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The Outsourcing Game: A Teaching Simulation of Power Dynamics in Outsourced Supply Chains

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Abstract. Traditional Operations and Supply Chain Management education fails to address the "wheeling and dealing" aspect of inter-firm interactions and procurement. With this motivation we created a role-playing simulation called "The Outsourcing Game", to illustrate the changed nature of decision-making in an outsourced supply chain environment. To date it has been experienced by hundreds of participants in MBA, executive, and industry training courses around the world. We attribute the game's traction to a number of factors. It addresses a high-profile topic that will only grow in importance. It has been shaped by the feedback of professionals concurrently immersed in the real business setting. It is versatile, having succeeded thus far in core Operations courses and electives in Supply Chain Management, Outsourcing, and Procurement. It is compact and self-contained, requiring of participants little advance preparation or prior technical or domain knowledge. It deliberately requires no special equipment or props, and a spreadsheet is the only software involved. Participants specifically appreciate that it is fast-paced, team-based, competitive, and involves negotiation.

Keywords: operations management, supply chain management, procurement, sourcing, product design, outsourcing, negotiation, simulation.

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1. Introduction

Focus on what you do best, and outsource the rest.

Many in the modern business community have embraced this seemingly sensible philosophy. Yet many have also misunderstood or underestimated the costs and risks that arise from converting internal functions into services procured from outside firms. Specifically, in distributing decision-making authority across multiple companies whose relationships are shorter-term and more transactional, outsourcing also necessitates greater vigilance regarding the exchange of information, the monitoring of actions, and the aligning of incentives. Management of the resulting extended enterprise thus takes on an increasingly political flavor, giving new importance to diplomacy in situations where central authority was once adequate.

This dynamic is nowhere more apparent than in the endeavor of stewarding a product from concept to market. Here the outsourcing of ever more functions, including product design, procurement, manufacturing, and logistics, has led to increasingly balkanized supply chains (Ojo (2005)).

Students receiving academic business training ostensibly prepare for such challenges during coursework in operations and supply chain management. However, such courses have traditionally been strong with respect to unilateral planning for operational activities, and relatively weak in addressing the "wheeling and dealing" aspect of inter-firm interactions. Furthermore, traditional frameworks seem oblivious to the prospect of deliberate deception by a firm's so-called “partners”.

We had this shortcoming in mind when creating a simulation called “The Outsourcing Game”, which enables participants to experience decision-making in an outsourced supply chain environment. The two authors (along with Corey Billington, formerly VP of supply chain services at Hewlett-Packard and now Professor of Operations Management and Procurement at IMD) became convinced of the need for this type of management education while surveying outsourcing practices at Fortune 500 firms (Amaral, et al. 2006). Because many of the crucial elements can be emotional and contextual, we felt the vehicle for conveying our findings should include a role-playing exercise. We are strong believers that lessons are imprinted more deeply when learned experientially, especially for participants who have been away from the classroom for a while. Role-plays and other simulations certainly are a mainstay of contemporary supply chain management education (cf. Johnson and Pyke (2000)). The recent review by (Lewis and Maylor (2007)) catalogs 222 OM-specific and OM-related games. However, it identifies none that overtly address strategic behavior or incorporate deal-making and coalition-building.

This game was introduced in 2003 in an MBA elective at Santa Clara University, and has been run more than 25 times with more than 600 participants (in MBA and executive courses at Arizona State University, IMD, MIT, Purdue University, Santa Clara University, Tulane University, and Washington University in St. Louis, and as part of a day-long outsourcing workshop delivered with iSuppli Corporation and at domestic and international sites within Hewlett-Packard). Feedback from this diverse and experienced pool of participants has both validated our approach and guided ongoing improvement. The game was a key part of a teaching portfolio that was honored with the Production & Operations Management Society's *Wickham Skinner Award for Teaching Innovation* for 2007.

Game participants are divided into five teams. One represents *Acme*, a company selling a branded product with high-end and low-end versions that are differentiated by a subassembly. The other four teams are Acme's supply chain partners: *BuildIT* (contract manufacturer), *Design* (outsourced design firm), *Hi-N* (supplier of high-end subassembly), and *Loen* (supplier of low-end subassembly). The game focuses on Acme's desire to switch to a common subassembly. With its power diluted by the outsourcing, Acme cannot implement the change by fiat and must build a coalition of support among its partners. Two initially favor commonality, but two oppose it (Figure 1). During approximately 3 hours of class time, the teams conduct a series of negotiations that determine the fate of Acme's plan. A voting scheme with uneven vote allocations simulates the peculiarities of power dynamics in multi-firm interactions.

Figure 1: Main Impacts of Commonality

Firm	Role in Supply Chain	Advantages of Commonality	Disadvantages of Commonality
Acme	Product brand owner	+ Reduced safety stock, cycle stock, and pipeline inventory	- Increased material costs
BuildIT	Contract manufacturer	+ Increased revenue + Reduced manufacturing complexity	
Design	Outsourced design firm		- Engineering expense to redesign low-end product - Take a hit on performance metric that rewards lowering material cost
Hi-N	Supplier of high-end subassembly	+ Significant gain of business	
Loen	Supplier of low-end subassembly		- Significant loss of business

The overarching theme is the difficulty of influencing a collection of autonomous stakeholders to make the "right" decisions. As the role-play is designed to elicit a full range of opportunistic behaviors, participants depart with a healthy degree of paranoia about managing highly outsourced enterprises, and are thus highly receptive to subsequent discussions about coordination and control.

The remainder of the paper is organized as follows. A self-contained overview of the process for executing the game is presented in an Appendix, as a complete instruction manual would exceed space limits. Readers should consult this at whatever point they feel to be appropriate. The main body focuses on commentary about the game (an abbreviated teaching note, in a sense): Section 2 presents high-level attributes and requirements, Section 3 outlines our design objectives, Section 4 dispels some natural misconceptions about the game, Section 5 explains key learnings for participants, Section 6 presents some participant and instructor opinions of the game, and Section 7 concludes.

2. Key Attributes

The basic logistical attributes and requirements of the game are as follows:

Time: Roughly 3.5 to 4 hours are needed. Some instructors have rearranged class schedules to accommodate the game, and we have found students to be willing to meet in the evening, especially if this replaces two other sessions. One instructor secured a continuous four-hour block by combining two sessions, moving to an evening, and providing pizza during the game and a round of beer afterwards at the student pub adjacent to the management building.

