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Child-Generated Personas to Aid Design across Cultures

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Abstract. Designers frequently use personas to model potential users, but these personas need to be accurate portrayals of people. With personas needed to facilitate a cross-cultural participatory design project, it was recognized that the personas needed to not only describe children appropriately, but also capture differences in behaviours between cultures. 56 children aged 7-10 in the UK and India participated in the creation of personas of elementary school children, describing aspects such as school life, family life and technology use. A tool developed to evaluate personas demonstrated that both sets of children could individually create plausible personas, while content analysis of the personas demonstrated that children focused on behavioural and activity-based narratives that were similar between the two groups, with only limited cultural differences identified. The findings suggest that child-generated personas can be a viable method in the design process, and may offer insights that aid cross-cultural design.

Keywords: Personas, Children, Culture, Child-Generated Personas.

1 Introduction

The participation of end users in the design of technologies has long been an important principle in Human–Computer Interaction (HCI) and Child–Computer Interaction (CCI). The use of children as participants in HCI research is not a new concept [1, 2] with their roles ranging from design partners to testers, though more recent research has shown that participatory design and co-design practices tend to be favoured by the CCI community. Sessions are generally used to capture design ideas in situations where the participants doing the design are the very same people who will ultimately use the product or service, for example, children designing interactive games for museums that they were likely to visit [3]. However, participatory design sessions with children are often also used to gain design ideas from children for products that they may not use themselves, with the assumption that they will be similar to the target users. Challenges can therefore arise when children are contributing to the design of products for children who are far removed from their own culture and values.

Within the context of this study, designers in India were tasked with developing a product for children in India and the UK to reduce plastic consumption. The designers would have access to children in India that could help inform the design of the product

but they would have no direct access to children in the UK. Thus, participatory design methods could only incorporate the values of the Indian children, which may differ from those in the UK. This scenario is not uncommon when developing products or technological solutions for a global audience [4, 5]. It may be that children in India can act as surrogates for the UK children or that alternative techniques may be required.

Children as designers of products for other children is a theme that has been well studied by the community [6, 7, 8]. Mazzone et al. [6] 'informed' teenagers that they were designing for other teenagers when they were actually designing for themselves. In the study by Read et al. [7], young children were introduced to a large toy hippo that neither spoke their language nor was able to manage finger-based interaction. Given these limitations, the children explored ways to understand the hippo by asking questions about his likes and dislikes and by talking with one another to better understand his needs, thus the collaborative aspect of participatory design was seen to be valuable in this context.

Designing for 'different' users raises new questions about the use of participatory design methods. Some of these questions have been raised by researchers working with adults, for example, Okamoto et al. [9] proposed new methods for looking at lifestyles and cultural backgrounds when doing participatory design with adults. A defence of moving participatory design away from design for self is given by Irani et al. [10] who discuss how design research and practice is always culturally located. Sim et al. [8] used sensitizing techniques with children who attempted to design a serious game for children of another culture, but despite the children being immersed into the other culture the end results showed the children were largely just designing games for themselves. Thus, when designers only have access to children from their own culture yet the product or service is intended for a different set of users, other techniques may be required.

One technique that may aid designers to understand children from different cultures is through the use of personas. Personas represent fictitious archetypical users that depict their needs and goals [11]. Within HCI it is a method to communicate information about the user(s) to designers, developers and other stakeholders [12]. Despite the vast amount of research on the creation and use of personas there is very little research on their use in cross-cultural design, especially with children and for products designed for children. Therefore, this research aimed to investigate whether child-generated personas could aid designers in a project to develop a technological solution that can be used by children in the UK and India to reduce plastic consumption. The primary objective was to determine whether children could generate useful personas. If so, these personas could then be evaluated by the project team to foster a shared understanding of the differences and similarities between the children in the UK and India. From the corpus of personas, a small subset could then be synthesized to be used in the design phase to help shape the specification and requirements. The capacity for children to generate personas has been examined briefly by other researchers [13] and this paper aims to contribute to this body of knowledge along with a critical reflection of the value of these as a design aid.

The main objective of this work therefore was to determine whether children could generate useful personas that could be examined by the project team to foster a shared

understanding of the differences and similarities between the children in the UK and India. Based upon this objective two research questions were created:

- Can child-generated personas be produced that are realistic and potentially useful to designers?
- Can differences be identified through the analysis of personas that may aid designers and developers?

The first question aimed to determine whether children in the UK and India could create personas that provide useful information that could help the project team understand children's behaviors, likes, dislikes and routines. The second question aimed to understand the differences between the children to help shape the design requirements as no product had been specified at this stage.

