

Telling tales: narratives of classification and control in the design of taxonomic software

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Abstract

This paper draws on concepts from the structuralist analysis of narrative to explore aspects of the role of stories in the small group design process. A brief review of relevant narratological concepts is provided. Their application in a preliminary analysis of case study data from a team designing taxonomic software is then reported. It is concluded that narratology, and in particular the notion of focalisation, has useful descriptive potential in this context, and may help to elucidate some difficulties in design communication and documentation. Suggestions for extension of the work are included.

Introduction

In this paper we present a case-study based exploration of the role of stories in the small group design process. Small group design activity has been the subject of much research and theoretical development. Shared space, physical resources and embodied action (e.g. Robertson, 1997; Dourish, 2001; Tang, 1991 and Radcliffe, 1996) have received considerable attention, as have the study of the elements and dynamics of the design process (e.g. Olson *et al* 1992; Olson *et al* 1996; Potts and Catledge, 1996, Ball and Ormerod, 2000) while the social constructivists have also made their case (e.g. Bucciarelli, 1994; Lloyd 2000). Again from a social perspective, collaboration styles have been studied by Maher *et al* (1997) while the pattern, structure and substance of communication within and outside the team has received the attention of a number of researchers (e.g. Cross and Clayburn-Cross, 1996; Cahour and Pemberton, 1998; Perry and Sanderson, 1998, Reid and Reed, 2000). We contribute to this last theme by illustrating how stories steer the design work, act as communication tools *and* create obstacles to mutual understanding. This last point is explored and illustrated by way of a narratological analysis. The paper shows how such an analysis can help both to describe and understand the process and the communication difficulties which arise. Our analysis (and illustration) is based on a study of a small group of designers developing taxonomic software for botanists in a project known as Prometheus II.

As practitioners and occasional theorists of user-centred design (UCD), this paper forms part of a developing strand of research into the role of narrative in the user design process. In contrast to the more familiar study of narratives in design (i.e. the use of the ubiquitous scenario) we are interested in how the concepts, vocabulary and constructs of narratology can provide us with a means of analysing, describing and illustrating the subject matter and dynamics of design meetings. Elsewhere we have discussed how the desire to commit to a coherent joint design story submerges many competing narratives, with predictably unfortunate results (Turner, Turner and McCall 2001). We have also shown how a strong narrative structure is an essential component of a successfully engaging collaborative virtual environment (Turner and Turner, 2002) and how the actions of the designer as narrated in many reports of UCD bears a startlingly close resemblance to the stylised story of the hero's journey found in myth and folktale (Turner and Turner, 2001).

Our focus complements the work of Lloyd (2000), who identifies four main roles for stories in the design context: in giving an account of progress to others; as a convenient index to past events or discussions, as competing rationales for the same object – so a specification may be regarded as a flexible resource for efficient selling in the salesman’s discourse, but a defined starting point for the designers – and as the socially constructed meta-story of the process itself. We are specifically concerned with the role of stories (or story fragments) which are told by designers about actual and potential user behaviour and about the role of the software under development. The analysis draws on structural concepts from narratology to analyse how the design team tell stories which arise from the same set of agreed user requirements, but are different in subtle, often unacknowledged, but insidious details.

A very brief introduction to narratology

Of necessity, this paper can only touch upon the richness of narratological theory, and the reader is referred to publications such as Onega and Landa, 1996, Bal, 1997 and Herman, 1997, for thorough introductions. For our purposes, we use narratology to mean the study of narrative texts, the “...representation of a series of events meaningfully connected in a temporal and causal way” (Onega and Landa, 1996:3). A ‘text’ may be in any medium, thus encompassing the spoken word, film and pictures and as well as written material. In recent decades narratological analysis has been adopted in many disciplines beyond its original domain of literary theory, most pertinently for us in discussions of the design process (e.g. Lloyd *ibid*) and organisational theory (e.g. Czarniawska, 1997, Pentland, 2000). Our treatment draws on the structuralist tradition of narratological studies. Post-structural theorists have addressed, *inter alia*, the central but vexed question of the relationship between author and reader in the construction of a story, but this is beyond the scope of the preliminary analysis presented in this paper.

