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**A Room of One's Own:
Making a Place for On-Line Communities**

by

Vidya Shankarnarayan, G.D.Arch.

A thesis submitted to the
Faculty of Graduate Studies and Research
in partial fulfillment of
the requirements for the degree of
Master of Architecture

Carleton University

Ottawa, Ontario

April 20, 2000

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**A Room of One's Own:
Making a Place for On-Line Communities**

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in partial fulfillment of the requirements for
the degree of Master of Architecture (Design and Technology specialization)

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Abstract

The goal of this work is to develop an approach for the design of on-line communities; a community within which users can realise a meaningful experience and understand the message conveyed. In order to foster the development of such a community, the environment - i.e. the user interface and technical infrastructure - must provide the means for the users to develop the community as a “place” for social interaction and evolve a fluid and cultural vocabulary.

The focus of the discussion is issues of relation (or not) of online communities to physical communities, the role of architects in designing them, the concept of a “place”, the potential to augment existing physical communities with virtual ones, organising data into meaningful information, and the role of technology. I identify and discuss these challenges and address them by designing an online community for pregnant women and their families, called “Pregnant Thoughts”.

Acknowledgements

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Special thanks to my focus group members: Kathy Crowe, Karen Hunter, Paula Stewart and Ann Sprague. Their knowledge and experience in Perinatal care enabled them to provide astute and thoughtful critiques of my work. The discussions we had in our bi-weekly meetings formed the basis for many issues of my work.

My work is multi-disciplinary and I have benefited greatly from being able to learn from experts in many fields. Professor Greg Andonian's teaching was useful in excavating links between the real world architecture and the virtual world. Professor Lois Frankel's teaching helped in topics of human computer interaction and usability. Robert Gascho introduced me to the study of data modelling and dynamic web authoring. Meeting with Gordon Hopkins helped immensely in resolving issues of social interaction and realising meaningful experiences in real and online communities.

My special thanks to Mike Getz who always provided his support and guidance for issues ranging from the working of my computer to hosting my work on servers. Discussions with friends have shaped many ideas in this thesis. I would like to especially thank Joey Benedek, Katie Chau, Jennifer Fraser, Laura Olac, Amit Tungare and Brent Welty. Many of the ideas discussed here were widely debated among them.

Sibling competition drove me to beat my sister in trying to complete this master's degree. My parent's belief in my capabilities, endless encouragement and support was instrumental in my pursuit of this master's degree. This thesis belongs to them.

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Chapter 1: Introduction

1. Introduction

In his book, "Genius Loci - towards a phenomenology of architecture", Norberg-Shultz states that, "There are not different 'kinds' of architecture, but only different situations which require different solutions in order to satisfy man's physical and psychic needs" (Norberg-Shultz 1980, p5). I consider that designing for the virtual world - the world of dynamic and interactive information, communication and experiences - is not a new "kind" of architecture, but a new situation requiring new architectural solutions to satisfy human needs

The emergence of virtual worlds has had a significant impact on the concept: structure of communities. Sociologists Wellman and Gulia, who have studied the impact of technology on communities over the last few centuries note that sociologists have always feared that technological changes along with industrialization, urbanization and capitalism would lead to the "loss of community". By loss they mean an erosion and disconnection of the kinds of relationships necessary to communities. Sociologists have long believed that communities thrive only in neighbourhood and kinship groups (Wellman and Gulia 1997).

Architects, too, are invested in the concept of communities based on proximity. Architecture has played an important role in giving form to such communities throughout time. Norberg-Shultz observes that while the private (or intimate)

domain is man's home, it is personal but not singular. The home is a shared environment where people maintain close personal relationships (e.g. as a family). He goes on to say that the concept of "home" is manifested by a "threshold" or "boundary" that separates it from the outside. This boundary also helps to form the community outside (Norberg-Shultz 1980, p184). The public realm – the infrastructure of what we generally consider to be community - consists of gathering places such as the agora, the forum, piazza, cafes, pubs etc. Hence the structure and separation provided by architectural elements has defined and identified both the "private" (or intimate) and "public" (or proximate) domains throughout history.

Wellman notes that sociologists have begun to concede that the very technologies that have threatened traditional communities - cars, planes, phone and now the Internet - can also help to maintain relationships over long distances. They now recognise that neighbourhood and kinship ties form only a portion of what constitute contemporary communities, and that communities can also exist as "social networks" of geographically disparate "friends", "kin", "colleagues" etc. Quoting Marshall McLuhan, Wellman says that, "It is not only that the world is a global village, but one's village could span the globe" (Wellman 1988). With the emergence of the Internet, the "proximate" relationships that characterised neighbourhood-based communities and were facilitated by public infrastructure can now exist in the "remote" realm – a realm previously characterised by erratic and radically asynchronous communication via mail

and/or expensive long-distance telephone calls. People now engage in regular, real-time interaction with others across great distances. Wellman and Gulia note that these changes have extended the concept of the traditional “place-oriented community” well beyond the neighbourhood (Wellman and Gulia 1997). The concept of “place” is crucial here and will function as a theme throughout the thesis.

As the number of people communicating and interacting over the Internet increases, so does the number of networked or online communities. In his book “City of Bits”, architect Bill Mitchell contends that this networked world re-imagines architecture and urbanism in the new context of digital telecommunications. He argues that the most crucial task now facing architects is that of “imagining and creating digitally mediated environments for the kinds of lives that we will want to lead and the sorts of communities we will want to have” (Mitchell 1995, p5). Architects have always participated in the creation and nurturing of social networks (communities) in the physical world – communities that shape people’s lives and experiences. Mitchell contends that architects must also apply their design expertise to virtual worlds as they, “will profoundly affect our character and content of public discourse, forms of cultural activity and the experiences that give shape to our daily routines” (Mitchell 1995, p5). Hence, like sociologists, architects must recognise the demand for new forms of community and participate in shaping them.

1.1 Problem: Meaningless Experience

While online communities are growing in size and importance, their evolution is often driven more by advances in technology than by a consideration of human needs. Though online communities differ from their physically organised counterparts, the same people inhabit both. In his description of successful urban environments, William Whyte notes that, "What attracts people most, in sum, is other people" (Whyte 1988). Applying the same principle to online communities, the more people that inhabit or visit them to communicate and interact with other people, the more remote communication will supplement the proximate realm of neighbourhoods and public spaces.

There have been numerous attempts to design online communities. More often than not, however, users of these communities are confronted with "unorganised" and "context-less" data. User interface designer Brenda Laurel notes that, "Interactive media is not about information, it is about experience". Though contemporary online communities provide information, in the absence of a context, most users cannot "experience" it. Hence they cannot understand the message conveyed. "Having the technology is only the start: a deeper understanding of both interface design and of sociology of online communities is needed in order to create truly viable online societies" (Donath 1997). This thesis explores the challenge of creating meaningful experiences in online communities and is meant to make a case for the participation of architects in the design of the remote realm.

1.2 Structure of thesis

The first part of the thesis (chapters 2 and 3) develops a theoretical basis for this endeavour. In her paper, "Cyberspace is not Disneyland", Bruckman contends that designers should establish a tone and mood to shape communities but not attempt to control their development. She believes designers should develop a context that permits users to continue evolving the community (Bruckman 1995). I consider that this context should evolve into an experience. By creating a "context", users can understand the information, communicate and interact to develop the community into a "place" for meaningful social interaction. The goal being users must realise a "meaningful experience" and "understand the message". Advancing this notion, I explore issues related to online communities including: their relation (or not) to physical worlds, the role of architects in designing them, the concept of a "place", the potential to augment existing physical communities with virtual ones, organizing data into meaningful information, and the role of a technical plan. The research draws upon studies of contemporary virtual communities, information visualization, and traditional studies of the human needs and aspirations that shape the design of communities in the real world.

The second part (chapter 4) explores the process of designing and creating the infrastructure for an online community. To do so, and to test my hypotheses about context and "place", I worked with the Perinatal Partnership Program of Eastern and South Eastern Ontario (PPESO) to design an online community

called “Pregnant Thoughts – a place to think about pregnancy”. PPESO is a consortium of health care providers who work with pregnant women and their families on pregnancy-related issues. Of particular interest to the project was the geographical dispersion of women across relatively unpopulated sections of Ontario and the social isolation of many (especially young) pregnant women. Together we identified the opportunity to improve and extend the support provided by PPESO by creating an online resource for pregnant women and their families.

The concluding part (chapter 5) reflects on the issues raised by this endeavour. It looks broadly at two challenges facing designers: their participation in shaping online communities and need to come to terms with these communities in the design and stewardship of the physical environment.

Chapter 2: A Study of Contemporary Virtual Communities

2. A study of contemporary virtual communities

“Community ties are already geographically dispersed, sparsely-knit, connected heavily by telecommunications (phone and fax), and specialized in content. There is so little community life in most neighbourhoods in western cities” (Wellman and Gulia 1997).

“Even as the Net might accelerate the trend to moving community interaction out of public spaces, it may also integrate society. The Net’s architecture supports both weak and strong ties that cut across social milieus, be they interest groups, localities, organizations or nations. As a result cyberlinks between people become social links between groups that otherwise would be socially and physically dispersed” (Wellman 1988).

At the dawn of the 21st century interaction with our neighbours (or for that matter with anybody in the neighbourhoods which form our immediate local community) is rare. Hence local meeting places like community centres, parks etc., are frequented by fewer and fewer people. Barry Wellman observes that we once met our friends frequently at cafes, pubs and parks and also made new friends there. We exchanged information and gossip in these semi-public and public places. Today, with changes in the structure of communities, we socialize more frequently in our homes and communicate both with friends and members of our extended families over the telephone or by emails. Both architects and sociologists have bemoaned the loss of the public and semi-public places that characterised the traditional city. Starbucks aside, this has had a profound effect on the architecture and landscape of urbanity. Remote communication has encroached upon on the proximate realm and is seen to have eroded the public sphere.

Communication on the Internet began with emails and discussion lists, and grew to include Bulletin boards, chats, MUDs (Multi User Domain/Dungeon), Inhabited Virtual Worlds with avatars, extranets and intranets and World Wide Web sites (not exactly in this order). With each development came an increased potential to create a "sense of a social network". Using the Internet, people maintain relationships across great distances, blurring the time-honoured and architecturally-significant distinction between the intimate, proximate and remote realms. In the following sections I study a few of the media that have facilitated the recent rise of virtual communities and changed the structure of communities in the physical world.

2.1 Email, discussion lists and conferencing systems

Email, discussion lists, and bulletin boards/conferencing systems are all asynchronous media. Responses to email, messages posted on a bulletin board may come within minutes or not for months. The advantages of these media are that people in different time zones, on different schedules, and in different locations can exchange and share messages in a sustained and structured way. An example of an ongoing discussion list is *The WELL*. Brand and Brilliant founded The Whole Earth 'Lectronic Link (The WELL) in 1985, starting with a dialog between the independent writers and readers of the *Whole Earth Review*. This precipitated an open, literate, and uninhibited online discussion that continues even today. Figure 1 is an example of one such exchange. A new conference has been started by three veteran members of "The WELL". The

hosts provide an introduction and name to their conference – in this case Inkwell.vue conference. As seen in Figure 2 this conference has a wide range of topics from which to choose, read what others have said, and/or add to the discussion with one's own comments (see Figure 3). Many such discussions have been in progress for years, archived at regular intervals and available by a search for the topic name or discussion. The WELL is an example of a social community network. Members return to The WELL, often daily, to engage in discussions, swap information, express their convictions and greet friends.

“If you think of The WELL as a series of interconnected towns, Conferences are assorted places where townsfolk gather to talk: cafes, clubs, town halls and parks” (WELL home page).

But unlike cafes and clubs where participants must be present at the same place and time, WELL members can login and participate in the discussion any time and from anywhere. Wellman and Gulia consider that among other factors, virtual communities differ from “real life” communities on the basis of participants’ relationships with each other. On the Net people have a greater tendency to develop feelings of closeness on the basis of shared interests: (factors such as gender and economic status). Common interest fosters a level of understanding and mutual support is less important than they would be in face-to-face interaction. This kind of interaction is difficult to find elsewhere. An example of one such community on the WELL is “The Parenting Network” of children suffering from leukaemia. These parents share information, grief, and provide mutual support and help on a regular basis.

"Hi There" from the hosts of Inkwell.vue

Welcome to The WELL's Inkwell.vue conference! We, your charming hosts, have just started this conference, which will undoubtedly evolve into the most intelligent and witty writer's and reader's conference on the world wide web. Any day now. We will be interviewing authors and asking probing questions about real, complicated ideas, moral issues, but also "How Was Your Book Tour?" "What's Terry Gross really like?" "How can you tell who is the psychopath at the book signing?" You, dear reader, will have avenues to join the discussion and/or communicate with the hosts by sending email to inkwell-hosts@well.com.

The WELL has long been the home to a great assortment of writers, journalists, researchers, editors, and the occasional Deadhead. We get way too involved in discussion areas called "conferences." Traditionally, access to those areas and their remarkably heated and hilarious conversation has been by subscription only. With Inkwell.vue, we open up readership of a special WELL conference to anyone on the Web. We hope you enjoy yourself!

-- Your hosts, authors and longtime WELL veterans David Gans, Reya Basch and Linda Castellani

It's a different world: Special Note for WELL Members.

Check out the conversation: [Enter the Inkwell.vue conference](#)

[Inkwell.vue Home](#) [Enter the Conference](#)
[Get Involved](#) [Joining Members](#) [What's the Point](#)
[About The WELL](#) [Register Here](#)

Figure 1: A screen from a new conference on "THE WELL"

Total New Topics: 0			
Num	Topic Title	Last Post	Total
70	<u>Nick Barrock - "The Museum at Purgatory"</u>	(04/02/00)	34
69	<u>Hypernation?</u>	(04/02/00)	176
68	<u>Valerie Beer - The Web Learning Fieldbook</u>	(04/01/00)	63
69	<u>Happy 15th Birthday to the WELL!</u>	(04/01/00)	13
3	<u>Hello, my name is _____ and I am a _____</u>	(03/31/00)	280
42	<u>Mike Goodwin</u>	(03/31/00)	109
48	<u>Tim Powers</u>	(03/30/00)	249
62	<u>Indra Sinha: Cyberspace: Lust, War & Betrayal on the Electronic Frontier</u>	(03/30/00)	353
26	Ⓢ <u>Come Up in Inkwell.vue...</u>	(03/23/00)	6
67	<u>Tom Valovic - Digital Mythologies</u>	(03/20/00)	61
61	<u>Diary of a troubadour</u>	(03/16/00)	71
62	<u>Identity and "performance" online</u>	(03/14/00)	64
66	<u>Katie Granu - Attachment Parenting</u>	(03/03/00)	66
20	<u>Well (book) writers</u>	(02/28/00)	78

Figure 2: A screen showing the list of topics from the conference "INKWELL.VUE"

Figure 3: A screen showing messages posted at "inkWELL.VUE"

2.2 Chats

Chats support synchronous communication; groups of individuals can chat in real time by sending lines of text to one another. Hence a chat room might be called an “electronic agora” (Mitchell 1995) where people meet, discuss, and establish friendships. Chats can be text-based (ASCII) or graphically enhanced. ICQ and Internet Relay Chat (IRC) are examples of text-based chats, while the “Palace” and “Chat Circles” are examples of graphically enhanced chats. Chats can be private or public; private chats occur between select users or user group(s) while public chats are conducted among all individuals in the chat zone at a particular time. When a visitor enters the chat zone, he is given a list of all members currently available to chat with and a small description of their interests. Hence he could choose to chat with a person in Australia, i.e., in a different location, time zone and climate, on the basis of common interests.

