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Outsourcing and Offshoring Engineering Projects: Understanding the Value, Sourcing Models, and Coordination Practices

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***Abstract*—In this paper, we review recent developments in the field of outsourcing and offshoring and the implications for engineering management. We examine three aspects involved in outsourcing and offshoring, namely, sourcing models, coordination, and value extracted from outsourcing projects. We conclude that additional research is needed on recent trends in outsourcing and the impact of such change process on the practice of engineering management.**

***Index Terms*—Engineering management, offshoring, outsourcing, sourcing models, coordination.**

I. Introduction

BY OCTOBER 2010, the size of the worldwide market for information technology outsourcing (ITO) was $270 billion and the business process outsourcing (BPO) market was $165 billion. Recent estimates predict that between 2011 and 2014, ITO will grow at 5%–8% per annum and BPO will grow at 8%–12% per annum. It is also expected that the BPO market will overtake the ITO market [1].

Clearly, this ongoing growth in the outsourcing market has implications for engineering management and engineers involved in software development and other forms of product development. In the past, key engineering challenges were around the need to improve quality, enhance product features, integrate service with product offerings and speed up the innovation system. Nowadays, engineers are being asked to reorganize the product development function to accommodate outsourcing activities as part of the innovation process. This requires them to redefine 1) the way innovation is carried out within and outside the firm; 2) the boundaries of the product development function; and 3) the mode of coordination through which work is performed globally. Firms also have to develop new capabilities to support the ever-changing business models in their sourcing engagements. Understanding how and where value is created in sourcing engagements comes as an additional challenge as dependence on external partners increases. Executives responsible for innovation and information technology (IT) performance have been revisiting their business models and rethinking the roles of C-level managers, such as Chief Information Officers (CIOs), within the firm. At the same time, vendors of outsourcing services are more aware of growing demands from firms for innovation and transformation through outsourcing engagements, and are refocusing their effort to deliver value to clients by improving performance management systems and extending their offers.

This paper reviews the prominent changes that outsourcing causes within and outside the firms, in the context of engineering management. We take a practice-based approach in an attempt to bring together the vast research on outsourcing from both vendor and client sides, while also trying to provide some guidelines for engineers in the context of changing global business environments and reshaping of the practice of outsourcing within product development.

The rest of this paper is organized as follows. After this introduction, we explore sourcing models, project management, coordination practices, and the notion of value in outsourcing in the context of engineering management. We also offer links to the papers published in this special issue.

II. Sourcing Models: Outcomes for Practice

Choosing the appropriate sourcing model is a critical aspect in planning an outsourcing project. The range of sourcing models is diverse and includes single vendor, panel and multisourcing settings. In a recent study, Willcocks and Lacity [2] suggest that the ITO and BPO outsourcing markets will continue to grow through multisourcing. Although ITO and BPO spend has been increasing, in the last few years the average size and duration of individual contracts have been decreasing. How can we reconcile smaller, shorter deals with an overall increase in the ITO/BPO markets? The figures suggest that client organizations are actively pursuing more multisourcing. Multisourcing has always been the dominant practice and overall growth is driven by client organizations signing *more* contracts with *more* suppliers. While multisourcing helps clients access best-of-breed suppliers and mitigates the risks of reliance on a single supplier, it also means increased transaction costs since clients have to manage more suppliers. Multisourcing means also that suppliers incur more transaction costs. Suppliers have to bid more frequently because contracts are shorter, suppliers face more competition

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because smaller-sized deals mean that more suppliers are qualified to bid, and suppliers need to attract more customers in order to meet growth targets.

These arguments were used in the early 1990s to try to persuade customers to buy into large-scale long-term single supplier outsourcing arrangements. Critics argued that companies that signed long-term contracts lost control of their IT assets and capabilities (e.g., Strassmann [3]). An interesting fact that was lost in the focus on mega-deals, was that the dominant trend, even in the 1990s was not for long contracts. By 2000, there were only about 140 such deals worldwide. Research shows that in the U.S. and U.K. lead markets, over 75% of organizations consistently outsource 15%–50% of their IT budgets, typically to multiple suppliers [4]. Mega-deals, and especially single suppliers, have always been in the minority. One explanation for this is that most organizations want to reduce the higher risk profile inherent in large-scale outsourcing to third party suppliers [4].

What are these risks in practice? As companies accumulated experience with IT outsourcing through the 1990s, practices that differentiated success from failure emerged. Lacity and Willcocks [5] find that the relative frequency with which selective outsourcing (20%–80% of the IT operating budget goes to external providers) decisions achieved expected cost savings was higher than in the case of total outsourcing (80% plus of the IT operating budget goes to external providers) or total insourcing (more than 80% of the IT operating budget remains within the organization). The rationale is that few vendors or internal IT departments possess the expertise to perform all IT activities in the most efficient way. Selective outsourcing allows organizations to select the most capable and efficient sources, a practice some refer to as "best-of-breed" sourcing. Indeed, the ability to focus in-house resources on higher value work can also be the justification for selective outsourcing. In most cases of total outsourcing, participant firms encounter one or more of the following problems in trying to realize the expected cost savings:

1) extra fees for services beyond the contract, or extra fees for services the outsourcer assumed were included in the contract;
2) "hidden costs" on both the client side (e.g., IT spend hidden in decentralized budgets) and the supplier's side (e.g., cost of transferring software licenses);
3) inflexible contracts not allowing for changes in technology, market prices, business processes, or business direction.

