Exploring MECS User Personas

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Contents

1 Introduction

1.1 It's about people

At the heart of MECS is the idea that we will be addressing the real needs of the 3 billion who are still cooking with biomass with all the associated problems of health, environment, climate change and livelihood burdens. Headline figures are being used to suggest that 2 billion people have access to electricity and yet continue to cook with polluting fuels. These are very big numbers! Working with '2 billion' is not going to be very nuanced. So how can we sub divide the 2 billion in a way that meaningfully affects user design?

To make life more complicated, we have acknowledged in most of the MECS writing that cooking is a deeply cultural activity and we need to take this into account. You don't mess with people's cooking! So again, the question – how can we reduce the challenge to manageable user design?

The traditional way to disaggregate potential users is by their key demographic characteristics – gender, age, education, size of household, poverty indicators (indeed, all data in this programme must be gender disaggregated – it is a condition of UK Aid). However, these statistics say nothing about cultural differences between different groups and geographies. Are the households conservative and religious, do they adhere tightly to traditions, or has their migration to urban settings with the associated exposure to global media made them cosmopolitan with aspirations to be 'modern'?

There is then, a need to try to differentiate between different segments of users. While demographic data can give a good start, there is a danger that it leads to a very two-dimensional portrait of users. Designers are increasingly using personas and archetypes to create a more three-dimensional picture of potential users (the exact differences between personas and archetypes is debateable - an archetype is said to be a real person who is a typical user of a service, while a persona is a detailed description of a fictious person that is based on behaviours, attitudes and segmentation data of real people and users). We will use personas as the profiles in this document are fictitious, albeit based on data gathered by the MECS programme.

The three-dimensional nature of personas is unashamedly intended to create empathy of the design team with users. It brings users to life, along with their needs, struggles, hopes and dreams. There are a number of approaches to creating personas (archetypes), and the MECS team have already attempted to create some based on existing knowledge about the DFID priority countries.

For example, in the Life Cycle Analysis, the environmental impact of using electricity generated from solar power (e.g. autonomous solar home systems) will be different to using electricity from a national grid fed by coal fired power stations. The Environmental LCA describes 'user stories':

- User story, option 1: Zambia/Myanmar, peri urban weak grid, with lithium ion, simple pressure.
- User story, option 2: Kenya, rural, EPC, fuel stacking with mini-grid, lithium ion, simple pressure cooker.
- User story, option 3: Tanzania, rural, PV solar cell, Lithium ion, hot plate.

In another example the Loughborough geographers in 2015 highlighted household energy access characteristics (in terms of electricity supply and choice cooking fuels) that would be well suited to substitution with electric devices .

> *"Brown et al (2015) compares the level of electricity access with the level of cooking energy access in an effort to discretise the continuous population and identify which households are most likely to transition to eCook. Of course, this is a gross over-simplification of reality that does not take into account fuel-stacking, or people who have adopted a particular technology, but are unable to keep up with its ongoing costs and are therefore unable to benefit from it. However, the table is merely meant to provide a way*

of grouping people who have something in common so that we can focus on their behaviour momentarily, before returning to the chaotic textured reality." (Brown & Leary (2015)[1]

And in the last few months the (electrical) modellers group have proposed a methodology for devising 'scenarios', in which different devices might be used and different business models might be appropriate. A matrix of parameters proposed for this approach is presented. One parameter in this matrix approach refers to different sizes of grids:

- national grids,
- weak national grids
- islanded or limited infrastructure grids,
- solar home systems.

The innovations team have taken a similar technology centric approach, but based on mapping socio-technical innovation systems around specific clean cooking technologies.

1.2 Using the choice modelling data

In this paper, we try to approach the challenge by using data from the Choice Modelling surveys. This paper explores a limited number of personas (archetypes) based on consumers that have been surveyed in six countries using the discrete choice modelling surveys:

- Ghana
- Kenya
- Tanzania
- Uganda
- Zambia
- Myanmar

The personas do not represent all potential groups of consumers because they are based only on the data available from these convenience samples.

Having proposed a set of personas, the paper goes on to present the characteristics of each, the cooking practices of each (e.g. meals, fuels), the attitudes of each towards fuels, and then to explore the preferences of each. Details of the choice modelling methodology are given in another paper, but the choices were divided into three design domains, each with 4 or 5 parameters, which are given in Annex B. Note that while the names, family members and jobs are fictitious, all of the remaining descriptive text on education, household construction, cooking practises etc. is based on findings from an analysis of the DCE data. The purpose of the paper is to illustrate the insights that can be extracted from data using a UX type of approach based on personas[2].

[1] Brown E., and Leary J (2015) A review of the behavioural change challenges facing a proposed solar and battery electric cooking concept.

[2] N.B. UX research tends to be qualitative only, using rapid assessment techniques. Our analysis is possibly innovative in applying the archetypes thinking to quantitative data in large data sets. Anybody aware if this has already been done?

Table 1 – Categorisation of potential eCook adopters according to existing levels of energy access and assessment of each sector's likelihood of adoption.