“Operating over the Net, virtual communities are simultaneously becoming more global and local, as worldwide connectivity and domestic matters intersect. Global connectivity de-emphasizes the importance of locality for community; online relationships may be more stimulating than suburban neighbourhoods” (Wellman and Gulia 1998, p 17).

“Chat Circles”, an example of a graphical interface for chatting, was developed by Donath and Viegas in 1999. It uses abstract shapes to convey identity and activity within the chat space. While people are limited to sending lines of text to each other, the text is enclosed within a graphic that conveys the dynamics of the conversation and describes patterns of activity among users. It also features a

proximity-based filter that allows users to focus on the conversation in which they are involved without losing track of activity levels elsewhere in system.

To understand it better we can take an example from the physical world, of John in a party. He is talking with a group of people but he can also see other groups scattered across the party hall. He cannot see what they are saying, but can understand the nature of their conversation, by their body gestures. If interested, he can move closer, hear what is being said, eventually introduce himself, and join in. "Chat Circles" is an attempt to approximate the dynamics of face-to-face conversations online without web cameras or the need to know too much about the persons with whom one is chatting. When John connects to Chat Circles, he can see himself and all the other participants as small circles on the screen. Within the spatial distribution of participants (Figure 4), individual chat names are displayed adjacent to each circle and John's circle is differentiated by a white outline (Figure 5). Circles grow and glow with messages from participants and fade and diminish when they are silent (i.e. do not type). Users are always aware of their identity, location, the number of people connected to the chat and the activity level within each cluster of conversation. The physical proximity metaphor makes use of the ability of humans to peripherally and selectively sense activity around them. Chat interactions are spontaneous and organised spatially – as they would be in a physical space. The interface introduces a sense of "place" by describing relationships between participants in physical terms.

Figure 4: A screen showing spatial distribution of participants at "Chat Circles"

Figure 5: A screen showing participants, their messages and names at "Chat Circles"

Figure 6: A screen showing message postings in the "Conversational Landscape"

Figure 7: A screen showing threads of messages in the "Conversational Landscape"

When John joins a new group, he is given an update about the discussions he has missed. In Chat Circles, Donath and Viegas have developed a “Conversation Landscape” to visualize the conversational archive of online chats (Figures 6 and 7). Each user is represented by a different colour (same as the one used for chatting). It is a two-dimensional (2D) model of the conversation, with the y-axis representing time. The temporal sequence results in coloured threads on the screen that, when viewed together, reveal the interaction patterns within a conversation. Horizontal bars crossing the vertical time line display individual postings. The Conversation Landscape reveals interaction patterns comprised of clusters of activity and periods of silence.

2.3 Multiple User Dungeons (MUDs) and MOOs

MUDs are multi-user dungeons or dimensions - groups of multi-user, interactive, text-based virtual reality systems. MUDs were first developed in the late 1970s as interactive, networked systems for games like Dungeons and Dragons. This system allowed users to select a room by reading its textual description and move from room to room. While MUDs are a synchronous media--accommodating real time interaction and communication--they also support asynchronous communication (emails, conferences) and incorporate a range of synchronous forms of communication (e.g. chats) to facilitate game playing. With advances in technology MUDs have become increasingly complex, incorporating graphics and other multimedia components. At present there are several derivations of the MUD – MOO, MUSH, MUCK, WOO etc., - which are similar to

the MUD, but differ in their use. While MUD is an online game, MOO is geared towards communication and invites participants to create, extend and contribute to the evolution of the virtual environment. The MOO is continuously constructed and reconstructed by its members; users build new spaces and create objects using programming languages.

An example of a MOO is MediaMOO, a text-based, networked, virtual reality environment designed to enhance interaction among professional media researchers. It was designed and developed by Amy Bruckman (then at MIT Media lab) in 1993 and is now based at Georgia Tech.

"MediaMOO is designed to extend the type of casual collaboration which occurs at conferences to a daily activity. Visitors to a conference share not just a set of interests, but also a place and a set of activities. Interaction is generated as much by the latter two as the former" (Bruckman 1995).

Below is an excerpt from a typical conversation at MediaMOO (adapted from Bruckman's paper on MediaMOO, 1995).

PersonA: Can you tell me how to get to Ballroom A?

PersonB: I'm headed that way now. It's up this way.

PersonA: Thanks!

Person B: I see you're at Company X....

Person C: Is this seat taken?

Person D: No, it isn't.

Person C: I'm surprised the room is so packed.

Person D: Well, Y is a really good speaker....

"A text-based virtual environment can provide both a shared place (the virtual world), and a shared set of activities (exploring and extending the virtual world). Like at a coffee break at a conference, there is a social convention that it is appropriate to strike up a conversation with strangers simply based on their nametags. On MediaMOO, you can read descriptions of people's research interests as well as their names, and this can form a basis for striking up a substantive conversation" (MediaMOO home page)

The MediaMOO is structured as a virtual MIT Media lab. You enter into different rooms and converse with other people in the lab. You can move to other rooms, create objects and new rooms. As a guest member, one would experience the environment as described below: (adapted from Bruckman's paper on MediaMOO, 1995)

➤ **connect guest**

*** Connected ***

The LEGO Closet

It's dark in here, and there are little crunchy plastic things under your feet! Groping around, you discover what feels like a doorknob on one wall.

Obvious exits: out to The E&L Garden

> **out**

The E&L Garden

The E&L Garden is a happy jumble of little and big computers, papers, coffee cups, and stray pieces of LEGO.

Obvious exits: hallway to E&L Hallway, closet to The LEGO Closet, and sts to STS Centre Lounge

You see a newspaper, a Warhol print, a Sun SPARCstation IPC, Projects Chalkboard, and Research Directory here.

Amy is here.

➤ **say hi**

You say, "hi"

Amy says, "Hi Guest! Welcome!"

The developers of MediaMOO designed only the basic infrastructure, a few interesting places and several evocative objects. The central principle of the project is that users are encouraged to build upon the basics and create objects and places of their own. Bruckman notes that the community evolves through “constructionism”. This term was first coined by Seymour Papert and involves two types of construction.

“First, it asserts that learning is an active process, in which people actively construct knowledge from their experiences in the world. (This idea is based on the theories of Jean Piaget.) To this, constructionism adds the idea that people construct new knowledge with particular effectiveness when they are engaged in constructing personally-meaningful products. They might be constructing sand castles, LEGO machines, computer programs, or virtual objects. What's important is that they are actively engaged in creating something that is meaningful to themselves and to others around them” (Bruckman 1995).

People create and construct according to their interests; by personalizing their creations they develop a “sense of belonging”. Part of the motivation for investing time in creating environments for themselves is the recognition and appreciation they receive from others.

Unlike most MUDs, where participants are anonymous (i.e. they assume a name or avatar) each participant in MediaMOO is known by his/her name and research interests. As noted, each user also constructs his/her own home. One example, a writer's home, is named as “the panoptican”, another researcher in virtual communities named his home “electric communities”, and a psychology professor named hers “quiet light”. This expresses the rich diversity of the user

population and the use of naming to evoke specific qualities that adhere to and enrich the community as a whole.

Bruckman reminds us that both the ability to construct things and the community context for individual constructions is important. An ethnographic study of the MediaMOO community revealed the following:

- motivation for learning,
- emotional support to overcome technophobia
- technical support, and
- an appreciative audience for work completed

The ability to extend the virtual world with new objects and places was seen to provide:

- an opportunity for creative self-expression
- a means to establish a personal identity within the community
- a way for individuals to contribute something to the community
- a context for social interaction (both in the process of creating the objects, and in their use when finished)
- an enhanced sense of connection to the community

2.4 Inhabited Virtual World (IVW) and Avatars

“There is a movement of dedicated Internet users who want to colonize cyberspace and transform it into a galaxy of interconnected Inhabited Virtual Worlds (IVW)” (Bruin and Damer 1998, p1).

Many Internet users envision cyberspace as a matrix of interconnected virtual worlds inhabited in real time by millions of people represented as “avatars”.

“Avatar is your body double in Cyberspace, your presence in the virtual communities growing inside two and three-dimensional virtual worlds online”

(Bruin and Damer 1998, p3). Hence avatars are the visual embodiment of individuals in virtual worlds.

"IVWs are all about social interactions and the bandwidth of human experience". These virtual worlds have pushed cyberspace beyond a mere interface into the realm of "place" (Bruin and Damer 1998, p1). Virtual worlds have dimensions that permit users to check their location (coordinates); they represent a new way of experiencing cyberspace. Their ability to bring together people and expertise from many diverse backgrounds encourages the development of community and culture – expanding the concept of the virtual world. By using "avatars", visitors can go beyond simple chats in which only (spoken) text and documents are exchanged (e.g. "Chat Circles"). "Avatars" embody important aspects of human social interaction such as gestures, proximity to others, and emotions. As seen in Figure 8, the messages users type are seen as text within a bubble. Users can also orient their avatars to face others, or move away, or fly above others (lose sense of gravity) etc. (Figure 9). Users can also show emotions by body gestures (moving the avatar's hands/neck etc.). Bruin and Damer note that a conversation between people as avatars in an IVW comes closer to the feeling of a face-to-face conversation than in text-based environments.

Online IVWs become more common on the Internet as they can run effectively on a larger range of consumer computing platforms and modem speeds. An example is the "Avatar 98" trade show and conference held in November 1998. The entire conference was held in IVW and all visitors were avatars (Figure 8).

Each visitor chose his/her own avatar and was identified by that representation. Avatar 98 world was conceived as a one-kilometre square space modelled on the conventional conference hall. The virtual conference hall featured a "Ground Zero" landing zone for new attendees, a series of 48 exhibits for participating companies (Figure 9) and organizations, an art gallery, a webcam wall showing two dozen webcasts from participating locations (Figure 10), a "big board" conference schedule, an awards area, and six "speaker pods" for parallel tracks in virtual "breakout rooms".

Hence IVW and avatars are the closest of the current virtual worlds to the physical world. Their development is motivated by the assumption that the virtual world aspires to the qualities, context and kinds of interactions we associate with the physical world. This however, is not necessarily the case. As seen in Figure 11 in the Avatars 98 conference, the space is modelled to replicate a real world to the smallest detail, including the acoustic tiles on the ceiling - raising the question of why the perfection of virtual worlds implies a replication of the banality of much of our physical environment.

Problems with currently available technology include the navigational devices that are required to explore them (input devices like the key board, mouse, joystick etc.). Given the navigational devices available and the difficulty in navigating 3D space, users are easily disoriented. The more dimensionally

Figure 8: A screen showing avatars of participants in "Avatars 98"

Figure 9: A screen showing exhibits of participatory companies at "Avatars 98"

Figure 10: A screen showing the web cam wall at “Avatars 98”

complex the space, the more difficult it can be to understand. Detail can both help and exacerbate the problem.

2.5 World Wide Web sites

“While the World Wide Web has been hugely popular for some time, it is only more recently that it has become a site for interaction” (Kollock and Smith 1998).

Web sites began as a way of distributing information. The early web used text-based interface, using Hyper Text Markup Language (HTML) to display text. HTML uses hyperlinks to link pages within a folder, or to pages in other folders on the same server or to pages in on other servers. Aside from hyperlinks (the world wide web's most important innovation), however, interactivity on the web was limited. As they developed, browsers were able to support selected graphics and multimedia components. Over the past decade the web has evolved into a dynamic and interactive medium. It now supports asynchronous and synchronous communication and is increasingly recognized as a social network.

“The Web did not start as a social technology: it started as a way to distribute physics papers. Its emergence as a social technology is marked by two phenomena: the rise of the personal home page as a necessity part of online presence and the ongoing attempts to introduce interpersonal communication to the Web's publication-only model” (Donath 1995, p2).

Not so long ago peoples' identity in cyberspace was primarily limited to a contact address. Creations within MUDs and IVWs were restricted to members of the particular MUD or IVW. With the rapid growth of the web, people and corporate groups are now able to maintain permanent, public, virtual identities and

locations for themselves in cyberspace. Personal web pages, like avatars, represent individuals and entities in the virtual world.

In his book "The Presentation of Self in Everyday Life", Erving Goffman distinguished "expressions given" from "expressions given off". The former are deliberately stated messages indicating how one wishes to be perceived; the latter are more subtle -- often unintentional -- messages communicated via action and nuance. In relation to this, Donath has observed that,

"Home pages are already reaching the stage where one can read from them not only the expression given by their author, but the expression given off. As technology improves and as the pages become more common, the ability to 'people-watch' in cyberspace will grow" (Donath 1995, p2).

It is said that the face is a mirror to one's character -- that our faces speak volumes not only about what we might want to portray but what others see in spite of us. Web pages have come to play a similar role in the virtual world. Corporate groups and communities, who may or may not have a location in the physical world, can stake out real estate on the web. Hence the world wide web also provides a "place" for communities/companies/people who might not have a "place" for themselves in the physical world due to limitations of distance, economics, logistics etc. The world-wide web is not "members only"; its vision is universal and synthetic. The web has helped to break cyberspace into a series of recognizable places. The relationship of these places to their real-world

counterparts will be covered further below. "The Web, when you are in it, feels like a place" (Bray 1995, p9).

The web now integrates interpersonal communication. It supports asynchronous and synchronous communication media ranging from email links from web sites to chat and MUD links (e.g., telnet, IRC, ICQ, Chat Circles, Media MOO). Newsgroups have also been integrated within web sites. "The profusion of these Web-related communication systems indicates that there is a demand for communicative mechanisms within the web" (Donath 1995b, p3). The web site is an entry to other levels of interaction; it has become the de facto threshold to cyberspace.

After this study of a variety of mediums and technologies: for communication, interaction and information dissemination, and the role of designers, users, and technology in setting the appropriate context, I have summarized important issues in a matrix (Table 1) supported with examples.

