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# Constructive Chaos: Topic Management in Asynchronous Learning Networks

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*Abstract: Maintaining topic integrity in online discussions can be problematic for instructors. Understanding the underlying mechanisms of topic drift yields insight into how online classroom discussions can be effectively managed, enabling facilitators to assure conversational flow while limiting unproductive digressions. This paper presents an analysis of topic drift in asynchronous learning environments with the aim of discovering their structural dynamics and thereby showing, not only how drift may be avoided, but also how these same dynamics can be used as opportunities for topic development and revitalization. The study builds on previous research in conversational coherence and rhetorical structure to identify the dynamics of topic drift, and finds that devices such as parallel association and chained explanation are commonly employed in the asynchronous classroom, with meta-talk occurring less frequently. Moreover, the analysis suggests that topic drift does not occur as a matter of chance: participants use the devices of topic drift in order to adapt the discussion to a topic of preference. To this extent, these same devices can, in the hands of the instructor, become tools for topic management. Instructors may benefit through early recognition of topic integrity problems and through utilization of their own topic management strategies for taking adaptive action.*

Keywords: Asycnhronous Learning Environments, Interactional Coherence, Online Learning, Rhetorical Structure Theory

## Introduction

**MAINTAINING TOPIC INTEGRITY** in online discussions can be problematic for instructors. Online discussions, especially asynchronous online discussions, often drift aimlessly from one topic to another, without returning to key points or questions raised earlier (Herring, 1999; Hewitt, 2001; Severinson Eklundh & Rodriguez, 2004). Threads may diverge into numerous sub-threads, with no prospect for eventual convergence (Hewitt, 2001). Participants routinely ignore the contributions of others, so that the resulting transcript reads more like a collection of monologues than an integrated discussion (Henri, 1995; Hew & Cheung, 2003; Pena-Shaff & Nicholls, 2004). Once topic drift occurs, recovery is difficult to achieve. This, according to Herring (1999), is due to the level of overhead associated with conducting asynchronous discussions, including formulating and posting messages, reading and understanding messages, delay and asynchrony, speaker change overhead, and fault and repair.

Through investigation of the mechanisms underlying topic drift, we can gain insight into how online classroom discussions can be more effectively managed, enabling facilitators to assure conversational flow while avoiding counterproductive digressions. This paper presents an analysis of topic drift in asynchronous learning environments with the aim of discovering their structural dynamics and thereby showing, not only how drift may be reduced, but

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moreover, how these same dynamics can be used as opportunities for topic development and revitalization.

## Research in Topic Drift

Topic drift has often been associated specifically with computer-mediated communication (Raymond, 2003), but the concept has its roots in general linguistic research. It has been discussed in detail as a characteristic of spoken conversation by Maynard (1980), Hobbs (1990), Watson Todd (1998; 2004), and others. Therefore this literature review begins with a synopsis of salient work in topic drift in spoken conversation, and this is followed by an overview of research specific to asynchronous discussion.

Maynard's (1980) investigation of topic drift falls within the tradition of conversation analysis as defined by Sacks, Schegloff, and Jefferson (1974). Maynard found that in spoken conversation shifts do not occur randomly. In a well-behaved conversation, one turn moves to the next, with each successive utterance reflecting an understanding of the content of previous turns (Sacks et al., 1974). Each successive speaker seeks to provide a smooth transition from the previous remarks. Conversations are marked by transition places, at which the current speaker selects the next speaker, the next speaker self-selects, or the current speaker simply continues. However, Maynard observes there are circumstances under which a transition does not occur, and a perceptible lull occurs. At these junctures a topic shift may occur. Maynard argued that topic changes occur as a solution to the problem of unsuccessful speaker transition. Typically, transition failures such as these are marked by several brief silences during which speakers produce on-topic utterances, in an apparent effort to revive the stalled conversation and resume continuous talk. When this is unsuccessful, the new topic may be introduced, thus affecting the topic shift. In other cases, a speaker may use some aspect of the current topic in order to cause a shift.

