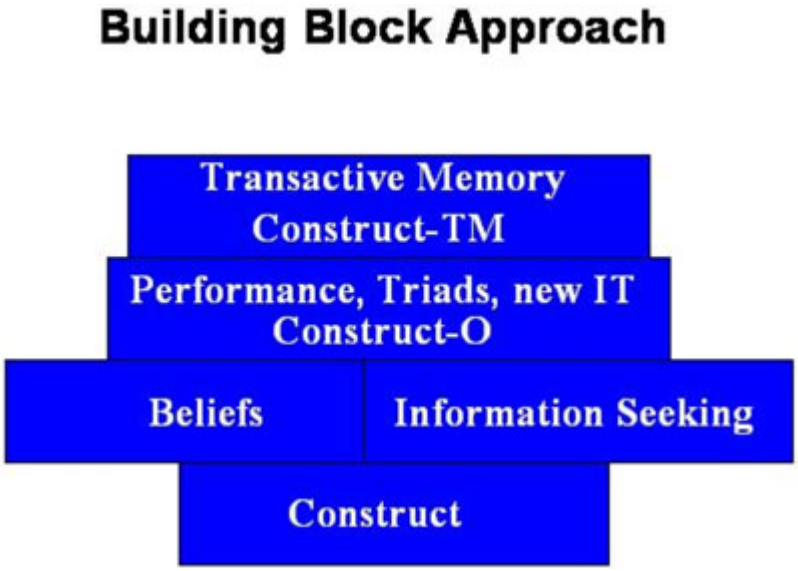
Software Engineering

Construct-TM was engineered using a building block approach. The building block approach allows each block or step to be tested and understood before adding more functionality and complexity. The model is retested and evaluated each time a block is added. In this way, Construct-TM has been developed within a well planned and logical framework.



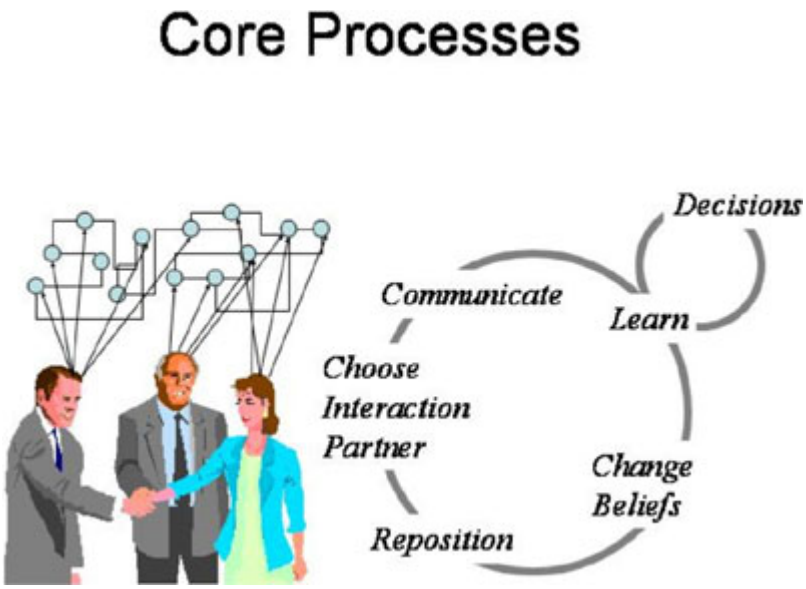
The central interactions of human agents were coded into the original Construct. The core of this implementation is the interaction based on relative similarity. Research has shown that people predominantly interact with others most similar to themselves. Beliefs were then added to Construct so that agents interacted and made decisions based upon their beliefs of how the world looked. The use of agent perception allows agents to err when perceptions mismatch with reality. Interaction based on relative expertise was added next. Relative expertise replicates human information seeking behavior.

The next version named Construct-O was released and it contained several new functionalities. Performance measures such as accuracy and timeliness were implemented to provide more diverse analysis and an understanding of the performance tradeoffs for organizations. Simmelian tie analysis was needed and triad measures were developed. Information technology agents were added so that informatted groups could be explored. Examples of information technologies modeled are avatars and databases. By representing the technology as an agent it becomes an integral part of the group and analysis can be done on the interactions between the human agents and the technology and the impact the technology has on knowledge, learning and the behavior of the group.

