12. Discussion and conclusions

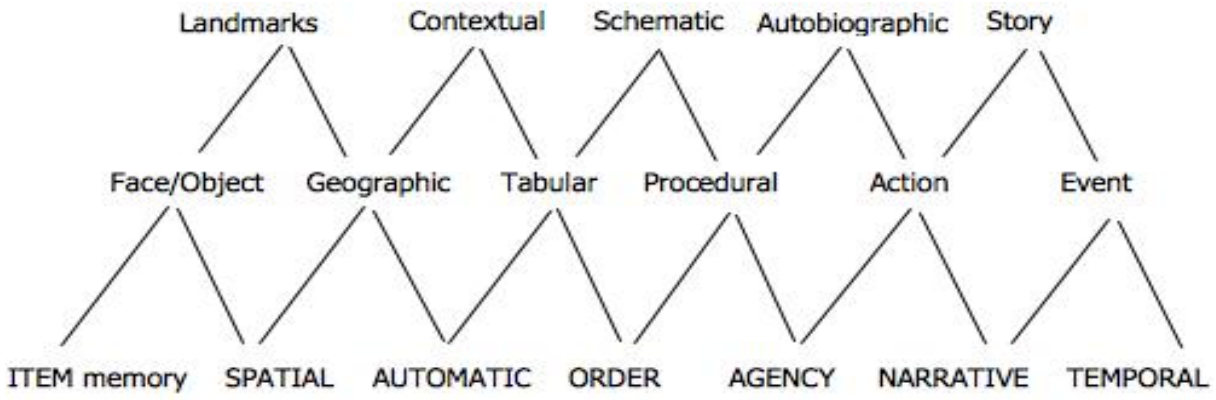

Figure 12.1. A schema based on 7 of the Memory dimensions. Note: the complexity dimension goes from the bottom row upwards.

The schema shown in figure 12.1. is an illustration of how different dimensions of memory combines into ever higher levels of memory. As an example: item memory at the lowest level of memory combines with spatial memory and automatic-associative memory into memory for landmarks and object positions (geographic) as well as face/object recognition. The temporal dimension combines with the narrative dimension at the highest level of complexity into story recall.

It may be noted that the rows above the dimensions are only examples of *types* of memory that are dependent on the underlying dimensions. Some of the categories may in themselves include sub categories. *Schematic memory* for instance is a large category that may include such diverse schematic knowledge as equation solving, book-keeping, and music composition.

12. 1. Hierarchy of dimensions

The theory implicit behind the 10 memory dimensions is based on two assumptions: 1. memory is a multidimensional ability, 2. one may combine the 10 dimensions accounted for into types of or higher levels of memory.

However, nothing is said yet regarding relationships between the 10 dimensions proposed. Looking at them it first obvious that the Complexity dimension that runs from the bottom of the hierarchical "structure" of memory has to be regarded as a principal or in less technical vocabulary, a *core* dimension.

Two dimensions with strong relationships to the intelligence factor v:ed (Vernon, 1950) are 6. Narrative and 9. Numericy. These dimensions are at the core of all human educational activities, and it would be almost impossible reach any high level of academic achievement without having to rely on knowledge based on the ability to read or write explanations (*narrative*) or arithmetic/mathematical concepts (*numeracy*).

Three among the 10 dimensions may be regarded as conative, at least having conative components: 5. Agency, 7. Interest, 10. Automatic vs. effortful. All these three memory dimensions are in one way or the other related to endeavours of the conscious individual.

The remaining four dimensions - 1. Temporal, 2. Order, 3. Spatial, and 10. Imagery vs. interference - seem to be more intrinsically mnemonic than the other.

On the basis of this short account we would arrive at an hierarchical structure of the 10 dimensions as the one illustrated in the table below.

Table 12.1

Core	*V:ed*	*Conative*	*Basic*
Complexity	Narrative	Agency	Temporal
	Numeracy	Interest	Order
		Automatic vs. effortful	Spatial/static vs. dynamic
			Imagery vs. interference

Are the seven dimensions discussed in this book exhaustive? The simple answer to that is "Probably not", because they are mainly based on available memory research. There might also be a personality dimension of memory, but there are too few studies on personality performance in memory, and therefore it is premature to propose a *personality* memory dimension. Such a dimension, however, may also be greatly involved in the agency dimension.

Some readers may also suggest that there would be a *developmental* dimension. Young children may in fact be lacking in certain aspects, and the broad dimensions would therefore possibly be fewer among them. That would be the case regarding children before the two-word stage during language development. Before that stage it may be irrelevant to talk about a narrative component. It is evident, however, that even a one year old baby nevertheless tries to tell the parents or other toddlers a lot by using gestures and single words. On the other hand, research on the first autobiographical memory shows that we remember very little before the age of three, i.e. at the stage of language development when children are able to use syntactically more elaborate sentences.

If there exists a developmental memory dimension, it would certainly be directly related to *education*. And in that case we would consequently also have to include a *cultural* dimension, because educational systems vary with different cultures. In a society that puts great emphasis on learning by heart, the narrative dimension would play a great role in many contexts, and therefore become an important memory dimension. Still, the number of dimensions would be the same.

How about a *logical* dimension? MST stresses the difference between semantic and episodic memory. The ability to categorize and think in terms of classes is essential not only for logicians and mathematicians, but for all of us. It is one of the primary cognitive abilities, and an empirically founded intelligence factor. Why would it then not qualify as a memory dimension on its own? It is, however, apparantly different from the narrative dimension in

that it is not *about* anything else. You may not use logic in order to find out about Cal's relation to his parents in East of Eden. And there is nothing temporal or spatial about logic. The answer may be that it is just because logic has very little to do with memory that there were few studies on the effect of logical thinking on memory. However, studying the memory schema above (Fig 9.1), it would be conventient to sort logical thinking into the Schematic memory box, i.e. at the intersection between *tabular* and *procedural* memory. Research on localisation of logic (Burgess et al, 2003) and logical/mathematical terms (Olm et al, 2014) shows that both prefrontal and parietal regions are activated during logical thinking.

It was mentioned in the introduction to the interest dimension, but it has to be noted this dimension may be regarded more as a *motivational* than a mnemonic factor.

References

Burgess PW, Scott SK, Frith CD. The role of rostral frontal cortex (area 10) in prospective memory: a lateral *vs* medial dissociation. Neuropsychologia. 2003;41:906–18.

ChristopherA.Olm, CoreyT.McMillan, NicolaSpotorno, RobinClark and Murray Grossman, M. (2014) The relative contributions of frontal and parietal cortex for generalized quantifier comprehension, Frontiers in Human neuroscience, doi: 10.3389/fnhum

Vernon, P. E. (1950). *The structure of human abilities*. London: Methuen.