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2010

The Science of Interpersonal Trust

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The
Science of
Interpersonal Trust

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The Science of Interpersonal Trust

A Primer

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The views, opinions and/or findings contained in this report are those of the author and should not be construed as an official government position, policy, or decision, unless designated by other documentation.

Acknowledgements:

Any merit in this primer is the product of a team effort. Any errors and omissions are solely my (RB) responsibility, and probably occurred because I neglected to seek or heed the counsel of some really smart and terrific people. Among those to whom I am immensely grateful are the following: Dr. Jason Colquitt, a Professor Business Administration at University of Florida, a world-class trust researcher who generously shared his time, expertise and perspicacious observations to improve this document and to help me to think more clearly about interpersonal trust. Dr. Robert Fein, one of the great contemporary thinkers on applying behavioral science to the most difficult problems, and a man of great ability, benevolence, and integrity. Dr. Adam Russell, a true, modern-day Renaissance man of amazing intellect and innovative vision. Dr. Paul Lehner, Julia High, and a cadre of others from The MITRE Corporation contributed greatly to making this document happen and to making it better, and I am deeply grateful for their patience and for MITRE's support.

The Science of Interpersonal Trust

A Primer

On the following site, researchers can access a repository of more than 500 bibliographic citations on interpersonal trust:

<http://www.citeulike.org/group/12066>

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Executive Summary

Interpersonal trust - *a willingness to accept vulnerability or risk based on expectations regarding another person's behavior* – is a vitally important concept for human behavior, affecting our interactions both with adversaries and competitors as well as with allies and friends. Indeed, interpersonal trust could be said to be responsible in part for nudging competitors towards becoming allies, or – if betrayed – leading friends to become adversaries.

This document summarizes the state of the art (and science) in interpersonal trust research, describing how researchers define trust and its components, exploring a range of theories about how people decide whether to trust, and describing how trust may work differently for some people than for others. This primer will not critique all existing studies and their methods. It is written as a relatively non-technical overview for individuals whose personal success depends on the development of trust and for researchers seeking to better understand how trust has been studied and operationalized, to date.



- Understanding trust is essential for improving performance of individuals and their organizations, as well as honing their competitive advantage by knowing whom outside the organization to trust. Much of the trust research to date, however, has not employed experimental conditions or measures that approximate those appropriate for real world conditions where an inadequate gauge of trust has meaningful, and often severe, consequences.
 - While a common assumption, the research suggests that deception and trust are not simply opposing concepts, but rather might coexist in certain situations.
 - Over the past 50 years, trust researchers have identified some of the main determinants of trust and the key behaviors it predicts, but have not focused on the biopsychosocial mechanisms of human trust. Combining these traditional approaches with those of social neuroscience researchers, who study the neural underpinnings of social behaviors, holds great promise.
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- Interpersonal trust has been defined in a variety of ways by different researchers. Most researchers agree that trust is driven mainly by a combination of cognitive (thinking) and affective (emotional) factors.
 - Theories vary as to whether trust starts from a positive, negative, or neutral baseline, and the difference is likely to depend on context. There are also different models that represent trust and distrust as separate constructs or as opposing ends of the same spectrum. The starting point for trust and/or distrust may depend upon characteristics of the person, the situation, and prior information about the potential trustee.
 - In a decision to trust, the trustor typically assesses the other's trustworthiness. The "Big Three" predictors in trustworthiness research are *ability* (perceptions of a trustee's competence and consistency), *benevolence* (perceptions of the trustee's caring, goodwill, empathy, and commitment to shared goals), and *integrity* (perceptions of the trustee's objectivity, fairness, honesty, and dedication).
 - Different techniques have been used to measure trust, including survey-style assessments and behavioral games (e.g., the Prisoner's Dilemma Game and the Trust Game). In social dilemma games, however, it is often difficult to discern whether behavior represents the effects of trust specifically or of some more general process like "cooperation" or "collaboration."
 - Humans have a limited capacity to process large amounts of complex social information, so they often unconsciously use mental shortcuts (heuristics) to simplify the process. These shortcuts, however, can lead to systematic biases and errors in generalized decision-making, and specifically in assessments of trustworthiness and decisions to trust.
 - Two complementary neural systems may affect human trust decisions: an *automatic* system that works quickly but learns slowly, is pushed by emotions, and doesn't do well handling unusual circumstances; and a *controlled* system that operates more slowly but learns more quickly, is more deliberative and shaped by formal reasoning, and adapts well to exceptional circumstances. These complementary processes enable us to understand thoughts and feelings from another's perspective. Far from being mutually exclusive, these systems likely interact with and influence each other in different ways under different conditions.
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- Several methods have helped to identify brain structures involved in developing trust and associated behaviors. Such approaches include studying patients with brain lesions, use of functional magnetic resonance imaging (fMRI), and electroencephalography (EEG). Key brain regions identified in this research include the *striatum*, *amygdala*, *prefrontal cortices*, and *anterior cingulate cortex*.
 - A variety of neurochemicals in the brain – such as *oxytocin*, *vasopressin*, and *dopamine*– are involved in trust decisions. In particular, oxytocin, a neuropeptide hormone, has received a great deal of attention based on studies showing that it facilitates social engagement and increases a person’s willingness to be vulnerable within a social interaction. Interestingly, however, this willingness to be socially vulnerable does not appear to be related to more general risk-taking behavior.
 - The behavioral norms and nature of the relationship between individuals and groups matter when attempting to understand and evaluate people’s behaviors in social interactions. Some social exchanges are based on communal norms, motivated by a caring, emotional bond and a desire to help, while other exchanges are driven just by market norms of getting what you pay for.
 - Group membership and relational status affect trust decisions. We are more likely to trust others whom we identify as being part of our “in-group” or with whom we share a close social relationship, even when their actual behavior and individual characteristics may not merit such trust.
 - Individual differences substantially affect trust relationships. The propensity to trust varies from person to person and from condition to condition, and is influenced by a variety of factors, including past experience, genetic predisposition, and personality characteristics, all of which may shape an individual’s interpretation of who and what can be trusted in a given context.
 - Cultural norms and differences can affect trust appraisals and decisions. Cultural influences may also shape how we perceive and encode social information. How, and the extent to which culture influences these processes, however, has only recently been rigorously studied.
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Introduction

Trust, defined in this primer as a willingness to accept vulnerability or risk based on confident expectations regarding another person's behavior, is important to many human interactions, particularly in contexts of limited information or high consequences for a betrayal of trust. Despite trust's importance and a long history of research on trust in specific environments, it has not been successfully operationalized for many broader contexts in which human trust plays a significant, if often underappreciated, role. This primer provides an overview of research, primarily from social psychology, economics, and neuroscience, aimed at helping to operationalize trust by identifying its psychological, behavioral, neural, and physiological signals and mechanisms.



1. Truthfulness and trustworthiness are not synonymous, nor are deception and untrustworthiness merely different endpoints of a single continuum. Indeed, trust and deception might coexist in certain situations, particularly in contexts where deception is either common place or necessary, yet trust is still vital.
2. While researchers have worked to define trust from a cognitive and physiological perspective, that research has often not translated into ecological-validity for real world behaviors and contexts.
3. In order to use trust research effectively, it will be necessary to integrate insights about human cognition from social psychology, information about decision making drawn from behavioral economics, and data on emotion and brain functioning from neuroscience into a model that allows us to better understand, monitor, and predict trust in contexts where human motivations, behaviors, and the environment itself, may be complex and dynamic.

Purpose of the Primer

Interpersonal trust is quite possibly the most pivotal, least well-defined, and least directly measured concept affecting individuals and organizations that must successfully maneuver complex and dynamic human-centric environments. Though definitions of trust, as discussed later, are varied and often complicated, trust is fundamentally *a willingness to accept vulnerability or risk based on expectations regarding another person's behavior*. As a practical matter then, trust is expressed through a decision. We decide - sometimes intuitively, sometimes after conscious deliberation - whether to trust. Such decisions are important when individuals and groups are interacting with adversaries and competitors and equally vital when fostering optimal team performance (see Appendix C).

DEFINING TRUST AND TRUSTWORTHINESS

Trust is defined here as a willingness to accept vulnerability or risk based on expectations regarding another person's behavior. A variety of specific trust definitions used by different trust researchers can be found in Section 2. Trustworthiness, on the other hand, refers to the characteristics of, and conditions around, the person or thing being trusted, and which facilitate that trust.

Trust in Complex Environments

The issue of interpersonal trust is complex when individuals or organizations are trying to achieve goals that are dependent on cooperative or uncooperative competitors. To meet these goals often requires maneuvering a frequently shifting landscape of individual, organizational, behavioral, economic, political, social, and cultural factors that influence both the competitor and the individual or organization trying to develop trust. When these goal-directed professionals must operate within such an environment, cooperation with competitors is sometimes necessary, yet simultaneous motivation may exist to deceive and gain a competitive advantage. In order for each party to accomplish their goals, they may have to engage in cooperative behaviors, which - in spite of deception - may require an assessment of another's trustworthiness. Many professionals that rely on personal relationships to accomplish their goals often seek to cultivate trust and they must likewise decide whom to trust, for what purposes, under what conditions, with which resources, and for how long.

- A previously unknown person may walk into a competitor company - or perhaps just send an electronic message - claiming to have valuable

information about another company's capabilities, products, and marketing strategy.

- A suspected criminal, who has been brought in for questioning, may have refused to cooperate at all for several hours, but finally, during an interview, freely reveals seemingly critical information of interest.
- A rescue operation might be planned to recover personnel believed to be trapped in a remote or hard to access area. Analysts have identified the location with a high degree of confidence, but just before the operation is to be launched, a longstanding resource from that area comes forward to say the location is incorrect.
- Under tight deadlines or facing critical decisions with limited information, organizational leadership and support staff – despite differences in their work skills and products – must be able to trust each other for an organization to function optimally and achieve its ends.
- A team working collectively on a project must have confidence in their colleagues' competence and shared commitment to the team's success, especially if the team is working in a geographically distributed manner.
- When an organization's personnel are given directives without an underlying explanation, some research suggests that they may react differently if the person delivering the instructions is someone they trust or someone they distrust.

As we can see, trust matters not only for interactions between different groups and organizations, but also for the internal interactions among personnel within a group, since some emerging research suggests that groups in certain environments require a degree of trust among their members in order to outcompete their rivals or to get their jobs done in austere and challenging environments.

How Might Trust Research Be Operationalized?

Interpersonal trust research could lead to some important advances in understanding – and optimizing - how organizations navigate complex, dynamic and often highly stressful environments. As evidenced by quite a bit of the organizational behavior trust research, measures of trust used in these studies, might easily transfer to such organizations, work teams and leadership. Operationally, however, much of the trust research has not been based on trust-related tasks or behaviors that approximate those encountered in the real world. Likewise, most of the measurements and signals of trust used in these studies thus far would be difficult to apply in “the field.”

For the most part, traditional research approaches to trust have tended to adopt a purely rational economic view, which assumes that people will adjust their own thresholds of vulnerability and confidence in others in ways that will maximize their own rewards and positive outcomes and minimize negative ones. But there are an increasing number of empirical examples where people’s decisions and behavior are at variance with objective and “rational” calculations of expected value.

Additionally, emotions also affect decision making and can override an objective calculus, sometimes disrupting otherwise good decisions, but at other times improving decision-making. Consequently, a recent trend in the field of behavioral economics is not to view human behavior (including trust) as either rational or irrational, but rather as social. A social orientation to trust presents a different set of rewards and punishments than a classical economic model. But how would this social orientation affect how people forecast or predict others’ behavior? What is the basis for a confident appraisal, and can it be modified by experience? These are the kinds of questions that, since the 1990s, have been the focus of social cognitive neuroscience.


**Social
Cognitive
Neuroscience**

While much of the “deep” research on defining trust has come from marketing, organizational behavior, strategic management, and industrial/organizational psychology, recent advances in understanding mechanisms of trust have emerged from the relatively new discipline of social

neuroscience. Social neuroscience seeks to understand the neurobiological underpinnings of social behavior (Decety & Keenan, 2006). It emerged during the boom of “neuro-disciplines” such as neuroeconomics, neuromarketing, neuroethics and neuroanthropology (Choudhury, Nagel, & Slaby, 2009; Vidal, 2009) – all exploring neural correlates of different human behaviors, fueled in part by significant advances in neuroimaging technology, such as fMRI (see page 34 for more discussion of these new technologies).

Social neuroscience examines the kinds of processes and questions that social psychologists have traditionally pursued, but using physiological measures and imaging tools from cognitive neuroscience (Crone, et al., 2009; Raichle, 2003; Van Overwalle, 2009).

Its researchers are particularly interested in how humans understand and control (or regulate) themselves in social environments, how they understand



**WHAT IS SOCIAL
COGNITIVE
NEUROSCIENCE?**

Social cognitive neuroscience is a multidisciplinary field of study combining the expertise of neuroscientists with scientists from the disciplines of social and cognitive psychology, anthropology, and sociology to better understand the neurobiological underpinnings of social behavior. Social cognitive neuroscience examines behavior at three levels – the social level (social and emotional contexts and behaviors), the cognitive level (mechanisms for information processing) and the neural level (the brain and related neurophysiological bases of observed behavior).

others, and what happens in self-other interactions (Adolphs, 2003; Lieberman, 2007).

Social neuroscientists have become increasingly interested in researching trust. Much of their research to date, however, has little theoretical foundation or conceptual texture to the definition of trust. Some consistent findings are emerging from their research, but the current nature of their research methodologies and conclusions means that it can be difficult to know if they are discerning signals of trust specifically, or some other general social cognitive process like empathy or cooperation.

On the other hand, trust researchers in the fields of marketing, organizational behavior, strategic management, and industrial/organizational psychology have looked at trust for over 50 years as an applied social concept. While they have progressed in identifying psychological antecedents of trust (such as trust propensity, ability, benevolence, integrity) and the behaviors it predicts (such as risk-taking, task performance, citizenship behaviors, and counterproductive behaviors), they have not advanced very far in understanding the biopsychosocial mechanisms of human trust.

What these researchers have done, however, is to interrogate and deconstruct the concept in a way that gives it texture; positing types and components of trust that could be very useful for conceptualizing more sophisticated research questions about how interpersonal trust is formed and changes. The potential synergy from combining the contributions of applied trust researchers and social neuroscientists seems to hold great promise for significantly advancing our understanding of, and methods for quantifying, different kinds of trust and trustworthiness among individuals and organizations that function in dynamic and complex environments.

Foundations of Trust Research

Researchers have defined trust in a variety of ways, but most definitions include a subject, an action or behavior, and an expectation of future actions. While there is agreement at this broad level, details of trust definitions vary substantially, particularly on questions about its unity or dimensionality, the baseline or starting point for trust, and the relationship between trust and distrust. This section discusses definitions of trust, and how researchers measure different signals of trust.



1. Trust definitions are often based on indirect behavioral measures. In studying trust, researchers should clearly define their working definition of trust and describe how this definition relates to their selected measures.
2. Theories vary as to whether trust starts from a positive, negative, or neutral baseline. The starting point for trust and/or distrust may depend upon characteristics of an individual (the trustor), the situation, and prior information about the potential person or group to be trusted (the trustee).
3. Polyvagal theory suggests a possible physiological explanation for shifts in baseline trust level. According to this theory, the vagus nerve may modify the body's "fight or flight" response depending on whether an interpersonal encounter represents a threat or an opportunity for social engagement.

4. Trust and distrust may not lie at opposite ends of a single spectrum. Rather, individuals may have complex trust relationships with others, in which they trust each other in some ways, but distrust in others.
5. Most researchers agree that trust is driven mainly by a combination of cognitive (deliberative) and affective (emotional) factors.
6. Different techniques have been used to measure trust, including survey-style assessments and behavioral games (e.g., the Prisoner's Dilemma Game and the Trust Game) as well as through neuroimaging technologies such as fMRI and EEG.

Leading biologists have grandly labeled trust and reciprocity as the “basis of all human systems of morality” (Nowak & Sigmund, 2000, p. 819). While this may be overstating the case, by any measure trust clearly plays important and often decisive roles in social interactions. Unsurprisingly for such a broad concept, then, trust has been defined, parsed, categorized and deconstructed in a variety of different ways by numerous scholars from a range of academic disciplines (for more on this, see Appendix A).

Consequently, one of the few issues on which trust researchers seem to agree is that there is little specific agreement about how to define trust (e.g., Bigley & Pearce, 1998; Rousseau et al., 1998). Until the mid 1990s, trust researchers rarely even addressed the definitional question in any depth (Castaldo, 2008). Since then, as McKnight and Chervany (2001-2002) point out, “There are literally dozens of definitions of trust. Some researchers find them contradictory and confusing, others conclude that the concept is almost (impossible) or elusive to define, and still others choose not to define it” (p. 37). Because trust is a broad concept, interacting with a variety of related behavioral concepts, it seems difficult - if not impossible - to define simply and precisely.

Trust may be a single, unitary concept affected by different precursors (Mayer, Davis, and Schoorman, 1995). Trust, alternatively, might be multidimensional,



THE CULTURE OF TRUST RESEARCH

Trust researchers often debate and disagree with one another about the fine points of the structure of trust. This diversity of viewpoints is common to many social science questions. Some may prefer the complexity of breaking down a concept into its smallest component parts, while others prefer to deal with the same concepts in a more unitary or parsimonious way. Fundamentally, however, most contemporary trust researchers are not that far apart in what they think is most important to understanding interpersonal trust. They may use different terms or nuanced definitions, and make convincing arguments about the uniqueness of the particular concept they propose, but the core elements and processes involved are often quite similar. We focus here on these core concepts.

comprised of a variety of different facets (McAllister, 1995). Or perhaps there are even distinctly different “types” of trust (Lewicki & Bunker, 1995). Most trust researchers have not yet come to a consensus on the fine points of the structure of trust (Lewicki, Tomlinson, & Gillespie, 2006), though they do agree on some of the basics, which are laid out below.

