

Dynamics of Offshore Software Development Success: The Outsourcers' Perspective

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Abstract

With the maturity of information and communication technologies, offshore development of software by outsourcers is a new trend for reshaping IT strategy around the globe. Technological advances have increased the interconnection between different societies, facilitating a continuous software development cycle or follow-the-sun approach by having team members located in different geographical settings. Software development is an iterative process, in which knowledge builds with the progression of software development work and requires an ongoing awareness by team members of all the changing definitions and relationships in the development effort. This poses a bigger challenge in a global environment as the software development processes happen in a dynamic and distributed setting. New Zealand and India are both exemplars of the emerging offshore software producer market, and hence a study of their offshore software development processes forms a basis of this research study. These issues are illustrated using three case studies of offshore software providers in New Zealand and India. The case study data reveals that these firms emphasize on different drivers for success in their work practices as they compete as outsourcing destinations.

Keywords

Offshore outsourcing, software development processes, outsourcer, success drivers

Introduction

Based on mature information and communication technologies, offshore development of software applications by outsourcers is a new trend that is reshaping IT strategy around the globe. As reported by Beck (2002), "Gartner projects that nearly half of Fortune 1000 global enterprises will choose not to own their IT assets, but instead will derive business benefits from shared IT utility infrastructures owned and operated by service providers hybrids". Furthermore, technological advances have increased the interconnection between different societies, facilitating a continuous software development cycle or follow-the-sun approach by having team members located in different geographical settings. As a result, software development is increasingly a multisite, multicultural, and globally distributed undertaking (Herbsleb & Moitra 2001).

Now is an opportune time to understand the software development practices that outsourcers in various countries adopt, since industry associations are vying with each other to promote outsourcing services globally (Sahay, Nicholson & Krishna 2003). New Zealand (NZ) and India are both exemplars of the emerging global software producer market, but differ in many respects, providing an opportunity for meaningful comparative research. This paper describes

three case studies of offshore outsourcers in New Zealand and India to understand their approach to the software development process and the impact of the different drivers in their work practices as they compete as outsourcing destinations.

Background

Software development is a knowledge intensive activity that typifies work in the “knowledge” or “network” society (Sahay, Nicholson & Krishna 2003). International outsourcing impacts on the software development practices in many ways due to differences in cultures, spoken languages, power structure within organizations, quality standards, documentation, time zones, and software updates and estimations. As offshore outsourcing becomes increasingly widespread, understanding the impact of these practices on the effectiveness of the software development effort will become increasingly important (Edwards & Sridhar 2003). There are certain key drivers affecting these practices, which have evolved during the outsourcers’ learning curve, come from past experiences, and can only be studied empirically.

The awareness of IS outsourcing has largely been driven by the practitioner community and has mostly been generated by consulting firms such as IBM, McKinsey, Forrester Research, Gartner Group and Global Insight or IT industry consortiums such as ITAA¹ and NASSCOM² (Dibbern et al. 2004; Rottman & Lacity 2004). Thus, there is a need for unbiased academic research in this area. There is a large body of knowledge which specifies determinants of success for outsourcing from a US perspective (Lacity & Willcocks 1998; Nam et al. 1996), but very little on the offshore software development processes by outsourcers (RajKumar & Dawley 1998; Ravichandran & Ahmed 1993; Smith, Mitra & Narasimhan 1996). Moreover, much of the literature of information systems outsourcing and offshore software development of applications considers a customer perspective or global perspective rather than the offshore software suppliers’ perspective (Levina & Ross 2003; RajKumar & Mani 2001). Which drivers do offshore suppliers or outsourcers consider to have a significant effect on project success thus needs to be addressed.

Global Software Development Success

The field of software engineering in the offshore domain is relatively new and procedures for quality control and project management, though developing very fast, have yet to evolve fully (Aman & Nicholson 2003). Research in IS project success has helped understand how to model and investigate IS success factors, but very little empirical work in this area has focused on global IS work involving outsourcing (DeLone et al. 2005). These factors have evolved during the client and outsourcer’s offshore learning curve based upon their past experiences. For offshore sourcing to assume its rightful place in the IT sourcing portfolio, stakeholders need to swiftly move through the learning curves with best practices institutionalized (Rottman & Lacity 2004). These practices refer to the various socio-cultural

¹ ITAA represents the Information Technology Association of America having 400 member companies in every facet of the IT industry, including computer hardware, software, telecommunications, Internet, e-business, e-education, outsourcing, computer services and more.

² NASSCOM is India’s National Association of Software and Service Companies, the premier trade body and the chamber of commerce of the IT software and services industry in India. It consists of 850 member companies which are in the business of software development, software services, and IT-enabled/ BPO services.

processes inherent in the process of knowledge transfer, including the manner in which clients and vendors draw upon and apply different forms of explicit-implicit, formal-informal knowledge (Sahay, Nicholson & Krishna 2003).

Some assertions from previous research to establish and understand the variables affecting software development project success are:

- IS project success is a multi-dimensional variable, so no single measure alone can tap into the various dimensions of IS project success. Measures of IS project success are: on-time completion, within-budget completion, costs/effort, meeting system requirements, system quality, user satisfaction, system use, and net system benefits (DeLone et al. 2005).
- The major dimensions of assessing customer performance are process performance (e.g. on-time/ on-budget completion, communication effectiveness, user participation, etc.) and product performance (i.e. performance of final deliverable) (Cooprider & Henderson 1991).
- Outsourcing success is measured by the operational delivery of the contract, the ability to fairly adapt to change, and the ability to identify value-added services (Lacity & Hirscheim 1994).
- Disciplined software processes in an organization have a significant payoff in terms of project success (Gopal, Mukhopadhyay & Krishnan 2002).
- It is crucial for vendors to expand their engagement and relationship management staff, to understand the offshore outsourcing process in order to fully help the client navigate its complexity, or else the project's chances for success are limited (Moore & Martorelli 2004).
- The issue of communication between client and developer has been identified as a major factor impacting on systems development for decades, since ineffective communication was found to be negatively correlated to success (Edstrom 1977).