Table 1: Matrix of Contemporary Virtual Communities

Example	Method of communication	Technology	Content	Context	Experience
Asynchronous Users post messages, host and participate in discussions.	Bulletin Board system	Users Users create content by communicating and participating in discussions	Users Users create the context. For e.g., Parenting Network	Communicative Users share experiences with others having similar interests.
THE WELL (http://www.well.com)
Synchronous	Real-time chat system	Users Users create content by real-time chatting. The content is archived in a conversation landscape context (screen is the space)	Designer Designer created a "face-to-face" conversation in a spatial context (screen is the space)	Evokes a sense of place Users can orient and identify themselves within the space, they are aware of others, and can communicate and interact with them.
Chat Circles (http://www.media.mit.edu/~fviegas/circles/new/index.html)					
	Synchronous	MUD (Multi User)	Designer and Users	Designer	Evokes a sense of place

Comprehensive (Synchronous and Interactive)	IVW with avatar (Interactive Virtual World)	Designer and Users Designers create the content and users continue building the environment.	Designer and Users Designers create the context and users continue building the environment and inhabit it as avatars	Evokes a sense of place within a vast space Users inhabit this environment as avatars and create places for themselves that have a distinct character
Asynchronous (passive)	CD-ROM based	Designer only Designers created the content and users view it through a passive interface	Designer Designer created the context of a street and the backyard of a house.	Evokes a sense of place and security The street, house and girlfriends at the window evokes a sense of security and comfort.
Comprehensive (Asynchronous, and Interactive)	World Wide Web site	Designer only	No context Information delivered like a newspaper supported with images of pregnant women	Passive information delivery Users read the information like a newspaper.

Avatars 98 (<http://www.ccon.com>)

Girlfriend's Guide (CD-ROM)

Baby Center (<http://www.babycenter.com>)

3. Building an Online Community

Designers are struggling to visualize, design and build the “perfect” online community. Studies and research on contemporary online communities have determined that it is not primarily the designers and developers that build them, but it is the users, the maintenance staff and the site administrators. Indeed the role of the latter has been shown to be more important than the former. Designers set communities in motion. Their work is judged to be successful only in as much as the users take over from them.

- While designers of online communities are similar to architects and engineers of the real world, they play a more profound role in shaping the users experience. In her thesis, “Inhabiting the Virtual City”, Judith Donath notes that the built environment designed by architects is only a small part of the real world, but in the virtual world users depend completely upon the infrastructure and tools provided by designers to inhabit the environment (Donath 1997).
- Maintenance staff maintain the community and keep it clean. Amy Bruckman, who designed MediaMOO calls them “janitors”. Along with the users they also provide new content, keeping the environment vital.
- Administrators are similar to the governing bodies in the real world communities and are responsible for its efficient running. Users who have difficulty accessing a site seldom return. Hence the dependability of the system is crucial to build trust and loyalty among users.
- Users inhabit the community and animate it into a social network.

In her paper "Cyberspace is Not Disneyland", Amy Bruckman describes that, "People come to the net to participate and create, not to receive information passively. The Information Superhighway is a misnomer. It's not about information; it's about community, participation, and creation" (Bruckman 1995a, p2).

"Man dwells when he can orientate himself within and identify himself with an environment, or, in short, when he experiences the environment as meaningful. Dwelling therefore implies something more than a "shelter". It implies that the spaces where life occurs are *places*, in the true sense of word.

The task of the architect is to create meaningful places, whereby he helps man to dwell" (Norberg-Schultz, p5).

Users might be said to dwell in an online community, when they experience it as meaningful; it is the designer's task to provide the context and initial infrastructure make it meaningful. This thesis concentrates on the designer's role in building a "meaningful" online community. Bruckman contends that "Cyberspace is not a Disneyland", where people enjoy perfectly built places designed by professionals. Instead she compares cyberspace to a finger painting party, where everyone participates in making things and wants others to appreciate their creations (Bruckman 1995a).

"I did not create MediaMOO - - I created a context for its members to create it. Which is not to say that I didn't strongly influence the form it took. Through initial design decisions and personal conduct, the founder of a community establishes a tone and mood, shaping but not controlling the community's evolution" (Bruckman 1995b).

Hence the designer's primary role is to create a meaningful infrastructure, one within which users can identify and orient themselves, create, participate and communicate, share experiences, develop a "sense of belonging" and eventually contribute to building a place for social interaction. While the online world is in many ways different from the real world, Wellman and Gulia note that both are inhabited by the same people. The underlying interests, needs and motivations of the inhabitants are common to both environments (Wellman and Gulia 1996).

It should also not be forgotten that designing an online community involves expertise not only in the field of architecture but also in the fields of anthropology, sociology, psychology, computer science, user interface design, information and interaction design, among others. Hence it is one of the most challenging tasks of today. In part because the endeavour is so inter-disciplinary, there are few guidelines or tried and tested conventions governing the design of virtual worlds. This is in part due to the constant and rapid changes in the technologies that facilitate these worlds; forcing changes to be more technology driven than based on an assessment of human needs and aspirations. The relationships between the "what", "how" and "why" are constantly changing.

"Designing the virtual environment is a challenging problem. In its newness and abstraction, it presents a nearly blank canvas to the designer. There is neither an inherent form nor much history and shared culture on which to base a design. Its features are unprecedented: millions of people worldwide are able to communicate with each other and share information, transcending the accustomed limitations of time and space" (Donath 1997).

Most of the web-based communities I have studied were designed to display information using the latest available technologies. The nature of the information being delivered and the question of for whom the information was intended had little impact on how these sites/communities were structured.

20th century philosopher Sir Karl Popper wrote that human beings inhabit three interconnected worlds. He identified World 1 as the objective world of materials, natural things and their physical properties, World 2 as the subjective world of consciousness – the intentions, calculations, feelings, thoughts, dreams and so on, in individual minds, and World 3 as the world of objective, real, and public structures interacting with each other and with the World 1. He noted that many World 3 structures are abstract, i.e., purely informational forms of social organization or patterns of communication. According to Popper these abstract structures have always equalled, and often surpassed the physical structures of World 3 in their beauty, complexity and importance to life. In his book “Cyberspace: the first steps”, Michael Benedikt extends Popper’s ideas by suggesting that cyberspace is the latest stage of the evolution of abstract elements in World 3. Benedikt contends that cyberspace will not replace but “displace” the earlier elements of World 3, that virtual environments will define own niche and force earlier elements to redefine theirs too (Benedikt 1990).

“Cyberspace has been defined as ‘an infinite artificial world where humans navigate in information-based space’ and as ‘the ultimate computer-human interface.’ However one defines it, this ‘virtual reality’ is clearly both the strangest and most radically innovative of today’s computer developments” (Benedikt 1990).

“Media spaces were intended to provide the structure from which placeness could arise, just as places arise out of the space around us. They were not designed as places themselves, but for people to make places in them” (Dourish and Harrison 1999).

Real world architects design the infrastructure (physical structures) that inhabitants (people) transform into places to which they develop a “sense of belonging”. Similarly, with respect to online communities, designers should not design spaces, but encourage the development of places through the infrastructure they provide.

“Spaces where life occurs are *places*, in the true sense of word. A place is a space which has a distinct character. Since ancient times the *genius loci*, or ‘spirit of place’, has been recognized as the concrete reality man has to face and come to terms in his daily life. Architecture means to visualize the ‘genius loci’, and the task of the architect is to create meaningful places, whereby helps man to dwell” (Norberg-Schultz, p5).

An online community becomes a “place” when life occurs within it. Here “life” is measured by the extent to which users participate, communicate, interact, share experiences with each other and invest in the evolution of the community. In their paper “Re-Place-ing Space: The Roles of Place and Space in Collaborative Systems”, Dourish and Harrison reinforce that the concept of place is fundamental to architecture and that place is a space with social meaning, cultural understandings and conventions. They go on to say that web designers should learn from the discipline of architecture to think about place in online communities (Dourish and Harrison 1996).

By definition, a place must have a distinct character and meaning. It is this distinct quality that distinguishes place from space. Place has characteristics particular to human beings. Hence the same space can function as different places, depending on how it is used. The sense of place transforms space. Each online community is a unique situation and should be designed in relation to content, context, target users and the shared experiences of its users.

Hence the infrastructure for each community should be in some ways distinct, however common the underlying issues are. Through the study of this topic and the design of an online community I am attempting to identify both specific and general issues – and to speculate on an appropriate process, that is described in the following sections.

Process

While the process is explained in detail, with relation to PPESO in chapter 4 the important steps are summarized below:

Step 1 – Discovery

Step 2 – Analysing Major Challenges

Step 3 – Design

Step 4 – Development

Step 5 – Evolution

Step 1 – Discovery

Designers must understand the needs, expectations and aspirations both of the client and target users. “Generally the goals and messages stipulated by a client will not be correct. Clients are usually too close to their problems to see solutions clear enough” (Shedroff 1999). Hence defining the goals of the on-line experience and the messages to be communicated through this community should be the first step. In his paper “Information Interaction Design”, Shedroff notes that here proper identification of goals of the community ensures that inappropriate data, technology, styles and techniques are not used (Shedroff 1999).

Step 2 – Analysing Major Challenges

Once the goals of the community are defined, designers must address challenges of:

- The concepts of: context, situation and place
- Materials: Infrastructure, metaphor and technology
- Tools: process

Together the three challenges above contribute towards achieving the goals of this community defined in Step 1 – “a meaningful experience for the user” and “conveying the right message”.

Step 3 - Design Phase

Based on the above, designers must generate an initial layout for the site -- as concept book, mind-map, storyboard, and/or flow chart. Then, create, test, and revise a text-only prototype leading to a technical plan to guide the graphic development of the site and build, test and review an Alpha Test site.

Step 4 - Development Phase

Designers must subject the Beta prototype to a functional analysis involving heuristic analyses, focus groups, and global user tests before the final design.

Step 5 - Evolution Phase

This involves monitoring, documenting, and responding to client feedback on site structure and user functionality. Ongoing compliance with approved solution design through regular audits and site evaluations must be ensured.

For the purpose of this thesis, I will study only Step 2 (Analysing Major Challenges) in detail. Though the challenges in Step 2 cannot be analysed individually by definitions and examples, they can be better addressed by studying complimentary relationships between the physical and virtual community, by transforming data into meaningful information, by drafting an appropriate technical plan and by analysing meaningful experiences. I look at each of these issues in the following sections. While at this point I am treating

them generally, I will address them in the design of an online community in chapter 4.

3.1 Complimentary communities: Physical and Virtual

This section explores a few of the relationships between the real world and the virtual world. This comparison is made not on the assumption that virtual communities should aspire to the structure and constraints of physical communities, but because the users of both worlds are the same. This study is restricted to four major issues – “Orientation and Identity”, “Presence and Awareness”, “Public and Private space” and “Virtual to Real loop”. I will discuss each of these issues below.

3.1.1 Orientation and Identity

“When man dwells, he is simultaneously located in space and exposed to a certain environmental character. The two psychological functions involved may be called “orientation” and “identification”. To gain an existential foot hold man has to be able to *orientate* himself; he has to know *where* he is. But he also has to *identify* himself with the environment, that is, he has to know *how* he is a certain place” (Norberg-Schultz 1980, p19).

Orientation and identification within the environment have been the most important aspects of man’s dwelling. In his book “Image of the City”, Kevin Lynch uses the concepts of “node”, “path”, and “district” to denote the basic spatial structures by which humans orient themselves in the physical world. The perceived interrelationship of these elements constitutes an “environmental image”, which, Lynch asserts “gives its possessor an important sense of

emotional security". People use environmental qualities such as "shape", "colour" or "arrangement" to make mental images of the environment (Lynch 1960). These mental images are crucial for orienting oneself. Without a clear picture of their environment people not only get lost but lose their sense of emotional security. Lynch notes that a vivid and integrated physical setting produces sharp mental images and plays an important social role by providing raw materials for the symbols and collective memories of group communication (Lynch 1960). Similarly a vivid and integrated virtual setting can play an important social role.

"Obviously a clear image enables one to move about easily and quickly: to find a friend's house or a policeman or a button store. But an ordered environment can do more than this; it may serve as a broad frame of reference, an organizer of activity or belief of knowledge. Like any good framework, such a structure gives the individual a possibility of choice and a starting-point for the acquisition of further information. A clear image of the surroundings is thus a useful basis for individual growth" (Lynch 1960).

A clear image of the identity and (infra)structure of online communities provides potential users both with a starting-point and motivation to acquire further information. "The abstract nature of the online world makes a legible environment especially important: a poorly conceived interface is far more impenetrable than the most twisted alleyways" (Donath 1997).

The user may get lost if the virtual setting is wholly abstract. Hence appropriate metaphors from the physical world can provide a balance between abstraction and reality.

“Without reducing the importance of orientation, we have to stress that dwelling above all presupposes identification with the environment.

In our context ‘identification’ means to become ‘friends’ with a particular environment” (Norberg-Schultz 1980, p20).

In “Genius Loci”, Norberg-Schultz notes that people most often identify themselves by saying “I am a Roman”, or “I am a New Yorker”, rather than on the basis of what they do (e.g., “I am an architect”). As human identity is closely tied to place, environments should not only facilitate orientation, but consist of concrete objects of identification. Norberg Shultz quotes Susan Langer, saying that “Architecture comes into being when a “total environment is made visible” (Norberg-Schultz, 1980). Applying the same principle for online worlds, a virtual space comes into being only when the “total environment” is made visible. The total environment, in addition to identifiable infrastructure, imageable objects, and clear routes of navigation between understandably distinct bits of data, involves the presence and awareness of other people and an understanding of the boundaries between private and public space. I will discuss these issues in the following sections.

3.1.2 Presence and Awareness

Arguably, more important than the buildings, landscapes or the artefacts that structure our physical environments is the presence of other people. Awareness of other’s activity allows us to structure our own activities by integrating communication and interaction. We orient ourselves with respect to others. Similarly online communities should afford us an awareness of others within the

environment and represent their level of activity. Examples of this are “Chat Circles” and “MediaMOO” discussed previously. A successful community must include a mechanism to be aware of and communicate with others.

3.1.3 Public and Private space

“In our context “creative participation” means two things: firstly the realization of a private “inside” which concretises the identity of the individual by gathering the meanings which constitute his personal existential content, and secondly the creation of public “outside “ which gathers the institutions of communal life and makes the meanings (values) manifest on which this life is based. The private domain is the home of man, in the narrower sense of the word “(Norberg-Schultz 1980, p182).

“In general the concept of the private inside becomes manifest in the “threshold” or boundary which separates it from and unifies it with the outside. At the same time the boundary gives the public outside its particular presence” (Norberg-Schultz 1980, p184).

Home has always been the private domain. The front door to a house acts as a threshold between the private and public domains. Hence the visual representation (the front door) embodies the social convention that a house is private. Understanding that their actions on the street or in the mall are public, people will change that behaviour once they cross through that threshold.

At present privacy in the online world is maintained solely through technology. Firewalls (representing impenetrable walls) prevent users from entering into certain spaces and passwords restrict access similar to the way in which a key controls access to a door. Firewalls and passwords however do not provide a visual separation. “The establishment of a clearly demarcated public space can

enhance privacy by increasing people's knowledge of what information is private and what is known to all" (Donath 1995). Technical solutions must be given a symbolic embodiment. As discussed before, metaphors can be used to structure and evoke a sense of privacy and separation. In online communities the symbolic distinction between public and private may be important in making the user comfortable and offering clues about how to act or interact in different spaces. In this context "to act" might mean to offer information or comments. Information given in the public space would be available to the whole community while information provided in the private realm would be personal and confidential and not available to others.