The ambiguity of fundamental concepts and definitions of trust poses a challenge not only to academic researchers but also to organizations and professionals that must make critical plans, decisions, and actions based, at least in part, on their own level of trust and on their perception of the trustworthiness of others. There is a dearth, however, of robust scientific evidence about which elements or indicators of trust are most relevant to which context, how this may change due to a variety of human or environmental factors, or how best to measure them.

How is Trust Defined?

One recent meta-analysis (Castaldo, 2008) pulled together 72 different published definitions of trust from a variety of academic disciplines to examine what they had in common and how they differed. Most of the definitions had elements that referred to (1) a subject, (2) an action/behavior, and (3) a future action (i.e. an intention) and/or expectation (i.e. a belief). The future element, which involves predicting or anticipating another’s actions, is a distinctive and critical feature of trust. Deception, for example, is about something that has happened or is happening. Trust, however, involves present decisions, often based on another person’s past behavior, that require anticipating some action that hasn’t yet happened.



WHAT IS A META-ANALYSIS?

Meta-analysis is a statistical research technique that combines results from multiple studies and experiments. In essence, each component study is treated like a participant in a larger experiment. For an over-simplified example, suppose we were to use meta-analysis to examine whether increased blinking was associated with trustworthiness. We would first identify all known studies that looked at the blink-trustworthiness relationship. For each study, we would determine how big the “blink” difference was between those who proved trustworthy and those who did not. This would be called an “effect size” – a standardized measure of the blink difference between the groups (trustworthy vs untrustworthy) that explains how helpful blinks are in discriminating one group from another. Some studies might find no difference, others a small (0.2 to 0.3) difference, some may be medium (~0.5) and others might show a large effect (0.8 or greater). Each of the effect sizes would be tallied together to estimate the overall size of the effect of trustworthiness on blinking. The advantage of a meta-analysis is that it provides larger number of participants (which makes for a more powerful study) and helps to minimize the impact of idiosyncrasies of any one experiment.

The following are a few illustrative examples of commonly used definitions of trust in the organizational behavior and management/marketing research literature:

- “an individual may be said to have trust in the occurrence of an event if he expects its occurrence and his expectation leads to behavior which he perceives to have greater negative motivational consequences if the expectation is not confirmed than positive motivational consequences if it is confirmed” (Deutsch, 1958, p.266).
- “accepted vulnerability to another’s possible but not expected ill will (or lack of good will) toward one” (Baier 1985, p.235).
- “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer et al., 1995, p.712).
- “The extent to which a person is confident in, and willing to act on the basis of, the words, actions, and decisions of another” (McAllister, 1995, p. 25).
- “a state involving confident positive expectations about another’s motives with respect to oneself in situations entailing risk” (Lewicki & Bunker, 1995, p. 139, quoted from Boon & Holmes, 1991, p. 194.).
- “expectations, assumptions or beliefs about the likelihood that another’s future actions will be beneficial, favorable or at least not detrimental” (Robinson, 1996, p.576).
- “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (Rousseau et al. 1998, p.395).

Common themes across these and dozens of other trust definitions suggest that interpersonal trust operates under conditions of acknowledged interdependence and is characterized by a willingness to accept vulnerability and risk based on confident expectations that another person’s future actions that will produce some positive result (Bigley & Pearce, 1998; Hosmer,1995; Kramer,1999; Mayer et al.,1995; Rousseau et al.,1998; Zand, 1972).

Some researchers have questioned whether trust and distrust might even be distinct constructs. One proponent of this distinction is Dr. Roy Lewicki, a social psychologist, who argues that, while trust and distrust may have cognitive affective/emotional and behavioral elements, the two concepts are different (Lewicki et al., 1998). He regards trust as comprising the “confident positive expectations regarding another’s conduct,” with distrust relating to

“confident negative expectations regarding another’s conduct” (Lewicki et al., 1998, p. 439). Negative expectations might include a “lack of confidence in the other, a concern that the other may act so as to harm one, that he does not care about one’s welfare or intends to act harmfully, or is hostile” (Grovier 1994, p. 240).

Different researchers often prefer the nuances of their own particular terms or definitions, which sometimes means that two researchers are talking about the same basic concept, but using different names or words to describe them. Tellingly, nearly all of the proposed definitions are based on correlates from paper-and-pencil inventories and hypothesized associations of variables that are measured indirectly. The science is improving, but there is still a sense that, as in the proverb, researchers are often trying to define an elephant, while only being able to touch a particular part of it.

How Does Trust Emerge?

Traditionally, trust has been thought of as something that emerges in interpersonal relationships over time. Competing views suggest, however, that situations and individual differences often create a more positive or negative (non-neutral) starting point, which can affect the time it takes to develop, maintain, or rupture trust. The traditional view of initial trust neutrality is called the “zero baseline” assumption (Blau, 1964; Rempel, Holmes, & Zanna, 1985). The idea is that in routine situations of interpersonal trust, people “simply suspend(s) belief that the other is not trustworthy and behave(s) as if the other has similar values and can be trusted”(Jones & George, 1998, p. 535).

Some researchers contend that people often begin a situation of trust, not at zero baseline, but at a higher (positive trust) or lower (negative trust) level starting point due to a number of factors, including psychological and cultural variables.. Consequently, any individualized starting point is probably affected by a variety of factors (McKnight, Cummings, & Chervany, 1998), such as:

- A trustor’s temperament, personality characteristics, and possibly even genotype may predispose her or him to be more trusting or suspicious of others generally. In trust research, this is generally called “trust propensity” (Rotter, 1971, 1980). Some studies have found that trust propensity varies across cultures (Fukuyama, 1995; Johnson & Cullen, 2002).
- A second set of factors comprising institution-based structures – such as regulation and oversight - may cause the trustor to feel more protected against harm or betrayal, just as their absence might increase a sense of vulnerability. Other contextual and situational factors might also serve to increase a propensity towards suspicion or

trust.

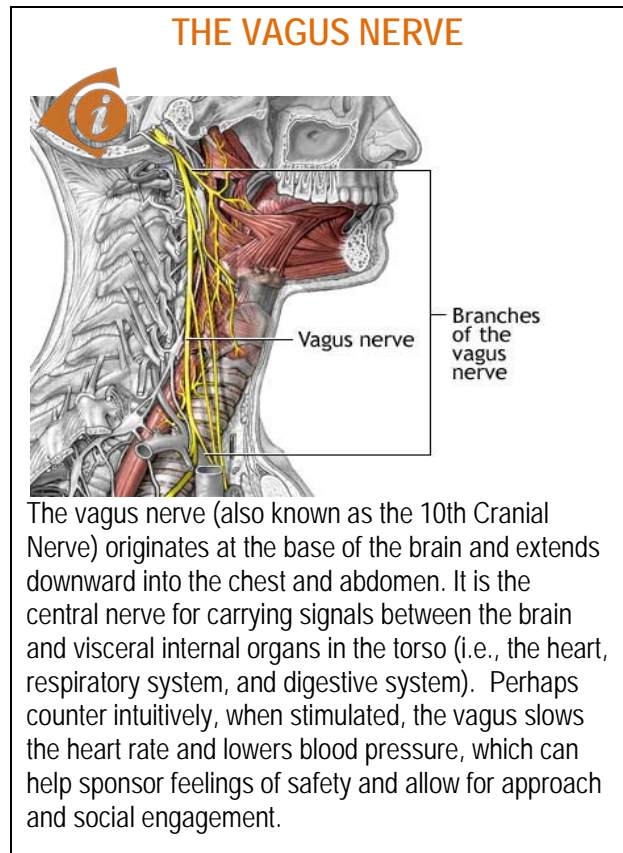
- Prior information about the trustee, such as knowledge of her or his reputation or past behavior, can influence initial baselines of trust.
- Cognitive and perceptual shortcuts and cues – such as stereotypes, rapid judgments, or responses to facial features - may operate immediately for the trustor, even if they are entirely outside of his or her conscious awareness. Such factors, while difficult to quantify, cannot be ignored, since a recent line of research shows that they can significantly affect who trusts whom, in what way, to what degree, and for how long.

This baseline question is proving to be quite important for understanding mechanisms of interpersonal trust. It prompts a fundamental need to distinguish whether we find others to be trustworthy (or not) because some positive emotion or belief is activated, or whether we make such judgments because some negative expectation or emotion, such as fear or anxiety, is inhibited. Knowing how positive affect/belief is generated or negative affect/belief is inhibited in trust development– and how these functions interact with each other – adds a layer of complexity, but one that can be used to study the triggers and mechanisms by which trust emerges, is sustained, or lost.

Polyvagal Theory

Dr. Stephen Porges, a Professor of Psychiatry at the University of Illinois, Chicago, offers one hypothesis about how human neurophysiological activation and deactivation might operate in our social interactions, potentially shaping trust baselines (Porges, 2001, 2003). Porges' concept, which he calls Polyvagal Theory, focuses on the form and function of the vagus (10th cranial nerve), a key part of the autonomic nervous system (ANS), that is responsible for inhibiting responses such as how fast you breathe and how quickly your heart beats. The theory

Dr. Stephen Porges, a Professor



The vagus nerve (also known as the 10th Cranial Nerve) originates at the base of the brain and extends downward into the chest and abdomen. It is the central nerve for carrying signals between the brain and visceral internal organs in the torso (i.e., the heart, respiratory system, and digestive system). Perhaps counter intuitively, when stimulated, the vagus slows the heart rate and lowers blood pressure, which can help sponsor feelings of safety and allow for approach and social engagement.

proposes that the vagus has two distinct branches – which Porges calls the “vegetative vagus” and the “smart vagus” - each with distinct neuroanatomic locations and neurophysiological functions (Porges, 2001, 2003). The vegetative vagus originating from the brain stem is believed to be phylogenetically older and primed for survival functions, such as freezing during threats. The smart vagus is found only in mammals and appears to adjust our level of activation and visceral responses in order to facilitate social communication and behavior (Porges, 2001, 2003).

These functions are an integral part of the human social engagement system and are similar, in many ways, to the approach-avoidance dynamic commonly discussed in the psychology of motivation (Elliot, 2006). The basic premise is that when people are presented with a novel social stimulus (such as another person) the brain (and the ANS) first orients to it – “what is it?” -, then selects whether to activate its affiliative/engagement circuits (e.g., facial expression, vocalization and listening) or the sympathetic “fight or flight” response – “is it dangerous?” (Porges, 2003). Because survival is the organism's first priority, “fight or flight” might be seen as its default response.

Sympathetic nervous system activation (SNS, “fight or flight”), however, can be counterproductive to social engagement. Affiliative engagement requires attentional resources, so when affiliation is the goal, the smart vagus sends inhibitory messages to the SNS, which calms the heart and respiration and allows the person to focus. When a threat is detected, however, and the immediate goal is to survive, the smart vagus withdraws, which allows the SNS to accelerate and prepare for “fight or flight” action (Porges, 2003, 2007).

If it is true that without a change in vagal activation social encounters would automatically trigger a “fight or flight” response, then perhaps the usual trust baseline is somewhat “below zero”. Thus, individuals would vary in the degree to which they are inclined to be wary and innately exist in some state of increased vigilance or wariness. And perhaps when we perceive a feeling of trust, we do so not because the other person has activated a positive emotion within us or inspired some discernible confidence in them, but rather because our natural alarm system is being disengaged. If the warning signals are not rapidly firing, then perhaps that translates into a feeling of relative safety. As of now, this theory remains speculative, of course, and does not resolve the zero baseline question or prove a particular mechanism of interpersonal trust, but it does at least propose one mechanism by which trust may emerge from a complex interplay between activation and inhibition of physiological systems.

Components of Trust & Trustworthiness

Trustworthiness In a decision to trust, the trustor is typically assessing the trustworthiness of another person. Trust and trustworthiness – many scholars argue (Mayer et al., 1995) – are distinguishable concepts. A common distinction presents trust as

a person's willingness to accept vulnerability to another conditioned on expectations regarding the other's behavior. Trustworthiness, on the other hand, comprises the characteristics of the thing or person being trusted (trustee) as those are framed by the environment in which trust must occur. In this way, trustworthiness may be viewed as the key antecedents, drivers or determinants of trust rather than as synonymous with the behavior of trust itself.

As a focus for research, dozens of studies have explored the potential determinants or antecedents of interpersonal trustworthiness. Three determinants of trustworthiness that have stood the test of time, having been posited early by Aristotle and continuing through the writings of contemporary authors (e.g., Kasperson, 1986; Kasperson, Golding, and Tuler, 1992) are **ability**, **benevolence**, and **integrity** (Mayer et al., 1995; Peters, Covello, and MacCallum, 1997).

Different researchers have used slightly different language to describe each of these concepts, but nearly all research has tended to incorporate ability, benevolence, and integrity. Here are a few examples:

- Peters, et al (1997) refer to the trustworthiness factors as (1) knowledge and expertise; (2) concern and care; and (3) openness and honesty.
- McKnight and Chervany (2001-2002) analyzed 65 published definitions of trust and identified four broad categories of trust-related characteristics, which they labeled– (1) competence, (2) benevolence, (3) integrity (value laden), and (4) predictability (value-less).
- Kasperson, et al., (1992) identified (1) commitment to a goal (and fulfilling fiduciary responsibilities; (2) competence; (3) caring; and (4) predictability as the four main components of trustworthiness.
- Renn and Levhe (1991) identified five component trustworthy attributes: (1) competence; (2) objectivity; (3) fairness; (4) consistency; and (5) faith (defined by the authors as goodwill).
- Covello (1992) offered the following four: 1) caring and empathy; (2) dedication and commitment; (3) competence and expertise; and (4) honesty and openness.

Each of these more contemporary concepts, however can be traced back to trustworthiness' big three.

- Ability, for example, is arguably based on a trustor's perceptions of a trustee's competence (Covello, 1992; Kasperson, et al., 1992) and

predictability (Kasperson, et al., 1992) or consistency (Renn & Levhe, 1991).

- Benevolence is based on perceptions and demonstrations of caring (Kasperson, et al., 1992), goodwill (Renn & Levine, 1991) and empathy (Covello, 1992), responsibly fulfilling obligations, and goal commitment.
- Integrity is rooted in appraisals of a trustee's objectivity, fairness (Renn & Levhe, 1991), and accurate/honest communication, each of which also supports a trustee's perceived dedication or commitment to a goal (Covello, 1992; Kasperson, et al., 1992).

Most contemporary researchers agree— whether they subscribe to a unitary or multidimensional view of trust - that trust has multiple drivers. The trustee's perceived ability, benevolence, and integrity (collectively, her or his "trustworthiness") provide the key data for the decision.

How do those data contribute to our understanding of trust? At the broad level, researchers believe these factors operate through two complementary processes in trust-related decision making; cognitive processes (generally associated with deliberation, thoughts and beliefs) and affective processes (generally associated with feelings). This distinction resonates with popular conceptions of interpersonal trust, as we sometimes *think* someone can be trusted, we sometimes *feel* like we trust them, and sometimes we both think and feel that someone can be trusted.

In practice, however, the distinctions among them are not so easily defined; the cognitive and emotional components are difficult to tease apart (Clark & Payne, 1997; Cummings & Bromiley, 1996; Van den Bos et al., 2008). Some researchers think these components actually represent distinct types and/or stages— rather than the components – of interpersonal trust, though as of yet, no decisive empirical support exists for quantifying discrete types of trust (Schoorman et al., 2007). Differing views exist about the potential roles and relative contributions of cognitive and affective factors and are a regular part of trust-related discussions and research (McAllister, 1995; Mayer et al., 1995).

Cognitive Component of Trust

The cognitive component, which focuses on the role of beliefs, appraisals, expectations, attributions, and judgments in forming trust, has been more extensively studied than the affective component – owing in part to the disciplines of the researchers and in part to the ease of measurement. The cognitive component of trust is based on having sufficient knowledge of another person to forecast with varying degrees of certainty how he or she is likely to behave in a transaction, on a task, or in an environment. It essentially comes from knowing the trustee "well enough" to feel confident that she or he will not betray the trust. This component influences a shift in the baseline level of trust from a zero baseline to a more positive or negative expectation.

A team leader, for example, might rely heavily on a new employee's academic credentials and prior work performance to assess her ability and integrity, and determine what type of assignment to entrust to her. McAllister (1995) would refer to this as cognition-based trust. Shapiro et al. (1992) would call it knowledge-based trust. Both draw on the cognitive drivers of trust decisions – often as deliberative appraisals of a trustee's ability and integrity - and are arguably very similar concepts.

Affective Component of Trust

The affective/emotional component of detecting trust is more elusive, although potentially just as influential. Most of the early studies simply focused on the absence of negative emotions, such as anger, in leading to trust. More recent studies on affective elements of trust have broadened to include a range of emotions – including hope and confidence – and to explore emotions that are present and/or activated as well as those that may be absent and/or deactivated (e.g., fear). The contemporary emphasis on understanding trust's affective component leans more heavily on concepts of mutual affinity/caring and on interpersonal bonds (McAllister, 1995).

