Workgroup Structures in Offshore Software Development Projects: A Vendor Case Study

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Abstract

Studies have shown that offshore development of software projects is not without its challenges, as development teams try to make sense of the organisational artefacts sent to them from distributed sites. These challenges are associated with; lack of implicit knowledge related to the client's functional work processes, inadequate coordination and control mechanisms, and lack of trust across dissimilarities. This paper describes how a vendor's organisational structures have been used to overcome the struggle associated with knowledge sharing in a virtual environment. The vendor has developed workgroup structures involving new boundary roles for building relationships with clients and coordination of project schedules at offshore development sites. Vendor employees located at the client country interpret the implicit knowledge related to the client's functional work processes, which are then translated over a centralised organisational portal to offshore development locations. Regular updates are maintained in the organisational portal to provide information on current project tasks to both clients and distributed team members. English language training is also provided to developers to improve trans-global communications.

1. Introduction

The low cost of software development in developing countries has spurred the growth in offshore software development (OSD). Organisations are combining technical expertise from low cost countries with project management skills located near client sites, and specialist workgroups are being formed. These workgroups collaborate using technological tools to develop various types of information systems. However, to realise the potential benefits associated with distributed OSD projects, organisations need to streamline their development processes and management procedures to make them effective in the context of the virtual environment [1]. Organisations implement governance structures in the virtual environment to ease the transfer of knowledge and resources across distributed workgroups. These structures facilitate understanding and appreciation of inter-related tasks between the specialist workgroups and also contribute to trust as relationships are built between the client and the vendor (or outsourcer).

Despite much previous work in this area, few empirical studies of the emerging OSD environment have addressed the "complex development of trust" between distributed workgroups [2] (p. 511). Also, there is a "relative lack of research directed towards an examination of *the relationship between the outsourcer and the customer*" and future studies should extend "the examination and analysis of that relationship" [3] (p. 88, italics in original).

This paper reports on an ethnographic study to investigate organisational structures in OSD projects. We describe the distributed workgroup structures used by one vendor to combine technical skills from specialist groups situated in low cost countries with management of relationships with clients situated in another country. We then analyse the practices associated with sharing of knowledge artefacts during project execution, relationship building and sustaining trust in the OSD environment. Finally, the paper identifies key practices in the vendor's governance structures used to bridge social and knowledge gaps across distributed sites and also to build closer ties with clients.

2. Knowledge struggle in offshore projects

Previous research has identified three elements related to the knowledge struggle facing distributed workgroups in offshore projects. The three elements are; lack of implicit knowledge of the client's functional processes, application of control, co-

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ordination and administrative mechanisms to bring about joint responsibility and accountability of project related tasks, and lack of mutual trust across dissimilar cultural workgroups [2, 4-6]. To overcome this knowledge struggle across organisational and cultural boundaries, vendors need to build effective governance structures for managing distributed workgroups.

The three elements of knowledge struggle are described in the following subsections.

2.1. Implicit knowledge elements for client projects

Software development in a global environment emphasises the collaboration of distributed teams to bring about shared understanding of physical, technical and management domains. The "local practices are codified, lifted out of a particular context and re-articulated in other global domains" [7] (p. 36), as team members make sense of each other's domain knowledge. However, due to the subjective nature of local practices involving individual or local interpretations, the translation of the local knowledge domain into a collective knowledge domain is not without challenges. Local teams often have "difficulty interpreting the implicit knowledge embodied in artefacts sent to them" as this knowledge is contextualised in the local work processes of offshore groups who operate in different settings [4] (p.411).

