The Review Function in Organizations and its Implications for Organization Theory, Cybernetics, and Ethnography

Paul D. NUGENT, Ph.D .
Management Information Systems Department, Western Connecticut State University
Westside Classroom Building, Room 203
Danbury, CT 06810, United States

and

Richard MONTAGUE, Ph.D.
Management Information Systems Department, Western Connecticut State University
Westside Classroom Building, Room 204
Danbury, CT 06810, United States

ABSTRACT

This paper analyzes the "review function" in organizations and its implications for theory and for ethnographic methods. Whether it is scholars peer-reviewing each other's work, or a quick informal "bouncing of one's ideas" to another, or a formal product review with a powerful customer, the review is a function within and across organizations that is so ubiquitous that it has eluded exploration as a distinct structural entity. Yet it is also at the heart of the signaling and feedback features undergirding cybernetic systems. Therefore, this paper looks at the kinds of signals/feedback that review activities reveal as well as drawing on foundational works in ethnography to consider how ethnographic methods can be better attuned to acknowledging the centrality of feedback and signaling in any social system.

Keywords: Cybernetics, ethnography, organization theory.

> In control and communication we are always fighting nature's tendency to degrade the organized and to destroy the meaningful…
> -   Norbert Wiener, *The Human Use of Human Beings* [1]

1. INTRODUCTION

This paper draws upon ethnographic data from a large defense contracting company in New England to highlight the technical, social, political, and linguistic facets of the review activities. It contrasts two types of reviews that are common in the defense contracting engineering environments: technical peer reviews and formal customer design reviews. A close examination of communications artifacts from these activities reveals that while the smaller internal peer reviews are mostly focused on compliance with rules and technical precedent, the formal customer review is an elaborate ceremony in which the critical question is whether or not the technical community developing the new system is demonstrating sufficient commitment and deference to the customer and his/her official interests.

A typical dictionary definition of the word *review* includes "examine or assess (something) formally with the possibility or intention of instituting change if necessary." Furthermore, the etymology of the word review stems, somewhat unsurprisingly, from the notion "to see again, go to see again," from Latin *revidere* [2]. Although it is possible that some "seeing" and some "evaluating" could be performed by non-humans (animals and machines) in some instances, in most cases it is performed by human beings on the artifacts created/managed by other human beings and therefore has a fundamentally social nature. It is also interesting that etymological origins of the term came from inspecting military forces in the mid-15th century A.D. Perhaps prior to this there really were few or no social contexts in which one human or group purposefully evaluated the state of affairs of another person or group in an institutionalized manner involving documentation, schedules, or rules. Prior to this there was no legitimized authority for performing this kind of activity. This compels us to consider how the review is a fundamental component or activity that is both a product of and a cause of modernity.

Although modernity has many facets and may historical sources, one of the most enduring is Max Weber's analysis of the roles of rationality, calculability, and intellectualization. While on the one hand he lamented that these forces lead to the "disenchantment of the world," he nonetheless saw it as inevitable due to their objective efficiency and effectiveness in institutions [3]. Rationality, by definition, is the alignment of actions to the achievement of goals. Therefore, as commercial, military, and political institutions grew in size and complexity, their goals became better defined and where conflicts over potential courses of actions arose, the ones best aligned to the goals would more often win out.

But in addition to courses of action, there are current states of affairs that also need to be evaluated for rationality. Are the military troops trained adequately, dressed adequately, properly motivated, and are there enough of them? Does the political communication meet the expectations of the leaders? Are the products of the butcher, the baker, and the candlestick maker of acceptable   quality?

Over the last couple of decades organizational scholars have called for reintroducing work to organizational theory [4][5]. In response, they have discovered ways in which the work activities themselves and the introduction of new technologies and processes have implications for organizing and for power relations hitherto ignored by theorists. In this paper, we will consider how the review function, as both an evaluation of work products and as a work activity itself, is a central phenomenon in modern organizations and its sociological and methodological implications.

2. CYBERNETICS AND ETHNOGRAPHY

In this section, we shall discuss the reasons why it is important to study the review function in organizations. We argue that both ethnography and organization theory tend to ignore or greatly reduce the significance of cybernetic activities within organizations and in so doing they miss important spheres of organizational functioning.