Some flexibility exists in case the full time is not available in one sitting. Half an hour is setup that can be moved to an earlier session, while half an hour to one hour is debrief that can be moved to a subsequent session. Beyond this, we certainly encourage instructors to be creative in solving their unique scheduling constraints, and simply offer a few caveats about breaking the game into parts. Vote #1 and Vote #2 should take place during the same session, so teams and individuals will not be tempted to discuss their private information with others. We discourage the conducting of negotiations outside of the controlled environment, as a key point of the game is the emotional experience of reactive decision-making under a time constraint. If time is extremely limited, Vote #3 can be eliminated in a compressed format in which Acme is provided the information on supply chain financials between the preliminary and final phases of Round #2 negotiations. A risk of this approach is that Acme might not reach the level of experience needed to understand what to do

with this information, and might lack the motivation that comes from having tasted defeat or victory. If the game is played across multiple sessions that are spread out in time, the instructor should require a checkpoint deliverable after the game (see "Participant deliverables" below for some suggestions) to keep participants engaged along the way.

Equipment, materials, and facilities: As this is purely a role-play, no special equipment or materials are involved. At least three private meeting areas are required, one of which must be large enough to seat the entire group. The areas need to be close together because the teams move frequently.

Number of participants: The game entails five multi-player teams. We have run the game with cohorts of size anywhere from 10 (five teams of two) to 80 (two simultaneous sessions with five teams of eight), and have concluded that the ideal arrangement is five teams of three to four members each. Responsibilities are assigned within each team, and this headcount enables each member to have a role. The pace and complexity of the game may frustrate teams smaller than this, as larger teams are more likely to possess adequate ability and relevant experience. However, overly large teams will experience more internal miscommunication and misunderstanding, straining the game facilitator and causing some participants to disengage. Also, larger teams seem to negotiate less quickly as more voices battle for airtime, and are more challenging to herd from room to room.

Very large cohorts can be handled in various ways. One is to run parallel sessions. Each session will require a dedicated facilitator, and ideally there will be an additional master facilitator circulating among the sessions. This likely will lengthen the game by at least 30 to 60 minutes, since misunderstandings may take longer to rectify and the master facilitator must jump back and forth. Alternatively, if the group has some scheduling flexibility, a single facilitator could run the multiple sessions on different days. For instance, the sessions could take place one evening and the subsequent morning. Information leakage is a risk, but we believe this can be managed. The facilitator should instruct the participants not to share information in advance, and team selections can be delayed until right before the game (be sure to budget 20 extra minutes for teams to read the private information). Further, the facilitator can bluff that the financial details will be different in each session.

Participant deliverables: Nothing is required of participants in advance besides reading brief instructions. We believe the game can be effective without requiring any post-game deliverable, but we understand that some instructors have augmented their implementation with these. We offer the general suggestion that such assignments regroup the participants by role, e.g.,

lawyers together, analysts together, etc. This helps players move beyond knee-jerk, "us-versus-them" interpretations of the game (e.g., "We lost because BuildIT was a bunch of two-faced, double crossing jerks.") and start to apply the game's lessons more broadly.

Target participants: The ideal participant will have had some prior exposure to "traditional" frameworks for operations management decision-making (in which all actions are controlled by a single, rational decision-maker). Those with industry experience are best positioned to appreciate and benefit from the lessons. A success factor in playing the game is the ability to imagine a full range of "sleazy" behavior, and those with work experience will surely have seen more of this firsthand. Some degree of negotiation skill is beneficial.

While supply chain expertise is not essential, ramp-up will be quickest for those with a basic concept of the principles of supply chain management and product design, especially the economics of a component commonality decision (e.g., risk-pooling and implications for supplier management). However, the game has been designed to require of the participants no deep modeling or domain expertise, and the computational component is very light. The major lessons ought to apply to any type of outsourcing, but perhaps a modified storyline might be appropriate for non-supply-chain courses (e.g., a simpler 3-party construction, featuring a company and two of its service providers).

Diversity among the participants is acceptable, even beneficial. However, parity among teams is important to the execution of the game.

Thus far the game has been used successfully with MBA and executive seminar students, and supply chain professionals. We have not yet tried it with undergraduate audiences.

Appropriate courses: This game will be most natural for groups with a high density of attributes described above. The original development environment, an elective entitled "Supply Chain Outsourcing" in Santa Clara University's MBA program for Silicon Valley's working professionals, exemplifies a particularly hospitable set of conditions. This course typically draws 20-25 students, a significant number of whom have concurrent or prior supply chain responsibilities at highly outsourced OEM firms (such as Cisco Systems, Hewlett-Packard, and Xilinx) or their service providers (such as Flextronics and Avnet). The Operations Management core course, which introduces risk-pooling, is a prerequisite. Most students take this elective fairly late in the program, and some will have studied negotiation by then. The course meets for 10 weekly sessions of 2.5 hours, and the game is played in the fifth session, with 30 minutes of the preceding session used for preparation. By this point, students have been exposed to the risks of outsourcing and the concept of moral hazard.

One corporate workshop containing the game engages an intact business team facing a specific outsourcing situation. A lecture component first introduces the advantages and disadvantages of outsourcing. The game then underscores the oft-neglected threat of opportunistic behavior. The workshop contains other exercises conveying the difficulty of writing clear and unambiguous specifications. The group adjourns after creating an action plan for mitigating the risks and realizing the potential benefits of outsourcing to a particular service provider.

We have found the game to work especially well in executive education for several reasons:

- Typical executive education often comprises multiple days of traditional lecture-style presentations. The game's format provides a change of pace and a natural ice-breaker.

- Executives greatly appreciate playing the role of the other side of supply chain relationships they have experienced first-hand. Such participants get new insights about the behaviors of their suppliers, service providers, or customers, which can clarify misunderstandings and spark innovative problem solving.

- The game provides a "safe" framework for executives to talk about real issues, without having to use their own company examples containing proprietary information. This benefit was apparent during a recent corporate session that included senior managers of different companies. Additionally, new team affinities and shared emotional experiences actually made participants more willing to share their war stories. Ironically, a game about mistrust actually built trust among semi-competitors!

3. Design Objectives

Below we map our main teaching goals to the design of the game.

To convey institutional knowledge about business models and preferences in the outsourced supply chain.

The game provides participants with a quick concept of the economics faced by various entities in the supply chain. In addition to the self-awareness required to place its own vote, each team must understand the motivations or business drivers of every other team to distinguish bluffs from legitimate

claims during the negotiations. A sharp contrast is also drawn between benefits for individual companies and what is best for the supply-chain as a whole.

To illustrate how outsourcing affects power.

An OEM that distributes control of assets and decisions certainly alters its power. Less intuitive is the nature of the impact. Inspired by (Lidow (2003)), we use an allocation of votes to represent power that is distributed unevenly across a set of stakeholders. Our many industry participants have validated this approximation of their world. While voting simulation games are common in various pockets of experimental/behavioral economics, political science, and law (cf. Holt (1999)), (Holt (2003)), we are not aware of any other role-play embedding this metaphor in an industrial negotiation setting.

