IEEE Access
Multidisciplinary | Rapid Review | Open Access Journal

Received September 16, 2016, accepted October 6, 2016. Date of publication xxxx 00, 0000, date of current version xxxx 00, 0000.

Digital Object Identifier 10.1109/ACCESS.2016.2631483

Identifying Relevant Socio-Theoretic Foundations for Supporting Multi-Issue IT Cloudsourcing Negotiations

DANIEL S. SOPER[1], HALUK DEMIRKAN[2], AND MICHAEL GOUL[3]
[1]Mihaylo College of Business and Economics, California State University, Fullerton, Fullerton, CA 92831, USA
[2]Milgard School of Business, University of Washington, Tacoma, WA 98402, USA
[3]W. P. Carey School of Business, Arizona State University, Tempe, AZ 85281, USA

Corresponding author: D. S. Soper (dsoper@fullerton.edu)

ABSTRACT Service level agreement (SLA) negotiations involving cloud-based information technology (IT) service providers and customers are now commonplace. Although historical research on negotiation has often relied on economic foundations, the important nature of IT service levels to organizations' operational effectiveness suggests that negotiation complexities in the context of cloud-based outsourcing (or *cloudsourcing*) cannot be well understood by relying on economic perspectives alone. To that end, this paper reports on experiments designed to determine the relevance of competing sociotheoretic frameworks as they pertain to IT cloudsourcing negotiations. Contributions include a rigorous examination of hypotheses derived from social exchange theory, equity theory, learning theory, and the win–win theories of negotiation. Additional contributions include the development of methodological constructs (using the Euclidean geometry) that reflect the complex nature of IT cloudsourcing SLAs, i.e., that they are composed of numerous service category contract clauses where negotiation tradeoffs within a service category as well as across service categories are possible. We find strong support for the relevance of the social exchange theory to IT cloudsourcing negotiations, as well as moderate support for the win–win theories of negotiation. Our conclusions provide clear directions for extending our work into the realm of negotiation support systems, and we rely on our findings to conjecture that IT cloudsourcing negotiation is a unique context for sociotheoretic negotiation research due to the inherent importance of information technologies to organizations' operational effectiveness.

INDEX TERMS Cloudsourcing, negotiation, social theory, negotiation support, geometric negotiation.

I. INTRODUCTION

Since the middle of the 20th century, several academically oriented and theory-based economic models of decision-making have become firmly entrenched in the minds of managers and executives worldwide. Among the models that have become the most well-known and influential are those related to production, transaction, and agency cost theories. While each of these models considers decision-making from a distinct perspective, they nevertheless share a universal emphasis on cost savings. Indeed, cutting costs emerged as a dominant organizational survival strategy during the recent global economic crisis. As demonstrated in both the scientific and trade literatures, the desire to cut costs and focus on core competencies has engendered a strong managerial interest in the formation of organizational outsourcing relationships [1], [2]. Cloud-based IT outsourcing (which we refer to as *cloudsourcing*) is now one of the fastest growing and most disruptive trends in the global economy, with Gartner Research estimating that worldwide spending on cloud-based services will reach USD$250 billion by 2017 [3].

With respect to the outsourcing of information technology (IT) assets and services, organizations typically negotiate formal contracts with one or more service providers to obtain those IT services that they are unable or unwilling to handle internally [4], [5]. Such contracts are known as service level agreements (SLAs), and they serve to define the expectations, roles, responsibilities, and channels of communication between a service provider and its customers (*ibid.*). Although IT SLAs are now commonplace, it was not until recently that researchers began to investigate the linkages between SLAs and outsourcing success [6]. According to Deloitte Consulting, almost 50% of outsourced projects fail outright (*i.e.*, they fail to meet customers' expectations), and 30% of outsourcing engagements have ongoing issues

with outsourcer management processes (*e.g.*, inadequate governance and conflict resolution procedures) [7]. The absence of well-defined outsourcing arrangements that clearly state requirements and expectations is one of the major contributors to outsourcing failure [8]. With cost savings as a principal motivator underlying the decision to outsource IT services to a cloud provider, the actual implementation of a cloudsourcing relationship requires the negotiation of an IT SLA between the service provider and the customer. This negotiation process is critical because the nature of the negotiated contract has important implications for the quality of service received by the customer, as well as the profits that can be realized by the provider [9]. Importantly, negotiation itself can be used as a means of understanding, classifying, and comparing modern organizational IT services, as well as positioning studies thereof. This concept is illustrated in Figure 1 below:

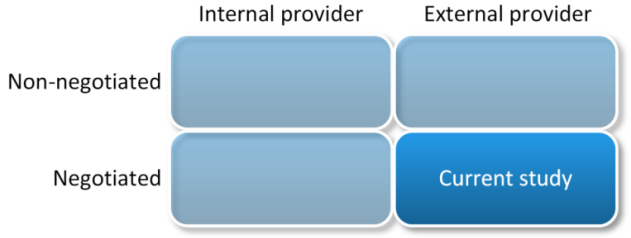

FIGURE 1. A typology of IT service provision in modern organizations.

As organizations increasingly rely on negotiated cloudsourcing relationships to acquire needed IT services, it is reasonable to expect that prudent "customer" organizations will seek to extract as much utility or value as possible from those relationships. In fact, the search for value has been recognized for many years as a principal motivator underlying the decision to outsource IT services [1]. Counterbalancing this objective, however, is the desire of the cloud service "provider" to maximize profits without losing the goodwill of the customer [10]. *Prima facie*, the contrasting goals of the cloud service provider and the customer may lead one to conclude that this is nominally a zero-sum game which should be subjected to a Pareto analysis. The problem with such a conclusion, however, is that it is based upon an assumption of rational decision-making behavior on the part of both parties in the context of complete information. While such assumptions may be theoretically tenable, in practice the contrasting interests of the two negotiating parties must be reconciled by human negotiators who do not always behave rationally [11], and who almost never find themselves with complete information [12].

The negotiation process itself is embedded within a dynamic decision-making environment in which complex social and emotional factors have critical implications for the negotiation outcome [13]. Theoretical perspectives linked to social behavior may therefore provide a greater degree of understanding and insight into IT cloudsourcing negotiations than could otherwise be obtained from economic models of decision-making alone. There are, however, several competing social theories that appear to be relevant to this domain, many of which produce orthogonal predictions with respect to negotiation outcomes. If further insight into the IT cloudsourcing negotiation process from a socio-theoretic perspective is to be gained, it is necessary to consider the general applicability of these social theories to IT cloudsourcing negotiations. Accordingly, the current paper describes an experiment that assesses the extent to which a set of these theories is relevant to the IT cloudsourcing negotiation process. By evaluating the applicability of each of these social theories, it is intended that this study will both improve negotiation outcomes for organizational cloudsourcing SLAs and provide a foundation upon which future research in this area can be built. The current paper also provides mathematical and geometric methods for understanding and assessing negotiations which are readily translatable into computer-based information systems (*i.e.*, negotiation support systems) which can support human negotiators during the negotiation process. By offloading the cognitive burden associated with the more mundane aspects of IT cloudsourcing negotiations, such systems can allow human negotiators to dedicate more time and cognitive effort to other aspects of the negotiation process, such as consensus and relationship-building.

In the following section, we discuss the comparative socio-theoretic models that are relevant to SLA negotiations in the context of cloudsourcing. In section 3, we describe the IT cloudsourcing SLA negotiation process, and derive hypotheses from the competing socio-theoretic models of behavior within the context of IT cloudsourcing negotiations. The design of our experiment and a detailed discussion of the geometric methods upon which our analyses are based appear in section 4. We then analyze and discuss those hypotheses in section 5, and conclude the article with a summary and a set of managerial considerations in the final section.

II. COMPETING SOCIAL THEORIES

Socially oriented negotiation models interpret the negotiation process from a number of different perspectives including learning, individual behaviors, joint decision-making, and the comparison of alternatives, among others [14]. Many of these models rely upon social exchange theory, which characterizes the relationship between two parties as being based upon a reciprocal give-and-take exchange process [15]. From this theoretical perspective, each party to the negotiation performs subjective cost-benefit analyses as it attempts to manage the negotiation process. Within certain boundaries, the parties are willing to consider refining their initial positions in exchange for concessions from the other party. Such give-and-take offers are, however, not assumed to be objectively equitable because each party may assign different levels of value or importance to the issues being negotiated. In the context of negotiation, this theory posits that an agreement will be reached only when both parties judge the benefits of the proposed relationship to outweigh the costs. With respect to the renegotiation of contracts, this theory posits that the

business relationship will be maintained until one or both parties believe the perceived costs to outweigh the perceived benefits.

Somewhat similar to social exchange theory is equity theory, which predicts that an accord will be reached when the parties judge the proposed relationship to be both fair and just [16]. For the renegotiation of a contract, this implies that a party will resist changing the terms of an IT SLA if its needs are being met through the current arrangement. An extension to this theory concretizes the notion of equity in the negotiation outcome by postulating that the midpoint between negotiators' past demands and offers will be viewed by both parties as ''just'', and that the parties will strive to meet at that midpoint with an eye toward fairness as achieved through reciprocation [17]. It is important to note that this theory implicitly espouses zero-sum principles, as one negotiating party must offer a concession in order for the other negotiating party to gain.

