



Contextual Invention: A multi-disciplinary approach to develop business opportunities and design solutions

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This paper describes a new research methodology, which brings together ethnographic, business, design and technical research in a focused way. Various combinations of these disciplines have been used together in the past, both inside HP Labs and in the wider industry. However, all four disciplines are rarely harnessed together in the pursuit of innovation and new business opportunities. We aim to do this in a principled user-centered way, by using a deep understanding of user and cultural needs to drive design ideas, business modeling and technological investigations. This approach can be seen as an extension of Contextual Design in which social and cultural factors are considered in the deployment of an existing technology. We call this approach Contextual Invention because the aim of the social science research is to inspire and generate new technology inventions with high social and business value. To develop and test this new approach, HP Labs India initiated a project towards understanding user needs and deriving concepts, at the same time providing sustainable business models for the end customer. The project was successful in creating business opportunities and design concepts that were at the intersection of user needs, design, business models and technology feasibility.

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Contextual Invention

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ABSTRACT

This paper describes a new research methodology, which brings together ethnographic, business, design and technical research in a focused way. Various combinations of these disciplines have been used together in the past, both inside HP Labs and in the wider industry. However, all four disciplines are rarely harnessed together in the pursuit of innovation and new business opportunities. We aim to do this in a principled user-centered way, by using a deep understanding of user and cultural needs to drive design ideas, business modeling and technological investigations. This approach can be seen as an extension of Contextual Design in which social and cultural factors are considered in the deployment of an existing technology. We call this approach Contextual Invention because the aim of the social science research is to inspire and generate new technology inventions with high social and business value. To develop and test this new approach, HP Labs India initiated a project towards understanding user needs and deriving concepts, at the same time providing sustainable business models for the end customer. The project was successful in creating business opportunities and design concepts that were at the intersection of user needs, design, business models and technology feasibility.

Background

The mission of HP Labs India is “to generate innovations targeted at the world’s emerging economies by deeply understanding the confluence of relevant social, cultural, economic and technological drivers”. Emerging Markets are very different from other developed markets in the diversity of the user needs, motivations and the business environment dynamics. A strong understanding of user needs (social, cultural, economic) and the business ecologies along with powerful technical insights is essential for success in these markets. To this end HP labs India has begun to explore new ways of combining user research, business studies and conceptual design with technological research, into its research portfolio (Greving, Ramani & Gopal, 2002). For example, contextual enquiry of small and medium sized retailers along with business analysis of the un-organized retail sector in India, and by obtaining feedback on early design concepts generated ahead of any serious prototyping effort formed the basis of investigation for a suitable computing platform for shopkeepers in India (Prabhu and Singh, 2004).

The current study is part of another attempt to combine these disciplines in a new way. Unlike un-organized retail domain, this study does it so much earlier in the design process. In fact the aim of the project is to identify a number of promising domains and activities in which new technology might be of benefit to ordinary Indian people.

Different approaches to invention

Before discussing the proposed methodology, it is necessary to explain its place in the broader process of invention within Hewlett Packard. Invention is important to HP and happens to be the catchphrase of our corporate identity ('invent'). In fact, we do what most large technology companies do by adopting four parallel approaches to invention. Our business divisions use **market research** projections to estimate the size and vitality of future business areas. They also employ designers to **design** new ways of styling and combining existing technologies to improve customer experience with our products and services. More disruptive techniques are used in our corporate research labs. **Technology research** is used to push the envelope of existing technology, and generate technical innovations which will enable entirely new ways of solving customer problems. **User research** is also employed to find uses for these innovations or discover un-solved problems that technology could help with. Various combinations of these disciplines have been used together in the past, both inside HP Labs and in the wider industry. However, all four disciplines are rarely harnessed together in the pursuit of innovation and new business opportunities as shown in Figure 1 .

When things are going well, the findings from one approach begin to 'gel' with those from another. For example, a technological breakthrough might align with a large market opportunity, with minimal design impact on the product. More typically, the findings of each approach do not align, or are not generated together, so that many good ideas in one area sit around waiting for conditions in the other areas to change. This is natural, but more problematic when trying to invent for markets whose dynamics are relatively unknown, or whose user needs and design preferences are unclear – as in the emerging markets. Hence design ethnography becomes very important in describing the cultural context for technology (Salvador et al 1999).

