Applying the Locales Framework to Understanding and Designing[1]

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Abstract

This paper presents another iteration in the ongoing CSCW dialogue between the understanding of work and the design of systems to support work. We overview the Locales Framework (and its five aspects of locale foundations, individual views, civic structures, interaction trajectory, and mutuality) as a shared abstraction for both understanding and designing. We describe the use of the framework in a telehealth case study and discuss the implications of the framework for the design of generic toolkit environments, as interpreted in the prototype system called Orbit. We conclude with a critique of the framework and suggestions for further iterations in the dialogue.

1. Introduction

The key challenge for the Computer Supported Cooperative Work (CSCW) community could be described as solving the twin problems of how best to understand work for the purposes of design, and how best to design systems for the purposes of work [23]. Despite widespread growth of networked computers, advances in technologies, and over twelve years of CSCW research, pervasive use of cooperative work support environments remains more a goal than a reality. Does this mean we are not understanding well, or not designing well, or both? We suggest the answer lies more in the relationship between the two. A significant part of what makes building cooperative work support so hard is the absence of a set of abstractions shared among the stakeholders (designers, sociologists, users, etc). This causes a 'communications gap' between how work is understood and how systems are designed.

This paper presents the *Locales Framework* as a principled approach that allows for construction of shared abstractions among stakeholders, bridging the gap between social and technical concerns with a common language. We illustrate the application of the framework to a telehealth workplace study and design project, and to a prototype design. To motivate the Locales Framework, we first explore the nature of the tension between understanding and designing that the framework seeks to address.

2. The Understanding & Designing Gap

CSCW is addressing a problem that is essentially wicked [21]. A wicked problem is usually situated in the social realm, where "the aim is not to find the truth, but to improve some characteristics of the world where people live" [21] (p. 167). A wicked problem can never be definitively formulated. In fact, *the problem is only understood progressively as solutions are developed*. As such, there are no right or wrong solutions, only better or worse ones. This is in contrast to tame problems – such as many engineering problems – that, however complex, can be specified, and for which optimal solutions are possible.

CSCW as a field is concerned with the wicked problem of how to improve the way in which people work together through the use of computer-based support. The activities of understanding and designing are intertwined, and integral to both the definition and solution of the problem.

As a multi-disciplinary community, those in CSCW concerned with understanding and those concerned with designing come from distinctly different backgrounds, neither of which fully prepares their proponents to work at the conjunction of the two areas.

Computer scientists have found that traditional approaches to requirements analysis and design are not able to account for the contingent complexity of lived cooperative work. Reported experiences with inappropriate applications of workflow technologies are examples of this [17] [27]. Also, while systems designers might want to support the 'social' insights that emerge from workplace studies, e.g., the importance of situated action [26], they are not trained to make sense of sociological accounts of work, and they struggle with how to actually translate social insights into the substance of design [16] [15].

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On the other hand, social scientists, be they from ethnomethodology, distributed cognition, activity theory [18], and so on, struggle with how to extend or evolve their traditional approaches to meet the demands of systems design [10], demands that their approaches were never intended to address. This has raised a number of challenges. For example, Plowman et al [20] talk about the lack of a translation process whereby accounts of the social organisation of work can be translated into design information. Shapiro [24] proposes that hybrid forms of social science should be evolved from combining traditional forms in ways more appropriate for uncovering design information.

A fundamental source of many of the tensions between understanding and designing has been *the role of abstractions or models in the different world-views*. Button and Dourish [3] suggest that computer scientists view abstractions as *generative* in that they give rise to as well as characterise system action whereas ethnomethodologists (and perhaps other social scientists) view abstractions as *analytic* explanations or descriptions of social action.

For our purposes, the point is not to engage in a futile discussion of the generative/analytical duality. Rather, we want to develop a viewpoint that can be used both analytically and generatively by *all* stakeholders, aiding the communication of workplace and work-practice information to designers, and design information to the workplace.

This is challenging. While the problem of how to improve the way in which people work together through the use of computer-based support is wicked, the form of support to be designed needs to be stated as a tame problem if it is to be built as software and hardware. The *challenge* then is to find an abstraction that accounts for and is grounded in the sociality of work and the uniqueness of each workplace setting, while also accounting for the pragmatic needs of design and systems building.

In this paper, we propose the Locales Framework as one approach to meeting this challenge and discuss the way in which we have used the Locales Framework for both understanding and designing for CSCW.

