May Reusable Text-based Learning Objects Exist?
Using Genre Theory for Analysing Reusability of Learning Objects

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Abstract: - Learning Objects (LOs) may be defined in multiple ways - such as reusable, self-standing pieces of training content. LOs provide the possibility for world-wide brokering of learning content resources. Yet the connotations about the concept of LO are multiple and there is a lack of means for LO design. A potential approach for modeling LOs from the viewpoint of semiotics has been proposed by Polsani. This paper is focused on the text-based learning content, and analyzes LOs as rhetorical constructs by utilizing the theory of genres. We define a genre-based framework for analyzing LOs, and illustrate it by two examples. The genre-based analysis implies that text-based LOs may not be totally reusable. There are problems on the way the text is constructed to convey meaning; and on the use of diverse technologies and media. These problems may prevent effective use of LOs in Learning Management Systems and in digital form in general.

Key-Words: - Learning Object (LO), Learning Content, Genre Theory, e-Learning

1 Introduction

Learning Object may be characterized as the smallest independent piece of information that conveys meaning for specific learning purpose (e.g., [1]). LO may consist of a document, audio, video or animation file, or of a simulation. It has been estimated that reuse of learning content may drop the development costs even by 50-80% [2]. Therefore many consider the use of reusable LOs as a holy grail for organizations and educational brokers. A number of LO repositories with a variety of kinds of LOs are already available via Internet (e.g., [3-7]). This variety reflects the fact that the connotations on what actually counts as LO, and how LOs should be designed and modeled for reuse remains largely as unknown territory [1]. This being the case, it may be questioned whether the reusability of learning content is possible or feasible after all [2].

Two kinds of problems related to design of LOs may be identified. Those related to difficulty of defining LOs as units of substantial content, and those involved with the LOs as digital content, such as files to be managed within Learning Management Systems (LMS); LO formatted for use in particular LMS may not be reusable in another LMS. Many initiatives, such as [8-10] are directed towards e-Learning standardization. However, these standardization efforts are focused on standardizing the metadata elements for learning content allowing LOs to be identified and searched for. Majority of these specifications rely on XML as commonly sharable, standard format for content [11]. The standardization of LO formats has not reached this level. Instead, a multitude of formats used for storing the LOs in digital form exist. The textual content formats are even less standardized.

Problems with LO as a communicational object involve the question about how much information may LO contain to convey a meaning, but to be reusable in multiple contexts at the same time. In another words, we are in the search for conventional grain size that is economical for LO. On the other hand, we may also consider the contexts provided by diverse areas of science and how to adjust our LO to be reusable in many, not only one scientific areas [12].

This paper is focused on analyzing LOs consisting of textual content both from technological and communicational viewpoints. We consider Polsani's [12] approach on adopting a theory of sings for modeling LOs, and explore the use of the theory of genres for defining textual LOs. Lately the theory of genres has been operationalized for analyzing organizational communication [14] allowing the inspection of communicational content independently from technologies and media used for communication [15], and also for inspecting the impacts of technology and media adopted for the features of genre content [14, 16]. The use of the

genre theory allows us to inspect the communicational content for learning, and the features of LOs. Hence, the adoption of the genre theory may provide us with new aspects for LO content design.

This paper is organized as follows. Section 2 introduces the theory of genres and the genre-based framework for the analysis of LOs. Section 3 illustrates the use of the framework by two examples. The first example uses the framework for illustrating Polsani's approach for modeling LOs by the theory of signs [12]. The second example describes the use of the framework for analyzing two possible LOs in a manufacturing company. The data for the second example was collected from unpublished project documentation produced in a case study carried out for analyzing requirements for training content reuse [17]. Section 4 concludes the paper.