An alternate social perspective emphasizes the role of dynamic learning in the negotiation process [18]. From this theoretical orientation, negotiators are viewed as attempting to optimize negotiation outcomes by employing bargaining strategies that may change dynamically as the negotiation unfolds. Parties select an initial bargaining strategy based upon perceptions of their opponent, which in turn emerge from what each party has learned prior to and during the negotiation. Within the framework of this learning theory, the degree of *in situ* contemplation and learning can thus be expected to affect negotiation outcomes. Indeed, evidence from the literature suggests that IT outsourcing negotiation outcomes can be improved when information asymmetries between negotiating parties are narrowed through effective learning [19]. Motivated parties that actively and effectively engage in learning activities may thus be able to outperform their opponents in an IT outsourcing negotiation.

In addition to the theoretical perspectives noted above, principled negotiation has been put forth as a ''win-win'' approach to reaching a lasting agreement [20]. Proponents of this model argue that negotiation outcomes can be improved for both parties if the negotiation focuses on the interests of the parties rather than on their positions. Negotiating parties are expected to generate several distinct options before attempting to arrive at a final agreement, which itself must be based solely upon objective measures. A similar interest-based, ''win-win'' negotiation theory has also been proposed wherein one party influences the preferences of the other by discussing their underlying motivations for adopting specific goals. The discussion is thusly shifted away from goals, and instead focuses on the relevance of those goals [21]. Indeed, such joint problem-solving approaches have been shown to strengthen strategic supplier alliances [22]. Although a high level of trust is required – which itself can reduce negotiation costs [23] – parties behaving according to this ''win-win'' approach may discover capabilities or needs in the other party that were not initially considered or identified during pre-negotiation preparations. Such discoveries are expected to lead to an ''expansion of the pie'', wherein both parties are able to extract additional benefits from the relationship that were not anticipated at the outset of the negotiation process. Both parties must negotiate in good faith, however, and inter-party trust must be high. A graphical comparison of these four socially-oriented perspectives of the IT cloudsourcing negotiation process is shown in Figure 2 above.

In addition to providing alternate lenses for studying SLA negotiation, the models above identify factors that may affect negotiation outcomes. The factors relevant to the models may provide starting points for the identification of negotiation support system requirements tailored to the IT cloudsourcing domain. One or more of these theoretical models may be relevant to the negotiation of IT cloudsourcing SLAs, however since each model seemingly provides a tenable predictive and explanatory framework for the cloudsourcing negotiation process, an inquiry is required to assess the relevance of each to this increasingly common business strategy.

III. NEGOTIATION PROCESS AND RESEARCH HYPOTHESES

The typical IT cloudsourcing negotiation process begins with each party preparing an initial proposal that specifies its objectives for the potential relationship. For the customer, this proposal may include the cloud-based services it wishes to purchase, service and performance expectations, desired cost structures, and any other terms that the customer deems relevant or necessary. For the service provider, this proposal may include a menu of available products and services, capabilities, cost structures associated with different service levels, and any other terms that the provider deems germane to the relationship. With these proposals in hand, the process continues with one or more rounds of interparty negotiation during which the parties attempt to reconcile their differences and establish a mutually beneficial business partnership. Since each party must maneuver to ensure that its interests and positions are achieved to the greatest extent possible, this can be a complicated and highly nuanced process. A negotiation ends successfully when both parties agree to a set of terms that is formally detailed in a written contract, or it ends in a breakdown when, despite the efforts of the negotiators, such an agreement cannot be reached. Each of the theories described in the previous section can be mapped to this generic negotiation lifecycle, which is depicted in Figure 3 below. Note that the negotiation lifecycle can – at least in theory – continue indefinitely through repeated stages of negotiation, impasse, and adjournment. Negotiations over the Iranian nuclear program, for example, persisted for more than 12 years [24].

Evaluating the applicability of each theory to this negotiation lifecycle in the context of cloudsourcing requires a deliberate, stepwise approach in which an increasingly robust and rigorous body of scientific evidence is developed over time. The way in which this process is rendered is critically important since it may produce new boundary conditions for one or more well-established theories.

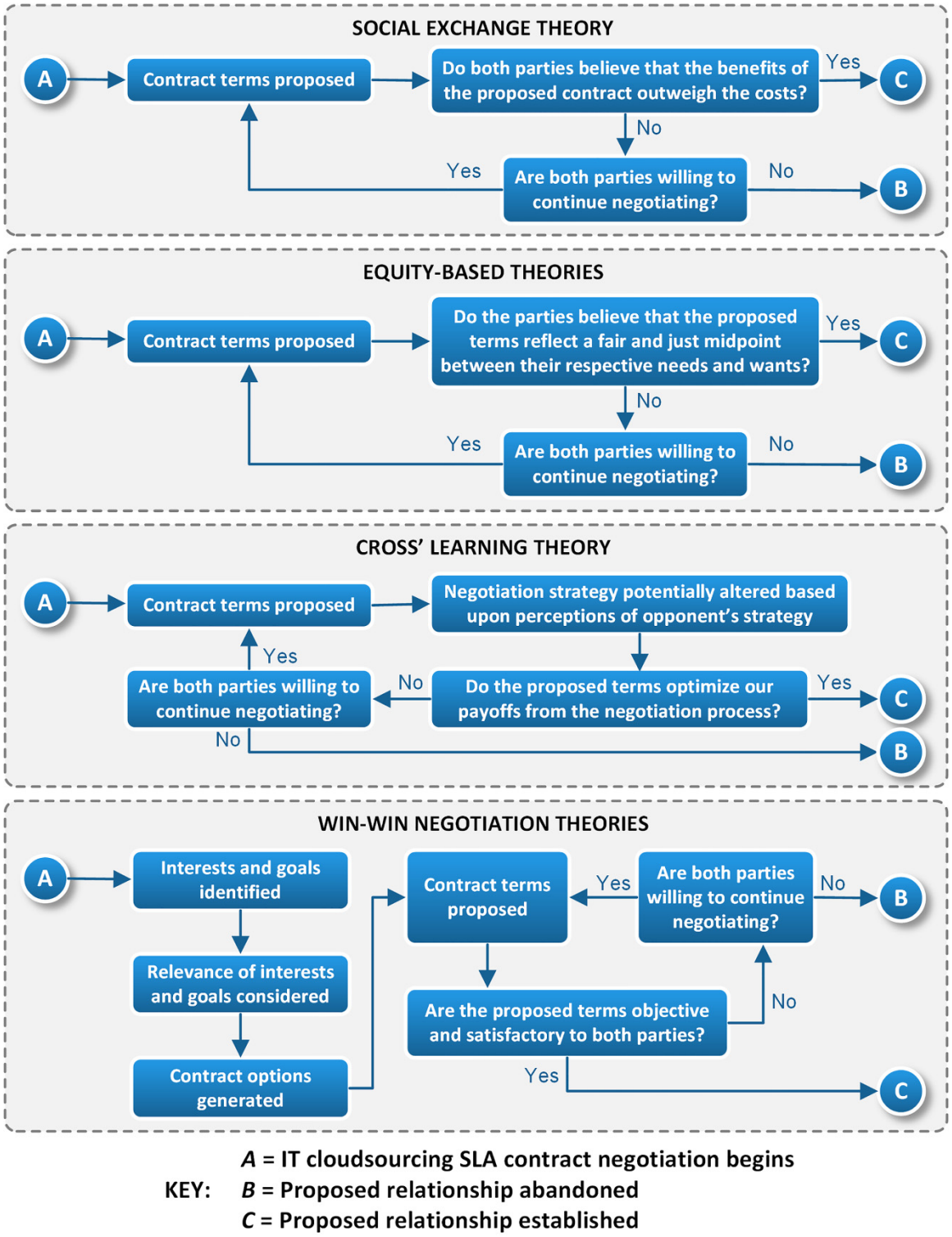

FIGURE 2. Comparative socio-theoretic models of the IT cloudsourcing negotiation process.

We believe that the evaluation of several research hypotheses tailored to a two-party IT cloudsourcing negotiation scenario represents a foundational point of embarkation for this larger theory testing process. The balance of this paper is directed to the development and testing of such a set of hypotheses.

