Working Paper

IIMK/WPS/471/OB&HR/2021/09

July 2021

Client-centric modular architecture: Empirical investigation into the organizational design of a large Indian IT service vendor

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Abstract

Modularity is increasingly being discussed as the most relevant organization design principle for the current organizational landscape. Although an intuitively appealing concept, empirical literature that shows how modular organization designs actually look like in practice is scarce. In this paper, we address this gap. Based on an in-depth case study of an Indian IT services vendor, we provide a blueprint of its modular architecture. The study also surfaces that the underlying design logic as client-centric modularity, and not product/service-centric modularity as the dominant literature would have predicted. The client-centric modular design enables the organization not only to minimize the task interdependence among organizational units, but also to reduce the impact of external environment on the overall organization by restricting client related complexities to single organizational units. Further, we discuss the implications for research and practice.

Key words: Modularity, Organizational Design, Services, IT services

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Introduction

Modularity may be the most celebrated design concept of the last decade. The concept hinges on the idea that a system can be broken into components that have minimal interdependencies between each other, and made into whole by recombining them through structured interfaces (Baldwin and Clark, 1997; Schilling, 2000). Both academics and practitioners find modularity as a versatile concept applicable to a variety of design issues in management including product/service design, production system design and organization design (Campagnolo and Camuffo, 2010). In the last five years, the interest in exploring the potential of modularity in organization design in particular, has increased (Colfer and Baldwin, 2010). Perhaps because modularity concept was first applied in product design, modular organization design is often seen as a mere mapping the modular product architecture onto organizational architecture. The current literature barely ventures out of examining the correspondence between product architecture and organizational architecture. Campagnolo and Camuffo (2010) say that 'modularity in the organizational design context is still seeking its theoretical 'identity'' (p.276) and calls for studies that show how modular organizational designs look like in practice. In response, we undertook an in-depth case study of the organizational architecture of a large Indian IT services vendor. We discovered that this organization was indeed modular, but the underlying logic of the organization design was client-centric modularity, and not product/service-centric modularity as the dominant literature would have predicted. In this paper, we provide a detailed description of the modular organizational architecture and an empirical model based on the findings. We further discuss the implications of the findings for research as well as practice.

The paper is organized as follows. First, we present an overview of the existing literature. Then we explain the research methods and findings. This will be followed by the discussion of the empirical model and implications for research and practice.

Literature

Modularity emerged as an engineering approach in the field of product design (Sanchez and Mahoney, 1996) and has spread to other aspects of firms such as production systems design (Sturgeon, 2002) and organizational design (Campagnolo and Camuffo, 2010) Near-decomposability of complex systems (Simon, 1962) allows them to be broken into component systems with minimal interdependence and recombined in a loosely-coupled fashion (Weick and Orton, 1990) through structured interfaces (Schilling, 2000) with little loss of functionality (Langlois, 1992; Sanchez, 1995). In today's context heterogeneity of both inputs and demands increases pressure for the system to become more modular (Schilling, 2000).

A modular approach makes it possible to access necessary components from anywhere in the world through strategic alliances and outsourcing (Langlois, 1992). Schilling and Steensma (2001) suggest that availability of standards, technological change, and competitive intensity that characterize today's competitive landscape heighten the need for flexibility leading to modular organizational arrangements such as contract manufacturing, alternative work arrangements, and alliances. Modular production systems are now common in many industries (e.g. Sturgeon 2002) where responsibility for delivering different components/services is outsourced to various other organizations. The basic premise is that the technical interfaces between product modules will become natural interfaces between the organizations. Though it is yet to be resolved whether product design modularity led to outsourcing, or the other way round, both are found to be strongly interlinked (Campagnolo and Camuffo, 2010; Hoetkar 2006).

In nascent ways, modularity has begun to feature as an organization design principle

(Campagnolo and Camuffo, 2010). Compared to the product design and production system modularity literature, organization modularity literature is very thin. Campanagnolo and Camuffo (2010) distinguish between one stream that examines the relationship between product architectures and organizational architectures and the other stream that applies the concept of modularity to the entire organizational structure. The majority of studies in this area belong to the former stream. A key idea that had been driving this stream is that organizations can be made modular by mirroring the modular architecture of the products they make (the 'mirroring hypothesis' - Colfer and Baldwin, 2010), i.e. coordination needs within organization can be minimized by grouping all activities related to the specific aspects of a product under one organizational unit and the organization will be a collection of several such units (Baldwin and Clark, 2003). A vast majority of the research is aimed at proving or disproving this relationship (Colfer and Baldwin, 2010; MacCormack et al., 2011; Brusoni and Prencipe, 2001; Cabigiosu and Camuffo, 2012; Langlois 2002; Sosa et al., 2004), though conclusions are not unanimous.

