Modeling the Social Practices of Users in Internet Communities

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Abstract. As the Internet has become widely accessible mailing list servers are being used increasingly to support collaborative discourse in scholarly communities. The majority of these communities are open and new users may join who have met few, if any, of the other list members, and come to know them primarily through email discourse. However, new members joining the discourse of an established group may have difficulty calibrating their constructs with those of the existing members, particularly since the disciplinary background of members may not be evident and may vary widely. Major misunderstandings can arise because members use the same term with different technical meanings, or use different terms for the same construct. This article provides a framework for modeling the conceptual structures of members in an Internet community and describes web-based tools that can be used by members to develop models of the social practices of other users in the community and to calibrate their own use of terminology and constructs against those of others.

1 Introduction

Communities develop social practices (Phillips, 1977; Bloor, 1983) that make it difficult for those outside the community to understand the *language games* within it (Wittgenstein, 1958; Shotter, 1993). This is particularly problematic for those joining Internet list servers since the rationale for the discourse is often undefined, and the backgrounds of those participating is usually unclear. Scholarly communities, in particular, often use colloquial words as *aide memoires* for technical terms which are intended to evoke a highly specific context for the discourse (Roberts and Good, 1993). Members who do not know the technical term will be misled if they read it colloquially, and members who know the term in a different disciplinary context may be misled into thinking they understand the discourse when they do not. The issues of academic discourse as social practice are well-documented (Brodkey, 1987; Bourdieu, Passeron and Martin, 1994), as are the specific problems in the use of language that arise in scientific prose in different disciplines (Atran, 1990; Gross, 1990; Selzer, 1993). One way to support new members of an Internet community is to provide them with systems through which they can test their use of terms against usage representing the practice of the community.

Personal construct psychology (Kelly, 1955) offers a constructivist approach to thought and language that leads to tools that enable individuals' conceptual frameworks to be compared. Individuals are modeled as focusing on *elements* of the world and classifying them through *constructs* that make distinctions among elements in order to anticipate future distinctions. People differ in their constructions and, when communicate, they use terms for elements and constructs that may also differ, so that processes for the formation of socially shared constructions and terminology are significant, and the comparison of individual construct systems may show major differences. Kelly developed a technique called the *repertory grid* in order to elicit elements and constructs from an individual, and various analyses have been developed to derive conceptual structures from grids and to compare structures between grids and across populations (Shaw, 1979; Gaines and Shaw, 1980; Shaw, 1980). Repertory grid elicitation and analysis from experts in a domain has also been used extensively as a knowledge acquisition technique for expert systems (Shaw and Gaines, 1983; Bradshaw, Ford, Adams-Webber and Boose, 1993; Gaines and Shaw, 1993b; Gaines and Shaw, 1993a).

The repertory grid is a technique for modeling actual practice in the use of language that can be used to enable individuals to compare their practices with those prevalent in a community. We developed a system on a network of the Apple Macintosh computers called *RepGrid-Net* that allowed a special-interest group to combine email with grid elicitation and analysis in order to understand the community and find those with similar interests (Shaw and Gaines, 1991), but its use was limited to local area networks. In recent years we have ported the grid elicitation and analysis techniques to the web as *WebGrid*, a system that supports knowledge acquisition for expert system development on the Internet (Gaines and Shaw, 1997). *WebGrid* was intended primarily to introduce repertory grid techniques to new users and focused on basic capabilities. However, it rapidly came into widespread use for major research projects and interest grew in having a full range of knowledge acquisition tools available on the web. *WebGrid-II* extends *WebGrid* to provide integration with multimedia, additional data types in the grid, entailment analysis to induce rules from grid data, and an expert system inference engine to allow the rules to be tested on new cases as part of the elicitation process. *WebGrid-II* also extends the system to provide the features of RepGrid-Net as a public service on the web so that communities can incorporate conceptual modeling and comparison facilities in their web facilities on an anonymous basis without requiring any special privileges at our servers.

This article describes WebGrid-II in its application to community modeling.

2 Repertory Grid Elicitation

To show WebGrid-II in action we will use an example from an international research community undertaking intelligent manufacturing systems research that we have supported and studied as a ‘society of research agents’ (Gaines and Norrie, 1997). One problem for this community was the presentation of the project objectives and activities to its funding agencies. There was a common theme of ‘soft’ or reconfigurable systems in the technical program, but it became clear that this was inadequately explained in the project documents. In preparation for a major review meeting in June 1993 an analysis was made of the *soft machine* construct using repertory grid tools.

