

**Read Ahead Document for Structural Modeling Video Conference
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This month, our discussion will address a specific focus on the SMP software capabilities compared to the capabilities described in the GMU ISM Software. The context for this discussion will use the terms and information from *A Handbook of Interactive Management, 2nd Edition, 1994* (the Handbook). We will also discuss the need for a more specific method for communicating the logical properties of a natural language organizing relationship than appeared in the Handbook.

Software Capabilities

The GMU ISM software, described in the Handbook, has three basic system structuring commands. These commands are:

- **DOMODEL** This command is very general, and can be used *for any ISM structuring application*.
- **DOCLUS** This command is used when the system structure consists of *one or more cycles*.
- **DOPRIOR** This command is used when the system structure is a *priority structure*.

The augmented model-exchange isomorphism (AMEI) was developed, in part, to provide a well-defined method of identifying different system structure types. In terms of the AMEI, the commands listed above handle systems of the following types:

- The **DOMODEL** command may be used on systems that are structured using
 - *asymmetric*,
 - *symmetric*, and
 - *non-symmetric*

natural language structuring relationships.

- The **DOCLUS** command may be used on systems that are structured using
 - *symmetric*

natural language structuring relationships.

- The **DOPRIOR** command may be used on systems that are structured using
 - *asymmetric*

natural language structuring relationships.

The AMEI categories were designed, in part, to provide a structure that aligns cleanly with these three GMU ISM Software commands. The Battelle Monograph, Number 4, April 1974, *Structuring Complex Systems*, has a list of binary relation logical properties that includes only those that are:

- *reflexive*
- *irreflexive*
- *symmetric*
- *asymmetric*
- *transitive*.

The non-symmetric logical system structuring property is required to justify the **DOMODEL** command and was added to the AMEI. The non-transitive and intransitive logical properties were added to the AMEI

based on Warfield's treatment of the 'adjacent' natural language system structuring relationship. Warfield listed the adjacent natural language system structuring relationship as having a transitive logical property. The complete logical property set for Warfield's adjacent natural language system structuring relationship is: irreflexive, symmetric and transitive (IST). However, in the Handbook, Warfield describes a natural language system structuring relationship, 'immediately adjacent' that is *intransitive*. This intransitive version of the adjacent natural language system structuring relationship, *is constrained to operate between only two adjacent objects*. This specific situation – with the 'adjacent' natural language system structuring relationship – sheds light on the fact that the 'adjacent' natural language system structuring relationship **can have a limited scope**. There is no need to limit 'adjacent' to just two objects, it could be four or ten objects. This application highlights the need for a logical property binding scope. This is an advanced topic and will not be discussed further in this document. The treatment of the 'adjacent' natural language system structuring relationship highlights the need for the inclusion of *intransitive* and *non-transitive* logical properties in the AMEI.

The *non-reflexive* logical property was added to the AMEI based on information and process material provided in the article, "Binary Matrices in System Modeling," 1973.

Software Algorithms

The GMU ISM Software is based on an implementation of the transitive embedding algorithm developed by Warfield. The SMP open-source software, up to this point, is based on standard computer science searching and sorting algorithms. This open-source SMP software now has the same capabilities as the **DOPRIOR** command, but does not use the transitive embedding algorithm, yet. The next SMP software development task is to implement the transitive embedding algorithm. Once this task is complete, there will be three or more solution approaches that are all designed to address systems structured using a system structuring natural language relationship that has an *asymmetric* logical property. The solutions based on standard searching and sorting algorithms are provided to ease the introduction of ISM algorithms to individuals that are familiar with basic computer science.

Software Interface

The SMP open-source software needs to improve the graphic user interface. Requirements for this area of development are actively being sought.