The second stream does not presuppose such a relationship and aims to examine the concept of modularity as applied to organizational structure directly (Campagnolo and Camuffo, 2010). Baldwin and Clark (1997) advise that modularity can be achieved by separating the information into 'visible design rules' and 'hidden design parameters'. Visible design rules are decisions pertaining to the overall design and include architecture (modules and their functions), interfaces (how the modules will communicate and interact) and standards (tests for confirming module's adherence to rules). Hidden design parameters on the other hand are decisions pertaining to local modules that do not affect the others. It is expected that this will make complexity manageable, enable parallel work and improvement, and generate adaptability to deal with uncertainty (Bladwin and Clark, 2003). Campanagnolo and Camuffo (2010) point out that although scholars study the effects of modular organization structures, there has been

only very limited research that defines modular organizational structures. This may partly because most modularity research seems to focus on industry level analysis and thus losing out on the firm-level richness (Schilling and Steensma, 2001).

This paper is aimed at addressing this gap in literature. In this paper, we examine and describe the phenomenon of modularity by identifying and outlining its contours in operational terms at a firm level. Specifically, we look at how modules, interfaces, and standards operate together in a modular service provider firm. One of the challenges of modularity is asset specificity (Schilling and Steensma, 2001) and it may be reduced through the development of standardized interfaces (Sanchez, 1995; Sanchez and Mahoney, 1996) between modules. Quality systems and standards is one such useful interface element especially to enforce adherence to quality standards from outsource vendors. Campaganolo and Camuffo (2010) ask a very pertinent question about the relationship between adoption of a process perspective and a modular organizational structure. Our study explores how adoption of an industry standard such as Capability Maturity Model (CMM) provides a process based framework for the entire firm, thus acting simultaneously acting as standard as well as a driver of modular organization.

Our study is based in service sector because of the paucity of modularity studies in this sector. Most of the modularity scholarship is focused on contract manufacturing firms and industries and not on services (Bask et al., 2010; Miozzo and Grimshaw, 2005). Although a few attempts have been made recently to apply the idea of modularity in the service industry (Pekkarinen and Ulkuniemi, 2008), at this point, it is still quite limited in its scope. For example, Bask et al (2010) describe how modularity may be applied in the service industry, but their paper focuses on manufacturing services, specifically logistics. The primary concern of current the service modularity literature is service design than service organization design (Voss and Hsuan, 2009). As Bask et al. (2010) argue, service modularity is a more complex entity than product modularity because it involves the “human touch”. Miozzo and Grimshaw (2005) who studied

modularity in IT services industry, support this view, and point out that the knowledge-bound and inseparable nature of IT services and Knowledge Intensive Business Services (KIBS) in general make them extremely difficult for practicing modularity. We located our study in a large Indian integrated service provider in the field of IT and Business Services, and performed an empirical investigation of the use of modularity principles in the organization design.

Research Method

Since the purpose of the research was to generate a thick description of 'how' modularity is applied in organization design in order to yield nuanced understanding of the concept in practice, we decided to go for a single organization case study method (Yin, 1984). A combination of methods including observation, interviews and the study of organizational documents and software systems was used to collect the data.

Research site

The study was conducted in a large IT services outsourcing company in India, which will be referred to henceforth as Indian Services Company (ISC). ISC was chosen as the site as it is regarded as a typical, but exemplar IT services vendor. ISC was founded in 1980's and entered the outsourcing market in 1990's. It is now among the top 5 IT services companies in India in employee strength and revenue and enjoys a worldwide reputation. ISC is a CMM Level 5 company (Capability Maturity Model® Integration (CMMISM), Version 1.1, 2002) and has laid out business processes for each step in the delivery of services and closely monitor the quality standards. ISC has won several awards in this regard.

ISC is typical of the IT services companies in India in its spectrum of services, and the business domains and geographic spread of its clientele. ICS services include development of customized software, software application maintenance and support, business process consulting, packaged software implementation, infrastructure management, software testing etc. The clients belong to the business domains of telecom, banking, financial services,

insurance, manufacturing, retail, energy and transportation and are predominantly from North America and Europe. At the time of data collection ISC had 700+ clients and 97% of the revenue was from repeat clients.