2 Related Work

Within the literature three different perspectives on personas have been proposed over the years: goal-directed [14], role-based [15] and engaging and fiction-based [16]. Two main research topics related to personas have been identified by Moser et al. [17], the first being making them more memorable for those who need them and finally the study of how to develop and create personas. The second research area will be the focus of the work presented in this study.

2.1 Personas

Within HCI, personas have been created using various techniques and methods, mainly using real data. In essence, designers gather information about the users' needs, preferences, and behaviours to consolidate these into a number of fictional individuals [15]. There are many challenges for designers in determining how to segment the users to ensure a sufficient representation of the target audience is obtained [18]. Thus designers need to be able to create realistic personas that sufficiently represent the users. It is suggested that by using narrative, pictures and names this helps practitioners imagine they are designing for a real person [19]. It has been argued that one of the key desirable objectives of the persona set is for them to generate empathy within the design team [20]. Creating empathy can enable designers to understand and identify with the needs of the users.

Within the context of CCI, personas have been used in a range of product developments. Child personas were critiqued by Antle [21, 22], who identified and expanded upon three dimensions that are required: childhood needs, developmental abilities, and experiential goals. For example, 'childhood needs' discussed the importance of positive social relationships, whilst 'developmental needs' did not explicitly state rules but touched on aspects of theory such as Piaget's age-dependent stages [23]. Child personas offer the designers the opportunity to deflect from their own childhood experiences and memories which may bias their decision making.

Personas have since been incorporated into methods for designing for and with children. In one study, personas in the form of a comic board presentation were created in a series of facilitated workshops with children [24]. In the first workshop each child worked with an adult facilitator to create the cartoon personas, then had two subsequent workshops where storyboards were produced and finally a prototype of the system was created. Child-generated personas were also created in [13], where 15 children worked in 4 groups to create personas based upon their educational ability. This was based upon the assumption that children would find it easier to create personas that shared similar traits to them, but it is unclear from their study whether children could feasibly create personas independently or for children of a different age or ability. In another study, cultural probes were used to capture and document children's experiences and these were analysed by the researchers to synthesise persona sets for games design [25], but unlike the previous studies children were not used in the direct creation of the personas. A three-phased approach for creating child personas was reported in research by [26] to develop a survey tool to create personas. In this study children were initially interviewed, followed by the creation of a survey tool, and using data from the first two phases the survey tool was validated. The work of [26] did not create personas but provided designers with the means to generate personas from survey data. Therefore, although children can and do contribute to the creation of personas it has not clearly been established how to do this effectively; at present there appear to be a number of options, and the cost benefit of these for practitioners is yet to be established.

2.2 Persona Validation

There has been criticism over the use of personas, as it has been argued that they cannot be falsified or disproved due to their fictitious nature, thus their scientific validity can be drawn into question [27]. Other concerns focus on the development process and the fact that they can be biased by the creator [28], contain personal bias and prejudices [29] and if they are only generated from a small set of user data they may not adequately represent the user group [30]. However, despite these criticisms the HCI community has continued to embrace personas within a user-centred design methodology.

In the work by Faily and Flechais [31] the emphasis was on grounding the personas in empirical data, thus enabling characteristics within each persona to be traced to the original source. This may be judged as a means of validating the persona through a grounded theory approach. The approach to validating personas based on real data is common within HCI [32, 33], yet other techniques have been applied. For example, heuristics have been used when validating personas in an e-Commerce context [34]. In a recent study by Salminen et al., a survey tool was created for understanding the perception of designers towards a persona based on psychology and market research techniques [35]. Their survey tool consisted of 44 questions covering 11 constructs identified from the literature, and would enable designers or practitioners to validate the quality of personas. This approach may be useful when designers are creating technology for a population similar to themselves but in cross-cultural design it may not be appropriate or may need modifying. For example, it would be hard to rate constructs such as familiarity and similarity for populations that are not similar to the rater.

2.3 Designing for other Cultures

Culture is a complex phenomenon, with many theoretical perspectives and definitions. There appears to be agreement that culture is something relatively stable, accounting for durable differences between societies [30]. Culture refers to the cumulative deposit of knowledge, experience, beliefs, values, attitudes, meanings, hierarchies, religion, notions of time, roles, spatial relations, concepts of the universe, and material objects and possessions acquired by a group of people in the course of generations through individual and group striving [36]. There is evidence to suggest that people from Western and Asian cultures may use different cultural theories to construct and reconstruct their life experiences [37]. Thus culture is an important consideration in the design of technology for a global population and there has been research by the HCI community into cultural aspects of design [38] and evaluation [39].

