

© 2014, Elsevier. Licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International  
<http://creativecommons.org/licenses/by-nc-nd/4.0/>

# PRIMARY VENDOR CAPABILITIES IN A MEDIATED OUTSOURCING MODEL: CAN IT SERVICE PROVIDERS LEVERAGE CROWDSOURCING?<sup>1</sup>

**Dorit Nevo<sup>2</sup>**

Rensselaer Polytechnic Institute  
110 Eighth Street, Troy, NY, USA  
[nevod@rpi.edu](mailto:nevod@rpi.edu); +1-518-276-2230

**Julia Kotlarsky**

Aston Business School  
Aston University, Birmingham, UK  
[j.kotlarsky@aston.ac.uk](mailto:j.kotlarsky@aston.ac.uk); +44-121-204-3116

## Abstract

*Crowdsourcing platforms that attract a large pool of potential workforce allow organizations to reduce permanent staff levels. However managing this “human cloud” requires new management models and skills. Therefore, Information Technology (IT) service providers engaging in crowdsourcing need to develop new capabilities to successfully utilize crowdsourcing in delivering services to their clients. To explore these capabilities we collected qualitative data from focus groups with crowdsourcing leaders at a large multinational technology organization. New capabilities we identified stem from the need of the traditional service provider to assume a “client” role in the crowdsourcing context, while still acting as a “vendor” in providing services to the end-client. This paper expands the research on vendor capabilities and IT outsourcing as well as offers important insights to organizations that are experimenting with, or considering, crowdsourcing.*

**Keywords:** outsourcing, crowdsourcing, mediated outsourcing model, service provider, vendor capabilities

## 1. Introduction

With increasing globalization and technological advancements outsourcing has become a daily practice for many organizations. Outsourcing implies contracting with a third party (a service provider) not

---

<sup>1</sup> This paper is published in Decision Support Systems, Special Issue on Social Decision Making and Crowdsourcing. Please cite as: Nevo, D. and J. Kotlarsky (2014) “Primary Vendor Capabilities in a Mediated Outsourcing Model: Can IT Service Providers Leverage Crowdsourcing?“, Decision Support Systems, 65, pp. 17-27.

<sup>2</sup> Corresponding author

directly controlled by the client organization to accomplish work for a specified length of time, cost and level of service [38, 44]. Outsourcing is fueled by service providers with strong technological capabilities and access to a global talent pool, which they employ in global delivery centers typically located in developing countries, in rural areas where salaries and operating costs are low. This enables IT outsourcing vendors to achieve economies of scale when delivering services through an onsite-offshore service delivery model [e.g., 6, 43], one of the most popular sourcing arrangements for delivering IT and business services [44].

Recently, a new model has emerged that offers several potential benefits to service providers, among them an alternative to the onsite-offshore model. This next generation of outsourcing which is associated with the “human cloud”, a virtual, on-demand workforce [26], is enabled through crowdsourcing platforms. In its broadest form, crowdsourcing implies outsourcing a job to an undefined, generally large group of people in the form of an “open call” [22]. A crowdsourcing platform provides access to a large pool of potential workforce to be used on-demand [16, 26, 44]. The crowdsourcing model is increasingly being adopted by the open innovation movement (e.g., InnoCentive, IdeaConnection, TekScout, and many other open innovation marketplaces and communities) as well as a large number of new business ventures such as iStockphoto.com that sells photos, illustrations, audio and video files; and Threadless.com where individuals can submit their designs to be printed on T-shirts and other garments.

As large companies such as Microsoft<sup>3</sup>, IBM<sup>4</sup>, GE<sup>5</sup> and Google<sup>6</sup> have started experimenting with crowdsourcing, its growing popularity stimulated a range of mixed reactions in the outsourcing community. Some established service providers ignore the fact that an “unknown workforce” is delivering jobs that could have been contracted to them [26]. Others realize the increasing competition and attempt to utilize this virtual on-demand workforce for their benefit. In particular, during the economic downturn, when reducing headcount across global delivery centers is seen as one of the obvious solutions to reduce

---

<sup>3</sup> <http://www.lionbridge.com/microsoft-crowdsourcing-case-study/>

<sup>4</sup> [http://researcher.ibm.com/researcher/view\\_project.php?id=3832](http://researcher.ibm.com/researcher/view_project.php?id=3832)

<sup>5</sup> <http://www.gequest.com/>

<sup>6</sup> <http://www.engadget.com/2013/02/07/google-mapathon-2013-india/>

costs, especially fixed costs, a possibility to tap into a global talent pool and employ required skills on demand creates an interesting proposition for established service providers.

While the expected economic benefits of this proposition are significant, it is not clear what effort is required from established IT service providers to be able to successfully leverage crowdsourcing. Kaganer et al. [26] suggest, for example, that the organizational challenges associated with the human cloud require new management models and skills from the contracting organization (the buyer). Putting this perspective into the outsourcing context, we argue that service providers interested in utilizing crowdsourcing will require additional skills and new management practices to successfully integrate crowdsourcing with internal delivery processes. However, existing research on vendor capabilities is based on the assumption that the vendor is delivering services using an internal workforce [15, 37], developing core capabilities that are at the heart of the vendor's value proposition [37]. So far, it is not clear whether or how the inclusion of crowdsourcing in the delivery model will affect the vendor's core capabilities. In this paper we aim to address this gap by studying the crowdsourcing phenomenon with a focus on the capabilities required for outsourcing vendors to successfully employ crowdsourcing in delivering services to their clients. We revise and expand the theory of vendor capabilities to include the case of the mediated outsourcing model where a vendor utilizes an on-demand external workforce via a crowdsourcing platform, which is the main theoretical contribution of our research.

## **2. Literature foundations**

### **2.1 Capabilities under traditional outsourcing models**

Outsourcing capabilities have been mainly studied from the client perspective [e.g., 19, 36, 42, 59], focusing on capabilities that clients need to develop in-house to ensure the successful outcomes of the outsourcing arrangement. The most frequently studied capabilities are the Business Process Management Capability and Supplier Management Capability [34]. The former refers to clients' ability to manage a business process themselves, before outsourcing it. This capability has been associated with greater

outsourcing success [e.g., 10, 53]. The latter implies clients' ability to manage outsourcing providers and encompasses capabilities such as contract management and relationship management [15, 20, 27, 48, 51, 52]. Client sourcing capabilities, which are required to ensure the successful delivery of services, are also referred to as "the retained organization" [44, 60].

In contrast, service providers' capabilities have received limited attention in the literature. The most influential work is by Levina and Ross [37] who studied large IT vendors<sup>7</sup> and distinguished between three types of operational capabilities (also referred to as "competences" [37]), that is, capabilities involved in the provision of a service or a product [24]:

- (i) *Client relationship management capability* involves routines and resources that align the vendor's practices and processes to the client's goals. More specifically, this capability is associated with the knowledge that a service provider must have of the client's business model and industry, as well as of the specifics of the client's operations.
- (ii) *Methodology development and dissemination capability* concerns task delivery routines and resources that accomplish software design, development, and execution. Six Sigma and the capability maturity model (CMM) are some of the better-known methodologies that aim to improve software development processes. This capability is important for introducing efficiencies in project delivery and operational improvements [37], as well as managing dispersed knowledge and expertise in a global vendor organization [43].
- (iii) *Personnel development capability* is related to recruitment, training, and mentoring practices; designing jobs that will expose individuals to a variety of tasks and enable them to broaden their skills; and developing performance appraisal and compensation systems.

Building on the previous work on complementarity in organizational design [e.g., 21] and core

---

<sup>7</sup> We use the terms "vendor" and "service provider" interchangeably. We acknowledge that, while practitioners prefer the latter term, in the academic literature, in particular IS outsourcing literature, the term "vendor" is commonly used.