The affective component of trust is based on shared goals, beliefs, values, and even identities among the parties. The trustor not only understands, but often shares the trustee's world view and factors that shape her or his behavior. They are “on the same page,” and this kindred connection creates, or at least reflects, an emotional bond between them. McAllister (1995) would refer to this as affective-based trust. Shapiro et al. (1992) would call it identification-based trust. Both draw on the affective drivers of trust decisions –often as appraisals of a trustee's benevolence – and, again, are arguably very similar concepts.

A research team led by Dr. Jason Colquitt, a Professor of Business Administration at University of Florida, analyzed a large compilation of studies from the trust literature, using 132 independent study samples. They found that the primary three dimensions of trustworthiness - along with individual dispositions to trust and emotional response to the trustee – comprise the major determinants of trust (Colquitt, Scott, and LePine, 2007). More importantly, they also found that the big three trustworthiness factors not only predicted trust *behaviors* but also significantly predicted people's *affective commitment*. *Affective commitment* is one's desire to be part of a collective or group because of social and emotional bonds, not just for the tangible incentives (Shore, et al., 2006). The trustworthiness triad was so robust that it predicted trust behaviors and bonds even with different trust measures, with a wide range of trustees, and in different kinds of relationships.

Trust Over Time

Swift Trust & Spontaneous Trust

Swift trust is a concept that describes the kind of trust that is required in environments in which there is little or no time to develop trust among persons over longer periods of time. However, “swift trust” has been a bit vexing in social science literature because different researchers have used the term to refer to very different behaviors. The origin of the “swift trust” concept, however, describes a dynamic that occurs in temporary or short-term working groups (Meyerson, Weick, & Kramer, 1996). Unlike the traditional notion of trust being based in social exchange and rational choice, “swift trust” is a perceptual shortcut used by temporary working dyads or groups, which allows them to behave cooperatively without first building relationships, especially when operating under time constraints. This sometimes happens when a team is assembled rapidly in response to an unexpected event, or when a new person is inserted into an existing team.

The term “swift trust” appears to trace back to Meyerson, Weick, and Kramer (1996) who suggest that “the trust that unfolds in temporary systems is more accurately portrayed as a unique form of collective perception and relating, that is capable of managing issues of vulnerability, uncertainty, risk, and expectations” (p. 167). If time is short and the group is temporary, it may not be feasible for members to spend time learning about each other, proving themselves, and building relationships before deciding to cooperate. To manage the ambiguity of vulnerability and risk, the temporary group members often use others’ roles – rather than their individual personalities - to satisfy their sense of trust (Dionisi & Brodt, 2008).

Some have used the term “swift trust,” however, to refer generically to situations in which a trustor quickly – and likely without conscious deliberation – perceives an introduced trustee as being trustworthy. This might happen because a person possesses a high degree of trust propensity, but it may also be driven by situational and contextual factors, or even features of the trustee and her or his trustworthiness (not all of which may actually predict trustworthiness, of course). In the organizational literature, this has been referred to as spontaneous trust, to distinguish it from generated trust (Hardy, Phillips, & Lawrence, 1998). Spontaneous trust “refers to situations where trusting relationships emerge ‘naturally’ or instinctively in the absence of any deliberate intent or intervention to create them” (p. 78).

Stages of Trust

Some researchers (Lewicki & Bunker, 1995; 1996) argue that trust based on cognitive or affective factors not only comprise distinct types of trust, but mark developmental stages of trust that evolve over the course of a relationship. According to this approach, all interpersonal trust begins with a calculus-based assessment of the benefits of behaving in a trustworthy way, weighed against the costs of betrayal. For

some relationships, this rational basis of trust is all that is required or may be as far as trust will develop. The relationship scope may be limited, there may be little risk, or conversely reputation or actual trust violations may preclude any deeper relationship-based appraisal.

Because many of the cognitive factors that can influence trust decisions are founded on a deeper knowledge of the other person and the stability of the other's behavior across time and contexts, it is perhaps more likely to occur only in extended relationships. Dr. Denise Rousseau, a Professor of Organizational Behavior at Carnegie Mellon University, suggests that over time the rational calculus typically becomes less important and the relational basis of trust becomes more important (Rousseau et al., 1998).

In a staged model like this, trust's affective drivers ostensibly build on each party's knowledge of the other, shared experiences, proximity, and cooperative efforts – typically in a small subset of relationships – to form an emotional bond or connection between the parties that seals their trust. Progressing to a more affective or relational basis for trust may involve a “transformation of motivation” (Kelly, 1984) where the parties move from a primary view of distinct self-interests to one of joint outcomes. This raises important practical questions of whether affect-based trust is more resilient to violations than cognitive-based trust, or whether it is more vulnerable to transgressions, and less likely to be repaired once ruptured?



RELIABILITY AND VALIDITY IN MEASUREMENTS

Within the psychological sciences, the terms reliability and validity have very specific meanings in characterizing measurements.

Reliability refers to the consistency or stability of a measure. If you measure the same thing (or person) multiple times with the same measuring tool under the same conditions, you would hope to get similarly consistent results each time. That would indicate the measuring tool was stable and reliable. However, this is no guarantee that what you are measuring is valid. For example, a ruler which is marked incorrectly will always give the same (wrong) measurement. It is very reliable, but not very valid.

Validity refers to the extent to which a device or tool measures what it claims to measure – for example, whether a measure of trust is actually measuring trust, as opposed to something else like risk-taking, social influence, etc. While less common, a measure may be valid but not reliable. Some have charged that the Myers-Briggs Type Inventory personality test is an example of a valid, but unreliable, measurement. That is, the Myers-Briggs is actually measuring certain aspects of personality, but they are not reliable dimensions, since personality is not a wholly fixed construct. So repeated MBTI tests on the same person – even under similar circumstances - will give different answers. Hence, while the MBTI appears to be validly measuring things like a person's degree of extraversion and conscientiousness, those measures will not be reliable due to different influences (such as mood or priming) on these dimensions of personality.

Defining Trust in Experiments

Despite having a voluminous library of rich, eloquent prose describing and defining trust, its types, and its components, to study it empirically, researchers must find a way to measure it in some discrete scale or task.

Trust Scales Some researchers measure trust by participants' scores on a psychometric test or instrument. Typically, these instruments contain a series of items that participants rate on a Likert-type scale; for example, responding to the statement: "I can confide in and rely on my co-workers" – with a 1-4 rating of agreement ranging from 1 (strongly disagree) to 4 (strongly agree). One serious problem with this type of research is that many trust-related studies employ trust measures that are inconsistent with their chosen definition (Gillespie, 2003). Researchers have conducted a couple of broad research reviews of trust scales and measures (Dietz & den Hartog, 2006; McEvily & Tortoriello, 2005), but none suggest that any particular scale is emerging as a gold standard. One large review (McEvily & Tortoriello, 2005) found that only 11 of 119 identified trust measures had been used in more than one study and that most studies provided little, if any, evidence that the scale was actually measuring trust. Other researchers have called for more "deep" qualitative measurement of trust using diaries, interviews, and communication analyses (Baumeister, Stillwell, & Wotman, 1990; Butler, 1991; Jarvenpaa & Leidner, 1999; Wilson, Straus, & McEvily, 2006).

Examples of Trust Scales

Scales to measure trust have been developed generally for research in organizational behavior, not specifically for field applications where individuals are highly motivated to assess and/or develop trust within high stress environments. The measures are largely self-report, paper-and-pencil inventories composed of items that tap one or more elements or examples of interpersonal trust. On most of the measures, respondents use a five- (sometimes a seven-) point response scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to rate their agreement with each item.

- Schoorman, Mayer, and Davis (2007) have been working since at least 1996 on a scale to measure the respondent's willingness (voluntarily) to be vulnerable to a potential trustee. The most recent working version of the "general willingness to be vulnerable" scale, has five items (Schoorman, Mayer, & Davis, 2007); for example:



"It is important for me to have a good way to keep an eye on my supervisor"

"Increasing my vulnerability to criticism by my supervisor would be a mistake."

- Mayer and Davis (1999) have developed a set of scales to test employees' perceptions of management's competence (6 items), benevolence (5 items) and integrity (6 items). For example:



Ability

“Top management is very capable of performing its job.”

Benevolence

“Top management is very concerned about my welfare.”

Integrity

“I never have to worry whether top management will stick to its word.”

- McAllister (1995) has developed an 11-item measure of affect- and cognition-based trust scales, to provide an example of multiple types/components/stages. Respondents rate their agreement with each item on a 7-point scale as they relate to a specific peer at work. For example:



Affect-Based Trust

“We have a sharing relationship. We can both freely share our feelings, ideas, and hopes.”

Cognition-Based Trust

“This person approaches his/her job with professionalism and dedication.”

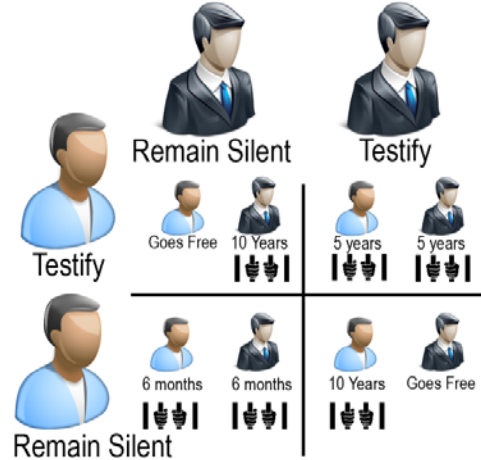
Trust Behaviors

An alternative to using surveys and scales is to create a task that requires people to execute (or not) trusting behaviors and choices. There is little empirical evidence, however, that these experimental tasks reflect the concept of trust and its complexity as it is described in the conceptual literature. This puts a different lens on defining interpersonal trust. In a neurophysiological study of trust, for example, even if the measures of brain activity and physiological response patterns were perfectly accurate, if the experimental task is not driven by or does not reflect trust then it would lack validity - even if it is named a “trust task”.

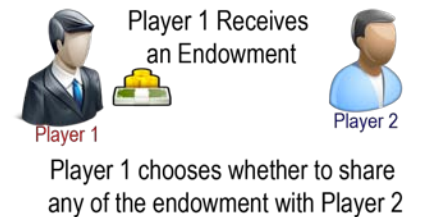
One of the most common research approaches to measuring trust in human transactions is through the use of behavioral games (Camerer, 2003). Emblematic of this approach is a sequential social dilemma game called the Prisoner's Dilemma Game (Poundstone, 1992).

The Prisoner's Dilemma Game

There are several modern variants of the game, but the classic prisoner's dilemma scenario, as created by mathematician and game theorist Albert Tucker, involves two criminal offenders who have been arrested and are being separately detained. Authorities offer an identical deal (or set of contingencies) independently to each offender. Without knowing the other's choice, each offender must choose whether to testify - or refuse to testify - against his partner. If one agrees to testify against the other ("defecting"), but the other refuses to testify against his counterpart ("cooperating") the defector goes free and the cooperator receives the maximum 10-year sentence. If both refuse to testify, both will be sentenced to only six months in jail for a minor charge. If both defect, however, both receive five-year sentences.

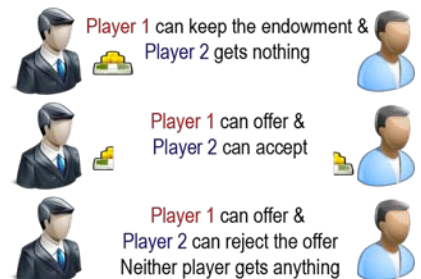


Payoffs in the prisoner's dilemma are structured so that the highest payoff occurs when one participant cooperates and the other defects, with the cooperating partner losing a substantial amount, while the defecting partner gains a substantial amount. The lowest payoff occurs, however, if both partners defect. If both partners cooperate, each will benefit more than if both defect. Though the classic game uses a static "one-time" scenario, variations often allow for multiple iterations with a single partner (creating the opportunity to punish someone for defecting or to change decisions over time as a result of the other's actions), changes in the payoff matrix, or providing information to one participant about the decision of the other.



The Ultimatum Game

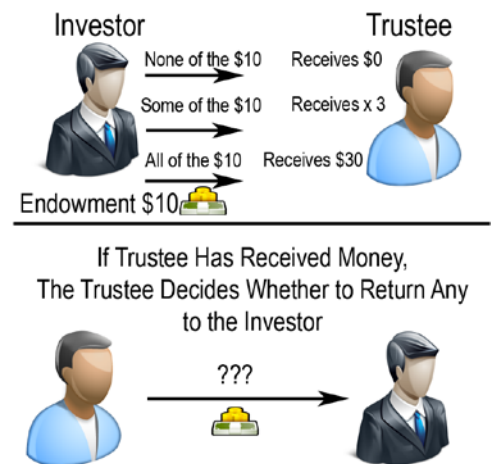
The Ultimatum Game is another commonly used behavioral game in trust-related research. In this paired-player game, Player One is given an initial endowment of points or money, and allowed to choose whether or



not to give any portion of that initial endowment to Player Two. If Player One makes an offer, Player Two can then either accept or reject the proposed division. If Player Two rejects the offer, however, neither player gets anything. In theory, the Player Two should accept any proposal that affords her or him any portion of the initial endowment, because some payoff is better than no payoff. In practice, many players will reject an offer that is not perceived as “fair” – that is, close to a 50% division of the initial endowment.

The Trust Game

The Trust Game is another popular experimental task. This is also a paired-player game, with one player designated as “the investor”, and the other as “the trustee.” Both players are given an initial endowment of points or money. The investor is allowed to choose whether or not to give any portion of her/his endowment to the trustee. If the investor chooses to bestow money on the trustee, the trustee will receive triple the shared amount (e.g., if the investor gives \$10, the trustee receives a total of \$30). The trustee is then allowed to choose whether or not to return some portion of the received amount to the investor. This game can play out over single or multiple iterations (e.g. Kosfeld, et al., 2005).



Based purely on a rational economic appraisal of utility, because there is no guarantee of cooperation, it makes sense for the investor not to pass any of the original endowment to the trustee. In fact, this tends to be the way the game plays out when the game has only one iteration/transaction or has multiple iterations but no opportunity to punish players for non-cooperative behavior. When game conditions allow players to punish a non-cooperative participant, however, cooperative behavior tends to increase, with investors passing all or nearly all of their initial endowment to the trustee, and trustees returning the “fair” share of their payoff to the investor (e.g., DeQuervain et al., 2004).

Limitations in Social Dilemma Games Social dilemma games are particularly favored by researchers who view trust as a purely economic decision, because the utilities (or payoffs) of each decision can be very clearly specified. There are open questions, however, about the extent to which these games are measuring interpersonal trust.

First, there is an obvious question of what researchers call “ecological validity”: how well do hypothetical decisions and behaviors in contrived game simulations reflect any kind of “real world” issues of trust (Zak & Ochsner, 2009)? Researchers who use these games acknowledge that “some of the everyday meanings of trust and trusting behavior are, no doubt, not captured by [the Prisoner’s Dilemma] framework” (Orbell, Dawes, and Schwartz-Shea, 1994, p.112). A recent compilation of 84 published studies worldwide using the trust game found that approximately 40% of the variance in trust and 30% of the variance in trustworthiness were explained solely by changes to the experimental protocols (Johnson & Mislin, 2008), suggesting that the games may be more sensitive to the contrived condition of exchange than to the concept of trust itself.



Ecological validity is a type of validity referring to the degree to which the methods, setting, and activities associated with an experiment approximate how it operates in the real world. Ecological validity also reflects the degree to which the results from any experiment will generalize to the real world.

Second, even if the games do approximate or generalize to real world behaviors, can “reciprocity,” “cooperation” or “collaboration” as defined in the game be reasonably used as a proxy for trust (Van den Bos et al., 2009)? Can trust exist without cooperation or can cooperative choices be made without trust? One might easily argue that cooperation is more common and more easily acquired than trust in dynamic environments where individuals or groups are highly motivated to achieve their goals and the consequences for not reaching them is also high. How do the potential consequences to the partner (as opposed to self) affect the decision; and how might an appraisal of those consequences be affected by the nature of the relationship between partners? Performance in social dilemma games would appear to be – at best - a very indirect and highly confounded measure of interpersonal trust. It would be useful to see new experimental tasks with greater ecological validity and more specificity in the measurement of trust.

Mechanisms & Signals of Trust

Though people may make certain choices based solely on a rational, cost-benefit analysis, social factors often drive decisions about interpersonal trust. These socially-based decisions may initially seem “irrational,” but understanding their psychological and neurophysiological bases will help to reveal how and why trust emerges in a particular circumstance.



1. Research suggests that people cannot accurately describe the methods or information they use to make trust decisions. In fact, too much internal reflection and deliberation may make the process less efficient and less accurate.
2. Humans often use “heuristics” or mental short cuts - primarily unconsciously - to simplify and speed-up complex interpersonal decisions, like those involving trust. While these shortcuts may work for specific purposes, they can lead to systematic biases and errors in decision making.
3. Two complementary neural systems appear to affect human trust decisions: an automatic system that works quickly but learns slowly, is driven by emotions, and doesn't do well handling unusual circumstances; and a controlled system that operates more slowly but learns more quickly, is more deliberative and driven by reasoning, and that adapts well to exceptional circumstances. Both systems can and do contribute to trust decisions, and reflect underlying anatomical differences in how information is processed in the brain.