Perhaps because of the challenge of inventing for the emerging markets, or because of our own and other's success in combining elements of the four approaches in the past (e.g. Frohlich, Dray & Silverman 2001), we decided to explore a new research paradigm in which each approach is represented equally. This can be seen as a fifth, hybrid, approach to invention which we call **contextual invention**. This decision to combine four disciplines in the pursuit of these aims was part of a methodological experiment in innovation.

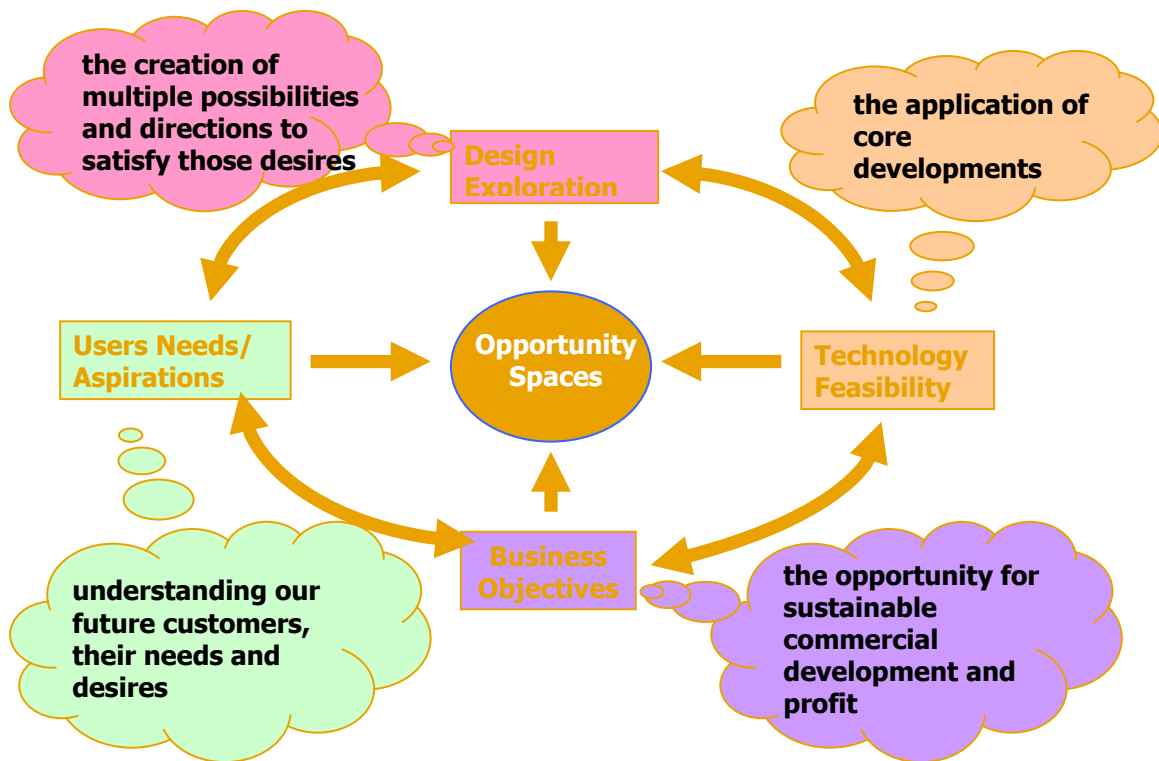


Figure 1 – Multi-disciplinary approach in Contextual Invention

Contextual Invention Process

In this new research methodology, we brought together ethnographic, business, design and technical research in a focused way and set about planning an early investigation of printing and imaging opportunities in India. This approach can be seen as a development of Contextual Design in which social and cultural factors are considered in the deployment of an existing technology. Rather than conduct a single user study of media use in India, we decided to embed this study in a generative process of design, invention and feedback. We call this process *contextual invention* because it involves the creative use of ethnographic data to generate new technology and business ideas in an interdisciplinary team (Frohlich & Greving 2002).