Transition to eCook very unlikely
Transition to eCook challenging as many barriers to address
Transition to eCook possible if several barriers are addressed
Transition to eCook likely if several barriers are addressed
Transition to eCook likely if key barrier addressed

		Current access to electricity			
		None	**Off-grid/isolated systems, e.g. Solar Home Systems (SHS)**	**Unreliable national grid or mini-/micro-/nano-grid**	**Reliable national grid supply**
Current Cooking appliance	3 stone fire or traditional stove Solid fuel collectors	**Least likely** to transition, as technical, financial and cultural barriers greatest.	Transition to PV-eCook **possible** with locally appropriate delivery model, awareness raising showing health benefits & innovative financing*. **No obvious financial substitution**.	Transition to B-eCook **possible** with locally appropriate delivery model, awareness raising showing health benefits & innovative financing*. **No obvious financial substitution**.	**Battery not required** from end-user perspective***. Transition **very unlikely** - households have currently chosen time based collection rather than cash expenditure on energy.
	3 stone fire or traditional stove Solid fuel purchasers	Transition to PV-eCook **possible** if technical training on PV systems, innovative financing*, awareness raising showing health benefits & locally appropriate delivery model offered.	**Likely** transition to PV-eCook with locally appropriate **delivery model**, **awareness raising** showing health benefits & **innovative financing*** as **fuel payments can offset cost**.	**Likely** transition to B-eCook with locally appropriate **delivery model, innovative financing***, **awareness raising** showing health benefits as **fuel payments can offset cost**.	**Battery not required** from end-user perspective***. **Possible** transition to eCook with innovative financing*, battery subsidy, locally appropriate delivery model & awareness raising showing health benefits.
	Improved Cookstove** Solid fuel collectors	Transition to PV-eCook **challenging** as technical training on PV systems locally appropriate delivery model & innovative financing*. No obvious financial substitution possible.	Transition to PV-eCook **possible**: locally appropriate delivery model, awareness raising showing health benefits & innovative financing* required. **No obvious financial substitution**.	Transition to B-eCook **possible**: locally appropriate delivery model, awareness raising showing health benefits & innovative financing* required. **No obvious financial substitution**.	**Battery not required** from end-user perspective***. Transition **very unlikely** - households have currently chosen time based collection rather than cash expenditure on energy.
	Improved Cookstove** Solid fuel purchasers	Transition to PV-eCook **possible** if technical training on PV systems, locally appropriate delivery model, awareness raising showing health benefits & innovative financing* offered.	**Most likely** to transition to **PV-eCook** as **fuel payments can offset cost**. Requires locally appropriate **delivery model** & **innovative financing***.	**Most likely** to transition to **B-eCook** as **fuel payments can offset cost**. Requires locally appropriate **delivery model** & **innovative financing***.	**Battery not required** from end-user perspective***. **Possible transition** to eCook with locally appropriate delivery model, innovative financing*, battery subsidy & awareness raising showing health benefits.
	LPG/Biogas**	Already have access to other forms of modern energy, but **relative monetary/time costs of fuel** may drive transition to eCook. Needs technical training on PV systems, locally appropriate delivery model & innovative financing*.	Already have access to other forms of modern energy, but **relative monetary/time costs of fuel** may drive transition to eCook. Requires locally appropriate delivery model & innovative financing*.	Already have access to other forms of modern energy, but **relative monetary/time costs of fuel** may drive transition to eCook. Requires locally appropriate delivery model & innovative financing*.	**Battery not required** from end-user perspective***. Already have access to other forms of modern energy, but **relative monetary/time costs of fuel** may drive transition to eCook if locally appropriate delivery model, innovative financing* & battery subsidy available.
	Electricity	N/a	Already using a form of PV-eCook. If these people exist, they warrant further study.	**Likely** to transition to B-eCook, which offers superior **reliability**. Requires locally appropriate **delivery model** & **innovative financing***.	**Battery not required** from end-user perspective***. Uptake of eCook **only possible if battery cost subsidised**.

Assumptions - *For some market segments eCook equal or less than current expenditure. ** User may be aware of health benefits having made transition to ICS/LPG/biogas. *** Battery only needed for national grid level system optimisation - load balancing and peak load reduction.

Cradle to Gate									Use	End of Life		
Geography	Location	Cooking Applicance	Cooking Appliance power requirement	Power source	Battery Type	Insulation Type	Local availability of raw materials	Local availability of appropriately skilled workforce	Cooking profile	End of Life options - Cooking appliance	End of life options - Battery	End of life options - PV grid
Kenya	Rural	EPC simple		Grid	Lead acid fluid/gels	Natural fibres (e.g.wool etc)	Within 10 miles	Within 10 miles		Repaired and reused	Materials recovered and recycled	Repaired and reused
Tanzania	Peri-Urban	EPC complex (wifi enabled)		Mini Grid	Lithium ion	Man-made insulation	Within Region	Within Region		Used for parts	Hibernated	Used for parts
Zambia	Urban	Hot plates		Weak Grid	Lithium iron-Phosphate		Within Country	Within Country		Materials recovered and reused	Landfilled	Materials recovered and recycled
Myanmar		Insulated devices		Solar	Nickel Magnesium					Materials recovered and recycled	Dumped	Hibernated
					Salt water					Hibernated		Landfilled
										Landfilled		Dumped
										Dumped		

Figure 1 Scenario Matrix (S2A Associates)

2 Methodology

The type of access to electricity appears to be a common theme that is part of all of the categorisations proposed to date. The analysis has, therefore, been conducted exploring the following starting points for the personas, proposed on the basis of access to electricity:

1. Isolated (no electricity)
2. Communal supply (island grid)
3. Weak national grid[3]
4. Strong national grid – small family
5. Strong national grid – large family

Given that most of the DCE surveys were conducted in urban and peri-urban areas, a large proportion of respondents were connected to the national grid, so this category has been sub-divided. It was sub-divided on the basis of household size because we suspect small households (typically young professionals?) may have distinct cooking behaviours.