Between 2000 and 2005, research showed that detailed short-term contracts worked well if participant firms were able to define requirements precisely. This ensured that they paid market prices, encouraged good vendor performance (based perhaps on threats to switch suppliers when the contract expired), allowed client firms to learn gradually how to outsource efficiently and, in some cases, allowed client firms to recover more quickly from any mistakes. More recent research reveals a number of emerging practices, which, in principle, will achieve success by other means. These include flexible pricing, competitive bidding beyond the baseline contract, beginning a long-term relationship with a short-term contract, and performance-based contracts [6].

The aforementioned findings and recommendations are holding up well in relation to outsourcing experiences and outcomes since 2000. By 2005, "multisourcing," as it came to be called [7], was being portrayed as the main sourcing model being applied by client firms for ITO and BPO. Unfortunately, many practitioners overlooked the notion of *selective* sourcing of external supply and also internal supply when warranted. Also overlooked was the important question of what number of suppliers was optimal. Clearly, the transaction costs involved in dealing with multiple suppliers could reach formidable levels, and the complexities involved in managing contracts and relationships could be daunting.

In a recent report, Willcocks *et al.* [8] look in detail at the tradeoffs between bundled services and multiple suppliers. By bundled services, they mean

> "A mix of business process and/or information technology services purchased separately or at the same time from the same supplier where synergies and efficiencies are sought in end-to-end processing, governance, relationship management, cost, and performance." (p.?)

Their findings apply equally well to major engineering projects involving choices about sourcing models and numbers of suppliers. They can be summarized as follows.

1) Multisourcing may give the client more power and more control over each individual supplier, and involve less dependence on each. However, greater control comes at the price of higher management costs, and more time, effort and measurement. It can be argued also that bundling outsourcing services makes the client larger and more important to the provider, which makes the provider more responsive, and especially in terms of improvements and innovation. In multisupplier environments, the retained management capability needed to manage outsourcing regularly costs between 4% and 10% of the total contract value [4]. As multisourcing governance has moved up the outsourcing agenda since 2007, these costs are rising [6].
2) In terms of risk, while dependence on one or two suppliers may be risky (much depends on their capabilities and their financial strength) multisourcing brings new risks, including cracks between service, security issues, hidden costs of continued monitoring and renewal of contracts, and possible replacement of suppliers. It is necessary to evaluate the size of the risks from bundling or not bundling, relative to the risks a business faces in the course of its main operations. Organizations often impose, quite inconsistently, higher levels of risk for back office deals than for strategic business initiatives, for example.

On incremental bundling, Willcocks *et al.* [8] found that many organizations adopted this route over time. They also found that some organizations gained from major one-off bundling deals, although this was rare for complex BPO arrangements. Much depended on the abilities of both client and supplier to manage these arrangements, capabilities that are quite specialized. Other organizations adopted the approach of rationalizing their IT and/or business processes, sometimes through a shared services

route, before seeking bundled outsourcing arrangements. This is a more tactical process and mitigates some of the risks inherent in outsourcing inefficient IT and processes, although depending on the savings on time and costs, such risks may be justified. The cost gains from bundling two or more business functions, for example, IT and human resources management (HR), or procurement and HR, rather than outsourcing them separately to different suppliers, could be of the order of 10%–15% [9]. The savings may be even higher if the supplier introduced a more standardized management and measurement process and is able to implement standardized business processes and IT. A prime contractor model which is a network of suppliers that is managed by one of the contractor accountable and liable for the delivery of the service represents a "half-way house," but it is unlikely to achieve significant cost savings, process standardization, or innovation compared to a bundled outsourcing arrangement. A prime contractor model presents many risks and experience shows that they do not necessarily bring benefits.[1]

So when do bundled outsourcing and fewer suppliers make operational sense? Willcocks *et al.* [8] find several advantages from bundling, such as that it:

1) simplifies and expedites procurement and contracting (sole-source versus tendering);
2) simplifies the governance process;
3) reduces duplication of management layers, processes, and costs;
4) reduces operating risks by limiting points of failure;
5) standardizes and simplifies operations;
6) achieves operational synergies across business processes and between a business process and the supporting IT;
7) mitigates delivery risk through simplified points of contact;
8) reduces service provider costs/prices through simplified management and scale economies;
9) supports preexisting standardized technology and process trajectories, e.g., use of enterprise resource planning (ERP);
10) can drive wider holistic back-office changes.

However, Willcocks *et al.* [8] conclude that this does not make bundled outsourcing the best option. These gains are possible, but much depend on the maturity and capabilities of client and supplier to deliver on the promises in the particular bundling deal. Thus, it is not surprising to find a range of client profiles when investigating outsourcing arrangements.

The bundling sourcing model is particularly critical in relation to innovation and knowledge. Willcocks *et al.* [1] show that senior executives generally adopt one of four approaches to innovation, each with distinct knowledge objectives (see Fig. 1).