Data collection

Data collection was done in two phases. In the first phase, information regarding the overall organizational architecture was collected from documentations on formal organization structure, intranet sites of all departments, annual reports, training materials, knowledge management repositories etc. In addition, interviews were conducted with managers from service delivery units as well as support departments such as Quality, R&D and HR.

In order to develop a deeper understanding of the internal structure and management of delivery units, a field study comprising of observation of a delivery team and interviews of its members was conducted. Access was granted to the internal documentations, meetings and software applications used by the team. Interviews of a second team that served a client from a different domain and geographic region also was conducted to generate data for comparison.

Substantial differences between teams in internal structures and processes were revealed in the initial data analysis. In order to make sure that the differences were not merely because of the domain and geographic differences, in the second phase of data collection, interview data was collected from two more delivery teams that served clients in the same domain and geographic region of the first team. The total number of respondents in the end was 58, of which 32 were software engineers, 12 team leaders, 10 managers, and 4 support function managers/executives.

Data analysis

Data analysis was done using Baldwin and Clark's (1997) framework for modular systems design. The focus was on identifying the components that they proposed a modular system should have, viz. visible design rules that affect the overall design and hidden design parameters that affect the individual modules. Visible design rules include architecture,

interfaces and standards. Qualitative coding of the data was done to identify the organizational units that were part of the overall organizational architecture and their functions, interfaces for communication and coordination between them, and process and performance indicators that served as standards to judge if they are meeting their objectives were identified. Further, an examination of the hidden design parameters affecting of modules responsible for service delivery was conducted. The differences between their internal structures, processes and management practices were mapped with the objective of uncovering the factors that led to them. In the next section, we present the visible design rules applicable across the organization as well as the hidden design parameters relevant for service delivery modules.

Findings

We discovered that the overall organizational design of ISC followed modularity principles. Further, we found that there were design parameters that affected individual organizational modules and most of these were related to the clients. The organizational architecture, interfaces and standards that constitute the visible design rules as well as the hidden design parameters and how they are dealt with by the organizational modules are described below.

Visible design rules

Table 1 provides a summary of the architecture, interfaces and standards.

Insert Table 1 about here

Organizational architecture

In ISC, organizational units dedicated for service delivery form the biggest structural elements in the formal organizational architecture. The most basic units for service delivery are the ‘account teams’. Each account team is dedicated to a particular client. Account teams are grouped into ‘business units’ and subunits based on the business domain and geographical location of the client. The non-service delivery part of ISC consists of support units and R&D

units. Support units include quality, HR, training, information systems, data security and audit, corporate planning, sales etc. The R&D units are meant for researching into process innovations and creating the infrastructure and technical tools for improving the service delivery in ISC as a whole. Account teams as well as support and R&D units are designed in modular fashion, i.e. each of them has independent task responsibility, is self sufficient in resources, and interacts with the other units through highly structured interfaces. The focus of this study is on account teams because of their centrality to service delivery.

An account team has *independent task responsibility* in meeting all service needs of its client. More often than not, in IT services outsourcing business, clients rely on the outsourcing vendor to deliver a range of services on an ongoing basis, than one or two random projects. Since IT is the backbone of business these days, each client may have hundreds of IT applications to support each of their business process. While outsourcing, many clients bundle together a number of closely interrelated IT applications and assign these portfolio of applications to a vendor. Client needs could range from day-to-day helpdesk and support services and minor changes to programs underlying these applications, to major redesign and changes to applications and development of new ones. Even when the services are of different types, the interdependencies among them may be high as they belong to the same set of IT applications. Therefore, assigning all services pertaining to a client to a single unit in the organization proves to be a better strategy to reduce interdependencies. Thus the interdependencies are contained within that unit. All teams in this study were given independent responsibility for servicing their respective clients. They hold sole responsibility for every stage in service delivery – from the initial service request or project idea, the effort and budget estimations, negotiation and planning, to the final stages of execution and even maintenance later.

The account teams also have *independent responsibility for profits*. The team managers (called ‘project managers’) are required to calculate the profit margins before bidding for a new project

from the client and ‘approval to bid’ is given only if the profit margins were above a certain level. The project managers carry the responsibility to maintain or improve the profit margin.