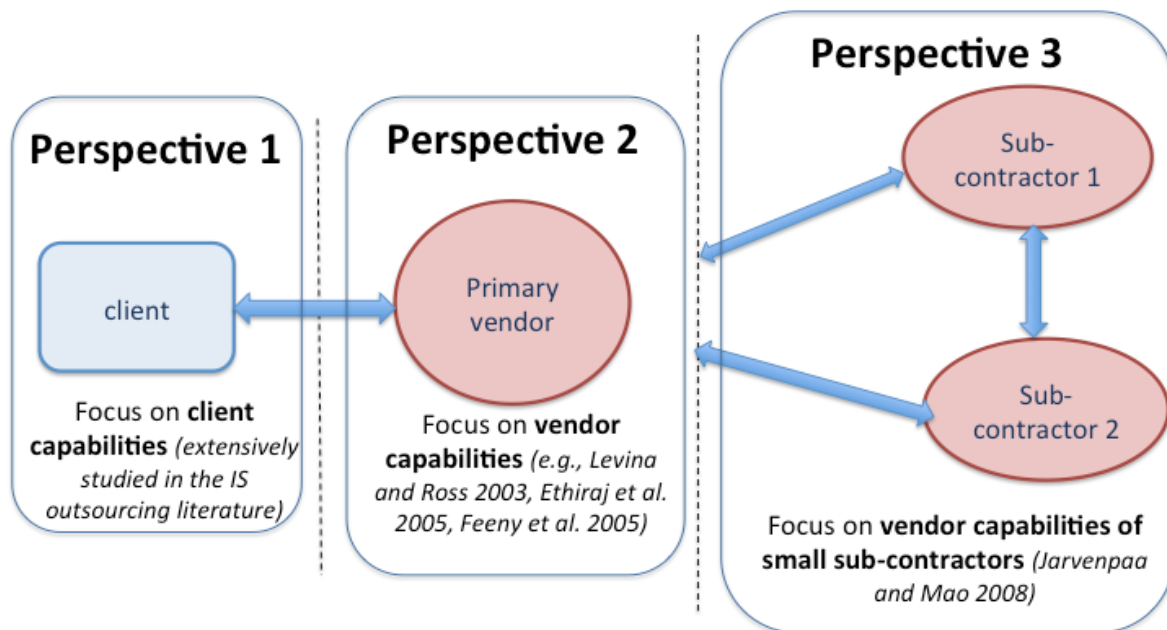
competencies of the Information Systems (IS) function [e.g., 58], Levina and Ross [37] argue that these three operational capabilities are mutually reinforcing and need to be simultaneously present in the vendor organization. In the offshoring context, Ethiraj et al. [13] found that higher levels of client relationship management and methodology development capabilities lead to higher levels of firm performance.

Complementary to these works is a more fine-grained view of vendor capabilities developed by Feeny et al. [14] who identified 12 capabilities that service providers could leverage into three competences, as seen through the eyes of the clients: delivery competency that reflects the supplier's ability to respond to the client's ongoing needs; transformation competency indicating the supplier's ability to deliver radically improved service in terms of quality and cost; and relationship competency reflecting the supplier's willingness and ability to align its business model to the values, goals, and needs of the client.

Among the few studies that focused on vendor capabilities, drawing on the work of Levina and Ross [37], Jarvenpaa and Mao [24] studied operational capabilities of subcontractors in a *mediated outsourcing model* [e.g., 13, 39, 49]. This model implies a mediating role by one (primary) service provider who is working directly with a client (end user/recipient of the service) as well as with other service providers supplying some services to the primary (or "middleman") vendor. Such an arrangement may take the form of subcontracting (when the primary service provider contracts a third party – one or more service providers [24]) or intermediation (brokering) such as legal services, moderating disparities between client and service provider, or staff augmentation by manpower agencies [39]. In the study of Jarvenpaa and Mao [24], the focus was on operational capabilities of small- and medium-sized Chinese firms who acted as subcontractors to a large IT vendor firm that was delivering services to the end-clients. Their study found a range of learning mechanisms that these subcontractors used, and demonstrated that the personnel development capability was most challenging in the mediated model, yet foundational for the development of the other capabilities [24].

Figure 1 illustrates the focus of extant research on outsourcing capabilities, highlighting the three perspectives discussed above: perspective 1 depicts research on client capabilities (most widely discussed

in the literature) in a client-vendor environment; perspective 2 depicts the focus of the few studies on the capabilities of large service providers providing services using their own resources; and perspective 3 illustrates a mediated outsourcing model and focuses on the capabilities of the *subcontractor*.



**Figure 1. Outsourcing literature on capabilities: various perspectives**

It is surprising that, despite the growing interest among outsourcing researchers to understand vendor capabilities and how they contribute to a vendor’s value proposition, these capabilities have been investigated primarily from the client-facing perspective (depicted as perspective 2 in Figure 1). These studies implicitly assume that vendor firms are using internal resources and do not take into account the involvement of sub-contractors or external resources that the primary vendor may use. Nevertheless, Jarvenpaa and Mao [24] highlighted the relevance of the mediated model to the outsourcing literature and the importance of understanding this mediated business model along with the relationship between the primary vendor, who is often a large IT service provider, and sub-contractors who are typically small service providers or software development firms. However, apart from their study that focused on the capabilities of the sub-contractors, this phenomenon of a mediated model has not been investigated. Our

research aims to contribute towards a better understanding of the mediated sourcing model by focusing on the primary vendor's perspective, which, to our knowledge, has not yet been addressed.

The gap we address in this paper goes beyond simply understanding the mediated outsourcing model from the vendor's perspective. We further integrate the new phenomenon of crowdsourcing into our model. Thus, we do not merely replicate the model used by Jarvenpaa and Mao, we augment this model by investigating a different type of sub-contractor, namely the crowd. In particular, our interest in this perspective was fueled by the increased competition in the IT outsourcing industry where small firms and individuals are starting to be recognized as the competitors of large IT service providers. This increasing competition is evident as new technology-enabled sourcing trends such as microsourcing<sup>8</sup> [16], impact sourcing<sup>9</sup> [17], and crowdsourcing [26] are becoming more popular. These sourcing models rely on a technological platform that enables service providers to reach many forms of virtual, on-demand workforces. Hence understanding the capabilities required to succeed in the crowdsourcing mediated model becomes an important competitive necessity. Along with growing competition, crowdsourcing also holds operational promises, such as the ability to assess the quality of work or skill of the individual before paying or contracting [54], which have sparked vendors' interest. It is, therefore, equally important to understand the capabilities required from organizations to realize such benefits.

Building on the above we thus focus, in this study, on the capabilities needed by the *primary service provider* in a mediated crowdsourcing-outsourcing model. Our main research question is: *What core capabilities are required for a large service provider to utilize crowdsourcing in service delivery?* Before exploring this perspective in more depth we move to discuss the concept of crowdsourcing and review

---

<sup>8</sup> Microsourcing relies on online marketplaces for sourcing customized products and services. Examples of such marketplaces include Freelancer.com, oDesk, Elance. This sourcing model is called *microsourcing* because it is suitable for only relatively small and well-defined tasks such as website design, software development to implement small product features, proofreading, or indexing. Client and vendor rely exclusively on online interactions and usually never meet face-to-face.

<sup>9</sup> Impact sourcing is a new sourcing model that is based on dividing work into small tasks ("micro-work") and sending it to centers in developing regions where employees complete it. It aims to promote economic growth in developing regions.

relevant literature.

## **2.2. Crowdsourcing**

Supported in large by the public Internet infrastructure, crowdsourcing is commonly conceptualized simply as outsourcing a task to the crowd in the form of an “open call” [1, 22]. Crowdsourcing can be explicit (e.g., completing a task directly assigned to you) or implicit (e.g., completing a task as part of another application) and can serve a range of purposes from building artifacts to solving conceptual problems [9]. Although crowdsourcing is not restricted to the Internet, the ability of technology in general, and the social web in particular, to reach and engage large crowds has fueled the growth of crowdsourcing in recent years [55].

Under the wide umbrella of the crowdsourcing phenomenon fall many different applications from crowd funding (e.g., Kiva.org), to knowledge contributions (e.g., Wikipedia), citizen science (e.g., NASA’s Stardust@home), microsourcing (e.g., Mechanical Turk), innovation communities (e.g., Dell’s IdeaStorm), and tournament-based crowdsourcing applications, which are the focus of this paper.

Platforms such as TopCoder in the software domain, Kaggle in the analytics domain, and InnoCentive for R&D all employ tournament-based crowdsourcing in which results are determined on a comparative basis, either as a one-time contest or a multi-stage tournament [41, 57]. Bullinger and Moeslein [4] provide a review of crowdsourcing tournaments and characterize this emerging field. They identify ten design elements of crowdsourcing competitions namely, the choice of media, the organizing body, specificity of the task, degree of elaboration of the required submission, the target group (crowd), eligibility of participants, contest period, reward/motivation, community functionality, and how submissions are evaluated. Organizations engaging in crowdsourcing thus need to consider all of these prior to launching their competition [4].

Delving deeper into some of these areas, research has identified the Internet as the key media facilitating crowdsourcing [1, 55]. Several studies focus on the crowd, its composition and motivation. Stieger et al.



[55], for example, argue that a smart crowd has to be diverse and independent, and has to have access to accurate information, and Erickson et al. [12] match crowdsourcing needs to crowd knowledge, value, and location. Crowd motivation has also been studied and ranges from making money to building reputation and demonstrating skills, to altruism and love of community [1, 3]. Afuah and Tucci [1] study when best to use crowdsourcing. They propose that crowdsourcing competitions should be used for problems that are easy to delineate and transmit and are modular, in cases where there is great distance between the focal organization's knowledge and the required solution and when the knowledge needed is tacit and complex. Terwiesch and Xu [57] in the context of open innovation<sup>10</sup>, focus further on the nature of the task and characterize it based on the expertise of the solver, any investment made by the solver, and some probabilistic component. The combination of these factors translates into three overarching types of projects with different managerial implications. In *expertise-based* projects performance is mainly driven by the solver's expertise, as is the case for many software development components. For example, through companies such as TopCoder and Kaggle expertise-based tasks such as programming and analytics can be crowdsourced. *Ideation* projects involve broad innovations problems in which solvers seek novel solutions. Finally, in *trial-and-error* projects solvers must experiment with many different solutions [57]. The investment required from solvers differs among these three types and, therefore, the design of the competition and reward offered to solvers should match the nature of the task [57].

