METHODS FOR COMMUNICATING

TECHNICAL INFORMATION AS PUBLIC INFORMATION

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ABSTRACT

Many challenges face the nuclear industry, especially in the waste management area. One of the biggest challenges is effective communication with the general public. Technical complexity, combined with the public's lack of knowledge and negative emotional response, complicate clear communication of radioactive waste management issues. The purpose of this session is to present and discuss methods for overcoming these obstacles and effectively transmitting technical information as public information. The methods presented encompass audio, visual, and print approaches to message transmission. To support these methods, the author will also discuss techniques, based on current research, for improving the communication process.

INTRODUCTION

The key to effective communication of technical information to the public is selection of the appropriate format for a particular audience which clearly and concisely conveys the necessary message. This presentation will explore methods and techniques for locating and using that key. Through these methods and techniques, communication of waste management issues becomes not only a challenge, but also an opportunity for achieving successful outcomes to the nuclear industry's long-term goal: public acceptance.

Communication is a process comprised of three stages of information transmission: input, throughput, and output. The primary elements are the audience, the purpose, and message. The components in the process are the communicator, the information, audience, and the audience's response or feedback. Critical to maintaining an effective, on-going communication process is constant awareness, consideration, and analysis of the "Five W's and One H:" Who, What, When, Where, Why, and How. Overlooking any aspect of the process promises potential problems.

THE COMMUNICATION PROCESS

Audience, Purpose, Message

When communicating nuclear waste issues to the general public, audience is the first consideration. Who is the "audience?" Who is the "general public?" What is a "layman?" The answer to these questions is often "I don't know," "I'm not sure," or "the average person." Vague answers such as these produce vague communications.

Identifying the audience, while not necessarily a simple task, is the most critical one. Basic questions, such as the following, will help provide the answer:

- What is the level of technical knowledge of this particular group?
- What are the needs and motives of the majority?
- What outcomes do they anticipate?
- Why do these people need/want this information?

In addition to identifying the audience, defining the purpose of the communication is also essential. "Providing information" and "educating the public" are valid, but generic answers. Effective transmission of information necessitates determination of specific outcomes for a particular audience. Since every communication contains a degree of persuasion, the purpose depends on defining what the communicator wants to persuade the audience to accomplish. The communicator needs to determine what he/she wants the audience to do after receiving the information.

Once the audience is identified and the purpose defined, the appropriate message can be developed. Again, with nuclear waste issues the message is often generic: assurances of public health and safety. This provides for partial development of a partial message. To accurately develop an effective message, the communicator must determine both the "big picture," or overall message, and the total amount of necessary detailed information, including facts, responses, and recommendations.

To summarize, effective information transmission depends on a complete and accurate identification of the particular audience, definition of specific purpose, and development of the appropriate message. These elements provide the basis for constructing the communication chain.

The Communication Chain

Communication is a process, a proceeding or movement forward. It implies the movement of information from one point to another: from communicator to audience. Communication, however, is not linear, but cyclical. Regardless of the medium employed, feedback exists in the communication process. Both short-range and long-term goals in nuclear waste management depend on the outcomes of the communication process, as well as feedback and resulting actions of the audience in response to the information transmitted

Viewed as a chain, then, the communication process is comprised of a series of links. The total chain is both continuous and cyclical. In addition, each link in the chain is intertwined. Since a chain is only as strong as its weakest link, each link must be strong: each component in the communication chain is critical to the total process.

The Forgotten Link

Components in the communication process are: the communicator, the information or message, the audience, and the audience's response or feedback. In nuclear waste management, the communicator is usually a technical expert conveying a technical message to a general audience whose feedback is often ambiguous, diverse, and/or chaotic. Why? The communication chain provides the answer; a "weak link" exists: the audience. A look at how people process information helps to explain why this occurs.

A Three-Stage Process

Three stages are needed for effective communication: incoming information (input), information processing (throughput), and outgoing information (output). The human brain processes information, to some extent, like a computer. Information, or incoming data, is fed into the brain, or processor, where it is computed and analyzed and sent out as outgoing information, or output. The critical stage is the processing or throughput. Especially when communicating technical information, the processing can easily malfunction or disfunction. Therefore, identifying and understanding the audience is critical to the successful transmission of information.

For example, the average presenter speaks at a rate of 125 words per minute. By contrast, the average listener can process 400-600 words per minute. What the listener does with that excess time is critical to effective communication. In addition, a a person is continually bombarded with an incomprehensible amount of information, coming into the brain through each of the five senses. To ensure that the message sent is the message received, gaining and maintaining a maximum amount of audience attention, including the excess time, is critical.