3. Locales Framework

The Locales Framework (a preliminary version was presented at OzCHI96 [8]) grew out of the broader CSCW community experiences with understanding and designing, and our own attempts at understanding and designing as reported in [8] [6] [15]. We also draw upon notions from Strauss' theory of action [25], namely that actions and interactions are continually permuting, and that social worlds, as groups of people who share some commitment to collective action, provide the major conditions for interaction.

Locale as the Unit of Analysis & Design: The primary unit of analysis and design in the Locales Framework is *locale*. Locale is constituted in the *relationship* between a particular social world and its interactional needs, and the 'site and means' its members use to meet those needs, i.e., the space together with the resources available there. As such, the framework is based on a metaphor of place rather than space [7] [8] [9]. This is in contrast to other uses of the spatial metaphor in systems design [2] [6] [22].

Because locale arises in the relationship between a social world and its use of space as place, it is eminently suitable as a shared abstraction for both understanding and designing, albeit used in slightly different ways for each. For understanding, the emphasis is on the appropriation and evolution of 'site and means' as place for the practical accomplishement of work. For designing, the emphasis in on the 'site and means' that are used to meet those needs, and on how better 'sites and means' or affordances could be built for meeting interactional needs.

Principles of Perspectives & Centres: There are two organising principles of the Locales Framework. The first principle is *perspectives* or point of view. It applies to the framework aspects themselves (different perspectives on the life of a social world), to social worlds (different perspectives on wider life), and to the processes of applying the framework (the issue that focuses the study, or as the theoretical, professional, experiential background that the designer brings to the process).

The second organising principle is *centres*. With the notion of centres come other notions, for example, of relationships around the centre, of distances from the centre potentially definable along multiple different dimensions, and of dynamically varying relationships of centres to one another. In this way, the effect of boundaries, and hence the affordances provided by boundaries for privacy and separation, can still be achieved by the degrees and limits of participation or distance from the centre, but in a more flexible and multi-layered way than traditional space-based approaches.

Locales Framework Aspects: In its current state, the Locales Framework is composed of five aspects. Each of these aspects characterises the nature of work from a different perspective. We explore these perspectives in far more detail in [4], identifying various properties of the aspect and the dimensions along which the properties could be characterised. Here we will give a brief overview of each.

- *Locale Foundations*: We first identify the group or social world of concern, looking at features such as how membership is defined, what are the internal structures within the group, and so on. We then identify their locale as constituted by the spaces, objects, tools and resources they use to support their interactions. Locale is the foundation for the rest of the framework in so far as the features identified here facilitate or constrain the life of the social world, as uncovered by the remaining aspects.
- *Civic Structures*: This is the broader context in which the social world and its locales exist. In particular we consider the external influences on a locale, locale lifecycle processes, how locales are structured and related, and how interaction between locales is supported.
- *Individual Views*: This accounts for the fact that groups are made up of idiosyncratic individuals who each belong

to multiple social worlds simultaneously. This aspect considers the different views that different members can hold over the one locale. It also considers the different locale views that an individual manages and negotiates simultaneously over the multiple locales in which they participate at dynamically varying levels of intensity.

- *Interaction Trajectory*: This accounts for the social world and locale 'in action' over time: past, present and future; cycles, rhythms and phases; the performance of work and the articulation of work; routines, contingencies and breakdowns; information flows; workflows; and so on.
- *Mutuality*: Mutuality is the very glue of collaborative activity – how *presence* is enabled in a locale and how *awareness* of that presence is supported. Mutuality enables the 'w' questions to be answered, e.g., who, what, when, where, why, and (almost a 'w') how.

These five aspects are highly interdependent and overlapping. Consideration of one aspect necessarily sheds light on other aspects. For example, when we look at individual view over multiple locales, we might also need to look at the 'civic' relationships among those locales, the different rhythms and cycles of each locale in action, how the individual is able to be aware of what is going on in the different locales in order to manage her multiple involvements, and the role of different features and/or objects in the locales in all of these interactions. Together, the aspects have the potential to capture many characteristics of the life of a social world, from local to global, individual to group, static to dynamic, formal to informal, and so on.