Some basic concepts

We consider design communication in relation to the three levels of narrative commonly adopted by literary narratologists, at least those of a structuralist persuasion. To paraphrase Bal’s (1997) definition, these are:

- The *text* itself – the set of linguistic signs which appear on the page, or are spoken or otherwise presented;
- the *story* which the text conveys;
- the *fabula* – the underlying events and circumstances of which a given story is only one possible account.

In our case we will consider the taxonomical software project outline as the *fabula*, and the *story* level as containing the set of explanations of how taxonomy is currently practised, how the new software will support (or change) this process, how the software will be used, how the software will work and so forth. The *text* consists of the words spoken by the designers, recorded as the verbal protocol of the meeting, together with the documents authored by project members (not considered further in the current paper. Our discussion very largely concerns an exploration of the *story* level in the design meetings studied.

The structural analysis of stories in literary narratology has focused on a wide range of story features, including but not limited to: characters, their characteristics and values; different types of narrator and the relationship between narrator and point of view; the actions available to particular types of character; the cross-cultural persistence of a set of story themes; the reflection of cultural norms in what is valued, condemned or left unsaid; the role of the narratee (the reader, viewer or listener) in shaping the story; intertextuality (the way in which

all stories necessarily relate to all other stories known to author or reader); and the treatment of temporal perspectives. We focus here on two main aspects: the differing emphases in the stories told by designers, and the manner in which these stories are told from different perspectives. A little more should be said here about the treatment of perspective in narratology.

Focalization, voices and roles

Every story has a narrator. This may be an external voice, whether the author of a novel or an academic paper, the witness taking the stand in the courtroom, or the teller of an anecdote in the coffee room. Equally, the narrator may themselves be a character in the story. However, the story is necessarily told from someone's (occasionally something's) perspective, and this is not always that of the narrator. It is the owner of this perspective whom Bal (1997) and other theorists term the *focalisor*. Sometimes the change of focalisor is explicitly introduced (I asked her to tell me how it all started and she said...), but frequently the adoption of a focalising persona is subtle and un-signposted. Just as for the characters in the story, each focalisor has their own set of characteristics and values. Events are thus seen and told through the a filter of perceptions and conceptions belonging to the focalisor (Lodge, 1980), as well as the narratological lens.

Focalisation can be regarded as a variant on Bakhtin's work on the role of 'voice' and related concepts. (Bakhtin, 1981, 1986 – note that these dates are misleading, since Bakhtin was active in the first half of the twentieth century.) For Bakhtin, language is a cultural tool and speech is a form of mediated action. Speech comprises utterances which are always oriented towards a particular addressee. Thus in the context of user centred design, language mediates the interplay between designers and designers assuming the role of users with the utterance being the appropriate unit of analysis. An utterance is speech terminated by a change of speaker, and reflects a point-of-view or 'voice' in Bakhtin's terminology. Our current analysis is accordingly at the utterance level. (A further key element of Bakhtin's argument is that both speaker *and* listener are active in the process of constructing meaning – c.f. post-modern narratology – this aspect is not taken further in this paper, but will be the focus of further analyses.)

Having equipped the reader with a basic set of narratological concepts and vocabulary we now turn to our case study.

The Prometheus II case study

One of the aims of plant taxonomy is the communication of taxon (groups of specimens or other *taxa*) concepts. This communication allows exchange of ideas and the development of taxonomic knowledge. Part of the communication is based on plant and taxon descriptions. Descriptions provide a textual account of what specimens look like so that the identification of specimens is made easier and the idea behind a taxon can be conveyed to other taxonomists that can in turn use it. However, these descriptions use non-standard words and concepts. It is for example possible to find several definitions of what a "leaf" is depending on the taxonomist that uses it and on the plant group that is described. The word used to talk about these descriptions itself, "character", is ambiguous and Colless (1985) collected nineteen different definitions. This makes objective communication impossible and as taxonomists usually use their own concepts to understand other taxonomists' descriptions, it may lead to misunderstanding.