Our philosophy was to lead with an ethnographic study that would serve as a source of inspiration and insight for the other three disciplines. A working model of the research process is shown in Figure 2. All members of the team were involved from the start and helped to formulate and conduct the ethnography up front. The topic of the ethnography was media use as described in the following section. From the initial data set of ethnographic materials we generated provisional observations about media-related behaviours and a list of unmet user

needs. These were then used to generate point product and service concepts with a view to identifying promising clusters of ideas. We expected these clusters to indicate business opportunity spaces which could be explored more thoroughly by other methods, including showing the concepts back to the original participants in our fieldwork.

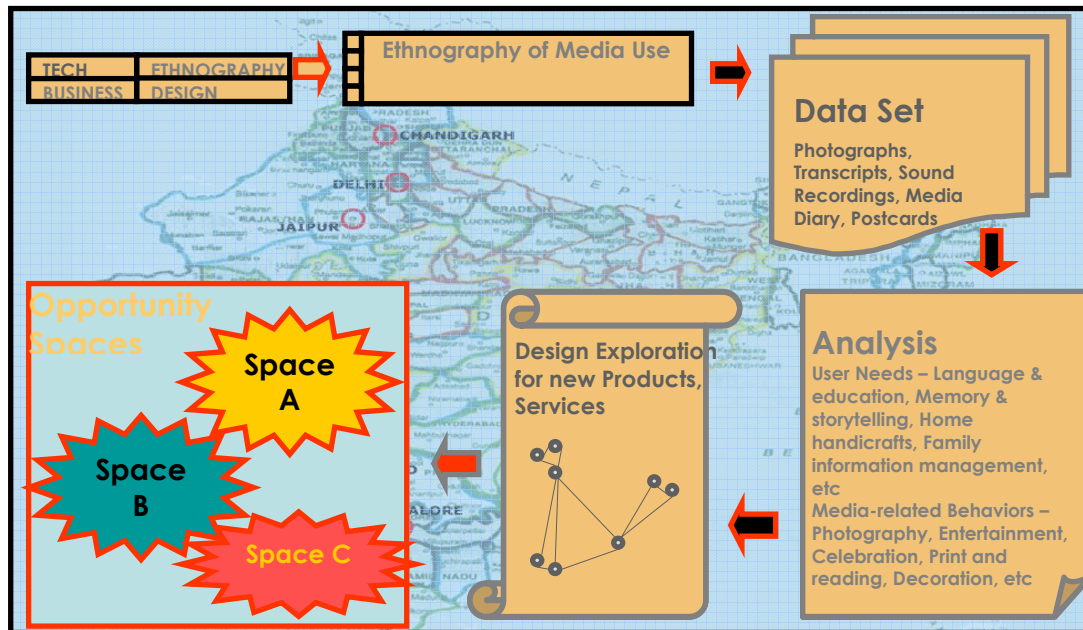


Figure 2 - Contextual invention research process

Although this process appears quite linear and rational in character, with one stage following another in sequence, it was actually more iterative and chaotic than this. Each individual investigation was influenced by the multi-disciplinary context, through the presence and participation of experts from other disciplines. Those people were also carrying out their own reading and research in parallel with the fieldwork and brainstorming, which itself affected the way that they thought about media. This personal influence was particularly strong on the ethnography, since all members of the team took part in the fieldwork and contributed to the analysis in different ways. They were also motivated to ensure that the results of the ethnography were useful to their subsequent investigations. Since those investigations concerned the design of new technologies, products, services and business models, it was necessary to make the ethnography as forward looking as possible, and to make its findings more applied.

Process application on media related opportunity space

To give some focus to the investigation and make its goal tractable we chose to limit our attention to *media-related behaviors*. For this project, the definition media was very broad as forms of information exchange and not only included mass media such as newspapers, radio, film and television, but also more

intimate personal media such as letters, telephone calls, conversation, music, photographs and imagery. This collection of behaviors was selected to give us a chance to discover new printing and imaging opportunities for HP lying outside the traditional product categories of printers, scanners, fax machines and cameras, or at least outside their traditional customer segments. As we got closer to defining these more precisely and formulating research and interview questions about them, we found it useful to draw on existing business and design definitions of media. This was a first step in ensuring a common language for what we were studying across the team.