Incoming information is subject to three basic processing "errors:" distortion, deletion, and generalization. Once data is fed into the system, the brain must select, sort, organize, and store the information. In the process, some information is distorted (the person may misunderstand part of the message), deleted (the person may miss part of the message), or generalized (the person may make assumptions based on prior knowledge or experience).

For a variety of reasons, technical information, specifically nuclear waste information, can be especially prone to processing errors. Effective communication must accomplish three objectives:

- Maintain a maximum amount of audience attention.
- Capitalize on the processing capabilities of the human brain.
- Adapt the information to ensure that the message sent is the message received.

To achieve these objectives, a number of factors can be considered, factors which can be bolsters or bottlenecks in the communication process.

BOLSTERS OR BOTTLENECKS

Factors for Consideration

Factors which can affect the outcome of the communication process when considering nuclear waste management issues include the following:

- Knowledge/Ignorance
- Emotion/Reason
- Trust/Mistrust
- Control/Impotence
- Perception/Reality
- Action/Indifference.

Each of these factors, viewed on a continuum, results in a range of audience reponses. The technical communicator needs to be aware that these factors exist, understand their implications for the communication process, determine where the audience falls on each continuum, and choose appropriate methods to utilize these factors as bolsters and not bottlenecks in the communication process.

Knowledge/Ignorance

The audience's level of knowledge about nuclear waste management will play a critical role in determining how clearly the message conveyed is also received. The audience is often diverse and may include some or all of the following: laymen, interested or concerned citizens, experts, and/or technicians. Targeting a specific audience and tailoring the message accordingly is a difficult but essential task.

For example, a lay audience will probably have little or no background information on the subject. Therefore, a written or spoken presentation containing technical terminology, scientific notation, and nuclear waste "buzzwords" will equate to a foreign language, unless definitions and simple analogies are used.

Ignorance can breed fear and knowledge can combat that fear. Therefore, identifying, as much as possible, the audience's level of knowledge will improve the communication process. One simple way to determine this level in a verbal presentation is to ask. A few basic questions posed either before or in the introduction will supply the targeted information. In a written presentation, on the other hand, a target audience can be selected and the material prepared specifically for that audience.

Emotion/Reason

Communication is a dual processing system: communication takes place on both a cognitive and an emotional level. Current research in neuroscience continues to explore the extent of this dual processing. While both levels operate simultaneously, one level tends to dominate at any particular time. Therefore, if strong emotions, such as fear, anxiety, or mistrust, are evoked, emotion will dominate reason. Logical presentation and analysis of technical information will not compute in the human brain at these times.

What the technical communicator says or writes becomes secondary to how he/she presents the information. For example, in a spoken communication, only 8% of the words sent are, on the average, remembered by the audience. 92% comes from the non-verbal "language" in the communication (37% from tone of voice, pitch, et cetera and 55% from body language). Eye movements, eye contact, gestures, appearance, et cetera, affect the outcome. The key for the communicator is awareness of the total message sent, not just the verbal message.

For effective information transmission, both communicator and audience must operate on comparable levels. When presenting technical information, the communicator's goal is to reach and hold the audience's attention and retention on a rational level. The key, then, is learning and applying methods to achieve that goal.

Trust/Mistrust

The level of trust the audience has in the communicator will also affect the successful transmission of information. People tend to believe people they trust and will then be more open and receptive to new information. Because of the complexity of nuclear waste issues, the public often has to rely on the competence of technical experts.

The expert is, in effect, leading the way into uncharted waters. Trust in the captain of the ship is essential to offset the risk of getting lost or drowning. Establishing and maintaining a high level of trust from the audience will help to increase the effective outcome of the message. Once again, the key lies in the total message sent and the methods used to achieve the desired outcome.

Control/Impotence

The amount of control a person has in a particular situation parallels the degree of acceptance of that situation. In nuclear waste issues, the communicator needs to be aware of the control factor and to take advantage of opportunities to enhance the audience's sense of control.

Lack of control leaves a person feeling powerless and helpless. When fear, stress, and anxiety mount, communication takes place on an emotional, rather than a rational, level. Then the message sent by the technical communicator is not the message received by the audience.

Perception/Reality

A perception is a conscious awareness. Individual perceptions are unique. One person's perception of reality may or may not correspond very closely with another person's perception. In addition, individual perceptions may or may not correspond very closely to reality. Understanding the differences is essential to effective communication.

