sup> investigating children's personal(ised) stories.

## 2. Challenges

With the rising popularity of personalised reading experiences, children's publishers are also becoming data owners, responsible for the privacy and confidentiality of millions of children's data. The data owned by publishers are more than typical consumer data, such as the number of purchases or country of delivery. Publishers of children's personalised books have individual children's names, postal addresses and personal preferences. This information is supplied by the children's main caregivers, as they attempt to create products that are as close as possible to the child's reality. In some cases, the publishers know how much children engaged with their book titles and for how long. This aggregation of individual data points (often represented as scores on individual tasks) affords them pattern recognition and user profiling opportunities that can lead to increased innovation and more refined products, but it can also have unintended consequences.

There are five key challenges that are relevant for publishers of children's personalised books and stories, and also for the wider publishing industry: design, moral, financial and ethical challenges. Our discussion of these challenges draws on

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<sup>10</sup> All quotes were taken from focus group interviews, conducted as part of the project *Personalisation in children's stories*, led by Dr Kucirkova at UCL Institute of Education and supported by the Economic and Social Research Council [grant number ES/N01779X/1].

<sup>11</sup> <http://blogs.lse.ac.uk/parenting4digitalfuture/2017/01/27/the-internet-of-toys/>  
<https://eandt.theiet.org/content/articles/2017/07/fbi-warn-parents-of-dangers-of-internet-connected-toys/>

<sup>12</sup> <https://www.ucl.ac.uk/ioe/departments-centres/departments/learning-and-leadership/personalised-stories/>



focus group interviews with six book publishers, six children's app producers, and two literacy experts from national literacy charities, reported in full in an academic article (Kucirkova & Flewitt, forthcoming).

## **2.1. Design challenges**

A key challenge for the personalised publishing industry relates to the actual use of personal data and how it is harnessed for effective design. Given that personalised books are an uncharted territory, with little empirical data to draw on, publishers are testing the market through a trial-and-error approach. Some publishers collaborate with academics to gauge the potential educational benefits of well-established learning models and theories, while others place the burden risk when testing these waters directly onto their users, i.e. children. One publisher identified this risk, saying that, 'there is no guideline on how far you could be going. It's completely up to an individual company. Based on their own understanding.'

While a conceptual framework called the 'networked capability approach' exists for 'theorising the complexities of children's rights in the digital age'<sup>13</sup>, there is not yet any deployed practical guidance for individual platform providers to deal with this challenge.

## **2.2. Moral challenges**

Closely linked to the above design challenge is a moral challenge as to how much, and what kind of personalisation can be considered ethical.

Books are an important source of meaning-making, especially for young children who are building moral worlds and language repertoires from their immediate environments. Many children do not have the cognitive capacity, life experience and emotional resilience to process difficult or inappropriate content. Without adequate support, children might non-critically absorb the content that they are provided with. Because a significant proportion of publishers of children's digital and personalised books operate as startups, and don't typically work with established authors and illustrators, they often produce their own content or commission stories from affordable, lesser-known authors. While in some cases this might represent a welcome addition to an established, and some argue<sup>14</sup> stagnating, canon of children's literature, in others it may be promoting children's engagement in books that are of an unverified quality.

Publishers carry the moral responsibility of deciding what they portray as 'good' or 'evil' in children's stories, which is then interpreted by children who directly identify with the characters in personalised books. If the publishers choose to portray children, their close friends, or their family members as good or bad story characters, the child might more readily assimilate information about these characters than they would about other, fictional story characters. Furthermore, publishers might leverage personalised books to influence children's emerging sense of democratic responsibility. In a personalised book published by *KD Novelties*<sup>15</sup>, a personalised children's book and gift publisher in the United States, the main character of the story, a child, meets President Trump and learns about his plans to 'Make America

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<sup>13</sup> <http://journals.sagepub.com/doi/abs/10.1177/1461444816686319?journalCode=nmsa>

<sup>14</sup> <http://journals.sagepub.com/doi/abs/10.1177/1463949116660950>

<sup>15</sup> <http://www.prweb.com/releases/kdnoveltiespersonalized/presidentialbookforkids/prweb14072436.htm>

Great Again', helping the president build a border wall. These developments are of significant concern to many educationalists.