"Do-It-Yourself" scores highly for retaining control and keeping the value of transformation within the company. However, success requires both funding and appropriate skills. This option is also most likely to encounter internal resistance if its importance is not flagged by senior management. The "Management Consultancy" route brings in external energy, is a clear signal of the commitment to major change, and reduces political resistance. The most significant risks from this approach are cost escalation, lack of sustainability, and poor knowledge transfer. "Fee-For-Service Outsourcing"—whether ITO or BPO—can result in small, usually one-off, innovation in inherited back-office management practices, business processes, and investment in new technology. However, the results are usually not long term. Fee-for-service contracts are structured around cost/service issues and do not incentivize the supplier to innovate. They signal an over-reliance on the supplier to innovate in business areas where new ideas should be an in-house problem. The supplier tends to focus on selling extra services to increase its margins and may become embroiled in immediate crises and operational problems. The employer does not develop or employ more innovative staff or make efforts to foster the contractual relationship.

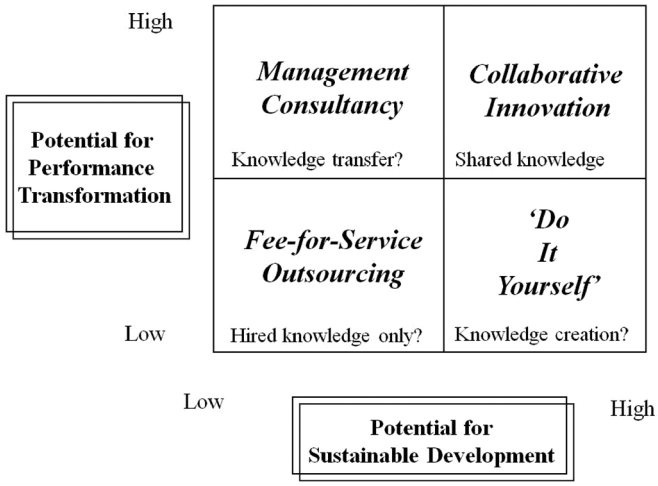

Fig. 1. Options for back-office innovation [adapted from Willcocks *et al.* [1]).

Based on the learning from a major engineering project—the building of Heathrow Terminal 5—Willcocks *et al.* [1] show that some form of "Collaborative Innovation" is required if sustained, significant IT or back-office, and business innovations are to be achieved. The greater the motivation, the more likely that the contract will include some form of risk-reward component. Collaborative innovation can take the form of a formal joint venture as in the case of several BPO deals and cases of engineering collaborations. The paper, "Global multisourcing strategy: integrating learning from manufacturing into IT service outsourcing" (by Levina and Ning) in this special issue extends these debates and practice points by integrating the learning from research in the operations management and IS fields and by developing a theoretical model of the tradeoffs associated with the use of multiple vendors for IT services. The authors produce a conceptual map of four configurations of what can constitute a multivendor supply base, and extend the debate even further by applying this map to analyze two global financial service firms and their global sourcing strategies.

We next examine project management practices and their relevance to managing engineering outsourcing projects.

[1]In [2] and [5], the authors point to cases where management costs were not noticeably lower than in other models, and best practice was not shared among the different suppliers.

III. Project Management in Outsourcing

There is a long tradition of project management studies in the engineering and construction sectors, and some of these developments and practices can be applied to outsourcing and offshoring of IT projects. For example, *Accelerating Change* report [10] that describes a U.K. project conducted by the Strategic Forum for Construction, led by Sir John Egan, lists the most important drivers as being client leadership, integrated teams, and relevant employees. Central to the approach outlined are partnering and collaboration. In relation to ERP implementation, the main problems are their large size, long time scale, complex, new or untried technology, and lack of clear detailed project staffing and management structures. Traditional "waterfall" systems development methods are not appropriate for implementing IT-based projects constituting real business innovation.

Many IT outsourcing projects are run according to a "time box" philosophy [11] in which the IT-based business innovation must be delivered within foreseeable period of time and must be aligned with the organization's overall IT architecture. It is sometimes possible to decompose such projects into smaller phases, each of which will deliver tangible business benefits. For example, in large-scale outsourcing projects, the transition phase, in which client systems are transferred to the vendor, is planned as a series of "waves" each taking from 2 to 3 months. Time discipline reduces the risk of a project failing to meet business requirements, ensures that some big projects are reduced to a series of more manageable units, that business benefits flow regularly, and that the team will remain focused be fully staffed over a limited period. In the outsourcing context, such an approach also makes it easier for client firms to ensure the continuity of the business during transition. For the vendors, on the other hand, a "time-boxing" approach offers a clear association between deliverables and rewards. Within projects further time boxing can occur in relation to different parts of the development to reduce drift from the overall business delivery target.

What is the role of suppliers in projects? Willcocks *et al.* [1] suggest that external perspectives and external knowledge can contribute much to the process of technical and business innovation. Suppliers can also compensate for in-house shortages in routine and specialized skills in order to ensure rapid delivery of the system. The routine, easily codifiable processes can all be outsourced [12]. Our research suggests that IT-based innovation means that suppliers are utilized most effectively if they are directed and controlled by the outsourcer, perhaps within the home company. "Insourcing" external skills, if properly managed, can release valuable transfer-of-learning effects.

