

Simulating the Process of Trust: Using simulation to test and explore a social process

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Business writers agree that trust is central to teamwork, leadership and organizational culture (Fairholm, 1994) (Nicholas, 1993). The academic research community agrees that trust is essential in all relationships (Seligman, 1997), (Govier, 1997), (Shapiro, 1987), (Hardin, 2000). There is increasing recognition of trust as a social good or social capital that is fundamental to human interaction and cooperation (Putnam, 1995), (Paxton, 1999), (Child & Faulkner, 1998), (Fukuyama, 1995). Despite this, there is no agreed definition of trust (Hardin, 2000).

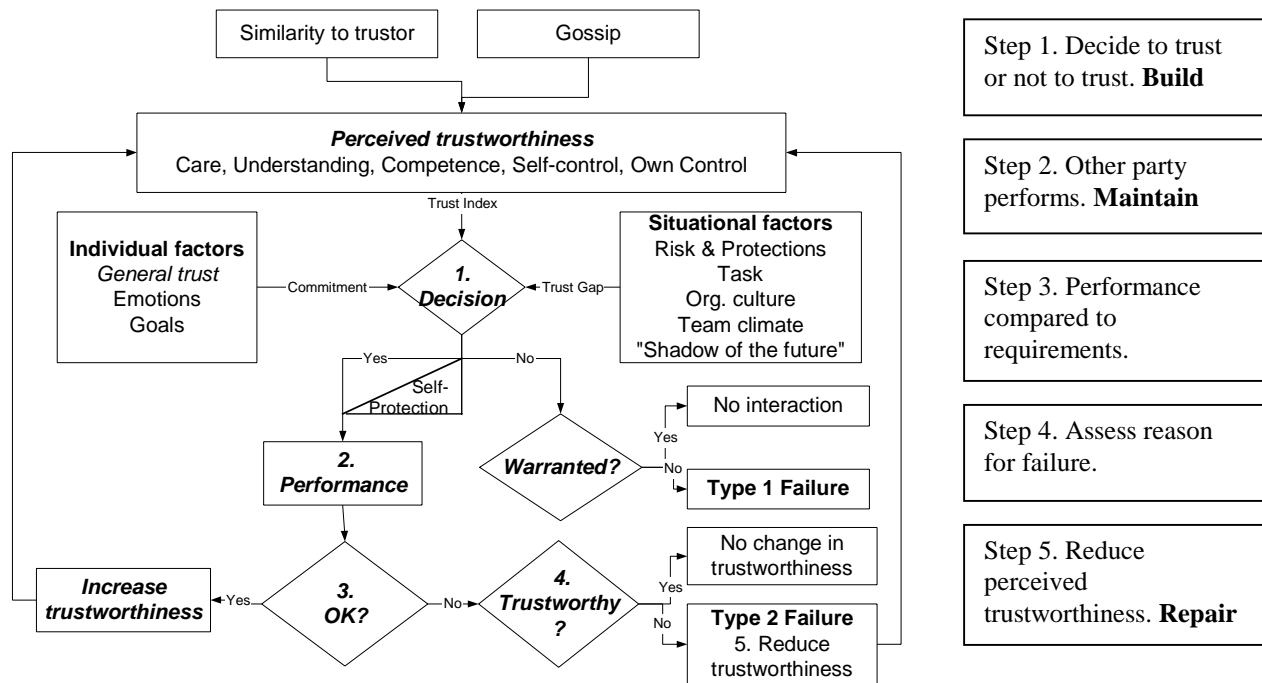
The goal of this research is to identify factors that contribute to the development of trust. To study the process of trust we developed and tested a model of trust building, maintenance and repair in AEC project teams. This paper presents the model of trust, a simulation of the model and the preliminary results.

The working definition of trust proposed in this research is:

Trust is the deciding factor in a social process that results in a decision by an individual to accept or reject a risk based on the expectation that another party will meet the performance requirements.