The Locales Framework can play a communication role between the two key activities in CSCW, understanding and designing. Our intent is that a locales-framework-based description of a collaborative work situation can be 'owned' by a variety of stakeholders, in the following ways, thus meeting the challenge laid out in section 2:

- *Understanding*: The Locales Framework can be a starting point to help sensitise the analyst and designer to the key elements of a collaborative work situation. In exploring the situation first hand, the Framework aspects can be used to motivate initial questions and observations. In working with pre-existing study data, the Framework aspects can also be used as a basis for structuring the data.
- *Designing*: Designers can use the Locales Framework aspects to help identify where features can be added to enhance existing locales, or to help identify where new locales can be created in order to coalesce the distributed life of an existing group or to facilitate the emergence of a new social world. These enhanced or constructed locales may be physical, or computer-based (we will call them virtual), or a mix of both physical and virtual features. The CSCW designer is specifically interested in the design of computer-based features. A strength of the Locales Framework for CSCW design is that decisions about computer-based support are driven by interactional needs, in the total context of how that interaction happens, rather than by a priori assumptions about the representational metaphor at the interface.

Thus, from a methodological viewpoint, the Locales Framework is best used in a multi-phase approach, starting naturally with analysis of existing locales of work, and shifting focus to design of new or enhanced locales, before iterating as understanding of the wicked problem emerges.

In summary, the Locales Framework can be seen as providing for the following: 1. A common language for understanding and design; 2. Potential consideration of issues from group to individual, local setting to global context, micro scale to macro scale, and structure to process; 3. A focus on the use of space and its affordances for support of interaction, space and its affordances being the very supports that CSCW is concerned with building; 4. Applicability to a wide variety of domains, physical, virtual, or mixed; 5. A common approach for describing what is as well as envisioning what could be; and 6. A framework rich enough to point to key elements of a collaborative environment but sufficiently high-level, open and incomplete so as not to prescribe nor circumscribe all that is of interest.

As with all wicked problems, we believe that a robust dialogue between exploration of abstract frameworks and their use in practice is essential if either is to be advanced. Hence, we acknowledge that this is a working framework that will be evolved as we use it for the purposes of both analysing work domains and designing, building and deploying systems for collaboration support within those domains. In the following sections, we report on experiences of using the Locales Framework both for understanding and designing. The first report focuses a telehealth environment where we both studied the environment and used the resulting Locales Framework insights to design new facilities for support of collaboration. The second report focuses on our design of Orbit, a generic collaborative work toolkit embodying principles from the Locales Framework. For those who might be interested, we have also used the framework to study a group of distributed researchers, reports of which can be found in [4] [5]. Space precludes discussion of this study here.

4. Telehealth Study

This case study [4] [14] is of a telehealth situation involving remote medical consultations among the Intensive Care Units (ICUs) of three hospitals. Intensive care telehealth is concerned with making clinical expertise, usually sited in a metropolitan tertiary hospital, more widely available to less well resourced regional hospitals. The focus of this study was on testing the usefulness of the Locales Framework for understanding work needs and guiding systems design to meet those needs.

An ICU is a busy, noisy, high stress, unpredictable environment in which to work. The patients in ICU are generally critically ill, often unconscious, and mostly connected to a plethora of machines, monitors and tubes, all of which

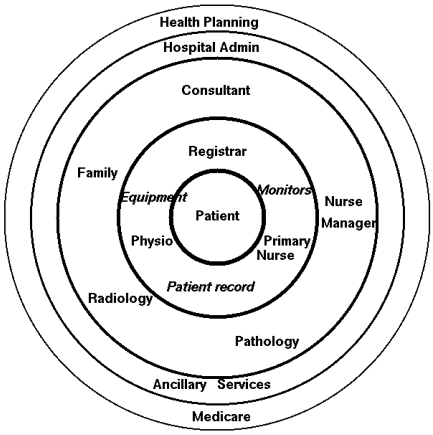

Figure 1. Patient view of civic structure

require a high degree of expertise to manage and interpret. Figure 1 depicts the patient locale and civic structures of ICU from a patient's perspective, where the elements closest to the centre are closely involved in the patient's care and those more distant less so.

In a face-to-face bedside consultation, the participating doctors have shared perceptual access to the rich environment of the patient, assorted machines, other staff, and, most importantly, to the patient record containing clinician notes, test results, etc. Further, the doctors already have an established relationship, or at the very least knowledge of the others' skill levels and areas of expertise, on which to base their level of trust in the information conveyed.

The need for inter-ICU consultations arises when the specialist expertise or resources needed to care for the patient are not available at the regional site. Current consultation practices between ICUs use the telephone as the medium of communication. The doctor at the remote site initiates a call, usually to a tertiary centre. The primary purpose of the call is to communicate complex patient information for advice on diagnosis or on-going management, or to request that the tertiary centre accept the patient as a transfer.