The implicit knowledge embedded in the organisational artefacts requires occupational know-how, as members relate the artefacts to the associated functional tasks. When these artefacts are sent to offshore groups, including programmers who write and test software, the offshore groups often lack an overall understanding of the associated functional tasks. Lack of understanding leads to 'tunnel-vision' of the associated project tasks, which may have severe ramifications for clients. The vendor needs to ensure that a general understanding of the client knowledge domain is acquired before the software coding task begins. Some recommendations suggested to overcome this problem are; having an on-site coordinator at the client site to shepherd the flow of knowledge offshore [8, 9], sending representatives to offshore sites to provide training in work methodologies and technologies [9] and sending offshore workers to the client site for several months to obtain a local view through direct face-to-face meetings and observation [10]. Another approach to reducing the knowledge struggle is to reengineer off-shore job roles by decreasing their context-dependent content [11].

2.2. Coordination and control mechanism elements

Offshore software development projects are also vulnerable to coordination, control and administration problems that affect project performance [12, 13]. Sabherwal [14] studied coordination in outsourced system development projects and categorised coordination mechanisms as standards, plans, formal mutual adjustments and informal mutual adjustments. Controls specify milestones, deadlines and deliverables which help to improve output and behaviour controls, as they reduce the complacency in the vendor's development effort and team members adhere to the immediacy of the specified schedules. When geographically dispersed members lack the interaction necessary to achieve a non-local view of a task, they could assume the worst of their remote team partner's work progress and may project these negative perceptions to other co-located partners [15, 16]. However, considerable coordination information is required to set up meetings and common schedules, and integrate work outputs across organisational boundaries. Levels of trust (addressed in the following subsection) also affect the way people interpret non-responsiveness, as low trust levels may foster negative attitudes towards the other party, if they do not promptly respond to previous communications [17].

To increase coordination and control, organisations identify boundary roles in which leaders facilitate communication between sites, coordinate project execution tasks and are responsible for task completion across their organisational boundaries. Leaders understand "all the personal and contextual nuances in the world of electronic communication" and are able to coordinate distributed activities across spatial, temporal, organisational and cultural boundaries [18] (p. 229).

2.3. Trust elements

Lack of trust is an important challenge faced by offshore located work groups. Hurley [19] says that trust is influenced by the fact that individuals are basically tribal and self-centred, and so find it easier to trust those who appear similar to themselves, as they can be counted on to act similarly in a given situation. People tend to tally up similarities and differences such as working style, cultural group, accent, dress code, or even gender within their local

visible spaces, before they begin to trust the other party [19]. An earlier study has also identified *trustworthiness* as a belief that comes before trust and is an intention or willingness to depend on another party [20].

Another view on trust by Giddens states that:

> Trust is related to absence in time and space. There would be no need to trust anyone, neither individuals nor abstract systems, if their activities were visible and easy to understand. So the prime condition for lack of trust is lack of full information [21] (p. 33).

Based upon Hurley and Giddens' views on trust, this paper identifies *dis*trust in an OSD environment as being characterised by lack of visibility across distributed local, social and cultural spaces leading to a feeling of vulnerability by all the parties concerned. *Accordingly trust requires a shared understanding of client-vendor perceptions towards each other's cultural and societal structures.* Though lack of visibility across geographical boundaries cannot be avoided, some transparency in information can be brought about by identifying a good engagement and relationship building philosophy [22]. Organisations try to increase the transparency of geographically dispersed operations by using tools that facilitate the sharing of information and artefacts in the shared virtual space. These tools help in building trust among the geographically dispersed members as, over time, these tools transform faceless commitments into scripted tasks or facework commitments [23].

3. Research design

In this study, interviews with semi-structured and open-ended questions were used to gain an understanding of how one OSD vendor (referred to as 'INV' in this paper) defines workgroup structures to overcome the knowledge struggle across distributed teams. Senior management and development team members in Pune (India) were interviewed in their organisational settings (such as in their offices or at their workstations), which helped to gain an understanding of professional workplace settings, as observations complemented the interviews.