Perceptions form conceptual maps of reality in each individual. As such, perceptions need to be factored into the communication process. A wealth of information, for example, has been compiled regarding perception of risk versus the reality of risk. A key consideration in communicating technical information on nuclear waste issues revolves around risk perception.

Many people fear radioactivity. Just as some people react violently to snakes, even though the majority are harmless, the words "nuclear" and "radioactive" can evoke strong fears and apprehensions. Managing those fears is a tremendous challenge to communicators in the nuclear industry. Every effort must be made to maintain awareness that these perceptions exist and to offset these perceptions with clear and complete information wherever possible.

Action/Indifference

A final factor which can affect the outcome of communication of nuclear waste issues is the audience's actual response to the message received. The communicator must determine what type of response he/she wants from the audience. This response may vary from action to indifference.

The "fight or flight" syndrome comes into play here. An individual's response to a particular situation will be based, in part, on his/her tendency to approach or avoid novel or risk experiences. Awareness of this syndrome allows the technical communicator to prepare for a range of responses to nuclear waste issues and to adapt presented material accordingly.

In some situations, the ideal response may be inaction or neutrality. In others, action or indifference may be detrimental to an effective outcome. The communicator needs to know what outcome is desired and how to proceed with the communication process to achieve that outcome.

COMMUNICATION BRIDGES

Completing the Cycle

Once the communication process is clearly understood and potential bolsters/bottlenecks are analyzed, the communicator can select methods to bridge communication barriers and effectively communicate technical information as public information. These bridges include:

- Connotation
- Mapping
- Interpretation
- Alignment
- Adaptation
- Simplification
- Visualization
- Repetition.

Use of all of these avenues produces a cohesive communication package. Since flexibility is an advantage, particularly in communicating complex issues, these methods may be combined in various ways. The primary selection criterion is the audience.

Connotation

Technical industries rely heavily on precise and accurate use of terminology. Minute distinctions between words can alter meaning and confuse communication. Therefore, terminology is complex and extensive. To the outsider, this terminology is another foreign language. Understanding must be based on prior knowledge and the ability to determine meaning from context.

The connotations of words can also carry great significance. Connotations, comprising implicit meanings of words, can alter the communication process. An effective technical communicator must consider the various connotations of words and, in conjunction with the precise definition, provide enough information, geared to the level of the audience, for the audience to understand the meaning of specific words and, consequently, the overall message being conveyed. An effective technical communicator will avoid words which convey negative emotional responses.

The word, "dump" is a common example, which carries a negative connotation along with "trash" and "garbage." Therefore, "disposal facility" is a preferred word choice when discussing waste management.

Mapping

"Mapping" is composed of three steps:

1. Identifying the conceptual framework under which the audience is currently operating.
2. Understanding that the communication process is also a change process.
3. Implementing a new conceptual map to replace the current one.

Analyzing the potential bolsters/bottlenecks in the communication process provides the means to completion of step one. Step two is accomplished by an awareness of the impact of change on people. Reaction to change is a process. One breakdown of this process is:

1. Denial
2. Anger
3. Bargaining
4. Depression
5. Acceptance.

When confronted with change, individuals progress through these steps at varying speeds and levels of acceptance. Technical communicators present change to their audience, either by asking the audience to learn new information or by attempting to persuade the audience to adopt new ideas. They can expect the audience to go through the change process to some degree. How the communicator handles this change process can affect the outcome of the communication process.

Interpretation

Interpretation is a method for accomplishing the third step in mapping: implementing a new conceptual map for the audience. Interpretation, or translating the message, can be accomplished by the use of "reframing" or adjusting the content or context of the communication to accomplish the desired outcome. For example, the word "nuclear" often connotes "atomic bomb" and "Hiroshima." Changing the context to "medical diagnosis" and "safeguarding health" can reframe a negative situation into a more positive one.

Another way to reframe is to use analogies or metaphors. People can understand more clearly if the situation is related to their own realm of experience. Therefore, equating radiological exposure risks to cigarette smoking, air travel, and so on, translates the information into the audience's frame of reference. From there, the communicator can progress into acceptance of everyday risks. A new conceptual map is formed.

Alignment

"To align" is "to bring into agreement or close cooperation." Alignment is a communication method to establish rapport, maintain rapport, share information, and avoid resistance. Using the previously presented factors as bolsters for the communication process, as well as the methods, allows the technical communicator to construct the necessary framework for alignment.