Households already equipped with solar home systems (SHS) would appear to be a good fit for eCook, because PV-eCook can take advantage of the technical knowledge transfer and consumer awareness of electricity. However, this has not been included in this set of personas because surveys conducted to date have captured only small numbers of SHS users.

Data from each of the six country surveys were compiled into a single dataset. Overall, 186 respondents could not be categorised into any of these personas for one of two reasons: either they did not specify their electrical connection, or were national grid users but didn't provide details on the quality of their connection. The numbers of cases in each persona category is given in Table 2.

Table 2 Personas

	Frequency	Valid Percent
Isolated (no electricity)	110	9.1
Communal (island grid)	42	3.5
Weak national grid	321	26.6
Strong national grid - small family	300	24.8
Strong national grid - large family	436	36.1
Valid Total	1209	100.0
Missing	186	
Overall Total	1395	

When looking at the distribution of cases from each country (Table 3), differences in the communities sampled are evident. For example, households with no connection were mostly found in Tanzania and Zambia. Household connected to mini-grids were almost exclusively found in Myanmar. National grids in Kenya and Uganda were strong (few people were categorised as having a weak connection).

Table 3 Persona by Country

	Country						Total
	Myanmar	Ghana	Kenya	Tanzania	Uganda	Zambia	

[3] A grid connection was classified as weak if respondents reported experiencing blackouts twice a week or more on average.

Isolated (no electricity)	2	4	1	36	22	45	110
Communal (island grid)	24	0	1	16	1	0	42
Weak national grid	50	119	17	76	14	45	321
Strong national grid - small family	10	49	115	5	95	26	300
Strong national grid - large family	23	78	72	27	165	71	436
Total	109	250	206	160	297	187	1209

Nevertheless, despite obvious cultural differences between countries, there is remarkable consistency across the data sets, not only in terms of the basic demographic descriptors, but also in the attitudes and outcomes of the choice modelling.

From this clustering of data we describe five personas, using the data to construct the narrative. To keep the document readable, the data is presented at the end (Annex A), and we have not kept to the typical academic style of making a statement and then justifying it with bracketed numbers. Anyone wishing more detail can ask the authors.

3 Proposed personas

3.1 The Isolated pioneer

Prisca

Prisca lives with her three daughters and her mother in a rural village with no electricity supply. This is a relatively large household size.

She completed her primary education before leaving school to work in the local market.

The family live in a small house built with cement block, with a corrugated iron sheet roof, but a dirt floor, which means her household is classified as deprived. One of the girls fetches water from a borehole every day.

Like most people in the village, Prisca owns a mobile phone, but only a basic phone, she uses it sparingly and has to pay to get it charged from a local shop. She doesn't use mobile money and she has never used social media or the internet.

Cooking practice

They cook 3 meals a day plus morning snack (tea), especially during the school holidays. Prisca does most of the cooking, although her mother will sometimes cook. They cook on a basic stove, which is their only cooking device, using only charcoal. Sometimes they use the stove outdoors, and sometime inside the kitchen, depending on what is being cooked and the weather.

Beliefs on fuels

She is not really aware of LPG, so has no opinion on whether it is safe or not, but she thinks that it is readily accessible although it is also expensive. She feels that Although wood is neither safe nor convenient, but it is the most readily available fuel. The down side of using charcoal is that it is often not available, but it is convenient, and she believes that it makes food taste better. However, she does understand that smoke is a health problem. She would be unwilling to use electricity for cooking as she believes it is too expensive.

3.2 Communal energy pioneer

Nang Cham

Nang Cham lives with her husband, their only daughter, and parents in a rural village. She completed only primary education before leaving school to work with her parents on the farm.

They live in a house with a cement floor, and corrugate iron sheet walls and roof. They collect rainwater in a plastic barrel fed from the roof, which means her household is classified as deprived in terms of a poverty index.

The mini-grid does not provide electricity 24 hours a day, but is reliable enough to charge her smartphone, which she owns herself and uses only once or twice a day. She uses social media on her smartphone, but does not otherwise use the internet. Nether does she use a mobile money service.

Cooking practice

She cooks 3 meals a day and occasionally prepares a morning snack (tea). She does almost all of the cooking herself. She cooks on two basic stoves, using mainly wood, but sometimes she will use charcoal. Although most women in the village cook outdoors if they tend to use wood, her house has a small kitchen area, so she is able to cook indoors.

Beliefs on fuels

Even though she uses wood, she feels it is not safe and it is expensive, but it is the most readily available fuel. On the other hand, charcoal is difficult to get hold of. They feel that LPG is readily accessible but choose not to use it.

Although she uses wood, she feels strongly that it is harmful, and even more strongly that smoke is a health problem. She has neutral views on whether charcoal is convenient or makes food taste better, but does recognise that it is harmful to health. She has friends who LPG so she doesn't really believe it is too expensive, but she does strongly believe that electricity is expensive.

3.3 Weakly connected pioneer.

George

George is a widower who lives in town with his three boys. After secondary school he went to technical college to train as an electrician and he now works for a small building company.

They live in a cement block house with cement floors and a corrugate iron sheet roof. The house is connected to a national grid supply but it is frequently cut off. The landlord did a poor job of wiring the house, using sub-standard wiring, which restricts what can be plugged in safely. There is no standpipe nearby, so he sends one of the boys out to buy water sachets from the corner shop every other day. This means that the household is classified as deprived.