We first consider social exchange theory and the way in which parties reconcile contentious issues in two-party

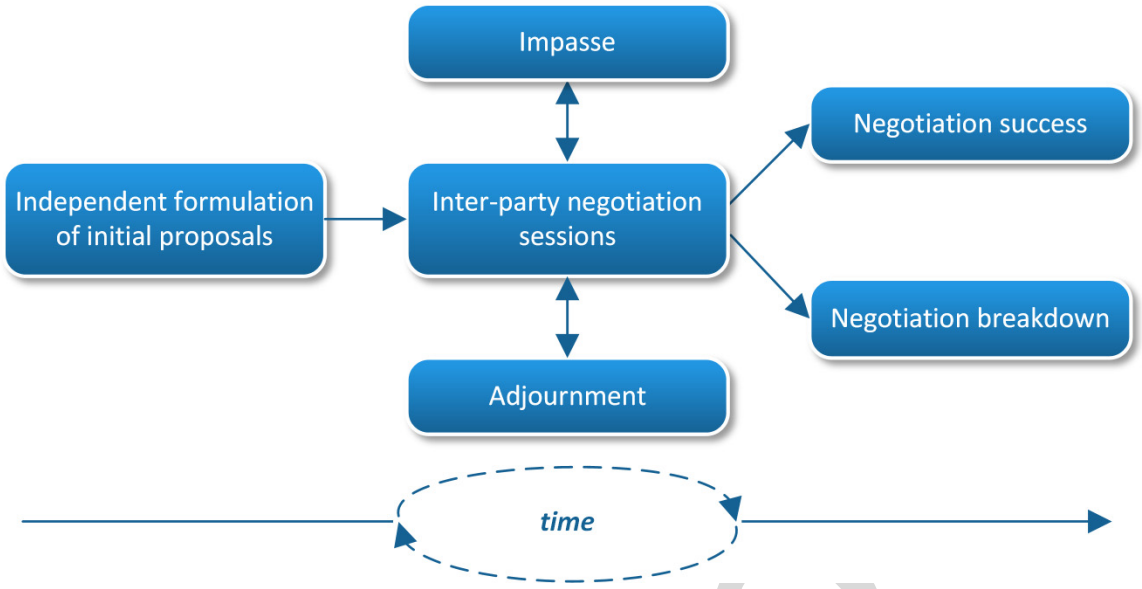

FIGURE 3. Negotiation lifecycle. Adapted from Holsapple *et al.* [25].

IT cloudsourcing negotiations. From this theoretical perspective, the parties involved in an IT cloudsourcing negotiation will iteratively offer trade-offs to one another in an effort to secure a mutually-beneficial accord [15]. When the result of this iterative give-and-take process is a set of terms that is viewed by the parties as yielding a net benefit for their respective organizations, a final agreement can be achieved. Thus:

Hypothesis 1: Contentious issues in two-party IT cloudsourcing negotiations will be resolved through a reciprocal give-and-take exchange process.

We next consider the equity-based theories, which together postulate that parties will seek to resolve contentious issues by negotiating agreements that lie at the midpoint between each party's initial needs and wants [16], [17]. If correct, this theory could usefully aid negotiating parties in creating and applying an objective, quantifiable conflict resolution and prevention strategy that strives for justice and fairness. Thus:

Hypothesis 2: A midpoint between contentious initial positions in two-party IT cloudsourcing negotiations will be viewed by both parties as just, and the parties will strive to achieve that midpoint.

With respect to Cross' learning theory, the classification of negotiators as fundamental learning and decision-making units may also have important implications for the negotiation of IT cloudsourcing SLAs. According to this theoretical perspective, negotiators who engage in comparatively high levels of thoughtful contemplation and situational scrutiny during the negotiation process can be expected to outperform their less contemplative, lower-learning counterparts [26]. Thus:

Hypothesis 3: The performance of IT cloudsourcing negotiators is positively related to their levels of contemplative thought and situational scrutiny during the negotiation process.

The final hypothesis is derived from the "win-win" negotiation theories, and relates to the theory-driven findings of Lee and Kim, which focused on partnership quality [27]. These researchers posit that negotiation outcomes are related to partnership quality, which in turn is influenced by inter-party communication and participation. Parties that engage in friendly, good faith negotiations may therefore be able to discover additional capabilities or needs in one another that were not originally identified during the pre-negotiation process, thereby producing more expansive agreements which increase the value of the relationship for both parties [20]. Thus:

Hypothesis 4: Comparatively high levels of partnership quality during two-party IT cloudsourcing negotiations will lead to more expansive agreements than were initially considered.

The following section details the methodology for an experiment which was designed to determine the extent to which each of the above hypotheses, and by extension the underlying theoretical foundation of each, is relevant to two-party IT cloudsourcing negotiations.

IV. EXPERIMENT DESIGN AND METHODOLOGY

Testing the hypotheses developed above was accomplished by conducting a series of semi-structured, two-party negotiations in a controlled laboratory environment. To facilitate the investigation, an SLA-based IT cloudsourcing scenario was developed in which two parties negotiated for the provision of multiple IT services. To ensure that the negotiation scenario was familiar and relevant to the participants, the two negotiating parties were operationalized as a large business school

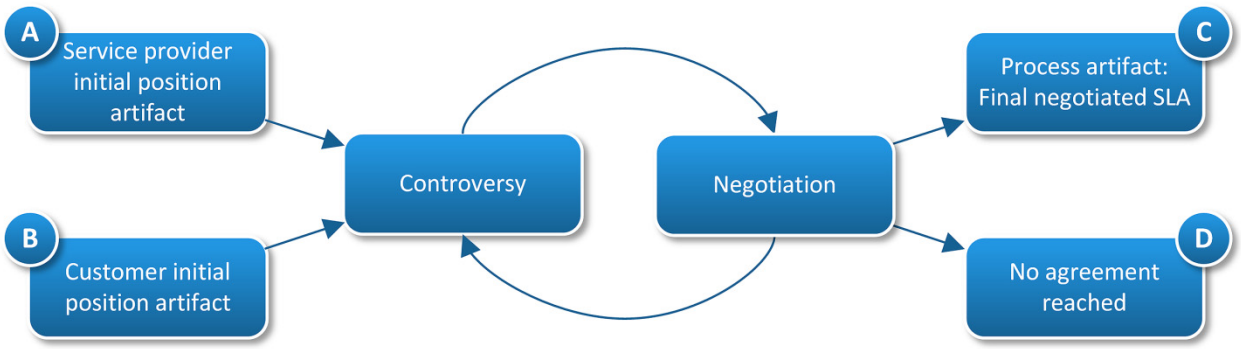

FIGURE 4. IT cloudsourcing negotiation process model.

(the customer) and a respected outside IT cloud service company (the service provider). In the experiment itself, several simulated IT cloudsourcing negotiations were conducted in order to gather data regarding negotiation outcomes and the process leading to those outcomes. In conjunction with pre- and post-negotiation surveys, these data were codified and analyzed in an effort to evaluate the hypotheses developed in the previous section. The process model which guided the IT cloudsourcing negotiations is shown in Figure 4 below.

The subjects in the study were graduate students (232 total subjects) from a leading business school in the southwestern United States. Subjects were compensated USD$5 for their participation in the experiment, and were motivated to do well by the promise of an additional bonus payment (USD$50) being awarded to the three top-performing negotiators. Prior to participating in the experiment, each subject was required to read an instructional document which (1) explained the concept of IT cloudsourcing, (2) familiarized them with the purpose and structure of IT cloudsourcing SLAs, and (3) acquainted them with the IT cloudsourcing negotiation scenario which formed the core of the experiment. Next, half of the subjects were randomly assigned to play the customer role during the negotiation, with the remaining subjects being assigned to play the role of the service provider. Subjects were then asked to complete a brief pre-negotiation demographic survey which inquired into their age, gender, and level of negotiation experience.

After completing the demographic survey, subjects were supplied with documents that detailed their initial positions for playing the business school (*i.e.*, customer) and service provider roles. To introduce a realistic degree of service breadth into the experiment, these documents were comprised of a list of ten cloud computing service items adopted directly from the menu of services available through the Amazon Web Services (AWS) cloud computing platform [28]. Specifically, the cloud-based IT service items available for negotiation in the experiment included analytics services, application software hosting, data backup services, database services, document search services, email services, file storage services, identity management services, online tech support services, and web software hosting. For each subject, each of the ten IT service items was assigned a random integer between zero and ten (inclusive) which indicated the desired level of service or service provision for that item. This random assignment approach was taken because corporate negotiation teams are typically required to pursue objectives determined not by themselves, but rather by management [29]. By way of example, suppose that a subject received an initial position document for playing the customer role that indicated a desired service level of 10 for the ''application software hosting'' item, and a desired service level of 3 for the ''data backup services'' item. Such a situation would indicate to the subject that the business school desired a substantially higher level of service for application software hosting than for the provision of data backup services. These initial position documents are represented by *A* and *B* in Figure 4 above.

Returning to the preparations for the experiment, each negotiator was told that the initial positions with which he or she had been provided were financially optimal for their organizations, and that deviations from those positions would either increase total costs (customer's perspective) or decrease total profits (service provider's perspective). This information was intended to provide the teams with a general framework for valuing and assessing costs and profitability. Further, the subjects were instructed to consider the service level scaling to be equal across service items and across roles. A three-point change in the service level for a given service item, for example, would have the same relative impact on costs or profits as a three-point change in the service level for any other service item.

Upon completing their preparations, subjects were provided with a computer terminal which displayed an interactive web application designed to facilitate negotiations between customers and service providers. This approach was taken with a view toward ensuring the anonymity of each party, thereby mitigating the potential effects of any preexisting social relationships. The web application automatically paired subjects with a randomly chosen opponent, and provided each subject with the ability to prepare and send offers to the opposing party, accept an opponent's offer, or terminate

FIGURE 5. Sample IT cloudsourcing negotiation interface.

the negotiation if the subject believed that an agreement could not be reached. A sample of the negotiation interface as seen from the perspective of the customer is provided in Figure 5 below.

