Subjective representations of educational design systems

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Abstract

This paper explores the benefits of repertory grid technique (RGT) for research on educational design systems.

1. Introduction

Several authors define taxonomic dimensions for *educational design languages* and *educational modeling languages* [1] [2]. We suggest completing these with the analysis of subjective (idiographic) representations of various stakeholders in order to identify design issues that analytical methods cannot detect easily.

Repertory grid technique (RGT) was invented in the 1950's by Kelly [5] and is based on the assumption that people's view of objects with which they interact is made up of an idiographic (individual) collection of related similarity–difference dimensions, referred to as personal constructs. RGT has been used quite extensively in HCI, software engineering and management for various purposes, but we found very few publications related to educational technology.

RGT starts by the identification of a set of *elements* within a topic (e.g. a set of design languages) which are then rated with criteria termed *constructs.* Elements and constructs are usually elicited from the subject by a *triadic method*. Participants will first name a few elements they are familiar with, e.g. names of design systems. They will then compare triads, e.g. design A with designs B and C, and state in what aspect two are similar and the third is different. This procedure is repeated with other combinations until no more new constructs are elicited and until all elements can be discriminated in the construct space. This resulting grid of *m* elements in terms of *n* constructs can then be analyzed with various data analysis techniques, such as visual inspection, factor and cluster analysis.

2. RGT and educational design systems

We suggest four ways to use RGT in the area of educational design languages and systems.

(1) Research on visual design languages implicitly defines a parallel design situation with various competing approaches. Evaluation of each design artifact with RGT may produce rich and concrete data to guide future designs. Such a "similar systems" analysis has shown to be easy to conduct [3].

(2) Clearly defined design and modeling languages are not the only means to design pedagogical scenarios. We suggest throwing all kinds of design approaches together and seeing what construct systems emerge.

(3) After applying RGT to a large diverse population, we could produce a typology of different construct systems and identify essential features for design systems that are "revealing" for various types of stakeholders. Explicating such diverse constructs should help communication.

(4) RGT can be used to study how users perceive a single system, i.e. its various tools and features.

3. A feasibility example

To explore the interest and the feasibility of RGT to study perceptions of a *global "design systems" space*, we created repertory grids with a few people working in educational technology. After initial exploration, we adopted the following procedure. Participants first had to identify at least six design systems with varying features from a list [6]. Each system was then shortly demonstrated. RepGrid IV's built-in triadic elicitation script [7] was used to extract at least four constructs. Next, ratings for each aspect were adjusted. Construct names were also adjusted during this process, being usually made more general. Finally, "break match" warnings about non-discriminated elements or non-discriminating constructs were followed up if possible.

At the end, participants adjusted scores by looking at all elements for each construct.

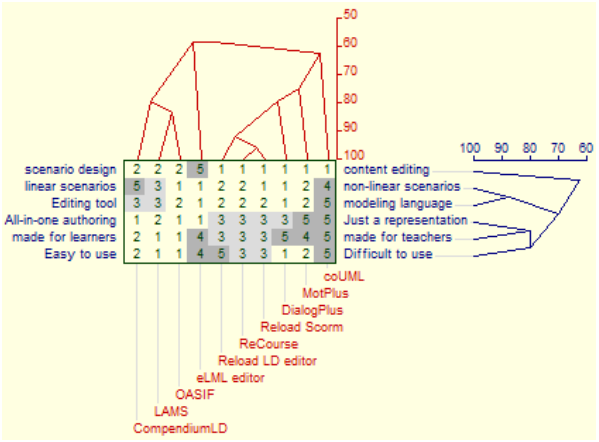

Figure 1: Two way cluster analysis of a small grid.

The two-way cluster of one participant's grid in fig. 1 shows that systems considered fall into very distinct categories. At a (low) 70% cut-off rate, we get 4 types: (1) eLML (a semantic content markup) and (2) coUML are isolated. We then find (3) a group of production tools, and (4) a group of learning design editors. Constructs that cluster together are *all-in-one authoring / just a representation* and *made for learners / teachers*. *Easy/difficult* to use is not far from this category. Then, we find *linear/non-linear scenarios* and *editing tool / modeling language* in a cluster. Finally, the *scenario design / content editing* construct is set apart from all others. A principal component's analysis that leads to similar results is not shown here.

4. Discussion and issues for further work

This exploration raised several issues. First, we noticed that many emerging constructs have to do with how a system can be used. Idiographic repertory grids therefore should be suitable for highlighting how practical considerations correlate with perceived characteristics and how various systems fit into a personal construct space.

The repertory grid technique (RGT) is best used when participants are able to identify representative elements and to rate them with their own criteria. This implies that participants need to be trained. In addition, we suggest creating vignettes describing each system and showing them to the participants.

We also need a reliable method to insure that the most important constructs will enter the grid. We found the trialogic procedure useful since it helps find "natural" and strong constructs. However, we suggest halting this procedure in the middle of the process. Participants will be shown results (e.g. the cluster analysis) and if they find two systems to be too close, a discriminating construct should be elicited, else one of the two elements should be removed. If two constructs are too close, a system that differentiates the two should be added.

We found comparing very different systems an interesting strategy but construct spaces quickly become complex. Data reduction will not produce "tight" clusters and variance explained by the two first factors will be below 50%. Such rich data is useful to the educational design researcher but we also should analyze very similar systems in order to identify focused constructs about a class of design systems.

We did not explore analysis across construct systems. Commonly used constructs of a larger set of participants can be identified through content analysis. A sample of 15-25 persons should generate constructs that are representative of the universe of meaning [4]. Another avenue is to explore group elicitation techniques [7]. Finally, we suggest comparing idiographic constructs obtained through a fixed nomothetic grid. Its constructs could be assembled from a synthesis of analytical and evaluation grids found in the literature. The elements should be a representative selection of various and somewhat known design systems.

In conclusion of this exploration, we put forward the conjecture that RGT could become a useful communication tool among design researchers and between researchers and expert users.

5. References

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