3.1.4 Virtual to Real loop

In his book "City of Bits", Bill Mitchell attempts to convey to architects that the virtual world compliments rather than threatens the physical world (Mitchell 1995). I consider that the two worlds are not only complimentary, but supplement each other. At present people spend a lot of time in online communities. In their paper "Net Surfers don't Ride Alone", Wellman and Gulia explain the concerns of critics. Detractors worry that life and experiences on the Net will never be meaningful or complete as it will lead people away from the full range of interpersonal contact. They also worry that if people get engulfed in virtual reality they risk losing contact with "real life" (Wellman and Gulia 1997).

On the contrary I believe that in key instances online worlds or communities can be used to make people more aware of their real worlds. They are capable of creating social links between people and groups that are socially and physically dispersed. Taking the example of "The WELL", (see in section 2.1), the parenting conference created a community of parents whose children suffered from leukaemia. These individuals were too few and far between to come together as a local community and there was no mechanism to know of each other's existence. But even if two or more of these parents lived in the same city and could arrange to meet they might not choose to do so. Many people are more comfortable asking personal questions over the Net where identity and anonymity are not an issue. Moreover meeting on the Net does not preclude subsequent face-to-face meetings – it can even facilitate them. It can also be used to share local community information (such as sources for funding, good doctors) and much more. If doctors joined in on an online conference, they too could learn from the discussions and upgrade their services. Hence a continuous loop is developed. Real and virtual communities compliment and augment each other.

Addressing the issues of "Orientation and Identity", "Presence and Awareness", "Private and Public space", "Virtual to Real loop", to compare and align real and virtual worlds in the evolution of online communities into "places" for social interaction contribute towards evolving the community into a "place" for social interaction. I contend that to gain a meaningful experience, users have to

experience “a sense of place” and not only the “sense of space”. Dourish and Harrison assert that “Space is the opportunity and Place is the understood reality”. Online communities are generally modelled based on space, but it is the concept of “place” that gives it a distinct character and distinguishes it from other communities (Dourish and Harrison 1996). Hence designers confronted with infinite space (cyberspace which has no physical boundaries like the physical world) must address the challenges of realising places within it. In his paper “Measuring the Web” Tim Bray has sketched a model of cyberspace, where the vast and infinite space is filled with places of distinct character and meaning (Bray 1995). Again it should not be forgotten that online communities depend on content or information to function. In the physical world, this content is conveyed in a variety of ways, from face-to-face conversation to watching an interesting play at the theatre, in the online world, however, clients provide the “initial raw data” (the data required to kick-start the community) which must be transformed by the designers into meaningful information, hence laying the foundation for users to continue building the information resource of the community. These issues are discussed in the following sections of this chapter.

3.2 Transforming Data into Meaningful Information

Users must be able to make sense of the information in the community, find it meaningful, and to contribute additional information. In most contemporary online communities, communication takes the form of "data technology" i.e. users are presented with data delivered by the latest technology. More often than not the data is context-less, and therefore incomplete. Users are faced with the challenge of sorting the data themselves to make sense of it.

"Successful communications do not present data. If, for example, presenters haven't bothered to provide context and build meaning, audiences have little patience for doing it themselves. As designers, we constantly must ask ourselves what service we provide" (Shedroff 1999).

Shedroff says that data is the product of discovery, research, gathering, creation and writing. It is raw material to be used for building communications and interactions. Data has to be organized, transformed and given a context to become meaningful information. Shedroff refers to it as a continuum of understanding (Figure 11), where data is first transformed into meaningful information, information is transformed into knowledge, and knowledge into wisdom. He quotes Brenda Laurel's statement about the relation of information to experience. Similarly, users could be said to "dwell" in the interactive media only if the experience is meaningful.

Just as every day of a person's life is a different experience, every visit of a user to an online community should be a new experience. In our daily life, even

Figure 11: A screen of Nathan Shedroff's "Continuum of Understanding"

though we follow a strict routine, we have unexpected encounters. No two days are the same. Our life evolves through these experiences. Hence it is necessary for the designer of the online community to understand its users, their needs, abilities, interests, and expectations, and for the users experiences to evolve within this context.

“Information makes data meaningful for audiences because it requires the creation of relationships and patterns between data. Transforming data into information is accomplished by organizing it into a meaningful form, presenting it in meaningful and appropriate ways, and communicating the context around it” (Shedroff 1999).

Hence the data must be presented in such a way that it can be transformed into meaningful information.

3.2.1 Transforming the data

“The first step in transforming data into information is to explore its organization. One of the things I do is look at the morphology or structure of any piece of information and try to find the natural form that will bind together that information in much the same way that a comedian binds together a routine” (Wurman 1989, p114).

In his book, “Information Anxiety”, information architect Richard Saul Wurman notes that, while information is potentially infinite, it can be organized only in five different ways. He defines there as (1) category, (2) time, (3) location, (4) alphabet, or (5) continuum. These modes are applicable to all forms of information, from personal files to multinational corporations (Wurman 1989, p59). Hence to transform data, it must be organized.

3.2.1.1 Organizing the data

- **by Category**

Categorization is organization by type. For example in a shoe store, the winter boots, sports shoes, and dress shoes are displayed on different racks. Wurman notes that categorization helps in organizing items of similar importance. (i.e. where there is no hierarchical or sequential distinction between data. Categories can be reinforced by appropriate colour coding (Wurman 1989, p60). Shedroff says that it is crucial to define specific categories, as they communicate the designer's prejudices and understanding of the information. Categories control the perception of information (Shedroff 1999).

- **by Time**

"Time is an easily understandable framework from which changes can be observed and comparisons made" (Wurman 1989, p60). Time is a good organizing principle for events that happen over fixed durations, or important changes that happen constantly. Time can be addressed broadly as days, weeks, months or years, or in detail as minutes and hours.

- **by Location**

“Location is the natural form to choose when you are trying to examine and compare information that comes from diverse sources or locales” (Wurman 1989, p60)

When organizing data that have relationships and connections to each other organizing by location is easy.

- **by Alphabet**

Alphabetical organization is culture specific; different languages will have different indexes for the same information. This method is useful for large bodies of information. It is common in online glossaries. Alphabetical organization is non hierarchical and uses an arbitrary absolute (first letter) to organize for easy searching. Users need to know little about data in order to scan it. However, the arbitrary nature of the organization can sometimes make the information difficult to browse – like categories of information are not necessarily adjacent.

- **by Continuum**

This method is used to organize items by magnitude i.e. from small to large, least important to most important. Hence it is used to assign value and hierarchy to the information. It can be expressed by colours, numbers or units.

“Understanding the structure and organizing of information permits you to extract value and significance from it” (Wurman 1989, p65). Designers tend to use all the above-mentioned methods to organize data. A web site for low-calorie food recipes, for example, might be organized by category, by alphabet and so on. Hence the designer has to understand the structure of the data and choose the best possible method to organize it to create meaningful and valuable information. Multiple organization system are best in that they give a user a choice of ways to browse or search through the information. Most books contain both a table of contents (by continuum) and an index (by alphabet). I will discuss multiple organization in the following section.

3.2.1.2 Multiple Organizations

“Almost all organizations are actually nested, multiple organizations. A primary organization is not necessarily the only organization and it allows for secondary or more sub-organizations. Each of these, need to be clear and meaningful” (Shedroff 1999).

Let's take the example of a directory of workers in a large corporation. It is first organized by location. Hence if the company has 10 locations, the primary organization is by location. Each location is further categorized by department and each department has an alphabetical listing of its employees. Hence this nested organization uses three methods – “location”, “category” and “alphabet” to organize data and make it meaningful to the user who is searching through the directory. Once the data is organized, the next step is to put it into context.

3.2.1.3 Setting the Context

The dictionary defines context as “the parts of a discourse that surround a word or passage and can throw light on its meaning” or “the interrelated conditions in which something exists or occurs” (Merriam Webster online). In many online communities data is organized but not presented with a context. Hence while the data may be both searchable and browse-able, it is not necessarily meaningful.

Context gives meaning to organized information. Describing MediaMOO Bruckman notes that she provided a context for users to continue building. With just a few lines of meaningful text, Bruckman was able to orient the new user. As noted in section 2.3 new users must enter the site through the LEGO closet en route to the lounge. Had Bruckman not set this initial context of entering through the closet and finding one's way around the rooms, new users would not be able to make sense of the space. Once familiar with this new environment, users can start creating and contributing to it. Bruckman's context shapes the evolution of the community; while it does not control data, it gives it a form and contextual meaning. Hence the users are not likely to attempt to convert MediaMOO into a community for Pokemon freaks and/or become frustrated because they cannot. “Context tells us to get as close as possible to the ideal situation of being physically present. Staying in context enables us to gather ongoing experience rather than summary experience, and concrete data rather than abstract data” (Beyer and Holtzblatt 1998, p47). Context gives us clues on how to interpret

data; it helps us understand what it is, why it might be there, and how to position ourselves relative to it.

“Metaphors are one way of setting context (i.e. transforming data into information). It is important that the context implied is the one intended and that it matches the desired understandings. They are a means of representing things than a way to organize or present them. They achieve a cognitive orientation of meaning rather than one of structure” (Shedroff 1999).

In “Metaphors We Live By”, Johnson and Lakoff describe “metaphors” as a cognitive tool and a way of structuring thought (Johnson and Lakoff 1980). Hence the image of an armchair near a window can set the context of a place and suggest how it is to be used. Metaphors can be visual or text based.

One effective means of communication is the use of visual clues, such as icons, symbols and pictographs. They can carry a great deal of information in them and can be immediately understandable to speakers of different languages” (Wurman 1989, p115).

Once raw data is transformed into meaningful information, it has to be effectively communicated to the user. The means of communication depends upon the nature of information, the message to be conveyed and the expectations of the users with regards to realising an experience. I discuss these issues in the following section on “Technical Plan”.

3.3 Technical Plan

Technology plays an important role in communicating the “message” and realising the ‘meaningful experience’ of the community. Two important factors

that determine the appropriate technology for an online community are Content and Target users. Each must be analysed in relation to the other, as content is structured depending on target users and target users depend on the content for their experiences within the community.

By content I mean the meaningful information that leads to experiences. We can take the example of “Baby Center” (Figures 12 and 13). The community is a web site for pregnant women and provides them with textual information supported by graphics. Were the “Baby Center” site designed as a IVW it would not succeed as majority of its target users would not have the technology to view and use it, and moreover, the target users of this site may be novice computer users and would be unable to navigate through a IVW. It is not enough that the choice of technology is appropriate to the content, it must be appropriate to the users. Once the appropriate medium (or technology) is chosen, the designer has to tap its potentials to the maximum.

I addressed the challenges that must be considered for users to realise a meaningful experience and understand the message conveyed through the online community. In the next section I will discuss experiences briefly.

Figure 12: A screen showing the home page of "Baby Center"

Figure 13: A screen showing the chat hosts of "Baby Center"

3.4 Building the Experience

Scriptwriters, storytellers, dancers, singers etc., communicate stories and messages through performance by creating experiences for their audience. Shedroff observes that people are not taught to create experiences in the same way that they are taught science, history, geography etc. He notes that while a stimulating conversation is among the richest of the human experiences, we are not trained to converse or to interact with others -- at least not in any formal way. The field of interaction design addresses the creation of human experiences. I will discuss this only briefly in this section, as a detailed study of interaction design is beyond the scope of this thesis.

Experiences can be passive or interactive. In his book "Designing Business", Clement Mok evaluates experiences. It is apparent that while technology plays an important role in making experiences rich and interactive, user's needs and expectations are also crucial to building the experience. Reading a book, listening to the radio or watching television can be a passive experience but can be transformed into a rich experience

when the author has understood the target audience and designed an experience for them. For example watching a play at the theatre is a passive experience, but speaking directly to the audience, offering suggestions, planting actors in the audience, or inviting them to participate in the action on stage transforms theatre into an interactive experience. Experiences must be built for

the situation. The situation depends upon factors such as users, their needs and expectations, available technology, techniques and much more. Users can realise experiences only when they understand the environment and are comfortable within it. Hence I contend that by realising the “sense of place”, “understanding the meaningful information” and using the “appropriate technology”, users can realise a “meaningful experience” and understand the message conveyed. These are not the only challenges, but they are important when designing an online community.

For the purpose of this thesis, I will restrict my study to creative, shared, communicative and adaptive experiences in an online community. “Creative products and experiences require that others participate by creating or manipulating, instead of merely watching and consuming” (Shedroff 1999). An interactive experience becomes creative if the users or audience create, participate and share their creation. Considering MediaMOO again, Bruckman was successful in this regard. Once familiar with the environment, users worked individually and together to build the community. Users realised the “sense of place”, perceived information as meaningful and were enabled by the technology to continue building the community. Mutual appreciation of one's creations encourages further creation. A chain of experiences allows the community to develop a momentum – from interactive-creative-shared experiences.

An interactive experience is also communicative. An interesting telephone conversation for example, is an interactive and communicative experience.

Similarly online chats are interactive and communicative. “Chat Circles” is an example of an online chat (explained in detail in section 2.2).

An interactive experience becomes adaptive when it is tailored to the user’s profile. “Adaptive technologies are those that change the experience based on the behaviour of the user, reader, consumer, or actor. These can include ‘agents’, modifying behaviours and ‘pseudo-intelligence’” (Shedroff 1999). Agents can be set to run autonomously to perform specific unsupervised functions. Modifying behaviours change the tools and/or content based on the user’s profile, behaviour, and actions. The success of adaptive experiences depends upon a good understanding of the users and their needs.

In the next chapter I will apply these principles to address the challenges of an online community.

Chapter 4: Developing the Design Platform

Developing the Design Platform

To investigate the issue of “a meaningful experience” for an online community, I prototyped a site for PPESO. My design is not intended as a definitive answer to the challenges of online communities but an attempt to better understand the challenges through the design process. In this respect the design of a site for the PPESO is intended as a form of research. In the following sections I discuss this research in detail.

4.1 Discovery

The PPESO is a consortium of health care providers and support organizations working towards improving perinatal (before, during and after pregnancy) care for women and their families in Eastern and South Eastern Ontario. PPESO propose to develop a Perinatal Evaluation, Education and Resource System (PEERS), an Internet resource that will expand and improve PPESO’s services in the areas of perinatal health status and performance measurement, perinatal information dissemination and professional development. PEERS comprises three applications.

- Application 1 – designing and developing an online interface for the perinatal database. This would enable perinatal service providers to more easily access and enter information into the database.
- Application 2 – expand the database in application 1 and add a second interface for input from women and their families on health care and

facilities provided at hospitals and community centres. This feedback will be used to improve service provided by health care providers.

- Application 3 – a web site to provide the public with tailored information on pregnancy, healthy behaviours, and care of infants. This web site will both serve and be served by the main perinatal database of information and resources. Feedback from users will be used to expand the database.

“All effective communications involve defining the goals of the experience and the messages to be communicated as early in the development process as possible. These definitions drive all decisions”. Many times, the goals and messages stipulated by a client will not be correct. Clients are usually too close to their problems to see solutions clearly enough. It is important to uncover one or two layers of goals behind those stated and agree to these if you want to be successful. Otherwise you may find yourself unable to satisfy a client or communicate the correct messages to your audience” (Shedroff 1999).