After completing a brief tutorial on how to use the negotiation interface, a two-party negotiation between opposing subjects was conducted, the result of which was either a jointly constructed final IT cloudsourcing SLA (*C* in Figure 4 above), or no agreement at all (*i.e.*, a negotiation breakdown, depicted as *D* in Figure 4). As with the initial position documents, a final cloudsourcing SLA was characterized by a list of ten service items, the negotiated service levels for which were indicated by an integer ranging from zero to ten. Upon completing the negotiation process, subjects were required to respond to two post-negotiation survey questions which asked them (1) about the nature of their negotiation environment (5-point Likert-type scale anchored at *1 = confrontational* and *5 = friendly*) and (2) for a self-assessment of their overall performance (5-point Likert-type scale anchored at *1 = poor* and *5 = excellent*). Of the 116 total negotiations that were conducted in the experiment, 28 negotiations (24.1%) ended in breakdown (*i.e.*, no agreement was reached), with the remaining 88 negotiations (75.9%) ending with an agreement and an associated IT cloudsourcing SLA. Given that the primary objective of the current study was to determine the extent to which competing social theories accurately described and predicted successful negotiation outcomes, the 28 negotiations that did not result in a final agreement were omitted from further consideration. The research artifacts produced by the successfully concluded negotiations thus included three demographic variables for each subject (age, gender, and negotiation experience), subject assessments of both the nature of the negotiation environment and their own performance during the negotiation process, 176 initial position documents, and 88 final negotiated IT cloudsourcing SLAs. The web application that facilitated the inter-party negotiations also captured the total amount of time (in seconds) used by each subject, the total number of negotiation rounds that were required in order for subjects to conclude the negotiation process, and the offers that were made by the opposing parties during each round of negotiation.

In light of the study's research hypotheses, it is important to define what is meant by "negotiator performance" in the context of IT cloudsourcing negotiations. We believe that the performance of a negotiator is best measured by the extent to which she is able to achieve her objectives, *relative to that of the opposing party*. In other words, it is the comparative degree of similarity between a negotiator's initial positions and the terms contained in the final negotiated IT cloudsourcing SLA that defines how well the negotiator performed during the negotiation process. As a simple example, assume that a person wishes to purchase a particular used vehicle, and that her objective is to acquire the vehicle for the lowest price possible. Contrarily, the objective of the seller is to sell the vehicle for the highest price possible. If the buyer's initial position is that the vehicle is worth USD$10,000, and the seller's initial position is that the vehicle is worth USD$15,000, then a negotiated compromise in the sales price will need to be reached if the sale is to conclude successfully.

If we assume that both parties assign an equal value to money, and if the final sales price of the vehicle is USD$12,000, then it could reasonably be concluded that the buyer outperformed the seller in the negotiation process because her initial position was closer to the final sales price than was the seller's initial position.

At first glance, this measurement approach may seem to suggest or favor equity-based theories. However, when the number of terms to be negotiated is large, the combinatorics associated with individual and conditional tradeoff analyses significantly confound the decision-making process, and the dynamism of the negotiation process makes it extremely difficult for human negotiators to rely on repeated formal analyses – particularly when tradeoff costs and benefits are impossible to precisely quantify. This approach to measurement also supports situations in which both parties can potentially extract greater benefits from the negotiation than what zero-sum approaches might prescribe. Indeed, the many benefits of this measurement model imply that it may serve as a useful foundation for negotiation support systems (NSSs) designed to facilitate the IT cloudsourcing negotiation process.

Although the example above required negotiation on only a single dimension (*i.e.*, the price of the vehicle), the tenets of Euclidean geometry can be used to examine the same notion of subject performance in more complicated, multi-issue negotiations. It is important to note that the Euclidean geometry-based measure of negotiator performance used herein does not preclude the possibility of both parties extracting benefits from the negotiated outcome. Indeed, social exchange theory asserts that both parties must perceive that they are benefiting from the proposed agreement if the negotiation is to be successful. Our method simply allows those benefits to be unequal, and connects the performance of the negotiating parties to the degree of disparity in net benefits extracted from the agreement.

Returning to our IT cloudsourcing scenario, recall that artifacts reflective of the initial positions and the final negotiated IT cloudsourcing SLA all contained service level values for the same ten service items. As such, the content of each artifact was readily reducible to a vector of ten integers. By ensuring that the order in which the service level values were recorded for each artifact was identical from vector to vector, each of the resulting vectors (one for each artifact) represented a fixed point in a shared multidimensional Euclidean space [30]. To clarify, suppose that the parties only needed to negotiate service levels for three service items (instead of ten), which we will call X, Y, and Z. If the service level values for these three dimensions are extracted from the initial position artifacts and the final cloudsourcing SLA, and if the order in which those values are recorded is identical (e.g., X, followed by Y, followed by Z), then together the values represent point coordinates in a shared three-dimensional space. This is illustrated in Figure 6 below.

As shown in the figure, this approach allows the content of the documents to be represented geometrically. Further, it becomes possible to determine the degree of disparity between any two document artifacts simply by computing the geometric distance between them. While the example above utilized only a three-dimensional space, the concept is readily extensible into an n-dimensional space (*i.e.*, a hyperplane) wherein the distance between points (*i.e.*, the distance between artifacts) is determined by the Euclidean distance formula (*ibid.*), defined as:

$$d_{A,B} = \sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 \ldots + (a_n - b_n)^2} \quad (1)$$

Where:

A = A point in Euclidean space defined by Cartesian coordinates $(a_1, a_2, \ldots a_n)$.

B = A point in Euclidean space defined by Cartesian coordinates $(b_1, b_2, \ldots b_n)$.

$d_{A,B}$ = The Euclidean distance between A and B.

Note that this formula allows distances to be calculated not only between bargaining positions as a whole, but also between individual issues within a broader, multi-issue negotiation. For several of our analyses, it was necessary to standardize this notion of "distance" in order to allow valid comparisons to be made among negotiations in which the participants began with varying initial positions. For the current study, the distances between the subjects' initial positions and the final negotiated cloudsourcing SLAs were thus

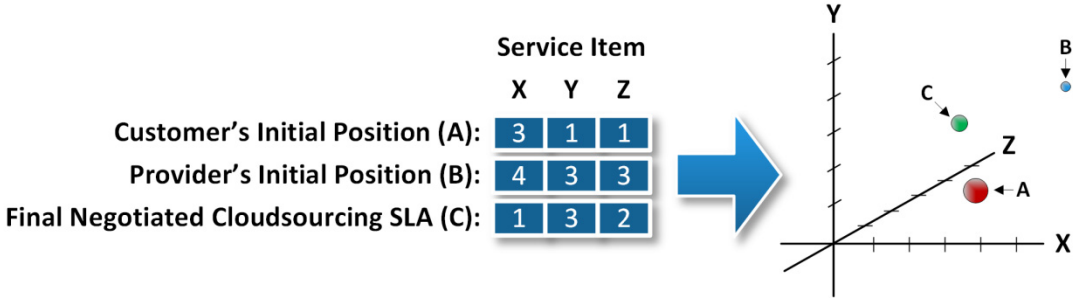

FIGURE 6. A geometric representation of document content.

standardized as:

$$D_{A,C} = \frac{d_{A,C}}{(d_{A,C} + d_{B,C})} \text{ and } D_{B,C} = \frac{d_{B,C}}{(d_{A,C} + d_{B,C})} \quad (2)$$

Where:

- A = Subject A's initial position.
- B = Subject B's initial position.
- C = The position of the final negotiated cloudsourcing SLA.
- $d_{A,C}$ = The Euclidean distance between A and C (see Equation 1).
- $d_{B,C}$ = The Euclidean distance between B and C (see Equation 1).
- $D_{A,C}$ = The standardized distance between Subject A's initial position and the final SLA.
- $D_{B,C}$ = The standardized distance between Subject B's initial position and the final SLA.

$D_{A,C}$ and $D_{B,C}$ in (2) above produce continuous standardized distance values that fall between zero and one (inclusive). These values represent the distance between a given subject's initial position and the final negotiated cloudsourcing SLA, relative to the distance between the opposing subject's initial position and the final negotiated SLA. According to this standardization method, $D_{A,C}$ and $D_{B,C}$ will always sum to 1.0, and the mean of $D_{A,C}$ and $D_{B,C}$ will always be 0.5.

For the standardized distance values described above between a negotiator's initial position and the final SLA, it is important to note that such values decrease and approach zero as the negotiator increasingly achieves her objectives relative to her opponent. Given the definition of negotiation performance as the extent to which a negotiator is able to achieve her objectives relative to that of the opposing party, we adopted the unity difference of the standardized distance between a negotiator's initial position and the final SLA as our quantitative measure of overall negotiator performance (Equation 3). This resulted in a readily interpretable standardized performance metric for each negotiator which ranged from zero to one, with increasing values directly reflecting increasing negotiation performance.

$$P_A = 1 - D_{A,C} = D_{B,C} \quad (3)$$

Where:

- P_A = The overall standardized negotiation performance for Subject A.
- $D_{A,C}$ = The standardized distance between Subject A's initial position and the final SLA (see Equation 2).
- $D_{B,C}$ = The standardized distance between Subject B's initial position and the final SLA (see Equation 2).

For purposes of clarity, an example of the relationships among the standardized distances between negotiation artifacts and the negotiators' standardized performance values are illustrated in Figure 7 below.