In evaluation studies of automotive interfaces [40], the UK and India were selected as they were judged to be sufficiently different based upon cultural dimensions proposed by Hofstede [41, 42]. These dimensions were used to frame the evaluation of the interface, with the results highlighting differences based upon power distance and collectivism, but not all the differences identified by Hofstede were revealed. Hofstede's dimensions have also been used to evaluate the interfaces of e-commerce sites across different European countries [43]. However, it is worth noting that Hofstede's approach has come under criticism over the years, as it has been suggested that defining national characters can cause stereotypes to emerge, and a theory that defines culture based upon social structures might be more appropriate [12]. For example, Sahay and Walsham [44] proposed a framework that describes the possible influences that social structures have on the shaping of managerial attitudes in India, and how the structures themselves could be influenced through the role of human agency. Alternatively, a theory such as Schein's Organizational Culture Model [45] may offer further insights, but the 3 categories within this model do not so clearly map onto personas. Any models such as these will have their limitations, yet due to the prevalence of Hofstede's approach in the HCI literature, it is suggested that Hofstede's dimensions may be an appropriate lens to help understand how culture is expressed within personas.

Personas have been used to aid the development of technology and products across cultures (e.g. [46]), but despite this there can be practical issues in the data gathering process to facilitate their creation. For example, to produce a waste management system for a rural village in India researchers used ethnographic techniques by immersing themselves within the village for 3 months [46]. This data gathering process may not be feasible for all designs, thus alternative methods may be desirable. In research by [38], personas were created for entire families rather than individuals to aid the design of a water service for a village in India. This adaptation to the method is rather rare, as personas tend to represent a single user of the system rather than portraying a collection of users. There has also been some criticism of the persona process when used across culture due to its implicit colonial tendency in depicting 'the other' [47]. Thus it is important to ensure there is minimal power distribution when creating personas of different cultures. This highlights the importance of understanding the human, their values and culture when designing technology.

3 Method

3.1 Participants

School children from the UK and India participated in this research study. Ethical approval was sought at both universities involved in the study, and children were informed about the nature of the study prior to the research and at the end, in line with ethical practices outlined in [48]. Within the UK, the participants were a class of 32 children aged 7-9 years old, from one primary (elementary) school in the North West of England. As part of the ethical approval process the head teacher examined the study and agreed that the proposed activity would be appropriate for the age group. The school analysed the study material and sought consent from parents, whilst consent was also sought from the children on the day. The children within this school are predominantly white middle-class children and it was anticipated that this might be reflected within the personas.

The participants from India were from a large school in the North East of India consisting of classes spanning Kindergarten to Higher Secondary. 24 children aged 8-10 participated in the study. Researchers first met school authorities to explain the objectives of their study, and inform them of the nature of the activities that the researchers planned to undertake and of the data collection methods. The researchers took sufficient care to mention confidentiality in data collection. The school authorities were concerned about the careful use of time and of maintaining a conducive child-friendly environment during all the interactions, and so they gave researchers access to the intended group of children for limited durations, which was typically of 40 minutes. Similar to the children from the UK school, all the children were judged to be predominantly middle-class. Two researchers who were experienced at designing with children facilitated the persona creation session within the UK, whilst three designers with limited experience of working with children facilitated the Indian session.

3.2 Apparatus

A persona template for the children to complete was designed in collaboration with their teacher. The focus of the discussion was about the amount of writing that would be realistic for them to complete within the timeframe and the amount of space required for them. The persona template was divided into 5 sections to reflect the activities within the children's lives, see Figure 1 for completed examples from the UK and India.

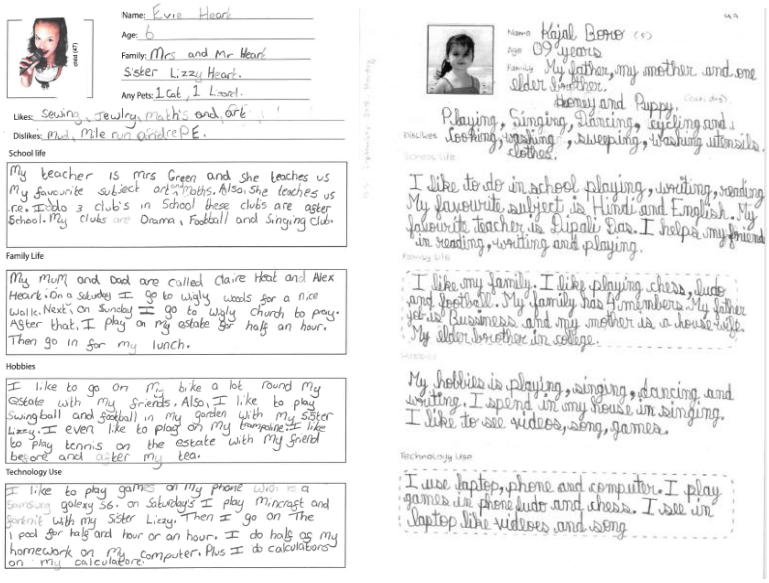

Fig. 1. Example of completed persona template from the UK (left) and India (right).