Janesick suggests the use of exact quotations from interview participants, as "an interpretive commentary related to the data, because the data cannot speak by itself", to lead the reader to the identified themes [24] (p. 109). The use of quotes in a qualitative write-up is a way "to bring in the voice of participants in the study" [25] (p. 170). Quotes provide compelling evidence allowing the reader to reach an independent judgment regarding the merits of the analysis [26].

4. The case narrative

The case narrative is introduced by setting the context of the study organisation which provides the basis for the examination of the vendor practices.

4.1. Context of the case

INV is a software provider offering web enabled application integration solutions for creating social networking platforms. They have developed many software tools and applications which are used by client websites for creating their own online social communities. INV has also developed web services and software tools for popular social networking websites such as Facebook and MySpace amongst others. INV have recently completed a project for a major computer manufacturer in Canada and the United States, by linking their 8,000 retail offices across North America. They are presently working on other similar projects with the same client, and also with new clients.

INV has offices in two locations namely, California, in the United States (on-site location) having 8 employees and Pune in India (off-site location) having 200 employees. The on-site employees report to the director who is also located in California and they manage the sales and client relationship side of their business. The off-site development centre, headed by the chief executive officer (CEO), is involved in creating software solutions for clients.

The customer representative staff located in California gather client requirements, which are then communicated to the development teams in India over a virtual private network (VPN). The on-site and off-site teams interact regularly over emails, store related artefacts in the organisational portal and communicate with each other using VoIP tools. However, in some situations where some technical expertise is required on-site, a developer from India may travel to the client's site to help resolve the technical issues, though generally the organisational portal is used to bring about clarity and visibility in project related tasks.

4.2. Vendor work practices

The vendor work practices are reported through the words of senior and middle management teams based in Pune, India. The chief executive officer of

INV commented that their overseas customers are *"very straight jacketed"* with *"very structured working styles"*. INV prefers direct meetings with customers to be held by their local team in the United States, rather than the Indian developers. Accordingly, INV have employed front end personnel in their California office to interact directly with their customers. This ensures that *"as far as customers are concerned they have one point of contact. They don't have to worry about communicating with people in Pune. The customer sees us there so it is not out of sight out of mind"*.

INV have identified governance structures to realise a shared social and technical context across their two locations. The on-site team located in California comprises account managers and account executives. The account executives (AEs) report to the account manager and are responsible for building relationships with clients. The on-site team members interact directly with the clients to understand the local nuances of client projects, which are then translated into concrete tasks and are conveyed to the off-site team members located in Pune (India). The CEO explained their customer relationship strategy:

> *We always have per customer a representative staff over there. It depends upon the size of the project. Sometimes we may also have two or three representatives, but one person* [i.e. account manager] *is overall responsible over there. The reps are in charge of customer accounts and they also know the projects very well. They also control the team here. So the team here is reporting to two people: the accounts executive there and the life cycle manager here.*

However there are certain times when the developers from INV need to visit the on-site centre in California. In such situations, the developers are given training on cultural and language differences. The project manager explained some of the differences perceived by them:

> *Customers evaluate us and form an opinion about us. So HR person manages this. An example of the training is in English skills. Our English is good but there are some typical words we commonly use like prepone rather than saying bring forward. The US team understands postpone but not prepone. Plus our pronunciations differ. We have people from North India or South India and everyone has different accents. So we try to tell everyone to speak in a neutral accent.*

Customers have been given access to the organisational portal through separate logins to check their status. The management said this practice ensures that customers are aware of the work processes and hence there is no need to send weekly reports to the customer. The CEO explained their strategy:

> *... they* [i.e. customers] *are 24/7 online and can check what is going on. Now they come and tell us at the right moment that what we are doing is wrong and needs to be corrected. The impact of that mistake is immediately taken care of. So with our customers we have realised the best thing to do is have a VPN. We also don't have to provide weekly or fortnightly reports because they are available online. The conventional system of generating reports is meaningless because we can flavour the reports nicely by saying that though we are slightly back we have taken action to make sure it happens. This is not preferred anymore. Let the customer see for himself what is happening where the development process is stuck. And let me tell you - the customers appreciate this.*

The distributed team members use VoIP tools (e.g. Skype, Microsoft Messenger) to clarify project tasks. Embedded tools in the organisational portal (e.g. discussion forums, blogs) help team members to inform each other of project updates and of any concerns they may have.