Key Success Variables in the Offshore Software Development Process

The variables involved in the outsourcing process are very complex, which are further complicated by the non-determinism of most methods as the continually changing business environment means that requirements are fluid. They cannot be simply handed to the software provider as a comprehensive document without a good interactive development environment. Unfortunately, there are a number of pitfalls in global software development, as knowledge held by software developers is tacit, and transferring it in conditions of time, space and cultural separation is not problem-free. Each project deliverable is evaluated for new value addition by team members at different geographical boundaries, requiring ongoing awareness of all changing definitions and relationships in the development effort. Thus knowledge builds with the progression of software development work as software modules go through an iterative process of design, creation, test, distribution, deployment, utilization, and revision in a distributed operating environment (Ptak 2005).

There is a great need for vendors to be flexible in adjusting their development methodology, life cycle and specifications to meet the customer's needs. Accordingly, the methodology

used for each project will be different (RajKumar & Mani 2001). However, other parameters that can affect the offshore software development processes for offshore suppliers are communication and co-ordination variables; cultural differences; requirement deficiencies; relationship management; quality processes; project management tools for project estimation, change management; configuration management; test environment; release management; relationship management with the customer; and, very significantly, the effect of staff attrition (Carmel & Agarwal 2001; Cullen 2002; Gopal, Mukhopadhyay & Krishnan 2002; Lurey & Raisinghani 2001; Mockus & Herbsleb 2001; Moore & Martorelli 2004; Powell, Piccoli & Ives 2004; RajKumar & Mani 2001; Sahay, Nicholson & Krishna 2003)

Typically for an outsourced development, 70 to 80 percent of the work is done offshore and the other 20 to 30 percent is done at the customer's site (Gopal, Mukhopadhyay & Krishnan 2002; RajKumar & Mani 2001). However, this onshore-offshore mix is not static and shifts over time depending upon peaks and troughs of workload in the dynamic environment of the software development processes involved (Sahay, Nicholson & Krishna 2003). Such a globally interconnected environment requires proper knowledge integration mechanisms across the customer-vendor boundary to be in place. Some mechanisms proposed in previous researches are: automated tools to facilitate the coordination of pre-defined work flows, synchronized test fixtures by dispersed teams, close customer-vendor interactions to build trust and confidence, up-front effort in designing the architecture of the system with the customer, and use of mature software processes (e.g. CMM³, ISO 9001) (Gopal, Mukhopadhyay & Krishnan 2002; Ptak 2005; RajKumar & Mani 2001; Sahay, Nicholson & Krishna 2003; Tiwana 2003). Keane (2003) further notes that the best outsourcers rank quite high on the CMM scale of maturity, and organizations at the lower end of the CMM need years of effort and massive cultural change to achieve the level of process maturity present in a best-in-class outsourcer. However, once a common quality model is established, maintaining it is a challenging task requiring commitment from the organization and a proper work culture. These processes are document heavy, with key practices being measured, tested, and controlled to increase the productivity of software development. Such standardization helps to impart structure and predictability to the offshore software development processes (Sahay, Nicholson & Krishna 2003). Thus good knowledge management will allow for many reuse opportunities, saving on cost and time (Herbsleb & Moitra 2001).

Proper synchronization of test procedures (e.g. defined milestones, clear entry and exit criteria) between the teams is essential, especially if the development team is at one site and the test group is at the other site (Herbsleb & Moitra 2001). Another aspect of good project management is to reduce the impact of staff turnover or attrition. Work practices such as training staff, so that the teams are not overly reliant on any one person, establishing backups, mentoring, programming and testing standards, code reviews, documentation standards, and maintenance screens will help to reduce the impact of staff attrition (Cullen 2002).

Based on the published literature, the variables that have been considered important for successful software development and project implementation are summarized in Table 1.

³ The Capability Maturity Model for Software (also known as the CMM and SW-CMM) has been a model used by many organizations to identify best practices useful in helping them increase the maturity of their processes. The CMM consists of five maturity levels and 18 key process areas (KPA's). Each KPA addresses a set of related goals that must be fulfilled by a set of processes within the organization.

Table 1: Summary of Key Success Variables

Variables	Literature
Cultural Differences	(Carmel & Agarwal 2001; Davey & Allgood 2002; Edwards & Sridhar 2003; Ein Dor, Segev & Orgad 1993; Heeks et al. 2001; Herbsleb & Moitra 2001; Kaiser & Hawk 2004; Lurey & Raisinghani 2001; Mockus & Herbsleb 2001; Powell, Piccoli & Ives 2004; Rottman & Lacity 2004; Shore & Venkatachalam 1995)
Communication	(Crampton 2001; Dube & Pare 2001; Herbsleb & Moitra 2001; Hinds & Weisband 2003; Hulnik 2000; Lurey & Raisinghani 2001; Mark 2001; Powell, Piccoli & Ives 2004)
Relationship Building Trust	(Davey & Allgood 2002; Dibbern et al. 2004; Dube & Pare 2001; Edwards & Sridhar 2003; Heeks et al. 2001; Kaiser & Hawk 2004; Kishore et al. 2003; Mockus & Herbsleb 2001; Moore & Martorelli 2004; Oza et al. 2004; RajKumar & Mani 2001; Rottman & Lacity 2004)
Co-ordination and Control No. of Customer Liaisons Project Status Meetings Documentation	(Carmel 1999; Carmel & Agarwal 2001; Dube & Pare 2001; Gopal, Mukhopadhyay & Krishnan 2002; Kraut & Streeter 1995; Nurmi, Hallikainen & Rossi 2005; Powell, Piccoli & Ives 2004; Rottman & Lacity 2004; Sabherwal 2003)
Quality Management Issues Audits, Documentation KPA's measured	(Agarwal et al. 2001; Endres & Rombach 2003; Gopal, Mukhopadhyay & Krishnan 2002; Jalote 1999; Oza et al. 2004; Sahay 2003; Sahay, Nicholson & Krishna 2003)
Project Management Estimations, Test Environment, Release Management, Requirements Volatility, Over-Engineering, Training, Prior Domain Experience, Incentives, Staff Attrition	(Agarwal et al. 2001; Cullen 2002; Dube & Pare 2001; Edwards & Sridhar 2003; Gane 2001; Gopal, Mukhopadhyay & Krishnan 2002; Herbsleb & Moitra 2001; Kirsch et al. 2002; Mingus 2001; RajKumar & Mani 2001; Rottman & Lacity 2004; Urquhart 1999)
Type of Contract	(Gopal, Mukhopadhyay & Krishnan 2002; Sahay, Nicholson & Krishna 2003);