The relationship between votes and power is not a simple linear one. Having more votes is always better (weakly), but a stakeholder with 2X votes does not necessarily have double the power of a stakeholder with X votes. In general, the power conferred by an allocation of votes depends on how all the other votes are distributed. For instance, if winning requires a simple majority and one stakeholder has 51 votes out of 100, all other votes have zero power. This is not so if no stakeholder has a majority by itself. Consider that if three stakeholders have 49, 49, and two votes respectively, the one with the two votes has just as much power as either of the others. Various methods of quantifying these properties of relative power in block voting systems, such as the Shapley-Shubik (Shapley and Shubik (1954)) and Banzhaf (Banzhaf (1965)), (Banzhaf (1968)) power indices, have arisen originally in the literatures of law and political economics. For an introduction, see (Livingston (2003)).

Our participants have seemed to grasp the analogy between votes and power. They recognize that real supply chain entities "vote" on decisions through their allocation of resources and choices of partnerships.

The postgame debrief addresses the many factors that affect supply chain power. We also ask the rhetorical question, "How would this be decided if Design was still part of Acme?" As that entity would control 82 of the 100 votes, the answer is obvious.

To demonstrate the workings of hidden information and hidden actions, and how these translate to leverage.

Each team has private information, and quickly makes the distinction between what is verifiable by other teams and what is not. Negotiating with every other

team over multiple rounds affords each team plenty of practice in exploiting its private information, as well as opportunities to be victimized as other teams exploit theirs.

To highlight the behavioral ramifications of ill-conceived compensation schemes.

The game includes some real incentive schemes from current industry practice that are known to have unintended side-effects. An OEM probably would not want its contract manufacturer to favor increases in materials cost, but this is Acme's fate for paying BuildIT as a percentage of that cost. Design's performance bonus/penalty rewards the minimization of bills-of-materials costs and Design is also fully responsible for NRE (nonrecurring engineering) expenses. Design therefore has dual objections to Acme's commonality proposal and becomes receptive to Loen's overtures.

To examine the concept of trust, and how it can be created and destroyed.

Trust becomes vital in settings where actions and information are readily hidden. The game has been consistently able to generate illustrations of how trust is influenced by behavior.

The vote following the first set of negotiations spotlights any discrepancies between each team's words and its actions. Even though the rules dictate ignoring these past events in the next round, some teams are unable to let go. The resulting lack of trust can prevent parties from undertaking beneficial activities. For instance, the economics of the commonality proposal are such that enough benefit is generated to make every party better off. Moreover, before Round #3, Acme is granted the global visibility to facilitate unanimous support for commonality. (That information is also presented to the other teams after the final round of play, which allows them to contemplate during the debriefing whether Acme had been "fair" in its earlier dealings.) When one team is widely suspected of deception, we have observed the other teams banding together as a matter of principle.

These instances are autopsied at the final reckoning, where each team assigns every other a "strength-of-relationship" score after the second and third rounds of play (1= strong distrust, 3= neutral, 5= strong trust). Since the game contains only a single period of business (played twice with different assumptions), we instituted this measure to discourage unrealistically myopic behavior. The reporting of scores reliably stimulates discussion about the specific actions that built or destroyed trust. Particularly noteworthy are any instances of asymmetry in a pair's mutual assessment.

We have found that a bad reputation is very hard to overcome. Teams do seem to respect honesty and try to punish deceit. Arrogance and confrontational attitudes tend to backfire. One team was so offended that it assigned its nemesis a strength-of-relationship score of -100. Issues of trust can also touch a very personal, emotional chord. A past participant informed us that after the game a co-worker who played on a competing team started jokingly calling him "traitor", and continued this for weeks afterwards (and may still be doing so!).

To condition participants to the emotional sensation of time-constrained, group decision-making under imperfect information.

We fully intend for participants to feel that there is not quite enough information or time for analysis. The challenge for us was to make the game rich enough to be engaging, but not so complex as to be overwhelming.

In early versions of the game the negotiations were completely unrestricted, and the participants became immobilized by the endless discussions on contract terms. We subsequently introduced contract templates to structure and therefore accelerate the discussions. We found that the seemingly insignificant action of formatting these to resemble real legal documents (e.g., legalistic tone and calligraphic fonts) helped participants engage the role-play. We also began providing calculation worksheets to assist with analysis. Sample contracts and worksheets appear in the Appendix.

4. What The Game Is Not

Readers can more quickly appreciate the game by understanding that it has no intention to be the following:

An application of classical models for decision-making under uncertainty.

Uncertainty is present in the game, not only implicitly in the risk-pooling rationale for commonality, but also explicitly in the outcomes of the negotiations. However, many parameters needed to infer other teams' behavior are private information, and we provide no probability distributions or any of the other structural elements needed for computing expected values, formulating decision trees, and so forth. (We have, nevertheless, seen participants attempt these tasks.) Instead, for any proposed contract each team must calculate its payoffs under the two product design alternatives, which is

an arithmetic exercise in which most of the terms are exogenously specified. This simplifies the analysis participants must perform under time pressure.

An exercise in designing contracts to achieve supply chain coordination.

Many of the likely academic adopters of the game are aware of the body of research examining the ability of various contractual structures to guide decentralized supply chains to a central-planner optimum (cf. (Tsay, et al. (1998)), (Cachon (2003)). Certainly any scenario containing a moral hazard might invite attempts at mechanism design. However, compared to what is considered in the existing literature, the game setting is in some ways too complex (too many independent decision-makers, too many elements of hidden information, and unlimited degrees of freedom in making deals) and in other ways much simpler (total system profitability can have just two possible outcomes, and these are specified exogenously), and decision-makers do not make any traditional operations choices such as capacity, inventory, or production quantity). Rather than seeking a Pareto improvement for the system, each team negotiates to secure for itself the better of two payoffs.

A test of convergence towards a specific equilibrium predicted by Game Theory.

The game can be described with the constructs of Cooperative Game Theory. The financial parameters are such that commonality would generate enough additional profit to enable Acme to fund not only a majority coalition, but unanimous support. The game has a non-empty core, indicating the existence of a set (a continuum, actually) of possible outcomes from which no firm or coalition of firms would have incentive to defect. However, in light of the breadth of possible actions, the asymmetry of information, the number of participants, and their bounded rationality, we do not expect convergence to a point in the core within the allotted time. We believe the outcome to be highly dependent on the attitude, behavior, skill, and luck of the participants, and we have seen a broad range of outcomes. Consequently, any academic analysis of the game would benefit from incorporating perspectives from the emerging field of Behavioral Operations Management (Bendoly, et al. (2006)).

Concepts and known results from Game Theory do emerge when debriefing the experience. Particularly salient are the idea of iterated games versus one-round or final-round games, and the ramifications of various "nasty" or "nice" negotiation strategies.

5. Discussion Themes

In addition to the teaching messages described in Section 3, the following themes consistently emerge in the post-game discussion.