Six major sub-projects were used as initial elements (which the user called “systems”, see Figure 1), and the ensuing repertory grid elicitation process resulted in the addition of another 10 systems, including human operators and organizational structures that provided contrasts to some aspects of the technological projects. Eleven bipolar constructs (which the user called “qualities”) were elicited that provided detailed insights into the complexity of the notion of reconfigurability, and were used in presentations to the funding agencies to explain more clearly the roles of the projects and their relevance to issues of soft machinery. The resultant grid provides a record of the social practices in the use of constructs and terminology in the community and provides a referent for newcomers against which to calibrate their own conceptual systems.

We will first illustrate how such a reference grid is elicited. Figure 1 shows the initial screen of WebGrid-II.

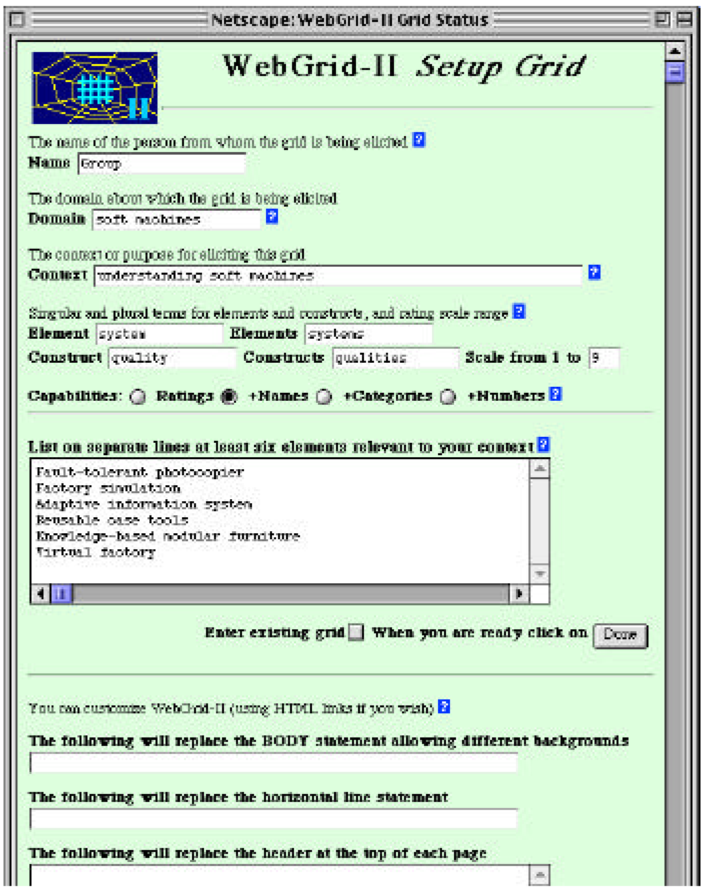

Figure 1. WebGrid-II initial setup screen.

The HTML form requests the usual data required to initiate grid elicitation: user name; domain and context; terms for elements and constructs; default rating scale; data types allowed; and a list of initial elements. It also allows the subsequent screens to be customized with an HTML specification of a header and trailer—this capability to include links to multimedia web data is also used to allow annotation, text and pictures, to be attached to elements.

When the user clicks on the "Done" button at the bottom the server processes the data and generates an HTML document resulting in the screen that allows the user to elicit a construct from a triad of elements. The user clicks on a radio button to select an element which she construes as different from the other two and enters terms characterizing the construct. When the user clicks on "Done" the server generates the screen shown on the left of Figure 2 which places a popup menu rating scale alongside each element enabling the user to rate each one along the new construct as shown on the right.

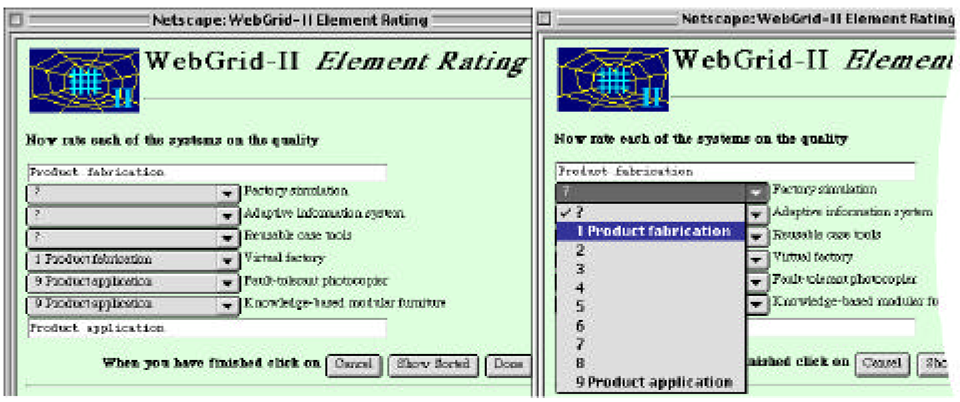

Figure 2. Rating elements on constructs.