I identified “Application 3”, an online resource for pregnant women and their families – as a potential online community and also as an excellent vehicle for researching my challenges. Working with a five-member team from PPESO, I helped PPESO to identify and define their goals.

4.1.1 Identifying Challenges of PPESO

The challenges were identified as follows:

- While women and their families in Eastern and South Eastern Ontario have access to health care providers, they may not have adequate or consistent support. Here support means the wherewithal to make sense of

advice provided by health care providers and the opportunity to share one's own experiences with others.

- While support is available in the form of local community resources, many women may not be aware of them. For example, if a woman has had her third miscarriage, she might like to share her grievances with another woman/family who has overcome a similar grief or get support from a counsellor at a community centre. She is not always aware if support is available in her local community.
- For perinatal education, people depend on books as the only reliable and easily accessible resource. Books are very useful, but they provide all the information at once, which is easy to grasp, but easily forgotten. During pregnancy, women undergo changes daily or weekly. Hence receiving information at regular intervals relative to progress through pregnancy would be helpful. Prenatal classes provide people with information for each stage of pregnancy. Each woman requires personal information at specific periods during pregnancy. Individual classes are not possible and also due to geographical and economical constraints, very few people avail themselves of the education provided in the classes.
- Health care providers provide high quality service, but are not always aware of people's problems and questions relative to the advice they give. A feedback loop would enable them to improve their service, avoid further problems and improve the perinatal health care system.

- Despite rapid advances in technology, most women have access only to low-end technology i.e. small monitors with 256 colours, dial-up modem access to the Internet, etc.

As mentioned, designers must work with the client to define “what message is to be conveyed to this community?”; and “what experience do users expect?” Before identifying them, it is necessary to identify target users and their needs, as discussed in the following sections.

4.1.2 Target User Groups

From the initial surveys and study of precedents, I identified 5 user groups

User Group 1 – a woman considering pregnancy or already pregnant

User Group 2 – the partner of the woman from User Group 1

User Group 3 – a family member of a new baby (until 20 months old)

User Group 4 – anyone interested in sharing experiences about pregnancy and parenting

User Group 5 – members of PPESO for maintenance and administration of the site

Given the scope of this thesis, the User Needs Assessment and prototype have been developed for users of User Group 1 only, as they were identified as the “main users”.

4.1.3 User Specific Issues

Pregnancy is a time of great change for women and their partner. Apart from health related issues, they have to learn to cope with sudden changes in lifestyle. The target users of this site are women ranging in age from thirteen to forty. Together (me and the team from PPESO) we identified the following issues:

- Women's fear of using computers
- Fear of providing personal information
- Fear of having a conversation (online chats) with other unknown people
- Women's "place" in the society, as regards to the stigmas associated with teenage pregnancy, pregnancy in one's forties, single mothers, physically abused women, etc.
- Women's access to computers at home and work place

An in-depth study of these issues is beyond the scope of this thesis, but I will raise these issues in the "user needs assessment".

4.1.4 User Needs Assessment

I interviewed 25 target users. The User Needs Assessment questionnaire and results are available in Appendix A.

Challenges of PPESO, Target user groups, User Specific issues and User Needs Assessment provided the basis for defining goals of this web site.

4.1.5 Goals of the site

- It is an online community, called “Pregnant Thoughts - a place to think about pregnancy” (see last question of User Needs Assessment in Appendix A, that resulted in this name) developed as a web site and accessible via the Internet.
- The site targets 18,000 women, their partners and families, 25,000 square kilometres in Eastern and South Eastern Ontario.
- Education, prevention, and empowerment of women with respect to health and pregnancy-related issues.
- Site is secured through unique “visitor names” and “passwords”, hence recognizes users and provides personalized information.
- To supplement and augment the existing health care system by providing information and support to the women, their partners and family members.
- To create a feedback loop i.e., in return for the information provided, get feedback from users, understand user needs and make necessary improvements to the health care system.
- Provide synchronous and asynchronous methods of communication and interaction.
- Encourage users to create and participate in the growth and development of the community.
- To create a loop between users of the online community and the real communities in their vicinity.
- Easy to maintain and accommodates future expansions.

- Create a system that could become a template for a provincial and/or national resource.
- Reduce costs in health care system by providing information and support online.

4.1.6 The Message and Experience

After identifying the client's challenges, user needs assessment and goals of the site, it becomes easier to distil the "message to be conveyed" and "experiences expected by users".

- Woman's "place" in society varies, depending upon her situation and social conventions. Pregnant women need a "place" that they can call as their own. Secondly, these women do not want to be alone as many of them are already isolated in their physical communities. Hence their "place" (or home) should be situated within a vibrant and interactive community. This leads to an experience of "a room of one's own" within an interactive community. The user must realise this is a secured "place", be aware of others in the community and continue building it as per her interests (within the scope of the available technology). She has her own "place" which is private and a "community" which is public.

4.1.7 Site Specifications

- Screen resolution of 640 x 480, 72 dpi
- Web safe colour palette (216 colours)
- Compatible with 3.0 browsers and above only
- Minimum use of audio and video, with provision for adding advanced technological features in the future, on availability of higher bandwidth
- Use of Oracle as the database, Cold Fusion as the middleware and HTML browser as the client for the web site.

Once the goals of the community have been identified, designers must address challenges to achieve these goals. For this thesis, I will address the challenges at the end of this chapter, as it will be combined with a discussion of my prototype.

4.2 Design Development

4.2.1 Comparative Analysis of precedents

Through my User Needs Assessment and surveys on the web I found CD's and web sites available and currently being used for pregnancy-related information, general health related issues and support. I studied many examples, but most web sites were similar as content is displayed in a broadsheet view (Figure 12). The "Girl Friends Interactive CD", was a very good example of providing context to the content delivered. Screens from each of them are available in the following pages and a comparative matrix in Table 1.

- Girl Friend's Interactive Guide to Pregnancy (Figures 14 and 15)
- Baby Center (Figures 12 and 13)
- Parents Place (Figure 16)

4.2.2 Content Inventory

Before starting the process of mapping out the site it is important to layout the proposed content. In addition to providing an organized overview of the site's content, the content inventory is a tool by which to track the status and location of the of site content. A detailed Content Inventory is available in Appendix B.

4.2.3 Site Architecture Blueprint and Use Case Scenario

The Site Architecture Blueprint is an initial, graphic layout of the site's structure -- expressed as pages and links. The diagram includes a box for each page of the site and the major links between site components. Each box contain the following: a title (which is the page title), subtitles for each of the major sub categories of information, and links from the sub categories to additional information about each category. Figures 17 and 18 are the site architecture blueprints for "Pregnant Thoughts".

The site architecture blueprint is organized hierarchically and suggests the general order in which information will be arranged and the various paths a user

Figure 14: A screen showing the virtual counsellors of "GirlFriend's Interactive CD"

Figure 15: A screen showing the background of a house in "GirlFriend" Interactive CD"

[Articles](#) | [Community](#) | [Health](#) | [Moms](#) | [Pregnancy](#) | [Baby](#) | [Kids](#) | [Lifestyle](#) | [Education](#) | [Relationships](#) | [Experts](#) | [Events](#) | [Help](#) | [Home](#)

Sunday, Jan 22, 04 01PM [Welcome New Visitors](#) | [Join Us Now](#)

Today on ParentsPlace.com:

- [New Beginnings 2004](#)
- [Create a Personalized Birth Plan](#)
- [Birth Stories: Share the Joy](#)
- [Increased Your Sex Life? Light the Fuse](#)
- [Snuggly Pillow: Perfect for Your Weekend Journal](#)

Community News:

My daughter will be celebrating her birthday in February and we have decided to let her have a sleepover this year. She is inviting four other girls, so it will be a nice small group. [Discuss your plans ahead for this party and why plan for your year ahead!](#)

—A community member, ladyand20, [Birthdays: parties message board](#)

Positive Parenting

[Building Healthy Minds](#)
[Learn More](#)

ParentsPlace.com Departments

Articles	Baby.com	Welcome Note						
Pregnancy	Maternity.com	New Home Page						
Health	Kids	Pregnancy Calculator						
New Stories	Chats	Pregnancy Newsletters						
Birth	Birth	Birth Plan <tr> <td>Work</td> <td>Messages</td> <td>Immunization Chart</td> </tr> <tr> <td>Lifestyle</td> <td>Live Journal</td> <td>Customer Service</td> </tr>	Work	Messages	Immunization Chart	Lifestyle	Live Journal	Customer Service
Work	Messages	Immunization Chart						
Lifestyle	Live Journal	Customer Service						

Baby Name Finder

Enter a first name:

Daily Poll:

How much time do you spend nurturing yourself each day?

☐ More than an hour
☐ Around an hour
☐ About 30 minutes
☐ About 15 minutes
☐ Time for myself — you're kidding!

VOTE!

Full suggestions are [excluded](#).

Ask our Experts

Choose an Expert:

Find It

☒ on ParentsPlace
☐ on Village.com
☐ on

Today's Board Highlights:

- [Motivated Birthing](#)
- [When Is Gestation](#)
- [Current Debates](#)
- [All Boards...](#)

Today's Upcoming Chats:

Figure 16: A screen from "Parents Place"

[illegible]

Figure 19: Use Case Scenario

might take through the site. One use-case scenarios has been traced over the site indicating the route described in a user in the following scenario:

Jane Doe is 20, single and is 22 weeks pregnant with her first child, a boy. The pregnancy was an accident and it is already affecting her daily routine that is quite hectic. She lives in Renfrew (Ontario) and works as a receptionist in an architect's office. She completed her Grade 12 a few years ago and now wants to pursue a career in computers and takes computer courses thrice a week in the evenings, at the local college. Between working during the day and evening classes, she has no time to attend prenatal classes or read all the recommended books related to pregnancy issues.

She is computer literate as she has been working on desktop publishing, and lately uses the internet to visit "Pregnant Thoughts" three or four times a week. She uses the computer at work to access the site, but after working hours only. Before getting pregnant, she chilled out at the local pub twice a week and smoked 10-15 cigarettes a day. Nowadays concerned about the health of her child, she has stopped visiting the pub, except for the small drink once or twice a week and has reduced to 2-5 cigarettes a day, but is striving hard to quit.

She is scared stiff that she will lose her carefully maintained figure. She controls her eating habits, but has a few binges that trigger her to diet for a week after it to shed the extra pounds. She badly needs advice about nutrition and exercises.

For advice she has a few friends who are mothers themselves, but due to her busy schedule, does not meet them regularly. Her father recently married for the fourth time and keeps in touch once a year during Christmas. Her mother remarried and moved to Mexico. She has no siblings, except for half brothers. Her major source of support is "Pregnant Thoughts". Figure 19 shows the Use Case Scenario for Jane, on her first visit to "Pregnant Thoughts".

Alpha prototype is available in Appendix C. User testing plan and results are available in Appendix D.

4.3 Addressing the challenges

This thesis tries to develop an online community within which users can identify and orient themselves, communicate, interact, share experiences with others and participate in the growth and development of resources and community infrastructure – hence experiencing the community. Through my design I have attempted to address challenges of my hypothesis. These challenges are interrelated, for example context can be a part of metaphors from the physical communities and a metaphor for organizing the information. Hence there will be overlaps while addressing the challenges. For a better understanding of the design I suggest viewing the prototype available in the accompanying CD.

4.3.1 Complimentary Communities: Physical and Virtual

This online community is being designed to “augment” the physical community of pregnant women and their families. Here augment means to extend and improve the services provided to them, to increase communication and interaction, by creating a common “place” for them. Here “place” means a specific location (for example www.pregnantthoughts.com), which could be the “portal” to enter a community of pregnant women.

For this particular situation, my challenge became simpler as a physical community exists. In many other existing situations for online communities, there are no clearly defined physical counterparts. While “Pregnant Thoughts” has a physical counterpart that is not clearly defined as it’s members have one thing in common – pregnancy. They are geographically disparate, in different social and economic conditions etc. Hence the challenge was what can I take from this physical community and apply towards designing “Pregnant Thoughts” and the major issue was consideration of the needs of a pregnant woman with regards to a “place” for herself.

4.3.1.1 Sense of Place

Pregnancy is a major change in a woman’s life that affects her emotionally and psychologically. This is an in-depth study on its own and beyond the scope of this thesis, but I consider these issues for designing the “place”. Considering the

challenges of “Orientation and Identity”, “Presence and Awareness” and “Private and Public Space” I identified the major issues as:

- The “place” must be secured. Entry into “Pregnant Thoughts” is secured through unique “visitor names” and “passwords” (Figure 20)
- Once within the environment, the user must be able to create a strong mental image of it facilitating orientation and an “emotional security”. In his book “Space and Place” Tuan asserts that an armchair can invoke a “sense of place”, as it provides people with a familiar memory cue, that they can identify with (Tuan 1977). Figure 23 shows objects “memory cues” for “Pregnant Thoughts”, namely a rocking chair, books, a carpet and a crib to invoke the “sense of place”. The objects are placed within the background of a window overlooking the street outside (Figure 23). Hence the “sense of place” is further enhanced by providing a window that acts as a threshold between “Jane’s Place” (target user) and the vibrant community outside. Jane becomes aware of her presence within the community and the presence of others, who are very close, but outside the threshold. Jane realises that information in her personal “place” is confidential and information provided outside it, (outside the window) becomes available to the whole community.

4.3.1.2 Creating the Virtual to Real loop

In the initial questions, Jane gives the first three characters of her postal code, (Figure 22) which identifies the city she lives in. Hence in Jane's personal page (Jane's Place), she is provided information about her local community, i.e. Renfrew community (Figure 23). She is made aware of the local community resources, emergency call centres, local events important to her and much more. Hence she is encouraged to use facilities of her local community, before accessing the remote community within "Pregnant Thoughts".

4.3.1.3 Creating the Feedback loop

Information provided by users is useful to PPESO. Information such as their age groups, marital status, nutrition level, stress, etc. is valuable to the health care providers to improve their services. Secondly information queried by the users, for example, if more than 50 users search for information on "pitocin", the health care providers become aware of the fact that users have to be provided with more information on "pitocin".

While "Pregnant Thoughts" uses objects from the physical community to invoke a "sense of place", it in return creates a loop back to the physical community, thus contending that online communities compliment and do not threaten to replace the physical community.

4.3.2 Transforming Data into Information

The raw data provided by the clients was transformed into meaningful information. The following sections will discuss the challenges.

4.3.2.1 Multiple Organizations

The target users of "Pregnant Thoughts" are demographically diverse. Hence the first task was to divide users into groups and to provide a customized interface and information to each user. I divided the target users by "category" into five groups (Figure 21) based on an assessment of what they might hope to get from this site. For example, a user from group 1 (a woman who is pregnant) will have different needs as compared to a user from group 3 (mother of a new baby). This web site provides users with information tailored to their profile. Hence asking the right questions and keeping the questions to the minimum was important (Figure 22).

The second challenge was to organize the information to be delivered through this web site. PPESO provides users with personalized information and the users themselves create new information through communication and participation that results in the growth and development of the community. Hence as the designer my task was to organize the "existing raw data" provided by PPESO into meaningful information by providing a context for it, within which the users could continue building resources for the community.

pregnant thoughts...

if you are a regular visitor please type your

visitor name

password

if this is your first visit, join our community now by clicking on enter below

Figure 20: A screen of the opening page of "Pregnant Thoughts"

pregnant thoughts...