4. Techniques used to record activity of the brain have helped to identify those structures that are involved in certain trust-related processes like empathy, acquiring social knowledge, and decision-making.
5. A variety of chemicals in the brain also play a role in trust. One that has achieved particular prominence is oxytocin, a neuropeptide that seems to facilitate social engagement and to increase a person's willingness to accept interpersonal vulnerability.
6. Psychologically, interpersonal trust decisions tend to be driven by our perceptions of others' trustworthiness, as a function of their ability, benevolence, and integrity.
7. Behavioral norms and expectations vary across different kinds of relationships and situations.
8. Group membership and relational status affect trust decisions. We are more likely to trust others whom we identify as being part of our "in-group" or with whom we share a close social relationship, even when their actual behavior and individual characteristics may not merit such trust.

There can be no simple, formulaic, or even typical description of how trust works. Because trust is complex and fluid the mechanisms by which it is formed and changes may vary based on characteristics of the trustor, the trustee, their behavior and experiences with each other over time, and characteristics of the context and setting. Over the past two decades, the scientific community has been learning more about the neural and psychological mechanisms of human social behaviors - including whether particular processes are stable or strongly affected by situational factors, and whether some mechanisms are more universal and others more sensitive to individual and cultural differences. Identifying mechanisms and signals related to trust is the focus of this second generation research on interpersonal trust.

The mechanisms of trust have been broadly classified according to two traditions of inquiry (Kramer, et al., 1999): (1) the behavioral tradition of trust, which views trust as rational-choice behavior, such as cooperative choices in a game (Hardin, 1993; Williamson, 1981); and (2) the psychological tradition of trust, which attempts to understand the complex intrapersonal states associated with trust, including expectations, intentions, affect, and dispositions (Mayer et al., 1995; Rousseau, Sitkin, Burt, & Camerer, 1998). Having discussed trustworthiness in the previous section, this section focuses on the mechanisms and signals of interpersonal trust involved in the decision-making of the trustor, and how such decisions are affected by the nature of the relationship and behaviors between the parties involved.

Trustor

How Do We Decide to Trust or Distrust? The mechanism of trust – as conceived in the behavioral tradition – is based on a rational choice model and rooted in the concept of social exchange (Blau, 1964; Dionisi & Brodt, 2008; Homans, 1958). Consistent with the homo economicus or “rational man” assumptions of classical economics, the rational choice model suggests that “people are motivated to maximize their personal gains and minimize their personal losses in social interactions, and react to other individuals, organizations, authorities, and rules from a self-interested perspective” (Kramer & Tyler 1996, p.1). This is the central assumption in social exchange theory as well – that people constantly weigh costs and benefits and make decisions based on which side outweighs the other (Blau, 1964; Homans, 1958). Trust based on social exchange also has a dynamic, developmental component. It evolves over time and across transactions as information about outcomes (e.g., whether the trustee cooperated or betrayed the trust) feeds back into the trustor’s ongoing trust appraisal (Weber, et al., 2005). This purely utilitarian, rational model has also been referred to as deterrence-based trust (Shapiro, et al., 1992) when focused only on avoiding the “cost” of betrayal, and calculus-based trust (Lewicki & Bunker, 1995; 1996) when decision making weighs those costs against the “benefits” of trustworthiness.

While it appears to be true that people generally have the capacity for rational, calculated, self-interested decision making under certain circumstances, this is not their only mechanism, and very often it is not the dominant one. As recent research is demonstrating, people are often not very accurate at knowing what factors affect the decisions they make or describing how their decisions are made. Their behavioral patterns are not totally unsystematic or unpredictable, but they do not always follow the prescribed rules of rational choice. Again, it may be that people are best understood as being neither rational nor irrational, but as social.

This is likely to be as true for trust decisions as it is for a range of other choices that people make. If you just ask people whether, how and why they trust someone, they will likely respond with a sincere rational \ post-hoc account, but, when researched using controlled experiments, it is clear that such descriptions often have little to do with the reality of how humans decide and behave.

Despite the popularity of analogies and metaphors that compare the brain to a computer, the human brain is functionally not well-equipped for complex configural analyses of information or for context-free decision making. The brain tends to compensate for these limitations by simplifying the decision points or using mental shortcut decision rules, sometimes called “heuristics” (Kahneman, 1991, 1994; Kahneman, Slovic, & Tversky, 1982).

These systematic biases and mental shortcuts have been observed and extensively studied for more than 75 years, and some of them that apply to cost-benefit decisions are the focus of behavioral economist Dan Ariely's popular book: *Predictably Irrational: The Hidden Forces That Shape Our Decisions* (Ariely, 2009). One can also find these inconsistencies in experimental trust studies such as in the Ultimatum Game when recipients reject an offer and knowingly choose to get nothing because they perceive the division of funds to be unfair (Kahneman, Knetsch & Thaler, 1986), and would rather sacrifice their own gain in order to punish others.

Without reviewing the dozens of short cuts and processes (the “heuristics”) that affect our decisions (see Kahneman, Slovic, & Tversky, 1982), three general cognitive trends are worth mentioning here as they relate to our decisions about interpersonal trust.



#1 Our limited brains, in order to function efficiently, attempt to simplify our complex world.

When faced with a decision about trust, there is an almost limitless amount of data available to us that could affect our choices. Most humans have neither the time nor mental computational capacity to process it all, nor to assess what is relevant and what is irrelevant. So the brain tends to pick out what it deems most salient and to cluster chunks of information together – or to use some factors as proxies for others – in order to make the best decision possible under the circumstances. Unsurprisingly, then, much research suggests that the best possible human decision is nearly always suboptimal – both in terms of accuracy and the process by which the judgment is rendered (Kahneman, 1991).

Research on the social psychology and social neuroscience of stereotyping behaviors illustrates how these simplifying mechanisms sometimes work, particularly in people's judgments based on features like appearance, race and gender. Researchers have presented subjects with pictures of strangers' faces. Some faces are consistently rated as being more trustworthy than others (Todorov, 2008). In fact, very high levels of agreement emerge about what untrustworthy people “should” look like. The brain uses those cues to render a quick judgment within 150 milliseconds (Engell et al, 2007; Todorov et al, 2009). Those consensus impressions, however, tend not to correspond to the pictured persons' actual trust-related behavior or their trustworthiness for any specific environment (Engell et al, 2007; Gordon & Platek, 2009). The untrustworthy valence also evokes an automatic emotional response. When a person views an untrustworthy face, the brain's amygdala (fear center) is activated, and this is true even when the person is not first primed to assess the other's trustworthiness (Breiter et al., 1996; Frith & Frith, 2006; Frith & Singer, 2008).

These processes can carry over into various forms of prejudice as well (Jenkins, et al., 2009). Prior studies have shown the amygdala to react more to “negative attitude” stimuli than to “positive attitude” stimuli, and across studies, even with different methods, when Caucasian or African American research subjects are presented with the picture of an African American person, the amygdala is often activated (Eberhardt, 2005; Ito & Bartholow, 2009; Ito, et al., 2006; Lieberman, et al., 2005; Wheeler & Fiske, 2005). The degree of activation varies somewhat from subject-to-subject and is statistically related to implicit (unconscious) measures of prejudice, but not to explicit measures of prejudice - an example of how conscious appraisals of our own cognitive processes are often at variance with our actual behavior and our implicit attitudes (Ito & Barthlow, 2009).

In a study of gender-based perceptions and trust, Orbell and colleagues (1994) assigned judges to predict whether players would cooperate or defect in a “trust” social dilemma game. Both male and female judges predicted the female player would cooperate much more often than male players, though this expectation was not confirmed in the player’s actual performance. The judges did not explicitly use gender as a basis for their predictions or for choosing whether to play the game with a particular individual. This could simply reflect an implicit bias, but it could also suggest that the stereotypic biases about gender did not necessarily drive individual choices – or at least that they were sublimated by other factors (Orbell et al., 1994).

When humans get too deliberative in analyzing their decision process, they often fail to accurately reflect on how the decision is made. When they try to add more options and incorporate more information and data points into their decisions, the outcomes may become less, rather than more, accurate. A recent study found that people were able to accurately identify psychopaths from a 5 second video clip, but that longer clips (more information) did not improve – and in some case reduced - their accuracy. These participants also performed comparably well when given only nonverbal cues or only verbal cues, but more poorly when given both together (Fowler, et al., 2009). The brain’s simplifying shortcuts are not perfect, and not always economically rational, but more often than not, in day-to-day decisions, they serve our interests reasonably well.



2 Human brains are wired to make decisions about options and value based on comparisons, not in absolute terms.

When meeting a stranger, our mental computer is not just uploading and calculating variables like attractiveness, likeability, and facial expressions in relation to some absolute criteria or gold standard. It is appraising characteristics in relative terms by comparing them to some other person, option, or mental representation, including our own self. The explicit question of whether this person is trustworthy is built on an answer to the tacit question of “relative to what/whom?” This suggests that judgments may change based on the point of comparison, or frame of reference (Tversky & Kahneman,

1981). Indeed, this is what researchers consistently find both in consumer choices and interpersonal appraisals. Comparisons and “framing” guide the decisions.

Framing and comparison effects also may affect our decisions by evoking emotions. Here's a classic example: A group of people are given a scenario in which 600 people are in peril, and they must decide between two courses of action. Half are given the first frame: “Option A will save 200.” The other half are given an alternative frame: “Option A will allow 400 people to die.” The phrasing of the first emphasizes the number of lives saved, while the alternative frame emphasizes the number of deaths. The actual probabilities are identical, but more people choose Option A with the first frame than with its alternative (Kühberger, 1995; Tversky & Kahneman, 1981). A team of researchers (De Martino, et al., 2006) used this task in an fMRI study and found each of the two frames produced different patterns of activation in the amygdala- a region involved in processing emotional and social information, and correlated strongly with the chosen course of action, suggesting emotions were responsible for the framing effect. Interestingly, however, task-related activity in the brain's higher level thinking and reasoning areas (the prefrontal cortex) mitigated susceptibility to the framing effect.



3 *Our expectations affect our judgments and outcomes.*

Our expectations are often built on a set of tacit or implicit assumptions, which may not be perfectly rational, but do simplify our decisions. Studies show, for example, that people report much more pain relief from taking a pill (placebo) when told it costs \$2.50 than when told it costs only a dime. Why? Generally higher quality items cost more, so humans carry the implicit notion that “you get what you pay for.”

The effects of our expectations carry over into all kinds of interpersonal decisions in various ways. For example, if we believe a person does not like us, we are more inclined to interpret how they look at us or what they say as being negative or hostile than if the same look or words came from a friend. This is one example of what decision researchers call confirmatory bias (Evans, 1989; Rabin & Schrag, 1999). Because the brain is looking for ways to simplify information and for benchmarks (even if arbitrary) to make comparisons, what we “find” in our environments tends to be guided by what we expect to find. This suggests that what we know of people's reputations is very likely to affect our appraisals of their trustworthiness. Indeed, prior studies have found that an untrustworthy reputation evokes feelings of distrust (Deutsch, 1960; Lewicki & Bunker, 1995, 1996).

This effect is not always maladaptive or counter-productive. In some circumstances, it may accelerate our ability to cooperate with others. Humans generally learn (and acquire social knowledge) about other people over time as they interact with them, and as they observe them interacting in turn with


others. Through those observations, humans come to assign a positive or negative value to the other person (Frith & Singer, 2008). In social dilemma games with multiple iterations, people not only learn who is a cooperators and who is a defector, but they also come to like the former and dislike the latter. Each person's earned status creates a reputation that generalizes to her or his likeability, which has been shown to shape the perception of their trustworthiness.

What Happens in the Brain When We Decide Whether to Trust?

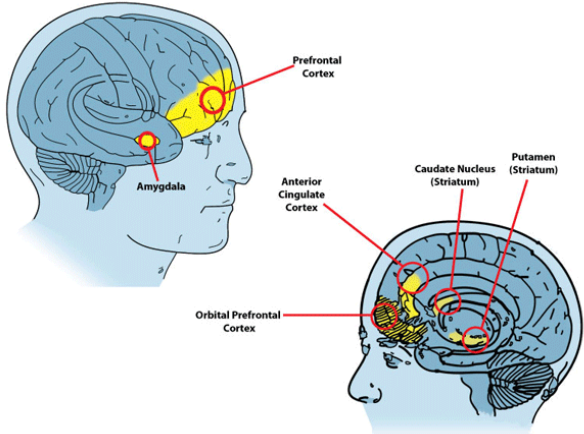
Social cognitive neuroscientists have used imaging technologies to examine what happens in the brain when deciding whether to trust. In most of the studies, the researchers observe images of brain activity while participants are engaged in various social dilemma games. When people engage with cooperators, their brains show a very different response pattern than when they engage with defectors. Engaging with a defector, not surprisingly, tends to activate the brain's fear center – the amygdala (Singer et al., 2004a).

The brain also tends to respond somewhat differently based on whether the other player's cooperation or defection is intentional or not. One study, for example, compared brain activity patterns among persons engaged with intentional cooperators to those engaged with non-intentional cooperators. Both kinds of cooperators behaved the same way. The only difference was in their perceived intentions. But people's brains responded differently to the faces of intentional than non-intentional co-

operators. The nature of those differences in brain activation suggests "subjects were not simply learning which faces were associated with reward. They were learning whom to trust" (Frith & Frith, 2006, p. 38).



TRUST IN THE BRAIN



Many areas of the brain play a role in supporting trust-related processes, including the amygdala, prefrontal cortex, anterior cingulate cortex, caudate nucleus, and putamen, pictured here. The specific functions of each area are described in more detail within this section.

Confirmatory biases and reputation-based expectations, however, can sometimes override interpersonal experiential learning. One study used an iterative trust game in which participants were given a “bio” of their counterpart player, presenting either a neutral, a praiseworthy, or a morally suspect history of behavior (Delgado, Frank, & Phelps, 2005). In reality – across all three conditions – the counterpart partners played with a 50% cooperation/reinforcement schedule.

A part of the brain that guides future decisions based on prior reward feedback (the striatum) was generally activated in participants when the partner cooperated or defected, most likely representing reward-based trial and error learning. But significant activation of the striatum was only observed when participants thought they were playing with the morally “neutral” partner, not when playing the morally “good” partner. In fact, as people played the game through multiple iterations – even though they only achieved “cooperation” half the time – participants persistently made more risky choices when they thought the partner had a good moral reputation. Thus, prior expectations about an individual drove their judgments and in some cases inhibited their ability to learn from their experiences (Delgado, Frank, & Phelps, 2005).

Automatic and Controlled Processing Systems

The human brain has two powerful, but somewhat distinct, systems for processing information, one of which is more automatic and the other more controlled (Loewenstein, 2000; Engel & Singer, 2008); both are important for understanding interpersonal trust (Winston, et al., 2002). The automatic system operates quickly and spontaneously, taking inputs simultaneously from multiple sensory channels, while the controlled system operates more slowly and intentionally to reflectively consider information in a stepwise fashion.

Automatic	Controlled
Reflexive	Reflective
X-System	C-System
Bottom-Up	Top-Down
Driven by emotion/intuition	Driven by logic/reason
Fast operation	Slow operation
Less affected by cognitive load	Affected by cognitive load
Efficient under conditions of high physiological arousal	Less efficient under conditions of high physiological arousal
Sensitive to subliminal influences	Less susceptible to subliminal influences
Insensitive to nuances and “exceptions to the rule”	Sensitive to nuances and can handle “exceptions to the rule”
Learns slowly	Learns quickly

Different names have been used to refer to these automatic and controlled systems: Reflexive and Reflective; X-System and C-System (Lieberman, 2007; Satpute & Lieberman, 2006); bottom-up and top-down (Ochsner, et al., 2009); and Low Road and High Road (Goleman, 2006). It is a “dual process”

model (Chaiken & Trope, 1999; Evans, 2003), with the automatic system being driven more by emotion/intuition and the controlled system more by logic and reason. The dual process model involves more than just two discrete sets of neural pathways. Both systems are affected by a range of hormones, neurochemicals, and perceptual factors, like the cognitive biases just described (Lieberman, 2007). Each system can also affect the other.

Each system has its own strengths and weaknesses and is better suited for some kinds of tasks or situations more than others. The systems may conflict, but one is not necessarily the enemy of the other. Research evidence suggests “decisions dictated by reason are not always good, while decisions dictated by emotion are not always bad” (Frith & Singer, 2008, p.3884). Though the automatic system is fast, unaffected by cognitive load, and works efficiently under conditions of high physiological arousal, it is also more sensitive to subliminal (outside of conscious awareness) influences, less sensitive to nuances and “exceptions to the rule,” and is much slower to learn. The controlled system, though slower, less efficient under high arousal, and more sensitive to cognitive load, is relatively unaffected by subliminal influences, learns more quickly, and handles “out of the ordinary” cases very well (Lieberman, 2007; Satpute & Lieberman, 2006).

There is a dynamic interplay between the automatic and controlled systems that provides for a balance of influence. Emotions tend to dominate our initial interpersonal impressions and our interpersonal predictions, so they may have the home field advantage but they don't always win. The controlled system can exercise a top-down override of biases and emotional impulses, so that we are not entirely subservient to our inclinations, impulses and predispositions (Rilling et al., 2007). Those top-down controls keep our behavior in line and permit us to have more harmonious and productive social exchanges (Frith & Frith, 2006). The rational-emotional balance is a critical component in regulating our social behavior – likely so with trust as well.

The tension between reason and emotion in decision making is particularly important to understanding complex social behaviors such as trust (Han et al., 2009). Trust researchers have acknowledged for years that the rational and emotional aspects of trust often work together. Nearly 25 years ago, it was observed that “trusting behavior may be motivated primarily by strong positive affect for the object of trust or by 'good rational reasons' why the object of trust merits trust, or, more usually, some combination of both. Trust in everyday life is a mix of feeling and rational thinking” (Lewis & Weigert, 1985, p. 972).