The crowdsourcing context studied in this paper is software development, which includes components of all three types of crowdsourcing tasks characterized above and thus makes an interesting case to study. For example, software idea generation is an ideation-based crowdsourcing contest, programming is an expertise-based contest, and software testing is a trial-and-error contest<sup>11</sup>.

---

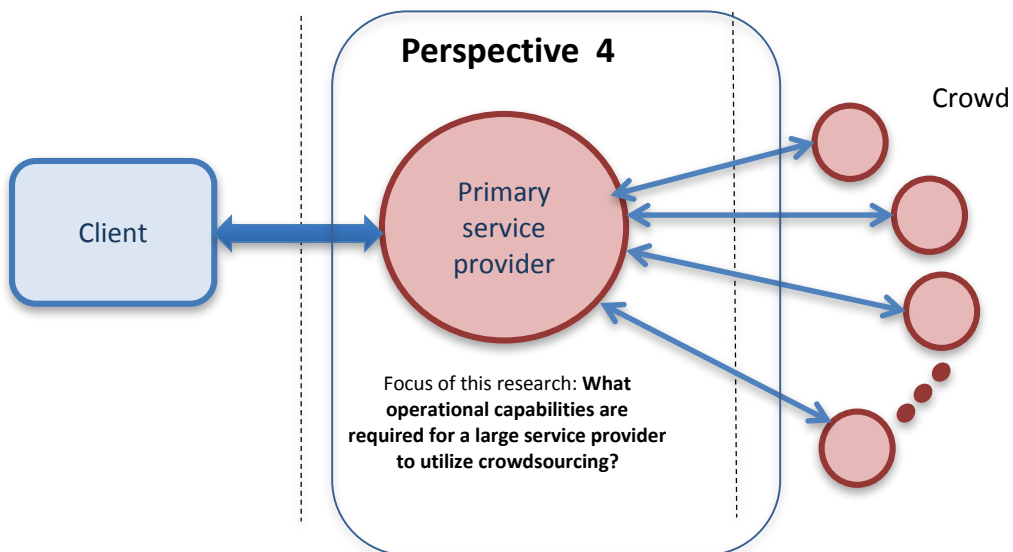
<sup>10</sup> Although open innovation (which implies that a firm is using external as well as internal sources of innovative opportunities [7]) and crowdsourcing are not the same, they are, nonetheless, related. On the one hand, crowdsourcing may be used, along with other approaches, to implement open innovation initiative in a firm. On the other hand, crowdsourcing could deliver different objectives, beyond open innovation. As such crowdsourcing and open innovation may share some attributes, as noted by several researchers [1, 55].

<sup>11</sup> We thank the anonymous reviewer for pointing this out.

As mentioned in the previous section we explore the capabilities needed from software service providers to manage projects, clients, and the crowd in a mediated outsourcing model. We expand on this perspective next.

### 3. A fourth perspective of outsourcing capabilities models

The perspective put forth in this paper is that of the vendor who operates in a mediated outsourcing model and uses the crowd as the subcontractor. This perspective is illustrated in Figure 2. Under such a scenario the primary service provider is essentially acting as a “client” when buying products or services through the crowdsourcing platform, and at the same time continuing to act as a “vendor” by integrating crowdsourced and internal deliverables into services, which are then delivered to a client firm. We thus capture this scenario as a fourth perspective (Figure 2): that of the *service provider* who is using the crowd as its subcontractors when delivering services to the client. In the previously studied mediated model (perspective 3 in Figure 1 above) this would be the primary service provider using the crowd instead of subcontractor organizations.



**Figure 2. The focus of this research**

Beyond the different point of view taken in perspective 4 compared with perspective 3, a key difference between these two perspectives lies in the nature of the third party that the primary vendor is using to sub-contract work. As discussed in the previous section, the characteristics of the crowd are different to those of the organizational sub-contractors, studied by Jarvenpaa and Mao [24] in perspective 3. Crowd attributes, motivation, composition, and various other factors may play a role in defining the capabilities needed to successfully sustain the relationship between the crowd and the primary service provider. Hence, to better understand both the vendor's point of view and the unique demands of working with the crowd we study perspective 4 in more depth in this paper. Our study involves a qualitative case study exploring vendor capabilities in the crowdsourcing model, as described next.

#### **4. Research methodology**

In line with past studies suggesting that case studies can be used to advance understanding of a particular phenomenon [e.g., 11, 35], we conducted an in-depth qualitative case study of the introduction of crowdsourcing into a service providing organization. To this end, we investigate a large technology service provider's venture into crowdsourcing and the lessons learned thus far. The focal organization is a large multinational technology firm that is one of the leading IT service providers (among the top ten worldwide). The study organization has tremendous outsourcing experience and a highly qualified workforce around the globe. Through focus groups with crowdsourcing leaders within the organization we explore what new capabilities are needed to effectively harness crowdsourcing contests when delivering services to the end-client.

##### **4.1 Crowdsourcing initiative: background**

This organization has extensive outsourcing experience providing services as a primary provider, and recently engaged in several crowdsourcing initiatives. Initial experimentation with crowdsourcing in this organization began internally, as the organization was looking for ways to procure short-cycle work without retaining new team members. The initiative was launched in February 2011. Consequently,

members of teams across the organization who had free time were encouraged to register for crowdsourcing work. Project managers first identified specific work that was sufficiently componentized and thus perceived as suitable for crowdsourcing. They then put this work out as an “open call” (internally referred to as an “event”) using an online platform and invited developers to compete on the event. In defining events project managers also defined the event’s scope, schedule, and compensation. After experiencing crowdsourcing internally, the organization expanded the crowdsourcing channel outside organizational boundaries, using a crowdsourcing platform to locate qualified developers for competitions. Similar to the earlier (internal) approach, events were created by project managers with a defined scope, schedule, and compensation, and made available for outside developers to compete on through the crowdsourcing platform. This external initiative was the one investigated through our focus groups.

## **4.2 Data collection**

To identify the major themes related to service provider capabilities under the crowdsourcing model we collected exploratory qualitative data from multiple focus groups. Focus groups are particularly useful when our knowledge of a phenomenon is limited [28], and the insights obtained from focus groups are based on consistent patterns of responses of carefully selected participants [47]. Focus groups are a common exploratory method in IS research [e.g., 23, 25, 45].

The focus group sessions took place approximately six months after the launch of the crowdsourcing initiative. Four broad and open-ended questions were created (shown in the next section) to develop a better understanding of new crowdsourcing capabilities. A total of five focus group discussions, ranging from six to 12 members each (48 individuals in total), were conducted via a combination of a teleconference and an online group support software. The majority of respondents were project managers (70%) or lead architects (16%) and the remaining participants were business analysts, delivery managers, developers, or IT specialists. Respondents were members of different project teams within the organization and were all involved with crowdsourcing planning and execution. Participants were

selected for this study to represent teams with high crowdsourcing success as well as teams with low success, as identified by the organization. This allowed for different perspectives on crowdsourcing capabilities.

Each focus group session lasted approximately 90 minutes. The discussion began with the facilitator (a senior executive in the organization) describing the first question to participants over the conference line as well as posting it on the virtual discussion board. This was followed by a 15-minute period in which each participant typed his or her response on the virtual discussion board. Each group member was able to see all other responses immediately, as they were typed by other focus group participants.

A valuable aspect of the focus group research method is its ability to leverage the interaction among participants to identify common reactions, experiences, and opinions on the focal topic [23]. Hence, the focus group sessions were designed to support such interactions in two ways. First, group members were able to comment on each other's inputs through discussion threads on the virtual board. The facilitator tracked responses as they were entered and allowed additional input time if needed. After all the responses were entered, the facilitator verified that the answers were meaningful and did not require further clarification, and that all comments from other group members were entered.

Second, once all responses and comments were inputted, the facilitator initiated a discussion over the conference phone line to elicit further comments and experiences. The facilitator typed these comments on the discussion board during the discussion and ensured that focus group participants reviewed and approved the discussion content. Upon completion of the follow-up discussion the next question was posted on the board followed by another 15-minute answer period, and so forth for a total of four questions.

The first author participated (passively) in the focus group discussions by observing the questions and answers but otherwise remaining uninvolved. As the questions and answers were all recorded digitally, it was not necessary to transcribe them prior to analysis.