The purpose of the Prometheus II project is the definition of a data model and a database system that would support objective understanding and comparison of plant descriptions. The approach is twofold. Firstly, a standard structure for descriptions is devised, so that

manipulation of descriptions by a computer system is made possible. This standard structure is designed to be able to capture all possible descriptions. Secondly, terms are always accompanied by a definition, so that similarities in terminology and concepts can be explicitly recorded. This allows taxonomists to access the definition of a term to make sure they understand it as the author of the description intended. This also allows reasoning about these terms and concepts so that implicit relationships can be discovered, more concepts compared accurately, and checks are possible to ensure that only valid comparisons are performed.

Dramatis Personae

At the time of the first meeting in the series studied (see section immediately below) the project was just starting to design the first in a series of three conceptual data models for plant classification. The model was to be used to drive the design of an initial software prototype for testing with users and with a specimen data set. Further iterations would develop two further data models and three prototypes of increasing degrees of complexity and sophistication. The core project members taking part in all the observed meetings were:

- E – the project manager at institution A (a school of computing), a database specialist, although originally a biologist
- F – the project manager at institution B (a botanical institute), a botanist and taxonomical software specialist
- G – a research assistant at institution A, a database specialist
- H – a research assistant at institution B, a biologist.

Other personnel contributed to some meetings, specifically another database specialist and a research student investigating data visualisation issues, both members of institution A.

The approach to analysis

We should stress here that this was a preliminary study to explore whether and how narratological concepts could be applied to inter-team communications in the design phase. One of the first two authors attended each of 5 successive meetings between designers in the project. Meeting 1 was audio-taped, and meetings 2 and 3 videotaped. Problems with equipment prevented recording of meetings 4 and 5, but the attending author took detailed written notes, including verbatim records in instances where stories or fragments of stories were voiced. Meetings varied in length, but in total material from around 7 hours of meetings was collected. Informal questioning of the second two authors (members of the design team) by the first two authors, together with project documentation, provided the context for the data obtained from meetings.

The approach to subsequent analysis (by the first two authors) was both bottom-up and top-down. The meeting data (for this study confined to the combined verbal protocol generated by the participants, forming the *text* in narratological terms) was reviewed several times, at first to gain familiarity with the content, and on later passes to make a preliminary identification of aspects of storytelling in the meetings. Once stories or story fragments had been identified, a more fine-grained narratological analysis was applied using the concepts from the literature identified above. The next section summarises the preliminary results of this work, drawing out the varying roles of story in this particular instance of design process.

Analysis

Each of the meetings comprised discussion (or continued discussion) of a series of draft documents prepared by G, the computing research assistant. The documents were intended to

capture the current understanding of the conceptual data model for classifying plant specimens. In later months, the project would turn its attention specifically to usage aspects, but even at this stage there was much discussion of the concrete details of current and potential taxonomic practice. Our first step was to interpret and form an understanding of the text we had captured. This process is necessarily and unavoidably subjective and the end result is a series of different stories about the design process. This analysis of the meeting data uncovers evidence of differing stories on several levels. These are now discussed, with verbatim extracts from the meeting protocol (in *italics*) included by way of illustration.

Variations on a theme

The analysis of the text (the collective verbal protocol) reveals there are at least two stories concerning the purpose and direction of the project in terms of the benefits to be gained from the taxonomic software, and to whom these benefits will accrue. These do not conflict fundamentally, and indeed are both present in one of the high level project descriptions (Napier University, 2002), but their differing emphases have consequences when the practical usage implications are considered. These parallel variations distilled from the meeting protocols can be summarised as set out below.

Variation a – “The taxonomist as expert”. The taxonomic classification of botanical specimens is a complex task, requiring the exercise of expert judgement. The software will support taxonomists in this task and be as easy to use as possible.

Or as the project description (Napier University, 2002) states “...one of the main challenges in the project will be to create a user-interface that allows the specification and subsequent use of the character framework in an easy way for taxonomists to use. Statements regarding the equivalence of concepts must remain under the control of the taxonomist...”