Negotiation skill will become a priority in the age of outsourcing.

Outsourcing dramatically increases the number of inter-firm touch points. Technical and financial expertise turn out to no longer be a sufficient skillset, as many managers are forced to become de facto negotiators. This is complicated by the fact that the negotiations increasingly involve elements that are difficult to assess ahead of time, such as in procurement of complex services or defining intellectual property. Furthermore, with some information and actions remaining unverifiable, trust elevates in significance. Hence, negotiators must master the delicate task of pursuing their own interests and being sufficiently suspicious of others, while themselves retaining an air of trustworthiness. Similarly, engineers collaborating with counterparts at service providers may weaken their own negotiating position by unwittingly disclosing key information.

While teaching specific negotiation tactics is not our main focus, participants do enjoy the opportunity to practice their favorite tricks. For instance, it is well known that when a transaction generates surplus for both a buyer and seller, how the surplus will be allocated is very dependent on the bargaining path. This should be familiar to anyone who has ever haggled for a new car, as car salesmen are trained to probe for the customer's maximum acceptable price, rather than volunteering the dealership's lowest acceptable price.

Most people are not bad, but specific situations can induce most people to do "bad" things.

Just as we are not trying to teach negotiation, we are not trying to teach business ethics—though the topic inevitably comes up during the discussion. We are only trying to emphasize that the confluence of hidden information, hidden actions, and misaligned incentives can cause individuals to act in very human ways. Our participants, who presumably consider themselves to be of good upbringing and character, all too readily learn to bluff and lie, and become competitive and vindictive.

This leads participants to realize that demonizing certain people or cultures as lacking ethics or morality is not productive. Participants are thus better able to relate to the situations in which they put their suppliers and partners.

Nevertheless, we have found that participants have tended to rationalize their own behavior in the face of ethically nebulous conditions, but are quick to condemn other people's behavior as immoral.

Participants ultimately realize that rather than bemoaning human nature, they must design proper incentive and control systems. Over time many companies have become adept at these efforts for internal activities, but typically still lag in their oversight of outsourced functions.

Open-book accounting by itself does not achieve supply chain coordination.

Some participants will have heard the merits of the Japanese practice of open-book accounting with "keiretsu" suppliers. The game illustrates that without strong relationships supported by mutual trust and interdependence (as are present in keiretsu), simply exposing all the hidden information will not magically align supply chains if hidden actions and misaligned incentives remain. After all information has been revealed to all parties, teams still bicker about the "fairness" of proposals for gain-sharing.

Beware of "Winner's Curse" when outsourcing.

Winner's Curse is a phenomenon that can arise in auctioning an item whose true value is unknown. The highest bidder will win the auction, who by definition runs the highest risk of having overestimated the item's value.

Suppliers sometimes bid aggressively to win the right to supply a good or service, but already know or subsequently discover that they will be unable to make a profit under the contracted terms. This becomes a winner's curse for the buyer, who will develop some dependence on a supplier who will either go out of business, cut corners to minimize its losses, or raise prices (Kern, et al. 2002).

Standing to lose everything if the common subassembly were to be adopted, in principle Loen would agree to supply the LE subassembly at (nearly) no profit margin in order to keep Acme's business. Acme benefits from this in the short term, but could be forced to somehow keep Loen afloat down the line. While these long-term considerations do not appear explicitly in the game, this creates an opportunity to discuss supply chain stability. The key message is that firms that outsource might best serve their own interests by helping their critical suppliers remain financially viable.

Like other management activities, supply chain management is susceptible to cognitive biases.

While they were not a major consideration during our design of the game, many of the cognitive decision biases formalized by Kahneman and Tversky and others frequently manifest during play. Some are cataloged in Figure 2.

Figure 2: Cognitive Decision Biases Exhibited By Participants

Cognitive Bias	Expression in Game
Endowment effect: the tendency for people to value something more as soon as they own it.	The Acme team views gains from commonality as an entitlement. This tends to make the team greedier and less willing to share the benefits. Acme should instead use the status quo as the reference in evaluating proposals.
Anchoring: the tendency to rely too heavily, or "anchor", on one trait or piece of information when making decisions.	All teams anchor off their own benefits when beginning negotiations. The most obvious example is when Acme and BuildIT get together. $10,000 is much more significant to BuildIT than to Acme.
Ingroup bias: preferential treatment that people give to those perceived to be members of their own group.	If a dynamic of "Us vs. Acme" develops, some groups stick together even when Acme eventually makes a more attractive offer.
Projection bias: the tendency to unconsciously assume that others share the same or similar thoughts, beliefs, values, or positions.	Most groups assume that Loen is motivated by absolute dollars and relationship scores. It never occurs to them that Loen's behavior also reflects the account manager's personal metric.
Self-serving bias: the tendency to claim more responsibility for successes than failures.	The "winning" teams often attribute their success to their strategy or negotiation skills. The "losing" teams believe that the situation was unfair and "rigged" against them, or that other teams were untrustworthy, illogical, or spiteful.

Such topics are not typically discussed in Operations or Supply Chain Management courses, but we so no reason to bypass a meaningful opportunity for interdisciplinary teaching. The prevalence of these biases in the game suggests that managers need to be aware of them in real life.

We have found that the success of the postgame discussion does not depend that much on the specific outcomes of the financials and relationship scores. The structure of the game itself—vote allocations, hidden actions/ information, bad incentives, and the win/loss negotiation scenario—almost ensures that the events that transpire will be interesting in the intended ways.

That said, however, the quality of the facilitation is crucial. In addition to maintaining the pace and "getting everyone through the rapids in one piece," the facilitator's most vital role is to keep participants *emotionally* engaged so that they can feel, rather than just analyze, the salient business issues (power, hidden actions/information, bad incentives, trust). Major offenses are neglecting participants who start to "check out" or feel bad, or allowing negotiations to drag on ("another minute, we're almost done"), derailing the schedule and draining everyone's energy. For example, every time we have allowed participants the additional time they want, they ultimately complained that the total game took too long. (They fail to realize that 3 extra minutes for each of 18 "phases" adds up to almost an hour.) A little commiserating by the facilitator with the "down and out" teams during their private meetings can make a big difference. The nature of the game is that some teams must "lose", but subtle counseling can avoid a bitter and vindictive debriefing. This is another reason not to put too much emphasis on the financial outcomes and scores. Of course, bonus points go to the facilitator who can achieve all this while preserving a light and fun atmosphere.