The first section required children to provide generic demographic data (name, age, family members, pets, likes and dislikes) and select 1 of 50 child images to represent their persona. The next two sections were chosen to aid the understanding of life in school and within their home (labelled ‘school life’ and ‘family life’), whilst the final two sections were selected to reflect the activities the children participate in during their spare time (labelled ‘hobbies’ and ‘technology use’). These sections were identified as being important aspects of children’s lives in which they interact with people and technology and have been the focus of child personas in other research [49, 13]. However, the template was not designed to catch interaction or user goals for a specific scenario, which does mean that empathy within a design scenario may be difficult to measure.

A survey tool was developed based on work conducted by Salminen et al. [35] to evaluate the persona. In Salminen et al.’s work, they note that there is limited research on evaluating personas, but propose a survey tool to measure perceptions of personas based on criteria derived from literature. Our survey consisted of the first four criteria used in Salminen et al.’s study: credibility, consistency, completeness and usefulness or willingness to use. Only four constructs were used as some of the other factors were judged to be inappropriate within the context of this work: for example, it was not felt to be appropriate for adults to rate their interpersonal attraction to a child’s persona, or to judge how similar they felt they were to the children. Each of Salminen et al.’s constructs was evaluated through scaled responses to four questions; only example questions for each construct were accessible at the time of this study, so these were used along with the synthesis of an additional three questions, to produce 4 questions for each construct in line with the original survey tool. These questions were answered using a 5-point rating scale, from strongly disagree to strongly agree. The reliability and validity of the tool was re-established using the same techniques as the original

study [35] with the alpha reliabilities for each construct shown in the analysis section below.

3.3 Procedure

UK School. The study took place in the children's classroom and was scheduled to last one hour. Two researchers who both had considerable experience of working with children and two teachers were present to assist the children. Prior to the children completing the personas, they were given a 10 minute briefing via a PowerPoint presentation consisting of 3 slides. The first slide described what personas are, the second slide introduced the research aims and ethics, and finally a completed persona for a teacher within a fictitious school was shown to enable the children to understand the activity. At the end of this briefing the children were then informed about the ground rules for creating the personas:

- They cannot use real names of children in their school or parents etc.
- They cannot use personal details such as real street names, and therefore the children were asked to base the information on a fictitious village called 'Wiggly Wells' with the children attending Wiggly Wells Primary School.

The children were divided into 4 groups of between 7-8 children based on the seating arrangements within the classroom. Each group would create personas for different ages of children within Wiggly Wells Primary School, so that at the end of the study personas would have been created to represent all the children within a primary school. The first group would create personas for the Reception class and Year 1 (ages 5-6), the second group would be for Year 2 (ages 7-8), the third group Year 3 (ages 9-10) and the final group Year 4 (aged 11). Each child was given a blank template and 50 pictures of children were placed on each of the tables so that the children could select one picture to illustrate their persona. The activity was split into 3 stages, the first requiring the children to complete the first part of the template (select a picture and demographic data). During this stage the researchers and teachers assisted any child who was struggling with any aspect of the process. The biggest challenge during this stage appeared to be the creation of names for either family members or pets, for example one child was struggling to think of a name for a pet rabbit. At the end of stage one, the children were then reintroduced to the types of information that may be included in the school life and family life sections and were given approximately 15 minutes to complete this, and the same process was applied in stage 3 for the hobbies and technology use. During the final two stages the researchers assisted and encouraged the children to complete the personas, as some of the children need encouragement and prompts to expand the information they were writing. For example, some of the children were stating they played a sport but not how often or the position they played and they were encouraged to enhance their personas. To avoid repetition in the final two sections, the children were encouraged not to talk about computer games within the hobbies section and to focus on non-technology based activities such as sporting clubs.

At the end of the session the children were thanked and consent was again discussed with the children to ensure that they did not mind us keeping the personas. The personas the children had created were photocopied by the teachers to give to the children.