Create your profile

Interest
We would like to know more about your interest in joining us.

you are

- ☐ a woman who is thinking about having a baby, already pregnant or in post partum care
- ☐ partner/spouse of the woman mentioned above
- ☐ family member of a new baby
- ☐ just interested in sharing experiences and advice about pregnancy, birth and parenting

Visitor Information

To enable quick entries for your forthcoming visits, enter the required information below. To remember, you may want to print or write down these entries.

visitor name (between 4 and 8 characters long)

password (between 4 and 8 characters long and not a complete english word)

confirm password (re enter password for confirmation)

a hint to remember your password (provide a multiple hint or idea which would enable you to remember your password)

Figure 21: A screen showing the profile page in "Pregnant Thoughts"

pregnant thoughts...

interview

Hi Jane as this is your first visit, you will have to take a quick interview

The interview is in two parts. The first part is designed for general information to enable us to create personalized feedback for you and the second part is for detailed information about your nutrition, lifestyle, stress management and physical activity

You may wish to stop the interview at any time and continue later on from where you left

All the information you give us remains confidential.

Part I

age group	<input type="text" value="teenager"/>
present marital status	<input type="text" value="single"/>
education	<input type="text" value="didn't complete high school"/>
the language you are most comfortable	<input type="text" value="English"/>
first three letters of your postal code	<input type="text" value=""/>

We provide you information on local community resources.

you are	<input type="text" value="planning pregnancy"/>
is this your	<input type="text" value="first pregnancy"/>

Figure 22: A screen of the general interview process in "Pregnant Thoughts"

Figure 23: A screen of "Jane's Place"

Figure 24: A screen showing personalized information

Figure 25: A screen showing layering of information (pop up window) in "Jane's Place"

Figure 26: A screen of "Jane's Place" when Jane would be in week 30 (future)

Pregnancy is a forty-week process. It is broadly divided into three trimesters of which each is divided into weeks. It is commonly said, "Jane is in her second trimester; hence she has no morning sickness". It is also said that, "Jane is in her 22nd week; hence she is more than half way through her pregnancy". Pregnant women undergo changes every week or sometimes even within the week. Hence the most appropriate method of organizing information for them was "by time". I organized all the information based on a timeline (Figure 24). The timeline spans from "week 1" to "week 40". It is broadly divided into three sectors, representing the three trimesters of pregnancy. Each trimester is further divided into weeks and each week into days. Hence when Jane, (user gave her name as Jane) who lives in Renfrew (she gave her postal code as L1J) visits this community and provides her profile, she is given a personalized web page called as "Jane's Place". She is identified as Jane from Renfrew, Ontario, where Jane is an assumed name. Hence she is anonymous. She is immediately aware of her stage of pregnancy (week and day). All the information provided to her (her pregnancy organizer, her readings for today etc.) are organized by her timeline. She can also use the timeline to plan for the future or go backwards (Figure 26).

4.3.2.2 Setting the context

In "Pregnant Thoughts" I use a combination of "text" and "graphics" to set the "context" for the user to continue building the community. "Jane's Place" is her personal web page, and all the information provided is confidential (Figure 23). Jane can personalize her "place" with pictures and change its "look and feel".

The timeline at the top is similar to a personal calendar and always reassures her of her stage in pregnancy. On each visit she can read an anecdote that leads to a short story (personal experience). The anecdotes are customized to Jane's profile. Hence if she had answered "yes" to smoking, she would receive anecdotes to reduce or quit smoking. A chair and a few books represent Jane's quiet corner where she is learning. As her pregnancy advances, the chair becomes more comfortable, number of books increase and towards the last few weeks, a crib is added next to the chair (Figure 26). Hence as Jane's pregnancy advances, "Jane's Place" evolves. With time, she develops a relationship with "Pregnant Thoughts" and a sense of ownership relative to her "room" or personal home page. The metaphors help Jane to orient herself in the site. The timeline gives Jane the comfort that of knowing where she is in her pregnancy and the window, chair and books keep her aware that she is in her personal (private) page. The evolving context helps Jane in identifying with "Pregnant Thoughts". She realises that the web site is specialised for her.

This is Jane's private page (similar to her home). Outside her window, she can see the local café and the prenatal studio. Hence the metaphor of the window provides Jane with a threshold/boundary between her private information (her home) and public information (community). In the café Jane is aware of the presence of other users of "Pregnant Thoughts". Jane can chat with others visiting "Pregnant Thoughts". As she is anonymous to them (Jane is an assumed name), she is comfortable asking personal questions or sharing personal

experiences. Hence, Jane who lives in Renfrew could chat with John who lives in Kingston, and whose partner has similar problems as Jane. They met at “Pregnant Thoughts” for the first time a few weeks back, when they participated in the weekly conference – “Weight gain during pregnancy”. Jane read that John’s partner had similar problems as hers for which her mother made home remedies. Hence John provides Jane with more information about the remedy and soon they decide to chat more often. Similarly Jane meets others visitors, who provide valuable advice. Jane herself shares her experiences with others. Hence the community gradually evolves into a “place” where pregnant women, their partners or family members, or others interested in sharing their experiences of pregnancy and parenting, communicate and interact.

Each user is very valuable to the community. Users come and go, but their experiences are archived. Each user can have his or her personal diary. The diary is identified by their “visitor names” hence they are anonymous. Users create their diaries to share experiences with others. Taking an example Julie, who is in her 40’s and pregnant for the first time. Her experience is unique and very few women are in a similar situation. Julie finds Rita’s diary at “Pregnant Thoughts”, and Rita had her first child at 45. Reading Rita’s experiences is useful to Julie. She realises that her experience would also be useful to others and starts creating a personal diary using the tools provided with notes on her progress during pregnancy. She creates a personal archive of her experiences during pregnancy and others in similar situations can learn from her experiences.

Hence even if users leave the community, their presence is felt through their archived experiences.

In the prenatal studio, users learn important issues such as building their baby's room with the correctly sized crib, making it "baby safe" etc. Participating users create their own "baby room" and fill it with the available accessories. Others visiting the community could see their room and comment on it. Users learn better and faster when they see others creations and when they are acknowledged for their own creations. They can always refer to the health standard guides provided in the studio.

Another important aspect of is the "virtual counsellors". I created 6 counsellors (similar to the avatars of IVWs) and each counsellor had a specific profile. Users could choose a counsellor of their choice, and the counsellor would guide them through their interview process and provide them with regular feedback. This concept failed at the user testing. Users felt they were being controlled. The suggestion of having two options; one with and one without the counsellor was widely accepted by all users. (similar to a guided and non-guided tour).

4.3.3 Schematic Technical Plan

The target users for this network are dispersed across a large geographical area, with a varied base of telecommunications infrastructure. The solution has to integrate with other applications of PEERS (explained in section 4.1). To simplify

integration and for reasons of long-term viability and the expandability of the system, I propose available industry-standard technologies and products. This project involves the implementation and integration of a “network infrastructure” and “application framework”. I studied and analysed them before deciding on the best possible option as below. Full implementation is beyond the scope of this thesis.

Network Infrastructure

For “Pregnant Thoughts” to be successful in reaching all its target users and integrate with PEERS, a web site accessible over the Internet through a minimum of a 56 k modem seemed the best possible option.

Application Framework

While the network infrastructure is the vehicle, the applications are the core elements of the integrated system. A group of applications are required to serve this widely distributed base of users and provide them personalized information. I propose a three-tier system for the applications: a back-end database, a middleware application server, and a thin or dumb client. Proposed technologies for each tier are:

- **Client – HTML browser**

I rely on standard Internet browsers for the web site, using the middleware application to generate pages dynamically. The web site will be available to a

minimum “version 3” browser such as Netscape 3 and Internet Explorer 3.

This will ensure the widest availability of the web site to users with almost any computing platform. Alternately java applets and DHTML enhancements will be added where client side processing is possible.

- **Middleware – Cold Fusion Server**

Cold Fusion is an application server that uses an extended set of HTML tags to create dynamic web pages and database applications on the Internet. Cold Fusion runs on top of standard Internet server such as Apache, Netscape or Microsoft Internet Information Server. HTTP requests are processed by Cold Fusion and the results are dynamically returned to the user in the form of standard HTML pages. Cold Fusion is open and extensible, allowing connection to any ODBC database, Java applets and new standards such as CORBA. The server allows programmers to create and register custom tags and programs to extend functionalities.

- **Database - Oracle**

The database forms the core of the system, and most of the functionality will be built into it. I propose Oracle on the merits of its power, scalability, replication/distribution features and because it currently is in operation in some of the medical environments in Ontario region. Using the extensibility of Oracle, and through external interfaces, a solid backend will be created, synchronizing the data from “Pregnant Thoughts” with that of the other

applications of PEERS. Newer versions of Oracle are compliant with CORBA and will prove useful in future to expand the database to include new applications. Oracle will create an integrated and maintainable system in which all components are incorporated in a single source – the database.

The choices are based on cost-effectiveness and to meet the immediate demands of the users. This technical plan may become outdated with advances in technology. However I contend that new technologies could be used to enhance the experience within “Pregnant Thoughts”.

4.3.4 Building the Experience

As I discussed before, experiences have to be built for the situation. In Jane's case, she is 20 years old, 22 weeks pregnant, single, in her first pregnancy, and she depends on “Pregnant thoughts” for advice and support. “Pregnant Thoughts” gives her an adaptive experience by providing her with information tailored to her profile. She gets a communicative experience by communicating with other users. She continues building the infrastructure and resources of the community by creating her personal diary and sharing her experiences with others. Overall she experiences “a room of her own” within a vivid and integrated community.

Chapter 5: Conclusions

5. Conclusions

I began this thesis with a quote from architect Norberg-Shultz about designing for different situations rather than different architectures. I continued with the hypothesis that designing for the virtual world is a new situation, one within which architects have a major participatory role. I've identified three points of convergence between the design of physical and virtual communities: the concept of "place", the importance of context in transforming data into meaningful information, and the role of the architect in setting communities in motion.

By insisting on the concept of "place" I'm not suggesting that information environments have four walls and a ceiling. Rather, I'm advocating the use of appropriate spatial metaphors and visual cues to ground and locate online communities. To the extent that they engage space at all, most online environments treat it as a vast and undifferentiated ether. I believe that online communities can stake places of their own within this vast cyberspace. Whether "cyberplaces," "virtual places" or just places, these sites must benefit from distinct characteristics, reflective of and affected by the behaviour of their users. In the design of "Pregnant Thoughts", I attempted to evoke a sense of a "place" by considering the issues I identified in chapter 3, namely orientation and identity, navigation, the presence and awareness of others, and the distinction between private and public. These principles not only set the tone for a "sense of place," but set communities in motion. Effective design encourages users to

communicate, interact, invest time and effort in building, and realise a “sense of belonging” towards the environment.

The designer's role is to sketch out a context and provide the appropriate infrastructure, not to attempt to control the evolution of the “place”. In the physical world, spaces are designed for users to inhabit, and in so doing, for users to transform into places. While the “sense of place” is not created by the designer, it can be facilitated by the decisions designers make. In “Pregnant Thoughts”, “place” and “context” are aligned. For example, as Jane advances through her pregnancy, her “place” evolves with her i.e., the chair changes, a crib is added and different information is available. Hence “place” describes Jane's experience of the content in the context of the site.

Metaphors are powerful tools for structuring context. Whether “textual” or “graphical”, however, metaphors should not be taken too literally. In this thesis I've both argued for a connection and attempted to strike a balance between the “reality” of the physical world and the “abstract freedom” of virtual worlds. Hence by selectively borrowing key elements from the physical world, spaces such as I've created for my fictional user, Jane, might be simultaneously safe havens and portals to new possibilities of learning and communicating with others.

The idea that real and online communities might compliment (rather than compete with) each other is not new. It's been studied in detail by many of the

writers on whose work I've drawn. In *Pregnant Thoughts* I've attempted to (re)emphasise this concept by looping virtual and local communities together and using the virtual to make users more aware of the resources in the real world -- as well as using elements from the real world to make users experience their virtual environment more meaningfully. The dynamic play of "connectedness" and "distinction" between the virtual and real worlds have made this challenge a unique and extremely rewarding one.

I have analyzed the different attributes required for a better understanding of elements that characterize web sites to becoming successful on-line communities. The matrix in Appendix E provides a summary of this analysis. From this research, I have identified ten principles for the design of online communities and they are discussed below.

5.1 Principles for the design of On-Line Communities

1. User-Generated Content
2. Context
3. Creating the "Place"
4. Presence and Awareness of others
5. Private and Public spaces
6. User Identity, Recognition and Control
7. Personalization

- 8. Mutual sharing and exchanging
- 9. Use of Appropriate Technology
- 10. Sense of Belonging (dwelling)

1. User-Generated Content: On-Line communities must encourage, organize and accommodate content from users.

User input takes two forms: 1) Externally accessed content must evolve in response to user requests and preferences; a feedback loop must be created to allow users to affect the kinds of content that is delivered to them. 2) The site must encourage, accommodate, organize and deliver up content contributed by users. A sustainable site is one that grows organically through interaction and interventions of its users.

2. Context: In order to be useful, information must be presented in context.

Context can take a variety of forms. Anecdotal information is necessary to annotate and qualify factual information. Spatial metaphors are integral to creating a perceptual context for the environments in which information is delivered. Metaphors can be evoked by both text (terminology) and images. The use of metaphor as context is covered further in the concept of "place" below.

3. Creating the "Place": Communities must evolve as imageable "places." Here "place" is defined as a distinct character that distinguishes one community from another and from the general, neutral concept of "space." Apart from basic

elements of “placeness” – orientation, navigation, circulation within the site – the “place” must evolve a series of distinct thresholds and loci, evoking vivid and integrated mental images that set a tone and mood for users to inhabit, move through, and claim ownership of the site.

4. Presence and Awareness: Users must be aware of the presence of others in the community, hence increasing social participation and interaction.

While the concept of presence is abstract, it is the ability to be aware of and position oneself relative to other users and groups of users logged on at the same time. Users must also know and control the extent to which they are recognized by others.

5. Private and Public spaces: The community must provide distinct private, semi-public, and public spaces.

Distinctions must be achieved both by technological means (e.g., password protected areas), and through graphic and textual cues that establish clear thresholds, boundaries and transitions between public and private information/interaction.

6. User Identity, Recognition and Control: Users must be able not only to be recognized as distinct individuals by others, but by the system itself. Moreover, they must be able to recognize themselves within the system. This is crucial in establishing a relationship with and building trust in the community.

Identity and recognition are not limited to a face or name but refer to the user's presence, interests, and requirements in the community.

7. Personalization: Appropriate tools must be provided for users to locate themselves relative to a space, personalize it as a place, and continue building community resources through participation and interaction.

8. Mutual sharing and exchanging: Sharing of resources and experiences encourages social interaction.

Users must be encouraged and provided with the tools and context to share and exchange information, and help other users.