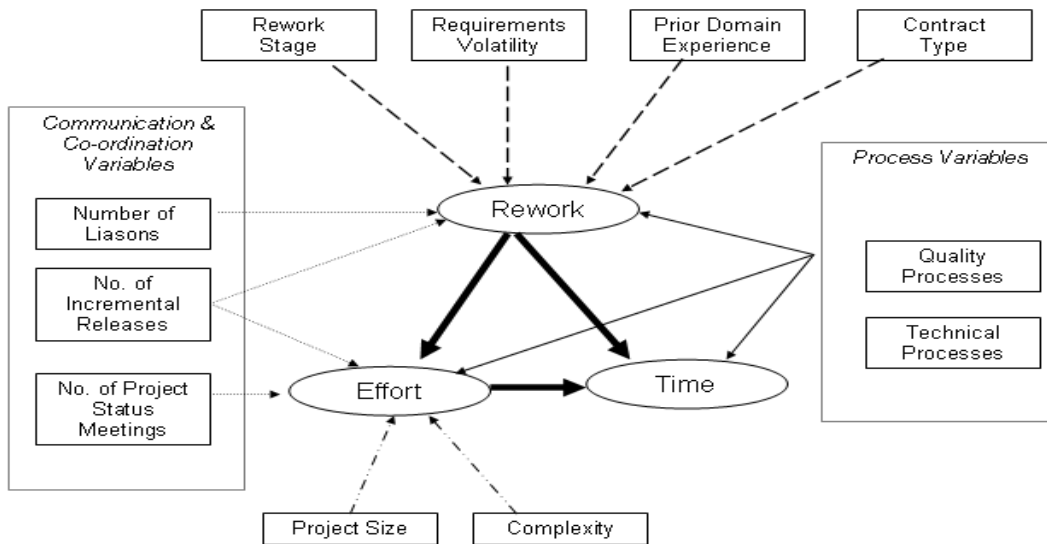
Outsourcing Models

Domain skills relating to technologies, specifications, processes, methodologies, skills, objectives, and management systems can be transferred from client to developer. But they all have informational components consisting of two parts: the explicit knowledge that can be laid out formally and the tacit knowledge regarding customer, design and programming choices, and working practices that cannot (Heeks et al. 2001). Hence, with such extended knowledge, the librarian law applies, which states: "The more knowledge that is available, the more effort has to be spent on the processes to use it". Offshore vendors too have recognized this law and are moving to capitalize on the currently growing global scenario, by trying to capture and emulate offshore development models that have met with success (Herbsleb & Moitra 2001).

Frameworks related to the managing of the process of offshore outsourcing of software development have been developed in previous research studies (e.g. Heeks et al. 2001; Smith, Mitra & Narasimhan 1996). Gopal, Mukhopadhyay et al. (2002) have defined a conceptual model for offshore software development, based on data collected from 34 application software firms from two large offshore development houses in India (see figure 1). Their model emphasizes the effect of many software development processes on the three performance measures of software development viz. time, effort and rework. Software estimation is a continual process used throughout the life cycle of a project, and use of proper documentation with detailed history of model calibration and modifications made will

provide guidelines for future cost estimations in software development (Agarwal et al. 2001; Gopal, Krishnan, Mukhopadhyay & Goldenson 2002). However, certain aspects of virtual team communication, coordination and control, cultural differences, project and process management issues, and relationship management issues too need to be addressed or elaborated in the model, as they have been identified as key variables in earlier literature.

**Figure 1:
Conceptual Model for Offshore Software Development**



Source: (Gopal, Mukhopadhyay & Krishnan, 2002)

Outsourcing Climate in New Zealand and India

Researchers and policy makers have had a long fascination with the question of why a certain national industry succeeds: what led to success, what factors will keep it successful, and what prescriptive factors can be gleaned for other nations to use (Carmel 2003). Success is aided by the software industry's ability to pool some resources into a national association or consortia that serve to promote the nation's industry abroad and provide services back to its member firms. One such case is the prominent Indian association NASSCOM, which helped the branding (in the marketing sense) of the Indian software industry (Carmel 2003). Similarly, a central point of contact for organisations wishing to outsource has also been set up as a joint initiative between ITANZ⁴ and the Government of New Zealand called Outsource2NewZealand (<http://outsource2newzealand.com>) (Hamilton 2004).

At the 2004 Outsourcing and IT Services Summit by the Gartner Group, New Zealand was ranked in the "up and comer" group as an overseas business development destination (Kumar 2004). Gartner says that although NZ cannot beat India head to head, there exists some high-value niche IT disciplines where NZ could be a potential destination for off-shored jobs.