To make these points, let us begin with the anthropologist Clifford Geertz's statements about culture and signification through Gilbert Ryle's example of winks versus twitches:

> Consider, [Ryle] says, two boys rapidly contracting their eyelids of their right eyes. In one, this is an involuntary twitch; in the other, a conspiratorial signal to a friend. The two movements are, as movements, identical; from an I-am-a-camera, "phenomenalistic" observation of them alone, one could not tell which was twitch or wink. Yet the difference, however unphotographable, between a twitch and a wink is vast; as anyone unfortunate enough to have had the first taken for the second knows. The winker is communicating, and indeed communicating in a quite precise and special way (1) deliberately, (2) to someone in particular, (3) to impart a particular message, (4) according to socially established code, and (5) without cognizance of the rest of the company. [6][p. 6]

At the heart of social activity and meanings, then, is not merely understanding cultural categories but also how these play out *in motion* – in actual activities in which signals are sent from one individual to another and, based upon the context, have a reliable meaning.

This dovetails well with Norbert Wiener's conceptualization of cybernetic systems.

> In giving the definition of Cybernetics in the original book, I classes communication and control together. Why did I do this? When I communicate with another person, I impart a message on him, and when he communicates back with me he returns a related message which contains information primarily accessible to him and not to me. When I control the actions of another person, I communicate a message to him, and although this message is in the imperative mood, the technique of communication does not differ from that of a message of fact. Furthermore, if my control is to be effective I must take cognizance of any messages from him which may indicate that the order is understood and has been obeyed. [1][p. 16]

The key points here are that, in agreement with Geertz, the *act* of messaging and signaling is central to communication, and beyond Geertz, Wiener is emphasizing the centrality of messaging/signaling to *control* in techno-social systems. And in addition to communication and control, are the feedback mechanisms of control in which *uncertainty* over the accuracy of the communication is resolved.

It is our claim that in ethnography's quest to understand cultural categories and meanings, they tend to rely too heavily on interview data in which a "native" or "informant" is asked a series of open-ended questions followed by probes to tease out these "data." [7][8][9][10] However as Geertz and Wiener remind us, much of what is *really going on* in these settings are the activities themselves in which winks, messages, and signals are sent and received within the context of purposeful organized social *systems*.

Again, according to Wiener,

> It is my thesis that the physical functioning of the living individual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback. Both of them have sensory receptors as one stage in their cycle of operation: that is, in both of them there exists a special apparatus for collecting information from the outer world at low energy levels, and for making it available in the operation of the individual or of the machine. In both cases these external messages are not taken as *neat*, but through the internal transforming powers of the apparatus, whether it be alive or dead. The information is then turned into a new form available for the further stages of performance. In both the animal and the machine this performance is made to be effective on the outer world. In both of them, their *performed* action on the outer world, and not merely their *intended* action, is reported back to the central regulatory apparatus. This complex of behavior is ignored by the average man, and in particular does not play the role that it should in our habitual analysis of society; for just as individual physical responses may be seen from this point of view, so may the organic responses of society itself. I do not mean that the sociologist is unaware of the existence and complex nature of communications in society, but until recently he has tended to overlook the extent to which they are the cement which binds its fabric together. [1] p. 26, 27]

In concert with this view, there are organization theorists who lament that organizational research has been overly preoccupied with abstract theories that make strong assumptions about the nature of work and that these assumptions are often incorrect and misleading and that researchers need to observe what is actually going on, technically and socially, in the work activities themselves [4][5]. These themes led us to identify and analyze underexplored work activities in organizations. In particular, the review is both a formal and an informal function or activity within the organization that not only strikes at the core of the work itself, but also represents a very important moment in signaling, feedback, within the techno-social system. It is within this context that we chose to compare and contrast communication artifacts from two different kinds of formal

reviews in an organization to consider the overall cybernetic roles that the review function has, in general, for organizations.

3. RESEARCH SETTING

The two types of review that were analyzed were technical peer reviews and formal customer reviews from a defense contracting organization of roughly 1000 engineers and managers in New England. Research data were not drawn from interview data, although interview data did help to provide social, technical, and political contexts for interpreting the data, but rather were the actual communications (often comments and responses) that occurred and were recorded during these reviews. The two types of review were chosen because of data availability and more importantly because they offer a functional contrast – the technical peer reviews are more focused and entail a small group of technical stakeholders reviewing, primarily the technical correctness of a product, and the customer review being a much more elaborate review of an entire complex system by the Department of Defense (Dod) customer and other government contractors. Also, in line with Wiener's analysis of cybernetics, we focused on those communication artifacts, especially those phrased as questions, that served to express or to reveal some level of *uncertainty* within the system.

While there are more detailed results for our analysis of the reviews, space limitations here compel us to present these results in a more summary fashion that nonetheless will allow for drawing conclusions about the general cybernetic role of the review function in organizations.