9. Use of Appropriate Technology: Technology depends on the content and target users of the community. Overly technological solutions to simple concepts of place and interaction may backfire when it ignores the level of technology available to and the level of technological expertise of target users. Moreover, technologies change. System design must be transparent, adaptable, and extensible.

10. "Sense of Belonging" (dwelling): Users feel a "sense of belonging" (dwelling) towards the community when they realize a meaningful and useful experience. Together, the principles discussed above contribute towards realizing this experience.

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MediaMOO - <http://www.mediamoo.com>

Parents Place - <http://www.parentsplace.com/>

THE WELL - <http://www.well.com>

Appendix A

User Needs Assessment Questionnaire

Part A

1. What is your age group?

- ☐ Teenager
- ☐ 20-25 years
- ☐ 26-30 years
- ☐ 31-35 years
- ☐ 36-40 years
- ☐ above 40 years

2. You are:

- ☐ Planning pregnancy
- ☐ Already pregnant
- ☐ Mother of a newborn baby (within one year)
- ☐ Partner of a woman considering or already pregnant
- ☐ An experienced parent

3. Do you have access to a computer and Internet? If yes, please check

all those places from where you access them

☐ Home	☐ Cyber-cafe
☐ Office	☐ School/College
☐ Library	☐ Friend's place
☐ Community Centre	☐ Others (specify)

4. How often do you access the Internet?

- ☐ Everyday
- ☐ Few times a week
- ☐ Once a week
- ☐ Few times a month
- ☐ Never

5. What is your purpose of accessing the Internet? (check all that apply)

- ☐ Schoolwork
- ☐ Office work
- ☐ Emails only
- ☐ Browse the Internet for fun
- ☐ For specific information
- ☐ Others (specify)

Part B

1. What are your different sources for perinatal information? (check all that apply)

☐ Health Care Provider	☐ CD's
☐ Books	☐ Web sites
☐ Prenatal Classes	☐ Friends and Relatives
☐ Radio and Television	☐ Others (specify)
☐ Videos	

2. What are your different sources for support before, during and after pregnancy?

- ☐ Health Care Provider
- ☐ Family
- ☐ Friends
- ☐ Local Community Centres
- ☐ Others (specify)

3. Do you often have questions or doubts, which you are not able to ask your health care provider or family? If yes, why do you hesitate to ask them?

- ☐ Personal questions
- ☐ Silly questions
- ☐ Too many questions to bother others
- ☐ Do not have anyone to answer all my questions
- ☐ Others (specify)

4. Do you attend prenatal classes? If yes, How often?

☐ Regularly

☐ Rarely

5. Which books do you read for perinatal information?

6. Which web sites do you access for perinatal information?

7. Why do you use web sites, in addition to books, videos etc.

8. What would you like to see added to these web sites

9. Do you trust information received from web sites? If yes, give reasons for trusting.

10. Are you comfortable giving personal information such as age group, gender, marital status and postal code in web sites that are secured by passwords and assure confidentiality?

☐ Yes

☐ No

11. Do you read or have access to recent publications and discoveries in perinatal health? (For e.g. World Health Organization recently published an article about breastfeeding as prevention for breast cancer.)

☐ Yes

☐ No

If yes, what are your sources for such information?

☐ Health Care Providers

☐ Newspapers

☐ Television

☐ Web sites

☐ Others (specify)

12. Are you aware of local community resources for perinatal information and support, such as "Single Parents Network", "Buns in the Oven" etc.

☐ Yes

☐ No

If yes, how helpful are local community resources?

--

13. Do you chat, exchange and share views with others in a similar situation as yours?

☐ Yes

☐ No

If yes, how often and how satisfactory?

--

Part C

We at PPESO are proposing to create a web site for pregnancy-related information and support. What name would you give for this web site? (check a maximum of three names that you like and/or gives suggestion).

☐ Pregnancy Info Place	☐ Mother's Village
☐ Proud Parents	☐ Newborn Dreams
☐ Parenting Centre	☐ Pregnant Thoughts
☐ Awaiting the Stork	☐ Baby's Village
☐ Partners in Pregnancy	☐ Curious about Pregnancy

Your suggestions:

Results of User Needs Assessment

I interviewed 25 target users.

Part A

1. What is your age group?

- ☐ 10 Teenager
- ☐ 3 20-25 years
- ☐ 5 26-30 years
- ☐ 5 31-35 years
- ☐ 1 36-40 years
- ☐ 1 above 40 years

2. You are:

- ☐ 7 Planning pregnancy
- ☐ 10 Already pregnant
- ☐ 2 Mother of a newborn baby (within one year)
- ☐ 2 Partner of a woman considering or already pregnant
- ☐ 4 An experienced parent

3. Do you have access to a computer and Internet? If yes, please check all those places from where you access them.

☐ 5 Home	☐ 2 Cyber-cafe
☐ 4 Office	☐ 8 School/College

☐ 5 Library	☐ 3 Friend's place
☐ 6 Community Centre	☐ Others (specify)

4. How often do you access the Internet?

- ☐ 5 Everyday
- ☐ 10 Few times a week
- ☐ 2 Once a week
- ☐ 5 Few times a month
- ☐ 3 Never

5. What is your purpose of accessing the Internet? (check all that apply)

- ☐ 5 Schoolwork
- ☐ 5 Office work
- ☐ 5 Emails only
- ☐ 15 Browse the Internet for fun
- ☐ 10 For specific information
- ☐ 5 Others (specify)

- For chatting with friends

Part B

1. What are your different sources for perinatal information? (check all that apply)

☐ 25 Health Care Provider	☐ 1 CD's
☐ 20 Books	☐ 5 Web sites
☐ 5 Radio and Television	☐ 10 Friends and Relatives
☐ 5 Videos	☐ 5 Others (specify)

- Local community centers

2. What are your different sources for support before, during and after pregnancy?

(check all that apply)

- ☐ 5 Health Care Provider
- ☐ 8 Family
- ☐ 4 Friends
- ☐ 5 Local Community Centres
- ☐ Others (specify)

3. Do you often have questions or doubts, which you are not able to ask your health care provider or family? If yes, why do you hesitate to ask them?

(check all that apply)

- ☒ 5 Personal questions
- ☒ 8 Silly questions
- ☒ 4 Too many questions to bother others
- ☒ 15 Do not have anyone to answer all my questions
- ☐ Others (specify)

4. Do you attend prenatal classes? If yes, How often?

- ☒ 5 Regularly
- ☒ 4 Rarely

5. Which books do you read for perinatal information?

- What to Expect While Expecting
- Girlfriend's Guide to Pregnancy
- 1000 questions about your pregnancy
- Alcohol, Pregnancy and the Developing child
- 125 Things you must know of Being Pregnant

6. Which web sites do you access for perinatal information?

Only 10 users had accessed web sites for pregnancy-related information.

- Baby Center
- Pregnancy Today
- Parents Place
- Ask Jeeves

7. Why do you use web sites, in addition to books, videos etc.

- To ask questions that cannot be asked to friends and family.
- Chatting with others in similar situations

8. What would you like to see added to these web sites

- Prenatal classes
- Personalized information
- Current information
- Formatted information, as there is too much information to read and understand.
- Shopping

9. Do you trust information received from web sites? If yes, give reasons for trusting.

- Trust information received from web sites of recognized health care providers.

10. Are you comfortable giving personal information such as age group, gender, marital status and postal code in web sites that are secured by passwords and assure confidentiality?

☒ 23 Yes

☐ 2 No

11. Do you read or have access to recent publications and discoveries in perinatal health? (For e.g. World Health Organization recently published an article about breastfeeding as prevention for breast cancer.

☒ 4 Yes

☐ 21 No

If yes, what are your sources for such information?

☒ 2 Health Care Providers

☐ Newspapers

☒ 1 Television

☒ 4 Web sites

☐ Others (specify)

12. Are you aware of local community resources for perinatal information and support, such as "Single Parents Network", "Buns in the Oven" etc. breastfeeding as prevention for breast cancer.

☐ 6 Yes

☐ 19 No

If yes, how helpful are local community resources?

- Only 5 users were aware of local community resources and came to know them in the last stages of pregnancy. They felt that the community resources are very helpful.

13. Do you chat (face-to-face conversation), exchange and share views with others in a similar situation as yours?

☐ 10 Yes

☐ 15 No

If yes, how often and how satisfactory?

- Only 7 users had frequent chats with their partner, family or friends.
- 5 users had occasional chats with friends
- The others did not have any experienced or trusted person to chat, share grief, experiences and clarify queries.

Part C

We at PPESO are proposing to create a web site for pregnancy-related information and support. What name would you give for this web site? (check a maximum of three names that you like and/or gives suggestion).

☒ 3 Pregnancy Info Place	☐ Mother's Village
☒ 10 Proud Parents	☒ 5 Newborn Dreams
☐ Parenting Centre	☒ 23 Pregnant Thoughts
☒ 2 Pregnancy Info Place	☒ 9 Mother's Place
☒ 10 Awaiting the Stork	☒ 5 Baby's Village
☐ Partners in Pregnancy	☒ 6 Curious about Pregnancy

Your suggestions:

- Parent's Village
- 123 Start

Appendix B

Content Inventory

This is a sample content inventory developed for a few pages only.

description of fields in the content inventory

<i>item #</i>	- each content chunk is identified by an item #
<i>content chunk</i>	- the actual content in the page
<i>context for the content</i>	- every content chunk has a context, for its requirement in the page and its relationship to Jane's profile
<i>type of link</i>	- each item has different attributes. it could be an external link, could open a new window, or load into a new frame
<i>priority</i>	- each item is marked by priority of its requirement in the page. '1' is least and '5' is maximum requirement.

home page

item #	content chunk	context for the content	type of link	priority
1.1	logo	a logo for the web site - "Pregnant Thoughts"	external link- links back to the home page of the web site	5
1.2	page title	the title reassures Jane of her location within the site	no links	5
1.3	image/icon/ link for classrooms	prenatal classes page is customized to provide Jane with the appropriate class depending on her week of pregnancy	external link which takes Jane to the prenatal classes page	5
1.4	image/icon/ link for cafe	meeting place for Jane and other members of 'Pregnant Thoughts', to exchange views, play games and have fun	external link which takes Jane to the cafe	5
1.5	icon for glossary	glossary of medical terms and medicines	a link opening a small new window within Jane's page	5
1.6	icon for help	on-line help is provided on every page of the site and provides a searchable database of topics and contact information	a link opening a new window within Jane's page	5
1.7	icon for contacting	Jane can contact the administrators of 'Pregnant Thoughts'	a link opening a new window with email information	5
1.8	health-line	a time based health line which indicates graphically the current week of pregnancy, the growth of the fetus	dynamic updating from the database	1
1.9	daily pregnancy organizer	the calendar gives Jane a daily to-do list	external link which takes Jane to Jane's Place	4
1.10	readings for today	daily Jane is provided with news features customized to her profile	external link which takes Jane to Jane's Place	4
1.11	your baby room	Jane is provided a page to create her baby's room and fill it with the required items, hence encouraging her to learn in the process. the icon dynamically changes to show the progress in the room	external link which takes Jane to Jane's Place	4
1.12	you and your baby	provides her with information about her body and her baby's growth, depending on the week of pregnancy	external link which takes Jane to Jane's Place	5
1.13	the Renfrew community	provides Jane with local community resources customized to her location	external link which takes Jane to Jane's Place	5
1.15	Amy says !!!	daily or at each new login, Jane is provided with anecdotes customized to her profile	opens a new window and dynamic updating from the database	3

Jane's Place

item #	content chunk	context for the content	type of link	priority
1.1	logo	a logo for the web site - "Pregnant Thoughts"	external link- links back to the home page of the web site	5
1.2	page title	the title reassures Jane of her location within the site	no links	5
1.3	image/icon/ link for classrooms	prenatal classes page is customized to provide Jane with the appropriate class depending on her week of pregnancy	external link which takes Jane to the prenatal classes page	5
1.4	image/icon/ link for cafe	meeting place for Jane and other members of 'Pregnant Thoughts', to exchange views, play games and have fun	external link which takes Jane to the cafe	5
1.5	icon for glossary	glossary of medical terms and medicines	a link opening a small new window within Jane's page	5
1.6	icon for help	on-line help is provided on every page of the site and provides a searchable database of topics and contact information	a link opening a new window within Jane's page	5
1.7	icon for contacting	Jane can contact the administrators of 'Pregnant Thoughts'	a link opening a new window with email information	5
1.8	health-line	a time based health line which indicates graphically the current week of pregnancy, the growth of the foetus	dynamic updating from the database	1
1.9	daily pregnancy organizer	the calendar gives Jane a daily to-do list	links which open within the frame	4
1.10	readings for today	daily Jane is provided with news features customized to her profile	links which open within the frame	4
1.11	your baby room	Jane is provided a page to create her baby's room and fill it with the required items, hence encouraging her to learn in the process. the icon dynamically changes to show the progress in the room	link which opens within the frame	3
1.12	you and your baby	provides her with information about her body and her baby's growth, depending on the week of pregnancy	link which opens within the frame	5
1.13	the Renfrew community	provides Jane with local community resources customized to her location	link which opens within the frame	5
1.14	your personal diary	Jane can have an on-line personal diary - she can write notes, paste pictures and share the diary with others	link which opens within the frame	3

Classrooms

item #	content chunk	context for the content	type of link	priority
3.1	logo	a logo for the web site - "Pregnant Thoughts"	external link- links back to the home page of the web site	5
3.2	page title	the title reassures Jane of her location within the site	no links	5
3.3	image/icon/ link for Jane's page	Jane's page is her home, providing easily accessible information customized to her profile and is her private page	external link which takes her to Jane's page	5
3.4	image/icon/ link for cafe	meeting place for Jane and other members of 'Pregnant Thoughts', to exchange views, play games and have fun	external link which takes Jane to the cafe	5
3.5	icon for help	on-line help is provided on every page of the site and provides a searchable database of topics and contact information	a link opening a new window within Jane's page	5
3.6	icon for contacting	Jane can contact the administrators of 'Pregnant Thoughts'	a link opening a new window with email information	5
3.7	icon identifying with classrooms	the icon identifies with Jane's profile and creates a comfortable atmosphere within the page	no links	4
3.8	class(s)	a list of classes customized to Jane's profile (class # 8. class # 9, exam # 7)	link which opens within the frame	4

Cafe

item #	content chunk	context for the content	type of link	priority
4.1	logo	a logo for the web site - "Pregnant Thoughts"	external link- links back to the home page of the web site	5
4.2	page title	the title reassures Jane of her location within the site	no links	5
4.3	image/icon/ link for Jane's page	Jane's page is her home, providing easily accessible information customized to her profile and is her private page	external link which takes her to Jane's page	5
4.4	image/icon/ link for classrooms	prenatal classes page is customized to provide Jane with the appropriate class depending on her week of pregnancy	external link which takes Jane to the prenatal classes page	5
4.5	icon for help	on-line help is provided on every page of the site and provides a searchable database of topics and contact information	a link opening a new window within Jane's page	5
4.6	icon for contacting	Jane can contact the administrators of 'Pregnant Thoughts'	a link opening a new window with email information	5
4.7	bulletin board(s)	a list of bulletin boards available for Jane to choose from and they lead into their respective chat rooms	link which opens within the frame	5
4.8	weekly special	every week there is a new topic of discussion at 'Pregnant Thoughts'. members can send in their personal experiences and comments	link which opens within the frame	2
4.9	the fortune teller	a horoscope section and a section for the baby's identities(color of eyes, hair ...)	link which opens within the frame	1
4.10	baby name finder	all members can use this to find suitable names for their baby and seek advice from other members	link which opens within the frame	3
4.11	games/puzzles	this page has a new game/puzzle every week, which can be played by Jane alone or with other members	link which opens within the frame	1

Appendix C

The following pages have samples of the storyboards and rapid prototypes I developed for "Pregnant Thoughts".