As a CMM Level 5 company, ISC is a staunch follower of *process frameworks* for every conceivable aspect of the business. Process frameworks are used to define the stages involved, the input and output for each stage, documentation to be kept, responsibilities of those who will be involved, potential risks and mitigation plans etc. The quality department of ISC provides detailed manuals on how to define processes for different kinds of services and supplies ready-to-use templates. In the beginning of each service project, the senior engineers and team leaders are required to produce a document that laid down the exact processes that will be following in that project. Tailoring of the framework is strongly encouraged so that it fits the specific features and demands of the service to be delivered. ISC insists that every project is at CMM4 level or above.

The account teams are *self sufficient in resources,* especially human resources, both in terms of number of members in the team and the available set of skills. Every team is composed of software engineers, team leaders and project managers. The team size is decided based on the volume of service needs, leading to variations in size from team to team. For example, three teams in the study had members in the range of 40-70 while the fourth team had 250 members. Self-sufficiency is needed in skills as well. IT infrastructure and applications of most vendors are based on a variety of hardware platforms, database technologies, programming languages and tools. In order to cater to all service needs, it is necessary that the members of the account team collectively possess skills in all technologies that the client uses. In ensuring self-sufficiency, sometimes, variations in manpower requirements crop up as a challenge.

At any given point in time, the client may have multiple service needs (each called a ‘project’). The big projects (e.g. development or enhancement of a new software module) go on for months to years, while the small ones (e.g. assessing the impact of making minor changes in

one program on the other programs, or fixing a small bug) takes only a few days to weeks. The number of people required to carry out each project varies drastically resulting in fluctuations in manpower requirements over time. The responsibility for acquiring and deploying human resources rests with the teams. Careful project planning and work allocation practices are followed in teams to even out the fluctuations in resource requirements and utilization.

Thus, task independence, profit responsibility, process frameworks and resource self-sufficiency make the account teams self-contained modules. They have little interdependencies with other organizational units, and thus are encapsulated entities. The encapsulation of the account teams that we studied was so total that it had led to social encapsulation of its members. It was observed that the team members tended to confine their social relationships and interactions to their own teammates. It was interesting that geographic co-location was not a necessary condition for this. The team members were in constant communication with their teammates located onsite via chatting software and phone all through the day, but most of them did not even know the names of members from other account teams who sat in cubicles adjacent to theirs. The most cited reason for this was high mutual dependence within the team, and the lack of need for interaction with other teams.

Interfaces

The second key element of modular systems is interfaces or integration mechanisms that specify how different modular units interact and fit with each other. In this section, we describe the nature of relationships and tools for interaction between the account teams and other organizational units. The account teams have no interdependency with other account teams in ISC (not even with those served clients in the same domain or geographic region) and hence there is no need for interactions. No interfaces that enabled direct interactions among account teams were found. The organizational units that they interact with in the parent organization are the support and R&D units.

The relationship with each support unit is of a different nature, and this determines the purpose of the interface. For example, units such as sales and business planning are meant to find new clients or service opportunities. Their interaction with account teams are mainly for *coordinating* the efforts in the initial phases of bidding and negotiations. Interactions may be through designated people, emails/phone and/or face-to-face meetings.

Units such as Finance have a more *monitoring or control* role. The interactions are through online systems implemented organization-wide (the team member could fill the online form, which will be delivered to the concerned person for information and/or approval). Clarifications are sought through emails (which are stored in designated folders as part of records) or over the phone. Face-to-face meetings are rare even when they are located in the same physical premises.

R&D units as well as many other support units (e.g. IT) are viewed as *'service providers'*, they in turn view the account teams as 'internal customers'. The relationship that the account teams have with the support functions is similar to the relationship between the teams and their clients. The interactions are on need basis and highly structured. The channels for interactions are also highly streamlined. Many support functions in ISC have online systems using which the employees could 'raise a ticket' and a representative would contact them. Otherwise there are designated persons for assistance whose contact details are made available. It was also observed that just as the account teams try to sell/promote it services to the clients, some of these units market their services internally. They conduct their own brand building exercises. Bulletin boards full of professionally designed posters and information kiosks that provide information on the activities and initiatives by the support units are a daily sight. While the expenses of certain services (e.g. IT) is included in the cost structures of account teams as flat rate, specialist services (e.g. certain R&D services) have to be separately paid for.

Unlike other support functions, Quality and HR units have a *mixed role* – they act as both

monitors and service providers. They appoint dedicated representatives for each account unit. In some account teams, the quality representative shares the same office space with the account team. HR representative holds periodic face-to-face meetings with the entire team. Periodic reports and documentations have to be submitted to Quality and HR (e.g. Milestone reports to Quality, time sheets to HR).