Using the Locales Framework, we can characterise the current consultation locale, depicted in Figure 2, as a transient shared audio space with participation limited to the doctors involved in the call and containing no persistent shared information. The only way in which the doctors can be mutually present to each other is through voice. The patient is present only indirectly. The consultant doctor has to rely on the remote doctor's ability to convey complex medical information and interpret complex radiological images via word pictures only. The consultant makes notes from the verbal report but has no direct access to the patient or patient information. The consultant's recommendations are given verbally and noted by the doctor at the remote end. If follow-up calls are needed, much of the same information often needs to be repeated. Also, the doctors usually do not have an established relationship on which to decide their level of trust in the information conveyed.

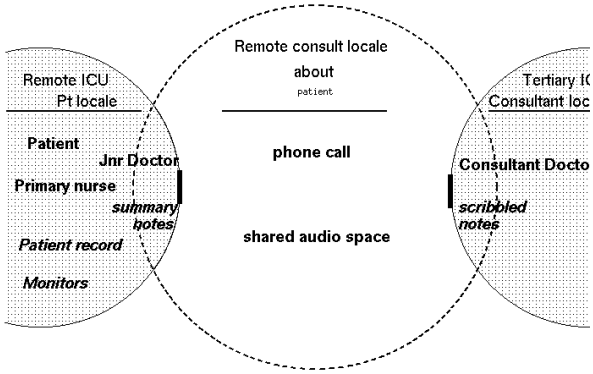

Figure 2. Initial remote consultation locale

Ultimately, the success of the call depends on both doctors building a shared understanding of the patient's condition. In general, these clinicians are remarkably skilled at doing this, but even so there can be difficulties, breakdowns and uncertainty because of the lack of direct awareness that the consultant has of the patient's condition. This can result in both clinical and logistical problems in patient management. The clinicians who initiated, owned and drove this project believed that a telehealth system could result in more appropriate transfer of patients to the tertiary centre, and better supported management of those patients who did not need to be transferred.

The design of a support system for inter-ICU consultations could be technologically driven, focussing on the telecommunications aspect of the desired solution. Instead, the Locales Framework gives a way of considering the total environment in which the consultations take place and to motivate a solution grounded in work terms rather than purely technical terms.

Having used the Locales Framework to characterise existing inter-ICU consultation practices, we are able to identify problems and engage in a second phase discussion of how to create an improved consultation locale. Some of the requirements for such a locale would include:

- Enable the clinicians to have richer forms of presence and more media of awareness (mutuality);
- Enable patient information, e.g., patient record, radiological images, test results, and physiological monitors, to be made directly available as shared objects within the locale (foundations, mutuality);
- Enable more people to be directly involved in the call where relevant, e.g., members of the team looking after the patient , the team who will be receiving the patient, the medivac team who will be transferring the patient, the patient's family, the patient him/herself (foundations, extending the social world);
- Provide opportunities across sites for clinicians to interact with each other and build up peer networks, thus increasing trust levels (civic structures);
- Provide support for the consultation, such as check lists covering the basic body systems used in the reporting of the patient's condition or covering the standard proce-

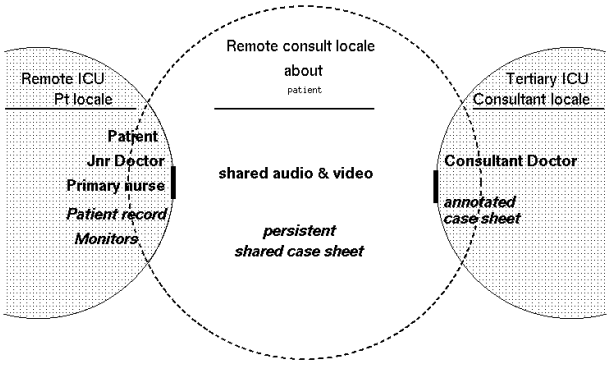

Figure 3. Evolved remote consultation locale

dures for organising a transfer (trajectory);

- Enable locale persistence as a place for follow-up consultations (mutuality, foundations, trajectory);
- Consider the medico-legal implications of giving the consultant more direct access to patient information and the liability entailed in his suggestions (civic structures);
- Provide a technical solution that is simple and quick to use because of the pressured environment of an ICU and the critical patient condition (civic structures, trajectory).

Based on these requirements, the project is now engaged in an evolutionary process of systems development, deployment, evaluation, and evolution. The diagram in Figure 3 depicts the first stage in the design of the new consultation locale, deploying PCs equipped with video-conferencing hardware and software with object sharing, running over a high-speed network, with digital video camera, and flat-bed scanner.