Story Boards and Rapid Prototypes

A screen showing "Pregnant Thoughts – a place to think about pregnancy"

A screen showing "Pregnant Thoughts – a place to think about pregnancy"

A screen showing "Jane's Place"

Story Boards and Rapid Prototypes

A screen showing home page for "Jane's Place"

A screen showing the pregnancy organizer in "Jane's Place"

A screen showing 'you and your baby' in "Jane's Place"

Alpha Prototype

A screen showing the home page of "Jane's Place"

A screen showing 'you and your baby' in "Jane's Place"

A screen showing in "Jane's Place" in week 30 (future)

Appendix D

Usability Testing

Goals for Testing

- The user interface should be inviting, friendly and comforting.
- The user should be enticed to come back often, at least three or four times a week.
- The user is not required to recognize all the available functions the first time, she can learn through discovery, but should be able to remember after a few times.
- Navigation, Orientation and Circulation through the web site is very important and the user should not get lost and always be aware of her location.
- The user should be aware of the private and public zones of the web site and that providing information in the café becomes public property.
- Finally the user should be comfortable providing personal information to Pregnant Thoughts.

Acceptability for Usability Testing

At least 75% of the users (total # of users is 8) must be able to perform all the tasks.

- Able to perform: no assistance required
- Minor assistance required: 1 hint to complete
- Major assistance required: 2 hints to complete
- Unable to do: Unable to complete the task after 2 hints

Ease of Use

- At least 75% of the users must answer the scale with 4 or above.

Test Plan**Introduction**

I am Vidya Narayan, a student at Carleton University. For a project at school, I am working with an official health organization. I have designed a web site called as "Pregnant Thoughts- a place to think about pregnancy." It is for pregnant women and their families to access pregnancy related information, community resources and support.

As a requirement of my project I need to get my design evaluated. Your feedback would be of great help to me in realizing my mistakes, improving my design and finishing the project. Thanks in advance for your time, help and cooperation....

The information provided by you will be kept confidential.

Participant #

Scenario

Recently a friend told you about a web site 'Pregnant Thoughts'. She visits it daily for pregnancy related information, to chat with friends, information on happenings in her local community and prenatal classes. You decide to check out 'Pregnant Thoughts'.

Task 1:

"Join Pregnant Thoughts".

- ☐ Able to do
- ☐ Able to do with 1 hint
- ☐ Able to do with 2 hints
- ☐ Unable to do

Start time:

End time:

Ease of Use:

Very Difficult

Very Easy

1

2

3

4

5

6

Comments:

Task 2:

"Could you explain the screen to me? What do you think of all the images and icons on this screen"?

- Logo
- Jane's Place
- Time line
- Anecdote
- Rocking chair and books
- Window and icons within it
- Daily pregnancy organizer
- You and Your baby
- Readings for today
- The Renfrew community
- Your personal Diary

Comments:

--

Task 4:

You just heard from your doctor about 'pitocin'. "Find more information about pitocin".

- ☐ Able to do
- ☐ Able to do with 1 hint
- ☐ Able to do with 2 hints
- ☐ Unable to do

Start time: End time: **Ease of Use:**

Very Difficult

Very Easy

1

2

3

4

5

6

Comments:

Conclusion

1. How easy did you find the overall interface?

Very Difficult

Very Easy

1

2

3

4

5

6

Comments:

--

2. What are your comments on the look and feel?

--

3. What do you like?

--

4. What do you dislike?

5. What would you like to change?

6. How would you rate this design?

Very Uncomfortable

Very Comfortable

1

2

3

4

5

6

Comments:

Usability Testing Results

Participants:

<i>User Group</i>	<i># of participants</i>	<i>status</i>
Teenager	2	pregnant
Teenager	1	mother of 3-year old son
20-25	1	pregnant
25-30	1	considering pregnancy
25-30	1	pregnant woman and partner
30-35	1	partner of woman considering pregnancy
above 40	1	mother of fourteen year old son

Scenario:

Recently a friend told you about a web site 'Pregnant Thoughts'. She visits it daily for pregnancy related information, to chat with friends, information on happenings in her local community and prenatal classes. You decide to check out 'Pregnant Thoughts'.

Task 1:

“Join Pregnant Thoughts”.

- ☒ 8 Able to do
- ☐ Able to do with 1 hint
- ☐ Able to do with 2 hints
- ☐ Unable to do

Ease of Use:

- ☐ 1 Very Difficult
- ☐ 2
- ☐ 3
- ☐ 4
- ☒ 5
- ☒ 6 Very Easy

Comments and Recommendations:

- Two users wanted graphics in the interview process as it is monotonous now.
- Two users could not remember their postal code.
- One user said that an audio-visual interview would entice her to complete the process.
- All users were comfortable in answering all questions, as they said the questions were not too personal, and they were assured that the system is secured with passwords.
- All users were comfortable in joining as PPESO is a recognized health service provider and their information can be trusted.
- Three users felt that an introductory note from PPESO committee, explaining in brief their goals and objectives for “Pregnant Thought”, would give them an extra assurance, and they would know that this is

Task 2: not any other web site for information, but a community specially

"Could you explain the screen to me? What do you think of all the images and icons on this screen"?

- Logo
- Jane's Place
- Time line
- Anecdote
- Rocking chair and books
- Window and icons within it
- Daily pregnancy organizer
- You and Your baby
- Readings for today
- The Renfrew community
- Your personal Diary

Comments and Recommendations:

- Two users did not understand the icons for window, the café and studio.
- Two users did not understand – "Daily Pregnancy Organizer", but after clicking on it, they understood.
- Three users did not understand the "search" and "email" icons.
- All users felt that the chair and books gave a feeling of a quiet corner for them to study and when showed a screen without the chair and icons, they felt that they are missing the sense of their "room". Two users said that it is their personal Internet room. They felt that at last, they have a room for themselves and a whole community of people to chat with and share personal experiences.
- One user did not like the picture of "Amy" with the anecdote, as she felt that someone was intruding into her personal space. She felt that the anecdote without the picture would be fine.

- All users said that the personalized anecdotes (with short stories) made them feel that they have someone more experienced and sharing very important information with them – this gave them an example to follow and they also felt comfortable that there are others who have similar problems.
- Five users favoured the concept of the “threshold” or “boundary” represented by the window, as it separated their “private” room from the community outside.
- All users were aware that information in their room was confidential and all information in the café and studio is available to all visitors of the community.
- All users said that having a “personalized” information place for themselves is very useful, as they do not have to bother others with silly questions about pregnancy and secondly they are comfortable asking questions in the chat rooms of “Pregnant Thoughts” as they are anonymous. Hence they are comfortable asking and giving personal information. They are recognised by their visitor name (a name they choose) and their city.

Task 3:

You are interested in knowing more about changes in your body and your baby's growth. "Please look for this information".

- ☒ 8 Able to do
- ☐ Able to do with 1 hint
- ☐ Able to do with 2 hints
- ☐ Unable to do

Ease of Use:

- ☐ 1 Very Difficult
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☒ 6 Very Easy

Comments and Recommendations:

- All users said that this was very easy and obvious. They felt that the name "you and your baby" conveys the message well.
- All users were comfortable with the navigation moving towards the side and the scrollable window for information.
- Five users clicked on the image for more information and felt that this information is very important and very easy to find.

Task 4:

You just heard from your doctor about 'pitocin'. "Find more information about pitocin".

growth. "Please look for this information".

- ☒ 3 Able to do
- ☒ 3 Able to do with 1 hint
- ☒ 2 Able to do with 2 hints
- ☐ Unable to do

Ease of Use:

- ☐ 1 Very Difficult
- ☐ 2
- ☒ 3
- ☒ 4
- ☒ 1 5
- ☐ 6 Very Easy

Comments and Recommendations:

- Five users could not find it without hints. Two suggested a new icon for search, and two others suggested including it as the sixth item in the navigation list.
- Three users who were able to do it without hints said that, they could find it, as the icon was similar to the "search" icon in standard browsers (Netscape and IE), but felt that it should be changed.

Task 5:

You are planning a trip during the Easter weekend. You want to be prepared in advance and organize yourself. "Check your 'pregnancy organizer, and bodily changes for that weekend".

- ☒ 4 Able to do
- ☒ 4 Able to do with 1 hint
- ☐ Able to do with 2 hints
- ☐ Unable to do

Ease of Use:

- ☐ 1 Very Difficult
- ☐ 2
- ☐ 3
- ☒ 3 4
- ☒ 5 5
- ☐ 6 Very Easy

Comments and Recommendations:

- All the four users who required one hint (I told them that the timeline is interactive), said that if they were provided a quick demo of "how to use the timeline", then the task would have been very easy".
- Two users, who were able to do it with no hints, said that they knew the timeline would have to do something more than being static hence they tried moving it.
- All users felt that the evolution of the room - the changing chair, increasing the number of books and adding a crib, reassured them of their stage in pregnancy, and that this room is their own as it evolves with them.

Conclusion

1. How easy did you find the overall interface?

☐ 1 Very Difficult

☐ 2

☐ 3

☒ 4

☒ 5

☒ 6 Very Easy

Recommendations:

- All users said that the interface is very easy to use. The "Search" button was not clear, but all other interface elements were clear and conveyed their meaning

2. What are your comments on the look and feel?

- Six users felt that it was a friendly interface. The concept of having the community outside your "home" enticed them to come back to "pregnant Thought" often, to share experiences with others in the community.
- Two users said that the interface could be enhanced with audio; such as the background noise in a café, soft music in her room.
- Two users said that real-time chat could be enhanced with audio and video.

3. What do you like?

- All users like the idea of a personal “room” or “place” and a “community” outside to chat with and interact.
- Seven users liked the interactive timeline and its very efficient use to give them a context of their stages in pregnancy.
- Five users said that the colours chosen for the interface were subtle and comforting.

4. What do you dislike?

- Seven users had nothing to dislike.
- One user disliked the picture of “Amy” on her personal page as she felt that Amy was intruding into her house.
- Two users said the interface colours were dull and boring.

5. What would you like to change?

- Five users wanted to change the “search” icon.
- Three users wanted change the “email” icon.

6. How would you rate this design?

- ☐ 1 Very Difficult
- ☐ 2
- ☐ 3
- ☐ 4
- ☒ 5
- ☒ 6 Very Easy

Appendix E

<i>general principles</i>	<i>description</i>	<i>general attributes</i>	<i>applied in prototype</i>	<i>general conclusions</i>
Content	data delivered through the web site	<ol style="list-style-type: none"> 1. provided by client 2. created by users 3. combination of the above two 	<ol style="list-style-type: none"> 1. perinatal information, pregnancy organizer 2. personal diary, chats 3. anecdotes, tree of experiences 	Data provided by the client and users, and the data generated by the combination of both are important elements of the on-line community
Context	to convert the data into meaningful information and set the tone for a meaningful and useful experience.	<ol style="list-style-type: none"> 1. initial context is provided by the designers 2. users continue to build the context and personalize it. 3. combination of the above two 	<ol style="list-style-type: none"> 1. sense of place - Jane's Place 2. The user can add, edit and enhance the context 3. Pregnant Thoughts – the community is created by the designers and users 	The initial context must be provided by the designers - it sets the tone and mood of the community and the users continue building by personalizing and modifying the context to suite their interests.

<i>general principles</i>	<i>description</i>	<i>general attributes</i>	<i>applied in prototype</i>	<i>general conclusions</i>
Technology	Technology is used to create the community and access it	<ol style="list-style-type: none"> 1. medium of communication 2. tools for communication, interaction and building the community 3. medium to deliver information 	<ol style="list-style-type: none"> 1. Pregnant Thoughts is a web site accessed over the Internet 2. Tools for communication and interaction are "chats" and "bulletin boards". Tools for building the community are using "Flash Generator" and "Java Applets". 3. HTML, DHTML and Javascript are used to deliver information 	Technology must depend upon the content and target users
	User Identity and Interaction	<p>users can be anonymous or reveal their identity. The lack of physical presence (the human body) challenges designers in creating experiences visualized (or experienced) through a computer screen</p> <ol style="list-style-type: none"> 1. personal identity and profile 	<ol style="list-style-type: none"> 1. Each user is identified by a unique visitor name(given by them) and a password. Hence their identity in not revealed 	Unless specifically required for the community (for e.g. MediaMOO), users identity (in the physical world) must not be revealed in on-line communities. This increases the flow of communication, interaction and participation.

<i>general principles</i>	<i>description</i>	<i>general attributes</i>	<i>applied in prototype</i>	<i>general conclusions</i>
cyberplace in cyberspace	<p>Space is the opportunity and place is the understood reality. Hence cyberspace is the vast space within which places with distinct characteristics must be created.</p> <ol style="list-style-type: none">1. Orientation2. Navigation3. Identity4. Presence and Awareness of others	<ol style="list-style-type: none">1. users are always comfortable within their place as they are provided with a interface (e.g. Jane's Place) that produces sharp mental images and helps in orienting2. users will never get lost. Jane's Place is the private zone where Jane has her personal room and she can see the public zone through her window. Hence by using appropriate mental images from the physical world navigation becomes easier3. Each user is identified by an unique visitor name and password provided by them4. not yet developed in the prototype	<p>Distinct "cyberplaces" can be created within "cyberspace". Designers provide the infrastructure (all the above mentioned issues) for these places and users continue building the place and evolve it as a community</p> <p>This raises many questions to explore for the future of "cyberplaces" for communities:</p> <ul style="list-style-type: none">• study of private and public zones within the cyberplace and user interaction within each. For e.g., in the physical communities, we bring our close friends home for a chat, but chat with others at pubs or over the phone. Similarly, in the on-line community users must have the ability of chatting with their close friends in their private zone and with others in cafes etc.• study of communication, links and sharing information within a particular cyberplace (for e.g.	

5. Private and Public	5. the window acts as the threshold or boundary between the private zone (Jane's' Place) and the public zone (cafe etc.) of the community	Pregnant Thoughts) and communication between cyberplaces (for e.g. between Pregnant Thoughts and Parents Place) • study of social and cultural understandings and behaviours within cyberplaces • study of "preventing deviant behaviour" in cyberplaces • study of psychological issues in relation to the target user
6. Cultural understandings	6. not yet developed in the prototype	
7. Social behaviour	7. not yet developed in the prototype	
8. security	8. secured by password	