### 4.3 Data analysis

The data analysis process followed several steps. First, the two researchers reviewed all comments and inputs by focus group participants to create a single file of all the comments from the five groups. Then the data was analyzed by both researchers independently using open-coding techniques [8]. Examples of codes assigned at this stage included “involve team”, which was used to code a comment made about getting team members involved in crowdsourcing events, and “low submissions”, which was used to code a comment made about the low number of submissions to crowdsourcing competitions. Each coder then reviewed the codes to ensure consistency and uniqueness. At the second stage, the two coders compared and discussed their coding of the comments until agreement was reached. Then the researchers jointly engaged in axial coding [8] which involved grouping codes that were perceived by the researchers as representing the same theme into categories. The data analysis was concluded when it had reached theoretical saturation, where no new analytical themes were emerging from the data [18]. In addition to the analysis, the coders also counted the frequency of each category’s appearance in the data to provide some insight on the relative importance of topics [e.g., 31].

While the open-coding stage was driven by the data, as statements were coded to reflect topics that emerged in the focus groups’ discussions, the axial coding stage was guided by the literature on vendor and client capabilities. During the latter stage, we reviewed themes that emerged from the data through the theoretical lens, but stayed open to identify new themes, beyond those discussed in the literature. We have included a detailed overview of the data analysis approach in Appendix A where we distinguish between literature-driven concepts and categories, and data-driven codes and themes (colored in light grey in the Appendix)<sup>12</sup>. As evidence regarding the required capabilities that emerged from the data, we

---

<sup>12</sup> In Appendix A we show how themes included in Tables 1 through 4 are grouped and linked to specific literature-driven categories. We have also included an explanation that provides our interpretation of each category. This explanation is rooted in the codes associated with each category. This explanation (interpretation) was used to formulate extensions to the client and vendor capabilities included in Figure 3. Therefore the link between the data and our extension of vendor capabilities could be traced from looking into *codes* (data in Tables 1 through 4) -> to *categories* (analysis in Appendix A) -> to discussion of *findings* (Table 5) -> to *results* (theorizing, Figure 3).

turned back to the literature to deepen our understanding of client and vendor capabilities (in line with the principle of dialogical reasoning suggested by Klein and Myers [29]). This allowed us to revise and extend these capabilities to capture new primary vendor capabilities for a mediated outsourcing model in which a primary vendor is aiming to utilize crowdsourcing in service delivery.

In the next section we present our findings from the focus groups following the sequence of questions that were discussed by the groups. We then move to present and discuss our analysis through the lens of the primary vendor’s capabilities.

## 5. Findings: Insights from focus groups

### *Question 1: What tasks are best suited for crowdsourcing competitions?*

The first question presented to focus groups members focused on task definition, which is the foundation of crowdsourcing events. Because crowdsourcing is commonly associated with labor-intensive tasks, and to a lesser extent with expertise-related tasks, we felt it important to understand the nature of tasks that crowd-management capabilities should focus on. Our analysis reveals that responses from participants focused on two aspects of the task: *type* and *characteristics*. In terms of type, the most common answer was that development tasks are best suited for crowdsourcing (in line with Terwiesch and Xu’s [57] identification of expertise-based tasks as suitable for tournament-based crowdsourcing), followed by documentation and labor-intensive tasks (such as bug fixes), and finally idea generation. Hence, our evidence shows that the crowd is viewed as capable of handling tasks that require specialized expertise. Having said that, four specific task characteristics emerged as important: the task has to be a stand-alone task, off the critical path, well defined, and not requiring domain knowledge. Table 1 provides a summary of the answers given to this question and supporting quotes.

**Table 1. Best software development tasks for crowdsourcing**

<i>Themes</i>	<i>Codes (frequency, out of 48 participants)</i>	<i>Exemplary quotes</i>
Task	Stand-alone task	“Stand-alone components that have simple interface with the rest

characteristics	(25 participants)	of the application”; “Work for parts of the application which can be easily isolated from the rest of the application”
	Clear definition (14 participants)	“You need well-defined specs, with a well-defined spec you can achieve successful development”; “I agree! Clear and well-defined specs are the key to any event!”
	Non-critical path (8 participants)	“Low priority ‘nice to have’ requirements that are not on the project critical path”; “work that is not critical”
	No domain knowledge needed (7 participants)	“Those sub-components that require little or no business domain knowledge”; “Tasks where no business knowledge is required to accomplish it”
Task type	Development (programming) (17 participants)	“New development which is not tightly coupled with existing functionality”; “competitions are best suited for component development and assembly of components”
	Labor intensive (e.g., bug fixes, documentation) (10 participants)	“Labor-intensive work which is relatively simple to execute requiring basic skills”; “manual tasks which take up developer’s time”
	Idea generation (2 participants)	“Idea generation – how would you address this problem”

***Question 2: What are the best practices observed thus far?***

The key themes emerging in this question were around proper management and planning of the crowdsourcing initiative. The first theme focused on the need for a team effort in making competitions successful. All team members need to be involved and dedicated roles should be assigned for competition management. The second theme dealt with detailed practices around running events and competitions. Reuse emerged as important, with focus group respondents highlighting the benefits of reusing specifications and collectively managing and planning events. In addition, proper scheduling and tracking were identified as important, underscoring the external nature of crowdsourcing. The third theme focused on managing external crowdsourcing players (specific individuals from the “crowd”), reusing players where possible, and ensuring that proper support is provided.

**Table 2. Best practices for software development crowdsourcing**

<i>Themes</i>	<i>Codes</i>	<i>Exemplary quotes</i>
---------------	--------------	-------------------------



	<i>(frequency)</i>	
Team management	Involve team (11 participants)	“We are getting more team members involved to help manage their own events, which spreads out the effort across a larger group of people”; “We have a weekly meeting as a team to discuss what’s worked, what hasn’t and what’s coming up”
	Dedicated staff/manager (8 participants)	“Getting someone to create and manage the events”; “Have dedicated team members to support and manage competitions for a project”
Competition management	Collective management (7 participants)	“When preparing for a ‘series’ of events, we prepare all the event documentation at one time so we don’t repeat that same action over and over again”; “Create a month’s worth of competitions at once. Players get more involved when they see a long stream of continuous employment”
	Reuse (specifications) (10 participants)	“Reuse specifications from previous successful competitions as a baseline when creating new competitions”; “Reusable templates for specifications allow team members to write specifications more quickly”
	Scheduling (9 participants)	“When scheduling events, leave ‘white space’ between the end of one competition and the beginning of the next to account for delays in completion/final fix”; “Strong emphasis on intelligent scheduling of contest deliverables to assure success and avoid penalties”
	Track progress/status (9 participants)	“Centralized tracking makes it easier to see overall progress, and then actions could be taken afterwards”; “In order to improve the successful completion of events, I check on the status of each event daily so that my team does not miss any phase deadlines”
	Good specifications (8 participants)	“Specification document should be very clear and expected output should be clearly mentioned”; “Quality of the specification is key”
Players’ management	Reuse (players) (3 participants)	“Nurture relationships with players. Create a pool of return players. Notify them in advance of upcoming work”
	Communications & support (4 participants)	“Communicating with the players and answering most of queries”
	Encourage participation (3 participants)	“Give a catchy headline for the requirement which will attract the audience”

***Question 3: What are the key challenges you have had to overcome?***

Three themes emerged when challenges to crowdsourcing were discussed. The majority of respondents brought up the resource constraint, highlighting the cost and time-consuming nature of setting up and managing events. An important challenge concerned the fit of crowdsourcing with existing

methodologies, in particular agile [cf. 5], and with existing applications. Specifically, the fast-paced nature of agile was seen as critically mismatched against the careful planning requirements of crowdsourcing. Finally, a “state of the practice” theme emerged when the focus groups discussed the quality and availability of skills and of resulting submissions.

**Table 3. Challenges**

<i>Themes</i>	<i>Codes (frequency)</i>	<i>Exemplary quotes</i>
Resources	Cost & Time (18 participants)	“Creating sufficient technical documentation to describe the problem and solution can often take more time than actually doing the work itself”; “Crowdsourcing is not cheap, there are fixed costs and then there is the cost of your architect to build and answer questions and the developers who have to put the pieces together. Our customers are experiencing severe budget cuts. The combination is not pleasant”
Fit	Fit with methodologies (8 participants)	“As the client gets used to the Agile lifecycle, it’s hard to define complete stories in advance”; “Completion of events in Agile iterations is not achievable”
	Fit with applications (10 participants)	“Existing applications are difficult to decompose to remove dependencies and focus on a specific problem”; “Enterprise applications are not a good fit due to licensing agreements, the tightly coupled transport system for moving code from development to test, the expense to the clients of having two development and test environments”
Submissions	Quality of submissions (8 participants)	“Some of our winning submissions have been just marginally acceptable”; “Receiving solutions that are not acceptable”
	Skill availability (4 participants)	“Technical skills not available in the market”
	Number of submissions (7 participants)	“Competitions launched which [require] rare skills don’t get many submissions and tend to fail”; “You can expend a lot of time and money and get no responses”

***Question 4: What changes are recommended going forward?***

The final question asked focus group participants to reflect on how they would change existing work practices to better fit crowdsourcing. Here, convergence on three specific themes reflected many of the challenges and suggestions highlighted in previous responses. Focus group participants raised three important change categories that could improve the crowdsourcing experience: design for crowdsourcing,

plan for crowdsourcing, and stakeholder buy-in.