Deciding in Social Contexts

The human brain and physiology are known to operate somewhat differently in social (interpersonal) than in non-social contexts. In interpersonal trust transactions, humans attempt to read what the other person is trying to convey (communicative intent), while attempting to convey a trustworthy impression (Berg et al., 1995). This effect does not occur, however, when they are interacting with a computer (McCabe et al., 2001; Rilling et al. 2004) or when outcomes are determined by an algorithm (for example, in an automated trust game) (Singer et al. 2004). During an interpersonal trust game, for example,

each player is simultaneously signaling and assessing trustworthiness (King-Casas et al., 2005). In our trust appraisals, to form expectations regarding another person's behavior, we must be able to understand the other's perspective through the lens of their own beliefs, intentions, and emotions. This typically occurs through a mix of sensory inputs and social cognitive processes, which appear to be unique to social/interpersonal interactions (McCabe et al., 2001; Rilling et al., 2004).

Recent research suggests that humans use the same specific neural networks to process others' mental and emotional states as when we are experiencing those states ourselves (Jackson et al., 2006; Morrison et al., 2007). So, for example, if an individual is watching another person being afraid and trying to understand what he/she is feeling and experiencing, that individual will activate many of the same brain areas and pathways as if they were being directly frightened (Frith & Singer, 2008). The degree of activation, however, may depend on a variety of social factors, such as the individual's general attitudes/feelings toward the other person and the extent to which they can identify with the other person.

A variety of automatic and controlled processes are responsible both for our capacity to understand thoughts and feelings from another's perspective and for these parallel or "shared" patterns of neural activity. At the most fundamental, biological level, there is accumulating evidence that our own neural systems detect and mimic what we observe in others. A recently popular hypothesis is that this is the effect of a mirror neuron system (Rizzolatti and Craighero, 2004).

Mirror Neurons

It is clear that the human brain is sensitive to social/interpersonal transactions. A trustor's brain is affected by the mere presence of the potential trustee. The resulting brain activity will affect whether the individual decides to trust the other. How do these socially-activated brain changes occur? One possible mechanism is through mirror neurons. Mirror neurons are a set of neurons that respond both when an individual performs a goal-directed action, and when observing another individual performing the same action. Neural pathways in the inferior frontal gyrus (IFG), ventral premotor cortex, inferior parietal cortex, and posterior superior temporal sulcus (pSTS) seem to be particularly implicated in this type of activity (Iacoboni and Dapretto, 2006; Rizzolatti and Craighero, 2004). These neurons are believed to be crucial to human and non-human primate abilities to imitate others. Some suggest that they are also responsible for social contagion effects (such as yawn contagion) that occur when others' feeling states, facial expressions and body postures cause our bodies to respond accordingly (Frith & Frith, 2006).

Another revelation showing that these mirror systems are socially sensitive, not just reflexive, is that the extent of our mirror activation seems to depend on the degree of social engagement. If a person moves while making eye contact with an observer, the observer will exhibit much stronger neural activation than if the actor was facing away from him (Kilner et al. 2006). Mirror neuron activity

has primarily been studied in the context of intentional imitation of goal directed action. Very little data exist on the relationship between mirror neurons and nonverbal communication, most of which appears to be unconscious and non-cognitive.

Empathy Humans (and their brains) – as noted in prior research (see p. 29) - not only respond to others' behavior, but also to their intentions. Empathic processes are a key part of how people assess others' intentions. These are the processes that allow us to understand and even share others' emotional and feeling states (de Vignemont & Singer, 2006). Empathy occurs at an intermediate level on the automatic-controlled continuum. Whereas social contagion effects occur unconsciously, when we empathize we are aware that our reactions and feeling states are prompted by someone else's reactions and experiences (Lamm, et al., 2008). We are – with awareness - viewing a situation from another person's perspective. Our empathic responses are also socially sensitive. The nature and extent of their activation can vary according to nature of the relationship, the situation, and how we perceive the other person (Akitsuki & Decety 2009). Having a strong emotional bond with the other person may enhance our empathic activation (Singer et al. 2004a), but if we perceive the other person as being unfair or somehow deserving of pain or punishment, we may experience much less empathic activation (Lamm, et al. 2007; Singer, et al.,2006). The degree of empathic response can also be modulated by the intensity of the stimulus we are observing (Avenanti et al. 2006).

Mentalizing Mentalizing (also called Theory of Mind) invokes the very conscious and deliberate processes we use to infer or predict what others are thinking and feeling (Frith & Singer, 2008). It's what happens when we are thinking about what someone else may be thinking. We know only a little from social neuroscience research about this process, and mostly in an indirect way. In these studies, people are rarely interacting with another person. Instead, they are typically shown a picture or story and asked to relate what the subject might be thinking or feeling (Hampton et al., 2008). These non-social actions are called "offline" tasks. Brain imaging studies of mentalizing activity report fairly consistent findings, including – (a) activation of the pSTS, an area at the bottom and rear of the brain known to be active when we are evaluating others, and also associated with altruism and ethical/moral decision making, and (b) activity in the medial (referring to the area closest to the body's centerline) prefrontal cortex (mPFC), an area in the front of the brain believed to help us discern the meaning of our emotions and experiences (Frith and Frith, 2003; Saxe et al., 2004). In social dilemma game studies where participants are assigned either to play against a person or a computer, the mPFC is activated during inter-person play, but not during person-computer interaction (McCabe et al., 2001; Rilling et al., 2004).

Detecting Signals of Trust in the Brain

Two of the most common contemporary methods for measuring the neural basis of psychological processes such as trust are EEG and fMRI. EEG measures changes in electrical brain currents that occur when large groups of neurons in the outermost layer of the brain, the cortex, fire simultaneously. These changes are measured using electrodes placed on the surface of the scalp and face. Because EEG picks up electrical signals, it is a fairly direct and “real-time” measure of brain activity. The signals are detected very near the time when the activity occurs. Because each EEG electrode covers a zone, however, it is not very precise in pinpointing highly focalized areas of activity.

EEG and fMRI as Measures of Trust

The powerful magnetic field in fMRI is used to detect changes in the ratio of oxygenated to deoxygenated hemoglobin in the brain’s blood flow. This ratio is known as a blood-oxygenated level dependent (BOLD) response. Oxygenated blood tends to flow into areas of the brain that are active, so changes in this oxygenation ratio correlate with changes in the surrounding level of neural activity. Unlike EEG, it does not measure neural firings directly. fMRI is much better than EEG at isolating small areas of signal activity, but – because it is only measuring changes in oxygenated blood flow, and not neural electrical signals - it is also a more indirect, and somewhat delayed measure of brain activity. EEG measures neural firings as they occur, but changes in blood flow take some time, perhaps even several seconds, after the neural response. fMRI is better than EEG at pinpointing location, but worse at pinpointing the timing of neural activity. The two methods can be combined, but doing both simultaneously is technically and computationally demanding (Debener & Herrmann, 2008; Herrmann and Debener, 2008; Moosman, et al., 2008; Varios et al., 2006) and doing them sequentially introduces variability that could confound the results.



Several fMRI studies have identified patterns of BOLD response during games of trust and during judgments of trustworthiness based on facial expressions. Commonly activated brain areas include: the amygdala, anterior medial prefrontal cortex, paracingulate cortex, insula, ventral tegmental area, septal area, fusiform gyrus, superior temporal sulcus, and orbitofrontal cortex.

Technical measurement aside, most neuroimaging and neurophysiological studies of trust to date have very little conceptual or theoretical foundation (some do not even define trust at all) and are profoundly lacking in ecological validity. They use offline tasks or contrived social dilemma games, in which trust is inferred from cooperative behavior in a reciprocal exchange. Because of the constraints of cumbersome technology, nearly all are done in laboratory

environments. Even if the neural measures were direct and highly precise, it is not at all clear that trust is what is causing the neural activation.

Given that fMRI research thus far has not been able to identify consistent and specific signals for even basic emotions, (Barrett and Wagner, 2006) it should not be surprising that anything like a “trust center” in the brain” (if one exists) has eluded detection. Most neurophysiology and neuroscience techniques used in the study of trust provide only partial insight into the system as a whole. It is possible that techniques like psychoneuropharmacology and behavioral genetics, which address cognition and behavior at a systemic level, might hold promise in the investigation of large scale neural system interactions that are key to the development and maintenance of trust.

Neurochemicals & Trust *Oxytocin*

Oxytocin (OT) is a neurochemical – technically a “neuropeptide hormone” - that has received a flood of popular attention over the past several years. It has even been hyperbolically described as the “trust hormone.” OT is a naturally occurring neuropeptide, found in most mammals, and in humans is synthesized in the hypothalamus (a part of the brain that connects the nervous and endocrine systems, serving as a control center for hormones and regulating behavioral circadian rhythms/patterns). OT is implicated in a diverse array of physiological and psychological processes including birthing, lactation, sexual arousal, blood pressure, anxiety, and social behaviors (Gimpl & Fahrenholz, 2001; Barberis & Tribollet, 1996). OT appears to facilitate the forming of social bonds and attachments (Carter, 1998; Insel & Young, 2001); to speed the healing of physical wounds; to enhance positive communications and perceived social support (Gouin, et al., 2010), and to mitigate the stress-response effects of social anxiety and social stressors (Heinrichs et al, 2003).

In other experiments, studies have shown that administering OT (intra-nasally) can artificially increase its levels in the body, leading to increases in cooperative and trust-like behaviors (Baumgartner, et al., 2008; Kosfeld et al., 2005). Professor Ernst Fehr (Fehr, et al., 2005; Fehr, 2009, 2008) from the University of Zurich and Dr. Paul Zak (2008, 2007, 2005), director of the Center for Neuroeconomics Studies at Claremont Graduate University, have been at the center of efforts to explore the role of OT in interpersonal trust and relationships. In previous experiments using the Trust Game, researchers found that OT levels naturally and consistently rise in the receiving player who was given part of the endowment from the first player. OT’s role in this signal of being trusted, therefore, was confirmed when researchers administered doses of OT, and players tended to show more reciprocity in their game behavior; that is, they were both more likely to give money back and to return a greater amount of their benefit to the other player. With the boost of OT, reciprocity and generosity increases, even when risk-taking itself (e.g., playing “against the odds” in a gambling or probability task) does not change,

suggesting OT's effects are very specific and sensitive to the social context (Kosfeld et al., 2005).

Following up on these findings, Professor Gregor Domes from the University of Zurich led a study (Domes et al., 2007b) exploring whether and how OT might affect a person's ability to infer another's internal state. Recall, these tasks generally fall into the category of mentalizing or Theory of Mind. Though some colloquially refer to this as "mind reading," that might overstate the process a bit. Reading others, however, is a regular and essential part of human social engagement generally, and because trust judgments are conditioned on our expectations of how others will behave, trying to gauge the motivations and intentions of others is likely to be a part of assessing whom to trust, with what, to what degree, and under what conditions. Therefore, the fact that OT seems to improve the accuracy of this assessment is of particular interest, and was investigated further in a follow-on experiment.

READING THE MIND IN THE EYES TEST STIMULI



Baron-Cohen S. et al. (2001)

Domes and his colleagues used the "Reading the Mind in the Eyes Test" (RMET; Baron-Cohen et al., 2001) in a rigorous double-blind, placebo-controlled experiment. RMET was originally developed by researchers in the 1990s to measure impairments in social mentalizing functions among people with autism spectrum disorders. RMET participants view a series of photographs, each depicting the area around a person's eyes, and are asked to choose from a list of two to four words which best characterizes what the pictured person is thinking and feeling (Baron-Cohen, et al., 1997, 2001). The photos vary somewhat in their level of difficulty. Domes and colleagues found that participants given intranasal OT performed significantly better on the RMET than those given the placebo, and that the difference was particularly apparent in the more complex or challenging inferences – more evidence of OT's social specificity (Domes et al., 2007b).

In a separate set of studies by the same researchers, subjects viewed snapshots of faces displaying angry, fearful, happy or neutral expressions.

Males given OT showed a blunted response of the amygdala to anger, fear, and happiness, compared to placebo-treated males (Domes et al., 2007b). In another study, females were tested using the same pictures and an increase in amygdala activation was seen in the OT-treated females, but only when shown the fearful faces (Domes et al., 2010). These results further demonstrate the role of OT in processing emotional and social stimuli, but also the important interactions it may have with other neurochemicals, such as sex hormones, and how this may modulate neurophysiology and behavior.

Another intriguing aspect of OT studies in human interaction is that there is a distinct subgroup of people – approximately 2% of their study participants – who almost never reciprocate and seem more impervious to OT's socially facilitating effects. Some have likened this group to “psychopaths” who tend to show callous, unemotional disregard for other people. Researchers suggest that most people reciprocate conditionally – when the other player sends them more money, they return more money. But these hardcore non-reciprocators don't behave that way. One might be inclined to think that perhaps, their brains - unlike most - aren't releasing OT when they initially receive the money. Surprisingly, they find quite the opposite.

OT's normal release pattern is in tightly regulated bursts. When the brain perceives a social cue of trust (like being given money in the Trust Game), its typical pattern is to quickly switch on OT production to release the chemical, then to quickly switch off again. In the non-reciprocators, the automatic “off switch” doesn't engage and they wind up with very high levels of peripheral OT. Yet they don't respond to OT like the others. It doesn't increase their reciprocity and cooperative behavior. This has led scientists to wonder if perhaps the glitch among the hardcore non-reciprocators lies in their OT receptors, which may be abnormally upregulated or downregulated in specific regions of the brain or have structural or functional problems such that OT does not appropriately bind to the receptor. Additional research is needed to understand the effect of individual differences in the oxytocinergic system on social decision-making processes.

Vasopressin

Vasopressin is a peptide hormone with a chemical structure very similar to that of OT, and also synthesized primarily in the hypothalamus (Skuse and Gallagher, 2009). Vasopressin expression is modulated by genetic mechanisms on the X- or Y-chromosomes and may promote somewhat different responses in men than in women. Like most hormones and neurochemicals, vasopressin has multiple effects and functions. Though it acts as an antidiuretic, and is involved in regulating blood pressure, it has also been associated with male-typical social behaviors, including aggression, pair bonding, scent marking, and courtship (Heinrichs et al., 2009). Centrally active vasopressin seems generally to be associated with increased vigilance, anxiety, arousal, and activation. Interestingly, increases in OT usually suppress vasopressin.

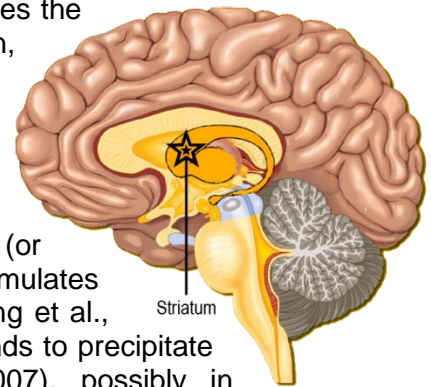
Dopamine

Dopamine (DA) is one of the most important neurochemicals in the brain's reward system (Badgaiyan, et al., 2009). The dopaminergic system modulates emotion – such as fear – and regulates the brain's perceptions of reward, particularly in social behavior. DA serves many other functions as well from pleasure seeking to detecting disruptive or disturbing environmental changes, and even selective information processing (Pani, Porcella, & Gassa, 2000). Dopamine has somewhat different effects when it is distributed in different areas of the brain. Its circuits in the upper (dorsal) striatum, which includes the caudate nucleus and putamen, for example, can help us to monitor the outcomes of our actions in order to facilitate reward-based learning. Dopaminergic circuits in the lower (ventral) striatum can help anticipate or predict whether reward will result from a future action. In the case of interpersonal trust, fear is often prompted by a belief or feeling that the other person will either act against our expectations, against our interests, or both. Reward, on the other hand, occurs when our positive expectations about the other's behavior are met. In that way, Dopamine contributes physiologically to our decisions about when, with whom, and under what circumstances we should be vulnerable to another, and helps us to learn from our trust experiences and our assessments of others' trustworthiness.

Brain Structures & Systems of Trust

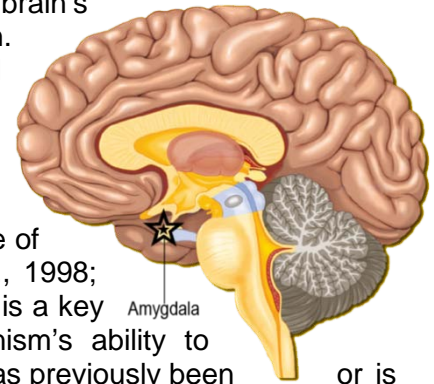
The striatum

The striatum – which includes the caudate nucleus, putamen, and nucleus accumbens— plays a major role in the brain's reward system. This is primarily because of its role in regulating dopamine (DA), known to be a key chemical in the reward pathway. Research studies have found that engaging in cooperative (or sometimes “justified” punishing) behavior stimulates activity in the striatum (DeQuervain, 2004; Rilling et al., 2004). Conversely, activation in the striatum tends to precipitate cooperative behaviors (Caldu & Dreher, 2007), possibly in anticipation of a reward. Cooperation occurs when two or more people act toward a mutually beneficial outcome. Rationally, cooperation only makes sense when it is reciprocated. So, to use cooperation adaptively in situations of interpersonal trust, people need to be able to learn and to anticipate when they should and should not do it. Dopamine pathways in the striatum help to regulate those signals and to facilitate adaptive learning about when to trust.