6. Participant Feedback

Some academic adopters have offered perspectives on the game:

> Frankly, I was reluctant to "give up" two class sessions for a game that, I thought, was focused mostly on incentive compatibility. After all, it is a simple concept that students experience in their own personal lives.
>
> What I was ignoring, of course, is the importance of emotional involvement in grasping a simple, but otherwise theoretical concept. The game also gets students more deeply into the role of decision-makers than a case-study discussion does. Last, but not least, events that took place during the game became a reference point for subsequent class discussions about the importance of trust and power in buyer-supplier relationships.
>
> So, I am looking forward to "giving up" two more class sessions next academic year.
>
> Leroy B. Schwarz, Louis A. Weil, Jr. Professor of Management, Krannert Graduate School of Management, Purdue University

The game provided an excellent opportunity for students to engage in realistic multi-party negotiations that they will see in their careers. It reinforces many of the concepts in outsourcing and supply chain management that we teach in our courses.

Chris Caplice, Executive Director, Master of Engineering in Logistics Program, Massachusetts Institute of Technology

The students thoroughly enjoyed this fast-moving simulation that embraces the complexities of managing an outsourced supply chain - including a consideration of the needs and concerns of the various parties involved. The broad perspective provides critical insights into supply chain power and relationship issues.

Lisa Ellram, Richard and Laurie Allen Professor of Business Administration, College of Business, Colorado State University

The following remarks are representative of typical participant reactions:

The Outsourcing Game really showed me how negotiations can work (or not work) for a somewhat simple decision with many parties involved. Everyone has hidden information, but some people are more skilled at playing with a straight face and making a good deal out of nothing. It was an intense session with decisions having to be made quickly. Although usually there'd be more time for negotiation in real life situations, the game mirrored the complexities of problems being dealt with frequently in every company, including supplier outsourcing contracts and having to work with several departments at once.

MBA student, Financial Analyst at Applied Materials

(A major lesson from this course was) the existence (and problem) of hidden actions and hidden information. Nothing illustrated hidden actions and hidden information quite like the Outsourcing Game. In this simulation, my team (BuildIT) lied and connived our way to the best profit turnaround of any group. The hidden actions and hidden information in the game allowed us to take advantage of our supply chain partners. The problem is we lied and connived to achieve this result, and I doubt many wanted to do business with us in the end…

MBA student, IT Consultant at Ernst & Young

7. Conclusion

In the 1800s, German Chancellor Otto von Bismarck famously commented on the reality of political decision-making, "Laws are like sausages, it is better not to see them being made." This sentiment will surely resonate with managers of significantly outsourced enterprises, as outsourcing often turns business decision-making into a political exercise among firms, complete with conflicting agendas, the bluffing and posturing that are enabled by private information, and even moral relativism.

In operations and supply chain management coursework, the typical decision framework presumes either an omnipotent single entity or a group of decision-makers acting as a unified team, with uncertainty coming only from environmental sources. These simplifying assumptions facilitate quantitative approaches to such complex tasks as multi-location inventory placement or logistical scheduling. While these are vital analyses with many success stories, the increasing sophistication of modern firms means that the incremental benefits at stake may be small percentage points. Meanwhile, in modern outsourced supply chains those gains and more can easily be wiped out or siphoned away by collusion and hidden actions.

By crisply illustrating the reality that sometimes your "partners" might be working against you, the Outsourcing Game serves as a meaningful companion to the traditional educational framework. The game also efficiently imbues participants with a degree of institutional knowledge about the typical outsourced product supply chain, through the negotiation framework that requires each team to understand the economic concerns, decision rights, and informational state of every entity in the chain.

Emeraldwise, LLC, manages distribution of the Outsourcing Game. For more information, please contact Jason Amaral at JAMARAL@EMERALDWISE.COM.

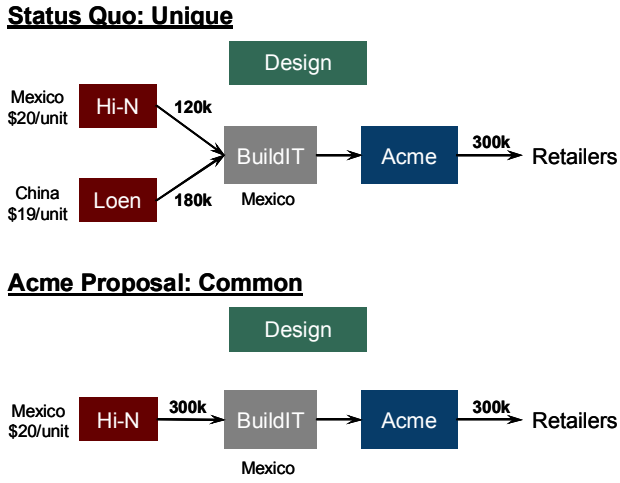
APPENDIX: Playing the Game

Decision Scenario

Acme sells a branded product with high-end (HE) and low-end (LE) versions that are differentiated by a subassembly. Acme sources the subassemblies from two different suppliers: *Hi-N* provides the HE subassembly (120,000 units at $20/unit, produced in Mexico) and *Loen* provides the LE one (180,000 units at $19/unit, produced in China). *BuildIT* performs the manufacturing in Mexico, for which Acme pays a fixed percentage of material costs. The design for Acme's product is the responsibility of *Design*, an outside firm paid a fixed fee plus a bonus that rewards low material cost.

A manager at Acme proposes redesigning the low-end product so that the HE subassembly could be used in both products (i.e., becomes "downward substitutable" into the LE product). The supply chain impact is shown in Figure 3.

Figure 3: Current and Proposed Supply Chains



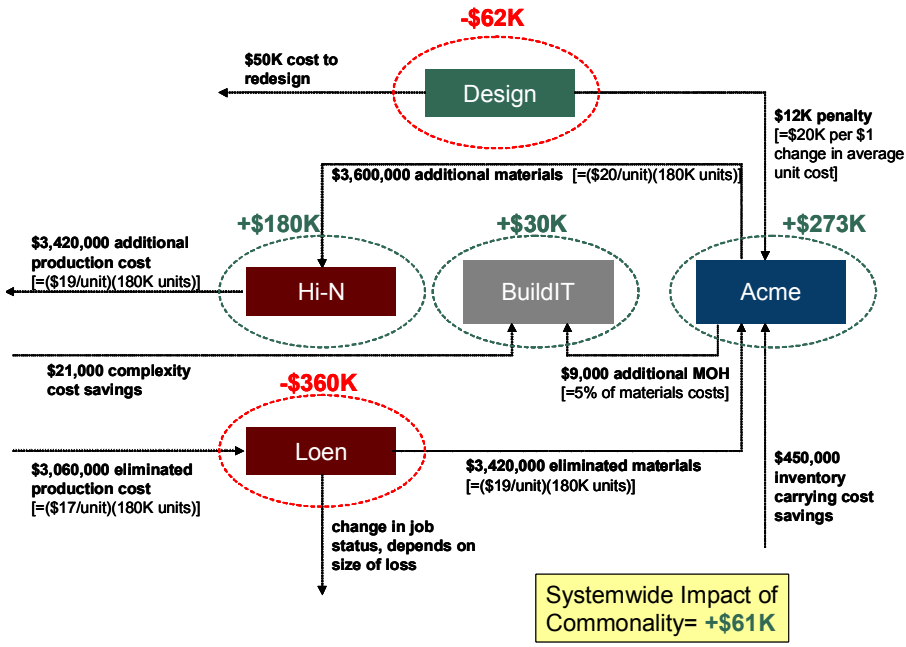
Although Acme's total material cost would increase with commonality, inventory cost (safety stock, cycle stock, and pipeline inventory) would diminish due to risk-pooling of demand uncertainty and the geographic proximity of the Hi-N plant. Naturally, Hi-N is excited about this proposal, and BuildIT would also enjoy reduced manufacturing complexity and increased revenues. However, Loen would lose a large chunk of business, and

Design would have to absorb the engineering cost of the redesign and pay Acme a performance penalty.