Based on the proposed working definition of trust, we formalized the trust process as a model that combines accepted theories of trust. (See Figure 1)

Figure 1 The Trust Development Model



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The theories of trust are organized into three categories:

- The *Trust Gap*. The *Trust Gap* is a proposed construct that represents situational factors that create the “leap of faith” that the trustor needs to make in order to trust the other person. It is calculated from the amount of risk involved in the task, less the level of protection available from social controls such as cultural roles and norms.
- The *Trust Index*. The *Trust Index* represents the perceived trustworthiness of the trusted person measured using five dimensions of trustworthiness; *Care*, *Understanding*, *Competence*, *Self-control*, and *Own-control* (Smedslund, 1997).
- The trustor’s *Commitment*. *Commitment* is a measure of the trustor’s level of urgency to address the problem. It is calculated from the individual’s personality characteristic for General Trust, emotions and motivational urgency to achieve the goal.

The *Trust Decision* is not a simple binary, “Yes” or “No” decision. The closer the trustor is to making a negative trust decision the more time and effort will be spent in self protection which includes checking the other party’s performance, and in hedging, that is, secretly performing some of the other party’s work.

Source of data

Stanford’s Project Based Learning Lab (PBL) provides an ideal test bed for such research. Seven groups of geographically distributed students engaged in a realistic role-play simulation of a multidisciplinary design/build construction team engaged in the design, structural analysis and construction planning of a complex building project. Data sources include questionnaires, video recordings of group Internet meetings, group discussions, individual interviews and Internet interaction pages. Internet Interaction Pages are specially designed web pages that facilitate and record interactions within groups and with significant external parties. The following constructs are measured: perceived trustworthiness, general trust, trust decisions, trust behavior, and overall group performance.

Description of the simulation

The simulation reads the database used to store the team’s web based interactions and sets up a simulated team based on actual team records. Information gathered from Internet questionnaires is also contained in the database. Independent variables not taken from the team data include the emotional levels of the actors and the level of interdependence of the tasks.

The simulation calculates each individual's team member’s level of *Commitment* depending upon:

- The team member’s estimated time commitments (indicates urgency to achieve the goal)
- The team member’s General Trust (personality characteristic)
- Emotional levels (this variable is randomized but can be adjusted higher or lower)
- The amount of time since a successful interaction.

The simulation calculates the *Trust Gap* depending upon:

- Task risk (Preliminary results show that the architecture is perceived to be riskier than structural engineering, which is riskier than construction management.)
- Task interdependence (Higher interdependence involves smaller tasks which means less risk)

The *Trust Index* representing the team member’s measure of perceived trustworthiness for other team members starts at zero and is calculated during the simulation based upon the number of interactions and the outcomes of the interactions. After reading the data from the database the simulation predicts the trust behavior using a number of rules that we develop from our observations.

Negative trust decisions are only made in clear situations, for example, the *Trust Gap* is high, the *Trust Index* is low and *Commitment* is low. In borderline cases a positive Trust Decision is made but the

trustor will engage in checking and hedging behavior. Similarly, a positive trust decisions without checking and hedging is only made in situations unequivocally in favor of trust. As an initial assumption the situation represented by the *Trust Gap* is given the greatest weight followed by the *Trust Index* and finally *Commitment*. The time spent in checking and hedging is added to the time of the project.

The simulation calculates each team member's actual task performance based upon the team member's level of experience and training in his or her discipline.

The outputs of the simulation that will be presented include:

- The levels of perceived trustworthiness that have developed
- The amount of time that is added to the project for checking and hedging
- The number of iterations that are performed during the project.

Validation Contributions

We will present the first stage of validation. While holding all variables constant, small variations are made to one input variable at a time. This tests the operation of the system and usually yields interesting insights into the operation of the hypothesized trust process.

This research tests a measurable definition of trust and model of the trust development process. We believe that simulation will be a valuable tool for testing a social interaction process that operates over an extended time period. By attempting to make predictions based upon the model we can validate our model or highlight variations that give rise to better theoretical models.

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