Indian School. The same study was replicated within the primary school in India but due to differences in class times the sessions needed to be altered. Three researchers carried out the activity and they worked with 6 children at a time to complete the personas over two 40 minute sessions as it was not feasible to complete the personas in a single class interval of 40 minutes. The decision was also made not to create personas for the younger age range as the teachers felt that they may struggle to complete this task, therefore personas were generated for children in the age range of 8 to 11 years old.

3.4 Analysis

The personas were analysed in three stages. In the first stage, three of the researchers read each persona and rated them based on the survey tool to determine if the individual child could create a realistic persona. In line with the study by [35], Cronbach's alpha reliability test was calculated for each of the 4 constructs. This was to establish whether the survey tool enabled researchers to accurately rate the usefulness of the personas, in order for the first research question to be answered. Without a high consistency score then it would not be possible to infer that the child-generated personas are perceived to be useful.

A high level of reliability was demonstrated for each of the four constructs as shown in Table 1. The decision was made to remove one of the items, 'The picture of the persona matches other information' for the consistency category, as this resulted in an alpha value of <.70 and this may have been attributed to the fact that children had access to a limited selection of pictures.

Table 1. Alpha reliability scores for each construct on the persona evaluation survey tool.

Construct	Items	Alpha
Credibility	1. This persona seems like a real person 2. This sounds like a made-up person to me 3. I could believe this describes a real child 4. The information provided seems realistic	.944
Consistency	1. The picture of the persona matches other information 2. The family information is in line with the other information provided 3. The likes and dislikes do not fit with the rest of the persona 4. The sections seem to connect into a consistent persona	.789
Completeness	1. There is plenty of information about the persona	.972

	2. There is enough information here for me to learn what this person is like 3. This persona seems to be missing useful information 4. The information seems very general and could apply to many people	
Usefulness and Willingness to Use	1. I would make use of this persona in my work 2. I found this persona helpful for understanding a child like this 3. Designers could use this to help them understand children 4. I don't feel I need this information to help me understand a child like this	.977

The next stage of analysis involved two researchers re-examining the personas using conventional content analysis [50]. For each of the sections in the personas, starting with 'school life', each persona was analysed by reading through the comments and generating themes and subthemes. Researchers identified topics that they felt were similar to each other, and themes were created from these. For example, in 'school life' children often commented about their friends; this generated the theme of 'friends', and subthemes emerged within this based on the narratives within the personas. In this example, the subthemes related to 'best friends', 'lots of friends', and 'playing with friends'. During this process the wording of themes was altered in some instances to reflect the inclusion of additional subthemes. An example of this was within the 'hobbies' category, where the theme of 'play' was amended to represent 'outside play' and 'playing indoors'. This approach was continued until the two researchers were satisfied that the themes adequately reflected the persona data for both the Indian and UK child generated personas. After the initial themes were identified, an independent researcher re-examined the data for consistency and one theme was reclassified to better represent the data.

The final stage was to explore representations of culture. Two researchers examined all the personas to identify if any section provided cultural references that could be mapped to Hofstede's dimensions [41, 42] and coded them using the following codes:

1. Individualism (a) vs Collectivism (b)
2. Small Power Distance (a) vs Large Power Distance (b)
3. Masculinity (a) vs Femininity (b)
4. Uncertainty Avoidance (a) vs Uncertainty Tolerance (b)
5. Long Term Orientation (a) vs Short Term Orientation (b)
6. Indulgence (a) vs Restraint (b)

The two researchers examined each of the personas, and if they felt any narrative provided a cultural reference based on Hofstede's dimensions then this was coded to the relevant dimension – for example a code of 3b would relate to Femininity. A frequency count was then performed, to identify how many of the personas incorporated some narrative that matched each dimension.

4 Results

All 56 children managed to complete a persona, with only 1 of the UK personas having a blank section as they ran out of time to complete it.

The results are presented in two sections: the results from the survey tool, followed by the results of the content analysis and cultural analysis.

4.1 Survey Results

In order to answer the question of whether children can produce realistic personas, the survey data was analysed based on the four constructs represented in the survey tool, and the results are shown in Table 2.

Table 2. Means and standard deviations for the four constructs for the UK and Indian personas

	Credibility	Consistency	Completeness	Usefulness
UK	3.75 (.95)	4.05 (.85)	3.06 (1.17)	3.27 (.92)
India	4.27 (.45)	4.04 (.57)	3.61 (.84)	3.5 (.88)

The personas all score above 3, indicating a perceived level of realism in the personas, but the completeness and usefulness and willingness to use scores are lower compared to the credibility and consistency. This could be attributed to the fact that a number of children in the hobbies and technology section purely listed items rather than elaborating on them, which brought these scores down. It may have also been attributed to methodological issues with the template and procedure.