5. Orbit – A Collaboration Environment

In this section we explore implications of the Framework as a basis for systems design, through discussion of the design of Orbit [19]. Orbit is an open toolkit environment for support of collaborative work activities built around concepts from the Locales Framework. The central concept in Orbit is that of a 'group zone' as a representation of a virtual locale in the network. Users may have many group zones, each one tailored to, and furnished for, a particular group or social world. As Figure 4 illustrates, we base Orbit on a three-layer architecture:

Artifacts Layer: This layer contains the objects and tools, stored in a variety of repositories, which will be manipulated by Orbit. Examples of repositories include file systems, CVS repositories, databases, the web.

Group Zones Layer: Group zones (called 'locales' in earlier papers) gather together artifacts, tools, events and people to form an ongoing context for a particular group.

Views Layer: Each user participates simultaneously in many group zones. Users can have different intensities of view on each zone. For example, keeping some group activities and objects 'clearly in focus' with a high intensity view, while 'keeping an eye' on other group activities and

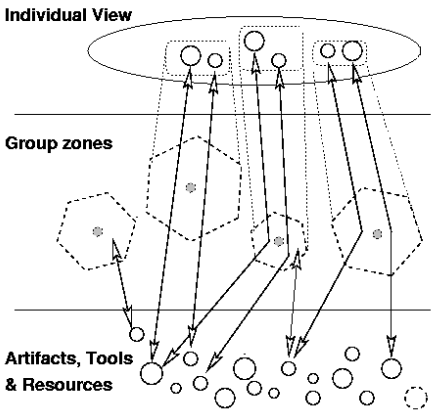

Figure 4. Orbit Abstract Architecture

objects through lower-intensity views. Intensity here is a user-controlled measure of the view one has on a zone. A high intensity view usually includes more objects, more awareness of what other users are doing, and audio and video presence. Lower-intensity views usually selectively exclude parts of this information.

Figure 5 is a screen dump of a composite Orbit user interface. Users employ a *Navigator* panel to provide access to their group zones, awareness information, and control over furnishings in group zones and views over the furnishings. A *Workspace* panel can tile together the objects in

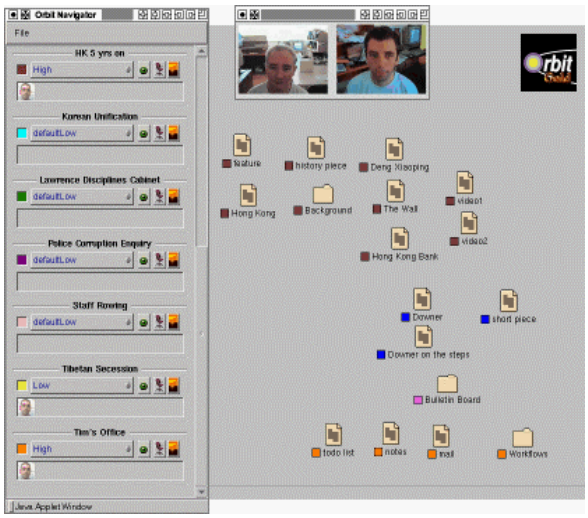

Figure 5. Composite Orbit User Interface

view from the group zones at any time. Colour chips are used to relate artifacts to zones. Several other windows can also be displayed, such as video panels, audio panels and various awareness widgets such as notifiers and tickertapes. In the figure, the user has a mixture of views over group zones, including a video view into one zone, and a mixture of objects in view from four other zones to which the user belongs. A ubiquitous, scalable underlying event service

provides extensive awareness information that is in turn projected to the user through notifiers and other awareness widgets (assuming the user has selected a view which makes this information visible).

Thus, the current implementation of Orbit focuses almost exclusively on the foundations, individual view and mutuality aspects of the Framework. Locales manifest themselves as group zones. This is a crucial distinction as 'locale' reflects 'site and means' for work, and in general a locale can thus be broader than simply a computer-based place, including, for example, a physical extension. Each group zone is furnished with objects drawn from the underlying repositories, has mechanisms for controlling access and membership, and supports individual view through view manipulation mechanisms and mutuality through a variety of awareness and presence indicators and widgets.

Civic structure and trajectory have not yet been considered in any detail in Orbit. Our earlier wOrlds prototype [6] indicates various mechanisms for structuring relations among group zones, navigation, and finding and calling users in a complex collaboration environment. Initial plans for civic structure support will start from this experience. Trajectory, beyond workflow and event trails, is extremely complex, and remains an open issue for us.