As defined by Hobbs (1990), topic drift occurs as a series of incremental changes in a discussion, where each turn is coherent with its immediate predecessor, but where there is no overall topic continuity. Hobbs described conversational topic drift in terms of three coherence relations: *parallel association, chained explanation,* and *meta-talk*. Parallel association relies on common semantic entailments shared by adjacent discourse segments. Chained explanation occurs when the topic of one turn is used as opportunity for introducing a new topic in the successor. The meta-talk relation holds between two segments when one segment evaluates another in terms of its support for the goals of the conversation. Hobbs argued that most instances of topic drift can be accounted for with the parallelism, explanation, and meta-talk relations (Hobbs, 1990).

Watson Todd (1998) used topic-based analysis to study coherence in classroom discussions. Topic-based analysis combines bottom-up methods, such as theme-rheme and lexical analysis with topic-down development of a semantic network. This permits categorization of topics in terms of drift, maintenance, renewal, and insertion. Watson Todd found that confusion and topic drift tended to occur when the instructor neglected to use explicit indicators of topic change when managing classroom discussion.

While an understanding of topic drift in spoken conversation is useful to the study of asynchronous discussion, Osborne's (1998) study of topic development in USENET groups found important differences between asynchronous and spoken formats. In spoken conversation, the number of participants is limited, and only one topic is discussed at a time. In

one online discussion Osborne studied, there were over 300 participants, and participants took part in multiple discussions at the same time. Online topics frequently splintered into sub-topics, which were carried out concurrently with one another. It was rare that these topics reconstituted once divergence had taken place. Whereas a conversational turn may typically consist of only a few sentences, asynchronous messages can be lengthy, extending to hundreds of words. According to Osborne this contributes to coherence and makes for more reasoned discourse.

But the asynchronous nature of online discussion works against orderly turn-taking typical of spoken conversation. This, Osborne (1998) noted, is particularly evident in USENET discussions because the distribution of the network is global, and messages arrive at nodes in unpredictable order. It is not unusual for a reader to see a reply to a message when the original message has yet to arrive. In addition, because messages may be cross-posted to multiple newsgroups, it is not unusual for the same or overlapping discussions to appear in multiple groups. Thus, while asynchronous communication lends itself to greater coherence within the composition of individual messages, the ability to maintain coherence across turns seems reduced, as compared to spoken conversation.

Herring (1999) notes that in online discussions topic drift is both prevalent and problematic. Topic drift is problematic because of the difficulty in repairing a discussion once drift has occurred. Indeed, online discussions are distinctive in terms of the costs imposed on the participants. That is, the effort to produce and read online messages is significant; a discussion once gone astray may be irrecoverable. Although asynchronous discussion enables participants to review previous contributions and to revise their own contributions before transmitting them, they place severe limitations on the ability to maintain sequential or temporal integrity of communication. And although participants may have the opportunity to review previous messages before posting, the evidence suggests that they seldom do (Herring, 1999).

Constraints such as these impose various costs on achieving successful collaboration (Clark & Brennan, 1991). Costs associated with asynchronous discussion include formulation and production costs, reception and understanding costs, delay and asynchrony costs, speaker change costs, and fault and repair costs. Formulation and production costs are the costs associated with creating and transmitting messages. Reception and understanding costs are the costs associated with accessing and assimilating the messages of others. Delays levy costs when participants misinterpret the interval that occurs between a message and its subsequent response. Asynchrony costs result from the inability to employ communication techniques that involve precise timing. Speaker change costs result from the lack of cues for selecting the next contributor in an exchange. Fault and repair costs have to do with the effort required to restore coherence once a breakdown occurs. For asynchronous discussion, the picture that emerges is one where there are plentiful opportunities for misinterpretation, these misinterpretations are conducive to the sort of incremental changes that lead to topic drift, and topic drift, once it occurs, is difficult to repair (Clark & Brennan, 1991).

Brennan and Ohaeri (1999) used this concept of communication cost to explain the lack of politeness in online communication. In this context, politeness was not defined in terms of common courtesy, e.g. the use of "please" and "thank you," but rather in the use of hedging as a means of softening the strength of claims made in online exchanges. For example, participants may soften their claims using questions instead of assertions of disagreement, or by using expressions of tentativeness or uncertainty. Brennan and Ohaeri found participants in online discussion used significantly fewer hedges than those in face-to-face discussions,

and they attribute this to the formulation and production costs involved in participating in the discussion. This tendency, when combined with topic drift, helps explain why online discussions not only stray from their announced topic but also commonly dissolve into rounds of recrimination and bickering (Fahy, 2002; Herring, 1999; Kayany, 1998).