**Table 4. Suggested changes for how to better fit crowdsourcing**

<i>Themes</i>	<i>Codes (frequency)</i>	<i>Exemplary quotes</i>
Design for crowdsourcing	Componentization (8 participants)	“During design -- look to compartmentalize your code better”; “Try to make new applications more modular”; “Develop a component model in concept phase, plan to develop some components using competitions as part of project very early in the cycle”
	Integration into lifecycle (6 participants)	“Bring crowdsourcing into the lifecycle earlier -- see where it will be able to fit in”; “Include in the requirements evaluation and internal design process a step to break out anything that could be done via crowdsourcing channel. This needs to become a regular step in our development process now”; “The crowdsourcing outcome should be easily integrated into the existing application”
Plan for crowdsourcing	Project (12 participants)	“When planning project and costs -- need to estimate in the cost of crowdsourcing to overall project costs”; “Recognize event managing as a specific skill and role when planning”; “Ensure that the budgets allow for the cost of crowdsourcing”
	Competition (7 participants)	“Allow additional time between the end of a ‘parent’ competition and the start of any ‘child’ competitions to allow for delays”; “Plan the event well in advance so that we have sufficient time to use the outcome in project”
Stakeholders buy-in	Customers (6 participants)	“Ensure customer buy-in”; “Get the client buy in early in the process so they don’t have any surprises”; “Get more customer buy-in so they don’t push back when they hear you are doing crowdsourcing”
	Team (3 participants)	“Ensure the teams which will support the systems after it is deployed are involved in the process to ensure a smooth knowledge transfer”; “Share the crowdsourcing vision to team”; “Get more buy-in from the existing team”

We have thus far discussed our insights obtained from the focus groups and characterized the crowdsourcing phenomenon and its implications to software service providers. We identified key themes in the responses for each question and provided supporting quotes and frequencies of occurrence. In the following section we discuss these findings using the foundations introduced earlier from the literature on vendor capabilities under traditional and mediated sourcing models, and client capabilities. We compare our findings with those of previous studies and identify the new capabilities emerging in the mediated

outsourcing model that aims to utilize crowdsourcing.

## 6. Analysis and discussion of findings

We have compared themes that emerged from the focus groups with client and vendor capabilities identified in the outsourcing literature (as discussed earlier in the paper). In Table 5 we show outsourcing capabilities identified in the literature through the lens of our particular case of a large service provider attempting to utilize crowdsourcing in service delivery. This is followed by a broader view discussion of the implications for capabilities required for a primary service provider that aims to utilize crowdsourcing when delivering services to the clients.

**Table 5. New capabilities for service providers using crowdsourcing**

<i>Capabilities under traditional models (as identified in the literature)</i>	<i>Capabilities in a crowdsourcing model</i>
<p>Client relationship management capability [2, 13, 24, 30, 37, 46]</p> <ul style="list-style-type: none"> <li>• Routines, resources and knowledge that a service provider must have of the client’s business model and industry, as well as of the specifics of the client’s operations</li> </ul>	<p>This capability is expanded when the service provider is using crowdsourcing, as the client specific knowledge must trickle down to the crowd.</p> <p>The service provider is now responsible for ensuring that crowdsourcing players (who participate in competitions) have two layers of client-related knowledge in the domains that the crowd is responsible for:</p> <ol style="list-style-type: none"> <li>1. Knowledge of the end-client and their needs.</li> <li>2. Knowledge of the service provider organization and the project as a whole.</li> </ol> <p>The first layer implies that the crowd, acting as a subcontractor, may still need some knowledge about the end-client organization. However not having direct contact with the end-client, crowd members are not likely to acquire this knowledge. Therefore it will become the responsibility of the primary vendor to convert client-specific knowledge into specifications and deliverables for crowdsourcing events.</p> <p>The second layer reflects the fact that the work is split between the primary service provider and the crowd. Therefore, crowd members who see the primary vendor as their end-client now require “vendor-specific” skills. It is the responsibility of the primary service provider to ensure that such knowledge exists within the crowd or, alternatively, to select crowdsourcing events that do not require vendor-specific knowledge.</p>
<p>Methodology development and dissemination capability [2, 13,</p>	<p>The nested nature of crowdsourcing work, which presents a project within a project, requires fit between internal and crowdsourced components of the work. Hence the vendor’s service delivery</p>

<p>24, 30, 37, 40, 43, 46, 56]</p> <ul style="list-style-type: none"> <li>Task delivery routines, resources and methodologies that help to accomplish software design, development and execution, and help to improve efficiency and operational improvements</li> </ul>	<p>methodology needs to ensure such fit.</p> <p>The methodology development and dissemination capability of the service provider needs to be extended to include crowdsourcing projects. In practice, this means that crowd members should be able either to use the vendor’s methodologies and processes, or to be able to plug their deliverable into the vendor’s processes. Practices that constitute this capability include several adjustments in the service delivery methodology, such as:</p> <ol style="list-style-type: none"> <li>The proper technology infrastructure is made available to crowdsourcing players. (Or there is a clear interface between the crowdsourcing platform and vendor’s internal infrastructure.)</li> <li>Careful planning for crowdsourcing to ensure that resources and schedules for crowdsourcing deliverables are appropriate and fitting with schedules in delivering services to end-customer.</li> <li>Methods used to design how services are delivered to end-customer are adjusted to take crowdsourcing into account (to ensure that work is componentized [32] and suitable for crowdsourcing).</li> <li>Fit exists between internal methodologies and routines embedded in the crowdsourcing platform to ensure limited friction at the interface between internal and crowdsourced work.</li> </ol>
<p>Personnel development capability [2, 24, 30, 37, 40]</p> <ul style="list-style-type: none"> <li>Recruitment, training, and mentoring practices; designing jobs that will expose individuals to a variety of tasks and thus enable them to broaden their skills; and developing performance appraisal and compensation systems</li> </ul>	<p>Though the original personnel development capability introduced by Levina and Ross [37] referred to the internal staff within the vendor organization, when a service provider employs the crowd this capability should be extended to external personnel (that is, the “crowd”).</p> <p>In particular, the service provider should be able to locate and manage crowd members who are of value to the organization (i.e., individuals that have unique skills that the service provider wants to utilize in the future) and be able to:</p> <ol style="list-style-type: none"> <li>Properly match tasks to skills, especially when specialized expertise is concerned.</li> <li>Ensure that the crowd skills complement, rather than interfere with, internal skills.</li> <li>Broaden these skills to accommodate a better fit with the context in which the service provider operates.</li> <li>Motivate skilled crowd members to remain loyal to the service provider and continue bidding for new crowdsourcing work.</li> </ol>
<p>Supplier management capability [15, 20, 27, 48, 51, 52]</p> <ul style="list-style-type: none"> <li>A <i>client’s</i> ability to manage outsourcing providers. This encompasses capabilities such as contract management and relationship management</li> </ul>	<p>Using the crowd as subcontractors puts a primary service provider in the position of a “client” who needs to manage their suppliers. Thus the notion of “supplier management capabilities” introduced in the outsourcing literature also applies to service providers who engage in crowdsourcing, in particular:</p> <ol style="list-style-type: none"> <li>Internal team members need to be able to accommodate crowdsourcing delays and problems. Thus, team members’ involvement in all stages of the crowdsourcing lifecycle is crucial to facilitate workflow.</li> <li>The crowd represents a new stakeholder group that the service</li> </ol>

	provider needs to manage. The service provider needs to invest in building relationships with individuals from the crowd and find ways to reuse players as possible.
Architectural capability [50, 60] <ul style="list-style-type: none"> <li>• A <i>client's</i> architectural and design knowledge of the service</li> </ul>	In the crowdsourced model this capability requires the service provider organization to componentize work so that it can be effectively and seamlessly crowdsourced. Furthermore, interfaces and procedures should be in place to ensure easy integration of crowd deliverables with deliverables of the internal team.

Overall, the combination of capabilities discussed in Table 5 would enable a primary vendor to manage the three stakeholder groups that play an important role in crowdsourced projects:

1. *The client* who is ultimately the most important stakeholder, with client buy-in needed to ensure their satisfaction. Not all clients that contract a specific organization may agree to have (parts of) their work crowdsourced.
2. *Internal team members* who need to design, facilitate and manage crowdsourced work, as well as integrate crowdsourced deliverable into the services delivered to the end-client.
3. *The crowd* who needs to have appropriate support (e.g., infrastructure) from the primary service provider, and feel motivated to respond to crowdsourcing calls.