2 The Genre-based Framework

2.1 Genres of Communication

Departing from the times of Aristotle, the theory of genres has been utilized for classifying "things" into categories. For example, music may be classified into genres of jazz, rock, classical or pop. Rhetoricians and applied linguistics have adopted the theory of genres for inspecting and typifying communication, mainly in the context of textual documents. From this perspective genres are considered as prototypical models for communication units [13] allowing the inspection of content used in organizational settings, too [14]. For example, one may scrutinize the differences between memo documents and Internet home pages by using the features that make these genres different from each other. One may also study the impact of technologies for genre features; for example by scrutinizing the features of certain genre before and after e-mail was taken into use for delivering it ([14]). Yates and Sumner [16] have pointed out that the genres act as glue between social practices and technologies. Once the technology changes, people rely exceedingly to the genre features for being able to cope with different genres enacted as document types through the undifferentiating digital media.

Yates and Orlikowski [14] have characterized a genre of organizational communication as a typified communicative action which is taken as a response to a typical communicative situation. The identification of the typical situation and the decision to product certain genre in response to it is action governed by genre rules [18].

2.2 From Genre Features to the Genre-based Framework

The features of genres have been studied using a number of differing frameworks. For example, Orlikowski and Yates [19] have proposed the "5W1H" framework for scrutinizing features of genre systems. The 5W1H framework has also been operationalized for inspecting individual genres (e.g. [20]). For analyzing LOs a framework based on the genre features of substance and form [14] is defined. *Substance* of a genre refers to social motives, such as the purpose and content of the communication. *Form* of a genre refers to the physical and linguistic features of genres that are observable. When a genre for a communicational situation is needed, the substance and form of it are crafted to fit the communicational purpose and the social context in which it is used.

For the framework, the features of substance and form are divided into more detail. While substance consists of purpose of communication it may also consider *themes* and *topics* that constitute the information within a genre (e.g., [13, 21, 22]). Topics of a genre are pieces of information that convey a meaning by themselves and should be ordered in a specific way to fulfill the overall purpose of communication (e.g., [13, 21]). Topic of a genre may carry out a rhetorical move [23] within a genre, such as to introduce an idea, reassure the reader about the proposed finding, or draw ones attention. Hence, a topic of a genre may also have a communicational purpose of its own in order to satisfy the overall communicative object causing that communicative purpose of a genre may not be easily identified (e.g. [24]).

Genre features of form may consist of *language* as a way of speaking (e.g., formal way of speaking, technical or legal jargon), *media* used for delivery of a genre and visual form as a *layout* for a genre [14]. As the genre layout may be influenced by the technology or system used, the feature of file format/standard is added into the features of genre form.

It may be questioned whether the genre theory is applicable for analyzing LOs. It seems that the grain size of LO content should be remarkably smaller than that of genre's. The definition of a topic as a building block within a genre fits the idea of reusable LO better. A topic within a genre may be self-standing in a way that it contains enough

information to convey a meaning, yet is small enough to be reusable. For the purposes of analysis the differences between a genre and a topic within one are not radical, since topic of a genre inherits its communicational overall purpose and its form the genre in which it resides. The difference between a genre and its topic is the grain size. Therefore, we may apply the framework presented here both on genres and on topics if we take care of separating the rhetorical moves of topics and the communicational purpose of a genre from each other. Table 1 summarizes the framework for analyzing LO features.

Table 1. The framework of genre features

Substance	Form
Communicative purpose	Language (e.g. jargon, acronyms, etc) used
Topics of content	Layout
Themes of content	Format/system
Rhetorical moves/ communicative sub-purposes	Media for delivery

3 Analysis of Two Cases for LOs with the Framework

3.1 Example 1: Polsani's Approach on Modeling LOs

Polsani [12] brings out the need for analyzing the content and the grain size of information for defining LOs. He proposes an approach of adopting Peirce's theory of signs for clarifying the grain size of LO, and for deriving an approach for modeling LOs. According to Polsani's approach, a LO might be defined as "a form of organized knowledge content by means of triadic action involving learning purpose and reusable value".