And in parallel

Variation b – “The need for consistency”. Classification of specimens in current taxonomic data is inconsistent; this makes comparisons and reuse of descriptions difficult. The software will help the taxonomic community by enforcing consistency.

Or again from the project description “...a three year project concerned with increasing the rigour and precision with which taxonomists can store, integrate and disseminate their data... ..taxonomic output is fundamental to all fields of biology that refer to organisms, and taxonomists in turn use data derived from these sources when refining past classifications. However, in taxonomy there is no single way of interpreting data, even though rigorous scientific methods are used to collect them. The result is confusion when using names and ambiguity when reading descriptions...”

The above variations are rarely voiced explicitly during the meetings, but surface in the designers’ discussions of how the software will be used. As we shall see in the next section, they generally belong to different focalisers in stories of current practice and potential software use.

Characterisation and focalisation in usage story fragments

Contributions to discussions about current and future taxonomic practice are frequently expressed as fragments of stories. The fragments concern the interplay between several characters: the taxonomist, both as a practitioner using current tools and as a future user of the software; the software itself; and a shadowy entity which we might characterise as the ‘taxonomic community’. From a close analysis of the story fragments we can see the characteristics ascribed to each character. For example, taxonomists are variously idiosyncratic, trustworthy, rigorous, and require flexibility. Here is an illustrative extract from meeting 1.

F: *...so the only sensible way forward is to give the user some credit and hope that they're going to put appropriate units.*

Taking the analysis a stage further, stories of taxonomists and the software can be seen to adopt different focalisers. (As we briefly explained above, a focaliser is the character from whose perspective events are perceived.) All the four designers frequently narrate fragments about how taxonomists currently work, or how they will do so once the software is in place. In the meeting protocol, the designers most frequently focalise their remarks from their own primary perspective, whether this is as taxonomist or database designer. This is H, a biologist, describing the practice of measurement in relation to landmarks in meeting 3. She is placing herself in the role of the taxonomist recording the measurement

H: *Landmarks are used to highlight where you've made a measurement ...*

And E, a database specialist, commenting about taxonomic practice but on the evidence of the terminology used, speaking from her own perspective...

E: *So the taxonomists, when they're describing something, they're entering structure, property, value...*

However, the database specialists sometimes focalise the perspective of the prospective user of the software (extract below), and the biologists in turn speculate about how the software might work from a technical perspective.

G: *When you read the description at breast height you don't have a picture of the person who described it so how do you know how high it is...*

And quite frequently the identity of the current focaliser is unclear – who, for example are “we” in the fragment below?

G: *and we have problems for comparisons because we have to understand what breast height means...*

The values implicit in different variations of the project story, and the characteristics ascribed to users surface in how users actions are described. When the focaliser is a user, flexibility and ease of use tend to be emphasised, even if the speaker is a database designer, as in the second extract. (The extracts are discontinuous.)

H: *You have to put a unit on, but you are allowed to choose what unit you put on there.*

E: *...they don't stop and think am I doing one like this or doing one like this or doing one like this...*

Conversely when speaking as a database designer or member of the taxonomic community, expressed values are of consistency and clear structure, while users are characterised as idiosyncratic, as in the statement below from one of the biologists. Note that this is also a very rare instance of “point of view” being mentioned explicitly.

F: *I think you see from point of view of reproducibility and consistency then if you just let them use free text then you start to lose meaning and comparability.*

Thus we have a situation in which parallel versions of stories of purpose and use, with their attendant values, flow through the meetings side-by-side. In the meeting itself, we suggest that designers are aware of these subtle differences, and although navigation through the eddying streams and currents of story can be a lengthy process incorporating diversions and false starts, there is an impression of consensus. However, this fragile achievement has to be created anew at the beginning of each session. At least two factors can be identified at work here. Firstly, between most meetings discussion is filtered and condensed onto paper, a

medium much less forgiving of parallelism, ambiguity and inconsistency than ephemeral speech. Secondly, a further problem hampering the achievement of mutual understanding in the design meetings is the nature of our cognition. As early as 1932, Bartlett demonstrated experimentally that stories are reconstructed rather than recalled. When he asked people to read and remember a story he found that of the original material little was retained except for 'isolated and striking details'. Moreover these details were only remembered if they fitted into the individual's pre-conceptions or prior experience. In practice this means that memories are recalled as *gist*.