Vendor capabilities identified and studied in earlier literature [e.g., 13, 24, 37] need to be adjusted in the crowdsourcing model to reflect the need for the primary service provider to manage the crowd. Because the crowd is not a typical subcontractor, the responsibility to deliver to client expectations and, consequently, the burden of the ongoing management of service delivery (for both primary vendor as well as the crowd) falls on the vendor organization. This means that the primary vendor is responsible for communicating relevant client-related knowledge to the crowd, as well as coordinating the process to seamlessly integrate crowdsourced work.

Our table above discusses how the three formerly identified vendor capabilities of (1) client-specific capability, (2) methodology development and dissemination capability, and (3) personnel development capability, need to be adjusted to fit the crowdsourcing model. Specifically, the primary vendor now

needs to open its infrastructure to crowdsourcing players, to incorporate crowdsourcing in the design and planning of projects, and to ensure fit between internal development methodologies and those supported by the crowdsourcing platform. Furthermore, the personnel development capability needs to be extended to include external individuals from the crowd and to nurture their unique skills and motivate them to engage in future crowdsourcing work. Because crowdsourcing may be more challenging to execute when specialized expertise is required of crowd members, the service provider needs to develop capabilities for accurately identifying and communicating (i.e., clearly specifying) needed expertise. The service provider also needs to select crowd players with “vendor-specific” skills, so that both the crowd and the primary vendor can understand each other in a similar way as a primary vendor can understand the end-client.

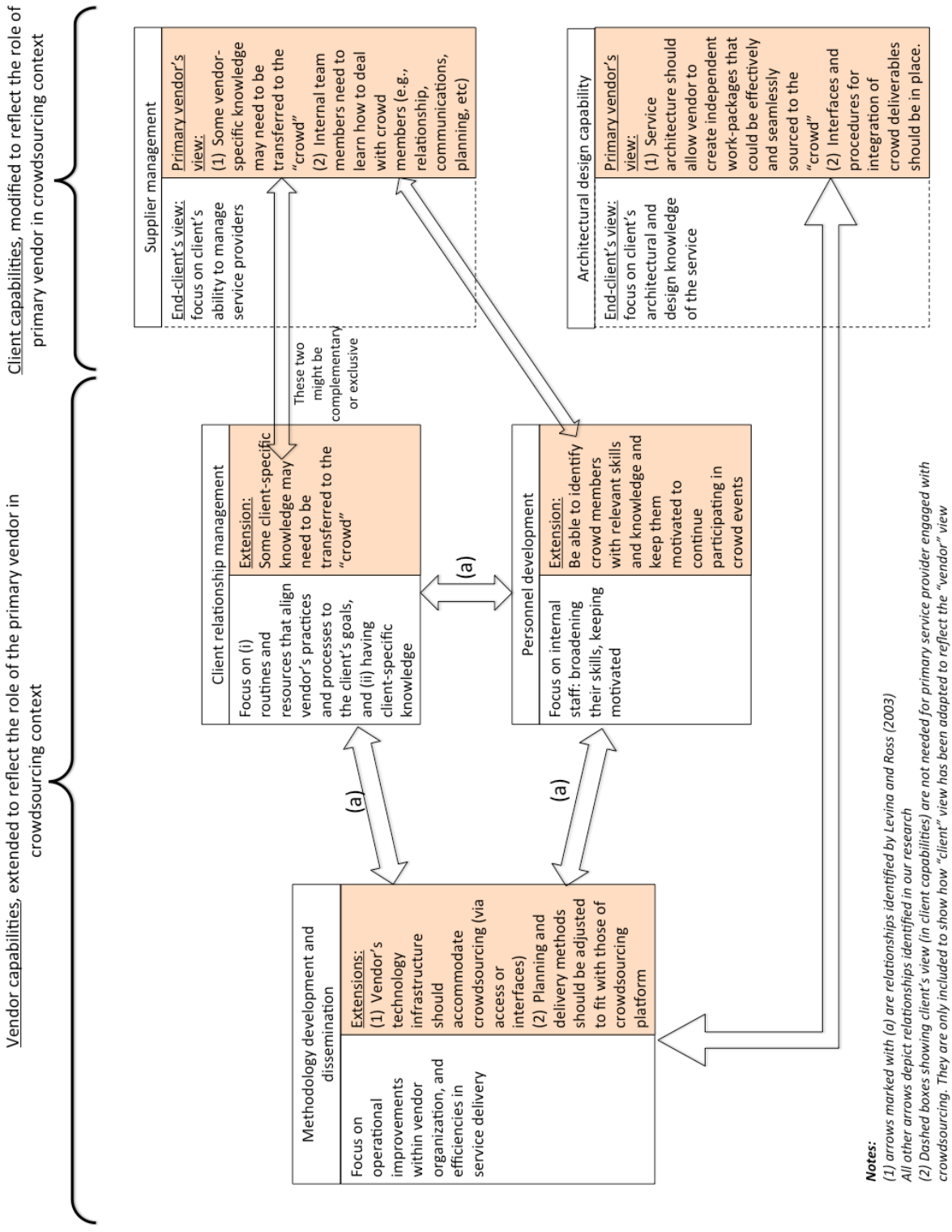
Beyond the above capabilities, a primary service provider needs to adopt capabilities traditionally associated with a client in prior literature, in order to accommodate the service provider’s new role as a “client” of the crowdsourcing market. However, these capabilities take a slightly different shape when considered from a primary vendor’s perspective. In particular *supplier management capabilities* which encompass contract management, relationship management, and vendor development [14, 61] are imperative for the primary vendor’s success in the crowdsourced model. These capabilities are particularly important if the primary vendor wishes to develop longer-term relationships with successful crowd players. In addition, similar to the above “process management capabilities”, the primary service provider needs to have strong *architectural and design knowledge* [60] to be able to componentize work so that it can be easily crowdsourced.

In Figure 3 below we summarize our findings and the above discussion in the form that depicts the two relationships that the primary service provider is engaged in, in the mediated outsourcing model. On the one hand, in the relationship between the primary service provider and the crowd, the vendor acts as a “client” of the crowd, thus requires capabilities that reflect a client’s behavior in a “client-vendor” (or rather “client-crowd”) relationship. On the other hand, in the relationship between the primary service provider and the end-client, the service provider assumes the “vendor” role and therefore requires vendor

capabilities. However, the need to simultaneously assume two roles (client, when dealing with the crowd, and vendor, when facing the end-client), as well as the need to deal with the “crowd” which is a unique type of subcontractor, requires the primary service provider to *extend* and/or *modify* prior vendor and client capabilities, as identified in the literature in the context of the traditional client-vendor relationship. In Figure 3 we distinguish between capabilities identified in prior research and extended or modified capabilities required for the primary service provider to utilize crowdsourcing in service delivery. The framework depicted in this figure describes the capabilities of a primary service provider in a mediated outsourcing model that utilizes crowdsourcing.

Building further on the work of Levina and Ross [37] who argue that the three operational vendor capabilities are mutually reinforcing and need to be simultaneously present in the vendor organization, in the extended framework developed in this research we identified links between new vendor capabilities (we refer to them as “extensions” to the previously identified vendor capabilities, which are required for managing crowdsourced work), and new capabilities that reflect the “client” behavior of the primary service provider towards the crowd. In particular, the need to develop inter-personal and team-management skills within the internal vendor team (which is part of the supplier management capability) is mutually reinforcing with the need to identify talented crowd members and keep them motivated to participate in crowd events (which is part of personnel development capability). Furthermore, architectural design capability and methodology development and dissemination are reinforcing each other, as design self-contained work packages [33] require adjustment in software development and project management methodologies.





**Notes:**  
 (1) arrows marked with (a) are relationships identified by Levina and Ross (2003)  
 All other arrows depict relationships identified in our research  
 (2) Dashed boxes showing client's view (in client capabilities) are not needed for primary service provider engaged with crowdsourcing. They are only included to show how "client" view has been adapted to reflect the "vendor" view

**Figure 3. Capabilities of a primary service provider in a mediated outsourcing model that utilizes crowdsourcing**

## **7. Conclusion and future research**

This paper explored the crowdsourcing phenomenon as a new sourcing model for software projects and the capabilities required from service providers engaging in crowdsourcing. Unlike prior studies on vendor capabilities, the focus of this paper was on the “primary vendor” but in a unique environment, which includes not only the client but also the crowd. There are several interesting lessons learned from the crowdsourcing case explored in this paper. First, the fact that the crowd is not working directly with the end-customer, but through the mediation of the primary service provider, resulted in a nested model in which the primary service provider needs to combine client capabilities for dealing with the crowd with vendor capabilities for dealing with the end-client.

Furthermore, the service provider discovered that setting up and managing crowdsourcing competitions required significant effort in terms of the amount of internal resources and their time. Poorly planned competitions (e.g., if not enough preparatory work was done internally to select and/or specify the task advertised as an event for a crowdsourcing competition) did not get enough quality bids, which meant wasted time for the organization.