The current version, Construct-TM, added the feature of transactive memory. Each human agent has the ability to know and learn about other members of the group. The agents can understand who knows what or who has what resource, etc. Research provides support that transactive memory impacts group performance. In Construct-TM agents can use their transactive memory to choose interactions and to make

decisions. As Construct-TM is further developed we try to understand and model the cognitive science behind humans, groups and organizations.

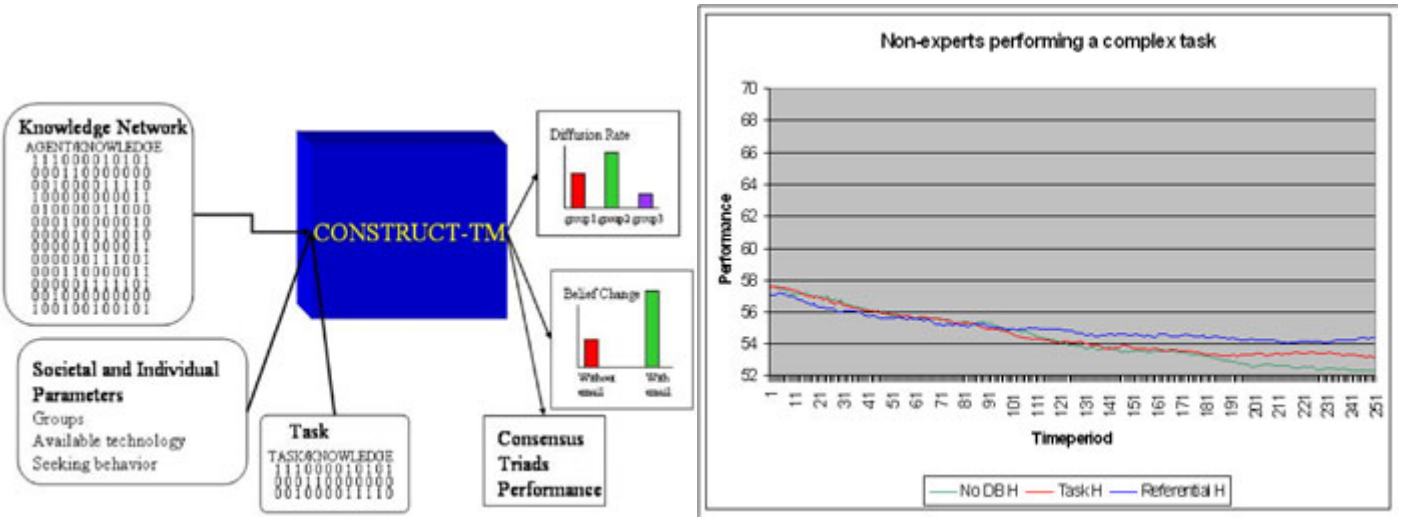
Core Processes



Construct-TM is a multi-agent model of group interaction whereas the agents communicate, learn, and make decisions in a continuous cycle. Agents select interaction partners based on relative similarity or relative expertise. This selection is dependent upon the perceptions and goals of the individual and the goals and culture of the group. When agents interact they communicate and learn both task knowledge and cognitive knowledge. As they learn their beliefs and perceptions of the world change and they reposition themselves in the network based on these new beliefs and perceptions (reconstruction). Periodically the agents make task-related decisions with the knowledge they have at the time. The knowledge they possess may be sufficient or insufficient for the task at hand as measured by performance.

Validation and Real World Use

The Construct-TM model has been scientifically validated several times (Carley, 1990; Carley and Krackhardt, 1996; Carley and Hill, 2001; Schreiber and Carley, 2003). The first validation (Carley, 1990) used Kapferer's Zambia tailor shop data. By combining individual and social considerations, the model was able to predict observed changes in human interactions. The latest validation (Schreiber and Carley, 2003) found significant correlation between communication patterns within real-world organizations and agent interactions within the model.



The model has been used for analysis and consulting in industry (health care, aerospace, consulting, professional associations, financial), non-profit and emergency response (charity foundation, American Red Cross), higher education (universities), military (DARPA, ONR) and government (NSF, NASA).