Clicking on the "Done" button in Figure 2 sends the ratings back to the server which generates the status screen. This shows the elements and constructs entered, allowing them to be selected for deletion, editing and so on. It also offers various suggestions as how to continue the elicitation based on the data entered so far, facilities for analysis, saving the grid, and so on.

3 Repertory Grid Analysis

To show WebGrid-II in action we will use an example from an international research community undertaking intelligent manufacturing systems research that we have supported and studied as a 'society of research agents' (Gaines and Norrie, 1997). One problem for this community was the presentation of the project objectives and activities to its funding agencies. There was a common theme of 'soft' or reconfigurable systems in the technical program, but it became clear that this was inadequately explained in the project documents. In preparation for a major review meeting in June 1993 an analysis was made of the *soft machine* construct using repertory grid tools.

The repertory grid elicitation continues with the system generating more triads, suggesting that the user enters elements to break matches between constructs, and *vice versa*, and generally attempting to prompt the user into exploring all the relevant dimensions of their conceptual space. In the example being used here this process resulted in 17 elements and 12 constructs.

WebGrid-II provides various analysis tools to reflect back to the user the conceptual structure it has elicited. Figure 3 shows the output of the "Map" tool which uses the FOCUS (Shaw, 1980) algorithm to sort a grid to bring similar elements and similar constructs together. The tree diagrams on the far right show how the constructs (top) and the elements (bottom) cluster together. For example, it shows that the two most similar "qualities" are "System notes reconfiguration need—User notes reconfiguration need" and "System reconfigures itself—User reconfigures system." Three pairs of highly matched elements can be seen—two pairs at the top of the lower tree, and one pair at the bottom of the lower tree.

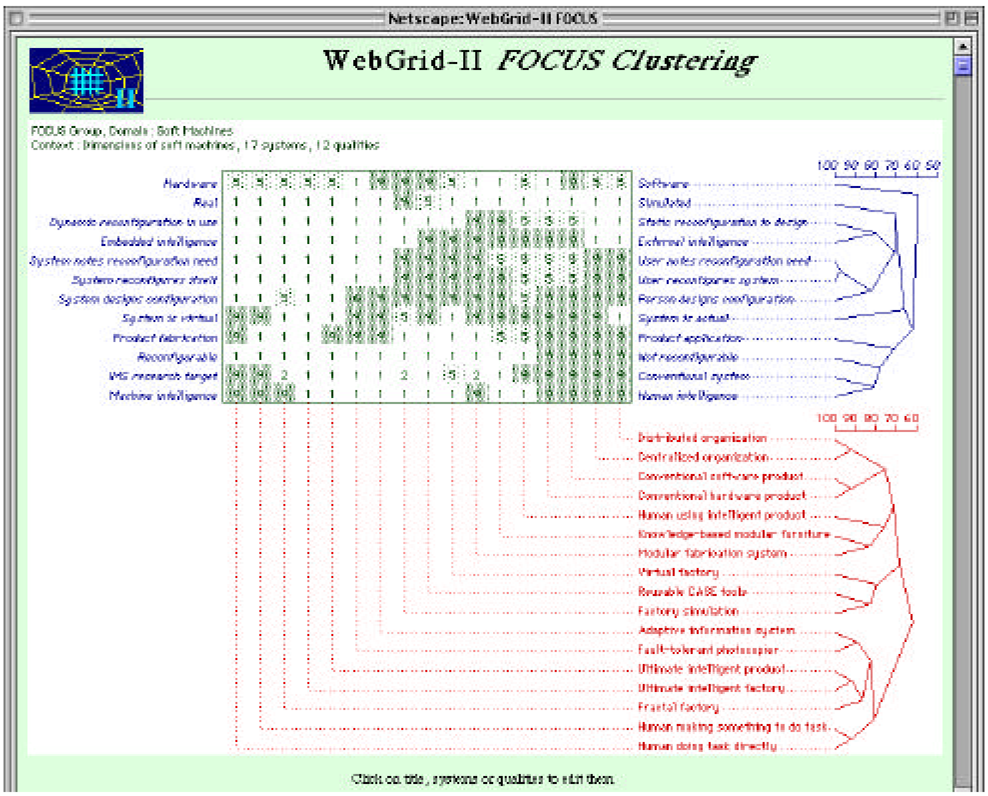

Figure 3. Grid sorted to show similar elements and similar constructs.