The alternative of outsourcing the management of IT-based innovation to a third party, places the external supplier in an invidious position. Technical work requiring the application of expert know-how and techniques can be outsourced to the appropriate specialists. The more complex (i.e., adaptive) the work becomes, the more leadership is required and the greater become the requirements for multiple stakeholders to engage with defining the problem and work together to come up with a solution. Adaptive challenges arise in situations where problems and solutions are unclear, multifunctional teams are needed, learning is vital, innovation is usually necessary, and there is a general business goal rather than precise metrics guiding the project. In such situations, the role of leadership is to maintain direction and shape the context and process that will accomplish this goal. Moreover, the more radical and business focused the innovation goal, the more crucial it is for the client to lead the project. Willcocks and Lacity [2] show that in-house leadership is vital for large-scale IT and back-office innovation and transformation because they generally involve adaptive challenges. Even fee-for-service outsourcing will involve some adaptive challenges, which are often interpreted as technical challenges.

Offshore outsourcing introduces additional dimensions and complexity to project management. Offshore outsourcing can involve time zone and cultural differences [13], impose the need for more control [14], [15], involve problems related to the transfer of knowledge [16], require more precise definition of requirements [17], and introduce difficulties in terms of managing dispersed teams [18]. The transaction costs involved in offshore outsourcing are considerably higher than those related to domestic outsourcing [19]. Researchers have identified practices and capabilities specific to offshore outsourcing [20] including the use of middlemen [21], the design of special client-offshore supplier employee interfaces [16], the use of larger numbers of links [17], and others [22], [23].

Governance models are also an important factor that influences success in outsourcing relationships. In their article in this special issue, "Managing Software Outsourcing Relationships in Emerging Economies: An Empirical Study of the Chinese Small- and Medium-Sized Enterprises," Ren, Ngai, and Cho explore three different governance models and their impact on success of engineering projects in the emerging Chinese outsourcing market. The authors analyzed three different interorganizational models: contractual-based, relational-based, and vendor-specific investment. By analyzing the success of 83 software engineering projects from 77 Chinese small- and medium-sized firms, they found that both contractual and relational governance models were key contributors to successful projects. Combined with vendor-specific investment, the three models accounted for 45% of the variance in outsourcing project success. Their study also showed that Chinese client firms utilize vendor specific investment to protect their financial investment connected to the relationship. The investment was shown to enhance the long-term partnerships client firms have with their suppliers. As emerging economies continue to expand their role in the software engineering landscape, this study also confirms the importance of relational-based governance models and vendor management.

Deeper insights into offshore outsourcing are provided by Gopal *et al.* [24] who examine the effects of capability process maturity (CPM) and communication/coordination practices on ITO project outcomes, in the context of application development projects outsourced to offshore suppliers. The authors find that CPM quality processes *reduce* the level of project reworking, *increase* project efforts, and have *no effect* on project duration. CPM technical processes *reduce* the level of project effort, *increase* project duration, and have *no effect* on the level of rework.

Also the greater the number of project status meetings, the more this increases project effort; and the more incremental releases, the less project rework but the more project effort.

The paper "An empirical investigation of client managers" responsibilities in managing offshore outsourcing of software testing projects' (by Jain, Poston, and Simon) in this special issue examines client managers' responsibilities in the management of offshore outsourcing of software testing projects. The authors point out that while this practice is increasing, little research has been done on the problems encountered by clients in managing projects with offshore vendors, or on the changes required to manage offshore outsourcing relationships effectively. The authors use a case study approach to identify six project management activities. They discuss the changes that were required and examine the coping strategies employed by client managers to deal with these project management activities. They describe how the interplay among multiple global boundary variables affects these activities, and integrate insights from global distributed teams, organizational communication, and the offshore outsourcing literature to ground the relationship theoretically, between the boundary variables and coping strategies.

Another paper in this special issue "Information technology and distance-induced effort to manage offshore activities" (by Aubert, Rivard, and Templier) examines the role of distance and IT in the management of offshore activities. The study develops a model of the effect of distance on the effort required to manage an offshore activity. This involves developing an understanding of which aspects of distance and which features of the technology influence the effort required to manage an offshore activity, how this influence is exerted, and how IT and distance interact. The authors study 12 organizations in Canada, Western Europe, and Eastern Europe. The model they propose posits that perceived distance is a key antecedent to effort. Their model suggests that IT facilitates higher level formalization of the information exchanged and moderates the impact of geographic distance on the effort required to manage offshore activity.

In the next section, we examine coordination and knowledge management practices in the context of engineering management outsourcing projects.

IV. Coordination and Knowledge in Outsourcing and Offshoring Engineering Projects

In large-scale engineering projects, coordinating the work is a primary management task. In the context of software engineering, the unique properties of software make its development more difficult than other engineering disciplines. Software systems are *complex*, *not visualizable,* and constantly subject to *change.* Software systems have to *conform* to the continuously changing environment of their application [25]. These inherent challenges make software engineering a complex discipline and increase the obstacles to management practice that relies on "traditional" coordination mechanisms, such as *organization design,* which encompasses formal structures such as hierarchies, linking pins, teams, and direct contact; *work-based mechanisms*, which include plans, specifications, standards, categorization systems, and representations of work-in-progress such as prototypes and design documents; *technology-based mechanisms,* which enable information capture, processing, storage and exchange (e.g., electronic scheduling, groupware, and shared databases), and replace human input by automating certain tasks; and *social mechanisms,* which involve communication activities, working relationships and social cognition [26].