⁴ ITANZ represents the Information and Communications Technology industry of New Zealand; a business sector that generates combined annual revenues in excess of \$11 billion. ITANZ members account for approximately 85% of this revenue and directly employ more than 30,000 people. Their aim is to maximise the economic and social potential inherent in these technologies to create advantages for all New Zealanders.

However, NZ is still not perceived to be a major destination for global outsourcing with some NZ companies having had limited success (Kumar 2004). Another study of 32 NZ organizations over a four-year period shows an ad hoc approach to system development practices, with a low emphasis on mature disciplined processes (Taylor 2000).

Indian vendors have done applications outsourcing and development for many years and, over time, they have developed high quality, mature processes for application support. However, a report from Forrester Research argues that Indian teams are much too used to the disciplined processes that have made them so successful, and these are antithetical to the dynamic nature of many of today's IT organizations (Moore & Barnett 2004).

New Zealand and India are both exemplars of the emerging global software producer market, and a study of their offshore software development processes forms a basis for this research study. The purpose of this research study is to determine and describe the key influences involved in the offshore software development processes from the outsourcer's perspective in NZ and India. What is the emphasis on technical processes, project management practices, and quality processes by NZ and Indian organisations? Such practices ensure that when applications are developed off-site, the service providers would follow set processes to ensure consistent quality.

Research Approach

IS professionals are under continuous pressure for project deadlines, as they slip in and out of different technical, social, and cultural experiences (Sahay, Nicholson & Krishna 2003). These pressures take on a different form and level of complexity when looked at within the context of the temporal and spatial conditions of separation that are inherent in offshore software development processes. A question facing them is "How do the different variables tie technology with the cultural and software development environment to achieve benefits in the global software development processes?" Both practitioners and academia would benefit from a study that determines which variables are considered most important to link technology with the cultural and project management framework of NZ and Indian outsourcers in their global software development processes. Hence, a multiple case study was undertaken of three organizations, of which two are New Zealand organizations and the third is an Indian organization. Project managers and developers belonging to these organizations were interviewed to provide insight into the kind and extent of operations that can be effectively conducted in conditions of globalization. These three mini cases have revealed that certain drivers are considered essential for the offshore development process, consistent with the cultural and social mindset of these organizations.

Organization 1: TechNet is a small (approximately 15 employees) New Zealand IT services provider, based in Auckland. TechNet already has an established name in the local market and has recently entered the outsourcing arena as an offshore provider. It has had some bitter-sweet experiences and has used these to guide its current direction.

TechNet had its first offshore experience with a client based in Australia. The director of TechNet said although this project was "hopeless from the start", his team managed to complete the project within budget and within a reasonable time frame. He attributed the "hopelessness" to the poor communication and coordination with the client. Though NZ shares a close cultural proximity to Australia, TechNet felt that eventually it was the

organizational cultural disparity which got in the way. A telling comment was “I can discuss rugby with them for hours, but when it comes to company culture – NO WAY!”.

This project lasted for three months with deliverables being provided in real time through a virtual private network. Project deliverables were passed daily from the provider to the client team, and the client was required to validate each deliverable. However, the only means of communication between TechNet and the client was through email. TechNet complained that if the client did not agree with them, they would simply not respond to their email messages. Borchers’ (2003) experiment across US, Indian and Japanese teams also supports the view that daily build updates announced via email were not considered a “good thing by developers from any culture”. Furthermore, TechNet did not agree with the source control practices used by the client’s team. TechNet used an automated configuration and change management tool called StarTeam (by Borland) which was not fully exploited by the client. The variation in organizational practices brought the provider a sense of not feeling respected for his efforts and so he decided not to extend the relationship after the final deliverable.

The next offshore project, which is presently underway, is with a client based in the United Kingdom (UK). This time both the client and TechNet are using a customized solution of StarTeam, which is giving good results. Weekly meetings between the provider’s project manager and the client’s project manager takes place and problems are resolved amicably across the table. This job is now nearing completion and is geared for installation, with the provider hopeful for further development work.

Organization 2: SystemNet is a large (approximately 230 employees) New Zealand IT services provider, with its main offshore centre based in Wellington and another centre in Auckland. SystemNet has undertaken many offshore projects in the UK and Singapore. This NZ-owned company is one of the market leaders in NZ with a strong presence in the country’s offshore market and they have ambitious plans for further offshore software development. They have completed many onshore and offshore projects and are major industry participants in offshore discussion groups.

SystemNet was earlier an ISO 9001 certified company, but let the certification lapse due to the extensive documentation requirements for such certification. As the general manager said: “The more you document, the slower you become at changing, as it is extremely hard to change the documentation – and so you don’t change”. Such resistance to documentation by developers has also been highlighted in previous studies (e.g. Herbsleb & Moitra 2001). The use of internal audits using the Baldrige model is SystemNet’s way of coordinating processes rather than through international audits. The Baldrige criteria has been used by businesses since 1987 to measure the maturity of their organisational performance practices, capabilities and effectiveness in making organizations successful. SystemNet felt that it was twice as good as an average company, having scored more than double the points of an average company on the Baldrige scale, but it was nowhere near world class.

The main offshore destination market for SystemNet is the UK, though they have completed many offshore projects in other countries including Singapore. SystemNet emphasizes the importance of long lasting trusting relationships so they have one third of their team located at the client’s site. This team handles all the communication with the clients as “nothing can beat voice”. Then, any other communication between the offshore team and staff in NZ is an internal communication within the organization. Onshore and offshore team members

interact with each other over an internally developed communication tool called Clux or through open source tools for blogging like discussion forums and wikis. The interactive nature of blogging moves it from a “broadcast publishing mode to something closer to a conversation or a community-building and coordinating tool” (Herman 2003: 20). The management of SystemNet is very appreciative of the use of such tools and they have set up special interest groups (SIGs), which have their own electronic editorial boards. These SIGs report some interesting past experiences and also run some excellent documented parts of the wikis.