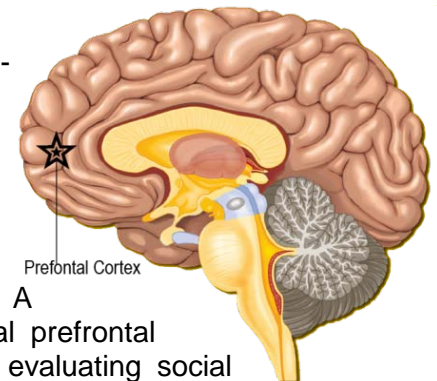
The amygdala

The amygdala was once thought to be the brain's center for fear-based emotional expression. Accumulating evidence supports a more general role for the amygdala in detecting threat and signaling reward, fear, and emotionally-laden social cues, and does so both for conscious, cognitively driven emotional responses and for unconscious and automatic responses like those of the autonomic nervous system (Adolphs, et al., 1998; Adolphs, 2008; Pessoa, 2008). The amygdala is a key structure for context conditioning – an organism's ability to locate and detect environments where reward has previously been or is likely to be found, and to avoid those without reward or where danger may be present (Le Doux, 2003). Studies using positron emission tomography (PET) and fMRI clearly show involvement of the amygdala in recognizing emotional facial expression, and suggest it may be important for social cognition as well (Kandel, et al., 1991). People decide to trust (or not) based on whether the other person's anticipated actions represent a potential threat or a potential reward (they will cooperate and behave as expected). The amygdala acts somewhat like a "social sonar" for interpersonal cues, helping us anticipate how the other person is likely to act.



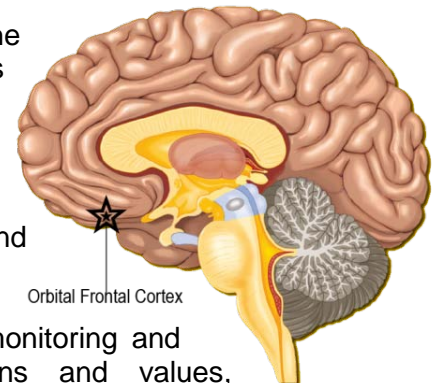
The prefrontal cortex (PFC)

The prefrontal cortex (PFC) is the brain's goal-directing cognitive control center. The PFC can be subdivided into three major regions: orbital, medial, and lateral. The orbital and medial regions are largely involved in emotional behavior, and the lateral region provides the cognitive support to regulate speech, reasoning, and the sequencing of behavior (Fuster, 2001). A robust and consistent finding is that the medial prefrontal areas are activated in humans when they are evaluating social norms and engaged in mentalizing tasks, particularly assessing another person's essential character or enduring traits (as opposed to what the person is imminently intending to do) (Frith & Frith 2003; Van Overwalle, 2009). It may also help to maintain a self-other distinction while facilitating our ability to relate to an experience or situation from another person's perspective (Elliott, et al., 2000). The PFC handles working memory and behavioral rules, which it synthesizes with information from all the forebrain systems to choose an appropriate course of action (Blumenfeld & Ranganath, 2007). The PFC helps us to organize and evaluate the neurochemical signals (and other conscious social cues) of fear, threat, or reward and to analyze the situation from the other's perspective to decide whether acting on trust is warranted in a particular situation.



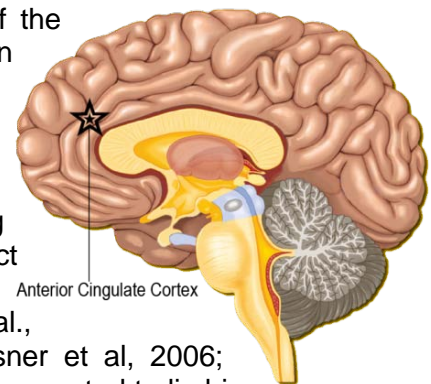
The orbitofrontal cortex (OFC)

The orbitofrontal cortex (OFC) located on the orbital surface of the frontal lobe, receives inputs from various sensory regions and from subcortical structures, such as the amygdala (Elliott, et al., 2003). The OFC is actively engaged in regulating social behavior, especially in reasoning and making decisions and choosing responses under conditions of uncertainty (Elliott, et al., 2003). The OFC is simultaneously active with the amygdala, in monitoring and storing information about reward conditions and values, especially in iterative transactions (Elliott, et al., 2000). It is activated both with intentional and unintentional (embarrassing) social norm violations (Berthoz, et al., 2002). It is also responsive to angry faces (Elliott, et al., 2000) and is likely part of a system that responds to others' anger and aversive reactions. So, the OFC – like the PFC – also supports our reasoning/decision-making about trust, but its effect is strongest when the situation is ambiguous, and it relies heavily on emotion-related signals for the amygdala.



The anterior cingulate cortex (ACC)

The anterior cingulate cortex (ACC) is part of the brain's executive control system, responsible in part for resolving conflicting information such as when people are sending "mixed signals." Functional neuroimaging studies have shown ACC activity during tasks that engage selective and sustained attention, working memory, language generation, conflict monitoring, and controlled information processing (Botvinick et al., 1999; Carter et al., 1998; Cohen & Servan-Schrieber, 1992; Posner et al, 2006; Raichle, 2003). The ACC is also anatomically connected to limbic (controlling emotion) and motor (controlling movement) cortical structures. Humans' ability to infer another person's mental states – sometimes called mentalizing - seems to rely on activation of the ACC, as well as medial prefrontal areas. It may also be a hub of emotional and cognitive decision inputs for choosing how to behave in ambiguous or uncertain circumstances – then storing that learning for future reference. Like other frontal areas of the brain, the ACC supports our decisions about interpersonal trust by controlling the flow of emotional and informational inputs for the decision, and by prompting a particular course of action.



Relationship & Behaviors

Trust is affected not only by the trustor's internal decision processes and appraisal of the trustee, but also by the social and contextual elements of the relationship and the parties' behaviors as they interact. These elements can shape the relevance and amplitude of signals and cues that human use to others' trustworthiness, with obvious implications when trying to understand and quantify different kinds of trust. In this section, we review some of the latest evidence related to the role of relationships and behaviors in terms of how another is determined to be trustworthy and thus who trusts whom.

Contextual Norms Interpersonal trust, as we noted, is theoretically rooted in economic principles of social exchange, but in reality, people often do not follow the economically optimal course of action. Researchers suggest one reason for this is that different norms of social behavior apply in different relational contexts – what some refer to as communal and exchange norms (Clark & Mills, 1993; Mills & Clark, 1994). The economic model is based on market or exchange-based norms where goods or services are ascribed some specific value and are paid for or reciprocally exchanged in direct proportion to their worth.

When you go to the convenience store to get a gallon of milk, the expectation is that you will pay the marked price to the cashier, and complete the transaction. If you advertise in the newspaper to trade some item or service for another, you will seek and expect to acquire something of comparable value to what you are offering. The other party will too. Those are fundamental shared assumptions in an exchange relationship, because – according to a common Euro-American paradigm - “it’s just business.” This of course is an idealized version of this kind of exchange, and rarely – if ever – reflects reality. Even in business, we develop relationships with owners, employees, and customers; we come to trust certain people and stores over others; and we select different partners with whom to do business for many reasons, some of which are not purely exchange-based, but are also related to the fact that we trust them as people. However, there is still the expectation that interpersonal trust will only get you so far in business.

On the other hand, with family and friends – what Clark and Mills (1993) call communal relationships – the parties' motivations and expectations for exchange are very different. In communal relationships exchanges of goods and services are typically motivated by a caring emotional bond with the other person and a desire to help them or serve their interests. There is no general concern about comparable exchange; in fact, the social relationship is better served if benefits exchanged are not exclusively quid pro quo.

Contextual Norms in Action

An interesting parallel exists with individuals or groups aiming to cultivate trust. Individual motivations for providing information to a competitor or adversary often vary in different people or even in the same person over time. Individuals who are effective trustors try to track how these motivations evolve. At times, a potential trustee may be “all business” about a particular tasking, but at other times may be reflecting more on how what (s)he is doing might be serving some cause or greater good, and – not uncommonly – some transactions heavily leverage the social capital that exists in the relationship between the trustor and trustee. If trustors are out of synch with the trustee’s expectations, they risk damaging the relationship and potentially alienating the potential or former trustee, when in fact they may be only vulnerable if they are unable to accurately detect any **change** in the trustee’s trustworthiness.

In Group / Out Group Status

More than half a century ago, Gordon Allport (1954) discussed the central importance of ingroup - outgroup status on prejudice and interpersonal perceptions. A substantial body of social psychological research shows consistently that people rate fellow ingroup members much more positively than outgroup members across a wide range of social attributes, including trustworthiness (Brewer, 1996; Turner, 1987). Perhaps this predisposition to ingroup affinity is an evolutionary adaptation (Brewer, 1999). Interdependence – and therefore cooperation – is a necessary condition for the long-term survival of the human species, but indiscriminate trust, as an individual strategy, is maladaptive. In this way, “ingroups can be defined as bounded communities of mutual trust and obligation that delimit mutual interdependence and cooperation” (Brewer, 1999, p. 433).

Within the ingroup there exists a depersonalized bond of trust that extends to all its members; one that is not contingent on other social knowledge or affective connections between individual parties. Group membership itself carries the imprimatur of trustworthiness. Some have referred to this as a form of “Category-based trust” (Kramer, 1999) and there is some evidence, as we have seen, that such a category-based trust can help reduce cognitive load in humans by providing mental shortcuts: you can trust person X because they are part of group Y.

Neuroscientific studies show that as people come to identify with an ingroup (what some would call identification-based trust [IBT, see page 9 for more discussion on IBT]), they increasingly process what happens to fellow members as though they were experiencing it themselves, down to the neural level (Damasio, Damasio, Immordino-Yang, and McColl, 2009). There are even observable responses, like facial expressions, that may signal that kind of emotional identification (Decety & Yamada, 2009). Having a general IBT with ingroup members predisposes us to perceive them more positively and to accord them preference over outgroup members. This supports the “social intuitionist” model of morality, which argues that moral judgment is as much of

a social process as it is an individual “in one’s own head” decision (Greene, et al., 2001; Greene & Haidt, 2002; Haidt & Bjorkland, 2007; Young & Koenigs, 2007).

Like other cognitive biases discussed earlier, knowing another person’s group status becomes a mental/emotional shortcut, at least to determine the initial or baseline level of trust. Initial levels of trust will almost always be higher for ingroup members and lower for outgroup members. Conversely, levels of distrust will almost always be initially higher for outgroup members and low for ingroup members (Kramer, 1999b; Turner, 1987; Williams, 2001). Perhaps we interpret outgroup status as indicating that the others’ values are different than our own, since we know that perceptions of value incongruence can evoke distrust (Sitkin & Roth, 1993). Factors that might mitigate ingroup-outgroup prejudice have been studied extensively. Some of the strategies that seem to reduce those biases most effectively are: having extended contact between ingroup and outgroup members (Pettigrew & Tropp, 2006; Turner, Hewstone, & Voci, 2007); redefining social categories to emphasize a common goal or identity between ingroup and outgroup members (Gaertner & Dovidio, 2000); and emphasizing similarities between the groups (Gabarrot, et al., 2009).

Relational Behaviors

In a relational context – as opposed to a single transaction – interpersonal trust is profoundly affected by the behaviors and interactions between the parties over time. This means trust is a dynamic variable. Even in a behavioral economic paradigm, when our trust is honored with cooperation, we count that as a reward or positive reinforcement, increasing the likelihood and possibly breadth of trust in future transactions. In essence, we learn about others’ trustworthiness by their actions. When our trust is violated, however, by the other party’s defection or betrayal, it is a negative response (punishment) that not only makes future trust less likely, but also may positively reinforce distrust in that person (Jones and George, 1998).

Social closeness is another determinant of trustworthy behavior. Cooperation tends to increase in closer relationships (Glaeser, et al., 2000; Orbell, van de Kragt, & Dawes, 1988; Macy & Skvoretz, 1998; Buchan, Croson, & Dawes, 2002), leading some to the conclusion that social distance is the first determinant of trust (Macy & Skvoretz, 1998). Perhaps this effect is based, in part, on having more experience with the other person in a greater number of transactions across different contexts, which might increase our confidence in predictions or expectations about the other person’s future action (Sitkin and Roth, 1993). This experiential calculus is probably a reasonable basis for trust decisions, since past trusting behaviors – much more than trust attitudes - are known to predict people’s future trust behavior (Glaeser, et al., 2000).

Peripheral indices of social distance and self-other similarity, however, also appear to affect trust decisions. Persons perceived as having high status (e.g., family status, social skill, charisma) tend to garner greater trust (more cooperation, fewer defections) from others, while persons who are

demographically different – for example, of a different race or nationality – tend to exhibit less trustworthy behavior (more defections) with one another (Glaeser, et al., 2000).

Trust's effect is reciprocal. Our trust in other people tends to increase as we come to believe that they increasingly trust us. The converse also appears to be true with distrust (Butler, 1983), creating something of a positive-feedback cycle for trust and distrust. Researchers have replicated this dynamic both in organizational and interpersonal contexts. When managers increase employee monitoring, it tends to make workers distrustful toward management (Cialdini, 1996; Kruglanski 1970). Interestingly, although not conclusive, some evidence suggests that in interpersonal encounters persons who tend to be more trusting of others, tend to be more trustworthy themselves (Glaeser, et al., 2000) – though the converse might not always be true. However, this notion can be taken to extremes in some cases, such as in people with Williams Syndrome, a rare, pathological condition that, according to several reports, makes people “biologically incapable of not trusting people,” to include total strangers. These people are themselves consequently untrustworthy since they are unable to take appropriate caution in situations in which most neurotypical humans would be at least slower to trust others.

Individual and Cross-Cultural Differences

A variety of individual and cultural differences can influence the type of trust generated within different contexts, the starting point or baseline level of trust, and the specific behavioral expression of trust. In some cases, there are clear biological underpinnings to these differences, and in others, the physiological mechanism(s) remains unknown. Further, many cultures will have very different assumptions about whom to trust, and to what extent.



1. Baseline trust or “trust propensity” (also known as “generalized trust” e.g., whether someone tends to assume that most people are trustworthy or that most people cannot be trusted) varies substantially from person to person, and is affected by a variety of influences, including past experience, genetic predisposition, and personality characteristics.
2. In extreme cases, like criminals or individuals with antisocial personality disorders, there are well-documented differences in both the structure and function of specific brain regions that are likely involved in forming trust.
3. Even very small genetic differences can have substantial impacts on physiology and behavior, which – while far from conclusive – may explain some variance in people’s trust and trustworthiness. While a single “trust gene” has not been identified, the study of disorders that impair social interactions has identified several genes that appear to be linked to certain trust-related processes.
4. In much the same way that cultural norms affect interpersonal

communication, they can also affect perceptions of normative or expected trust behaviors. While a majority of trust research to date has been conducted with European and American participants, these studies are increasingly being extended to non-Western cultures. Unsurprisingly, perhaps, while the neurobiology of trust itself may be universal to most humans, the assumptions of who and what to trust vary among different groups and cultures. Indeed, many findings point to cultural differences in the propensity to trust others and to reciprocate when an individual behaves in a manner indicating trust.

Trust's intense complexity is compounded by the different ways in which it operates for different people or groups of people. Just as people vary in their general personality traits – for reasons that have biological, psychological, and social underpinnings – they also vary in their baseline trust or general assumptions about others' trustworthiness. Likewise, an individual's personality and psychological behavior may affect different people in different ways. Finally, culture and patterns of socialization can affect both our predispositions to trust as well as how we process social/emotional information related to trust.

If the communities seeking to understand trust and scientists studying trust are to move toward an integrated biopsychosocial understanding of how interpersonal trust works for whom and under what circumstances, discerning systematic differences occurring across individuals and across groups will be critical.

Interindividual Differences

Individuals vary considerably in their propensity to trust based on whether they view “most people” as being reliable (or not) and in their willingness to depend on them (or not) (McKnight & Cervaney 2001, 2002). Some begin each interpersonal encounter with the assumption that others are usually competent, benevolent, honest/ethical, and predictable; that is, that they are trustworthy. Others – often generalizing from past experiences of betrayal - adopt the opposite assumptions.

This is the domain of individual differences known as trust propensity (Kramer, 1999; McKnight et al., 1998; Mayer et al., 1995; Rotter, 1967). In the literature on organizational behavior, this is sometimes called “dispositional trust,” and in other social science literature is referred to as “generalized social trust,” “thin trust,” or “impersonal trust” (Delhey & Newton, 2003; 2005). It is not a trust conditioned on any specific cognitive or affective appraisal of another person's individual characteristics, which is sometimes called “particularized trust,” or “strategic trust.” Trust propensity is the individual's default or starting point for

trust in nearly all interpersonal encounters. It is most often measured in large-scale social surveys by using a single “Generalized Trust Question” (GTQ) – a forced-choice item in which respondents either endorse the statement that: “in general, most people can be trusted” (these are called the *trusters*) or the statement “you can’t be too careful in dealing with people.” Reasonable concerns have been raised, however, about whether the traditional GTQ measure might confound the concepts of trust and caution (Miller & Mitamura, 2003).