Like most people in the neighbourhood he owns a smartphone which he uses intensively, mostly for work. He also uses both social media and the internet, mostly for buying materials and advertising himself for work. He also uses mobile money service most days for paying for materials and getting paid.

Cooking practice

Although George tends to buy lunches for himself on site, his sister lives around the corner and comes in to cook lunch for the boys most weekdays. They cook using charcoal on a single basic stove. Many of his neighbours cook with LPG, but George feels he can't afford the cylinder. He shares a compound with a few other small houses, and this is where they cook.

Beliefs on fuels

He uses charcoal because it is relatively easy to buy, it is convenient to cook with, and makes food taste better, even though does recognise (weakly) that it is harmful to health. He doesn't use LPG because his friends' experience is that it is difficult to get hold of, and he believes it to be expensive. Although wood is the most readily available fuel, he chooses not to use it because it is unpleasant, he believes it is harmful to health and smoke is a health problem. Even though some of his neighbours use electricity for cooking, he strongly believes it is expensive.

3.4 Connected and busy

 [4]

Anne and Mark

Anne and Mark live in a flat near the downtown areas with their new daughter. Anne is a university graduate and now works in an office for an insurance company.

Their flat has cement block walls, cement floors and celling, and piped running water, so it is classified as non-deprived. The flat has a good quality electricity supply, fed through a meter in their flat.

Anne owns her own smartphone, which she uses intensively every day, mostly for keeping touch with friends and family (and advice on how to look after the baby). She makes extensive use of social media and the internet for personal communications, but also uses the internet at work. Although she has a bank account, she uses mobile money most days just because it is easier.

Cooking practice.

She only cooks two meals a day, as she is able to leave the baby with a carer while she goes to work. Some of the other flats in her block are owned by men who will cook for themselves, mostly using gas. Her flat is a bit small with a tiny kitchen so she cooks on a single hob gas stove.

Beliefs on fuels

She uses LPG because it is reasonably priced, it is safe to use and, living in a more urban environment, it is reasonable easy to get hold of. She also feels that charcoal is just as easy to get hold of and is convenient to cook with. Her choice to cook with LPG is part of a modern lifestyle, but there are practical difficulties of using charcoal in a flat, and she does recognise that smoke is a health problem, even though she is not really convinced that charcoal (or firewood) is harmful to health. Although wood is the most readily available fuel, even in an urban environment, she chooses not to use it. Even though some of their neighbours cook with electricity, she strongly believes it is too expensive.

[4] Picture credit Ngware Mburu

3.5 Connected but sceptical

Jonah and Eve

Jonah and his wife, Eve, live with their three children in a small house in suburbs of the capital. After secondary school, he left to join the army before becoming a police officer.

Their house has cement block walls, cement floors, cement roof tiles, and a standpipe in the yard, which they share with a few other houses. The house has a good quality electricity supply, fed through their own meter. The house is classified as non-deprived.

He owns a smartphone, which he uses intensively every day. Although he uses his phone to access social media quite a lot, he doesn't use it for the internet. He does use it to make mobile money payments, but only rarely when it is easier to do so.

Cooking practice

They usually cook four times a day, only because his wife cooks lunch and tea for the children, and then prepares a second evening meal which she shares with Jonah later in the evening. They cook with both charcoal on a basic stove and a single hob LPG stove. Although the house has a small kitchen, his wife sometimes prefers to cook outside.

Beliefs on fuels

Even though they use LPG for some cooking tasks, they feel it is a bit expensive, and they feel that LPG is not safe, whereas they are confident that both charcoal and wood are safe. The main reason they like charcoal is because it is convenient, and it also makes food taste better. Even though they recognise that smoke is a health problem and they believe that firewood is harmful to health, they do not feel that charcoal is harmful to health.

Although wood is the most readily available fuel, even in an urban environment, they choose not to use it. Although some of their neighbours cook with electricity, they believe electricity is expensive.

4 Preferences from the DCE experiments

4.1 Design domains

An analysis of preferences in each of the design domains has been carried out for each of the personas – the results are summarised in Table 4. One of the interesting findings is the high degree of consistency across the personas:

- Cooking processes: all personas would like a cooking device that can both boil and fry, and a device with a lid (not sealed), and cost is important to all personas.
- Stove: all personas would like a cooking device that can cook for large numbers of people (e.g. 8, rather than 4). They would prefer not to cook with firewood smoke or charcoal smoke, but their aversion to charcoal smoke is weaker. Portability and cost are important to all personas.
- Functionality: all personas would prefer to pay by instalments (lease model) rather than simply make ongoing monthly payments (utility model). Cost is important to all personas.

When it comes to designing devices (and marketing messages) for specific sub-groups, the nuanced differences between personas can be of interest:

Cooking processes:

- Power (speed of cooking) is important to those with a weak grid connection, and to small families (strong grid);
- All personas except isolated would actually prefer a device that does not give a smoky flavour to the food, which is really interesting, given that all personas said they felt that food tastes better when cooked on charcoal (Table 23). We think this reveals a cultural social norm that traditional cooking gives a better flavour (evidenced by animated discussion in focus groups), yet it is not actually important to people, except possibly lower status consumers.

Stove:

- Even though most people in the isolated persona group have only a single cooking device, they do not express a preference for a device that can cook all of their food, which implies that, if they get an additional device, they would expect to stack it with their existing device(s). In contrast, people fitting the Communal persona wold prefer a device that can cook all of their food.