One type of alignment is called an "agreement frame," which consists of prefacing a potentially conflictive statement with phrases such as the following:

"I agree and ...."
"I appreciate and...."
"I respect and...."

By aligning with the other person, resistance and defensiveness can be avoided.

For example, openly disagreeing with an opinion is a confrontation. The other party has two options: fight or flight, attack or retreat. A conflict will most likely result. On the other hand, respecting an individual's right to an opinion or feelings eliminates the conflict and does not compromise either party. At the same time, an agreement frame allows the listener to concentrate on the speaker's opinions and not on the speaker's attack. Agreement frames can be used effectively in writing as well as in speaking.

Adaptation

Adaptation is, in essence, "stepping into the audience's shoes" and adjusting the message to the audience's frame of reference. In contrast to mapping, which is a method for altering the audience's frame of reference, adaptation adjusts the communicator's frame of reference to match the audience's.

Two ways to adapt the message to the audience have already been discussed: defining terminology and using analogies and metaphors. Another way to adapt the message is to begin with explanations which are familiar to the audience and progress to presentation of more complex or novel information. For example, an explanation of nuclear radiation can begin with discussion of light, how it spreads from the source, and the characteristics and effects of dispersion. The explanation can then progress to alpha and beta particles and gamma rays and subsequent effects of nuclear radiation.

Simplification

Simplifying the message ensures ease of understanding and retention. The average person, for example, will remember no more than five to seven items. In addition, memory is improved when

information is "chunked" or segmented into groups. A common application of this method is in telephone numbers, which are divided by hyphens to improve retention.

Simple explanations are often best, regardless of the audience. Levels of complexity snarl issues and confuse audiences. Simplification applies not only to the content of technical presentations but also to the format and structure.

Technical communicators, for example, can improve the effectiveness of both written and verbal presentations by keeping sentences and paragraphs relatively short and by using primarily basic sentence structure (i.e. subject-verb-object). A rule of thumb is to keep sentences under twenty-five words. People tend to quit reading and to lose interest in longer sentences.

A specific application of simplicity is in the preparation of word slides. Technical communicators can improve the effectiveness of their presentations by thinking in terms of simplicity and memory retention: list no more than three or four lines of print on a slide.

Visualization

"A picture is worth a thousand words." The use of visuals to convey complex messages helps to guarantee that the audience understands the message. Studies have proven that one side of the brain excels in capturing and retaining pictures and total concepts. Using visuals to convey messages has several advantages:

- Variety is added and monotony diminished.
- Memory is improved by capturing the message in the "big picture" side of the brain.
- Attention levels are increased by adding to the information provided to the five senses (i.e. in both written and verbal presentations, accessing the visual enhances effectiveness when additional senses are used to absorb information).

Visuals can include charts, graphs, sketches, diagrams, illustrations, and photographs. To effectively communicate technical information as public information, visualization should be incorporated as much as possible.

Repetition

Repetition for emphasis, not redundancy, is the key to effective use of this method for communicating technical information as public information. Significant facts and issues that the audience needs to remember should be repeated several times during the communication. In addition, the same information should be repeated in different ways.

A rule of thumb for repetition is "tell them three times:"

1. Tell them what you are going to tell them (Introduce the topic).
2. Tell them (Explain the details).
3. Tell them what you already told them (Summarize).

Repetition reinforces the learning process and, thus, the communication process.

THE MEDIUM MAKES A DIFFERENCE

The medium in which a message is conveyed does make a difference in the outcome of the communication. The use of multi-media, including videotape, slide/tape, and print materials, improves the attention and the retention levels of the audience. Print materials are enhanced with visuals and simplified formats and layouts, as well as clear, concise, and complete content. Verbal presentations are enhanced, not only by an effective speaker, but also by supporting visuals.

CONCLUSION

In the nuclear industry, communicating technical information as public information is a difficult but accomplishable task. The challenge is surmountable when communicators follow established guidelines:

1. Identify the audience, define the purpose, and develop the message accordingly.
2. Analyze significant factors affecting the communication process.
3. Apply appropriate methods to utilize those factors as bolsters instead of bottlenecks to achieve effective communication.

Communicators, especially in dealing with nuclear issues, can spend a large amount of time attempting to resolve differences. Implementing methods which simplify and ease the communication process, and focusing primarily on the characteristics of the audience, will increase similarities, thus creating a path of less resistance and more effective results. The audience will move along the continuum from fear to confidence.

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