SystemNet further emphasized the use of automated tools such as ProjectPlus and Microsoft SharePoint as a common frame of reference for sharing documents, tracking of any changes, and overall good software configuration management. However, it did not believe in too much standardization of policies and procedures for development, testing or change implementation.

Organization 3: InfoNet is a medium-sized (approximately 170 employees) Indian IT services provider having small offshore centers in Auckland, Melbourne, and Dallas. InfoNet has earned many export performance prizes from the Indian government. They presently have an offshore presence of 20 employees in Auckland which helped mediate project management across national and cultural boundaries. The offshore centre at Auckland has provided software solutions to many clients in NZ and Australia, including the tertiary sector, health services, online gambling, realtors, and others. Besides bringing tax benefits in the home country (India), this on-site team has also helped mediate cross-cultural barriers. The on-site team members are brought in on a continuous basis on work permits from India and are replaced by other Indian programmers when their work permits expire. These developers work six days a week, with each day’s work extending beyond the customary eight hours.

Further, InfoNet has provided two dedicated phone lines to its parent company in India, in addition to other sophisticated project management tools (e.g. Bynet) to integrate datacom and telecom systems within their development environment. The team members are allowed to freely communicate with friends and family in India through the telecommunication media provided, showing an awareness of the family and social structure of the Indian mindset.

InfoNet feels a special need to build lasting relationships with clients who have long term projects and so team members with good interpersonal skills are assigned to the client. In the words of the vice president of InfoNet “We provide a dedicated resource and they work as an extended arm of the client and so get well trained in the customer process and domain knowledge of the customer requirements”. Further meetings are held weekly or fortnightly between the project leader and the clients, which are documented in the form of minutes, so that all participants can receive the same message. Hence, knowledge is understood, codified, disembedded, and transferred across time and space to be re-embedded in other contexts as also described by Sahay et al. (2003). The InfoNet vice president admitted that these processes bring in a hierarchical and bureaucratic culture, but felt that they were necessary in order to avoid problems with processes, deliverables, deadlines, and effort that might result from miscommunication.

Another strategy to coordinate activities is the standardization of the project practices domain. Universal templates to define, guide, and evaluate management practices are rigorously maintained, somewhat like an organized religion. These standardised systems,

codified in manuals, serve as points of reference to coordinate activities across time and space. InfoNet took pride in these practices and showed the researcher many templates from past projects and current live projects. These documents are also necessary as InfoNet is a CMM Level 3 certified company and is audited by international external agencies on a regular basis.

Analysis of Field Survey

Examination of literature focussing on the processes involved in the offshore software development helped to formulate semi-structured questions for each case study, with a consistent basis to enable cross case comparison. Data were collected at each site through interviews, observations, documents, and field notes. The data gathered from the three cases were then analysed in view of the key success drivers shown in Table 1. Each issue was discussed and related to the relevant theoretical concepts, which have been identified from relevant academic literature.

A comparison of the work practices associated with the different driving variables which emerged from the case data for these organizations is shown in Table 2. While it is too speculative to comment on their strategies, it is interesting to analyse some of their methods in dealing with these issues.

Table 2: Analysis of Case Data Variables

Variables	New Zealand TechNet	New Zealand SystemNet	Indian InfoNet
Culture	<p>Team is New Zealanders/ European mix.</p> <p>Teams work 5 days per week. The Management is 'happy' on keeping a balance between work and fun at the workplace.</p>	<p>Team is a mix of New Zealanders/ Europeans and Asians/ Indians. The company website too boasts of its cultural mix.</p> <p>Working hours are team dependent. However, there is no compulsion to work on weekends.</p>	<p>Team is totally Indian (programmers come from India on work permits).</p> <p>The teams regularly work 6 days per week, and are encouraged to work late hours.</p>
Communication	<p>Informal</p> <p>Email alone was used in the first project, but they now realise the need for a strong client interface.</p> <p>Regular interactive face-to-face meetings are held with the client representative in NZ.</p>	<p>Semi – Formal</p> <p>Email, instant messaging, wikis created for separate project groups between project teams.</p> <p>Face-to-face meetings of onshore team with clients. Video conference facilities mainly used by management and generally used for stressful meetings.</p>	<p>Formal</p> <p>Dedicated telephone lines, email, instant messaging through open source tools (e.g. msn messenger, skype) between project teams.</p> <p>Regular meetings of onshore team with clients and feedback of these meetings are communicated to senior management regularly. Telephone conferences are used on a regular basis.</p>