### **2.3. Financial challenges**

As data owners, data handlers or data managers, publishers also need to take measures to protect against potential loss of privacy and confidentiality. Not all publishers have the in-house capability or budget to deal with this sort of challenge. Consequently, parents approach them with distrust, limiting their market. Some publishers seek a solution to this problem through partnerships with schools, increasing their trustworthiness but potentially limiting their access to necessary data security infrastructure. Partnerships like these can also help the publishers with data aggregation that could be used for more robust products, but, as a key children's publisher revealed in focus group interviews, not all publishers know how to do this in a secure way:

*'Because you can kind of like you say there is a benefit from sharing it with the institution and similarly, if I'm gathering a lot of data from my children at home and that can be shared with school in a way that helps my children in their formal learning environment that's fantastic, I would like to do that, I would like to know how it's done in a secure way.'*

### **2.4. Educational challenges**

Publishers of children's personalised books own data that might be of value to other publishers and educational institutions, but for this data to be valuable, however, they need to be aggregated and collected in a certain way. As yet, there is little awareness of the value of learning analytics in the children's publishing industry. While publishers experiment with how to directly use children's data, by displaying it in the books a child reads, they could also be experimenting with engagement data to predict and model their future reading behaviours. Learning analytics that have become integrated into several educational institutions internationally, and form a key component of many technological solutions, such as the McGraw Hill LearnSmart system currently being used in a number of universities across North America, for example, could be used for learning models that are imposed on the child. The pan-European project iRead, led by UCL London Knowledge Lab in the UK, aims to develop models that create effective personalised reading apps in this way.

### **2.5. Ethical challenges**

When children's publishers are focused on children's reading for pleasure, they face an additional ethical challenge related to data use surrounding the difficulty of explaining to young children what they are consenting to. As Dr Xiao Ma, Chief Operating Officer of the HAT Community Foundation has argued:

*'Proper consent for the use, disclosure, and exchange of personal information cannot be obtained from children under 16. They may be less aware of the risks, consequences, rights, and safeguards that come with the processing of their personal data. The brilliantly written maze of terms*

*and conditions, which often challenges lawyers, cannot be considered fully understood by adult app users, let alone children<sup>16</sup>.*

Until now, publishers and designers have merely informed their users about how they will use their customers' personal data, rather than seeking their explicit consent on whether they may do so. This situation will change when the new General Data Protection Regulation (GDPR) comes in effect in May 2018.

GDPR is the 'first comprehensive overhaul of data protection regulations in the EU for 20 years'<sup>17</sup> and it is applicable to all organisations that own or handle personal data based in one of the European Union countries. The current detailed provision of the GDPR regulation targets profiling technologies, that is, technology using aggregate data or patterns of data for automatic or human-mediated purpose. The draft GDPR paper identifies the following possible adverse effects of unregulated practices.

'[The] significant effects of profiling include [data] processing that:

- causes damage, loss or distress to individuals;
- limits rights or denies an opportunity;
- affects individuals' health, well-being or peace of mind;
- affects individuals' financial or economic status or circumstances;
- leaves individuals open to discrimination or unfair treatment;
- involves the analysis of the special categories of personal or other intrusive data, particularly the personal data of children;
- causes, individuals to change their behaviour in a significant way; or
- has unlikely, unanticipated or unwanted consequences for individuals<sup>18</sup>.

## **2.6. Legal challenges**

Finally, today's laws imply that data cannot be legally 'owned' due to the fact that it often has no fixed boundaries, instead remaining mixed between the public, the corporate custodian, and the individual. This ambiguity creates massive economic challenges, as the uncertainty of data boundaries, entities, and rights increase market transaction costs and limit the creation of new services. Unchecked, this friction could result in the full market failure of the digital economy.

In a broader view on what these effects might mean for personalised publishing and society more widely, The HAT Community Foundation summarises the possible risks as:

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<sup>16</sup> <https://www.facebook.com/notes/hat/verifiable-parental-consent-for-childrens-data/1291883300865010/>

<sup>17</sup> <https://www.secureworks.co.uk/resources/vd-what-is-gdpr>

<sup>18</sup> <https://ico.org.uk/media/about-the-ico/consultations/2013894/ico-feedback-request-profiling-and-automated-decision-making.pdf>

*‘...creating illegal data markets, deterring the creation of apps and services, allowing monopolisation in the digital economy, marginalising of entire populations of the market, crippling our efforts to deal with cyber security, and subjecting the digital self to costly dispersal and ageing<sup>19</sup>.’*

New user technologies can now provide an immediate solution to children’s publishers that help them comply with forthcoming regulation and establish a long-term and sustainable approach to the predictable future challenges of personal data management. The next section details the specific technological opportunities offered by HAT Private Microserver Data Accounts. While this is not the only solution to the challenges set out, it is a possible solution that can significantly mitigate against the five key challenges that are currently facing the sector.