6. Reflection

On Understanding: The case study is an example of the Locales Framework being used to explore a situation first hand, specifically telehealth consultations as repeated patterns of work. It is difficult to say what the outcome of the study might have been had we not used the Locales Framework. With this caveat, the Framework did prove useful for structuring study data. All of the aspects contributed to the uncovering of the story, although some aspects were more important than other aspects - the foundation and mutuality aspects were important for explaining the problems in building a shared picture of the patient's condition. In contrast for example, in the distributed researcher study not included here, the civic structures aspect was particularly useful for understanding the inter-organisational conflicts that contributed to a failed collaboration.

Based on this understanding, the Locales Framework aspects were able to point to suggestions for improved locales of work. The strength of the Framework is that such suggestions are framed in interactional terms taking into account the total context of work. Technological solutions are presented within this broader context. The same language is used to describe the problems of the current situation as well as the design solution, thus promoting communication and understanding within the group.

The generic nature of the Framework is both a weakness and strength for understanding work. The Framework does not pretend to provide an algorithmic solution to a wicked problem. By telling us *where* to start looking rather than what to look for, it can provide enough structure to support the beginnings of understanding while still allowing for the uniqueness of each workplace to demand appropriate attention. For the design of specific solutions, while the Framework is useful for motivating design decisions, the designer is still left to translate the motivations into actual systems.

A danger with presenting any framework though is that users looking for recipes will assume that it can be applied in mechanistic fashion. This is not the case. We also acknowledge that that if the Framework is too high level, it could prove to be of limited value for either understanding or designing. Even though we are both the developers and users of the Framework to date, our experiences suggest that this is not the case. Because it isn't a recipe, however, there is considerable effort involved to creatively and intelligently interpret, evolve, extend, or even discard (aspects of) the Locales Framework for the situation at hand. We believe this effort will be made easier as we work at building up a corpus of studies and experiences with the Framework, and evolve methodologies to support its intelligent use. To paraphrase Strauss who was talking about his theory of action (our paraphrase in square brackets):

> "… the principle function [of the locales framework] is not at all to supply or directly develop concepts that will constitute the [requirements analysis] about the particular phenomenon under study. Rather, what the [framework] is capable of doing is … to inform [key aspects of a collaborative environment]. It is not that thinking in this way requires you to keep looking over your shoulder …: Did I get this in? What have I forgotten? To use the framework in this way would be unreal, unworkable, and deadly for [systems design]. …One of the striking paradoxes of this [framework] is that just because it has been expressed systematically, … it can function implicitly during the course of [design] itself, rendering systematic the [analyst's] ordering of explanations." [25] [pp. 67,68]

On Designing: The Locales Framework has also been useful as a basis for collaboration systems design as embodied in Orbit. Earlier systems, such as ConversationBuilder [16], which was a fairly straightforward workflow system, and wOrlds [6], which supported a spatial metaphor of collaboration, both suffered from significant use problems. For example, it was very difficult in ConversationBuilder to support informal collaborations, and essentially impossible in wOrlds to work on more than one task at a time (since each task ended up in its own 'room', and rooms are invisible to each other). These problems are not unique to our tools but tend to manifest themselves in any workflow- or rooms-based collaboration environment.

Orbit offers a more flexible environment because it integrates several essentially independent mechanisms that implement different aspects of the Locales Framework. Thus users of the system can mix-and-match different views, mutuality levels, over many group zones, according to the needs of the moment. These dimensions of the Orbit toolkit

only exist because the Locales Framework identified clearly the various aspects of collaboration that required support. The Framework also provides a kind of convergent guidance for design enabling us to build different mechanisms within a common structure so that Orbit coheres conceptually without being overly prescriptive. This flexibility has allowed us to demonstrate Orbit in a range of applications from a newsroom to military command and control.

The attempt to reify the Framework by building Orbit, however, was more a matter of intuition based on continuous dialogue between the Framework designers and the system builders than a methodological refinement process. Our next step is to use the experiences of building the Orbit prototype to sketch a reference architecture for any locale-based collaboration environment. The architecture will be more abstract than the prototype, allowing us the opportunity to "reach up" toward the Framework and provide another link in the loop between understanding and design.

7. Related Work

Closely related to the work we present here are the viewpoints and framework approaches being evolved by Hughes et al at Lancaster University [13] [12] to address the issue of how to present ethnography in the design process. The three viewpoints - ecology, workflow and egological organisation - represent generic features of workplaces that can be used to structure ethnographic data. The three framework dimensions – distributed coordination, plans and procedures, and awareness of work – are used as presentational devices to communicate issues key to the design process. The relationship between viewpoints and framework dimensions seems to be centred on the framework being able to offer "a more general examination of the nature of systems within a work context" and so being more specifically related to systems design [11].