Relationship Building	<p>No onshore team at client destination.</p> <p>Earlier project did not have any client interaction, and the project ended with some bitter feelings. Now the project manager holds weekly meetings with the client representative.</p>	<p>Split onshore and offshore team.</p> <p>Project manager at the onshore site interacts regularly and informally with the client. SystemNet did not feel a need for any intervention by senior management for further relationship building, as it was the responsibility of the onsite group project leader.</p>	<p>Split onshore and offshore team.</p> <p>One senior experienced vice-president is stationed in the client country, who interacts with the clients on a regular basis. He explained his presence, due to the “introverted” nature of his programmers. Also, visits by clients to India are encouraged and their local needs in India are looked after by the HR team of InfoNet.</p>
Coordination and Control <ul style="list-style-type: none"> • Documentation • No. of Project Status Meetings • Tools used mostly by teams 	<p>Felt no documentation was needed. In the words of the director “Our job is programming, not taking minutes”.</p> <p>None in the first offshore project. Now, weekly or fortnightly face-to-face meetings with the client representative.</p> <p>Borland StarTeam</p>	<p>Minimal documentation Taking minutes of meetings depends upon the project team leader – and is project dependent.</p> <p>Meetings are decided by the project manager.</p> <p>Internally developed tool called Clux</p>	<p>Extensive documentation. Each project meeting is minuted and knowledge captured is sent to all participants.</p> <p>Weekly or fortnightly, in a formal atmosphere with vice president, project manager, on-site team members and offshore team members.</p> <p>Bynet</p>
Quality Processes	<p>No external certification, no standards for internal quality audits laid down, but keen to understand simple measures to control quality.</p>	<p>No external quality certifications (earlier an ISO 9001 certified organization, but felt the immense documentation reduced their flexibility to change), internal audits, use of Baldrige criteria to measure its maturity.</p>	<p>CMM Level 3 Organization Rigid quality practices are followed through regular audits by international agencies.</p>
Project Management <ul style="list-style-type: none"> • Cost, Time and Effort estimation • Prior Domain Experience • Test Environment • Requirement Volatility 	<p>Combination of ad-hoc estimations and judgement on the client’s capability to pay.</p> <p>Developers develop new skills on the job as the need arises per project.</p> <p>No standardization of the test cases.</p> <p>No formal procedure, but work is passed on regular basis and changes are generally absorbed.</p>	<p>Combination of statistical methods, expert judgement or Delphi Method and past project experience.</p> <p>Developers are given training on new language skills before being put on the job.</p> <p>No standardization of the test cases.</p> <p>Encountered problems with expectation management both from client and over enthusiastic developers.</p>	<p>Combination of statistical methods, expert judgement or Delphi Method and past project experience.</p> <p>Recruitment of developers with science degrees, strong technical skills and certifications.</p> <p>Test cases are standardized and placed in a centralized repository for common use by onsite and offsite developers.</p> <p>All changes are done through a formal procedure (with complete authorization, verification, and</p>

<ul style="list-style-type: none"> Attrition Rates (in past 2 years) 	<p>Zero</p> <p>The family like atmosphere was very conducive to the working environment.</p>	<p>Intervention of senior management is often required, if deadlines are not met.</p> <p>5 %</p> <p>However, a recent newspaper and TV report says the attrition rate of SystemNet has increased to 15%.</p>	<p>documentation). InfoNet absorbs 5 to 10 % of changes at later stage</p> <p>10 to 20 %</p> <p>Management was very unhappy with the volatile attrition rates and expressed their sentiments in very strong words.</p>
<p>Types of Contracts</p>	<p>Fixed Price Contracts, Time-and-Material Contacts</p>	<p>Fixed Price Contracts, Time-and-Material Contacts, Joint Ventures</p>	<p>Fixed Price Contracts, Time-and-Material Contacts, Joint Ventures</p>

Conclusion:

The aim of this paper has been to further clarify what we know, and what we don't know, about the practices linked with the key drivers of the offshore development process. A comprehensive list of the key drivers pertinent to offshore software development success was identified through a review of literature. These success variables have then been analysed in the context of a multiple case study by using three software vendors associated with NZ and India.

The case data revealed that the driver variables associated with the work practices differed in each of the three cases. It is interesting to note that the Indian company emphasised extensive usage of documentation, prior domain experience of developers, formal meetings with the clients, a centralized test case repository, and the use of standardized templates for project management. On the other hand, cases selected from New Zealand organizations had less rigid or sometimes no practices defined for certain variables. The ad-hoc processes involved with TechNet could also be attributed to the small size of the organization. When this question was raised to these NZ organizations as to why they had such an ad-hoc approach to these variables, their feedback was that rigid processes would bring a bureaucratic and hierarchical structure to the organizations. Their developers were proud of the autonomy given to them while handling the software development activities. This argument could also explain the reason for the high attrition rate of the Indian organization. However, the high attrition rate could also be explained due to the highly technical and professionally certified intake of developers, who are eager to learn more and also move up the career ladder by joining different organizations.

While there has been no general consensus on appropriateness of methods used for different drivers, the case study results revealed that for offshore software development, a significant challenge perceived by all the outsourcers was in building an effective relationship with the client, and dealing with communication gaps and understanding of each other's work practices. They each identified alignment of client and provider organizational culture through regular physical meetings to bring about a shared understanding of each other's products, processes, and work practices.

To summarize the findings in view of the case study data is that the selected New Zealand outsourcers consider drivers like informal and semi-formal means of communication,

minimal documentation, and internal quality checks rather than external agency quality accreditations, important to successful offshore development processes. The Indian outsourcer, on the other hand, perceived more formal communication and documentation processes instrumental to project success. They also emphasized external quality certifications like CMM, which they explained made them more “global” and was especially important for entering into the US market. All three organizations emphasized the importance of strong professional relationships through social interactions with clients, as well as the use of automated communication tools.

The findings reported in this study are the result of only three cases. The risk of forming conclusions from this small sample may lead to generalizations which may not hold true for all cases. Additional exploratory studies of this type are required, so that the software community understands how practitioners actually work with offshore projects. Further research is in progress to analyse some of the methods adopted in dealing with the variables involved in the offshore software development process.