### **3. A technological solution**

#### **3.1. Private Data Accounts**

Containerised microserver databases as private data accounts are a new technology that have been built to help individuals everywhere use the Internet to exchange and trade personal data with greater safety and privacy. Of these, the market leader is the HAT Private Microserver Data Account (PMDA), which any individual can use to store their personal data, for themselves, within a database that is ‘wrapped’ with its own containerised microservices. These containers give the individual full control, access, and ownership over the information they store inside, and can create for them the freedom and the power to own and exchange as much (or as little) of their own information as they want. This exchange is designed to happen between companies and individuals, and between individuals. These accounts are private and secure by design, and they are the personal property of their owner, as is the data inside.

Networks of these accounts constitute a comprehensive ecosystem, designed to re-align the digital economy and fulfil the real potential of the Internet for firms, organisations, and individuals, replacing corporate- or organisationally-controlled user accounts with private data accounts. Applications and services using these accounts enable companies to access the same data on their applications as they can to date, but only with the express and transparent permission of the user, who can completely control the organisations’ level of access.

The HAT’s technology is open source and was initially developed with more than £1.7m of Research Council UK (RCUK) Digital Economy funded projects involving six UK universities. The HAT Ecosystem is now led by the HAT Community Foundation (HCF), a non-profit organisation bringing community regulation and growth to the personal data economy. It has also established the ‘HAT Foundation Group’ to convene international interest and resources empowering governments, academic institutions, and corporate partners to champion the personal data revolution based on the HAT open technology platform.

#### **3.2. HAT Private Microserver Data Accounts**

HAT private data accounts as standalone databases wrapped with containerised microservices have the potential to make both individual children and their guardians

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<sup>19</sup> <http://wrap.warwick.ac.uk/86374/>

data controllers and processors in the cloud environment, in the same way PCs liberated individuals from mainframes in the 1980s.

Containerised microservices encase various discrete components of application logic and require only minimal resources to do their job. Unlike virtual machines, containers do not need an operating system. Instead, they call for operating system resources via an Application Programming Interface (API). Containerising databases in this way can isolate them at the (micro)server level. The content within them can be encrypted and backed up regularly, and traditional direct database access can be replaced by server-level API calls. This isolation creates an added extra layer of security, localising the impact of any breach and mitigating the risk of sysadmin-granted unauthorised access. Through containerisation, modular and micro cloud services are beginning to supplant large cloud architectures due to their portability and scale.

### **3.3. Addressing legal challenges with HAT PMDAs**

A child's personal data, sitting within his or her own dedicated database, can be legally owned and governed by guardianship. A good corpus of case law exists to support this; users who are the legal owners of their personal databases can be afforded all of the property rights of the database, reducing the ambiguity, cost, and friction that is normally a hindrance to the ownership requirements of raw data itself. Despite the fact that the database could be provisioned for individuals by a provider, they could be given ownership of the database and also have database rights if they have made a substantial investment (whether financial, human or technical) in acquiring, verifying or using the data in the database<sup>20</sup>. The database itself can be treated as property – i.e. a good – that confers upon the individual its bundle of rights: the right to use the good; the right to earn income from the good; the right to transfer the good to others; and the right to enforce property rights over the good. In addition, the digital assets that sit within the database can be managed and used as a part of the individual's estate, much as would the physical assets within a home.

For children, this sort of dedicated database can be the source of new access rights to their own information, freely given by themselves or by their guardians, if the guardian has the right to do this with the child's agreement, to others like personalised publishers. This absolves the publishers of the necessity of obtaining, protecting and storing this information for themselves, and of the requirements of adhering to the right-to-access conditions of new data regulations like GDPR. When the individual child holds their own data, with ownership and property rights, inside a PMDA, that data also gains a better longevity to follow the child through the passage of time. More importantly, there is a legal framework for the treatment of the database, that of property ownership and rights, which puts the control of its rights and use squarely with the individual.