4.2 Content Analysis Results

To explore the differences, the personas were analysed based on conventional content analysis. For the UK personas 11 themes emerged in the ‘school life’ section, whilst for India there were 14 themes. The second section of ‘family life’ had 8 themes for the UK personas and 9 for India, whilst for ‘hobbies’ there were 6 themes for the UK and 5 for India. The final section of ‘technology use’ had 9 themes in the UK personas compared to 5 in the Indian set. The key results are summarised in Table 3 below. Only the subthemes that appeared in more than 40% of the personas are detailed here, to reflect the dominant narrative within the personas. For example, in ‘school life’ a total of 11 subthemes emerged but only 4 of these are presented in Table 3 below. Other subthemes including ‘class’ are not represented in the table, where children were just stating the school class they were in, but all the data was used for comparisons.

In the section on ‘school life’ within the UK, personal traits such as loving school and good behaviour were reflected in the child-generated personas whilst these attributes were not evident in the Indian personas. In addition, 41% of the child personas from the UK attended some form of club before or after school and this was not the case in India with children appearing to go home for lunch. Within the Indian personas

there was more discussion of activities they did during break which are culturally different to the UK, for example ‘eating tiffin’ and ‘playing Kabaddi’.

Table 3. Key themes identified in the content analysis

Persona Section	UK Themes	% of Personas	India Themes	% of Personas
School Life	Favourite Subject	84	Getting to School	100
	Getting to School	44	Favourite Subject	95
	Personal Traits	44	Break	50
	Club(s)	41	Teacher	50
			Play	42
			After School	
Home Life	Activities	63	Parents	100
	Siblings	41	Family Activities	83
	Playing Outside	40		
Hobbies	Sport	91	Indoor Play	83
			Sport	58
Technology	Phone	56	Computer	87
	Tablet	50	Phone	83
	Console	50	Games	62
	Computer	47	Apps	50
	Games	46		

Within the ‘home life’ section all the child-generated personas from India discussed their parents with a strong emphasis on family activities including ‘grandparents telling them stories’, ‘studies with mother’ and ‘playing Ludo with grandparents’; these activities were not evident in the UK personas, which tended to focus on going to church and walking pets. Siblings and in particular ‘playing with’ them was a theme that emerged within the UK personas, whilst there was little mention of siblings in the Indian sets.

In the ‘hobbies’ section, sports dominated the UK sets and also featured heavily in the Indian personas. Football and cycling were mentioned the most in India, whilst football and swimming were most common in the UK. Despite some similarities, the way the children in the UK portrayed themselves was different, with the focus being on being successful. For example, one child stated ‘he plays as a midfielder and he is a goal scoring machine’ and another stated ‘they scored 72 goals for wiggly wells’. Indoor play features in the majority of the personas created by Indian children with activities such as drawing, singing and dancing being incorporated into half the personas.

In the final section of ‘technology use’, the biggest difference was with regards to the access to technology. No children in India had access to games consoles or tablets in any of the generated personas. In the UK personas children tended to focus on the make of the phones rather than the behaviour of the child with the device, which came across more in the India personas. For example, in the Indian personas there was lots of discussion about watching videos on the phones and playing games. The type of games differed between the two groups with Fortnite and Fifa being dominant in the

UK, and games such as Chess, Clash of Clans and GTA being mentioned many times within the India set. The use of apps such as Whatsapp featured in 50% of the Indian personas, but there was no mention in the UK of specific apps being used.

4.3 Cultural Analysis Results

Table 4 below shows the percentage of children in the UK and India whose personas contained aspects relating to Hofstede's dimensions of culture. The columns represent the sections in the personas and the numbers align to Hofstede's dimensions as reported in section 3.4 above. There were no instances in any of the personas of narrative relating to the following categories: Large Power Distance, Uncertainty Tolerance and Long or Short Term Orientation. Examining each persona there was evidence of cultural differences surrounding the dimension of Indulgence in some sections. In the personas generated by the children in the UK, 31% stated in the demographic information that they liked to play games but hated homework, and this was not evident in any of the Indian personas. In 20% of the Indian personas children were portrayed as hard working in the 'family life' section through doing extra studies in the evening, and this did not come across in any of the UK personas. In the Indian personas 95% of the children explicitly stated that they used technology to play games, notably on a computer. This was higher than the UK but this could have been attributed to the way it was coded, as consoles have multiple functionality but it was only coded as Indulgence if the persona mentioned playing games. There were very little cultural differences identified in the 'school life' section of the personas, with activities related to Indulgence (e.g. having fun and playing with friends) being evident in both sets.