The financial implications are quantified in Figure 4. The bottom-line impact of commonality is listed for each firm, with arrows itemizing the specifics (incoming arrows are inflows of cash, outgoing arrows are outflows). Each arrow is seen only by the parties involved, meaning that each firm's financial circumstances are private information. The numbers are imposed on the teams by exogenous specification of payoffs under each of the two options. This simplifies the analysis for participants, as they are shielded from any complex functional relationships that might be needed to compute these effects in practice.

With two exceptions, each of the payments in Figure 4 can only be altered by the two teams involved. That is, the overall decision is whether to adopt the common design, but any changes in payments between two parties must be agreed to by both of them. So, for example, a coalition of the other firms cannot force Loen to reduce the price of its parts. The exceptions are the total MOH payment from Acme to BuildIT and the design penalty/bonus that flows between Acme and Design, which both depend on the subassembly's average unit cost. We have seen Acme extract concessions from BuildIT and Design by exploiting these teams' aversion to the uncertainty surrounding parameters (HE and LE prices) over which they have only minor influence.

Figure 4: Financial Impact of Redesigning for Commonality



Representatives from the firms have come to Acme's headquarters to discuss the proposal. They have also set up meetings with each other while in town.

Decision Process

A voting scheme is used to model power dynamics in the outsourced supply chain. The votes are allocated in the following fashion: Acme (42), Design (40), Loen (8), Hi-N (8), BuildIT (2). A simple majority is required to implement the new proposal. A team may not split its votes. A 50-50 vote preserves the status quo, which uses the unique subassembly.

Assignment of Teams and Roles

The game is played by five teams, ideally with three or four members each. Specific roles are assigned within each team (possibly based on participant personality, skills, and experiences), to prevent one or two dominant members from taking over:

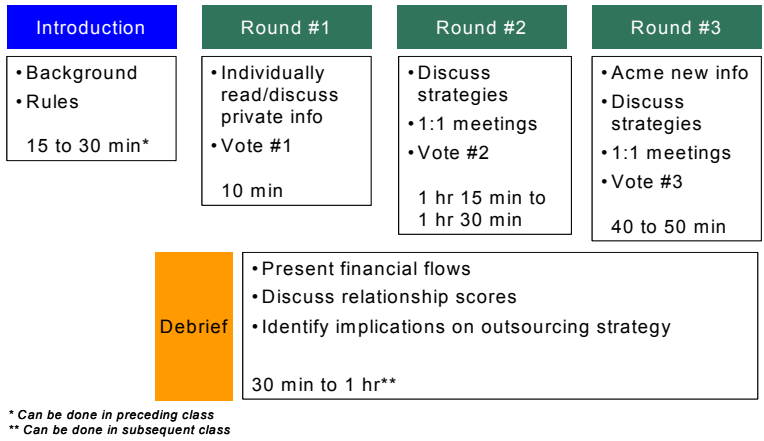
- *Lead*: does the talking during negotiations based on input from team.
- *Lawyer*: writes and signs contracts on behalf of the team, and assures compliance to terms.
- *Analyst*: evaluates financial implications of contract terms.
- *Time Keeper*: keeps track of time and rules, and moves team to meetings on time.
- *Reporter*: documents team observations.

With three-member teams, one member serves as a Lead/Lawyer, one as an Analyst, and one as a Time Keeper. With four members, the first four roles are assigned (no Reporter). With five or six, one or two Reporters are used. The instructor should attempt to anticipate strengths and skills of individuals, and seek parity in assigning people to teams.

Sequence of Events

Figure 5 outlines the progression of the game.

Figure 5: Game Timeline



Round #1 does not contain any negotiations and the intent of Vote #1 is to compel each team to understand the game structure and evaluate the two options. As apparent from Figure 4, in the absence of other financial transactions two of Acme's partners will benefit from commonality (BuildIT and Hi-N) and two will be harmed (Design and Loen). Based purely on maximization of financial payoffs, commonality ought to prevail by a 52-48 outcome. Although infrequent, some teams have opted for a poor Round #1 performance in order to bluff the other teams.

Round #2 then allows each team to negotiate with every other team, to make deals that will maximize its own allocation of value in the supply chain. A team can buy votes to build a majority coalition, sell its votes to the highest bidder, or do some combination of both. The exhaustive schedule of meetings is shown in Figure 6.

Figure 6: Round #2 Negotiations (Total time: 75 minutes)

Preliminary Talks (35 min):

Phase	Length	Room 1	Room 2	Room 3
1	5 min	Acme & Design	BuildIT & Hi-N	Loen alone
2	5 min	Acme & Loen	Design & BuildIT	Hi-N alone
3	5 min	Acme & Hi-N	Design & Loen	BuildIT alone
4	5 min	Design & Hi-N	BuildIT & Loen	Acme alone
5	5 min	Acme & BuildIT	Hi-N & Loen	Design alone
6	10 min	Meet alone with your groups		

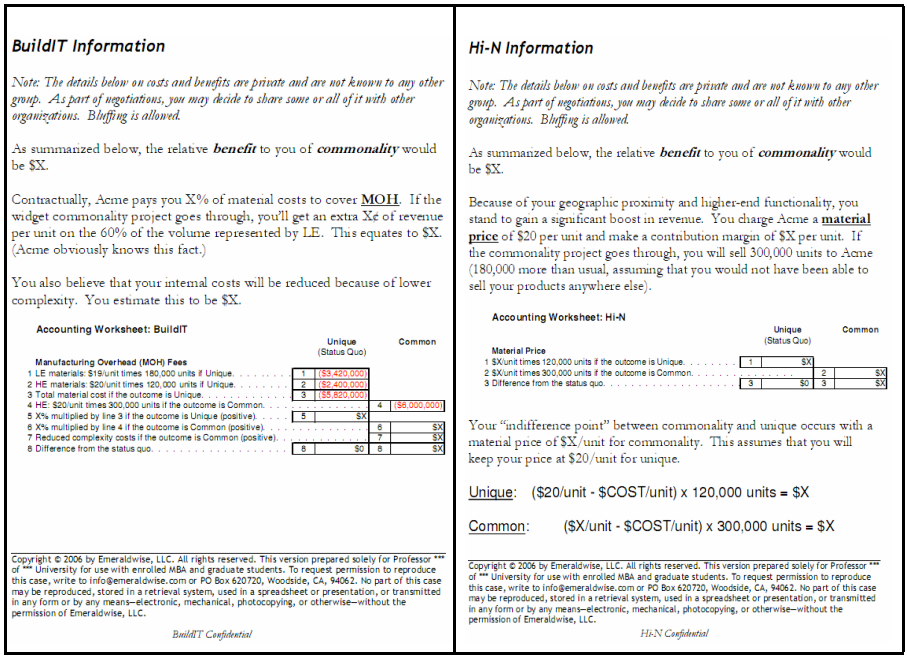
Final Talks (40 min):