On the whole, the purpose of interfaces is found to be co-ordination, monitoring or control and/or to seek services. Almost none of these interactions are directly related to the daily delivery of services by account teams.

Standards

Standards are pre-defined criteria to ensure the modular organizational units are working as well as they should be. Here, we describe three kinds of standards that were discovered in ISC – performance indicators, process frameworks and behavioral standards.

ISC tracks a number of *indicators to monitor the performance* of the account teams. These indicators are related to quality of work output, progress of the project, adherence to processes, productivity and customer satisfaction. Periodic reports have to be submitted by the teams providing information on all these indicators. It is customary to rank account teams according to the performance on some of these indicators and share the results with account teams. The best performing teams are given awards each year.

The *process frameworks* followed in the teams double as standards. Each process is accompanied with a set of checklists and documentations. At the beginning and end of each stage in the process, the checklists need to be completed and artifacts (e.g. design documents, test reports) uploaded in the designated repositories.

By *behavioral standards*, we mean the informal codes of conduct that ISC promote among its employees. The main vehicles for this are the corporate values and employee identity anchor. The corporate values include hard work, discipline, integrity, fairness and global ambitions and

are said to be of particular appeal to Indian middle class. The term 'ISCian' is promoted by ISC as an employee identity anchor. There are widely held and clear notions of what an ISCian is - competent, professional, hardworking and dependable – an image fully aligned with the corporate image. The interviews respondents claimed that this is how they want to come across when they interact with a client, and that they were willing to go an extra mile for that.

In summary, it can be said that each type of standard serves a different purpose. Performance indicators enable monitoring of each modular unit's performance and comparisons among them. Process framework is not just a standard to assess how well each module is doing. More importantly it facilitates modularization in many ways. By forcing to visualize the service delivery as a staged process with clear starting and end points, and inputs and outputs for each stage, it reduces the complexity of tasks. It also makes possible to identify the tasks and skill set required for performing the task in each stage, thus contributing to better utilization of human resources. Specifying the risks and mitigation plans serves to reduce the uncertainty involved. Since all organizational modules follow process frameworks, it also becomes a tool to integrate the overall architecture and ensure its reliability. Behavioral standards are more intangible. Though adherence to them cannot be clearly measured, they also may act as a force that unifies the disparate modular organizational units and imparts some common 'soft' characteristics.

Hidden design parameters

Hidden design parameters include aspects that impact individual modules, but do not affect the overall architecture. We discovered that the parameters that affect the account teams are mostly related to the clients that they are serving. They include process frameworks, IT organization structure, client's technological infrastructure and client specific knowledge. These parameters impact each team differently. However, it is necessary for the teams to devise ways of integrating them. Several decision factors influence the degree and method of integration

(Table 2).

Insert Table 2 about here

Client processes

Clients vary drastically in their *attitude* to, and awareness and use of processes. There are clients who are either uninterested in the process frameworks or have no expertise in them. Clients with many years of experience in outsourcing to multiple vendors, tend to develop their *own process frameworks* and checklists, and insist that all their outsourcing partners follow them. When account teams draw up the processes for each new project, they map them against client processes, if the client has set processes. Account teams are allowed to substitute ISC's processes with the client's processes if the client has equivalent processes. Teams may also combine or modify the processes to suit the specific project. The streamlining of processes is considered necessary to make it efficient and effective for all parties. The four teams that we studied flexed their approach based on the situation. Two of the four teams matched and streamlined their processes with those of the clients. One of the teams ended up using ISC's own process because their client was not process savvy. The fourth team's client knew about processes, but let the team follow ISC's and chose to keep a close watch through the online systems. In all cases, following processes required completion of forms, checklists and documentations, and sharing them with the clients.

Client IT organization structure

The primary structural entity that the account team interacts with on the client side is their IT outfit. Each client differs in the *size* of their IT department and *the way they organize their IT functions*. Some smaller clients may have a single department while bigger ones may have multiple units that handle different software applications or hardware infrastructure. It was

observed that an account team serving a client with a fairly large, multi-departmental IT organization divided itself into sub-teams that mirrored the client structure. In case of another team, in order to satisfy the *client's desire for greater integration* between client and vendor teams, the team actually plugged a number of the account team members into the client's team to perform certain job roles from the client side. The third team had to absorb client team members into the account team because of the *government regulations* with respect to offshoring that existed in the client's country. In case of the last team, the client had only one IT department, which was relatively small, and therefore the firm didn't have any impact on the internal structure of the account team.