Functionality:

- People fitting the Isolated persona would be just as happy with a simple hob, rather than a device offering lights, phone charging or TV. In contrast, the grid connected small family expressed a strong preference for all of these additional functions.
- Most personas expressed a preference for a device that could cook on all days, irrespective of the weather. The strong grid small family persona was the odd one out, reflecting multiple appliance ownership, and an ability to adapt cooking practices to different fuels and appliances.
- Having a device that is easy to clean was not important to isolated and weak grid personas.
- Only personas with a strong grid connection had a stronger preference for a 6 year lease over a 3 year lease.

Table 4 Binary logistic regression on each persona

	Persona									
	Isolated (no electricity)		Communal (island grid)		Weak national grid		Strong national grid - small family		Strong national grid - large family	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Cooking processes										
CP Cooking	.486	.002	1.236	.000	.917	.000	.749	.000	.677	.000
CP Speed Med	-.076	.692	-.458	.191	.284	.017	.014	.894	-.235	.011
CP Speed Fast	.271	.175	-.250	.460	.781	.000	.210	.045	-.015	.867
CP Flavour	-.086	.613	-1.068	.000	-1.023	.000	-.442	.000	-.593	.000
CP Pot Lid	.686	.003	1.278	.003	.967	.000	.640	.000	.704	.000
CP Pot Sealed	.121	.543	1.035	.006	.103	.394	.215	.049	.030	.753
CP 2 hob	.452	.010	.580	.062	.595	.000	.510	.000	.620	.000
CP 4 hob	.414	.043	-.414	.302	.043	.738	.317	.006	.453	.000
CP Cost	-1.603	.000	-.773	.003	-.490	.000	-.668	.000	-.936	.000
Stove design										
ST People 6	.245	.268	.838	.119	.368	.004	.153	.154	.276	.004
ST People 8	.527	.006	2.136	.000	.746	.000	.485	.000	.903	.000
ST Some Cooking	-.246	.247	.314	.548	-.314	.011	-.170	.110	-.026	.783
ST All Cooking	.221	.313	1.237	.009	.274	.029	-.172	.113	.216	.019
ST Wood Smoke	-.910	.000	-3.089	.000	-1.283	.000	-.813	.000	-.751	.000
ST Charcoal Smoke	-.488	.037	-2.100	.000	-.307	.018	-.359	.001	-.206	.028
ST Portable	.451	.009	1.062	.005	.777	.000	.562	.000	.669	.000
ST Looks	.203	.237	-.184	.649	.018	.857	.188	.025	-.031	.667
ST Cost	-.816	.000	-1.587	.014	-.655	.000	-.716	.000	-.605	.000
Functionality										
FU LED	-.058	.798	-.104	.780	.107	.496	.420	.021	.086	.476
FU Mob	.330	.191	.470	.249	.506	.004	.980	.000	.457	.000
FU TV	.459	.063	1.194	.005	.445	.008	.855	.000	.576	.000
FU Available	.931	.000	1.408	.000	1.367	.000	.103	.415	.273	.001
FU 6yr	.883	.000	1.194	.000	.530	.000	.946	.000	.807	.000
FU 3yr	.941	.000	1.252	.000	.618	.000	.790	.000	.797	.000
FU Cleaning	-.059	.725	1.048	.000	.040	.729	.520	.000	.318	.000
FU Cost	-1.317	.000	-.833	.000	-.797	.000	-.989	.000	-.657	.000

4.2 Purchasing preferences

Respondents were asked who would make decisions regarding the purchase of a cooking item (a cooking stove), and a technology type of item (a solar panel). For both decisions, the odd persona out was the gird connected small family. Decision making in these households appeared to be more of an individual rather than a shared responsibility. The proportion of respondents saying they would make a joint decision was lower than in the other personas, and the proportions saying that the head of household would make a decision alone (both male and female) were higher. N.B. this persona is drawn mostly from Myanmar and Tanzania.

When asked about paying in instalments, all personas expressed a preference for this payment mechanism over simply paying up front. However, families with a strong grid connection were more likely to feel they were able to pay up front. When asked about the frequency of payments, isolated and communal personas had an equal preference for monthly and quarterly payments, but grid connected personas had a stronger preference for monthly instalments.

When asked how many people would switch to using a modern cooking fuel if it were the same cost as their current fuel, most respondents across all personas said ‘most’ people would switch. However, responses were weaker among respondents with a strong grid connection. This suggests that resistance to change might be higher among these groups (further research is needed to explore that the reasons for this might be).

5 Cooking energy consumptions and costs

Although the primary objective of the DCE surveys was to understand preferences relating to various aspects of a cooking device, surveys were also used as an opportunity to gather a limited amount of data on household cooking practices. This includes data such as number of meals, cooking devices, and choices of fuels, which have been used to help describe each of the personas above. Respondents were also asked for details of how much of each cooking fuel they consumed, and how much they paid for it. The breakdown of fuels used by households in each persona (Figure 2) are reflected in the persona descriptions above. The monthly expenditure on all cooking fuels used has been calculated for each household. The cumulative distribution curves for each persona are presented in Figure 3. This shows that half of most personas spend more than 10 GBP/month on fuels. Only 25% of small families with a strong grid connection lay more than this amount, which makes sense given that they are cooking for smaller numbers of people. Only 20% of isolated households pay more than 10 GBP/month, which reflects lower charcoal prices in rural areas, and the ability to collect at least some firewood for free.