> *We have established rapport with our offshore teams and know what they are trying to tell us. Most important because they have been provided VPN connectivity, they write down their ideas – so there is no loss of communication due to misunderstanding. So we believe in very precise communication and not unnecessary documentation.*

The CEO of INV said that they only recruit technical staff, such as engineering graduates, postgraduates in computing and mathematics, who could *"understand the project and can relate to the technology and problems"*. Employees are encouraged to participate in knowledge sharing, and INV also have some personality development courses aimed at improving their employees' interpersonal skills, as they were wary of *"having loners who don't share their work with others"*.

The project manager of INV said *"anyone who is a new hire goes through the training. The first thing we start with is our culture, our HR policy and later we take him into technology and business areas"*. He also added that developers often lacked interpersonal skills rather than technical skills, so INV gives developers training in social and communication aspects. Local consultants are regularly contracted by INV for training of the Indian development team members in soft skill sets. Interactive training sessions are held with language specialists who engage team members in casual conversation on non-technical aspects. The specialists also use voice

recordings of employee presentations and group discussions. These recorded conversations are then played back to the group, and the group analyses the tone, accent, pronunciations and such like. The project manager commented *"The programmers quite enjoy when they can themselves see the difference"*.

To manage client tasks at the offshore site, INV has assigned a life cycle manager (LCM) for each software product. The LCM is located in Pune and is responsible for establishing processes related to that particular product and ensuring that project deadlines are met. The LCM interacts daily with the AEs and is the main contact by the on-site team members for management of any project issues at the offshore site. To motivate individual team members and bring in more responsibility and work commitment, INV have identified structures for rewarding each employee. Each month, employees are evaluated against certain performance crtieria such as new ideas generated, meeting of deadlines before scheduled dates and low defect rates, amongst others. The LCM is involved in evaluating employee performances against the set criteria and plays a key role in deciding financial rewards for individual knowledge workers. The CEO explained:

> *Suppose he [the developer] gets Rs.100 as salary. The Rs.70 is fixed and Rs.30 is based on certain performance parameters which we have defined. We have a very transparent system, and so he [the developer] can see his performance himself. This is a computer based system which we have developed ourselves and if he does more than 100% then we give him that amount also. So sometimes people here get as high as 120%, though generally a maximum a person draws is about 90%. This is of course confidential and only goes into the payroll.*

Finally, an issue faced by INV is their high attrition rate. The management of INV said that having an attrition rate of 25% meant that they need to have a plan in place for managing projects, in the event of experienced developers leaving the workplace. Accordingly, each project schedule is planned from the starting phase with additional manpower to take account of 18% staff attrition. This enables INV time to recover from work disruption caused by sudden staff turnover and also reduces the risk of overruns in project schedules. Moreover, INV management ensures that explicit documentation of work processes is maintained in the centralised organisational portal to minimise knowledge loss. The CEO explained:

> *If you develop a system which is person dependent then you are not managing. So focus has now shifted to HR management, and this is not something to be taken for granted anymore. Now organisations should have good HR management in place. Software industry has now moved to this gear. So if a person leaves an organisation, we may have a problem for five to eight days but it is not a catastrophe so that everything comes to a halt. But there is a delay. Now we have planned our work for 18% attrition and we try to structure our processes so that a process would be executed independent of that person. So internal systems available have standardised processes, and we build in buffers within our development work so that the target dates are not missed. Our policies are not shock proof but they help us to recover fast from such shocks. This is important, and this is what I call project management.*

5. Analysis of workgroup structures

In considering the challenges facing the offshore groups, INV have identified workgroup structures for management of the three elements influencing the knowledge sharing struggle across distributed work groups. Team structures involving boundary leadership roles have been established across distributed sites to overcome the challenges associated with knowledge teams spread across dissimilar cultural settings.