Differences were also identified in the dimension of Masculinity. 75% of personas in India demonstrated a Masculine role within the family environment based on gender roles: in these personas the father usually went to work whilst the mother was portrayed as a housewife.

Table 4. Percentage of personas that are mapped to Hofstede's dimensions

Hofstede's Dimensions	UK					India				
	Dem.	Sch.	Fam.	Hob.	Techn.	Dem.	Sch.	Fam.	Hob.	Techn.
1a		9	9					4		
1b		9	37	12	6	4	4	42		
2a			9			4				
3a	9	12	12	31	19	4	8	75	4	
3b		12					4	4	8	17
4a			16	6				4		
6a	31	50	31	6	44	4	29	8	8	95
6b				6				20		

For the Hobbies section, aspects of Masculinity appeared in the UK personas, especially the notion of competition, winning and being the best. For example, one persona

stated ‘Tennis team has won 4 tournaments’ and another stated ‘Plays for Wiggly Wells Primary School FC and was top scorer in club history and league history’. In the final section of ‘technology use’ again there was instances of Masculinity that were not evident in the Indian personas. The UK personas tended to be rather boastful in their ownership of technology, for example one child claimed to have ‘Xbox, Xbox1, iPhone 7, iPhone 6s, PS3, PS4, PS4 Pro, and a TV in his bedroom’ whist this was not evident in the Indian personas as there was no mention of specific devices by names (e.g. iPhone) and there was no game console ownership.

5 Discussion

The first research question aimed to identify whether children could generate realistic personas. A tool was developed based upon research from Salminen et al. [35] and the results indicated that the personas were realistic. Despite this, there were certain aspects in some of the personas that may not have been complete or especially useful based on the ratings from the Likert scale. However, comparing the personas to examples provided within the literature indicated that the detail is comparable to personas generated by children in other studies [13]. Previous work had demonstrated that children in groups could generate a persona [13] and their rationale for using groups was that they might find it easier to create personas with traits similar to their own. In the study presented in this paper, children generated personas individually rather than in a group context and as such a diverse array of personas were generated. This demonstrates that it is possible to use individual children in a facilitated session to generate personas that are perceived to be realistic.

In order to examine the personas a survey-based approach was taken based upon previous research [35]. Although this approach enables a judgement to be made on a number of constructs relating to the quality of the personas it does not offer any ecological validity of their usefulness in the design process. It may be that the information provided in the persona is realistic, but offers very little insight beyond the designers’ existing knowledge of children to help inform design decisions. Therefore, it is questionable whether the approach taken in [35] is completely appropriate for validating personas. The survey tool presented may be most useful in conjunction with other techniques and insights from the designers.

In total, 56 personas were created by the children in the UK and India, and for designers this number is impractical to work with in the design process whereby a small number of personas is usually required to represent the target audience [16]. The analysis of the personas did enable the designers involved in this project to gain insights that could aid the design. Reflecting on the process it was conjectured that through observing the children creating the personas and analyzing the data a greater understanding of children within the UK and India would be obtained. It was also felt that by having access to the persona sets, these could be amalgamated into a small number of personas using affinity mapping [51] or correspondence analysis [18] to form a small number of personas that could represent the users. For inexperienced designers creating products for children the data provided by the children offers awareness of behaviours

and routines that may be difficult to obtain from conventional persona creation techniques such as observations [15].

The second research question aimed to ascertain whether differences could be identified between the two sets of personas. This research highlights that child-generated personas may indeed be useful for designers or developers to understand different populations that they may not necessarily be familiar with. There were clear differences relating to the family, gender roles and the way children in the UK focussed on success and winning in sport. An example of these differences can be found in the Indian personas where children tended to present a list of hobbies without expanding on the details such as '*My favourite hobbies is swimming, dancing, singing and I like to craft.*' compared to the UK children who elaborated on the facts '*Plays for the tennis team in Wiggly Wells. The tennis team has won 4 tournaments.*'.

The use of content analysis was a useful way of capturing and analysing the behavioural differences. For example, within the child-generated personas in India there were games specific to the Asian culture being mentioned such as Kabaddi, and routines around school and family life that were different from the UK children. The parents and family activities played an important role in the Indian personas, for example *'I play cricket with my father. I study with my mother. I ask my uncle when I need something. I do story competition with my grandmother. I say some random stories in the competition. I play "Luka chupi" with my grandfather. My father is a doctor. My mother is a housewife. During holidays, we travel. We also go to my uncle's house. At my uncle's house, I play with my cousins.'* This type of narrative was not present in the personas from the UK. In particular, for the HCI community there were clear differences in the use and access to technology that would influence the design decisions. This has been examined in a range of technology contexts such as security [52] and education [53] but little focus has been paid to design with and for children. The UK personas had a strong emphasis on Apple products, in particular phones and tablets. From the current and previous projects working with middle class families in India, observations suggest that tablets have not become mainstream and games consoles are rare. These are important factors that would need to be considered and identified if developing for both cultures.