Finally, in an effort to gain insights into the ways in which the opposing parties' offers evolved as the negotiation process unfolded, it was necessary to develop a normalized measure of the distance between offers that would allow valid comparisons to be made both between negotiations and within specific negotiations over time. For this purpose, the raw Euclidean distances between the opposing parties' offers for each round of a negotiation were normalized using the standard unity-based normalization formula (Equation 4) to fall on an interval between zero and one. Using this approach, the maximum normalized distance between the parties' offers at any point during their negotiation would always be equal to one, while perfect agreement between the opposing parties' offers would yield a normalized distance of zero. This approach thus allowed for straightforward interpretation and for valid comparisons to be made both between negotiations and from one round of negotiation to the next within any given negotiation.

$$d'_i = \frac{d_i}{\max\limits_{j \in [n]} d_j} \quad (4)$$

Where:

- d'_i = The normalized distance between the opposing parties' offers for negotiation round i.
- d_i = The raw Euclidean distance between the opposing parties' offers for negotiation round i.
- $[n]$ = $\{1, ..., n\}$, the set of negotiation rounds within a cloudsourcing negotiation.

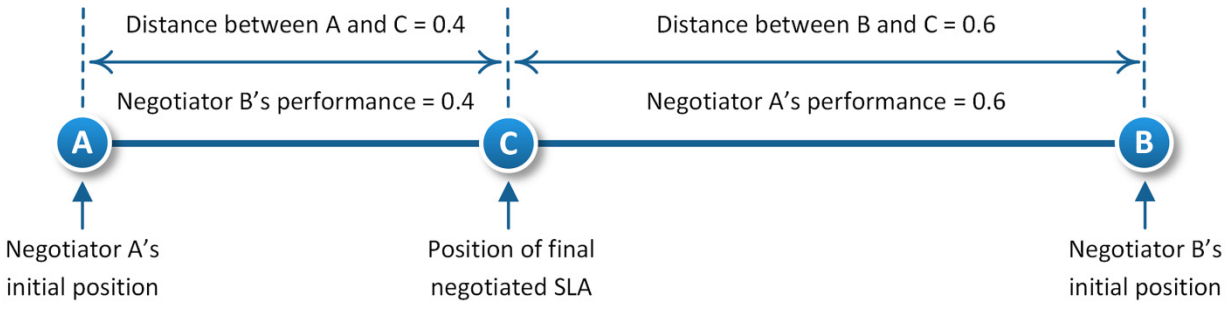

FIGURE 7. Relationships among negotiation artifact distances and negotiator performance.

TABLE 1. Descriptive statistics for study subjects.

	N	Median	Mean	Std Dev	Range
Age (in years):	232	31	35.17	12.96	22 - 75 years
Negotiation experience: (1 - 5 scale: 1 = "none", 5 = "extensive")	232	3	2.81	0.88	1 - 5
Negotiation environment: (1 - 5 scale: 1 = "confrontational", 5 = "friendly")	232	3	3.38	1.03	1 - 5
Self-assessment of negotiation performance: (1 - 5 scale: 1 = "poor", 5 = "excellent")	232	3	3.06	1.05	1 - 5

The quantitative methods and metrics developed above provided a very useful and valuable foundation for our subsequent statistical analyses. When used in conjunction with one- and two-sample t-tests and linear regression analyses, these quantitative measures allowed a great deal of insight to be gained into the theory-derived hypotheses developed in the previous section.

V. ANALYSIS AND DISCUSSION

Before proceeding to our analyses, we first present an overview of the subjects' demographics in Table 1 above with a view toward better contextualizing the nature of the participants in the experiment. Of the 232 total subjects, 110 (47.4%) indicated that they were female, while the remaining 122 subjects (52.6%) indicated that they were male. One-way analyses of variance revealed that there were no statistically significant differences among male and female subjects for negotiation experience ($F_{[1,230]} = 2.759$, $p = 0.098$) or self-assessment of negotiation task performance ($F_{[1,230]} = 0.031$, $p = 0.862$). Significant gender differences did, however, exist with respect to subjects' perceptions of the nature of the negotiation environment ($F_{[1,230]} = 4.350$, $p < 0.05$), with men viewing the negotiation environment as more confrontational than women. As further preliminaries, the data indicate that subjects were, on average, neither highly experienced nor highly inexperienced negotiators. The data also indicate that, on average, the subjects were neither overly pessimistic nor overly narcissistic regarding their own performance. Finally, the negotiation environment was, on average, characterized as more friendly than confrontational – an observation that is important because the "win-win" theories of negotiation purport to be particularly relevant in friendly and open negotiation environments. When considered together, the data exhibit reasonably large levels of variability within each of the constructs addressed by the pre- and post-negotiation survey instruments. This situation is encouraging because it implies a high degree of diversity among the subjects along the dimensions assessed in the study. Any broad conclusions drawn from these data may therefore have a greater intrinsic level of generalizability than if the subject pool had been more homogeneous.

As a means of providing additional preliminary insights, we next turn our attention to the bivariate correlational relationships among the data gathered during the experiment. Table 2 below thus presents the Pearson correlations among the study's variables, along with their associated (two-tailed) levels of significance.

The values reported in the table above reveal many interesting insights into the IT cloudsourcing negotiation process and its subsequent outcomes, and we will briefly consider several of these here. To begin, the strong positive relationship

TABLE 2. Correlations and significances among study variables.

	Elapsed time	Age	Gender (F=0, M=1)	Negotiation experience	Negotiation environment	Self-assessment of performance	Rounds of negotiation
Age	0.380***						
Gender (F=0, M=1)	-0.046	0.120					
Negotiation experience	0.173**	0.102	0.110				
Negotiation environment	-0.179**	-0.056	-0.137*	0.024			
Self-assessment of performance	-0.091	-0.093	-0.011	0.098	0.477***		
Rounds of negotiation	0.708***	0.092	-0.063	0.019	-0.283***	-0.157*	
Negotiation performance	0.365***	0.131*	-0.059	0.016	0.090	0.168*	0.297***

*** p < 0.001 ** p < 0.01 * p < 0.05

between elapsed time and performance suggests that subjects who invested more time into the negotiation process were likely to achieve greater levels of performance than their less patient counterparts. In turn, both older subjects and subjects with higher levels of negotiation experience were the most likely to invest comparatively long periods of time into the negotiation process. Subjects did, however, tend to classify the negotiation environment as more confrontational as the time required to conclude their negotiations increased. Contrarily, subjects were much more likely to classify the negotiation environment as friendly if they believed that they had performed well during the negotiation process. Interestingly, a significant positive correlation was observed between subjects' self-assessments of their performance and their actual negotiation performance, perhaps indicating that subjects are able to intuit when they have done well, even when faced with a reasonably challenging multi-issue negotiation scenario. Correlational observations such as these may serve as fruitful ground upon which future research can build testable propositions.

A. EVALUATION AND DISCUSSION OF HYPOTHESIS 1

Returning to our research hypotheses, the first hypothesis, which was derived from social exchange theory, posited that contentious issues in two-party IT cloudsourcing negotiations would be resolved through a reciprocal give-and-take exchange process. Substantial evidence of the existence of such behavior would thus provide support for the hypothesis and the relevance of its underlying theory to the IT cloudsourcing negotiation process. With a view toward gaining detailed insights into this hypothesis, the negotiation data were scrutinized from both micro and macro levels of analysis. From the micro perspective, the Euclidean distances between individual contentious issues (*i.e.*, issues for which different service levels were specified in the parties' initial position documents) were examined from one round of negotiation to the next in order to ascertain the extent to which negotiators were willing to offer concessions to their opponents on an issue-by-issue basis. From the macro perspective, both the number of contentious issues and the overall, normalized Euclidean distances between the parties' offers were examined from one round of negotiation to the next with a view toward determining the extent to which aggregate differences in the parties' bargaining positions were resolved through a reciprocal give-and-take exchange process.

Among the 88 successfully completed negotiations, a total of 789 contentious issues were identified with respect to the opposing parties' initial bargaining positions. Beginning with the micro level of analysis, we computed the Euclidean distances between each of these individual contentious issues for each round of negotiation that occurred during the negotiation process. In order to determine the extent to which issue-by-issue concessions were offered by the opposing parties over time, we estimated a linear model in which the distance between the service levels specified by the parties for each contentious issue was predicted by its associated round of negotiation. The results revealed the round of negotiation to be a highly significant predictor of the distance between individual contentious issues (model $R^2 = 0.024$, overall model $p < 0.001$, *negotiation round* parameter estimate $= -0.190$, *negotiation round* parameter estimate $p < 0.001$). From an interpretive perspective, the *negotiation round* parameter estimate of -0.190 indicates that on average, the distance between each individual contentious issue in a cloudsourcing negotiation was reduced by approximately 0.19 units during each successive round of negotiation. Although a great deal of variability was present in the rates at which distances between contentious issues changed over time (as evidenced by the relatively small model R^2), the overall trend was characterized by a steady and statistically significant reduction in those distances. This observation indicates that the opposing parties exchanged concessions on individual contentious issues over time, thus providing support for Hypothesis 1 from a micro perspective.