The Locales Framework and the Lancaster work evolved independently yet there are significant similarities. For example, 'ecology' addresses issues very similar to the locale foundations and mutuality aspects by looking at the spatial organisation of work, the affordances offered there, and their support for awareness. 'Awareness' also directly addresses mutuality aspect concerns. 'Workflow', 'distributed coordination', and 'plans and procedures' address issues of concern to the interaction trajectory aspect. 'Egological organisation', with its focus on the individual, has similarities to the individual view aspect.

The main differences in the approaches stem from the theoretical starting points. The Lancaster work is primarily driven from an ethnomethodological perspective involving sociologists and computer scientists, growing out of lived experience of the wicked problem of using ethnography in design. Our work has been driven from a systems design perspective; we are computer scientists wanting to know how to incorporate the lived complexity of real world settings into the design process, growing out of a lived experience of designing CSCW systems.

Being ethnomethodologically based and relying on what can be observed, the viewpoints and framework approaches could also be more biased to physically observable settings than is the Locales Framework – we have explicitly sought to make the framework generic enough to be applicable to any domain physical, virtual or mixed.

A concern for both the Lancaster researchers and ourselves is to avoid "the 'over-formalisation' of (the) process as this risks entering into some kind of prescriptive analytic agenda that serves to obscure the phenomenon under investigation" (Jon O'Brien, personal communication, Sept. 1997). This is coincident with our hope that the Locales Framework be used as a high-level sensitising device to be intelligently interpreted for the situation at hand. Despite all hopes or efforts however, there is always the chance that these frameworks will be used in unintended ways because of the different uses of abstractions within the various disciplines, as previously discussed.

8. Conclusions & Future Work

The problem that motivated this paper is how to address the tension between understanding how people work together and designing systems to support work based on this understanding. We presented the Locales Framework as a principled abstraction that could help in this dialogue by providing a common language for both understanding and designing. It can do this because locale, as its primary unit of analysis and design, is constituted in the relationship between a social world and its interactional needs, and the 'site and means' its members use to meet those needs. We have shown the use of the Framework for understanding and designing in a telehealth case study and in the design of a collaboration toolkit environment.

Does the framework capture the 'right' aspects or the only possible aspects? We expect not. In characterising CSCW as being concerned with wicked problems, we expect that we will learn more about the nature of both understanding and designing from our use of the Framework, and so evolve the framework or find even better solutions. Our suggestions for future work reflect some of these lessons.

The most obvious direction for future work is the application of the Framework by different people to more domains of work. To make the Framework more accessible and easier to use, the development of a methodology of use should be a priority. This is not to mean a step-by-step procedural approach but rather a toolkit that provides a collection of tools and techniques that could be used to populate the Framework as appropriate. Presentational tools are also needed to support the representation and communication of Framework data, both the description of what is and the design of what could be. We also need to consider more principled approaches for designing what could be, i.e., what constitutes a better locale design. We are currently

exploring the potential of Alexander's notions of patterns and centres [1] for this task.

In conclusion, while the Locales Framework is not *the* answer to the CSCW wicked problem, we believe that what we can learn from its use about both understanding and designing makes it a worthwhile candidate from which to evolve even better solutions.

9. Acknowledgements

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10. References

[1] C. Alexander, H. Heis, A. Anninon, and I. King, *A New Theory of Urban Design*. New York: Oxford University Press, 1987.

[2] S. Benford and L. Fahlen, "A Spatial Model of Interaction in Large Virtual Environments," in Proceedings of ECSCW '93, Milan, 1993, pp. 109-124.

[3] G. Button and P. Dourish, "Technomethodology: Paradoxes and Possibilities," in ACM Proceedings of CHI '96, Vancouver, 1996, pp. 19-26.

[4] G. Fitzpatrick, "The Locales Framework: Understanding and Designing for Cooperative Work," PhD Thesis in *Dept of Computer Science & Electrical Engineering*, The University of Queensland, 1998.

[5] G. Fitzpatrick, S. Kaplan, and S. Parsowith, "Experience in Building a Cooperative Distributed Organisation: Lessons for Cooperative Buildings," in LNCS 1370: Proc. of CoBuild '98, Darmstadt, Germany, 1998, pp. 66-79.

[6] G. Fitzpatrick, S. Kaplan, and B. Tolone, "Work, Locales and Distributed Social Worlds," in Proceedings of ECSCW'95, Stockholm, Sweden, 1995, pp. 1-16.