Polsani [12] uses Peircean semiotics to define LO as a combination of three components: a sign, an object and an interpretant. The interpretant, which is knowledge as well as the process, should be significant enough for the learner to gain more knowledge of the object so that the learner learns to recognize, connect and analyze objects through the interpretant. Polsani links the depth and breadth of

information to the quantity of information and the reusability of the LO. This is, how much information will be conveyed by the interpretant of the sign (depth) and to how many objects the sign can be applied to (reusability)? Polsani's approach is to group all the information contained in LO, and produce subgroups of information applicable only in a particular domain, such as mathematics, arts, poetry, history of science etc. Maximum reusability is achieved by dividing the content into fragments, each of which is throughout common to a specified set (one or more) fields. The learning principle is used to form the final LOs by duplicating some of the fragments and combining them with other fragments to form LOs containing meaningful quantity of information.

In the following, we study the approach proposed by Polsani in the light of the genre theory. Table 2 summarizes the genre features of LO items created by the approach.

Table 2. Analysis of genre features of LOs in Polsani's approach on modeling LOs

Substance	
Communicative purpose	LO consists only of the information content (topics or subtopics) necessary to convey a meaning. The content related to 1) a number of fields of knowledge, and 2) a specific field of knowledge should be divided into its own content polls.
Topics of content	Only one topic for each LO allowed.
Topics of content: rhetorical moves	The sub-purposes of communication not considered, nor the topics within LO.
Themes of content	No themes.
Rhetorical moves/ communicative sub-purposes	No rhetorical moves allowed; communicative sub-purposes not considered (such as proposing something, trying to convince, introducing a concept).

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Form	
Language (jargon, acronyms etc)	The approach does not consider domain-oriented jargon and acronyms, neither the differences on the "tone of speaking" to laymen or experts (domain-oriented jargon or acronyms).
Layout	Not considered (albeit may provide valuable cues of content and ensure consistency across collected LOs as they form a learning content).
Format/system	Not considered (approach does not consider technological affordances).
Media for delivery	Not considered (approach does not consider media albeit use of media may influence on content too.)

The brief analysis presented in table 2 some findings for future research may be identified. The Polsani's approach does not consider technology or media used at all. This does not come as a surprise, since the approach was not developed to consider those. However, the findings from genre research imply that technology and media used may affect not only the layout, but also the substance of communicational content. For example, a LO which is presented on a tiny screen of a mobile device may be limited by its multimedia capabilities, implying that the text cover of the subject should have more breadth. The approach presented by Polsani does not also consider the need to change your language, i.e. "tone of voice" including the use of acronyms and domain-oriented jargon which is common in multiple areas of science and appear also on everyday forms. For example, you may find a rap-singer singing about Web Services using It-jargon a bit strange. These genre-based findings could be incorporated in the analysis and grouping of scientific knowledge fields phase of the approach.

3.2 Example 2: The Case of BIRD
BIRD (alias of the company name) is a large, multinational enterprise producing production lines which are customized for individual factories. When a new production line is implemented, the people working in customer factories are trained for operating and maintaining it. Training is organized as a project that starts with a training plan. Course design considers the requirements set by the production line properties and knowledge about the skills of the employees to be trained. Actual training is carried out in various locations using multiple languages and a variety of training techniques such as lectures and hands-on training. Duration of a training project can exceed a year and involve up to 100 experts of BIRD and 100-200 employees of a customer organization. BIRD had defined four separate training groups according to the differing types of work in factories: managers, operators (people steering the production line), mechanical maintenance staff, and automation staff (people who maintain the software and ventilation systems).

It was estimated that even 80 % of training content for a production line could be reused from the Operation and Maintenance (O&M) manual produced by the customer documentation department of BIRD. Figure 2 illustrates the need for content reuse on the case of BIRD.
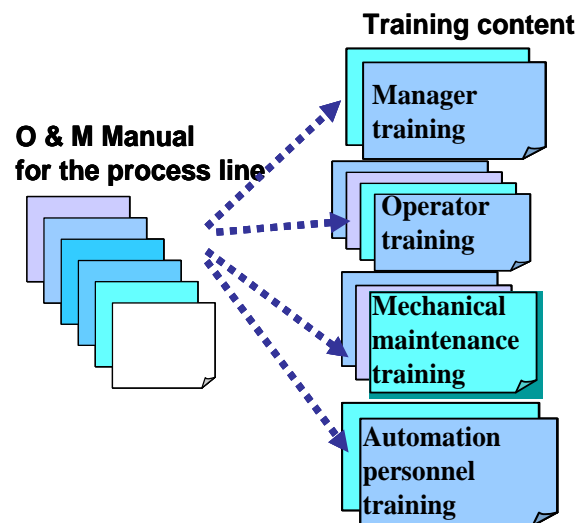