4 Repertory Grid Comparison

The visual analysis of repertory grids as shown in Figure 3 provides a conceptual model for a user of the relations between their elements and between their constructs which is valuable in its own right. The grid can also be used to enable other members of the community to compare their conceptual models with that embodied in this grid. WebGrid-II allows grids to be cached at the server and provides URLs for other members of the community to use the data in them for comparison purposes. The underlying theory of grid comparison has been documented elsewhere (Gaines and Shaw, 1989; Shaw and Gaines, 1989) and will be briefly reviewed here before giving some examples of comparative analysis.

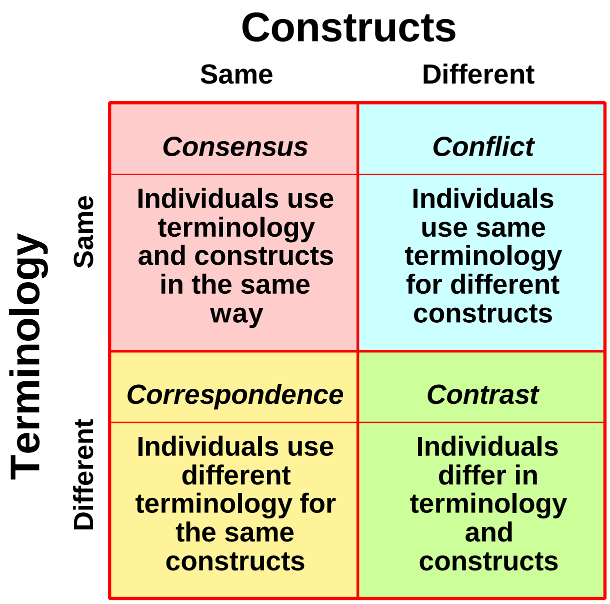

Figure 4. Consensus, conflict, correspondence and contrast in construct systems.

Figure 4 shows a two-way analysis of constructs dependent on whether two constructs make the same distinction among elements and whether they use the same terminology, leading to notions of consensus, conflict, correspondence and contrast.

The recognition of *consensual* constructs is important because it establishes a basis for communication using shared constructs and terminologies. The recognition of *conflicting* constructs establishes a basis for avoiding confusion over the labeling of differing constructs with the same terms. The recognition of *corresponding* concepts establishes a basis for mutual understanding of differing terms through the availability of common constructs. The recognition of *contrasting* constructs establishes that there are aspects of the differing knowledge about which communication and understanding may be very difficult, even though this should not lead to confusion.

Comparison of repertory grids provides a basis for recognizing consensus, correspondence, conflict and contrast in construct systems. If one member of community attempts to fill in the ratings in a grid derived from that of another member by deleting the ratings, then matches between constructs indicate consensus and major mis-matches indicate conflict. If member attempts to construe elements in a grid derived from that of another member by deleting both ratings and constructs, then a match between a construct in one grid and that in the other indicates correspondence, while lack of such a match indicates contrast.

The methodology used in WebGrid-II is to first have a new member develop their own constructs for a cached grid representing community practice with the ratings removed, and then have them fill in the representative grid with the ratings removed. The analysis of the first grid indicates correspondence and contrast (Figure 5), and that of the second grid consensus and conflict (not shown). After having calibrated their own constructs and terminology against those of the community, the new member can examine the analysis of the reference grid as shown in Figure 3. In this way a new member can situate their constructs and terminology within the social practice of the community.

The person in the community responsible for managing the use of WebGrid-II can insert script commands in the initial web page that control the initial triads used for elicitation and provide some offered constructs that prompt the users for constructs related to their personal interests or which are fundamental to the community. In this example “Relevant to my project—Irrelevant” and “Soft system—Hard system” have been inserted in the script as offered constructs.