Client technological infrastructure

As mentioned earlier, the clients' IT infrastructure include a large number of applications and databases spread over a variety of hardware and software platforms. These platforms are usually owned by the clients, and form the live infrastructure used for the day-to-day conduct of business by the client. There are some *services types* that need to be performed on the live infrastructure (e.g. production support), while there are others that can be performed on replicas (e. g. software testing). For some services, accessing the live infrastructure is necessary only at certain stages of *service delivery* (e.g. In application development, the live system may need to be accessed only during the final roll out stage). In all teams except one, the clients had allowed the account teams to create partial replicas of their infrastructure on ISC's networks. For services that need access to live systems, account team members were allowed to login to client networks. However, the clients who want to *control* the account teams more closely or those who are concerned about *security* may insist that the account team actually work only on their infrastructure, as is the case in one of the teams. The team members are not allowed to access ISC network while being logged onto the client owned networks. In all cases, detailed documentations are provided to pass on information about the structure of client infrastructure.

Client specific knowledge

Delivery of IT services is heavily dependent on knowledge and expertise of those who deliver them. Their performance depends on the not only on their expertise in technology and programming, but also on the *knowledge of client business processes* and the *layout of the client application network and technical infrastructure*. Several interfaces exist between the account teams and their clients for knowledge transfer. Detailed documentations on business and technical aspects are handed over by the client to the account teams. Account teams also engage onsite team members, and specially designated 'points-of-contacts' from offshore to facilitate knowledge transfer. For example, one of the teams in this study appoints trained business analysts only to gather information about business processes from non-technical end users in 'plain English' and translate it to the 'technical language' used by the engineers. However, much of the knowledge about application network and infrastructure is *tacit*, and only known to those who work on it on a daily basis. As a result, a 'division of knowledge' exists in all teams. The software engineers who are responsible for the technical part of service delivery dig deep into client's technology structures and develop expertise in it – sometimes even more than the client side personnel. The project managers do not get into this side at all, and focus on developing project managerial skills that are not tied to any specific client's context.

Thus, we see that the hidden design parameters are indicative of the areas in which account teams need to create inter-organizational interfaces and integration techniques, and that several decision factors come into play in the teams' choice of integration techniques.

Discussion

Empirical model of client-centric organizational architecture

Based on the findings, we arrived at an empirical model of the modular organization design in ISC. Figure 1 depicts the modular organizational units within ISC and their inter-relationships

as well as the key external entities that organizational units interact with.

Insert Figure 1 about here

The key features of this model are: (1) use of client-centric modularity as the foundation for organizational design, and (2) relationship and integration of modular organizational units with external organizations.

Client-centric modularity as organization design principle

Existing literature on the application of modularity principle in organization design posit product architecture as the blueprint for organizational architecture (Colfer and Baldwin, 2010, Campagnolo and Camuffo, 2009). With empirical evidence for (Colfer and Baldwin 2010, MacCormack, Risnak and Baldwin 2011) and against (Cabigiosu and Camuffo 2012, Brusoni and Prencipe 2001; Langlois 2002; Sosa et al, 2004), it cannot be conclusively said if product modularity indeed leads to organization modularity. Nevertheless, this idea that originated in manufacturing sector spread to the service sector as well. Modular service organizations are reported in finance (Baldwin and Clark, 1997) and logistics industries (Bask et al., 2010), in which services of the same type are provided to all customers by a single unit of the organization. Why doesn't ISC organize itself in the same fashion and form its delivery units based on service types? IT services are knowledge-intensive business services (KIBS) that are almost inseparable from the client's technological and business context (Miozzo and Grimshaw, 2005). Therefore, as our findings confirm, service delivery in these settings involve multiple ongoing inter-dependencies with clients. The central tenet of modularity is reduction of interdependencies among units (Martin and Eisenhardt, 2002; Sako, 2003). In ISC's case, it appears that grouping of organizational units based on clients reduces the intra-organizational inter-dependencies much more than a service type based grouping would. Further, when all

portfolios of services related to any one client is assigned to a single unit within the firm, there is a corresponding reduction in the overall coordination needs within the organization. As we presented in the findings, the interaction between units were not task related. Therefore, when Campagnolo and Camuffo (2010) ask if there can be modular organization structures that are not predicated upon the modularity of products and services they create, our answer is 'yes'.