### **3.4. Addressing ethical challenges**

In the physical world, children are almost always under the guardianship of a parent or other adult, but in the digital world the personal data of the child, once collected,

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<sup>20</sup> <http://www.icaew.com/en/archive/library/subject-gateways/law/intellectual-property/legal-alert/court-gives-guidance-on-database-legal-ownership-and-protection>

becomes entangled in a web of complex legal and technical challenges when it is used, reused, consolidated, and organised. This is not only ethically challenging, but is a wasted economic and technical resource, and a missed opportunity for richer learning. Private data accounts such as HAT PMDAs empower children and their guardians to grant beneficiary organisations the full value of this rich information without sacrificing their personal control or ownership over it. In other words, the situation is reversed. It is the child (via the guardian) who grants access to the data, and dictates its conditions of use, instead of the corporation.

The result is technologically elegant and can be applied in real world settings without being entangled in the complexity of third-party ownership or uncontrolled access to the highly sensitive information. HAT private data accounts leverage data exchange standards and protocols that are transparent and established using Internet open standards, meaning that they can then be used by the publishing community for personalisation without ethical concern. Since the HAT PMDA data exchange was built on the Internet (and not on a proprietary system), every stakeholder that exists in its community of researchers, individuals, and partners stands to benefit from their proliferation and the responsible transaction of the information stored therein. This is in clear contrast to the digital economy championed today, in which the best and most ethical treatment of highly sensitive children's data is that it remain *untransacted*, a sore loss of the value of much of that information.

### ***3.5. Addressing moral challenges: individuals as data controllers***

Containing one individual's data within an entire database as these private data accounts suggest also allows individuals themselves, and their guardians, to become controllers of their personal data, and to some extent data processors as well. The operationalising of the bundle of rights to which they are due lets individuals exchange the personal data within their database for their own benefit, deriving benefit from it or transferring it for fun or for services. The containers help individuals to do this using standard APIs, keeping them in full control.

Transfers and exchanges that are set up by the personal data controller, with their accompanying reduction in ambiguity, means that bargaining solutions (trade) can be better-achieved. A new primary market-driven exchange for personal data that is acted upon by individuals, rather than corporations, is made possible. When the child or the guardian is the data controller, personalised algorithms are not imposed on children, they are self-directed and self-evaluated by them for their own reading and learning. It thus provides a practical response to Swist & Collin's (2017) call for 'moving beyond linear, homogenizing and algorithmic categories of children's conduct towards more heterogeneous explorations that value their 'doings and beings'<sup>21</sup>.

### ***3.6. Addressing financial challenges: integration with Internet services***

There are two further benefits to containerised private databases. First, a database that is wholly owned by the child or guardian can become an effective on-demand data supplier to personalisation projects that require personal information. Personal data form entry, personalised quotations, assessments, online identity verification,

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<sup>21</sup> <http://journals.sagepub.com/doi/abs/10.1177/1461444816686319?journalCode=nmsa>

and user account creation all carry risks and costs for the corporation. An alternative that allows for the sharing of personal information, by users, from their own private data containers can save both businesses and individuals time, effort, risk, expense, and liability.

Widely adopted, the number of personal user accounts that sit within apps and services worldwide could also be systemically reduced and a massive simplification in the complexity of personalisation projects could result. In addition, large-scale challenges such as cybersecurity vulnerability and infrastructure maintenance could be reduced, since, as HAT PMDAs employ a distributed system, compromising one PMDA would be compromising only one individual database. In addition, children's HAT PMDAs could be offered by publishers, branded to the specifications of their business, much like the way banks would brand their current and savings accounts, which would give forward-looking publishers a direct, personal customer relationship with the child or trustee consuming their materials. In addition, publishers could offer add-on services on HATs that create even better privacy-preserving relationships with their readers.

Regardless of where children get their HATs from, the open source nature of HAT technology ensures that there will be no economic lock-in compelling usership. Individual consumers will stay with a selected HAT provider for their superior service. And due to the interoperability of HATs, other HAT users can use publishers' own services, creating a network effect that is advantageous to everyone.

### ***3.7. Addressing education challenges: personalisation of learning and reading with child HAT PMDAs***

The use of HAT PMDAs offers the potential to transform children's personalised learning and reading by offering richer data to benefit personalisation of content, potentially even creating insights into the health and well being of the child (e.g. how much sleep the child has had, their favourite meal types or height and age) without compromising on the exposure of their raw information.