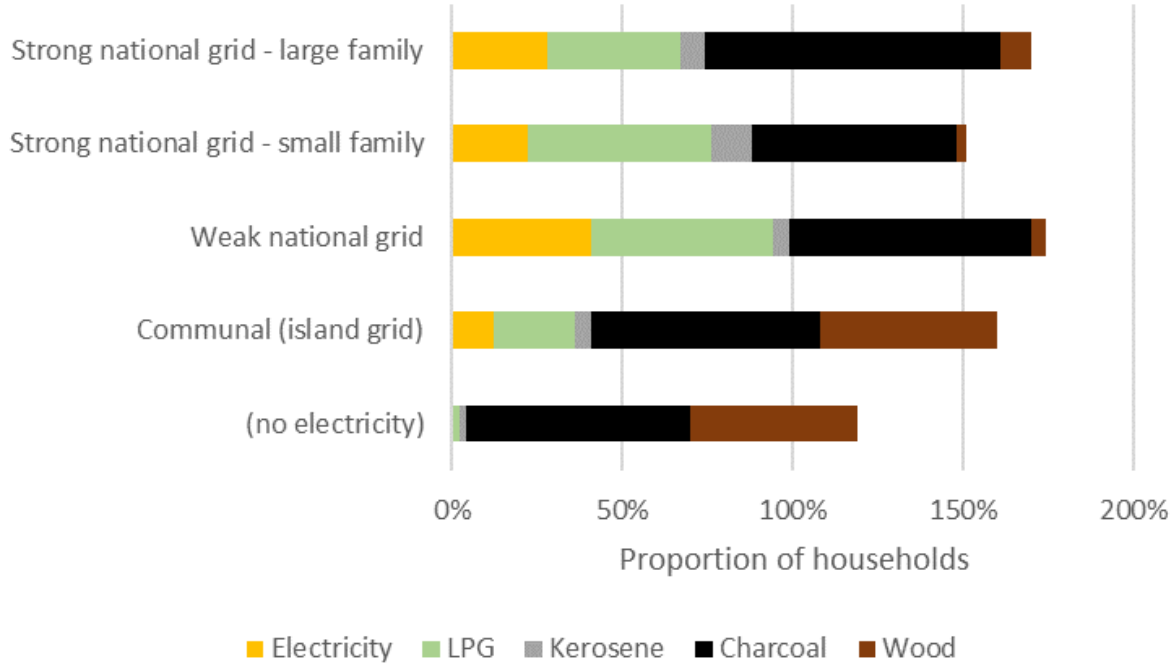

Figure 2 Breakdown of fuels used for cooking[5]

[5] N.B. households use multiple fuels, so total sum to more than 100%.

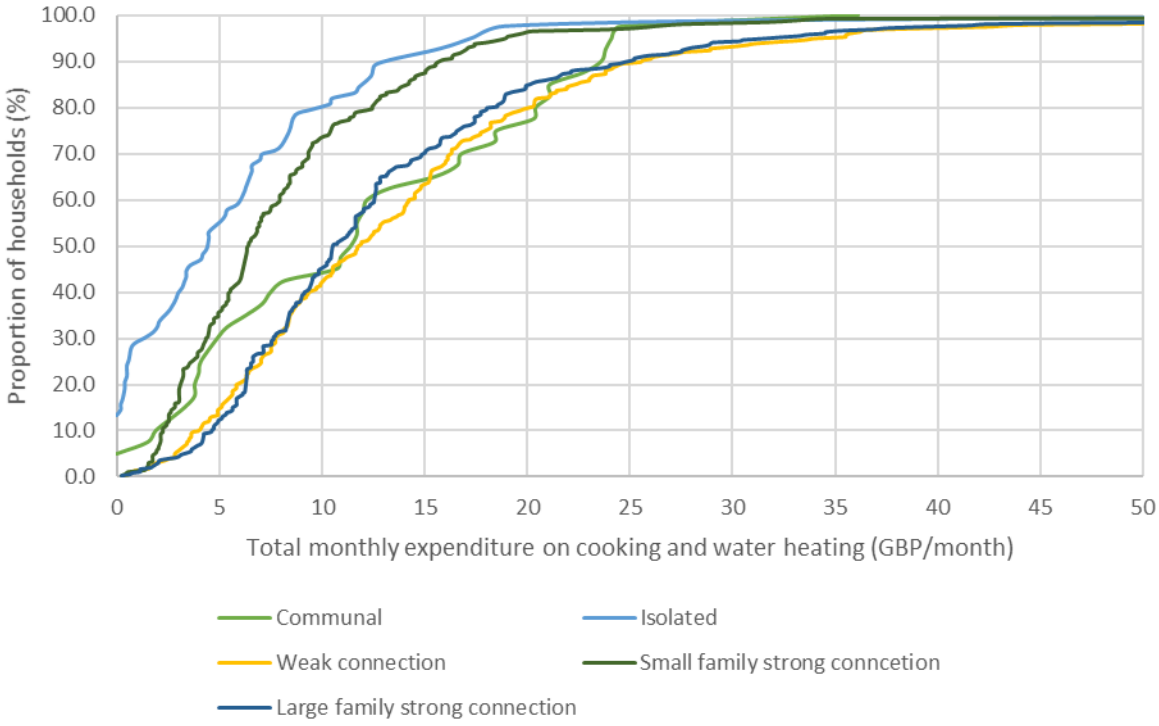

Figure 3 Monthly expenditure on fuel by persona (GBP/month)

6 Conclusions

The use of the choice modelling data to create personas is intended to ensure that any innovation and design of technology in MECS firmly keeps the user central to the process.