In his study of the use of quoting in asynchronous conversation, Reed (2001) found that participants tend to limit the depth of reference to preceding interaction. Reed found this depth usually extended to no more than two or three messages, and never exceeded five, regardless of the number of predecessor turns in the thread. Reed noted that this practice contributes to the conversational feel of the discussion, gives message writers considerable control over the apparent context into which they insert their responses. However, by so limiting their view of the discussion, participants may render their participation more prone to drift, despite the availability of the complete discussion transcript.

Van der Pol, Admiraal, and Simons (2006) discussed interactional coherence in terms of co-intentionality, co-reference, and common ground. Co-intentionality concerns shared objectives for the discussion, co-reference has to do with whether the participants are talking about the same thing, and common ground refers to the shared values and goals of the participants, as defined earlier by Clark and Brennan (1991). The loss of any of these would result in loss of interactional coherence. Van der Pol et al. claimed that by increasing the topical context, that is by structuring the environment to make the nature and scope of the topic under discussion more explicit, maintenance of co-intentionality could be improved. This could be achieved through anchoring the discussion around objects representing topics for discussion. Better co-reference and common ground could be achieved through software features that would enable users to respond to messages by defining links to the specific points to which they are responding. These expectations led to the development of an annotation conference system, such that discussion would be visually anchored around a designated document.

Van der Pol et al. (2006) then compared use of this system with use of Blackboard messaging. They found that users of the annotation scheme produced shorter, more direct messages than the Blackboard users. Blackboard messages tended to resemble email, containing openings and closings, various metacognitive statements, and the core message followed by more metacognitive or social statements. Messages in the annotation system tended to contain only the core statements. They often contained pronouns that referred to previous messages, suggesting that co-reference was not problematic. The volume of messages was much higher, resulting in increased levels of turn-taking, which afforded the students greater opportunity to make repairs when misunderstandings arose. In short, overall interactional coherence was increased through these changes in features.

## Methodology

The approach taken for this research builds on the observation that asynchronous discussions have characteristics of both spoken and written discussion (Crystal, 2001; Yates, 1996). Thus this study combined two models for examining asynchronous discussions. For the textual perspective, rhetorical structure theory was used, and for the conversational perspective, conversation analysis was used. Rhetorical structure theory is a theory of textual coherence (Mann & Thompson, 1988). The specific approach for conversation analysis is based on Hobbs' framework for analyzing conversational topic drift (Hobbs, 1990).

### *Rhetorical Structure Theory*

RST defines the coherence of a text in terms of the way its parts, or text-spans, relate to one another. It postulates a small number of schemas for defining the possible structural relationships among spans and defines an extensible set of rhetorical relations that may be used when applying a schema to a set of text spans. An RST analysis of a coherent document defines a hierarchical structure representing the rhetorical interrelationships of the text spans comprising the document. A text span may be either an individual segment or it may be a structure consisting of several segments interrelated by one or more relations. Most relations are binary, consisting of two text spans, with one designated as the nucleus and the other as the satellite. The nucleus is the more salient of the two. The example shown in Figure 1 uses the Evidence relation, where the satellite provides information that makes the nucleus more believable.