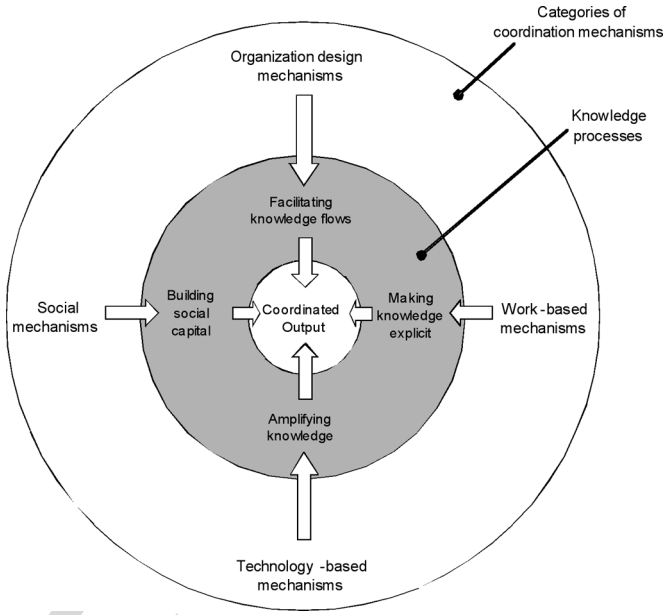

Fig. 2. Coordination mechanisms for managing knowledge in globally distributed teams (adopted from Kotlarsky *et al.* [15]).

A. Adapting Coordination Mechanisms for Outsourcing and Offshoring Project Teams

Outsourcing and offshoring arrangements make coordination more difficult due to the geographic, temporal, cultural, and often organizational distance (in outsourcing arrangements) between the individuals involved in remote collaborative engineering efforts [27]. The breakdown of traditional coordination mechanisms, an incomplete picture of what is happening in remote locations, the difficulties involved in working across different time zones and delays in distributed collaborative work processes have been reported in globally distributed projects [28], [29]. Additional challenges arise when tools, processes, and the information and communication technology (ICT) infrastructures are different across different remote locations [30], [31].

To deal with these challenges, coordination mechanisms for globally distributed teams have been adapted to allow remote teams to work across distance time zones. Coordination mechanisms have become crucial *knowledge management mechanisms* ensuring effectiveness and efficiency among globally distributed teams and improving the utilization of knowledge across dispersed sites, in the pursuit of a joint collaborative outsourcing/offshoring effort (see Fig. 2), as explained later.

Coordination mechanisms employed by global teams rely on *technologies,* which enable rapid access and dissemination of

knowledge through intranets, knowledge databases, and repositories that in turn rely on sophisticated search and retrieval mechanisms [32], collaborative technologies, and social media [26].

Organization design mechanisms facilitate knowledge flows by providing a structure that allows dispersed outsourcing project teams whose members typically include representatives of the client, supplier(s), and consultancy firms, to channel and integrate their expertise. Coordination requires the knowledge that resides in different parts of a globally distributed project team to flow and be connected in a structured manner. The design of the organizational structure of an outsourcing project team should make it clear who is supposed to know what, and who is supposed to communicate with whom, which makes knowledge flows more efficient [26], [32]. The organization design mechanisms that have proven successful in outsourcing and offshoring projects include implementing mirror organization structures onsite and offshore, setting up miniteams to focus on a specific feature or subject and establishing centers of excellence specializing in specific industry solutions or technologies, promoting direct contact between remote counterparts, and appointing contact persons to liaise between remote members [26], [32]. *Work-based mechanisms* capture knowledge and make it explicit through specifications, blueprints and prototypes, which enable replication and facilitate standardization across remote sites. This helps to diffuse knowledge and expectations and render it useful to people working in dispersed locations. The division of work driven by the availability of expertise (and not location), standardization and centralization of tools, and made accessible through the Web [29], implementation of knowledge transfer methodology and mechanisms to facilitate knowledge retention [32] are some of the work-based mechanisms that improve the efficiency and effectiveness of coordination of outsourced and offshore projects.

Finally, *social mechanisms* establish social capital and help individuals to learn who knows and does what. (What people are *supposed* to know and do is part of the organizational design mechanisms discussed earlier.) Communications, traditionally recognized as an adaptive coordination mode, are essential in outsourcing and offshoring projects where individuals from client, supplier and other participating organizations may be encountering unfamiliar circumstances and may be working with colleagues that they do not know. Through communications and engagement in joint social practices, they can establish a shared understanding and develop working relationships that enhance the accuracy of their expectations about others' thinking, activities, and expectations. The nature of outsourcing and offshoring projects creates barriers to social practices involving colleagues from different national and organizational cultures, working in geographically dispersed locations and in different time zones. Usually only top and middle management levels meet face-to-face, and while such meetings may be helpful, they are also generally very *formal* and taken up with discussion of project procedures and technical issues. Such face-to-face meeting is usually *short* and *sporadic*, which allows little opportunity for informal communication that might become the basis for interpersonal relationships and facilitate closer collaboration and understanding. Although ICT had advanced, it does not replace the need for personal contact or facilitate the social capital that is typically accumulated through face-to-face meetings [33]. Implementing social coordination mechanisms in globally distributed teams requires dedicated management and activities that vary according to the project lifecycle, and provide teams with the tools and technologies to support remote social practices. Table I, adapted from Oshri *et al.* [34], presents some activities and practices for individuals, groups, and organizations in globally distributed teams. These are designed to build and maintain social ties among remote counterparts before face-to-face meetings or after they have met.