4. THE PEER REVIEW

This dataset is comprised of 21 peer reviews. The products in these reviews include System Specifications (SS), Subsystem Specifications (SSS), System Design Documents (SDD), Subsystem Design Documents (SSDD), Software Requirements Specifications (SRS), Interface Requirements Specifications (IRS), and Interface Design Documents (IDD). The average number of comments captured per peer review is 157. Therefore all of these products represent requirements definition and system design. Grounded theory methods were used to evolve codes and to develop theory [7]. In the following paragraphs we will discuss the structure of the review as well as five key themes that emerged in the communication artifacts within the peer reviews.

Structure
The product (document) is distributed electronically to technical stakeholders from the main functions (systems engineering, software engineering, information assurance, hardware engineering, etc.) and provided with a week or so of review time. Comments are entered into a database including a reference to the location in the document. Most documents are written in a DOORS database so the references are usually an object ID. The author of the document strives to resolve most of the comments prior to the meeting, so the meeting focuses on those comments that were not readily resolved and require further dialogue by the participants. At the meeting, the comments information is projected from a computer onto a screen and one individual is the recorder and is the one that scrolls from comment to comment and records the responses/resolutions and comment attributes such as type, severity, defect category, etc. The review is not officially closed until all of the comments have been resolved. The organization gathers metrics on performance measures such as the amount of time the review is still active and the number of defects recorded.

Themes
The following themes emerged as being key uncertainties in the review activity.

Uncertainty over Documentation: Very often the object of the question is something about the document itself and if it is following rules associated with each kind of document. For example, a reviewer asked the following question: "There are MG valves beyond MG-6 and MG-11 - is this requirement better located in a general section rather than being limited to two of the MG valves?" The resolution to this question was: "look into whether to move this to a general MG section. Leave as-is."

Uncertainty over Language: In this category the question addresses language itself and how it is being used. For example, a reviewer's question was: "This appears to be a rewording without change of intent - is this change still necessary? This is applicable to a number of requirements in this section (391, 393, 394, 395, 396 for example)." To which the resolution was, "Global, go back and change reqmts that were modified for 'The CAMP shall....'"

Uncertainty over Ontology (System): In this coding category the question is posed to the system itself. These systems are being designed and developed so these questions really address uncertainty or ambiguity over what the system is supposed to be given technical and programmatic expectations. For example, a reviewer asked: "CAMP internal component replacement? can occur. Also, if subrack is powered off, are there any other capability besides MHC pumps that can be manually controlled? MHC heater controls? MDD?" and the resolution provided was, "Removed reference to "internal component replacement" When subrack is powered off, only the MHC pumps can be manually controlled."

Uncertainty over Linking: All of the documents being reviewed were written in a DOORS database that allows for the linking of objects between documents. For example, every requirement in a requirements specification must link "upward" to some higher-level requirement or requirements. For example, a reviewer's comment was, "If this is a requirement which specifies performing something "in accordance with OD 61988", how can this be linked to the FCS SS? Should this requirement really reference OD 61988?" to which the resolution was, "Agree, remove link."

5. THE CUSTOMER REVIEW

Structure
The DoD imposes very strict contractual requirements for reviews at various phases of a product development cycle. These requirements include "entrance criteria" for activities

needed to be completed prior the review, and "exit criteria" or requirements for review content and the reviewer's (customer's) satisfaction with the contents, as well as the resolution of comments and action items generated during the review. For this analysis, we analyzed artifacts from a Preliminary Design Review (PDR) that lasted three days at the prime contractor's site. The primary author was a systems engineer at the prime contractor organization during this time. There were 78 attendees including four customer representatives, roughly 25 from other contracting organizations, and the remainder from the primary contractor. All presentation materials (mostly Powerpoint presentations) were distributed to all participants prior to the meeting. Prior to the customer review the prime contractor conducts a series of internal "dry-run" reviews with program management and technical domain experts from various functional departments to ensure the content meets the review requirements and customer expectations.

The meeting itself is conducted in a large meeting room adjacent to the cafeteria with a small breakout room for refreshments and side-discussions. There are several rectangular tables arranged in a U shape so that the projected material and the presenter are at the open end. The DoD customer representatives sit at the back of the U so that they see the content and presenter head-on. Around them are the program managers responsible for the project as well as some of the higher-ranking members of the other contracting organizations. About a third of the attendees at the table have a laptop computer in front of them for scrolling through the presentation materials on their own or for their Email or other backup materials.