Discussion

It is noticeable from reviewing the meetings that discussions of apparently quite small points of envisaged usage, and the conceptual model that such usage would entail, are very prolonged. This is confirmed by one of the designers, who noted that the first version of the conceptual data model had taken rather longer to agree than originally envisaged. Any causal relationship between different perspectives adopted by designers, the differing values that belong to those perspectives, and the different contexts of story fragments, and the elusiveness of clear resolutions cannot of course be proved. But we suspect at least some obscurity was contributed by these narratological phenomena. In particular, the concept of focalisation at the level of usage stories has allowed us to suggest some of the reasons for prolonged discussion. (We should add here that we do not believe that the project studied was exceptional in its deliberations. Most of the many design projects with which we have been involved have encountered similar difficulties.)

The subtle and multi-stranded nature of design narrative we have illustrated above adds an additional explanation for the lack of systems such as gIBIS (Conklin and Burgess-Yakemovic, 1991) and QOC (MacLean et al., 1991) which attempt the capture of formal and unambiguous design rationale. The central role of the story in the design process also supports the growing tendency within the human computer interaction community to document designs by scenario. There would appear to be scope for a suite of parallel scenarios, embodying stories told by different focalisers and with different emphases, but which nonetheless are satisfied by the eventual design solution.

As for the next steps in this work, we intend in the short term to extend the preliminary analysis described in this paper by (i) examining the continuity of stories between meetings and documents (ii) tracking any systematic change in focalisation of usage stories over time, and (iii) by applying the concepts of the active listener or narratee to the data. We will then refine the analytical concepts for application to a more extended and complete series of design meetings. In the longer term, there are other aspects of story to address. In particular, we suspect that there may be stereotypical stories of users and usage which cross different design domains.

Coda: So what do the designers think they are doing?

Within the text of the meetings, there are explicit references to the project story that to be presented to the outside world, more specifically the community of fellow researchers. Here the issue is one of deciding the emphasis of a formal story for publication in academic forums. For example here are E and F discussing the academic story in meeting 2.

E: As far as I'm concerned the important conceptual idea is that we're tracking the usage of defined items, [murmurs of agreement] that's what we need to make sure is captured in the conceptual model and published..

F: *That's my view as well.*

This is not just a matter of presentation or 'spin'; the plot of the agreed academic story will partially determine the focus of the project's work. Thus, just as in the writing of a novel, the project's fabula (or activities) will be arranged to match an agreed story.

References

- Bakhtin, M. M. (1981) *The dialogic imagination: Four essays by M. M. Bakhtin*, Michael Holquist (Ed.) trans. C. Emerson and M. Holquist, Austin: Univ. of Texas Press.
- Bakhtin, M. M. (1986) *Speech genres and other late essays*, C. Emerson and M. Holquist (Eds.), trans V.W. McGee, Austin: Univ. of Texas Press.
- Bal, M. (1997) *Narratology: introduction to the theory of narrative*. 2nd Edition. Toronto: University of Toronto Press.
- Ball, L J.. and Ormerod, T.C. The influence of co-designers on the generation and evaluation of solution alternatives. In S. A. R. Scrivener, L. J. Ball and A. Woodcock, (Eds.) *Collaborative Design*, Springer, 243-252
- Bartlett, F. C. (1932) *Remembering: An experimental and social study*. Cambridge: Cambridge University Press.
- Bucciarelli, L. L. (1994) *Designing Engineers*. Cambridge, Massachusetts, MIT Press.
- Buckingham-Shum, S. and Hammond, N. (1994) Argumentation-based design rationale: what use at what cost? *International Journal Human-Computer Studies* **40**, 603-652.
- Cahour, B. and Pemberton, L. (1998) When people design: conversational positioning and roles in collaborative design dialogues. In F. Darses and P. Zaraté, Eds., *Proceedings of COOP'98*, Sophia Antipolis, INRIA, 35-46.
- Colless, D. H. 1985. On 'character' and related terms. *Systematic Zoology* 34: 229-233.
- Conklin, E. J. and Burgess-Yakemovic, K. C. (1991) A process-oriented approach to design rationale. *Human-Computer Interaction* **6**, 357-392.
- Cross, N. and Clayburn-Cross, A. (1996). Observations of Teamwork and Social Processes in Design. In N. Cross, H. Christiaans and K. Dorst, Eds., *Analysing Design Activity*. Chichester, Wiley, 271-299.
- Czarniawska, B. (1997) *Narrating the Organization: Dramas of Institutional Identity*. Chicago: University of Chicago Press.
- Dourish, P. (2001) *Where the action is*. MIT Press.
- Herman, D. (Ed.) (1997) *Narratologies :New Perspectives on Narrative Analysis* Columbus: Ohio State University Press
- Lodge, D. (1980) Analysis and Interpretation of the Realist Text. *Poetics Today* 1.4
- Lloyd, PA (2000) Storytelling and the development of discourse in the engineering design process. *Design Studies*, Vol. 21, No. 4, 357-373
- MacLean, A., Young, R. M., Bellotti, V. M. E. and Moran, T. P. (1991) Questions, Options, and Criteria: Elements of Design Space Analysis. *Human-Computer Interaction* **6**, 201-250.
- Maher, M. L., Cicognani, A. and Simoff, S. J. (1997) An Experimental Study of Computer Mediated Collaborative Design. *International Journal of Design Computing*.