The paper Coordination and performance in global software service delivery: the vendor's perspective (by Gopal, Espinosa, Gosain, and Darcy) in this special issue examines coordination and performance from the vendor's perspective. They look at coordination between client and vendor teams, and within vendor teams. Software quality and development speed are the performance outcomes studied in this paper. The authors show that both client-vendor coordination and vendor team coordination positively influence the quality of project output, but not the speed of development. This paper contributes to our understanding of coordination within and between vendor teams, and the impact that coordination has on software development performance.

B. Role of Transactive Memory Systems in Coordinating Knowledge in Outsourcing and Offshoring Projects

Globally distributed teams involved in outsourcing or offshoring focus their coordination efforts on managing knowledge across remote locations using the four types of adapted coordination mechanisms described earlier. Over time, they become familiar the responsibilities and knowledge of the members of their dispersed project team. As their familiarity and knowledge about their counterparts increase, the global team becomes more efficient in dealing with cognitive labor. Team members develop a *Transactive Memory System* (TMS) that is a combination of individual memory systems and communications (or "transactions") between individuals which enable a shared division of cognitive labor used to encode, store, and retrieve knowledge from different, but complementary domains of expertise through engagement in collective tasks.

Processes that enable the creation and renewal of a TMS are directory updating, information allocation, and retrieval coordination. *Directory updating* is associated with learning about the areas of expertise of team members and creating awareness about who knows what in the team or organization; *information allocation* refers to communicating information to the relevant experts for processing and storage; *retrieval coordination* refers to requests to access unique stored information to enable task performance [35]. The level of development of the group's TMS is characterized by its *specialization* which refers to the degree of differentiation of the knowledge possessed by team members; *coordination* that implies the team's efficiency at processing knowledge while working together; and *credibility* that

TABLE I
INDIVIDUAL, TEAM, AND ORGANIZATIONAL ACTIVITIES SUPPORTING SOCIAL TIES BEFORE, DURING, AND AFTER FACE-TO-FACE MEETINGS (ADAPTED FROM OSHRI *ET AL.* [34])

	Before F2F	**During F2F**	**After F2F**
Individual	• Offer language courses • Increase awareness of communication styles • Offer short visits of individuals to remote locations	• Create space for one-on- one interactions • Provide sense of importance of each member • Adjust communication styles	• Offer short visits to remote locations • Offer temporary co-location • Ensure real time communication channels • Ensure mixed audio and visual cues
Team	• Introduction of new team members • Increase awareness of team composition • Offer virtual F2F meetings • Increase awareness of communication protocol • Set up mini-teams • Appoint contact person per remote team	• Conduct kick-off meeting • Offer space for multiple interactions between counterparts • Offer team-building exercises • Organise social events • Discuss differences in national cultures	• Facilitate reflection sessions • Facilitate around-the-table discussions • Facilitate progress meetings
Organizational	• Distribute newsletters • Create and offer shared cyberspaces	• Discuss organizational structure • Discuss differences in organisational culture	• Ensure direct communication channels

refers to the team members' beliefs about the reliability of other members' knowledge [36]–[39].

The development and activation of core TMS processes (directory updating, information allocation, and retrieval coordination) are supported by knowledge directories that point to where knowledge and expertise reside [40]–[42]. According to Oshri *et al.* [43], these directories can be *codified* (e.g., information systems and technologies, ICT, and knowledge management systems) or *personalized* (e.g., one's own and other people's memories), which is in line with codification-based and personalization-based knowledge approaches in the literature (e.g., [44], [45]). In outsourcing and offshoring contexts, codified IT-based TMS directories available to dispersed workers typically include various corporate-wide and project-specific document- and knowledge-management systems, project portals, and expertise directories (e.g., "yellow pages") that can be accessed from remote locations. Personalized directories that are formed through experience of working together and informal social networks, typically, are less developed in globally distributed teams where members have few opportunities to use social coordination mechanisms that facilitate their development. Therefore, codified directories play a central role in facilitating the use of TMS in global teams.

As individuals gain on the job experience, and as team membership changes (which is common in large-scale long-term outsourcing contracts), a TMS develops and is continuously renewed by constant updating of codified and personalized directories [43]. Because these teams rely on codified rather than personalized directories, *technology-based* coordination mechanisms are critical for supporting the global team's TMS.

Work-based mechanisms facilitate the codification of knowledge, which, if stored in repositories or databases supported by efficient search capabilities, reduce the cognitive load of the group by storing codified knowledge in organizational memory systems, rather than the memories of individual group members.

Organization design mechanisms that provide a structure for the efficient flow of knowledge within the global team "protect" the TMS of the globally distributed team against deterioration resulting from changes to organizational membership, by capturing who is *supposed* to know what. For example, if a team member is replaced, the role to be filled and responsibility it entails (e.g., a specific system, portfolio of applications, or solution) is familiar to the rest of the team. The new appointee will be allocated the knowledge related to this area of responsibility. Clearly, interpersonal relations and personalized TMS directories will suffer if individuals leave the team, and it takes time for newcomers to develop relationships and be able to exploit the group's TMS.

Overall, coordination mechanisms adapted for globally distributed teams and TMS improve the utilization of dispersed knowledge resources which in turn improve group performance. The coordination challenges that arise in outsourcing and offshoring software engineering projects can be managed by focusing coordination efforts on managing dispersed knowledge [26], while a TMS facilitates the transfer and sharing of knowledge among team members (e.g., [41], [43], [46]).