Our study shows that the client-based modular organizational units are not very different from those in product based modular organizations in terms of task independence and skill sufficiency (Baldwin and Clark, 2003). However, they may derive greater benefit from process orientation, as it helps to manage the complexity and uncertainties inherent to knowledge based services of non-routine nature, by imposing a structured approach. ISC promotes CMM philosophy and frameworks across units for this reason. In addition, adoption of standard processes across units (Worren et al., 2002) is thought to enhance their replicability (Camuffo, 2004). The ready-to-use process templates made available by the Quality department make the formation of new account teams easier. Thus, process orientation contributes to the overall modularization both by providing standards and acting as a driver toward modularization.

Relation of modular units with external client organizations

It is necessary to consider the client-vendor relationships to fully understand the implications of a client-centric modular organizational design. The day-to-day operations of IT service vendors are geared towards ensuring smooth functioning of organizations external to them (i.e. the clients). For a large vendor, the imperative to address the needs of hundreds of client firms and their heterogeneous demands (Schilling, 2000) on daily basis is a source of enormous complexity. Client-centric modular organizational design is a structural solution to address this. In the ICS model, exposure to each client is restricted to only one organizational unit. As a result, managing the uncertainties arising from a client's organization and environment is reduced to a single unit's responsibility rather than that of the entire vendor organization. This

study reveals that client processes, IT organizational structure, technology, and client-specific knowledge are elements from the client organizational environment that individual vendor units will have to take into account.

Since IT services tend to be embedded in the client's technical and organizational architecture, the vendor teams will not be able to deliver them without interacting with them. Effective interfaces and interactive mechanisms are found to have strong impact on the success of the outsourcing arrangement (Miles, 2003; Miozzo and Miles, 2002).Unlike product modularity based organizations where the interfaces between modular components are envisaged to form embedded coordination (Sanchez and Mahoney, 1996), interfaces and integrative mechanisms will have to be specially created in client-centric modular organization. Past research has identified communication channels, team co-membership and geographical co-location as means for integrating client and vendor teams (Colfer and Baldwin, 2010). In addition to channels/interfaces for communication and information exchange, our study identifies three more techniques - matching and streamlining, mirroring and boundary breaching. Matching and streamlining is meant for ensuring compatibility of practices, mirroring involves copying of client structures, and boundary breaching requires vendor team members to penetrate deeply into the client environment. Communication channels/information interfaces may not have any impact on the vendor teams boundaries, but all the other techniques demand boundary shifting – each one a little more than the previous one. This shouldn't be surprising considering that past empirical work has shown that boundaries set for 'division of labor' between organizations in outsourcing contexts are usually moved around while actually performing the work (Brusoni et al., 2001).

We add further to the knowledge on integration techniques by showing which technique is adopted for dealing with which element. Communication interfaces are adopted across the board, matching and streamlining in case of process frameworks, mirroring and boundary

breaching for aligning team structures as well as technology infrastructure, and boundary breaching for acquiring client specific knowledge. We also reveal that teams' choice of technique depends on a number of other factors, some of which are related to service (service type, delivery stage, tacit nature of knowledge needed), others to the client (client capabilities, desire for control, concerns about security), and some other to more external forces (government regulations).We hope that this addresses Miozzo's and Gromshaw's (2005) concern about lack of empirical studies examining the inter-organizational interfaces, and provides a deeper understanding of integration mechanisms.

Implications for Research

Our main contribution is to the sparse organization design part of the otherwise extensive modularity literature. According to Campagnolo and Camuffo (2010), modularity in organizational design still lacks a theoretical identity. Currently, most of the theoretical conceptualizations and empirical explorations of organizational modularity is tied to the notion of product modularity (Sanchez and Mahoney, 1996; Cabigiosu and Camuffo, 2012; Langlois, 2002). Our finding of client-centric modularity breaks that tie, and brings to light other logics for conceptualizing task independence and ways of modularizing. This study also contributes to the nascent literature on service modularity (Bask et al., 2010) by extending the focus from service design (Voss and Hsuan, 2009, Bask et al., 2011) to service organization design.

