Chapter X

Results with Formal Concept Analysis

Objects, attributes, and concepts are basic notions of conceptual knowledge; they are linked by the following four basic relations: an object has an attribute, an object belongs to a concept, an attribute abstracts from a concept, and a concept is a subconcept of another concept. These structural elements are well mathematized in formal concept analysis (Luksch & Wille, 1991, p. 157).

Introduction

Chapter V provided some introduction to formal concept analysis through the visualisation of biographical results from the tacit knowledge questionnaire. The attention now turns to the strength of using FCA by examining the tacit knowledge inventory results which are one of the two major underpinnings of this work. To remind the reader, FCA had its beginnings at the Technical University of Darmstadt in Germany, and was the work of Professor Rudolf Wille. Formal Concept Analysis is a means of illustrating via a lattice like structure all sorts of information in virtually any discipline. The lattice-like structure illustrates relationships between objects (typically any type of noun), and their corresponding attributes (typically any kind of adjective). Through connecting these “concepts” together, sense is gained for the body of knowledge dealt with. The application of FCA to questionnaire results is rare but not unheard of, but its application to better understanding tacit knowledge is.
Usage of Formal Concept Analysis

Even if statistics was not the major tool used for processing questionnaire results, some use was nevertheless made of descriptive statistics to provide an indication which Likert scale values had been chosen by the respondents. With the addition of a formal concept analysis lattice further meaning could be derived from the data. Figure 1 provides an illustration of the lattice structure for a Likert scale result, in this case scenario 3, answer 12. A reminder that the lattice is read starting from the outer ellipses (ethical values) through to the inner lattice structures (realistic values). The reader will see that the answers are inclined toward the negative end of the spectrum. Note also that some personnel (1528, 17, 15E, 14E, 7, 33E, 35E, 5, 34E) whilst ethically feeling negative about this particular answer for dealing with scenario 3, nevertheless feel positive about the answer from a realistic standpoint. Alternatively note that individuals 20 and 13E feel positive ethically about this answer, but negative about it realistically. Generally speaking however the ethical feeling tends to be more negative than the realistic one.

The point of this exercise is that in examining each formal concept lattice for each answer option for each scenario, the researcher is slowly able to build up a picture for how novices have answered relative to that of experts. For example, in Figure 1, one can see that 1525, 1025, 1583, 2375, 1524, 1528, 17, 1507, 9, 7, 5, 1 and 20 have answered the same way as experts. By noting this similarity for all 125 answers (examining all concept lattices) novices can be listed in descending order of similarity with expert answer responses. Those novices with the greatest incidence of similarity with experts, head the list. For Organisation X, an extra 25 personnel were able to be identified who scored close to that of experts using the aforementioned technique, without necessarily being identified by their peers as being experts. Examining the closeness of the scores in descending order, it was decided the top 32 percent of ENEs warranted inclusion as a group as this group appeared to present a...