[7] G. Fitzpatrick, S. M. Kaplan, and T. Mansfield, "Physical spaces, virtual places and social worlds: A study of work in the virtual.," in ACM Proceedings of CSCW'96, Boston, MA, 1996, pp. 334-343.

[8] G. Fitzpatrick, T. Mansfield, and S. Kaplan, "Locales Framework: Exploring Foundations for Collaboration Support," in IEEE Proceedings of OzCHI '96, Hamilton, NZ, 1996, pp. 34-41.

[9] S. Harrison and P. Dourish, "Re-Place-ing Space: The Roles of Place and Space in Collaborative Systems," in ACM Proc of CSCW'96, Boston, MA, 1996, pp. 67-76.

[10] J. Hughes, V. King, T. Rodden, and H. Andersen, "Moving Out From the Control Room: Ethnography in System Design," in ACM Proceedings of CSCW'94, Chapel Hill, NC, 1994, pp. 429-439.

[11] J. Hughes, J. O'Brien, T. Rodden, and M. Rouncefield, "Ethnography, Communication and Support for Design," in *To appear in Workplace Studies*, C. Heath and P. Luff, Eds., 1998.

[12] J. Hughes, J. O'Brien, T. Rodden, M. Rouncefield, and S. Blythin, "Designing with Ethnography: A Presentation Framework for Design," in ACM Proceedings of DIS '97, Amsterdam, 1997, pp. 147-158.

[13] J. Hughes, J. O'Brien, T. Rodden, M. Rouncefield, and I. Sommerville, "Presenting Ethnography in Requirements Process," in Proc of RE '95, York, UK, 1995, pp. 27-34.

[14] S. Kaplan and G. Fitzpatrick, "Designing Support for Remote Intensive-Care Telehealth using the Locales Framework," in ACM Proc of DIS, Amsterdam, The Netherlands, 1997.

[15] S. Kaplan, G. Fitzpatrick, T. Mansfield, and B. Tolone, "MUDdling Through," in IEEE Proc of HICSS-30, Hawaii, 1997, pp. 359-548.

[16] S. M. Kaplan, W. J. Tolone, D. P. Bogia, and C. Bignoli, "Flexible, Active Support for Collaborative Work with ConversationBuilder," in ACM Proc of CSCW'92, Toronto, Canada, 1992, pp. 378-385.

[17] T. Kreifelts, E. Hinrichs, and G. Woetzel, "Sharing To-Do Lists with a Distributed Task Manager," in Proceedings of ECSCW '93, Milan, Italy, 1993, pp. 30-46.

[18] K. Kuutti, "Identifying potential CSCW Applications by Means of Activity Theory Concepts: A Case Example," in ACM Proc of CSCW'92, Toronto, 1992, pp. 233-240.

[19] T. Mansfield, S. Kaplan, G. Fitzpatrick, T. Phelps, M. Fitzpatrick, and R. Taylor, "Evolving Orbit: A Progress Report on Building Locales," in ACM Proceedings of Group '97, Phoenix, Arizona, 1997, pp. 241-250.

[20] L. Plowman, Y. Rogers, and M. Ramage, "What are Workplace Studies For?," in Proceedings of ECSCW '95, Stockholm, Sweden, 1995, pp. 309-324.

[21] H. Rittel and M. Webber, "Dilemmas in a General Theory of Planning," *Policy Studies*, vol. 4, pp. 155-169, 1973.

[22] M. Roseman and S. Greenberg, "TeamRooms: Network Places for Collaboration," in ACM Proceedings of CSCW '96, Boston, MA, 1996, pp. 325-333.

[23] K. Schmidt and L. Bannon, "Taking CSCW Seriously," *The CSCW Journal*, vol. 1, pp. 7-40, 1992.

[24] D. Shapiro, "The Limits of Ethnography: Combining Social Sciences for CSCW," in Proceedings of CSCW'94, Chapel Hill, NC, 1994, pp. 417-439.

[25] A. Strauss, *Continual Permutations of Action*. New York: Aldine de Gruyter, 1993.

[26] L. A. Suchman, *Plans and Situated Actions: The Problem of human machine communication.* New York: Cambridge University Press, 1987.

[27]D. G. Wastell and P. White, “CSCW in Practice: an Introduction and Case Studies,” in *Using Process Technology qto Support Cooperative Work: Prospects and Design Issues*, D. Diaper and C. Sanger, Eds.: Springer-Verlag, 1993, pp. 105-126.