Although the content analysis method enabled similarities and differences to be identified, this approach alone may result in an incomplete picture of the differences being documented. When examining the persona sets, other subtle differences were observed that did not fall into the categories. One such observation was the fact that children in the UK tended to specify the timings of events and activities, for example '*Trains 2 days a week, Mondays and Thursdays. Does Spanish on Thursday at 5pm – 7pm.*' and from another persona '*After that, I play on my estate for half an hour. Then go in for my lunch.*'. Timings were not evident in the personas created by Indian children. It may be that this is a cultural difference as India is perceived to be a past orientated society and as such are rather relaxed about timings [54]. Culture is an important consideration and there are different theoretical perspectives relating to culture and within the personas it is an important factor to consider if personas were to be aggregated or used to aid design decisions. Although Hofstede's dimensions have been criticised [55], within

the context of the work presented in this research it highlights that child-generated personas may indeed be useful for designers or developers to understand cultures that they may not necessarily be familiar with. For example, Masculinity differed between the two groups especially around family life. In India the women were often portrayed as staying at home whilst this was not the case in the UK. However care needs to be taken to ensure that the personas do not stereotype a population [29, 56], as it may be that this portrayal of family life is not reflected in other parts of India or the UK.

When comparing results and interpreting the data it is important to consider the methodological limitations and differences to determine how these may have impacted on the results. First, there were clearly time differences between the duration of the study in India and the UK that could have affected the detail provided by the children in the personas. Due to the different time requirements of classes, the UK children completed the personas in a 1 hour session, whilst the children in India completed them in two 40 minute sessions. The facilitators in India also worked with two children at a time so could more easily prompt the children, whereas in the UK the whole class was creating the personas simultaneously. Although no analysis was performed on the number of words generated, both sets of personas tended to provide a similar level of detail on the last two sections of 'hobbies' and 'technology use'. The children may have struggled to expand on these sections without additional support but it is unlikely to be related to fatigue as the children in India completed these sections in the second session after a break. It was observed that some of the children in India struggled to write and expand on points, as they were concerned with inaccurate spelling of words. This factor was not shown in the UK, where the children instead spent considerable time worrying about what name to give to pets and family members and this slowed the process down. In the analysis of the personas using the survey tool, one of the constructs related to completeness, with a question on whether enough detail was provided. It is worth noting that the template used may have had an impact on the amount of detail provided. Although this was designed in consultation with the teacher, it had limited space for writing, and the size of the children's handwriting may have affected the level of detail. Some of the children in the UK drew lines in the boxes and wrote several lines whilst others would fill the box with one or two sentences, whereas in contrast the children in India asked for a separate piece of paper if they filled the box and this was not the case in the UK.

6 Conclusions

This study aimed to investigate two research questions, the first of which was whether children in the UK and India could generate realistic personas. In total 56 personas were created by children. The personas were analysed through a survey tool that demonstrated a high level of perceived realism based on four constructs: Credibility, Consistency, Completeness, and Usefulness or Willingness to Use. For designers this method may be useful, as the children could create detailed personas that could aid the decision making process or be used to synthesize a small number of personas. The advantage of this is that it mitigates some aspects of the data collection process that have

been traditionally used in persona creation, such as interviews, which may be time consuming.

The second research question aimed to determine whether differences could be identified within the narratives in the personas. Using content analysis the 56 personas were analysed. The results highlighted a number of differences related to aspects such as gender roles, competition and expectations around study. To analyse differences it is important to examine the data through multiple lenses, as a single method may not be able to distinguish some important differences such as culture.

To conclude, child-generated personas can be a viable method to aid designers and developers understand children within the context of design. When the project is across cultures, child-generated personas can offer insights that may aid the decision making process.

Further research will aim to refine the methodology for creating the personas by examining the impact the template has on the level of detail the children provide as well as exploring additional methods for eliciting responses from children. The personas will also be re-examined to identify segmentation techniques that will enable a useful number of personas to be selected. The designers in India and the UK will create a subset of personas for their country and these will be evaluated for consistency across the project team. This subset of personas will then ultimately be used to inform the design of the technological solution to reduce plastic consumption. Finally, future work will also then be able to reflect on the use of these personas in the design.

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