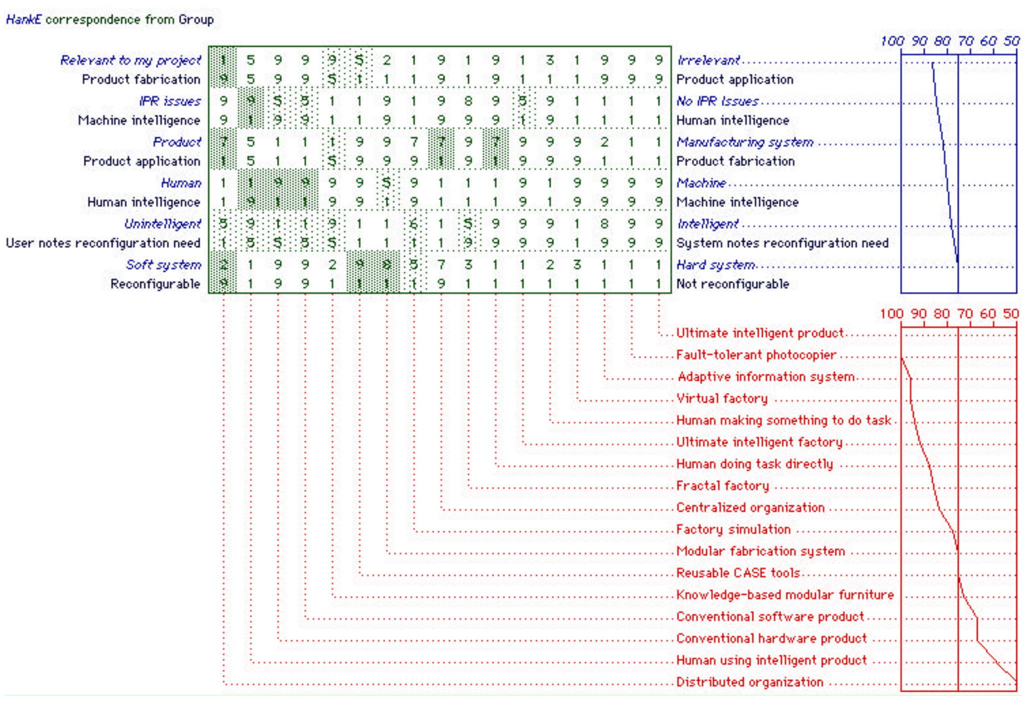

Figure 5. Correspondence and contrast.

Figure 5 shows the WebGrid-II analysis for correspondence and contrast. The newcomer’s construct “Relevant to my project—Irrelevant” has been matched against the reference construct “Product fabrication—Product application” which corresponds to the newcomer’s interests being in manufacturing systems rather than intelligent products. His construct “IPR issues—No IPR issues” has been matched against “Machine intelligence—Human intelligence” which corresponds to intellectual property rights being associated with the intelligent system developments. His constructs “Product—Manufacturing system” and “Human—Machine” correspond to equivalent ones in the reference grid. His construct “Unintelligent—Intelligent” corresponds to “User notes configuration need—System notes configuration need” and this is essentially a subsumption relationship between a general construct and a specific one that implies it. His construct “Soft system—Hard system” corresponds to “Reconfigurable—Not reconfigurable” which is the way the soft—hard distinction is used in the community. The graph on the right of Figures 5 show these similarities and so helps the user to see the cut-off point where he needs to review his understanding.

A similar comparison analysis provided by WebGrid-II shows the analysis for consensus and conflict.

5 Incorporating WebGrid-II in a Community Web System

WebGrid-II is designed to be used as a service that can be integrated with other web services designed to support Internet communities without the system integrator needing privileged access to, or local support at, our web site. Technical details and examples of how to do this are available (Gaines and Shaw, 1998), and independent user experience of integrating WebGrid-II with other web-based systems has been described (Tennison, 1997; Tennison and Shadbolt, 1998).

6 Conclusions

Communities develop conventions in the use of language that make it difficult for those outside the community to understand the socially situated discourse within it. This article has described and exemplified tools that allow new members of a community to check their usage of terms against those common in the community.

The use of repertory grid methodologies at an early stage sensitizes new members to the issues of constructs and terminology variations within the community, and helps to avoid the confused debates that arise through misunderstanding. It also introduces members of the community to a set of techniques and tools that can be used for a variety of community projects.

Repertory grid analysis can be used to derive social networks based on the capability of one individual to understand the constructs of another (Shaw, 1980), and in RepGrid-Net we used this to facilitate members of a community making contact with like-minded members (Shaw and Gaines, 1991).

In general, the concept of tools that support communities in understanding their discourse and knowledge processes is an important one. Grid-based approaches focus on the modeling of conceptual systems based on actual practice in the use of constructs and terminology. Concept mapping techniques allow users to portray their conceptual structures directly (Gaines and Shaw, 1995b; Gaines and Shaw, 1995a; Kremer and Gaines, 1996; Flores-Mendez, 1997) and can provide a complementary methodology to that described in this article. The derivation of conceptual structures from documents provides yet another approach (Callon, Law and Rip, 1986; Litowski, 1997; Hull and Gomez, 1998), and these various approaches can be combined and integrated to support the reflective processes in communities that can systematically accelerate their effectiveness.

Notes and Acknowledgements

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