HAT PMDAs would also improve personalisation of context of learning and reading, potentially benefiting not only the child, but also the parent or caregiver's reading with the child. Personalised contexts of learning that include the parent, caregiver or guardian's private data account could move learning and reading away from a book-to-reader interaction, to that of contextual interactions that are also personalised with the readers' own personal information. Recordings of previous readings of the same book by different people could be stored and played back (e.g. 'I love this part when grandpa read it – he always laughed in a funny way. Let's play back how he read it').

These accounts could also positively impact on the personalisation of learning and reading with memory effects. These could now include the role of history and memory, where the HAT PMDA holds information about the books that are read, including quotes salient to the reader, to enable better cross-referencing and other ways of taking learning out of its static context and turning it into a learning journey across time. 'Books I love,' 'favourite phrases and quotes,' and 'growing up with books and reading,' can become a digital journey of learning that is integrated through private data accounts, centralised around the reader alone. The parts of their reading context that are private can remain private, and the parts that the trustee or child wish to share with publishers for better services can be shared.

### **3.8. Advantages of microserver containers for children’s publishers and digital personalisation: summary**

<b>Benefits to the publisher</b>	<b>Benefits to the adult (buyer)</b>	<b>Benefits to the child (consumer)</b>
Richer data access for personalisation	Access to personalised learning resources for their child/steward	More engaging, enjoyable reading products
Improved cybersecurity capability and reduced risk	Immersive learning data that accumulates with the progress of the child	Better iterative learning resources
Regulatory compliance	Control over the delivery of personal data to publishers or educators	Accumulative data and learning repository
Ethical and moral treatment of customers	Secure data transaction capability	Control and ownership over their own information

### **3.9. Disadvantages and Limitations**

Increasing the educational impact of personalised reading should not be pursued at the expense of civic, moral and legal imperatives related to handling children’s personal data. HAT private data accounts offer a possible technological solution, which will need to be accompanied with a regulatory dimension, new models for professional development for teachers and guidance issued to guardians and caregivers. For example, from an ethical perspective, consent processes will need to be developed to ensure that even if technically possible for a guardian to consent without asking a child, this does not become the norm. Guardians and educational professionals will need to be involved in discussions around their responsibilities to teach children about how to transact and when *not* to transact their data.

From a technological point of view, possible risks and disadvantages of microserver containers for children’s publishers and digital personalisation include the relatively high complexity of acquiring personal data related to the child, as opposed to the current approach in which all data is pooled and stored centrally, and processed or analysed at will. The access management model to the publisher’s services needs to be adapted for potential revocation of access rights to the subject’s data, whether by disabling the services in question or implementing processes for requesting fresh grant of access; existing systems need to be integrated with secure data transaction capability outside of publisher-owned infrastructures for data storage and retrieval. The challenges in establishing the identity of a young individual for legacy data access and migration to the new system where the established identity verification methods used in the finance industry are not applicable here.



For future technological implementations it is worth remembering that all well developed systems need to be regularly updated to work well and their use implies regular professional development, training and assessment.

## 4. Conclusion

In conclusion, ‘personalisation algorithms influence what you chose yesterday, what you choose today and what you’ll be choosing tomorrow’<sup>22</sup> and it is crucial that those enabling these algorithms for use in children’s reading make them educationally optimal, and morally, legally, and ethically sound.

The containerised private data accounts that are proposed by technology like the HAT’s, and owned by the individual, can be used to consolidate all of the vertical silos of industry, ‘horizontalising’ personal data to generate a far better usage of data-in-context for Internet users, personal reading customers, and this growing industry. The emergence of a market for such services will help it to succeed – but only if the ethical, legal, and technical challenges itemised in this white paper are adequately addressed.

Detailed and specific suggestions that can practically improve an aspect of personalised education are highlighted within this paper. HAT technology provides an elegant, efficient and effective solution, built on a tried and tested legal framework and the standardised protocols on the Internet, for advancing the use of personal data. It will benefit and support the children’s publishing industry, and might also be able to apply itself to other educational systems and domains.

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<sup>22</sup> Koponen, J.M. (2005) The Future Of Algorithmic Personalization, Tech Crunch, June Issue, Available online at: <https://techcrunch.com/2015/06/25/the-future-of-algorithmic-personalization/>

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