This first working paper on the subject is intended to start discussion, and to help the various teams refine their thinking. It is possible to create a different set of personas using different criteria, and the paper illustrates the level of insights into both design preferences and cooking behaviours that can be mined from the DCE survey data.

Annex A data tables

Household descriptors[6]

Table 5 Settlement type

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
rural	72	40	16	46	46	220
peri-urban	2	0	19	6	19	46
urban	36	2	285	248	371	942
Total	110	42	320	300	436	1208

Table 6 Household size

	Persona			
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid
Mean	5.32	4.64	4.40	4.24
Median	5	4	4	4

Table 7 Highest level of education attained

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
None	15	2	9	11	10	47
Incomplete primary	16	1	9	9	31	66
Completed primary	43	18	35	22	51	169
Incomplete secondary	25	2	47	46	98	218
Completed secondary	8	3	108	96	138	353
Higher than secondary	3	15	112	116	108	354
Total	110	41	320	300	436	1207

[6] Shaded categories represent those classified as deprived, for the purposes of creating a poverty classification.

Table 8 Dwelling construction – floor material

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
Dirt/ Mud/ Dung	54	5	1	3	5	68
Cement screed	50	17	176	202	298	743
Tiles	3	1	126	86	114	330
Wood/ Bamboo	1	0	1	3	2	7
Other	1	19	17	6	15	58
Total	109	42	321	300	434	1206

Table 9 Dwelling construction – wall material

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
Wood/ mud/ thatch	27	15	14	10	18	84
Mud bricks (traditional)	33	7	6	7	4	57
Corrugated iron sheet	1	8	4	8	16	37
cement block	42	4	277	222	321	866
Bricks (burnt)	6	7	19	51	74	157
Other	0	1	1	1	1	4
Total	109	42	321	299	434	1205

Table 10 Dwelling construction – roof material

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
No roof	0	0	0	1	0	1
Thatch/ palm leaf	22	8	0	0	0	30
Wood	4	0	1	5	4	14
Corrugated iron/ cement sheet	76	34	296	260	399	1065
Cement	1	0	17	29	14	61
Tiles	0	0	3	3	8	14
Other	6	0	4	2	8	20
Total	109	42	321	300	433	1205

Table 11 Main source of drinking water (n=1204)

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
Piped into dwelling	16	7	65	92	84	264
Piped into yard	5	3	27	68	88	191
Public standpipe	15	4	37	45	88	189
Tube well/ borehole	36	2	36	39	70	183
Protected dug well	15	2	4	2	8	31
Unprotected dug well	10	1	1	0	7	19
Protected spring	3	1	1	1	1	7
Unprotected spring	4	1	0	0	0	5
Rainwater	1	16	2	1	2	22
Tanker truck	0	0	0	1	4	5
Surface (river/pond)	1	4	0	0	1	6
Bottled water	0	1	36	5	12	54
Sachet	4	0	111	46	65	226
Other	0	0	1	0	4	5
Total	110	42	321	300	434	1207

Use of technology

Table 12 *Frequency of use of mobile phone in last month*

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
not used	33	4	5	12	21	75
weekly	3	1	7	15	20	46
once or twice a day	15	9	24	16	51	115
several times a day	55	28	284	252	340	959
Total	106	42	320	295	432	1195

Table 13 Phone ownership

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
No	26	4	7	11	18	66
Yes	81	38	314	289	415	1137
Total	107	42	321	300	433	1203

Table 14 Type of phone most commonly used

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
Basic phone	48	9	65	54	113	289
Feature phone	9	3	21	29	45	107
Smart phone	16	26	230	205	255	732
Total	82	38	317	299	430	1166

Table 15 Frequency of use of internet in last month

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
not aware of internet	22	2	13	8	17	62
not used	67	20	75	79	163	404
weekly	4	1	15	17	45	82
once or twice a day	6	5	51	27	53	142
several times a day	7	14	166	169	156	512
Total	106	42	320	300	434	1202

Table 16 Frequency of use of social media among users

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
Not aware of social media	4	0	3	3	8	18
No	76	18	59	64	135	352
Yes	26	24	258	231	287	826
Total	106	42	320	298	430	1296

Table 17 Frequency of use of Mobile Money

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
not used	59	29	69	40	84	281
1 or 2 times a month	38	7	136	104	171	456
3 - 10 times a month	7	4	107	113	131	362
daily	1	1	8	42	44	96
Total	105	41	320	299	430	1195

Cooking practice

Table 18 Number of meals cooked per day compared to how long it took

		Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family
Meals cooked per day	Mean Median	3.35 3.00	3.18 3.00	2.84 3.00	2.27 2.00	3.44 3.00
Hours spent cooking	Mean Median	2.71 3.00	3.00 3.00	2.35 2.00	2.19 2.00	2.66 3.00
Pearson correlation	r value p value	0.420 <0.001	N/A N/A	0.372 <0.001	0.387 <0.001	0.274 <0.001