In order to evaluate Hypothesis 1 from a macro perspective, we first considered the extent to which the number of contentious issues in a cloudsourcing negotiation changed as the negotiation unfolded. For this purpose, we computed the number of contentious issues that were present during each round of each negotiation, and then estimated a linear model in which the number of contentious issues was predicted by its associated negotiation round. The results revealed the round of negotiation to be a highly significant and reliable predictor of the number of contentious issues present at any point in time during a cloudsourcing negotiation (model $R^2 = 0.636$, overall model $p < 0.001$, *negotiation round* parameter estimate $= -0.696$, *negotiation round* parameter estimate $p < 0.001$). The results obtained from the linear model thus revealed that on average, the number of contentious issues in the cloudsourcing negotiations decreased by approximately 0.7 issues for each successive round of negotiation in which the parties engaged. Put another way, these results show that the opposing parties successfully reconciled more and more of the differences between their divergent positions as the negotiation process progressed, implying an aggregate willingness among the parties to offer increasingly substantial concessions with a view toward securing an overall agreement.

Finally, we evaluated Hypothesis 1 from a macro perspective by considering the extent to which the normalized distance between the opposing parties' bargaining positions changed from one round of negotiation to the next. For this purpose, we computed the normalized Euclidean distances between the parties' offers using the standard unity-based normalization formula (*vide supra*, Equation 4), with the normalized distance values being used in the analysis so as to aid in the interpretation of the results. By means of a standard linear regression model, the round of negotiation was then used to predict its associated normalized distance value, after controlling for the subjects' age, gender, level of negotiation experience, characterization of the negotiation environment, and self-assessment of performance. None of these control

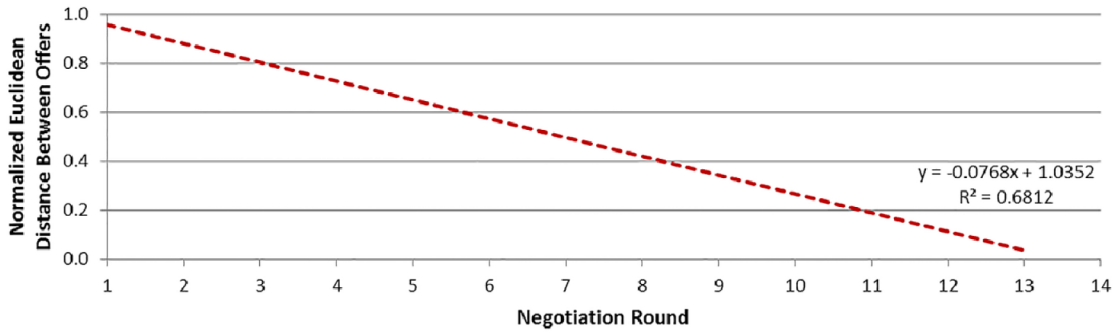

FIGURE 8. Normalized distance between party offers over time.

variables was observed to be a significant predictor. The control variables were thus removed from the linear model, after which the model was re-estimated. The results of this analysis are presented in Figure 8 below.

As shown in the figure, the round of negotiation was a highly reliable and highly significant predictor of the normalized distance between the opposing parties' offers over time (model $R^2 = 0.681$, overall model $p < 0.001$, *negotiation round* parameter estimate $= -0.077$, *negotiation round* parameter estimate $p < 0.001$). In light of the normalized nature of the distances between opposing offers, these results can be readily interpreted as indicating that on average, the total hyperplane distance between the parties' offers declined by approximately 7.7% for each successive round of negotiation. When considered in conjunction with the other results reported immediately above, the results of this analysis clearly reveal an aggregate willingness of the negotiating parties to reciprocally offer concessions over time, thus providing support for Hypothesis 1, and by extension, for the relevance of social exchange theory to the IT cloudsourcing SLA negotiation process.

B. EVALUATION AND DISCUSSION OF HYPOTHESIS 2

Hypothesis 2, which was derived from the equity theory of negotiation, posited that a midpoint between contentious initial positions in two-party IT cloudsourcing negotiations would be viewed by both parties as just, and that the parties would strive to achieve that midpoint. As with Hypothesis 1, the veracity of this hypothesis was considered from both macro and micro levels of analysis. In the case of the former, the standardized Euclidean distances between the two parties' initial positions and the final negotiated cloudsourcing SLA were statistically compared in order to determine if the overall outcome of each negotiation was equitable. In the case of the latter, the actual final service levels for each individual contentious issue were statistically compared against the final service levels that would be expected if those contentious issues had been reconciled at their respective midpoints, thus allowing for an assessment of the extent to which equitable outcomes were achieved on an issue-by-issue basis during the IT cloudsourcing SLA negotiations.

Beginning with the macro perspective, recall the standardized nature of the distance measures described previously. Using this measure, the overall outcome of a negotiation could be considered perfectly equitable if the distances between the parties' initial positions and the final cloudsourcing SLA were both equal to 0.5. In other words, if the overall performance of the parties in a negotiation was identical, then one could conclude that the result of the negotiation was an overall state of equity. Of the 88 successfully completed negotiations in the experiment, none resulted in this outcome. Despite this seemingly negative result, the possibility remained that when considered in the aggregate, the outcomes of the negotiations were indeed statistically equitable. To investigate this possibility, the distributions of Euclidean distances between the parties' initial positions and the final IT cloudsourcing SLA were compared using a two-sample t-test in which a hypothesized mean difference of zero was specified for the performance of each party. The result of this test revealed a highly significant difference in the overall outcomes of the IT cloudsourcing negotiations ($t_{174} = 4.147$, $p < 0.001$), indicating that on average, the 88 successfully completed negotiations did not result in equitable overall outcomes between parties. There was thus no support for Hypothesis 2 from the macro perspective.

From the micro perspective, equity theory implies that each contentious issue would be resolved by the parties agreeing to a midpoint between their respective initial positions for that issue. Our data again provided little support for this notion. Of the 789 contentious issues identified across the 88 successfully completed negotiations, only 77 contentious issues (9.8%) were ultimately resolved by the parties agreeing to a midpoint between the service levels specified in their initial proposals. With a view toward evaluating the statistical nature of this observation, the actual negotiated service levels for each contentious issue were compared against the final service levels that would be expected under equity theory (*i.e.*, the arithmetic midpoints between the parties' initial positions). For this purpose, the 712 contentious issues which were not equitably resolved were dummy-coded using a value of 1, while the 77 contentious issues which were equitably resolved were dummy-coded using a value of 0.

The data were then subjected to a one-sample t-test in which a hypothesized mean of zero was specified for the difference between the actual outcomes and the expected outcomes. The results of this test revealed that actual negotiated outcomes for the individual contentious issues encountered by subjects during their negotiations differed in a highly significant manner from what would be expected under the equity model ($t_{788} = 85.361$, $p < 0.001$). When considered together, the results of these macro- and micro-level analyses provide no support for Hypothesis 2, and we therefore conclude that under normal behavioral conditions, equity theory is not generally applicable in the context of IT cloudsourcing SLA negotiations.

C. EVALUATION AND DISCUSSION OF HYPOTHESIS 3

Hypothesis 3, which was derived from Cross' learning theory, posited that the performance of IT cloudsourcing negotiators would be positively related to their levels of contemplative thought and situational scrutiny during the negotiation process. As noted previously, the subjects in the study differed widely with respect to their levels of prior negotiation experience. Our preliminary correlation analysis (*vide supra*, Table 2) revealed that experienced negotiators tended to invest significantly more time into the negotiation process than their less experienced counterparts ($p < 0.01$), but did not require any additional rounds of negotiation in order to successfully complete the negotiation process ($p =$ ns). These observations thus imply that on average, experienced negotiators tend to invest more time into each round of negotiation than do less experienced negotiators, directly reflecting greater levels of thoughtful contemplation and situational scrutiny. In the subsequent analyses related to this hypothesis, the average time invested per round of negotiation is therefore adopted as a measure of the extent to which a subject engaged in situational reflection and scrutiny during the negotiation process.

To further investigate the learning theory-based link between a subject's level of contemplative thought and situational scrutiny and his or her performance in IT cloudsourcing negotiations, we conducted several linear regression analyses that evaluated the extent to which *in situ* situational reflection and scrutiny influenced negotiation outcomes. For each of these linear models, the standardized measure of negotiator performance described previously was used as the dependent variable. In addition to the measure of situational reflection and scrutiny (*i.e.*, the primary independent variable), the first regression model also included a subject's age, gender, level of negotiation experience, perceptions of the negotiation environment, and self-assessment of performance as control variables. After estimating the model, neither situational reflection and scrutiny nor any of the control variables was observed to be a significant predictor of negotiator performance (model $R^2 = 0.064$, overall model $p =$ ns). All of the control variables were then duly removed (leaving only *situational reflection and scrutiny* as the sole predictor), after which the model was re-estimated. Again, no significant impact of situational reflection and scrutiny on negotiator performance was observed (model $R^2 = 0.027$, overall model $p =$ ns). In light of these negative results, Hypothesis 3 was not supported, and we therefore conclude that Cross' learning theory is not generally applicable in the context of IT cloudsourcing SLA negotiations.

One possible explanation for this finding is that learning that takes place *prior* to the negotiation process may influence the negotiation outcome to a greater extent than *in situ* situational reflection and scrutiny. Indeed, the value of pre-negotiation preparation and learning has been noted by several authors [31]–[33], particularly in the context of negotiations that do not take place in a face-to-face environment [34]. It may thus be that the ability of a negotiator to scrutinize her opponent in advance and prepare for possible contingencies that might arise as the negotiation process unfolds can significantly improve IT cloudsourcing SLA negotiation outcomes. This is, of course, an open empirical question that will need to be addressed by future research.