References:

- Agarwal, R., Kumar, M., Mallick, Y., Bharadwaj, R.M. & Anantwar, D. 2001, 'Estimating software projects', *SIGSOFT Software Engineering Notes*, vol. 26, no. 4, pp. 60-67.
- Aman, A. & Nicholson, N. 2003, 'The Process of Offshore Software Development: Preliminary Studies of UK Companies in Malaysia', in M. Korpela, R. Montealegre & A. Poulymenakou (eds), *Information Systems Perspectives and Challenges in the Context of Globalization*, vol. 254, Kluwer.
- Beck, J. 2002, *IT Services Sourcing Goes Strategic*, Gartner, viewed February 7, 2005 <<http://www4.gartner.com/resources/106000/106031/106031.pdf>>.
- Borchers, G. 2003, 'The Software Engineering Impacts of Cultural Factors on Multi-cultural Software Development Teams.' *25th International Conference on Software Engineering*, IEEE, Portland, Oregon, pp. 540 -545.
- Carmel, E. 1999, *Global Software Teams*, Prentice-Hall, New Jersey.
- Carmel, E. 2003, 'The New Software Exporting Nations: Success Factors', *The Electronic Journal on Information Systems in Developing Countries*, vol. 13, no. 4, pp. 1-12 <<http://www.ejisdc.org>>.
- Carmel, E. & Agarwal, R. 2001, 'Tactical Approaches for Alleviating Distance in Global Software Development', *IEEE Software*, no. March/April, 2001, pp. 22-29.
- Coopridge, J.G. & Henderson, J.C. 1991, 'Technology-Process Fit: Perspectives on Achieving Prototyping Effectiveness', *Journal of Management Information Systems*, vol. 7, pp. 67-87.
- Crampton, C. 2001, 'The Mutual Knowledge Problem and its consequences for Dispersed Collaboration', *Organization Science*, vol. 12, no. 3, pp. 346-371.
- Cullen, P. 2002, 'The Pitfalls of Client/ Server Development Projects', in P.C. Tinnirello (ed.), *New Directions in Project Management*, Auerbach, Boca Raton, pp. 373-382.
- Davey, H. & Allgood, B. 2002, 'Offshore Development, Building Relationships across International Boundaries: A Case Study', *Information Strategy: The Executive's Journal*.
- DeLone, W., Esponosa, J.A., Lee, G. & Carmel, E. 2005, 'Bridging Global Boundaries for IS Project Success', *38th Annual Hawaii International Conference on System Sciences*, ed. I.C. Society, Big Island, Hawaii.

- Dibbern, J., Goles, T., Hirscheim, R. & Jayatilaka, B. 2004, 'Information Systems Outsourcing: A Survey and Analysis of the Literature', *DATABASE for advances in Information Systems*, vol. 35, no. 4, pp. 6-102.
- Dube, L. & Pare, G. 2001, 'Global Virtual Teams', *Communications of the ACM*, vol. 44, no. 12, pp. 71-73.
- Edstrom, A. 1977, 'User Influence and Success of MIS Projects: A Contingency Approach', *Human Relations*, vol. 30, no. 7, pp. 580-607.
- Edwards, H.K. & Sridhar, V. 2003, 'Analysis of the Effectiveness of Global Virtual Teams in Software Engineering Projects', *38th Hawaii International Conference on System Sciences*, IEEE.
- Ein Dor, P., Segev, E. & Orgad, M. 1993, 'The effect of national culture on IS: implications for international information systems', *Journal of Global Information Management*, vol. 1, no. 1, pp. 33-44.
- Endres, A. & Rombach, D. 2003, *A Handbook of Software and Systems Engineering - Empirical Observations, Laws and Theories*, 1 edn, Pearson Education Limited, Essex, England.
- Gane, C. 2001, 'Process Management: Integrating Project Management and Development', in P.C. Tinnirello (ed.), *New Directions in Project Management*, Auberach, Boca Raton, pp. 67-82.
- Gopal, A., Krishnan, M.S., Mukhopadhyay, T. & Goldenson, D.R. 2002, 'Measurement programs in software development: determinants of success', *IEEE Transactions on Software Engineering*, vol. 28, no. 9, pp. 863 - 875.
- Gopal, A., Mukhopadhyay, T. & Krishnan, M. 2002, 'Virtual Extension: The Role of Software Processes and Communication in Offshore Software Development.' *Communications of the ACM*, vol. 45, no. 4, pp. 193-200.
- Hamilton, G. 2004, 'The "Outsource2NewZealand" Initiative', *Software Development Conference 2004*, Software Education Associates Limited, Wellington, New Zealand.
- Heeks, R., Krishna, S., Nicholson, N. & Sahay, S. 2001, 'Synching' or 'Sinking': Trajectories and Strategies in Global Software Outsourcing Relationships', *IEEE Software*, vol. 18, no. 2, pp. 54-62.
- Herbsleb, J. & Moitra, D. 2001, 'Global software development', *IEEE Transactions on Software Engineering*, vol. 18, no. 2, pp. 16 - 20.
- Herman, J. 2003, 'Blogs for Business', *Business Communications Review*, vol. 33, no. 4, pp. 20-23.
- Hinds, P.J. & Weisband, S.P. 2003, 'Knowledge Sharing and Shared Understanding in Virtual Teams', in J.W. Sons (ed.), *Virtual Teams that Work: Creating Conditions for Virtual team Effectiveness*, First edn, vol. 1, Jossey-Bass, San Francisco, CA, pp. 21-36.
- Hulnik, G. 2000, 'Doing Business Virtually', *Communication World*, vol. 17, no. 3, pp. 33-36.
- Jalote, P. 1999, *CMM in Practice: processes for executing software projects at Infosys*, Addison Wesley Longman, Massachusetts.
- Kaiser, K. & Hawk, S. 2004, 'Evolution of Offshore Software Development: From Outsourcing to Cosourcing', *MIS Quarterly Executive*, vol. 3, no. 2, pp. 69 - 81.
- Keane, B. 2003, 'Outsourcing as a Means of Improving Process Maturity: An approach for More Rapidly Moving up the Capability Maturity Model', in P.C. Tinnirello (ed.), *New Directions in Project Management*, Auberach, Boca Raton, pp. 331-339.
- Kirsch, L., Sambamurthy, V., Ko, D. & Purvis, R. 2002, 'Controlling Information Systems Development Projects: The View from the Client', *Management Science*, vol. 48, no. 4, pp. 484 - 498.