There is an agenda that lists each of the presentation topics and their time window. The reviews usually begin at 8:30am and end at 5:00pm with an hour lunch break. The topics cover schedule and budget issues up front, and then give way to more technical content. The highest-ranking customer governs the meeting, its starts and stops, and typically gives some opening remarks each of the three days clarifying his/her general expectations as well as how he or she feels the review is going so far.

Themes

Consensus Building: The systems being developed are extremely complex (multiple computers with user interfaces, embedded sensors and controls, and nuclear safety). There are thousands of functional, programmatic, security, reliability, maintainability, produceability, etc. requirements and the overall system architecture and design elements demonstrate that they satisfy those requirements. While other attendees occasionally ask a question of the presenter, it is usually the customer who asks questions which usually center on both a clarification of his/her understanding of the content, but quite often also are open-ended questions to the other contractors and technical experts to establish consensus over the requirements and design content.

Capability: At the review all eyes are on one presenter representing a particular organizational function. Both the content of the presentation and the presenter's performance are available for all to evaluate. The presenter is at some stage in his/her career and cares a great deal about how he or she is being evaluated by the customer, by other contractors, and by their own managers. The presenter's character is also revealed in the manner in which he/she "thinks on his feet" when posed with a difficult question. A clear norm at all of these reviews is that if the presenter does not know the answer to the question he or she should never resort to "hand waving" or guessing at an answer.

Language: As with the peer reviews, ambiguity over wording, acronyms, and new terminology are often discussed. The goal of these discussions is usually to remove ambiguity completely in achieving technical goals.

Humor: For what is primarily an activity that is technical and objective, there is a surprising degree of humor. While some of this humor is responsive to practical issues/shortcomings of the review logistics, for the most part it is in response to known backstage realities of the various members of the community present at the review. Over the years various conflicts naturally occur between groups given their technical and budgetary jurisdictions/goals and this provides raw materials for the customer and other review attendees to highlight them in a humorous manner. While more could be explored in this theme, these episodes seem to both acknowledge the existence of these conflicts while diffusing what could be their negative effects. It also must be acknowledged that humor contribute toward a more friendly, less hostile, and more inclusive climate to the social gathering.

Commitment: A background assumption in the defense contracting world is that above and beyond the contractual relationship, there is a community of engineers and managers who are not guided by so much by parochial contractual constraints but more by an obligation to the community and its overall goals. Based upon the customer's comments throughout this and other reviews that the primary author participated in and presented at, a clear theme is one of, to use the sociologist Erving Goffman's terms, *deference* and *demeanor* [11]. Through the presentation materials and through the way in which presenters conduct themselves and answer the customer's questions, both deference and demeanor express or reinforce a social orientation toward the customer. Indeed, during the dry-runs the managers remind the presenters that the customer will ask certain types of questions to tease this out – to ascertain to what extent the presenter and the presenter's engineering group is knowledgeable about and committed to a particular technical goal. There is some level of tolerance here, as more junior engineers are attempting to fill the shoes of senior ones, but ultimately the customer is looking for an overall gestalt or picture of the commitment of the contractors to the community's overarching goals.

6. IMPLICATIONS FOR ORGANIZATION THEORY

From the analysis, we see that a great deal takes place within the two types of review activity. By focusing the data gathering and analysis on cybernetic principles of messaging, signaling, feedback, and control, we see that the review as a general type of function is structured primarily to *be* cybernetic – to overcome chaos and entropy to align collective action with institutional goals. Whereas the peer review is aligned to more technical goals for a specific product, the customer review focuses on a complex and variegated technical community and goals of coordination, capability, consensus, and commitment.

There are many varieties of organization theory (OT) that each attempt to offer explanations of why organizations are structured some ways rather than other ways. Rather than survey each, we would like to draw attention to the work of Arthur Stinchcombe in his book *Information and Organizations* because it dovetails the best with our analysis of the two types of review [12]. In particular, Stinchcombe posits that variation in organizational structures is highly responsive to the acquisition of new information about what is both important/critical, and what is also uncertain. This is consistent with cybernetics as Wiener presents it, because it is concerned with messaging and feedback related to goals, however Wiener tends to simplify his analysis by considering one particular goal at a time. In combination with Stinchcombe's theory, our results show that there are many overlapping and simultaneous goals that may be in agreement with each other or may be in conflict. Both types of review are structured specifically to address these multiple goals through presentation, dialogue, and resolution mechanisms. The key insight here is that without *seeing* (reviewing) a multitude of information sources, the institution would be unable to maintain control over goals at various levels of analysis. The review, then, is critical to organizations because it forces the cybernetic flow of information to occur so that existing goals can be controlled and new goals or conflicts identified. And as we have seen, the goals that emerge are not simply cost, schedule, and quality, but also include the maintenance of a local language [13], coordination of system elements, and consensus within and maintenance of a technical community. Therefore, this study highlights the role that review activities play maintaining a variety of social as well as technical goals.