While the focus in TMS research is mostly on couples engaged in close relationships, and small work groups (e.g., [47], [48]–[50]), some studies investigate how a TMS is developed and activated in contemporary settings, such as globally

distributed and virtual teams (e.g., [43], [46], [51], [52]), or quick-response organizations such as emergency rooms or disaster recovery teams where, to save lives, individuals need to be able to integrate their knowledge and act quickly (e.g., [53], [54]). From an engineering perspective, Oshri *et al.* [43] study the role of a TMS in transferring knowledge between onsite and offshore teams involved in offshore outsourcing software development projects. Their research demonstrates how encoding, storing, and retrieval processes enable knowledge transfer between remote counterparts and proposes specific mechanisms to support the development of codified and personalized directories between members based onsite and offshore.

The paper "Hallowed grounds: The role of cultural values, practices, and institutions in TMS in an offshored complex engineering services" in this special issue (by Jarvenpaa and Keating) examines how cultural differences among engineering team members affect the coordination of dispersed knowledge and the development of TMS, based on a longitudinal case study of a dispersed, cross-cultural team involving U.S. and Romanian engineers. The findings demonstrate that cultural differences in values, practices, and institutions have a major impact on TMS indicators of specialization, coordination, and credibility.

So far the paper has focused on exploring outsourcing practices in the context of engineering management. We now explore the notion of value in outsourcing projects.

V. Notion of "Value" in Outsourcing Projects

Extracting value from outsourcing engagements is a key objective for client firms and vendors. Existing research (e.g., [6], [55]) focuses mainly on the risks associated with outsourcing. Work that examines the impact of ITO on firm performance (e.g., [56]) provides little explanation of how these firm performance indicators inform the long-term strategies of firms.

More research is needed on whether clients see value from their outsourcing engagements. We refer to the notion of value not primarily as knowing the value of a particular activity in financial terms, but knowing *how* to value it, and *why* [57]. As outsourcing projects become ever more complex, and include multiple business functions and multiple vendors, client firms are finding it harder to realize the value these engagements bring to their organizations. A high degree of dependency between outsourced business functions, especially in the case of a bundled service-sourcing model to try to improve the entire or part of the value chain, may erect even more hurdles to understanding and measuring the value in complex outsourcing projects.

While client firms often see value as a one-off cost savings resulting from the outsourcing projects, the impact of most outsourcing projects, and especially those involving transformation and innovation, is much wider. A recent study by Oshri and Kotlarsky [58] aimed to understand whether client firms realize value from their outsourcing engagements, and the role of the CIO in the conceptualization of value within the client firm, as a first step towards capturing the notion of value in outsourcing. Their research was based on a survey of 263 CIOs and Chief Financial Officers (CFOs) from leading European firms with revenues between $500 million and $6 billion (71% over $1 billion), representing industries that have been outsourcing IT and business processes for some time, including financial services, manufacturing, logistics, retail, utilities, and telecoms. The survey was followed up with interviews with CIOs of several leading European firms including ABN AMRO, Royal Dutch Shell, Maersk, and Philips.

Results of this study highlight the difficulty in evaluating the value in outsourcing engagements that involve multiple suppliers and several business areas. For example, when clients expect vendors to actively help them to achieve competitive advantage, this adds additional difficulties in evaluating return on investment. The survey results support this with only 39% of CIOs and CFOs believing that assessment of the financial contribution of outsourcing activity is feasible. Also, more and more outsourcing contracts are related to high-value activities, which often require intense and ongoing collaboration in the form of joint ventures between client and vendor, further inhibiting the translation of the benefits from outsourcing activities into financial benefit. Only 28% of CIOs and CFOs believed that their organization was able to assess the business value of outsourcing beyond the one-time project cost savings.

Some sophisticated vendors have perfected their performance management systems with the development of metrics that capture and quantify the activities of their staff. Such metrics allow these vendors to secure their margins and avoid the "winner's curse" syndrome [59]. On the other hand, most client firms tend to rely on service level agreements (SLA) as a means to evaluate their satisfaction from outsourcing arrangements, which shifts the focus to the micromanagement of day-to-day performance with little attention to the long-term value from such partnerships. One CIO described the approach to evaluating satisfaction as the mean to assess the value of their outsourcing arrangements:

> "We try to simplify it. It's too much over the top. We have everything we outsourced on service level agreements and we have a pretty good matching system."

Quantifying the indications provided by SLA, however, is also not straightforward: 37% of the CIOs and CFOs surveyed never tried to quantify the financial benefits from outsourcing arrangements. Another 20% of CIOs and CFOs had no idea whether this has ever been attempted in their organization. Of those CIOs and CFOs who did try to quantify the financial benefits from outsourcing arrangements, 43% of them were not confident about how returns were measured. One commented that:

> "That is the problem. You know what it costs but you don't really know what the value is."

When asked: why have you not tried to quantify the financial contribution of your outsourcing arrangements? 51% of CIOs and CFOs said that these benefits were difficult to quantify, and 41% assumed that they were positive.