- Kishore, R., Rao, H.R., Nam, K., Rajagoplalan, S. & Chaudhury, A. 2003, 'A Relationship Perspective on IT Outsourcing', *Communications of the ACM*, vol. 46, no. 12, pp. 87-92.
- Kraut, R.E. & Streeter, L.A. 1995, 'Coordination in large scale software development', *Communications of the ACM*, vol. 38, no. 7, pp. 69-81.
- Kumar, S. 2004, 'New Zealand Trade and Enterprise - Strategic Capabilities Assessment', *Software Development Conference 2004*, ITANZ, Wellington, New Zealand.
- Lacity, M. & Hirscheim, R. 1994, *Information Systems Outsourcing: Myths Metaphors and realities*, John Wiley & Sons.
- Lacity, M. & Willcocks, L.P. 1998, 'An Empirical Investigation of Information Technology Sourcing Practices: Lessons from Experience', *MIS Quarterly Executive*.
- Levina, N. & Ross, J.W. 2003, 'From the Vendor's Perspective: Exploring the Value Proposition in Information Technology Outsourcing', *MIS Quarterly*, vol. 27, no. 3, pp. 331 - 364.
- Lurey, J. & Raisinghani, M. 2001, 'An Empirical Study of Best Practices in Virtual Teams', *Information & Management*, vol. 38, pp. 523-544.
- Mark, G. 2001, 'Meeting Current Challenges for Virtually Collocated Teams: Participation, Culture, and Integration', in L. Chidambaram & I. Ziguers (eds), *Our Virtual Worlds: the Transformation of Work, Play and Life via Technology*, Idea Group Publishing, Hershey, PA, pp. 74-93.
- Mingus, N.B. 2001, 'Managing Project Management', in T. P.C. (ed.), *New Direction in Project Management*, Auberach, Boca Raton, pp. 25-32.
- Mockus, A. & Herbsleb, J. 2001, 'Challenges of Global Software Development', *IEEE Software*, pp. 182-184.
- Moore, S. & Barnett, L. 2004, *Offshore Outsourcing and Agile Development*, Forrester Research Inc.
- Moore, S. & Martorelli, W. 2004, *Indian Offshore Suppliers: The Market Leaders*, Forrester Research Inc.
- Nam, K., Rajagopalan, S., Raghav, R., H. & Chaudhury, A. 1996, 'A Two Level Investigation of Information System Outsourcing', *Communications of ACM*, vol. 39, no. 7, pp. 36-44.
- Nurmi, A., Hallikainen, P. & Rossi, M. 2005, 'Coordination of Outsourced Information System Development in Multiple Customer Environment - A Case Study of a Joint Information System Development Project', *38th Hawaii International Conference on System Sciences*, IEEE.
- Oza, N., Hall, T., Rainer, A. & Grey, S. 2004, 'Critical factors in software outsourcing: a pilot study', *2004 ACM workshop on Interdisciplinary software engineering research*, ACM Press, Newport Beach, CA, USA, pp. 67--71.
- Powell, A., Piccoli, G. & Ives, B. 2004, 'Virtual teams: a review of current literature and directions for future research', *SIGMIS Database*, vol. 35, no. 1, pp. 6-36.
- Ptak, R. 2005, *White Paper on Managing IT Infrastructure for Business Success*, Ptak, Noel and Associates.
- RajKumar, T.M. & Dawley, D.L. 1998, 'Problems and Issues in Offshore Development of Software', in, *Strategic Sourcing of IS - Perspectives and Practices*, John Wiley and Sons, pp. 369-386.
- RajKumar, T.M. & Mani, R.V.S. 2001, 'Offshore Software Development: The View from Indian Suppliers', *Information Systems Management*, vol. 18, no. 12, pp. 62-72.
- Ravichandran, R. & Ahmed, N. 1993, 'Offshore System Development', *Information and Management*, vol. 24, pp. 24-40.

- Rottman, J. & Lacity, M. 2004, 'Twenty Practices for Offshore Sourcing', *MIS Quarterly Executive*, vol. 3, no. 3, pp. 117 - 130.
- Sabherwal, R. 2003, 'The Evolution of Coordination in Outsourced Software Development Projects: A Comparison in Client and Vendor Perspectives', *Information and Organization*, vol. 13, no. 3, pp. 153-202.
- Sahay , S. 2003, 'Global software alliances: the challenge of 'standardization"', *Scandinavian Journal of Information Systems*, vol. 15, no. 1, pp. 3-21.
- Sahay , S., Nicholson, B. & Krishna, S. 2003, *Global IT Outsourcing - Software Development across Borders*, First edn, Cambridge University Press, United Kingdom.
- Shore, B. & Venkatachalam, A.R. 1995, 'The role of national culture in system analysis and design', *Journal of Global Information Management*, vol. 3, no. 3, pp. 5-14.
- Smith, M.A., Mitra, S. & Narasimhan, S. 1996, 'Offshore Outsourcing of Software Development and Maintenance: A Framework and Issues', *Information and Management*, vol. 31, pp. 165-175.
- Taylor, H. 2000, 'Information Systems Development Practice in New Zealand', *13th Annual Conference of the National Advisory Committee on Computing Qualifications*, Wellington, New Zealand, pp. 367-372.
- Tiwana, A. 2003, 'Knowledge Partitioning in Outsourced Software Development: A Field Study', *International Conference on Information Systems*, Seattle, Washington, pp. 259-270.
- Urquhart, C. 1999, 'Themes in early requirements gathering', *Information Technology & People*, vol. 12, no. 1, pp. 44-70.