Last but not least, because crowdsourcing is limiting potential buyers and the participating crowd to online interactions, the processes enabling and supporting the crowdsourcing lifecycle need to suit the tasks (“open calls”) advertised to the crowd, which further limits the type of tasks that can be crowdsourced. This means that tasks that require some degree of flexibility or involve fuzzy requirements are not suitable for crowdsourcing. One of the problems that the service provider in our study faced was related to lack of fit between internal methodologies and processes, and agile software development practices with processes supported by the online crowdsourcing platform. In addition, the lack of flexibility of the crowdsourcing processes embedded in the platform reduced opportunities for the primary service provider to benefit from crowdsourcing. Future research can further explore fit between crowdsourcing and existing work processes and methodology, as well as the organizational settings most suited for successful crowdsourcing initiatives.

Another very interesting direction for future research that has emerged from this work concerns the uncertainty that is introduced by the nature of dealing with the crowd. Participants in our focus groups discussed uncertainty around things such as the skills available within the crowd, the number of submissions, and their quality and timing. This problem brings up an interesting trade-off that merits further attention in studying the crowdsourcing phenomena. On the one hand, the appeal of crowdsourcing is that it harnesses the “wisdom of the crowd” and opens the organization to new skills not always available within. On the other hand, the crowd is largely unknown. In a software development project where “on time and on budget” are key performance indicators it is not clear that the organization can bear such a degree of uncertainty. Focus group members in our study mentioned problems that arise when the submissions at the end of a specific crowdsourcing competition do not deliver what was expected, which ultimately delay the project as a whole.

Looking at how organizations can address this problem, our focus group participants mentioned establishing relationships with strong crowd players and reusing players between competitions. While this helps alleviate the uncertainty problem it also potentially reduces the crowd to subcontractors and possibly eradicates some of the benefits expected from the crowdsourcing model. There are definitely many unanswered questions as to how organizations should deal with the uncertainty inherent in crowdsourced work and future research should explore this topic in more depth.

Our paper makes two important contributions to the IT outsourcing literature. We (i) explore the phenomena of crowdsourcing that is increasingly becoming a popular sourcing model in the eyes of service provider organizations, and (ii) revise existing theoretical frameworks on vendor and client capabilities to develop a framework of new vendor capabilities for crowdsourcing in a mediated outsourcing model. This paper also has practical relevance, in particular for organizations that are experimenting with, or considering, crowdsourcing. Findings from the focus groups reported in this paper can be used as a guide for setting up and managing crowdsourcing initiatives.

## Appendix A – Data analysis approach

Concepts	Vendor capability			Client capability					
Categories (literature-driven)	Methodology development & dissemination			Personnel development	Client relationship mgmt		Architectural design		Supplier mgmt
Themes (data-driven)	Codes (data from focus groups)	Explanation							
Resources	Cost & Time	Time spent on planning and management of crowdsourcing events and other resources should be incorporated in the methodology and costed accordingly							
Fit*	Fit with methodologies	Development methodology (e.g. agile) should be adjusted to fit with crowdsourcing platform							
Design for crowdsourcing*	Integration into lifecycle	Crowdsourcing should be integrated in the service delivery lifecycle							
Plan for crowdsourcing	Project; Competition	Planning costs and required skills should be explicitly recognized. Planning should accommodate interdependencies between crowdsourcing competitions.							
Competition mgmt	Collective management; Reuse (specifications); Track progress/status; Good specifications	Planning methods should consider long-term vision for crowdsourcing and apply project management methods							
Team management	Involve team; Dedicated staff/manager	Planning methods should include allocating dedicated team to manage crowdsourcing							
Players mgmt	Reuse (players); Encourage participation	Identify crowd players with relevant skills and knowledge and keep them motivated							
Stakeholder buy-in*	Client	Ensure that client is aware (and has no objections) about the use of crowdsourcing in service delivery							
Task characteristics*	Clear definition**; No domain knowledge needed	Specifications should capture in-detail client knowledge, to make requirements clear for crowd players. Alternatively, tasks that do not require domain knowledge can be considered for crowdsourcing							
Task characteristics*	Stand-alone tasks; Non-critical path	Design principles for service architecture should take into account these task characteristics, to make them suitable for crowdsourcing							
Task type	Development; Labor intensive	Design principles should consider such tasks to be independent, so that they could be crowdsourced							
Design for crowdsourcing*	Componentization	Modularity and componentisation should be part of design principles, to allow creating of independent work-packages							
Fit*	Fit with applications	Service architecture should allow vendor to create independent work-packages that could be crowdsourced							
Stakeholder buy-in*	Team	Share crowdsourcing vision with internal team. Educate the team how to deal with crowd members							
Task characteristics*	Clear definition**	Specifications should capture relevant vendor knowledge, to make requirements clear for crowd players.							

\* different codes under this data-driven themes were linked to different literature-driven category. For example, "fit with methodologies" code under "fit" category is linked to "methodology development and dissemination"; and "fit with applications" code under the same "fit" category is linked to "architectural design"

\*\* "clear definition" code is linked to "client relationship management" and also "supplier management" categories because it reflects the relevance of the client-specific knowledge (in the former case) and supplier-specific knowledge (in the latter case)

Note: several codes included in Tables 1-4 are not included in this appendix because they were not identified as linked to any vendor or client capabilities. It is specifically relevant to codes that describe characteristics of task suitable for crowdsourcing. These codes were created during the first stage of data analysis as they helped us to understand better the nature of crowdsourcing in the vendor organization. However they were not used at the later stage as they did not reflect any "capability".

## 9. References

- [1] A. Afuah and C.L. Tucci, Crowdsourcing As a Solution to Distant Search, *Academy of Management Review*. 37 (2012) 355-375.
- [2] S.S. Bharadwaj and K.B.C. Saxena, Building Winning Relationships in Business Process Outsourcing Services, *Industrial Management & Data Systems*. 109 (2009) 993-1011.
- [3] D.C. Brabham, Moving the crowd at threadless, *Information, Communication & Society* 13 (2010) 1122-1145.
- [4] A.C. Bullinger and K. Moeslein, Innovation Contests - Where are we? *Proceedings of Americas Conference on Information Systems*. 2010.
- [5] L. Cao, K. Mohan, P. Xu, and B. Ramesh, A framework for adapting agile development methodologies, *European Journal of Information Systems*. 18 (2009) 332-343
- [6] E. Carmel, Building Your Information Systems from the Other Side of the World: How Infosys Manages Time Zone Differences, *MIS Quarterly Executive*. 5 (2006) 43-53.
- [7] H.W. Chesbrough, The era of open innovation, *MIT Sloan Management Review*. 44 (2003) 35-41.
- [8] J.M. Corbin and A.L. Strauss, *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 3rd ed Thousand Oaks, CA, 2008.
- [9] A. Doan, R. Ramakrishnan, and A.Y. Halevi, Crowdsourcing systems on the World-Wide Web, *Communications of the ACM*. 54 (2011) 86-96.
- [10] C. Duan, V. Grover, and N. Balakrishnan, Business Process Outsourcing: An event study on the nature of processes and firm valuation *European Journal of Information Systems*. 18 (2009) 442-457.
- [11] K.M. Eisenhardt, Building Theories from Case Study Research, *Academy of Management Review*. 14 (1989) 532-550.
- [12] L. Erickson, I. Petrick, and E. Trauth, Hanging with the right crowd: Matching crowdsourcing need to crowd characteristics. *Proceedings of Americas Conference on Information Systems*. 2012.
- [13] S.K. Ethiraj, P. Kale, M.S. Krishnan, and J.V. Singh, Where do capabilities come from and how do they matter? A study in the software services industry, *Strategic Management Journal*. 26 (2005) 25-45.
- [14] D. Feeny, M. Lacity, and L.P. Willcocks, Taking the Measure of Outsourcing Providers, *MIT Sloan Management Review*. 46 (2005) 41-48.
- [15] D. Feeny and L. Willcocks, Core IS Capabilities For Exploiting IT *Sloan Management Review*. 39 (1998) 9-21.
- [16] D. Gefen and E. Carmel, Is the World Really Flat? A Look at Offshoring at an Online Programming Marketplace, *MIS Quarterly*. 32 (2008) 367-384.
- [17] F. Gino and B.R. Staats, The Microwork Solution, *Harvard Business Review*. December (2012) 92-96.
- [18] B.G. Glaser and A.L. Strauss, *The discovery of grounded theory : Strategies for ualitative research* Chicago, 1967.