Figure 1. Reusing content form multiple training groups for a production line

The training department at BIRD launched a development project in order to find means for reusing the content of O&M manuals. The reuse project defined the topics and subtopics of training and studied the locations of O&M manuals in which the content could be located for reuse [17]. However, the content could not be reused as such for training. Tables 3 and 4 illustrate the reasons for

not being able to reuse the content by the light of the genre-based framework. Table 3 shows genre-based analysis on manager training topic as LO. Table 4 illustrates the counterpart of the same LO for mechanical maintenance personnel training.

Table 3. The genre analysis on manager training topic as LO

Manager training topic	
Substance	
Communicative purpose	To describe the features of production line with respect to enhancing quality of the products and feasibility of production.
Topics of content	Production line descriptions without technical details. Process-oriented division of overall content.
Topics of content: Rhetorical moves/ communicative sub-purposes as topics	Consists of topics such as: - introduction of training content - overall safety procedures - introduction of production line part - how to enhance quality - how to enhance feasibility - how to organize service, etc.
Themes of content	Enhanced quality and feasibility of production.
Form	
Language (jargon, acronyms etc)	Business- and accounting oriented terms and acronyms. Carefully crafted proposals for enhancing one's businesses.
Layout	According to layout rules defined for BIRD training materials (differing from those of O&M manual layout)
Format/system	Power Point slides and Word-documents.
Media for delivery	Speech, copies of slides, examples and rehearsals.

Table 4. The analysis of maintenance personnel training session topic as LO

Maintenance personnel training session topic	
Substance	
Communicative purpose	To explain how and when each production line component should be maintained or replaced.
Topics of content	Machine-part related topic division into LOs.
Topics of content: Rhetorical moves/ communicative sub-purposes	Consists of topics such as: - introduction of training content - safety regulations pertaining each individual component - introductions of production line component constructions - maintenance intervals and troubleshooting instructions
Themes of content	Maintenance and optimizing production time.
Form	
Language (jargon, acronyms etc)	Lots of technical part names in great detail; lots of domain and production-related acronyms. Concrete language and imperative voice when proposing maintenance procedures.
Layout	According to layout rules defined for BIRD training materials (differing from those of O&M manual layout)
Format/system	Power Point slides and Word-documents.
Media for delivery	Speech, copies of slides, examples and hands-on training.

The genre features described in tables 3 and 4 imply that the type of work position of the trainees affected the substance and form of training LO. The language, i.e. terminology and acronyms used for diverse training groups was differing. Even both key- and maintenance personnel trainees' work on the same industrial branch, the use of rhetorical moves, i.e. what is the purpose of communication differed, and impacts on the terminology used and

construction of LO text breadth and focus on describing the same construction of a production line. These examples illustrate why BIRD did not even aim for total reuse, but instead chose to re-target a great deal of effort for creating reusable generic learning objects for training.

4 Conclusion

Even though a concept of LO has multiple differing connotations the possibility for e-Learning brokering and learning content reuse provides multiple intriguing avenues, such as possibility to reduce the development costs of learning content even by over 50 %. Therefore, clarifying the concept of LO and finding potential ways for modeling LOs for efficient reuse is an important avenue of research. A promising attempt to this direction is the approach taken by Polsani, by analyzing LO from the viewpoint of semiotics.

The genre-based framework for analyzing LOs was described, and illustrated by giving two examples. The preliminary analysis carried out implies that the Polsani's approach could be enhanced for text-based LOs by considering the features of learning content as topics of genres. The approach could also be appended for taking the impacts of technologies and media into account.

The analysis of LO genre features at BIRD suggest that LO of a textual form may not be totally reusable in all contexts even though the trainees come from the same knowledge area of science. Our preliminary genre-based analysis thus provides us with more avenues for further research on LO features than solutions per se.

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