5.1. Structures to gather embedded implicit knowledge

Employees with local boundary leadership roles have been assigned near the client site to bring about understanding of the embedded implicit knowledge in the client's functional tasks. Customer representatives or account executives located at the on-site location (California) interact directly with the clients to understand their functional processes and translate their understanding into identifiable tasks. Later, the AEs guide the extended team members at the offshore location (India) on the necessary domain knowledge to help them correctly interpret the implicit knowledge embedded in client projects. Related business issues are clarified between the workgroups before the detailed architectural and programming aspects of the project are implemented. This practice ensures a broader vision of the client's knowledge domain by the off-site development teams who have a non-local view of the project.

VoIP tools are also used between the two workgroups to bring further clarification and a shared understanding of the associated project tasks. In this

manner, the responsibility of identifying the local implicit knowledge of functional tasks and transferring this knowledge to the non-local or off-site team members is with the designated boundary leaders (AEs).

5.2. Control and coordination structures

To manage issues associated with coordination and control of project tasks, INV have defined another boundary role at their development site. The life cycle manager's role is to ensure that schedules are met at the off-shore site and also to maintain regular updates on the organisational portal. The clients too have been given access to the organisational portal and hence INV does not email separate reports to clients. This practice ensures that all stakeholders (i.e. clients, on-site team and off-site team members) are on a common platform and are aware of the present commitments, deadlines, deliverables and delays. Frequent updates on portals eliminate some of the negative perceptions associated with delays in email responses that have been identified in an earlier study [17]. However, client access to the organisational portal could incur the danger of creating two separate knowledge-bases; one for the client, which displays the positive aspects of the work in progress and hides some of the problems being faced during the development process, and a second for co-workers, where problems such as programming bugs, tests passed/failed, missed deadlines and other causes of project delays are addressed. INV however, maintained that they used one knowledge-base for both clients and development teams.

INV also uses monetary incentives such as having a fixed and variable component in pay to motivate development team members and brings in more accountability and responsibility of project tasks. Rewards are offered to developers to encourage them to meet deadlines, share their knowledge portfolio with other team members and for suggestions offered to improve the project design. This strategy helps to address issues of attrition, in conjunction with defensive staffing policies.

5.3. Structures to build trust

Trust across culturally diverse client and vendor groups is brought about by having a centralised office near the client. The centralised office helps to bring direct visibility of the vendor to the clients, and makes the client feel as if they are interacting with a local vendor as opposed to an offshore vendor, resulting in more trust across similarities [19]. The clients directly provide their requirements to account managers and account executives who belong to the same national cultural group as them. Furthermore, clients have also been given access to the organisational portal, enabling them to log their requirements and issues and voice their concerns immediately. Finally, team members located at the Pune site are trained in English language skills, so that they can speak in a neutral accent when interacting with off-shore groups over VoIP tools.

Figure 1 shows the communication patterns and workgroup structures used across distributed sites by the vendor organisation. Senior management roles are defined at both on-site and off-site boundaries to bring about shared understanding of tasks which are not explicitly codified, collective ownership of project related tasks and a sense of participation and commitment in the relationship. The next section discusses the state of practice to provide empirical statements elaborating on the emerging work structures in the current OSD environment.