A specific business influence at this stage was on the **recruitment** of participants in the study. Having decided to take families as our unit of analysis and conduct interviews in and around their homes, there was much discussion of what sample of families to involve. The ethnographic requirement was to cover a spread of lifestyles which reflected the diversity of media practice in India. We also wanted families who would be willing and able to host us, to engage honestly with our questions and follow our instructions. The business requirement was to track how representative these families were of the Indian population, and to skew the sample in favour of the most promising consumer segment for media products and services. Our research partners at IMRB International (India Market Research Bureau) helped us reconcile these different views by carrying out a new market segmentation of Indian households by socio-cultural region (SCR) and media exposure. A socio-cultural region (SCR) is a group of districts clubbed together based on linguistic homogeneity combined with geographical contiguity, financial, economic and administrative homogeneity, regionalisation of culture & lifestyle, which make them unique from other districts and caste and class considerations.

An existing classification of 90 SCRs in India was clustered by the level of media exposure – a measure of penetration of mass media devices and content streams. This was carried out for HP by IMRB using household data from the NRS 2002 survey. Exposure was measured by the combined ownership of entertainment products, internet access, TV channel penetration and access to print. This reflected 5 levels of media infrastructure across SCRs, as shown in Figure 3. We then selected SCRs from two contrasting levels in the middle and top of the spectrum ('media light' and 'media heavy' respectively), avoiding SCRs at the bottom of the spectrum who might not be in a position to benefit from new media services because of a lack of infrastructure.

Given the focus of the study, this market was further segmented by lifestyle and location (north and south India). To cover a range of lifestyles we decided to include families from metropolitan, urban and rural areas where the pattern of life is very different. The final selection of location was based on the language skills available within the research team and consisted of Chandigarh and Mangalore to represent media heavy SCRs in the north and south respectively, and Jaipur and Dharwad to represent media light SCRs in the north and south respectively.

We also included Delhi and Mumbai as two media heavy SCR to represent Indian metros. Bangalore SCR, a media heavy SCR was included in the study as it was HP labs base and the pilots conducted in Bangalore were valid research data points.