- Napier University (2002) Prometheus II: Capturing and relating character concepts in plant taxonomy, http://www.dcs.napier.ac.uk/~prometheus/prometheus_2/prometheusII.html
- Olson, G. M., Olson, J. S., Carter, M. R. and Storrøsten, M. (1992) Small Group Design Meetings: An Analysis of Collaboration. *Human-Computer Interaction* 7, 347-374.
- Olson, G. M., Olson, J. S., Storrøsten, M., Carter, M., Herbsleb, J. and Rueter, H. (1996). The Structure of Activity During Design Meetings. In T. P. Moran and J. M. Carroll, Eds., *Design rationale: concepts, techniques and use*. Hillsdale, NJ, Lawrence Erlbaum Associates, 217-239.
- Onega, S. and Landa, J. S. G., Eds. (1996) *Narratology*. London: Longman
- Pentland, B. (1999) Building process theory with narrative: from description to explanation *Academy of Management Review* 24 (4), 711-724
- Perry, M. and Sanderson, D. (1998) Co-ordinating Joint Design Work: the Role of Communication and Artefacts. *Design Studies* 19 (3): 273-288
- Potts, C. and Catledge, L. (1996) Collaborative Conceptual Design: A Large Software Project Case Study. *Computer Supported Cooperative Work* 5 (4): 415-445.
- Radcliffe, D. F. (1996) Concurrency of Actions, Ideas and Knowledge Displays within a Design Team. In N. Cross, H. Christiaans and K. Dorst, Eds., *Analysing Design Activity*. Chichester, Wiley, 343-364.
- Reid, F.J.M. and Reed, S.E. Interaction and entrainment in collaborative design meetings. In S. A. R. Scrivener, L. J. Ball and A. Woodcock, (Eds.) *Collaborative Design*, Springer, 233-242
- Robertson, T. (1997) Cooperative Work and Lived Cognition: A Taxonomy of Embodied Actions. In J. A. Hughes *et al.*, Eds., *Proceedings of ECSCW'9*, Dordrecht, Kluwer, 205-220.
- Tang, J. C. (1991) Findings from observational studies of collaborative work. *International Journal of Man Machine Studies* 34 (2): 143-160.
- Turner, P. Turner, S. and McCall, R (2001) Getting the story straight. In People and Computers XV, Proceedings of HCI'01, 267-278
- Turner, P. and Turner, S. (2002) An affordance-based framework for CVE evaluation. To appear in People and Computers XVI, Proceedings of HCI'02
- Turner S. and Turner P. (2001) *Designer as Hero*. Proceedings of 'Voices from the Fringe' workshop, HCI'01.