- [19] T. Goles, Capabilities for Information Systems Outsourcing Success: Insights from the Resource-Based View of the Firm, R. Hirschheim, A. Heinzl, and J. Dibbern (Eds.) 2006. Springer-Verlag, Berlin. p. 347-378.
- [20] J. Goo and C.D. Huang, Facilitating relational governance through service level agreements in IT outsourcing: An application of the commitment–trust theory, *Decision Support Systems*. 46 (2008) 216-232.
- [21] L.M. Hitt and E. Brynjolfsson, Information Technology and Internal Firm Organization: An Exploratory Analysis, *Journal of Management Information Systems Management*. 14 (1997) 81-101.
- [22] J. Howe, *Crowdsourcing: How the Power of the Crowd Is Driving the Future of Business* London, 2008.
- [23] S.L. Jarvenpaa and K.R. Lang, Managing the Paradoxes of Mobile Technology, *Information Systems Management* 22 (2005) 7-23.
- [24] S.L. Jarvenpaa and J.Y. Mao, Operational capabilities development in mediated offshore software services models, *Journal of Information Technology*. 23 (2008) 3-17.
- [25] K.D. Joshi and K.M. Kuhn, What it takes to succeed in information technology consulting: Exploring the gender typing of critical attributes, *Information Technology & People*. 20 (2007) 400-424.
- [26] E. Kaganer, E. Carmel, R. Hirschheim, and T. Olsen, Managing the Human Cloud, *MIT Sloan Management Review*. 54 (2012) 23-32.
- [27] R. Kishore, H.R. Rao, K. Nam, S. Rajagopalan, and A. Chaudhury, A relationship perspective on IT outsourcing, *Communications of the ACM*. 46 (2003) 86-92.
- [28] T. Klaus and J.E. Blanton, User resistance determinants and the psychological contract in enterprise system implementation, *European Journal of Information Systems*. 19 (2010) 625-636.
- [29] H.K. Klein and M.D. Myers, A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems, *MIS Quarterly*. 23 (1999) 67-94.
- [30] C. Koh, A. Soon, and D.W. Straub, IT Outsourcing Success: A Psychological Contract Perspective, *Information Systems Research*. 15 (2004) 356-373.
- [31] J. Kotlarsky and I. Oshri, Social Ties, Knowledge Sharing and Successful Collaboration in Globally Distributed System Development Projects, *European Journal of Information Systems*. 14 (2005) 37-48.
- [32] J. Kotlarsky, I. Oshri, K. Kumar, and J. van Hilleegersberg, Towards Agility in Design in Global Component–Based Development, *Communications of the ACM*. 51 (2008) 123-127.
- [33] J. Kotlarsky, I. Oshri, J. van Hilleegersberg, and K. Kumar, Globally Distributed Component-Based Software Development: An Exploratory Study of Knowledge Management and Work Division, *Journal of Information Technology*. 22 (2007) 161-173.
- [34] M.C. Lacity, S. Solomon, A. Yan, and L.P. Willcocks, Business process outsourcing studies: a critical review and research directions, *Journal of Information Technology*. 26 (2011) 221-258.
- [35] A.S. Lee and R.L. Baskerville, Generalizing Generalizability in Information Systems Research, *Information Systems Research*. 14 (2003) 221–243.
- [36] J.N. Lee, The Impact of Knowledge Sharing, Organizational Capability and Partnership Quality on IS Outsourcing Success, *Information & Management*. 38 (2001) 323-335.

- [37] N. Levina and J.W. Ross, From the Vendor's Perspective: Exploring the Value Proposition in IT Outsourcing, *MIS Quarterly*. 27 (2003) 331-364.
- [38] A.Y. Lewin and C. Peeters, Offshoring Work: Business Hype or the Onset of Fundamental Transformation?, *Long Range Planning*. 39 (2006) 221-239.
- [39] V. Mahnke, J. Wareham, and N. Bjorn-Andersen, Offshore middleman: transnational intermediation in technology sourcing, *Journal of Information Technology*. 23 (2008) 18-30.
- [40] M. Miozzo and D. Grimshaw, Capabilities of large services outsourcing firms: the "outsourcing plus staff transfer model" in EDS and IBM, *Industrial and Corporate Change*. 20 (2011) 909-940.
- [41] J. Morgan and R. Wang, Tournaments for ideas, *California Management Review*. 52 (2010) 77.
- [42] B. Nicholson and S. Sahay, Some Political and Cultural Issues in the Globalization of Software Development: Case experience from Britain and India, *Information and Organization*. 11 (2001) 25-43.
- [43] I. Oshri, J. Kotlarsky, and L.P. Willcocks, Managing Dispersed Expertise in IT Offshore Outsourcing: Lessons from Tata Consultancy Services, *MIS Quarterly Executive*. 6 (2007) 53-65.
- [44] I. Oshri, J. Kotlarsky, and L.P. Willcocks, *The Handbook of Global Outsourcing and Offshoring*, second edition. Palgrave MacMillan, London, 2011.
- [45] R.F. Otondo, A.W. Pearson, R.A. Pearson, J.C. Shaw, and J.P. Shim, Managerial problem-solving in the adoption of Radio Frequency Identification Technologies, *European Journal of Information Systems*. 18 (2009) 553-569.
- [46] P.C. Palvia, R.C. King, W. Xia, and S.C.J. Palvia, Capability, Quality, and Performance of Offshore IS Vendors: A Theoretical Framework and Empirical Investigation, *Decision Sciences*. 41 (2010) 231-270.
- [47] A. Parasuraman, L.L. Berry, and V.A. Zeithaml, Understanding Customer Expectations of Service, *MIT Sloan Management Review*. 32 (1991) 39-48.
- [48] C. Qi and P.Y.K. Chau, Relationship, contract and IT outsourcing success: Evidence from two descriptive case studies, *Decision Support Systems*. 53 (2012) 859-869.
- [49] T.M. Rajkumar and R.V.S. Mani, Offshore Software Development, the View from Indian Suppliers, *Information Systems Management*. 18 (2001) 63-73.
- [50] J. Ross and C. Beath, Sustainable IT Outsourcing: Let enterprise architecture be your guide, *MIS Quarterly Executive*. 5 (2006) 181-192.
- [51] J.W. Rottman and M.C. Lacity, Proven Practices for Effectively Offshoring IT Work, *Sloan Management Review*. 47 (2006) 56-63.
- [52] N. Sanders, A. Locke, C. Moore, and C. Autry, A Multidimensional Framework for Understanding Outsourcing Arrangements, *Journal of Supply Chain Management*. 43 (2007) 3-15.
- [53] K. Saxena and S. Bharadwaj, Managing Business Processes through Outsourcing: A strategic partnership perspective, *Business Process Management Journal*. 15 (2009) 687-715.
- [54] G.D. Saxton, O. Oh, and R. Kishore, Rules of Crowdsourcing: Models, Issues, and Systems of Control, *Information Systems Management*. (in press).
- [55] D. Stieger, K. Matzler, F. Ladstaetter-Fussenegger, and S. Chatterjee, Democratizing Strategy: How Crowdsourcing Can Be Used for Strategy Dialogues., *California Management Review*. 54

- (2012) 44-68.
- [56] M.E. Swinarski, R. Kishore, and H.R. Rao, Impact of Service Provider Process Capabilities on Service Provider Performance: An Empirical Study. Hawaii International Conference on System Sciences. 2006.
  - [57] C. Terwiesch and Y. Xu, Innovation Contests, Open Innovation, and Multiagent Problem Solving, *Management Science*. 54 (2008) 1529-1543.
  - [58] L.P. Willcocks and D. Feeny, *Configuring the Information Systems Function: A Core Capabilities Approach*, 1996.
  - [59] L.P. Willcocks and D. Feeny, IT Outsourcing and Core IS Capabilities: Challenges and Lessons at Dupont, *Information Systems Management*. 23 (2006) 49-56.
  - [60] L.P. Willcocks and A.S. Graig, *The Outsourcing Enterprise: Building core retained capabilities*, Logica Whitepaper. 2008.
  - [61] L.P. Willcocks and M. Lacity, *The Practice of Outsourcing: From ITO to BPO and Offshoring London*, 2009.

### About the authors

**Dorit Nevo** is an Associate Professor of Information Systems at the Lally School of Management, USA. Her research focuses on technology use by individuals and teams, including reinvention of technologies, impacts on individual and organizational performance, and expertise coordination. Her published work includes articles in the *Communications of the ACM*, the *Journal of Management Information Systems*, *Decision Support Systems*, *Sloan Management Review*, and the *Wall Street Journal*. She serves as a senior editor for The DataBase for Advances in Information Systems.

**Julia Kotlarsky** is Professor of Technology and Global Sourcing at Aston Business School, UK. Her research interests revolve around outsourcing and offshoring of services, globally distributed teams, knowledge and innovation. She has published her work in numerous academic and professional journals including *MIS Quarterly*, *The Wall Street Journal*, *European Journal of Information Systems*, *Journal of Strategic Information Systems* and other outlets. Julia has published 8 books, among them “*The Handbook of Global Outsourcing and Offshoring*”. She serves as a senior editor of *Journal of Information Technology*. She is the co-founder of the annual Global Sourcing Workshop ([www.globalsourcing.org.uk](http://www.globalsourcing.org.uk)).