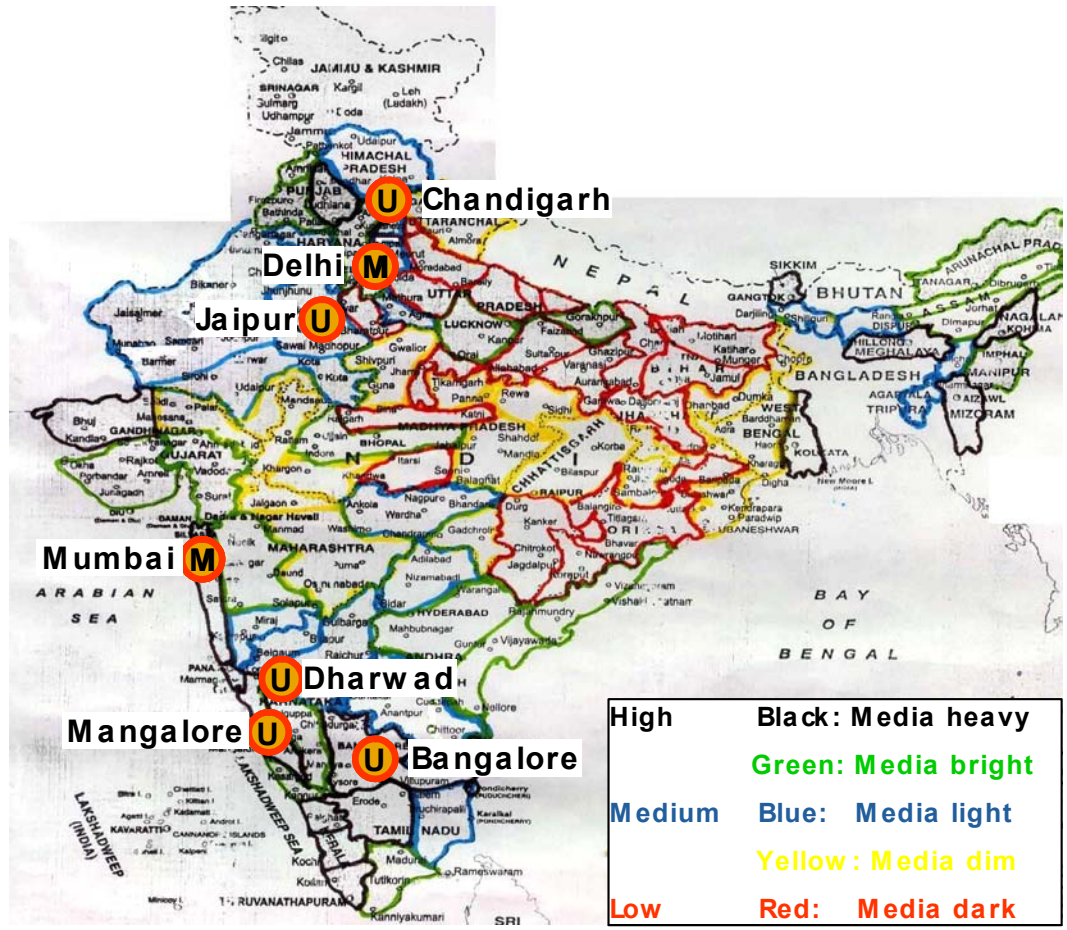


Figure 3 - Socio-cultural regions and research locations with high or medium media exposure.

A sample of families from these seven SCR was selected from an all-India panel of households maintained by IMRB. Families selected in Mumbai and Delhi represented Indian “metro” families. Urban and rural families were selected from the other five (5) SCR. Within each SCR, families were selected to represent a cross-section of Indian society, at least within a middle tier of socio-economic class and income levels. This middle tier is a large and growing population of strategic importance to HP. They have enough disposable income to consider purchasing new technology products, but may not be able to afford those products as they are currently packaged and marketed from the west. If this population is defined as lying between the top (Very Rich) and bottom (Destitute) sections of society, then it included at least 153 million households or 886 million

people in 2001/2, and is set to grow to 178 million households or 1021 million people by 2006/76 (NCAER 2001 source). It is also the market targeted by HP Labs India.

Practical factors such as how far away the fieldwork locations were from potential hotel bases, the time and working patterns of families, and their willingness to take part were all considered in the final selection. This was only possible because of the good local relationship already established between IMRB and a cross-India panel of families they maintain for research purposes. A figure of 24 families was arrived at out of a compromise between a much larger number that could have been interviewed, advocated by the business staff on the project, and a much smaller number, preferred by the ethnographers.

We administered a screener questionnaire to identify the spread of media practices in individual households, and ultimately recruit both high and low media practice families. This is because the actual behaviors of individual families could vary within a medium or high infrastructure area. Using a combination of these two factors simply ensured a spread of media behaviors across the sample. As a way of tracing the origin of comments and insights in the study, we refer to families by their SCR, location type and media practice category. Hence a 'Jaipur Rural Low' family would come from the Jaipur SCR (a blue media light region), live in a village, and have a low media practice score (relative to the mid-point for the whole sample).

Design and technology considerations came into play when planning the fieldwork **methodology** and interview **questions**. To maximise the usefulness of the study for technologists we attempted to cover the use of as many domestic media technologies as possible, including the TV, telephone, radio, PC and internet. Some discussion arose as to the feasibility of covering shared community media technologies such as telephone booths, cinemas and religious festivals. This led us to discuss these latter forms in the context of the home visits, around a 'media map', showing where media were consumed in relation to the home. An example of such a map is shown in Figure 4. We also made efforts to tour village and urban locations in order to take photographs of media centres, and interviewed village elders or chiefs about the provision of media services at the village level.