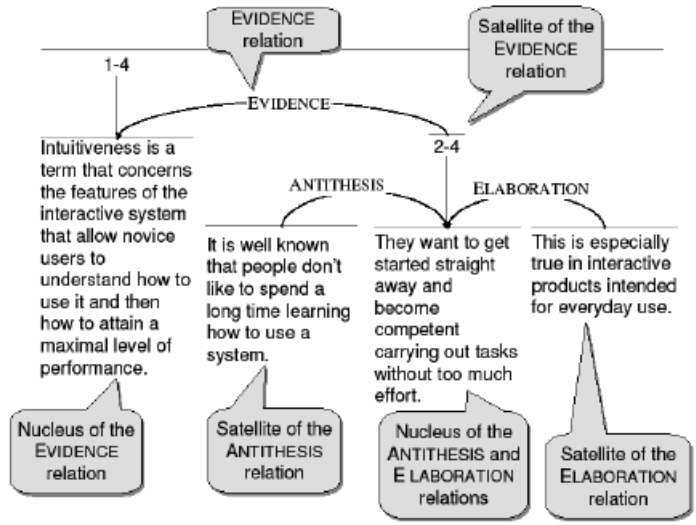


Figure 1: Rhetorical Structure Theory Example

### *Hobbs & Topic Drift*

As introduced earlier in the literature review, Hobbs (1990) described conversational topic drift in terms of three coherence relations: *parallel association, chained explanation,* and *meta-talk*. Parallel association occurs between two text spans when the spans are related tangentially to one another. Parallel association is achieved using a mechanism Hobbs called *discourse pivot*. A discourse pivot forms a link between two otherwise unrelated topics. Discourse pivot incorporates some associations in the preceding text with those of the emergent topic, thus smoothing the transition from one topic to another. In conversations, parallel association may be used as a pretext for making gradual shifts from one speaker's interests to those of another. Parallel association is similar to the RST List multi-nuclear relation, which consists of two or more comparable text spans. Other possible manifestations

are the Contrast and Antithesis relations, in which there is some basis for comparison, but, in other respects, the differences override the similarities.

The *meta-talk* relation occurs when one text span comments on another regarding the objectives of the conversation (Hobbs, 1990). When this happens, the topic may shift to become a conversation about the conversation. The main RST counterpart of meta-talk is the Evaluation relation, in which the satellite text span assesses the situation presented in nucleus text span. However, meta-talk is distinctive in that it assesses not the content, but the form or process of the evaluated text span.

*Chained explanation* is a complex mechanism involving a series of interlinked explanations, with each new explanation displacing the topic of its predecessor. Chained explanations may occur using a variety of relations in RST, such as Elaboration, Evidence, and Interpretation. It may also incorporate elements of the other strategies for topic drift, parallel association, and meta-talk. Through a sequence of text spans linked recursively by these relations, the topic may rapidly shift to where it has no relevance to its original subject.

Hobbs found that parallel association, meta-talk, and chained explanation account for most topic drift in conversation. Thus this analysis included an investigation of whether these strategies could account for topic drift in asynchronous discussions.

### *Transcripts*

The principal transcripts used in this analysis were from a course in Human-Computer Interaction (HCI). This course was part of the core curriculum in the Master of Science in Management Information Systems (MSMIS) program at Nova Southeastern University. Salient parameters regarding each of the transcripts are summarized in Table 1. The program is offered entirely online; participation in discussions is a required part of the coursework. The transcripts derive from two separate offerings of the course. The first offering took place in 2004 and the discussions were held using the Allaire Forums conferencing system, and the second offering took place in 2005 with discussions held using the WebCT conferencing system. To facilitate comparison, the topics discussed in the WebCT transcript were the same as those of the Allaire transcripts, and the same instructor moderated all.

In addition to the MSMIS transcripts, the investigation was amplified by a study of an additional transcript, one that occurred outside a formal educational program. This transcript was from a well-documented asynchronous scholarly debate (Dusek, 1998; Hert, 1997). The debate took place in 1994 on an email list devoted to the topic of science, technology, and society (STS). It attracted the attention and participation of numerous noted scholars in the field. Including a discussion of this nature offers the opportunity to gain a broader perspective as to the significance of the findings.

**Table 1: Transcript Parameters**

| Group | Discussion Topic | Participants | Messages |
|---|---|---|---|
| Allaire HCI | Intuitiveness<br>Usability Concepts<br>HCI and the Web | 26<br>25<br>26 | 35<br>53<br>39 |
| WebCT HCI | Intuitiveness<br>Usability Concepts<br>HCI and the Web | 24<br>20<br>21 | 61<br>73<br>62 |
| STS | STS Under Attack | 60 | 152 |

## Results

Just as Hobbs (1990) found in spoken conversation, three devices accounted for topic drift in asynchronous discussion: parallel association, meta-talk, and chained explanation. Using parallel association, participants leveraged previous discussion as opportunities for posting messages about favorite subjects. The analysis revealed that participants accomplished this using several types of parallel association, including *lateral association*, *subtopic escalation*, *pedagogical pivot*, and *redirection*.