D. EVALUATION AND DISCUSSION OF HYPOTHESIS 4

Hypothesis 4, which was derived from the "win-win" theories of negotiation, posited that parties engaging in friendly, good faith negotiations would construct more expansive agreements than were initially considered. To evaluate this hypothesis we examined the cloudsourcing negotiation data in three different ways, each of which compared the terms contained in the parties' initial proposals to those contained in the final negotiated cloudsourcing SLA, but from slightly different perspectives. Beginning with the most stringent analysis, we first considered whether any services not initially desired by either party were nevertheless included in the final negotiated SLA. Any service items for which a service level of zero was specified in both parties' initial proposals, but for which a nonzero value appeared in the final SLA would indicate that the parties had effectively "expanded the pie" by incorporating new services into their negotiated agreement that were not initially considered valuable or desirable by either party. Of the 91 non-contentious issues contained in the data set (*i.e.*, issues for which no difference existed between the parties' initial positions), five specified initial service levels of zero for both parties. Among these five issues, none was found to have a nonzero service level in its respective final negotiated SLA.

We next considered whether any services for which identical nonzero service levels were specified in both initial proposals (*i.e.*, individual services for which the initial Euclidean distance was zero) were assigned a value greater than the initially specified value in the final IT cloudsourcing SLA. For example, if both parties initially specified a value of three for a particular service item, and that service item was assigned a value of five in the final negotiated SLA, then it could be reasonably argued that the parties had "expanded the pie" along that particular dimension. Of the 91 non-contentious issues contained in the data set, 86 specified identical nonzero initial service levels for both parties.

Among these, 12 issues (13.9%) were observed to have service levels in their associated final negotiated SLAs which exceeded the (identical) values initially specified by the parties. In order to determine whether this potential evidence of "expansion of the pie" was statistically significant, a one-sample t-test was conducted on the observed data against a hypothesized mean of zero. The results of this test revealed a highly significant difference between subjects' observed behavior and what would be expected if no "expansion of the pie" had occurred ($t_{85} = 3.713$, $p < 0.001$), thus indicating that for a substantial number of non-contentious issues, the subjects agreed to adopt final service levels that exceeded their initial positions, despite the fact that those initial positions were identical.

Finally, we considered whether the average service levels specified in the final IT cloudsourcing SLAs were greater than those specified in either of the party's initial proposals. For example, if the average of the customer's initial service levels was 4.0, and the average of the service provider's initial service levels was 5.0, then it could be concluded that the parties had "expanded the pie" from an holistic perspective if the average service level in their final negotiated SLA was greater than 5.0. Among the 88 negotiations which resulted in an agreement between the two parties, 22 negotiations (25.0%) yielded a final SLA whose average service level exceeded that of both parties' initial positions. A one-sample t-test revealed that the statistical probability of such an outcome occurring by random chance was highly remote ($t_{87} = 5.385$, $p < 0.001$), thus indicating that in a statistically significant number of negotiations, the parties had, from an holistic perspective, effectively "expanded the pie" during their negotiations. Since under a zero-sum model of negotiation one would naturally expect the average service level in the final negotiated SLA to fall somewhere between the average service levels specified by the parties' initial positions, the observed outcome is notable insofar as it indicates that the parties were willing to formulate and accept negotiated agreements whose terms collectively exceeded the initial desires of either party.

Given that an overall "expansion of the pie" was observed in a statistically significant number of negotiations, we next assessed the extent to which the nature of the negotiation environment (*i.e.*, the extent to which the negotiation was characterized by subjects as friendly or confrontational) contributed to such an expansion. We therefore estimated a linear model in which the nature of the negotiation environment was used to predict whether an overall "expansion of the pie" occurred during a negotiation, after controlling for the negotiators' age, gender, level of negotiation experience, and self-assessment of performance. None of these control variables was observed to be a significant predictor, and after being removed from consideration, the model was duly re-estimated. The resulting analysis revealed a significant relationship between the nature of the negotiation environment and whether an "expansion of the pie" had occurred (model $R^2 = 0.074$, overall model $p < 0.01$, *negotiation environment* parameter estimate $= 0.116$, *negotiation environment* parameter $p < 0.01$), thus indicating that as negotiator perceptions of friendliness and cordiality during the IT cloudsourcing SLA negotiation process increase, so too does the likelihood that those negotiations will result in an agreement whose terms exceed the initial desires of either party.

Despite a negative result being obtained for our most stringent analysis of Hypothesis 4, the fact that a statistically significant number of non-contentious issues resulted in final service levels that exceeded the parties' initial desires, coupled with the fact that the friendliness of the negotiation environment was observed to be a strong predictor of whether a final negotiated IT cloudsourcing SLA included terms that collectively exceeded the initial desires of the negotiating parties, provides a reasonable degree of support for the hypothesis. Although "expansion of the pie" did not occur in the majority of negotiations, our analyses nevertheless provide evidence of this phenomenon in a substantial number of cases, and we therefore conclude that the "win-win" theories of negotiation are at least marginally applicable within the context of IT cloudsourcing SLA negotiations.

VI. SUMMARY, LIMITATIONS, AND CONCLUDING REMARKS

The recent global economic crisis accelerated the managerial trend toward deverticalization by engendering organizational restructuring efforts that focused on core competencies with a view toward achieving cost savings. One of the commonest and most visible strategies to emerge from these efforts has been to outsource IT services to third-party cloud service providers within the framework of negotiated IT cloudsourcing service level agreements. Since the extent to which organizations are able to extract economic benefits from such outsourcing efforts depends on the terms codified in the negotiated cloudsourcing SLAs (as well as the ability of the parties to honor those terms), an understanding of the socio-theoretic foundations that are applicable to this cloudsourcing SLA negotiation process is both timely and desirable. Accordingly, the major contribution of the current paper is its rigorous empirical evaluation of the relevance of four competing socio-theoretic frameworks that appear *prima facie* to be germane to the IT cloudsourcing SLA negotiation process.

The results obtained from our controlled experiment indicate that social exchange theory is strongly relevant to IT cloudsourcing negotiations. By contrast, our results revealed that neither the theoretical predictions of equity theory nor those of learning theory are salient in the context of IT cloudsourcing negotiations, particularly when the negotiators themselves do not participate in defining initial organizational objectives for the sourcing relationship. Since the responsibility for establishing such objectives most commonly falls within the domain of managers and executives rather than that of the negotiators themselves, our results indicate that these theoretical orientations will rarely be

of substantive value for efforts aimed at understanding or supporting IT cloudsourcing negotiations.

Finally, our results provided support for the win-win theories of negotiation insofar as an "expansion of the pie" was observed in a statistically significant proportion of the IT cloudsourcing negotiations that were carried out during the experiment. Despite being statistically significant, it is nevertheless important to note that the type of negotiation behavior that characterizes win-win negotiations and that is predicted by the win-win theories actually occurred somewhat rarely, with such behavior being observed in only about 25% of the IT cloudsourcing SLA negotiations. Given that the negotiators in the experiment were provided *a priori* neither with instruction about negotiation strategies nor with information about the tenets of any particular negotiation theory, the relative infrequency with which "expanding the pie" behavior was observed suggests that the majority of negotiators may, by default, hold a zero-sum orientation toward IT cloudsourcing negotiations. Such an orientation may have important implications with respect to the establishment and maintenance of long-term sourcing relationships [20].

As with all research efforts that aim to investigate complex socio-theoretic phenomena, our work has several limitations that must be acknowledged. First, although the 232 subjects in the experiment exhibited a wide degree of variability with respect to age, gender, and prior negotiation experience, the fact that they were all graduate students in business implies a certain degree of homogeneity in the sample that may not be present in the target population. Second, all of the negotiations carried out during the experiment were conducted anonymously, rather than in a face-to-face environment. This approach was taken in order to mitigate the potential effects of any preexisting social relationships between the subjects in the experiment. In so doing, however, informational cues that may have impacted negotiation behavior (such as body language, posture, tone of voice, etc.) were also removed from the negotiation environment, thus potentially impacting negotiation outcomes. Third, the random assignment of optimal service levels during the experiment may have inadvertently created negotiation scenarios in which anchoring behavior on the part of one or both parties dominated the negotiation process. Although anchoring can occur in real-world negotiations, the extent to which such behavior influenced the overall results obtained from the experiment is unknown. Finally, we examined the relevance of only four socially oriented theories to the IT cloudsourcing negotiation process. Although the four theories examined herein were chosen for both their longevity and their orthogonal predictions, other socially oriented theories may exist that are germane to the IT cloudsourcing SLA negotiation process, but which were not considered here. Together, we believe that these limitations represent fertile ground for future research in this area.