The designers' requirement from the ethnography was less about capturing a picture of technology use or even media practice in India, and more about absorbing the lifestyle and mindset of Indian people. To this end we built in a lifestyle section into the opening of the interviews and developed a number of techniques for recording aspects of life before and after our visits. These techniques can be seen as **cultural probes**, as defined by Gaver, Dunne & Pacenti (1999). They included a *camera probe*; a *media diary* and what we called *psychic postcards* (see Figure 5).

states that might give designers a clue to the respondent's personality or mindset.



Figure 5 - Cultural probes (camera, media-post box, and psychic postcards).

To further expand the range of materials collected from the fieldwork we planned a home tour in which we documented media artefacts and home architecture in photographs. Taken together, these design considerations led us to collect a wider range of ethnographic materials than we would ordinarily have recorded in the course of studying media-related behaviours. We also came to appreciate that the materials themselves were being collected as design resources in their own right, rather than as a means of producing an overarching 'analysis'.

A final modification of the fieldwork for design was probably the most significant of all. We allocated the last hour of each three-hour home visit to a **forward-looking discussion** of lifestyle futures. This began with a number of general questions asking about personal and family aspirations for the future, and went on to invite families to speculate on the role of technology in meeting such aspirations. We felt it was important to give people the chance to say directly what new technologies they would like, if they had a view. This became a chance

for them to exercise their own ethnographic imaginations (Willis, 2003; Frohlich and Prabhu, 2003) unprompted by our own ideas, and to air their views on technology in general. We then went on to prompt for reactions to our own imaginings, based first on what we had been told in the current visit and then in previous visits. This was an 'empty' slot in the interview schedule that relied on us thinking up technology ideas on the fly. For the current family we would try to connect what we had learned about their media use and interests to new, or simply missing, media technologies they might like. Once those ideas ran out, or ran aground, we would introduce ideas accumulated from other visits, about the kinds of technologies other families liked. In this way, design ideas could surface within a single visit and be followed up in subsequent visits in the series. We call this technique *concept feed-forward*, and see it as a way of applying ethnographic imagination within the interviewing process itself.

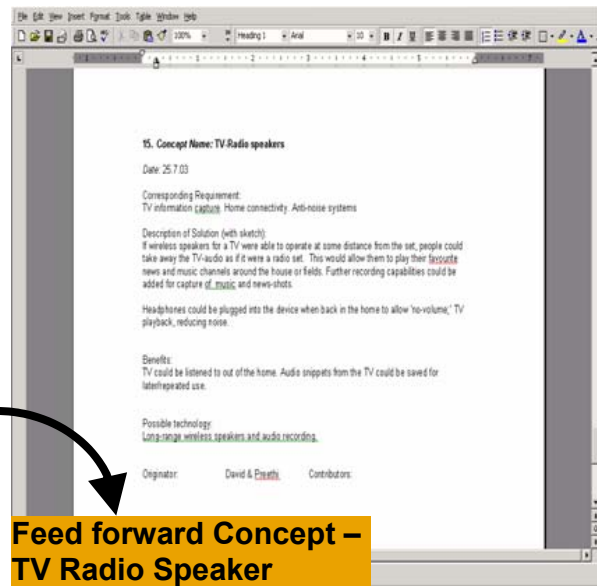
Design Exploration and Opportunity Spaces

At the end of the field study, due to concept feed-forward technique and also debriefing sessions, the team had a very good understanding about the general insights from the study and also a total of 64 product/service concepts based on user needs. In the follow-up design ideation sessions, the team wrote up each user need and corresponding concept(s) trying to meet those needs. As shown in Figure 6, observations and insights from a family could lead to one concept, which in turn led to multiple possibilities and concepts in subsequent idea exploration sessions. These concepts were then expanded and clustered to form super clusters of concepts as illustrated in Figure 7.

These super clusters were then examined using three criteria – a) strength of the user need, b) business potential of the concept cluster and c) alignment with HP's future business strategy. This allowed the team to develop "business opportunity spaces" for the company.