It is evident that since ITO and BPO are critical for the competitiveness of most firms, the role of the CIO and the *retained client organization* that encompasses in-house capabilities

required to manage the outsourcing relationships, develop vision for business and functions, and lead architecture planning and design [4] are becoming important to achieving business objectives. Both parties are expected to act as connecting links between the outsourcer's business strategy and the market, through a smooth execution of the sourcing strategy. It is imperative that the CIO can make a business case to the board and act as a change agent within the firm to achieve business transformation and innovation via outsourcing partnerships. However, according to our survey, 64% of the CFOs did not think that CIOs are successful in communicating the potential financial benefits from outsourcing arrangements. This would seem to question the maturity and sophistication of the retained organization. One CIO offered this reflection:

> [. . .] in my network when I discuss with other CIOs and I ask them, "How are you doing on your business case?" they said, "What do you mean 'business case'?." I then say: "You need something to describe against a report. If you don't start with a business case, if you don't start with clear objectives, how are you going to report?"

The results of our survey and interviews show that some of the critical strategic benefits from outsourcing, such as business transformation and the ability to achieve a competitive edge are perceived by CFOs to be poorly communicated to the board by CIOs. The fact that many CIOs are not members of the executive board magnifies this problem. Put it simply, often the message that the CIO sends to the board through the CFO is "lost in translation."

A. Dynamic Nature of the Value and the Role of the CIO

The results of the survey and the interviews with CIOs led to our first conclusion: *value should be perceived as a dynamic concept*. The desired value from an outsourcing arrangement set jointly by client and vendor at the start of the project is destined to change over time. Few firms are aware of this and even fewer take steps to mitigate this risk. If changes in value over the life of the outsourcing project are not acknowledged, tensions and disagreements will build up between the parties and will erode any benefit from the outsourcing arrangement. However, the dynamic nature of value does not mean that clients have the freedom to redefine their expectations autonomously. This needs to be a joint effort, in which the first step will be to develop mechanisms that will detect changes in value. Sensing mechanisms should be supported by joint learning between client and vendor. The more opportunities there are for joint learning among client and vendor teams, the more likely that value as a dynamic concept can be monitored. The research found that value is most easily detected if outsourcing arrangements are based on relational value. This means that efforts will be made to develop the supply network relationships by responding to the changing nature of value.

The second conclusion is that many CIOs still do not "speak" the "business language." Most of them are not executive board members, and many have emerged from the IT/IS ranks and often had little exposure and involvement in formulating the firm's business strategy. It has been argued that the role of CIO has become less strategic since IT is no longer a source of competitive advantage. However, since the mid-1990s, CIOs have been asked to lead outsourcing projects and transform the way that services are designed and delivered. Firm boundaries have been redefined and sources of innovation reconsidered. Clearly, nowadays the CIO is, if anything, more strategist than ever and its role within the firm is destined to grow. However, to cope with such changes CIOs need to learn. They need to learn the "business language" spoken at the executive board. They need to be able to formulate and argue a strong business case for an outsourcing arrangement, at the strategic, operational, and financial level. They need to learn to focus on business improvement processes rather than service improvement processes and on business transformation rather than IT improvements. Their position within the organization should be more central, with a direct influence on decisions made at the board level. A CIO then should become a central figure and a driving force in implementing the firm's sourcing strategy.

The paper, "The sidelining of top IT executives in the governance of outsourcing: antecedents, power struggles, and consequences" (by Chakarabarty and Whitten), in this special issue demonstrates the importance of understanding the dynamics between business executives and IT executives, as described earlier. The authors focus on the relative power of each executive group and the implications for firm performance, arguing that business executives have more power in IT outsourcing decisions if firm's financial performance has been poor and when the firm did not have a sizeable IT workforce. This situation, according to the authors, leads to poor firm performance. On the other hand, when power concerning IT outsourcing decisions lies with the IT executives, outsourcing performance is at best.

VI. Directions for Future Research

Since 1995, there has been an increase in the number of papers published on the topic of outsourcing and offshoring. Clearly, academics and practitioners are taking a greater interest in the phenomenon since its impact across the entire firm value chain has become more obvious. Although several areas related to outsourcing and offshoring have been examined, we believe that there are opportunities to advance our understanding of this practice and its impact on organizations and societies. We suggest three themes that would be particularly fruitful research areas in the near future.

First, Corporate Social Responsibility (CSR) has been linked to outsourcing and offshoring, but it is unclear whether "greening" IT and applying CSR to outsourcing and offshoring projects results in competitive advantage for client firms. The evidence suggests that much of the CSR rhetoric and practice is geared toward cost reductions. Such observations call for further research to examine the strategic role that CSR plays in outsourcing and how CSR is implemented in IT and BPO projects.

Second, research should look at the management of and strategic approach to offshore captive centers [60]. Very few studies have examined this phenomenon despite its growing importance (e.g., [61]). In particular, the relationships between the parent firm and the captive center are not well understood.

Third, research on outsourcing tends to overlook innovation. Although outsourcing initially was focused on the software development and IT management function, there is an increase in the level of outsourcing of more core, high value knowledge-intensive activities that involve high degrees of innovation [62]. How innovation is achieved and by what means are central questions that should be investigated in the context of outsourcing. Understanding the impact of various sourcing models on innovation performance is another fruitful line of research.

As outsourcing evolves, we would anticipate that other issues will become high on the research agenda, including new sourcing models (e.g., Cloud Services), sophisticated engagement modes (e.g., multisourcing, bundled services), and outsourcing performance (a shift from focus on SLAs to measuring the value in its holistic sense). Within these broad themes there will be numerous opportunities to advance understanding and expand the body of literature on outsourcing and offshoring.

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