Phase	Length	Room 1	Room 2	Room 3
1	5 min	Acme & Design	BuildIT & Hi-N	Loen alone
2	5 min	Acme & Loen	Design & BuildIT	Hi-N alone
3	5 min	Acme & Hi-N	Design & Loen	BuildIT alone
4	5 min	Design & Hi-N	BuildIT & Loen	Acme alone
5	5 min	Acme & BuildIT	Hi-N & Loen	Design alone
6	15 min	Multi-party negotiations; Revise, finalize and sign offers		

Each team is presented a worksheet, such as in Figure 7, detailing its (private) financial circumstances and structuring the likely computations. Given that Loen will lose all its business if commonality prevails, Loen has financial incentive to surrender virtually all its status quo earnings in desperately trying to build a coalition for unique design. Since this would undermine the game's effectiveness, Loen's incentive structure is modified with a personal motivation for the account manager. This ties the manager's adeptness at damage control to outcomes of "promotion", "keep job", "demotion", or "get fired".

Contract templates, such as in Figure 8, suggest some feasible deals to initially consider, but other agreements are allowed. This can include, for instance, reductions in unit price or lump-sum transfers of cash.

Figure 7: Sample Worksheets



BuildIT Information

Note: The details below on costs and benefits are private and are not known to any other group. As part of negotiations, you may decide to share some or all of it with other organizations. Bluffing is allowed.

As summarized below, the relative ***benefit*** to you of ***commonality*** would be $X.

Contractually, Acme pays you X% of material costs to cover **MOH**. If the widget commonality project goes through, you'll get an extra X¢ of revenue per unit on the 60% of the volume represented by LE. This equates to $X. (Acme obviously knows this fact.)

You also believe that your internal costs will be reduced because of lower complexity. You estimate this to be $X.

Accounting Worksheet: BuildIT

Manufacturing Overhead (MOH) Fees		Unique (Status Quo)		Common
1 LE materials: $1/unit times 180,000 units if Unique.	1	($3,420,000)		
2 HE materials: $20/unit times 120,000 units if Unique.	2	($2,400,000)		
3 Total material cost if the outcome is Unique.	3	($5,820,000)		
4 HE: $20/unit times 300,000 units if the outcome is Common.			4	($6,000,000)
5 X% multiplied by line 3 if the outcome is Unique (positive).	5	$X		
6 X% multiplied by line 4 if the outcome is Common (positive).			6	$X
7 Reduced complexity costs if the outcome is Common (positive).			7	$X
8 Difference from the status quo.	8	$0	8	$X

BuildIT Confidential

Hi-N Information

Note: The details below on costs and benefits are private and are not known to any other group. As part of negotiations, you may decide to share some or all of it with other organizations. Bluffing is allowed.

As summarized below, the relative ***benefit*** to you of ***commonality*** would be $X.

Because of your geographic proximity and higher-end functionality, you stand to gain a significant boost in revenue. You charge Acme a **material price** of $20 per unit and make a contribution margin of $X per unit. If the commonality project goes through, you will sell 300,000 units to Acme (180,000 more than usual, assuming that you would not have been able to sell your products anywhere else).

Accounting Worksheet: Hi-N

Material Price		Unique (Status Quo)		Common
1 $X/unit times 120,000 units if the outcome is Unique.	1	$X		
2 $X/unit times 300,000 units if the outcome is Common.			2	$X
3 Difference from the status quo.	3	$0	3	$X

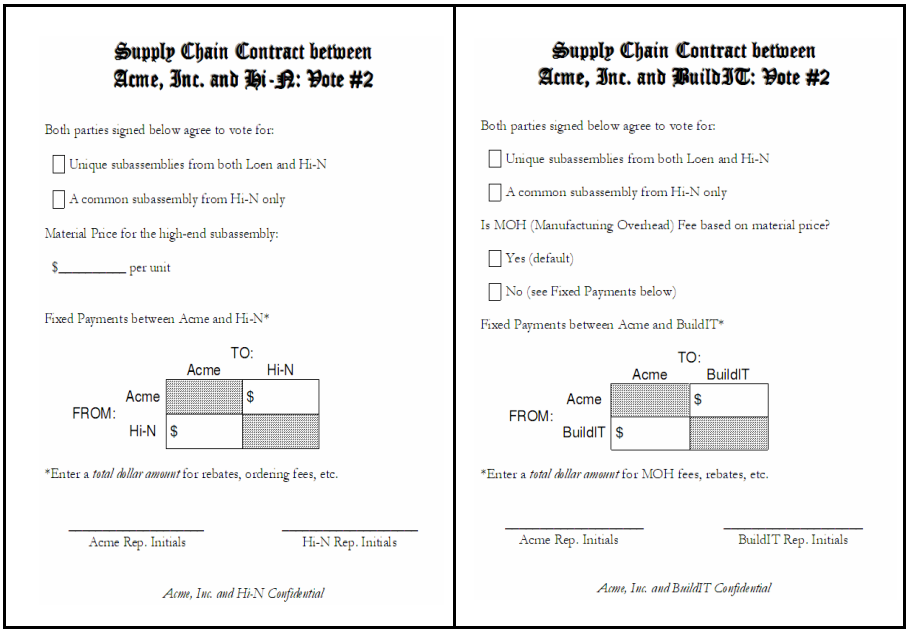
Your "indifference point" between commonality and unique occurs with a material price of $X/unit for commonality. This assumes that you will keep your price at $20/unit for unique.

Unique: ($20/unit - $COST/unit) x 120,000 units = $X

Common: ($X/unit - $COST/unit) x 300,000 units = $X

Hi-N Confidential

Figure 8: Sample Contract Templates



Supply Chain Contract between Acme, Inc. and Hi-N: Vote #2

Both parties signed below agree to vote for:

☐ Unique subassemblies from both Loen and Hi-N

☐ A common subassembly from Hi-N only

Material Price for the high-end subassembly:

$_____ per unit

Fixed Payments between Acme and Hi-N*

FROM: \ TO:	Acme	Hi-N
Acme		$
Hi-N	$	

*Enter a *total dollar amount* for rebates, ordering fees, etc.