Key observations on media practice and values	Description
1	No radio stereo system in the house (any only audio media). TV was compensating for the lack of it - any music channel would be switched on only if need be.
2	TV, phones were the dominant media used in the house by everyone. Very little use of any other media. No magazines, not much newspaper.
3	Busy schedules of children - they did not have too much time for themselves except for couple of hours in the evening, when they could go out and play (indoor games not too exciting concept of videogames was interesting to them though)
4	Aspiration of family members that the children get educated on computers.
Key design insights (requirement and solution ideas)	
1	Inexpensive, low cost way of learning the computer - for children, would help enhance their future.
2	Phone in the house used by community-neighbors, acquaintances etc. for incoming and outgoing calls. Caused irritation, cost and some tension. Some better way of sharing the phone, and conveying to others that they had a call without having to go and call

Observations and insights from one family



Feed forward Concept – TV Radio Speaker

Design Exploration

HOLLOW SPACES
THAT HAVE EMERGED OUT OF THE FRUSTRATIONS

- **DIFFERENT TOPIC OF INTERESTS BUT ONLY ONE TELEVISION.**
- **WE DON'T READ THE TV SCHEDULE EVERYDAY AND GET TO KNOW ABOUT AN INTERESTING PROGRAM JUST A FEW MINUTES BEFORE IT STARTS.**
- **PRIOR ENGAGEMENTS DO NOT ALLOW US TO WATCH A PROGRAM THAT WE WANT TO ALL THE TIME.**
- **MUSIC CHANNELS ARE SOMETIMES USED JUST WITHOUT THE SCREEN. THE TV IS SWITCHED ON AND THE PERSON CONTINUES TO CARRY OUT HIS/HER CHORES IN ANOTHER ROOM.**

- CAN THE TV HAVE A FACILITY FOR 2 SCREENS (DETACHABLE)?
- CAN THE PROGRAM ON ONE CHANNEL BE RECORDED WHILE WATCHING ANOTHER?
- IS IT POSSIBLE FOR ME TO REMOTELY CONTROL MY TELEVISION AND ASK IT TO RECORD A PROGRAM?
- OR IS IT POSSIBLE TO GET ALERTS... OF THE DAYS TV SCHEDULE ON MY PERSONAL DIGITAL ASSISTANT?
- CAN WE RECORD PROGRAMS?
- CAN MY TV BECOME MY MUSIC SYSTEM AND ALSO STAY A TV @ THE SAME TIME?
- WILL IT BE POSSIBLE TO REMOVE ONE OF THE SPEAKERS AND USE IT ELSEWHERE (FOR EG:- LISTEN TO THE MORNING NEWS WHILE WORKING IN THE KITCHEN)

- SMALL TV
- VCR
- BLUETOOTH
- MP3
- MOBILE PHONE
- PDA
- VIDEO TAPES
- PROGRAM CHANGES
- MP3 PLAYER
- PROGRAMS
- COORDINATE
- RADIO [...]