Lateral association is an association between the main topic of a message and its response. In subtopic escalation, the respondent to a message responds to a subtopic within the previous message, without acknowledging the primary topic. Pedagogical pivot entails a deliberate intervention by the instructor to shift the topic into alignment with learning objectives. In topic redirection, the respondent dismisses the previous message and proposes a new approach. Redirection is similar to pedagogical pivot, except that the writer carrying it out is not the course instructor. Redirection was seen only in the STS discussion. Examples of each of these subcategories are given in Figure 2. In the discussions studied, subtopic escalation occurred within instances of parallel association, chained explanation, and meta-talk. Lateral association and redirection were found in instances of parallel association and chained explanation. Pedagogical pivot occurred only in parallel association.

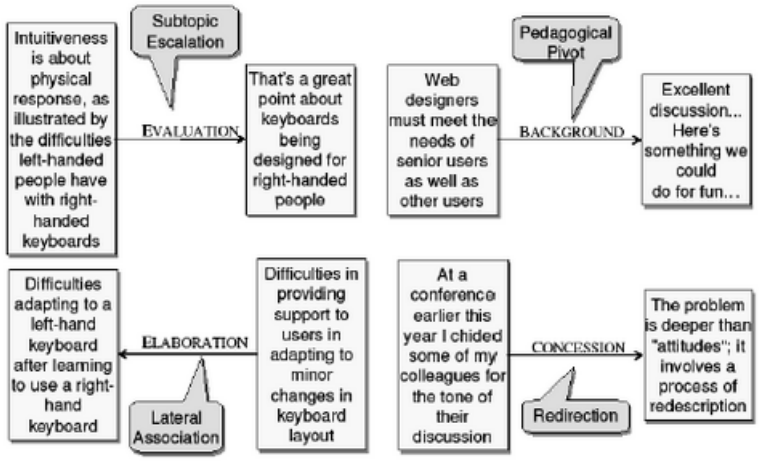


Figure 2: Examples of Lateral Association

Chained explanations commonly used subtopic escalation. Responses focused on explaining a subtopic within a previous message, and this subtopic would then become subject to a series of chained explanations. An example of this occurred in the WebCT Usability discussion, shown in Figure 3.

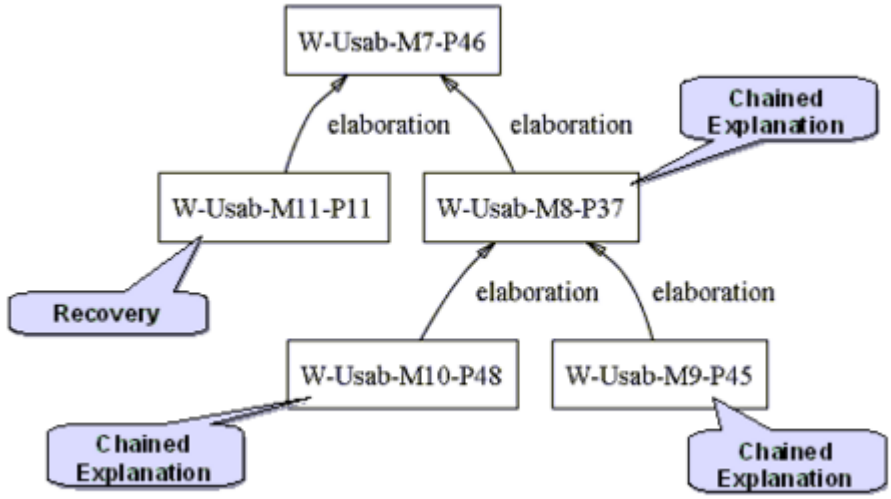


Figure 3: Subtopic Escalation in Chained Explanation

The thread opened with a message (M7) containing a research-based definition of user interface flexibility, and amplified this with an example based on the Microsoft Paint application and a more general observation about the flexibility of Microsoft Windows applications in general. This was challenged in M8, citing as examples of early versions of the Microsoft FrontPage Web authoring product (ignoring the central ideas of the previous message, focus-

ing solely on the example). This was followed by further responses, continuing the discussion of Microsoft FrontPage. Finally, the instructor commented on the original message, in a manner that attempted to recover the original topic. This is consistent with the notion that discussion participants seek to manipulate the topic to areas they are comfortable with. Discussing the shortcomings of applications they were familiar with was easy, but developing the concept of flexibility would have been challenging