_____ Acme Rep. Initials

_____ Hi-N Rep. Initials

Acme, Inc. and Hi-N Confidential

Supply Chain Contract between Acme, Inc. and BuildIT: Vote #2

Both parties signed below agree to vote for:

☐ Unique subassemblies from both Loen and Hi-N

☐ A common subassembly from Hi-N only

Is MOH (Manufacturing Overhead) Fee based on material price?

☐ Yes (default)

☐ No (see Fixed Payments below)

Fixed Payments between Acme and BuildIT*

FROM: \ TO:	Acme	BuildIT
Acme		$
BuildIT	$	

*Enter a *total dollar amount* for MOH fees, rebates, etc.

_____ Acme Rep. Initials

_____ BuildIT Rep. Initials

Acme, Inc. and BuildIT Confidential

Prior to negotiations the teams are reminded to be selective about what information to reveal in the course of negotiation. As in real bargaining, bluffing and deception are allowed. In fact, the more these behaviors arise, the stronger the impression on participants.

One basis for bluffing is to invoke factors that do not actually appear in the payoff numbers. For instance, Loen can try to persuade Acme that multi-sourcing provides risk reduction or enables sharing of technical capabilities/IP between suppliers. Loen can even claim that it will develop the capability to produce the HE subassembly, which is a complete fabrication given the assumptions of this game. (The facilitator should note that in reality some terms would never be put in writing, as they might constitute evidence of collusion, restraint of trade, or bribery. However, our research has found that some companies are quite adept at constructing deals that include undocumented terms.)

Teams are not prohibited from disclosing their private information. Certainly this can prove trustworthiness by leveraging the credibility of a trusted "intermediary" (the facilitator), a general tactic that arises in various forms in outsourced settings. This can also be used to pressure another team to either reveal its own worksheet or admit to bluffing. We have seen teams write into the contract that neither party can share any private information or even disclose the existence of a contract; often the teams want to continue "working the others" for money.

The teams are also told that they will assign a "strength-of-relationship" score to every other team after Votes #2 and #3. The possible scores range anywhere from 1 to 5:

- 1 = Strong negative: Mistrust; desire to "disengage" soon as possible; seek to exploit
- 3 = Neutral
- 5 = Strong positive: High trust; desire to foster a long-term, win-win partnership

This metric is intended to attach some long-run consequences to current actions, as the single-period nature of the game might otherwise lead to unrealistically myopic behavior.

After the first part of Round #2 (Preliminary Talks), the teams meet alone to discuss their strategies for the remainder of the negotiations. After the second part of Round #2 (Final Talks), the facilitator gathers contracts, tallies votes, and collects score sheets. The outcome of Vote #2 is unpredictable, as any deals can be made in the course of negotiation. The results reveal clues

about the incentives of each team, and, when viewed in light of the content of the negotiations, stimulate the development of trust or distrust.

Round #3 follows Round #2 in real time, but is not meant to represent a second period of business. It is purely a pedagogical construction to show participants how the game might play out under a different set of conditions. The teams are instructed to ignore all the events of Round #2, although we count on their inability to do this as their actions will then reflect the influence of trust. Before beginning the next round of negotiations, the facilitator meets with Acme alone. Role-playing as a consultant, the facilitator offers a pre-prepared calculation chart for comparing the financial impacts of various offers. Acme will enthusiastically accept and gain a strong appreciation of the importance of modeling financials before going into negotiations. The facilitator then asks what Acme knows about the other firms' financials. After learning that there is confusion and a feeling of being deceived, the facilitator declares that Acme management has also requested financial benchmarks and audits. Acme members are then allowed to ask questions about the cost structures of the other firms. The facilitator provides answers (per Figure 4), and Acme learns the value of (legally) collecting information about how its supply chain partners make their money. After this private briefing, the next round of negotiations begins. The teams no longer need preliminary talks, so to save time each team meets with every other only once for 5 minutes in Round #3, as seen in Figure 9.

Figure 9: Round #3 Negotiations (Total time: 40 minutes)

Phase	Length	Room 1	Room 2	Room 3
1	5 min	Acme & Design	BuildIT & Hi-N	Loen alone
2	5 min	Acme & Loen	Design & BuildIT	Hi-N alone
3	5 min	Acme & Hi-N	Design & Loen	BuildIT alone
4	5 min	Design & Hi-N	BuildIT & Loen	Acme alone
5	5 min	Acme & BuildIT	Hi-N & Loen	Design alone
6	15 min	Multi-party negotiations; Revise, finalize and sign offers		

After Vote #3 and the assignment of strength-of-relationship scores, the facilitator debriefs the game. Participants are asked whether they detected a shift in Acme's posture between Round #2 and Round #3, which would impress upon them the benefits of modeling and information gathering. The personal motivations of Loen's account manager are revealed for the first time (they were not disclosed to Acme during the private consultation). This is a surprise to many and helps to explain Loen's behavior. The group discusses the importance of probing how individual managers will *personally* benefit

from *corporate* negotiations. At appropriate points, the discussion reinforces the themes described in Sections 3 and 5.

Ground Rules

Participant instructions contain a list of specific rules, as seen in Figure 10. Several of these were added to preempt overly creative deals which would undermine learning. For example, before rule #9 was added, Hi-N and Loen could collude in raising prices since Acme has no other supply. This allowed them free rein in printing money and buying votes. Others have tried to transfer inventory ownership or manufacture products without having the necessary expertise.

Figure 10: Ground Rules

1. Winners are determined by financial results and relationship scores.
2. The time horizon is 1-year.
3. After negotiation time is up, the next team has the right to enter the room and listen in on the conversation.
4. Final offers are written up during the last round, and must be initialed and presented. A signed agreement is an obligation to vote as specified.
5. A 50-50 vote preserves the status quo (Unique).
6. The outcome is decided by whichever teams are in the room at the designated time (there is no quorum requirement).
7. The LE subassembly cannot be upward substituted (i.e., LE cannot be the common subassembly).
8. Hi-N cannot subcontract production of HE to Loen.
9. Hi-N and Loen cannot raise the subassembly prices.
10. Teams cannot change the unit demands or withhold deliveries.
11. The Unique supply chain includes all parties; the Common supply chain includes all except Loen.
12. Inventory ownership cannot be transferred (e.g., VMI).
13. Acme buys subassemblies directly from suppliers and consigns them to BuildIT. BuildIT does not pay suppliers or own subassembly inventories.
14. Only BuildIT can manufacture the final products.
15. Mergers are forbidden.

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