7. IMPLICATIONS FOR ETHNOGRAPHY

Returning to Geertz, not only does he use the wink versus twitch of one's eye to explain what culture is, but he also in the same volume uses his observations of a Balinese cockfight to illustrate the hierarchical structure of an entire society [6]. "Deep play" or high-risk wagering takes on different forms depending upon your place in society so these rituals and how they are played out both depend upon and reveal one's social position. No doubt, a more detailed analysis of the customer review at our site would provide more nuanced insights along these lines for the DoD and the contracting community, however for our purposes here the key point is that it is through actions – winking, twitching, wagering, etc. that signals are given, messages are sent, and meanings interpreted within structured contexts. While ethnographers emphasize the roles that observation and field notes play in their craft, less attention is paid to the collection of artifacts from work activities and the signs, symbols, messages, and language represented in them. It is here that culture and structure comingle and constitute one another. More than static "myths and ceremonies" that reinforce existing norms and relationships [14] the review also purposefully looks to *revisit* and modify those norms and relationships. Therefore, the collection of artifacts capturing actual communications between people and even between people and machines promises to reveal more about the cybernetic dynamics of organizations serving as a balance to the more thematic analyses based upon traditional interview-based methodologies.

8. CONCLUSION

While many of the themes in the analysis deserve more in-depth treatment, the purpose this paper is to sensitize scholars to the review function in organizations and its central role in addressing the multi-faceted and even conflicting technical and social goals in complex organizations. From this perspective, other kinds of reviews in this and other kinds organizations may be fruitfully approached; whether scholarly peer reviews, or formal financial audits, or the informal "bouncing of ideas" off one another. And only hinted at in the analysis, the review can also be seen as an important activity for maintaining or shifting power in organizations [15]. As Barley and others have shown with the introduction of new technologies as an occasion for reorganizing and modifying power relations [4], the review has similar potentials. This perspective may also reinforce and extend some of the key themes in the philosophy of technology that would frame the review activity as a form of technology and, as such, a dynamic lens through which human beings view their world, others in their world, and themselves.

9. REFERENCES

[1] N. Wiener, **The Human Use of Human Beings: Cybernetics and Society**, Da Capo Series in Science, 1950.

[2] Onlineetymology.com.

[3] H. Gerth and C. W. Mills, **From Max Weber: Essays in Sociology**, Oxford University Press, 1946.

[4] S. R. Barley, "Technicians in the Workplace: Ethnographic Evidence for Bringing Work into Organization Studies*,"* **Administrative Science Quarterly**, 1996, 41: pp. 404-441.

[5] S. R. Barley and J. E. Orr, J. E. (eds.), **Between Craft and Science: Technical Work in U.S. Settings**. ILR Press: Ithaca, 1997.

[6] C. Geertz, **The Interpretation of Cultures**, Basic Books, 1973.

[7] J. P. Spradley, **The Ethnographic Interview**. Fort Worth: Harcourt Brace Javonovich College Publishers, 1979.

[8] A. Strauss and J. Corbin, **Basics of Qualitative Research: Grounded Theory Procedures and Techniques**. Sage Publications, 1990.

[9] J. Van Maanen, **Tales of the Field: On Writing Ethnography**. Chicago: University of Chicago Press, 1988.

[10] D. Haraway, "Situated Knowledge: The Science Question in Feminism and the Privilege of Partial Perspective." **Feminist Studies, Inc**. 1988, Vol. 14, No. 3. pp. 575-599.

[11] E. Goffman, **Interaction Ritual**. Pantheon Books: New York, 1967.

[12] A. L. Stinchcombe, **Information and Organizations**. University of California Press: Berkeley and Los Angeles, California, 1990.

[13] L. Wittgenstein, **Philosophical Investigations**, MacMillan Publishing, 1958.

[14] J. W. Meyer and B. Rowan, "Institutionalized Organizations: Formal Structure as Myth and Ceremony." **American Journal of Sociology**, 1977, 83, No. 2 (September), pp. 340-63.

[15] C. Perrow, **Complex Organizations: A Critical Essay**. Third Edition. McGraw-Hill, Inc.: New York, 1986.