There were no instances of meta-talk in the Allaire and WebCT discussions. Meta-talk was used several times in the STS discussion, usually to voice disagreement with ongoing discussion or to express solidarity with others who were in disagreement. Topic recovery was used several times in the STS discussion, but was seldom used in the Allaire and WebCT discussions. The salient relations for topic recovery were Antithesis, Concession, and Elaboration. When used with Antithesis and Concession, topic recovery expressed dissatisfaction with the current topic.

## From Topic Drift to Topic Management

An implication of this analysis is that topic drift does not occur as a matter of chance, but rather as a result of deliberate efforts taken by participants seeking to control the discussion. This realization suggests that the same strategies used to cause topic drift can, once identified, be employed for more effective topic management. In this section we take a look at some of the ways topic drift strategies can be employed for more effective topic facilitation.

Parallel association, where previous discussion is leveraged as an opportunity for posting messages about favorite subjects, can also be used by the facilitator to nudge the discussion back to the assigned topic, or to fresh new topic. In Figure 4, the instructor uses the lateral form of parallel association to extend the topic from efficiency and flexibility to include learnability as part of the discussion.

Discourse pivot, when used judiciously by the facilitator can be used to revitalize a discussion, taking it in a new direction. This use of discourse pivot, called *pedagogical pivot*, can be a powerful tool for topic management. In one of the WebCT discussions, a student opened a thread with a message on the topic of senior-friendly Web site design. The message focused on the Web as an information resource for senior citizens. This was followed by several messages that elaborated on this topic. The instructor then posted this message:

> "This is an excellent topic of discussion. Kudos to P38 for getting this started… Here's something we could do for fun. We're all probably aware about the government's approval of the Medicare Prescription Card Program. Apparently, there are over 70 Medicare-approved drug discount cards to choose from. Where does a senior start? One resource seniors are referred to is http://www.medicare.gov, the Medicare Web site. What can we say about the design of this website? Is it "senior citizen user centered"? Check it out when you get a chance..."

This launched a new discussion as the students visited the Website and shared their findings with the group. In general the students found the Website, as designed at that time, suffered from serious deficiencies, and the students enjoyed identifying them.

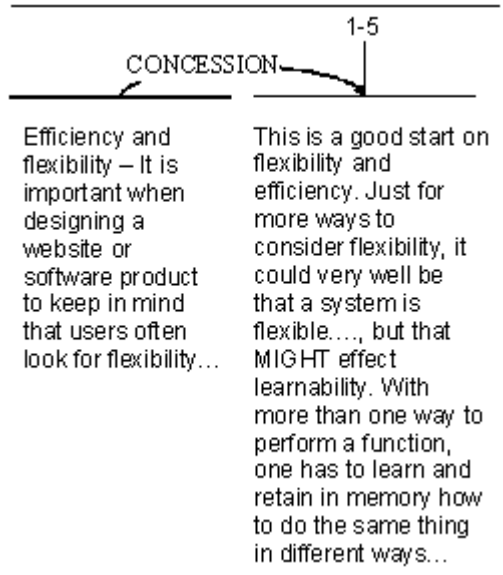


Figure 4: Lateral Association for Topic Management

## Conclusions

This analysis suggests that topic drift does not occur as a matter of chance. Participants used the devices of topic drift to adapt the discussion to a topic of preference. They used several types of parallel association, chained explanation, and meta-talk to exploit previous discussion as opportunities for manipulating the tropic. An effect of this process is that threads often begin with a strong research-based opening message, but quickly descend to anecdotes and personal commentary.

Asynchronous discussion is a powerful learning tool, but when topic drift is unchecked it may lead to topic degeneration and threaten the effectiveness of the discussion. However, to the extent that the devices underlying topic drift are available to discussion participants, they can, in the hands of the instructor, become tools for topic management. In particular, pedagogical use of discourse pivot was observed to be effective in topic redirection. Instructors may benefit from these results through early recognition of topic integrity problems, and through adoption of identified techniques for taking corrective action.

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