Table 19 Cooking fuels used

	Persona										Total
	Isolated (no electricity)		Communal (island grid)		Weak national grid		Strong national grid - small family		Strong national grid - large family		
Electricity	0	0%	5	12%	131	41%	65	22%	123	28%	324
LPG	2	2%	10	24%	171	53%	160	54%	170	39%	513
Kerosene	2	2%	2	5%	17	5%	37	12%	31	7%	89
Charcoal	73	66%	28	67%	228	71%	180	60%	378	87%	887
Wood	54	49%	22	52%	14	4%	10	3%	40	9%	140

Table 20 Main cooking fuels

	Persona										Total
	Isolated (no electricity)		Communal (island grid)		Weak national grid		Strong national grid - small family		Strong national grid - large family		
Electricity	0	0%	2	5%	44	14%	28	9%	37	9%	111
LPG	1	1%	7	17%	118	37%	140	47%	113	26%	379
Kerosene	0	0%	1	2%	1	<1%	11	4%	4	1%	17
Charcoal	65	60%	15	36%	151	47%	111	37%	254	59%	596
Wood	41	38%	16	38%	6	2%	5	2%	21	5%	89

Table 21 Number of cooking fuels used

	Persona										Total
	Isolated (no electricity)		Communal (island grid)		Weak national grid		Strong national grid - small family		Strong national grid - large family		
1	85	77%	20	48%	135	42%	164	55%	176	41%	580
2	23	21%	19	45%	135	42%	110	37%	207	48%	494
3	0	0%	3	7%	48	15%	20	7%	48	11%	119
4	0	0%	0	0%	3	1%	2	1%	2	1%	7

Table 22 Number of cooking devices in the household

	Persona					
	Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	Total
0	12	0	2	10	5	29
1	70	21	106	147	179	523
2	27	19	98	78	152	374
3	0	1	60	28	48	137
4	1	1	20	13	17	52
5	0	0	19	10	17	46
6	0	0	9	8	9	26
7	0	0	6	6	5	17
8	0	0	1	0	2	3
9	0	0	0	0	1	1
Total	128	66	761	579	894	2428

Table 23 Perceptions and beliefs regarding cooking fuels (by personas)

	Range	Persona					K-W p value
		Isolated (no electricity)	Communal (island grid)	Weak national grid	Strong national grid - small family	Strong national grid - large family	
How easy is it to access LPG	-2 to +2	-0.583	-0.286	0.841	0.883	0.516	.000
How easy is it to access kerosene	-2 to +2	-0.208	-0.610	0.321	0.413	0.216	.000
How easy is it to access charcoal	-2 to +2	0.756	0.878	1.045	0.840	1.167	.000
How easy is it to access wood	-2 to +2	0.213	0.667	-0.196	0.067	0.336	.000
How safe is LPG	-2 to +2	0.037	0.000	0.328	0.478	-0.002	.000
How safe is kerosene	-2 to +2	-0.324	-0.333	0.072	0.007	-0.211	.000
How safe is charcoal	-2 to +2	0.198	0.268	0.749	0.385	0.830	.000
How safe is wood	-2 to +2	-0.168	-0.357	0.009	0.383	0.538	.000
Smoke from stove is good at chasing insects away.	-1 to +1	0.411	0.500	0.166	-0.067	-0.037	.000
Smoke from cooking fuels is a big health problem in my family.	-1 to +1	0.670	0.952	0.592	0.530	0.463	.001
Certain food tastes better when cooked with charcoal or wood compared to gas or electricity.	-1 to +1	0.660	0.167	0.506	0.398	0.550	.001
Cooking with firewood is not convenient.	-1 to +1	0.477	0.500	0.530	0.312	0.427	.006
Collecting and preparing firewood is a burden for my family.	-1 to +1	0.429	0.575	0.596	0.149	0.406	.003
Firewood is expensive for cooking.	-1 to +1	0.280	0.643	0.235	0.213	0.167	.003
Cooking with firewood is harmful to a person's health.	-1 to +1	0.570	0.833	0.624	0.387	0.487	.000
Charcoal is convenient to use for cooking.	-1 to +1	0.682	0.119	0.569	0.440	0.693	.000
Cooking with charcoal is harmful to a person's health.	-1 to +1	0.486	0.488	0.220	0.201	0.005	.000
Electricity is expensive for cooking.	-1 to +1	0.726	0.714	0.694	0.664	0.751	.551
LPG is expensive for cooking.	-1 to +1	0.509	0.095	0.388	0.017	0.244	.000

Annex B

Table 24 Parameters and levels

Parameter	No. levels	Level 1	Level 2	Level 3	Level 4
Cooking processes					
Type of cooking	2	Boil only	Boil & fry		
Power (speed of cooking)	3	slow	normal	Fast	
Use of lid	3	No lid	Pot with lid	Sealed pot	
Number of hobs	3	Single hob	2 hobs	4 hobs	
Stove					
Capacity (people)	3	Cooks for 4 people	Cooks for 6 people	Cooks for 8 people	
Capacity (devices)	3	always need to use with another stove	sometimes need to use with another stove	you can do all your cooking on it	
smoke emissions	3	No smoke	gives same smoke as charcoal fire	gives same smoke as wood fire	
Portability	2	cannot be moved (too heavy)	can be carried in/out of the house		
looks	2	Looks plain	Looks good		
Functionality					
Devices	4	2 hobs	2 hobs + 3 LED lights	2 hobs + charge mobile phone	2 hobs + television
Availability	2	only works on sunny days	works on sunny and rainy days		
Financing	3	pay each month (utility)	lease over 6 years	lease over 3 years	
Cleaning	2	awkward to clean	Easy to clean		