Figure 6 – User needs and observations leading to design concepts

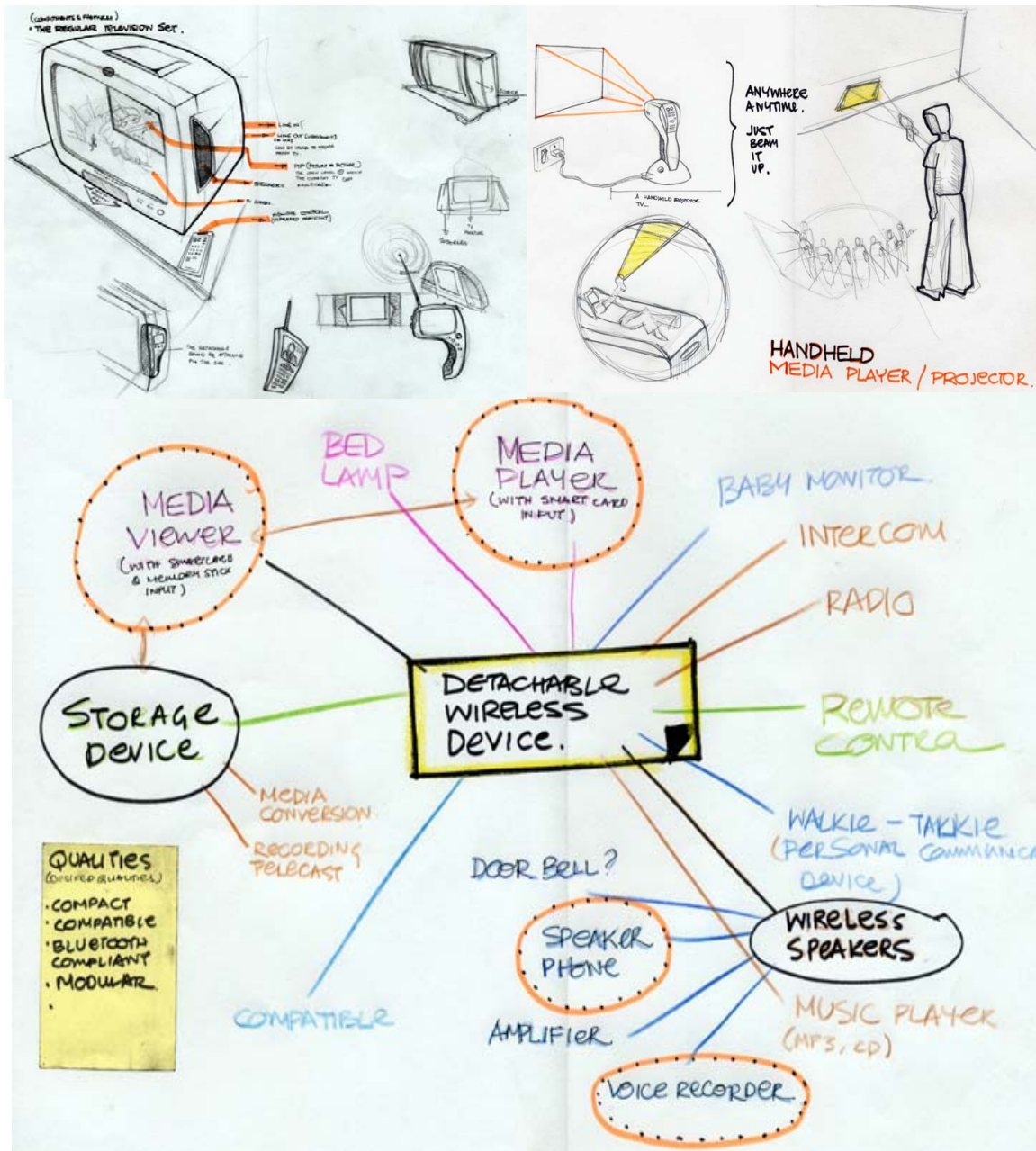


Figure 7 – Individual concepts clustered into related super cluster concepts

Conclusions

In short, we have attempted to look at developing opportunity spaces and design solutions using a multi-disciplinary approach. Through this method, we have suggested that ethnographers should work alongside experts from other disciplines who are more skilled at developing the design implications of social research. In particular, we recommended a blend of ethnographers, designers, business researchers and technologists, and went on to describe our own

experience of doing ethnography together in such a team. Our biggest lesson from this exercise is that the presence of experts from other disciplines transforms the way in which design ethnography is conducted, and can do so in a way which stimulates the ethnographic imagination of the whole team.

The ethnographers were affected by the technology, design and business issues surrounding the area of research. These encouraged them to think creatively about the implications of their findings, and about how to maximise these in the set-up and analysis of their research. We described a number of techniques for doing this, used in our own ethnographic study. Its framing was modified through the selection of an appropriate research topic, the recruitment of participants, the coverage of questions, the breadth of materials collected, and the incorporation of an explicit discussion of new product concepts. Its analysis was modified by the use of creative debrief meetings, the circulation of user need and concept sheets, and the generation and testing of design ideas. These changes all improved the quality of design imagination not only of the ethnographers themselves, but also of participants in the study and of other team members.

It has been a great learning experience and will continue to be as we apply this process to other projects. In no ways we are suggesting that we have found a perfect way to do contextual invention; however through this paper we are hoping that similar efforts will be reported and we will be able to devise a robust methodology that will allow inventors to develop technology and solutions that are grounded in the context.

Acknowledgements

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