Given the increasing prevalence of cloudsourcing as a means of acquiring needed IT services, organizations engaging in such activities should endeavor to extract as much value as possible from their sourcing relationships. Since the amount of cost savings that a customer organization is able to realize is directly related to the terms that it negotiates with a service provider, the negotiation process itself seems a fruitful target for optimization. The findings of our study, however, indicate that human negotiators encounter difficulties in accurately assessing and efficiently navigating the complexities inherent in multidimensional cloudsourcing negotiations, and we expect that these difficulties will multiply as negotiated contracts become increasingly complex. Fortunately, the mathematical and geometric methods for understanding and assessing negotiations that we describe in this paper are readily translatable into computer-based information systems which can support human negotiators during the negotiation process. Further, the results of this paper suggest that incorporating support into such systems for the tenets and predictions of both social exchange theory and the win-win theories of negotiation could substantially improve negotiation outcomes in the context of IT cloudsourcing negotiations. When coupled with the practical and theoretical findings of other research efforts, negotiation support systems (NSSs) constructed in this manner may contribute greatly to the quality of the negotiation environment by relieving human negotiators of at least part of their cognitive burdens, thus allowing them to focus their efforts on the more social – and indeed more human – aspects of the IT cloudsourcing negotiation process.

REFERENCES

[1] A. Young *et al.*, "Gartner on Outsourcing," Gartner, Inc., Stamford, CT, USA, Tech. Rep. G00164206, 2009.
[2] J. V. Gray *et al.*, "The influence of cost and quality priorities on the propensity to outsource production," *Decision Sci.*, vol. 40, no. 4, pp. 697–726, 2009.
[3] E. Anderson *et al.*, "Forecast: Public cloud services, worldwide 2011–2017," Gartner, Inc., Stamford, CT, USA, Tech. Rep. 4Q13, 2013.
[4] N. Karten, *How to Establish Service Level Agreements*. Randolph, MA, USA: Karten Associates, 1998.
[5] N. Levina and N. Su, "Global multisourcing strategy: The emergence of a supplier portfolio in services offshoring," *Decision Sci.*, vol. 39, no. 3, pp. 541–570, 2008.
[6] J. Goo, C. D. Huang, and P. Hart, "A path to successful IT outsourcing: Interaction between service-level agreements and commitment," *Decision Sci.*, vol. 39, no. 3, pp. 469–506, 2008.
[7] "Calling a change in the outsourcing model," Deloitte, New York, NY, USA, Tech. Rep., 2005.
[8] K. Goolsby and F. K. Whitlow, "Leading causes of outsourcing failures," Dallas, TX, USA, Outsourcing Center/Everest Partners, Tech. Rep., 2004.
[9] A. Gopal and B. R. Koka, "The role of contracts on quality and returns to quality in offshore software development outsourcing," *Decision Sci.*, vol. 41, no. 3, pp. 491–516, 2010.
[10] P. C. Palvia *et al.*, "Capability, quality, and performance of offshore IS vendors: A theoretical framework and empirical investigation," *Decision Sci.*, vol. 41, no. 2, pp. 231–270, 2010.
[11] H. A. Simon, "Rational decision making in business organizations," *Amer. Econ. Rev.*, vol. 69, no. 6, pp. 493–513, 1979.
[12] M. Weber, "Decision making with incomplete information," *Eur. J. Oper. Res.*, vol. 28, no. 1, pp. 44–57, 1987.
[13] A. De Moor and H. Weigand, "Business negotiation support: Theory and practice," *Int. Negotiation*, vol. 9, no. 1, pp. 31–57, 2004.
[14] L. H. Lim and I. Benbasat, "A theoretical perspective of negotiation support systems," *J. Manage. Inf. Syst.*, vol. 9, no. 3, pp. 27–45, 1993.
[15] T. Kern, "The Gestalt of an information technology outsourcing relationship: An exploratory analysis," in *Proc. 89th Int. Conf. Inf. Syst. (ICIS)*, Atlanta, GA, USA, 1997, pp. 37–58.

[16] G. C. Homans, *Social Behavior—Its Elementary Forms*. New York, NY, USA: Harcourt Brace Jovanovich, 1961.
[17] O. J. Bartos, "Simple model of negotiation: A sociological point of view," in *The Negotiation Process: Theories and Applications*, I. W. Zartman, Ed. Beverly Hills, CA, USA: Sage Publications, 1978.
[18] J. G. Cross, "Negotiation as a learning process," in *The Negotiation Process: Theories and Applications*, I. W. Zartman, Ed. Beverly Hills, CA, USA: Sage Publications, 1978.
[19] A. Köppel *et al.*, "How to support the negotiation of service level agreements (SLAs) for your client/server application," in *Proc. 5th Int. Conf. Informat. Syst. Anal. Synth. (ISAS) World Multiconf. Syst. Cybernet. Informat. (SCI)*, Orlando, FL, USA, 1999, pp. 1–8.
[20] W. Ury, *Getting to Yes: Negotiating Agreement Without Giving in*. New York, NY, USA: Penguin Books, 1991.
[21] I. Rahwan *et al.*, "Towards Interest-Based Negotiation," in *Proc. 2nd Int. Joint Conf. Auto. Agents Multiagent Syst.*, Melbourne, VIC, Australia, 2003, pp. 773–780.
[22] R. M. Monczka *et al.*, "Success factors in strategic supplier alliances: The buying company perspective," *Decision Sci.*, vol. 29, no. 3, pp. 553–577, 1998.
[23] R. Klein, A. Rai, and D. W. Straub, "Competitive and cooperative positioning in supply chain logistics relationships," *Decision Sci.*, vol. 38, no. 4, pp. 611–646, 2007.
[24] K. Davenport, *History of Official Proposals on the Iranian Nuclear Issue*. Washington, DC, USA: Arms Control Association, 2014.
[25] C. W. Holsapple, H. LaiAndrew, and B. Whinston, "A formal basis for negotiation support system research," *Group Decision Negotiation*, vol. 7, no. 3, pp. 203–227, 1998.
[26] Y. Bereby-Meyer, S. Moran, and E. Unger-Aviram, "When performance goals deter performance: Transfer of skills in integrative negotiations," *Org. Behavior Human Decision Process*, vol. 93, no. 2, pp. 142–154, 2004.
[27] J.-N. Lee and Y. G. Kim, "Effect of partnership quality on IS outsourcing success: Conceptual framework and empirical validation," *J. Manag. Inf. Syst.*, vol. 15, no. 4, pp. 29–61, 1999.
[28] *Amazon Web Services Cloud Computing Services*. Seattle, WA, USA: Amazon Web Services, Inc., 2016, p. 425.
[29] R. Lewicki, *Negotiation*. New York, NY, USA: McGraw-Hill, 2009.
[30] D. S. Soper *et al.*, "A vector-based, content-analytic methodology for comparing negotiated IT service level agreements," in *Proc. 11th Amer. Conf. Inf. Syst. (AMCIS)*, Omaha, NE, USA, 2005.
[31] R. M. Peterson and G. H. Lucas, "Expanding the antecedent component of the traditional business negotiation model: Pre-negotiation literature review and planning-preparation propositions," *J. Marketing Theory Pract.*, vol. 9, no. 4, pp. 37–49, 2001.
[32] J. Lim and Y. P. Yang, "Enhancing negotiators' performance with computer support for pre-negotiation preparation and negotiation: An experimental investigation in an East Asian Context," *J. Global Inf. Manage. (JGIM)*, vol. 15, no. 1, pp. 18–42, 2007.
[33] B. Barry, "Negotiator affect: The state of the art (and the science)," *Group Decision Negotiation*, vol. 17, no. 1, pp. 97–105, 2008.
[34] C. E. Naquin and G. D. Paulson, "Online bargaining and interpersonal trust," *J. Appl. Psychol.*, vol. 88, no. 1, pp. 113–120, 2003.

DANIEL S. SOPER is currently an Associate Professor of Information Systems and Decision Sciences with the Mihaylo College of Business and Economics, California State University, Fullerton. His current research interests lie in the realms of human cognition, interface design, and innovative applications of computational linguistics. His research has appeared in a wide variety of leading information systems and computer science journals and conference proceedings.

HALUK DEMIRKAN received his Ph.D. degree in information systems and operations management from the University of Florida. His research in analytics, service innovation and digital transformation with service-oriented technology and management has included recent industry-sponsored research projects with IBM, American Express, Intel, and Teradata.

He is currently a Professor of Service Innovation and Business Analytics with the Milgard School of Business, University of Washington, Tacoma. He has almost 20 years of professional work experience on maximizing the return on companies' resources by effectively implementing strategic data and analytic solutions for over 40 Fortune 500 companies. He has authored over 150 publications. He is the Co-Founder and sits on the Board of Directors for the International Society of Service Innovation Professionals.

MICHAEL GOUL currently serves as an Associate Dean of the Faculty and Research with the W. P. Carey School of Business, Arizona State University. He works with the School's Portfolio of Research Centers, coordinates the School's Ph.D. Programs, and represents the School on University research initiatives, such as those associated with advanced analytics. He spearheaded the development of the nine-month Master of Science in Business Analytics Program. He administered the launch of the School's undergraduate Bachelor of Science in Business Data Analytics degree and the launch of the online version of Carey's highly successful Master of Science in Information Management program. He has authored over 100 articles and cases. He is passionate about how the concomitant explosion of big data, the shift to cloud computing, and the emergence of the mobile/social web does and will impact the global economy. His most recent research efforts are in the area of big data and data science governance, fog computing, and analytics contracts. In 2016, he received the Outstanding Leadership Award by the IEEE Computer Society Technical Committee on Services Computing. He served as the Chair of the school's Department of Information Systems. He conducted analytics research at companies, including American Express, eBay, Intel, and Teradata.