Trust propensity is probably not so much a distinct personality trait as it is a behavioral tendency driven by a collection of traits – some temperamental, others shaped by experiences – that predispose people to be more or less willing to be vulnerable to others (as discussed below, for example, some research suggests that generalized trust is positively associated with I.Q, see Sturgis, 2009; Haier, 2009). People can be trusting or distrustful in different ways. Some evidence suggests, however, at a neural level, trust propensity (unconditional trust) may operate through a different set of processes than conditional or situation-specific trust. In one neuroimaging study, for example, individuals who made choices consistent with unconditional trust showed selective activation of a brain region associated with social attachment (i.e., septal area), whereas subjects who demonstrated conditional trust were seen to have differential activity of an area known to identify and evaluate rewards (i.e., ventral tegmental area) (Krueger, et al., 2007).

Personality factors and traits may comprise the primary internally-driven domain of individual differences. Interindividual differences in personality traits are reflected both in phenotypic variance, their characteristic patterns of cognition, affect and behavior, and in biotypical variance, underlying physiological or biological differences. Each type of interindividual variance affects the other (Stemmler & Wacker, 2009). A biopsychosocial approach to personality might define it as “a dynamic organization, inside the person, of psychophysical systems that create the person’s characteristic patterns of behavior, thoughts, and feelings” (Carver & Scheier, 2004, p. 5).

“on a very general level, sources of individual differences in manifest variables are biological (Canli, 2006). These sources comprise the genotype and the individual structure and function of the body’s organs, in particular the brain. Recent research has reported intriguing findings, for example, personality correlates of genetic polymorphisms (e.g., Ebstein, 2006) or of brain structure (e.g., Wright et al., 2006) and function (e.g., O’Gorman et al., 2006). Thus, a portion of the interindividual variance in manifest variables (phenotypical variance) is attributable to biotypical variance” (Stemmler & Wacker, 2009, pp.3-4).

Research has linked trust propensity to other well-established personality traits. Within the well-established Five Factor Model of personality (which includes Extraversion, Neuroticism, Openness to Experience, Agreeableness, and Conscientiousness), the trait of agreeableness has shown a particularly strong and positive association with predisposition to trust others (Mooradian

et al., 2006). This finding harmonizes with earlier studies showing interindividual variance in predispositions toward competitive versus cooperative behavior. Those who are more competitively oriented were more likely to view others as being untrustworthy and to behave toward them accordingly (Kelley & Stahelski, 1970).

Researchers tend to find higher levels of trust propensity (generalized social trust) among persons with better jobs and with higher levels of education and income. A recent study followed two British birth cohorts (comprising more than 35,000 people) over several decades and found that intelligence (measured around age 10) predicted generalized trust in later adulthood, lending support to Yamagishi's (2001) hypothesis about a link between trust and IQ. The essence of this theory, which Yamagishi developed from observing behavioral game performance, is that "socially astute individuals are better able to accurately detect signs of (un)trustworthiness in social and economic interactions. This means that, throughout life, they do not suffer the costs of betrayal so frequently, as they are less inclined to place their trust in those who are unlikely to honour it" (Sturgis, et al., 2009, p.8). It is possible that appropriately gauged interpersonal trust is part of the complex of what makes smart people successful (Haier, 2009).

Interpersonal suspiciousness, on the other hand, has been associated with predispositions to distrust since some of Morton Deustch's (1958) earliest writings on trust-related phenomena, emphasizing its effects on the cognitive dimensions of trust. Persons who are high in suspiciousness tend to be more self-conscious than others, and tend both to overestimate and to selectively attend to negative aspects of interpersonal interactions (Kaney, et al., 1997; Lee & Won, 1998; Marchand & Vonk, 2005) –factors likely to enhance the intensity of their distrust, creating a self-fulfilling prophecy of sorts and highlighting the costs of inappropriate distrust in certain situations. Research also has shown that persons with low trust propensity have higher rates of divorce, unemployment, discrimination, and poorer general health (Sturgis, et al., 2009).

Interindividual variance in trust-related processes and characteristics applies not only to self-report or phenotypic measures but also extends to physiological and neuroimaging measures as well. "Individual differences prevail in physiological recordings just as they do in behavior, thoughts, and feelings, even if individuals are in the same situation" (Stemmler & Wacker, 2009, p. 3). The measured variation may be caused by interindividual differences in brain structure, neural function, and perhaps even genetic predisposition, and recent research in epigenetics (that is, the study of the ways that experience can literally cause genes to be expressed or silenced) suggests that this mechanism may be more at work than previously appreciated.

Structural Differences

An earlier section on determinants of trust in the trustor described different brain areas and mechanisms involved in an individual's trust-related appraisals, responses and

decisions. A number of studies have found – with some consistency - that the brains of people who exhibit persistent antisocial and interpersonally transgressive behavior and who show little empathy or emotional regard for others are structurally different than brains of normal controls (Raine, 2008). Those structural differences tend to be most pronounced in areas of the brain associated with processing of social/emotional information and regulatory functions, which also happen to be the areas integral to trust-related processes.

Among criminal offenders, the prefrontal cortices – centers for regulating behavior and controlling emotion - tend to be smaller and to have less grey matter (fewer neurons). Their amygdalae (fear centers) tend to be smaller, and the hippocampus (which regulates conditioning and learning) is much more likely to be asymmetrical – at least among the “unsuccessful” ones who get caught- with the right side being larger than the left. The corpus callosum - a nerve fiber bundle that connects the brain’s left and right hemispheres – tends to be larger but thinner than normal; a structural abnormality that may accelerate transmission between the hemispheres, but which is also associated with diminished interpersonal emotional responsiveness, resulting in diminished feelings of social attachment or of remorse (Patrick, 2007; Raine, 2008; Raine & Yang, 2006).

Functional Differences

Interpersonal trust decisions appear to be heavily influenced by our automatic emotional reactions, and by our ability to assess the other person and anticipate her or his course of action. These processes all show significant interindividual variance.

Persons possessing psychopathic traits (e.g., persistently violating the rights of others and being callous and unemotional) are generally thought not to behave in trustworthy ways. This may be related – at least in part – to abnormalities in their functional social cognitive circuitry. Because trust typically emerges from a reciprocal exchange, these abnormalities can affect both how they perceive others and how others perceive them.

Psychopaths are among the people with serious deficiencies in their ability to (1) identify social cues, (2) to produce an appropriate reaction or response, and (3) to regulate emotional reactions and behavioral responses (Phillips, 2003a; 2003b). Studies have shown they have significant difficulty discerning emotion from others’ facial expressions and language; are particularly impaired in identifying sadness and fear in others; and tend to have severe deficits in their inhibitory controls and executive functioning (Gao & Raine, 2009). The brain’s executive functions not only produce and shape high-level reasoning and help put the brakes on impulsive actions, but they also play a vital role in self- and other-monitoring that affects social sensitivity, social awareness, and empathy (Herba, et al., 2007).

Genetic Differences

For the past half-century behavioral geneticists have strived to identify and understand how genetic variations might account for individual differences in traits and behavior. Nearly all DNA is composed from four nucleotides, which are represented as strands or sequences by the letters A (adenine), C (cytosine), T (thymine), and G (guanine). More than 99% of DNA sequences found in humans are identical and have remained quite stable across many generations of evolutionary adaptation. That small margin of interindividual variance, however, can produce substantial effects.

Genetic Variation and SNPs

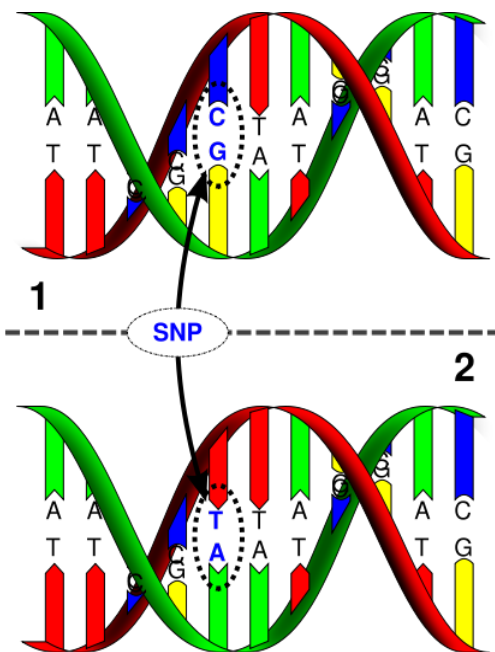
Because genes, like most cellular units, almost never function in isolation, but rather in the context of other genetic, functional and structural influences, discerning the effects of specific genes or particular behaviors gets complicated very quickly. More typically, genetic effects on behavior seem not to be direct and singularly causal, but to occur by creating a “genetic predisposition.” An intriguing development in the study of interindividual genetic variation is the single-nucleotide polymorphism (SNP, pronounced as “snip”). A SNP occurs when a particular DNA sequence differs by one nucleotide (hence “single nucleotide”) between individuals or between paired chromosomes within a given individual.

As in the graphic above, the sequence AACTAAC compared to AATTAAC would be an example of a SNP in which the first cytosine (C) nucleotide in the sequence was replaced by a thymine (T) nucleotide. These



SINGLE NUCLEOTIDE POLYMORPHISMS

Single nucleotide polymorphism (SNP) refers to a genetic variation where a particular DNA sequence differs by just one nucleotide (hence “single nucleotide”) between individuals or between a pair of chromosomes within a given individual. From a molecular standpoint, this is a very minor difference, but the resulting effects may be substantial. That tiny variation might change the way a particular chemical receptor is formed in the brain or even render the brain unable to produce a particular chemical at all. It can also have substantive and multiple effects on other genes’ activity, which can also shape brain functions. Changes in the way brain chemicals are produced or function can profoundly affect our emotions, our ability to think, and a variety of other behaviors.



small changes account for a large proportion of what makes humans genetically different from one another (Syvanen, 2001). No specific allele or DNA “trust sequence” has been found, though one particular SNP in OT receptors has been implicated as a cause of social attachment/affiliative deficits found in people with autism spectrum disorders (Jacob, et al., 2007). The previously mentioned Williams syndrome is caused by the deletion of genetic material from the region q11.23 of chromosome 7 (importantly, this region has at least 25 genes, which also explains the cognitive impairment associated with the pathological trusting behaviors in Williams Syndrome patients).

Culture and Interpersonal Trust

Cultural factors comprise one of the primary externally-driven domains of individual differences. Unlike many psychosocial constructs that have been researched almost exclusively with European-American college students, interpersonal trust has sparked quite a bit of intercultural and cross-cultural inquiry. Edward T. Hall (1959), a pioneer in the study of intercultural communication, speculated in the 1950s that persons from more collectivist and “high context” cultures (such as Asia and the Middle East) might construe and value interpersonal trust differently than persons from more individualistic and “low context” cultures (such as the U.S. and Western Europe).

Low and High Context Communication

In low context communication, people transmit ideas and sentiments primarily through words and specific, detailed verbal descriptions. Meaning derived from high context communication, however, relies much more heavily on shared experiences and expectations between the parties. In essence, high context communication assumes that one is transmitting ideas to other members of one’s own ingroup. “Inside jokes” are an example of high context communication. Hall suggested that in high context cultures the collective bond or promise was a dominant determinant of trust, whereas in low context cultures more reliance is placed on structural safeguards such as contracts, rules, laws and enforcement of consequences (Hall, 1959).

Does Trust Vary by Country?

Having compared *World Values Survey* results from 60 nations, Delhey and Newton (2005) conclude that “generalized trust is very unevenly distributed across the globe” (p. 311), with estimates that “most people can be trusted” ranging from 60% of the population in Norway and Sweden, to less than 10% in Turkey and Brazil. They find that the “high trust” countries tend to be those with greater ethnic heterogeneity, more pervasive Protestant religious traditions, good governance, higher gross domestic product (GDP) per capita and greater population equality among household incomes (Delhey & Newton, 2005). So, at a national level, trust seems to correlate with measures of success. Hall’s cross cultural comparisons focused mainly on the contrast between Japan and the United States. Subsequent cross cultural studies of

trust have extended Hall's work on Japan and the U.S. (Hayashi et al., 1999; Yamagishi et al., 1998) but also expanded inquiry to include a wide array of nations around the globe.

A very preliminary question has been whether "levels of trust" (presumably referring to trust propensity and generalized trust) differ among countries. Research studies have found that countries like Sweden, China, and the U.S. are high on trust propensity, while countries like Russia, India, and Mexico, are moderate, and citizens of countries like Romania or Brazil tend to have lower trust propensity (Johnson & Cullen, 2002). Results have sometimes been counter-intuitive: one study found, for example, that people in Bulgaria (Koford, 2001) have higher trust levels than those in the U.S. A four-nation study compared trust behaviors in a single round economic investment dilemma game among nearly 600 participants from China, Japan, Korea, and the United States, finding that – independent of ethnicity – U.S. and Chinese nationals showed greater trust (more money "invested" in the partner player), than those from Japan and Korea. The authors suggest that norms of reciprocity and of trust may vary across countries (Buchan, Croson, & Dawes, 2002). Further interesting research has been done in trying to explain trust behavior as explained by market integration and size of the group, and has generally found that trust and trustworthiness varies across 15 different societies based on several social and cultural factors (Henrich, 2004).

Does Trust Vary Within a Country?

Studies that have examined different trust and reciprocation patterns within a given country have also found significant differences, some of which appear to be mediated by stereotypes (see Fershtman and Gneezy, 2001 for one such example comprising different ethnic groups in Israel and Barr 2001, for a study comparing traditional and resettled villages in Zimbabwe). Others however are much more complex to interpret. In the Buchan, et al. (2002) four nation study, results demonstrated varied trends in trust (how much of the initial endowment was given to the partner) and reciprocation – what some would call trustworthiness (the amount of the investment returned to the investor).

The Chinese participants showed high trust and high reciprocation, while the Japanese participants had the reverse pattern, giving little of their endowment and receiving little in return (see also Buchan, Johnson, & Croson, 2006). The U.S. group tended to show high trust but low reciprocity and the Korean group showed low trust, but high reciprocity. This is consistent with findings by Danielson and Holm (2002) that reciprocity norms seemed to apply similarly in the U.S. and Sweden, but not in Tanzania, where reciprocity patterns were substantially different. The Buchan et al (2002) study asked subjects to only play a single round of the game, so we don't know whether these patterns might converge across multiple rounds. It certainly raises some intriguing questions, however, about intergroup variance across cultures – such as what causes these differences?; is it possible to shape a country's trust?; and how might this kind of knowledge affect intercultural negotiation?.

How Might Culture Affect Trust?

What is the mechanism or mechanisms by which culture might affect interpersonal trust? One of the distinguishing factors discussed most often in the literature concerns the extent to which members of a culture value and define themselves by individualistic and independent features or by collectivist and interdependent features of their identities (Hofstede, 1980; Markus and Kitayama, 1991; Matsumoto et al., 1998; Mesquita and Karasawa, 2002; Triandis, 1995). We know from related social psychological research that when people are dependent on others, they tend to perceive the others as more trustworthy (Weber et al., 2007).

Cultural affinity toward collectivist vs individualist orientations can also affect trust's ingroup - outgroup dynamic, though not necessarily in expected ways. In a number of studies, people not surprisingly tend to extend more trusting behaviors to ingroup members than to outgroup members. When researchers studied the phenomenon across countries, however, and randomly assigned players either to a partner from the player's own country or to a partner from a different country, the more individualistic players showed a greater ingroup trust preference than the collectivist players, who extended to their citizen neighbors only the same degree of trust as they extend to the strangers (Buchan, Croson, & Dawes, 2002).

Independent vs interdependent orientations can affect a number of cognitive and emotional processes related to trust. In each of these contexts, different norms and values apply to emotional expression. Persons in interdependent contexts tend to value emotional moderation and control and especially avoid expressing negative and socially disengaging emotions (Kim and Markus, 2002; Kitayama et al., 2006; Markus and Kitayama, 1991; Tsai et al., 2006; Wu and Tseng, 1985). In independent and individualistic contexts, however, emotional expression is regarded as "psychologically healthy" and a signal of individual authenticity (Bellah et al., 1985; Kim and Sherman, 2007; Matsumoto, 1990; Suh et al., 1998).

These emotional control patterns even correspond to different neurophysiological responses (Goldin, et al., 2008). In a study comparing Asian American (AA) and European American (EA) females' reactions to an anger evoking stimulus, AAs who valued emotional control felt less anger, exhibited less angry behavior and showed a cardiovascular response consistent with an active, motivated self-control response, and confidence in their regulatory capacity. For EA women, valuing emotional control diminished angry behavior but did not reduce their experience of anger. Their cardiovascular responses were more consistent with confronting a real threat, perhaps because they did not have the same confidence (and/or experience) in controlling their emotional reactions (Mauss & Butler, 2009).

Persons acculturated to independent and interdependent orientations have been found to perceive the world, particularly the social world, in fundamentally different ways. This line of research suggests that the effects of culture on

social interactions are not just mediated by different social norms and beliefs, but by moderating perceptions and encoding of social information.

Social psychologist Dr. Richard Nisbett at the University of Michigan has advanced the exploration of these differences with rigor and depth, particularly as they relate to patterns in behavioral differences between Westerners (e.g., Americans) and East Asians (e.g., Japanese and Chinese) (Nisbett, 2003; Nisbett & Masuda, 2003). Nisbett and his team find, in general, that Westerners make sense of their experiences and novel situations by:

- (1) identifying and focusing primarily on a central object of interest;
- (2) evaluating the object and its features to determine the category of stimuli to which it belong; and
- (3) using formal logic and analysis to understand the stimulus and its actions.

East Asians, by contrast, tend to:

- (1) focus primarily on the context – not a specific object – in a novel situation;
- (2) not to categorize the stimulus or its components, but to holistically view the context as the “causal factor” in the event; and
- (3) rely on dialectical reasoning (recursive analysis from multiple points of view) and associative thinking rather than formal logic to discern meaning from what they perceive.