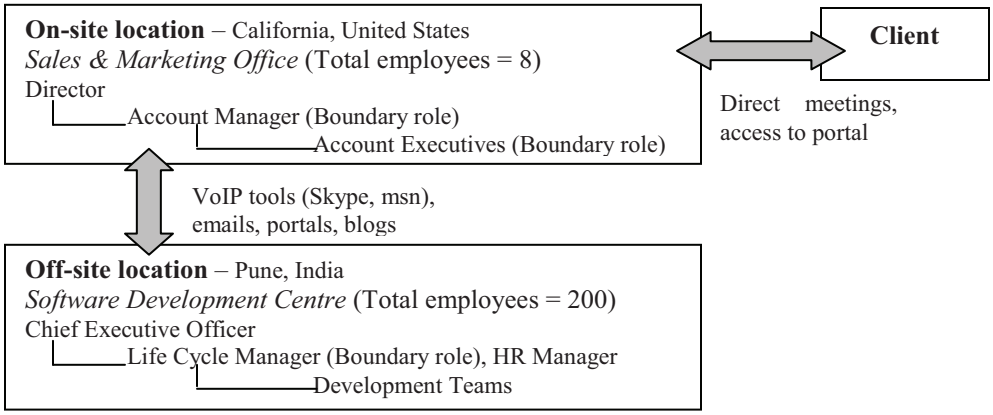

Figure 1. Workgroup structure for offshore software development projects

6. Discussion and conclusions

Vendors are aware of existing knowledge gaps in understanding the functional aspects of client projects and are sensitive to client perceptions of knowledge sharing and trust issues. They have identified social meanings to the knowledge struggle elements across dissimilar knowledge groups and have defined governance structures to enable knowledge sharing across organisational boundaries in the OSD environment. The resulting structures are enabled by both individuals (leaders having boundary roles) and by technology (organisational portals, voice tools and discussion forums), and help the vendor to develop a knowledge-based view in the cross-cultural offshore environment. To overcome the narrow perceptions or 'tunnel-vision' of non-local team members about the client's functional processes, vendors involve local (on-site) leaders to interpret the implicit knowledge of the client processes through direct interactions with the client. Also, to take advantage of the low cost of software development in developing countries, technological and managerial interfacing mechanisms have been aligned to the emerging knowledge artefacts created at offshore sites with the project deliverables to be installed at the client site. Reward structures have been identified to recognise individual and team contributions, thus motivating the knowledge workers at offshore sites. Finally, trust elements across diverse cultural boundaries have been addressed by having close proximity of the client with vendor workgroups who belong to similar cultural groupings. Direct interactions of on-site teams with the client increases visibility and leads to lower levels of vulnerability for clients in dealing with offshore vendors.

In examining the case data, three aspects of the vendor's networking mechanisms have been identified for managing the elements of knowledge struggle. This section condenses descriptions of the case study into empirical statements to describe evolving workgroup structures by offshore software development vendors.

The empirical statements describing the three aspects of vendor's practices are

1. Vendors identify boundary managerial roles near client sites to gather the local implicit knowledge embedded in the client's functional processes. These boundary employees are then responsible for translating the knowledge gained of the client's functional tasks to offshore groups who do not have a local view of the tasks.
2. Boundary roles at offshore distributed sites help to manage the issues related to control and coordination elements of knowledge work. These managerial positions are responsible for managing schedules, motivating knowledge workers and bringing in more accountability and responsibility among the team members.
3. A combination of personal meetings and electronic tools helps to bring in visibility of both people and knowledge artefacts. These practices bring in a shared understanding across organisational and cultural boundaries, further fostering mutual trust and confidence across dissimilarities.

This case study has provided a real-life perspective on workgroup structures for managing software projects in the OSD environment. Though the current body of research mentions knowledge struggle elements, it does not explain how they are employed in a real life setting. Our study has provided rich insights on current social networks adopted by offshore vendors for knowledge sharing in the diverse offshore software development environment. These insights have been translated into empirical statements as inputs to generalisation on emerging workgroup structures for further generalisations to be made into output theoretical statements to form empirical-to-theory (ET) generalisability [27]. This study realises that the governance and social network structures adopted for overcoming the knowledge struggle elements may differ across organisational domains and we recommend conducting similar ethnographic studies for other knowledge-based organisations.

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