They also suggest these perceptual differences originate and emerge from operating in different social systems (Nisbett, Peng, Choi, & Norenzayan, A., 2001).

Conclusion

To be trusted is a greater compliment than to be loved.

- *George Macdonald*

Trust everybody, but cut the cards.

- *Finley Peter Dunne*

Interpersonal trust is complicated, but integral to individuals and organizations that operate in complex and dynamic environments where human interactions are key to achieving goals. Understanding how, why and when people decide to be (or not to be) vulnerable to others and how they assess and decide how others are likely to behave toward them gets at the heart of why many individuals and organizations striving to build trust succeed or fail. It may even go some way in explaining why some organizations and some diverse communities of professionals have an ability to work collaboratively toward a common set of objectives, even in real world competitive environments in which very little can be said to be “trustworthy.”

This research-based overview on interpersonal trust has explored the myriad ways in which trust has been defined, how it operates, and the factors that may cause it to work differently for some people than for others. It seems there is a solid conceptual platform from which to launch a program of research on interpersonal trust that might serve the long-term interests of academia, industry, and government.

A number of challenges and a great deal of exciting work lie ahead. To succeed, researchers as well as people whose work depends, in part, on trust and assessing trustworthiness may need to re-examine some long-held assumptions about trust’s relationship to deception, stress, and its role in dealing with competitors as well as with allies.

In re-examining these assumptions, a trust-based research agenda may offer individuals and organizations new payoffs and new opportunities. At the same

time, it is clear that such an agenda must accept the inherent complexity of human problems, knowing that human behavior does not necessarily operate under orderly, universal laws like those that govern problems in fields such as physics and engineering. The cautious researcher will proceed with the view that humans are biopsychosocial organisms – neither determined exclusively by nature nor nurture, but profoundly affected by both. Consequently, it is unlikely that any researcher will find just “one thing” – biologically, psychologically, socially, or technologically - that will explain everything about interpersonal trust. People are composed of and operate within living systems – the biological, psychological and social factors affect each other not just in linear ways, but also recursively. And while humans are all carbon-based entities that have similar DNA structures, there are also profound differences between individuals that are likely to foil any attempts to find a “one-size-fits-all” approach to trust and trustworthiness.

With those caveats in mind, however, the literature suggests that many research communities know considerably more about interpersonal trust today than they did even a decade ago. With rigorous, persistent, and applied scientific research, it is not unreasonable to expect that what is known about trust in complex and dynamic environments will grow even more.

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Appendix A
SOME CLASSIFICATIONS OF TRUST: A SYNTHESIS
 From Sandro Castaldo (2003)

Criteria	Typologies
Trust dimensions	<ul style="list-style-type: none"> - Ideological, cognitive, emotional & routine trust (Lewis & Wiegert, 1985) - Affective, cognitive & behavioral trust (Cummings & Bromiley, 1996) - Behavioral & intentional trust (Nooteboom, Berger & Noorderhaven, 1997) - Affect-based & cognition-based trust (McAllister, 1995) - Reliability & emotional trust (Johnson-George & Swap, 1982) - Values, attitude and mood & emotions (Jones & George, 1998) - Institutionalization & habitualization (Nooteboom, Berger & Noorderhaven, 1997) - Competence- & goodwill-based dimensions (Nooteboom, 1996)
Relational layer	<ul style="list-style-type: none"> - Calculative, institutional ('hyphenated') & personal trust (Williamson, 1993) - Institutional-based, system-based & societal trust (Lane, 1998) - Individual, inter-personal, institutional trust (Lewicki & Bunker, 1995) - Calculative, relational & institutional trust (Rousseau, Sitkin, Burt & Cannon, 1998) - Dispositional, personal/interpersonal & system trust (McKnight & Chervany)
Contents and antecedents	<ul style="list-style-type: none"> - Calculative, knowledge-based & institutional (Lewicki & Bunker, 1996) - Deterrence-based, knowledge-based & identification-based trust (Shapiro, Sheppard & Cheraskin, 1992; Sheppard & Tuckinski, 1996) - Calculative, cognitive & normative trust (Lane, 1998; Child, 1998) - Contractual trust, competence trust & goodwill trust (Sako, 1991; Sako & Helper, 1998) - Predictability-based & value-based trust (Sitkin & Roth, 1993) - Predictability & explorative trust (Huemer, 2000)
Strength/Quality	<ul style="list-style-type: none"> - Full, instable & hopeful trust (Andaleeb, 1992) - Thick or thin, weak or strong, fragile or resilient trust (Williams, 1989, Meyerson,

	<p>Weick & Kramer, 1996)</p> <ul style="list-style-type: none"> - Weak, semi-strong & strong trust (Barney & Hansen, 1994) - Trust vs. distrust (many authors, e.g. Andaleeb, 1992)
Development processes	<ul style="list-style-type: none"> - Characteristic-based, process-based, institutionally-based (Zucker, 1986) - Calculative processes, predictive processes, intention-based processes, knowledge-based processes, transfer-based processes (Doney & Cannon, 1997; Doney, Cannon & Mullen, 1998)
Other classifications	<ul style="list-style-type: none"> - Basic trust, guarded trust & extended trust (Brenkert, 1998) - Deterrence, obligation, discovery & internalization (Sheppard & Sherman, 1998) - Task-focused, fiduciary & relational forms of trust (Barber, 1983)
Contiguous concepts	<ul style="list-style-type: none"> - Spontaneous trust, generated trust, manipulation & capitulation (Hardy, Phillips & Lawrence, 1998) - Trust, faith, confidence & reputation (Luhmann, 1989; Hart, 1989) - Trust, power & commitment (Gambetta, 1989; Anderson & Weitz, 1993; Morgan & Hunt, 1994) - Rational prediction, probable anticipation, uncertainty, panic, fate, faith (Lewis & Wiegert, 1985)

Appendix B

Trust Concepts McKnight and Chervany (2001-2002)

Higher Order Concept	Facets
<p>Disposition to trust, based on a person's longstanding temperamental or personality factors (p. 47)</p>	<ul style="list-style-type: none"> - Faith in humanity (underlying assumptions about people) means that one assumes others are usually competent, benevolent, honest/ethical, and predictable - Trusting stance (personal strategy) means that, regardless of what one assumes about other people generally, one assumes that one will achieve better outcomes by dealing with people as though they were well-meaning and reliable
<p>Institution-based trust, comprising the situational, contextual and environmental factors – rather than individual ones- that determine trust (p. 48).</p>	<ul style="list-style-type: none"> - Structural assurance means that one believes that protective structures—guarantees, contracts, regulations, promises, legal recourse, processes, or procedures—are in place that are conducive to situational success (p. 48). - Situational normality means that one believes that the situation in a venture is normal or favorable or conducive to situational success (p. 48).
<p>Trusting beliefs, which include the trustor's appraisals about the trustee's competence, benevolence, integrity, and predictability (p. 49)</p>	<ul style="list-style-type: none"> - Trusting belief-competence means that one believes that the other party has the ability or power to do for one what one needs done. - Trusting belief-benevolence means that one believes that the other party cares about one and is motivated to act in one's interest. - Trusting belief-integrity means that one believes that the other party makes good-faith agreements, tells the truth, acts ethically, and fulfills promises - Trusting belief-predictability means that one believes the other party's actions (good or bad) are consistent enough that one can forecast them in a given situation.
<p>Trusting intentions, which reflect the trustor's willingness to be vulnerable and to depend on the behavior of the trustee (p. 50)</p>	<ul style="list-style-type: none"> - Willingness to depend means that one is volitionally prepared to make oneself vulnerable to the other party in a situation by relying on the other party - Subjective probability of depending means the extent to which one forecasts or predicts that one will depend on the other party.

Appendix C

Benefits of Trust for Organizations

Adapted primarily from Dirks & Ferrin (2001) and Romano (2002)

Trust facilitates:	Empirical support offered in:
<p>Productive working relationships and competitive business advantage</p>	<p>Braddach, J. L., & Eccles, R. G. (1989). Price, authority, and trust: From ideal types to plural forms. <i>Annual Review of Sociology</i>, 15, 97-118.</p> <p>Creed, W. E. D., & Miles, R. E., (1996). Trust in organizations: A conceptual framework linking organizational forms, managerial philosophies, and the opportunity costs of controls. In R. M. Kramer & T. R. Tyler (Eds.), <i>Trust in organizations: Frontiers of theory and research</i> (pp. 16-38). Thousand Oaks, CA: Sage.</p> <p>Ring, P. S., & Van de Ven, A. (1994). Developmental processes of cooperative interorganizational relationships. <i>Academy of Management Review</i>, 19, 90-118.</p> <p>Wicks, A. C., Berman, S. L., & Jones, T. M. (1999). The structure of optimal trust: Moral and strategic implications. <i>Academy of Management Review</i>, 24 (1), 99-116.</p>
<p>Strategic collaboration and cooperation</p>	<p>McAllister, D. J. (1995). Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. <i>Academy of Management Journal</i>, 38, 24-59.</p> <p>Tsai, W., S. Ghoshal. 1998. Social capital and value creation: The role of intra-firm networks. <i>Academy of Management Journal</i>, 41, 464-476. (via increased resource exchange between organizations)</p>
<p>Organizational citizenship behavior (via trust in superiors/leaders, co-workers, and organization)</p>	<p>Deluga, R. J. (1995). The relation between trust in the supervisor and subordinate organizational citizenship behavior. <i>Military Psychology</i>, 7 (1), 1-16.</p> <p>Konovsky, M. A., & Pugh, S. D. (1994). Citizenship behavior and social exchange. <i>Academy of Management Journal</i>, 37 (3), 656-</p>

	<p>669. (via trust in leader)</p> <p>McAllister, D. 1995. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. <i>Academy of Management Journal</i>, 38, 24-59. (via trust in co-workers)</p> <p>Pillai, R., C. Schriesheim, E. Williams, 1999. Fairness perceptions and trust as mediators for transformational and transactional leadership: A two-study sample. <i>Journal of Management</i>, 25, 897-933. (via trust in leader)</p> <p>Podsakoff, P., S. MacKenzie, R. Moorman, R. Fetter. 1990. Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. <i>Leadership Quarterly</i>, 1, 107-142. (via trust in leader)</p> <p>Robinson, S. 1996. Trust and the breach of the psychological contract. <i>Administrative Science Quarterly</i>, 41, 574-599. (via trust in organization)</p>
<p>Conflict resolution</p>	<p>De Dreu, C., E. Giebels, E. Van de Vliert. 1998. Social motives and trust in integrative negotiation: The disruptive effects of punitive capability. <i>Journal of Applied Psychology</i>, 83, 408-423. (via trust between negotiators)</p> <p>Parks, C. D., Henager, R. F., & Scamahorn, S. D. (1996). Trust and reactions to messages of intent in social dilemmas. <i>Journal of Conflict Resolution</i>, 40 (1), 134-151.</p> <p>Porter, T., B. Lilly. 1996. The effects of conflict, trust, and task commitment on project team performance. <i>The International Journal of Conflict Management</i>, 7, 361-376.</p> <p>Schurr, P. & Ozanne. J. (1985). Influences on exchange processes: Buyers' preconceptions of a seller's trustworthiness and bargaining toughness. <i>Journal of Consumer Research</i>, 11, 939-953. (via positive effect on negotiations)</p>
<p>Openness in communication (within and between organizations)</p>	<p>Benton, A., E. Gelber, H. Kelley, B. Liebling. (1969). Reactions to various degrees of deceit in a mixed-motive relationship. <i>Journal of Personality and Social Psychology</i>, 12, 170-180. (trust in partner >> increased perception of increased information accuracy)</p> <p>Boss, R. W. (1978). Trust and managerial problem solving revisited.</p>

	<p>Group & Organization Studies, 3, 331-342.</p> <p>Roberts, K., C. O'Reilly. 1974. Failures in upward communication in organizations: Three possible culprits. <i>Academy of Management Journal</i>, 17, 205-215. (trust in leader >> increased perception of increased information accuracy)</p> <p>Smith, J. & Barclay, D. (1997). The effects of organizational differences and trust on the effectiveness of selling partner relationships. <i>Journal of Marketing</i>, 61, 3-21.</p> <p>Zand, D. (1972). Trust and managerial problem solving. <i>Administrative Science Quarterly</i>, 17, 229-239.</p>
<p>Employee job satisfaction</p>	<p>Andeleeb, S. S. (1996). An experimental investigation of satisfaction and commitment in marketing channels: The role of trust and dependence. <i>Journal of Retailing</i>, 72 (1), 77-93.</p> <p>Boss, R. W. (1978). Trust and managerial problem solving revisited. <i>Group & Organization Studies</i>, 3, 331-342. (via satisfaction with meeting)</p> <p>Brockner, J., Siegel, P. A., Daly, J. P., Tyler, T., & Martin, C. (1997). When trust matters: The moderating effect of outcome favorability. <i>Administrative Science Quarterly</i>, 43, 558-583. (via increased satisfaction with/support for leader)</p> <p>Driscoll, J. (1978). Trust and participation in organizational decision making as predictors of satisfaction. <i>Academy of Management Journal</i>, 21, 44-56.</p> <p>Muchinsky, P. (1977). Organizational communication: Relationships to organizational climate and job satisfaction. <i>Academy of Management Journal</i>, 20, 592-607. (via positive perceptions of organizational climate)</p> <p>O'Reilly, C. A., K. H. Roberts. 1974. Information filtration in organizations: Three experiments. <i>Organizational Behavior and Human Performance</i>, 11, 253-265. (via satisfaction with communication)</p> <p>Rich, G. A. (1997). The sales manager as a role model: Effects on trust, job satisfaction, and performance of salespeople. <i>Journal of the Academy of Marketing Science</i>, 25 (4), 319-328.</p> <p>Roberts, K., C. O'Reilly. 1974. Failures in upward communication in organizations: Three possible culprits. <i>Academy of Management</i></p>

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<p>Individual employee performance</p>	<p>Earley, P. C. (1986). Trust, perceived importance of praise and criticism, and work performance: An examination of feedback in the United States and England. <i>Journal of Management</i>, 12, 457-473. (via trust in supervisor)</p> <p>Oldham, G. (1975). The impact of supervisory characteristics on goal acceptance. <i>Academy of Management Journal</i>, 18, 461-475. (via trust in leader)</p> <p>Rich, G. (1997). The sales manager as a role model: Effects on trust, job satisfaction and performance of salespeople. <i>Journal of the Academy of Marketing Science</i>, 25, 319-328. (via trust in manager/leader)</p> <p>Robinson, S. (1996). Trust and the breach of the psychological contract. <i>Administrative Science Quarterly</i>, 41, 574-599. (via trust in organization)</p>
<p>Work group/unit performance</p>	<p>Davis, J., Schoorman, F., Mayer, R., & Tan, H. (2000). Trusted unit manager and business unit performance: Empirical evidence of a competitive advantage. <i>Strategic Management Journal</i>, 21, 563-576. (via trust in manager)</p> <p>Dirks, K. T. 1999. The effects of interpersonal trust on work group performance. <i>Journal of Applied Psychology</i>, 84, 445-455. (via trust within group)</p> <p>Dirks, K. T. (2000). Trust in leadership and team performance: evidence from NCAA basketball. <i>The Journal of Applied Psychology</i>, 85(6), 1004-1012. (via trust in leader)</p> <p>Schurr, P., J. Ozanne. 1985. Influences on exchange processes: Buyers' preconceptions of a seller's trustworthiness and bargaining toughness. <i>Journal of Consumer Research</i>, 11, 939-953. (via positive effect of trust between negotiators on the</p>

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<p>Employee acceptance of (and compliance with) management/leadership's goals and decisions</p>	<p>Kim, W. & Mauborgne, R. (1993). Procedural justice, attitudes, and subsidiary top management compliance with multinationals' corporate strategic decisions. <i>Academy of Management Journal</i>, 36, 502-526.</p> <p>Oldham, G. (1975). The impact of supervisory characteristics on goal acceptance. <i>Academy of Management Journal</i>, 18, 461-475.</p> <p>Rousseau, D., & Tijoriwala, S. 1999. What's a good reason to change? Motivated reasoning and social accounts in promoting organizational change. <i>Journal of Applied Psychology</i>, 84, 514-528. (trust in management >> greater acceptance of rationale for organizational change)</p> <p>Tyler, T. & DeGoey, P. (1996). Trust in organizational authorities: The influence of motive attributions and willingness to accept decisions. In R. M. Kramer and T. R. Tyler (Eds.), <i>Trust in Organizations: Frontiers of Theory and Research</i>. Thousand Oaks, CA: Sage Publications.</p>
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<p>Fairness and justice perceptions</p>	<p>Brockner, J., Siegel, P. A., Daly, J. P., Tyler, T., & Martin, C. (1997). When trust matters: The moderating effect of outcome favorability. <i>Administrative Science Quarterly</i>, 43, 558-583.</p> <p>Fulk, J., A. Brief, S. Barr. 1985. Trust-in-supervisor and perceived fairness and accuracy of performance evaluations. <i>Journal of</i></p>

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<p>Customer satisfaction</p>	<p>Chow, S., & Holden, R. (1997). Toward and understanding of loyalty: The moderating role of trust. <i>Journal of Managerial Issues</i>, 9 (3), 275-298.</p> <p>Swan, J. E., Bowers, M. R., & Richardson, L. D. (1999). Customer trust in the salesperson: An integrative review and meta-analysis of the empirical literature. <i>Journal of Business Research</i>, 44 (2), 93-107.</p>