Another distinguishing feature of this study is that it takes a wholly vendor centered perspective. So far, the focus of research was on organizations at the center of production networks (so called 'integrator' firms – Brusoni et al., 2001). The organizing challenge for these organizations is integration of the work of all the vendors by creating interfaces and common standards (Sturgeon, 2002). The challenge for vendors on the other hand is that of differentiation. Vendors are members of the production networks of many clients who want them as their integral parts, and demand not only customized services, but also customized

ways of delivering them. Given that the complexities that the vendors have to deal with are very different from that of the client, the organizing logics that they subscribe to also may be different. Locating the research in a highly reputed vendor organization that serves hundreds of very heterogeneous clients across the globe (considered a strategic partner by many of its clients than mere provider of services), helped us to map the complexity to a greater extent and discover an alternate logic for modularizing the organizational design.

We do not however claim that client-centric modularity is the ideal way to organize service vendor organizations. Further research is needed to understand the drivers for adopting different kinds of modularity. Comparative studies of modular service organizations exploring the relationship between service and client characteristics, and the type of modularity may take us in this direction. Qualitative studies are recommended to develop a more nuanced understanding of features of modules, purpose and types of interfaces and standards and hidden design parameters in different service organizations, and identify similarities and differences. For example, our study reveals process orientation as a key feature of organizational modules. But, it cannot be said if it is unique feature of this particular organization, IT sector or service industries. Studies to detect the relation of the type of modularity with performance, adaptability, and client satisfaction also will be very valuable.

Implications for practice

Modular organizational designs are often associated with outsourcing (Camuffo, 2004). Outsourcing vendors of IT services or other Knowledge Intensive Business Services (KIBS, e.g. accounting, consulting) may find the empirical model presented in this paper very appealing. The specification of modules, interfaces and standards in Table 1 gives the beginnings of a blueprint for organization design for new IT service vendors who are predicted to emerge from East Europe, Asia and Latin America. But organizational modularity is advocated for any organization that wants to achieve strategic flexibility irrespective of

industry or sector (Baldwin and Clark, 1997). Our findings offer some important pointers for practitioners thinking of building modularity into their organizational design.

Firstly, caution must be exercised in the choice of *modularity type* to be used as the foundation of the organizational design. It may be natural for manufacturing organizations to gravitate towards product-centric modularity. Service organizations may think of choosing between client-centric or service-type centric modularity. The key is to find out which type is better in breaking the organization into components with minimal task interdependence. It is advisable to draw alternate designs that depict proposed modules, interfaces and standards before arriving at a decision. It is possible that they might chance upon ways of modularizing other than these types, logics that are unique to their own organizations. The right design enhances operational efficiency as well as flexibility. The phenomenal success of Indian vendors in the global IT services market is partly attributed to how quickly they learned to put together teams that could serve clients from any domain and geography (Athreye, 2005).

Secondly, in addition to being self-sufficient in resources, it is helpful if the organizational modules are *process oriented.* It helps manufacturing organizations to ensure product quality and increase operational efficiency, and the service organizations – especially those delivering knowledge intensive and/or non-routine services - to increase predictability and manage complexity. Creating online systems to support the processes decreases the chance of them resting in the manuals that nobody reads.

Thirdly, *hidden parameters* that may have impact on each module must be recognized. For services, especially Knowledge Intensive Business Services (KIBS), client and service specific factors are of particular importance. Mechanisms should be built into the individual modules to address these factors. The hidden parameters may also play a key role in manufacturing as well, particularly when the product is non-modular (Colfer and Baldwin, 2010). Paying attention to client-related factors helps to develop better relationships with clients and adapt to

their needs, both of which have been found to make the organization a more desirable partner in outsourcing arrangements (Plugge and Janssen 2009).

Conclusions

In the rich modularity literature, the part on organizational design is relatively underdeveloped. Although a very versatile design concept to apply in the dynamic and complex business environments, the current literature remains narrow with its singular focus on mapping product architecture onto organizational architecture. Our paper responds to the call for more empirical studies that demonstrate how modular organizational design is actually done in real-life. Departing from the prevalent quantitative study designs that examine the relation between product/service and organization design variables, we undertook a case study of a modular organization. In addition to generating a detailed blue print of the organization design, this helped us to surface a kind of modularity - client centric modularity – that is different from what has been discussed in literature so far. The client-centric modular design enables the organization not only to minimize the task interdependence among organizational units, but also to reduce the impact of external environment on the overall organization by restricting client related complexities to single organizational units. The findings help to advance research by providing an alternative anchor for conceptualizing organization modularity other than product design. We hope that this will broaden the scope of organizational modularity concept and encourage explorations into more new and innovative ways of modularizing organizations.

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Figure 1. Empirical model of client-centric modular organizational design of ISC

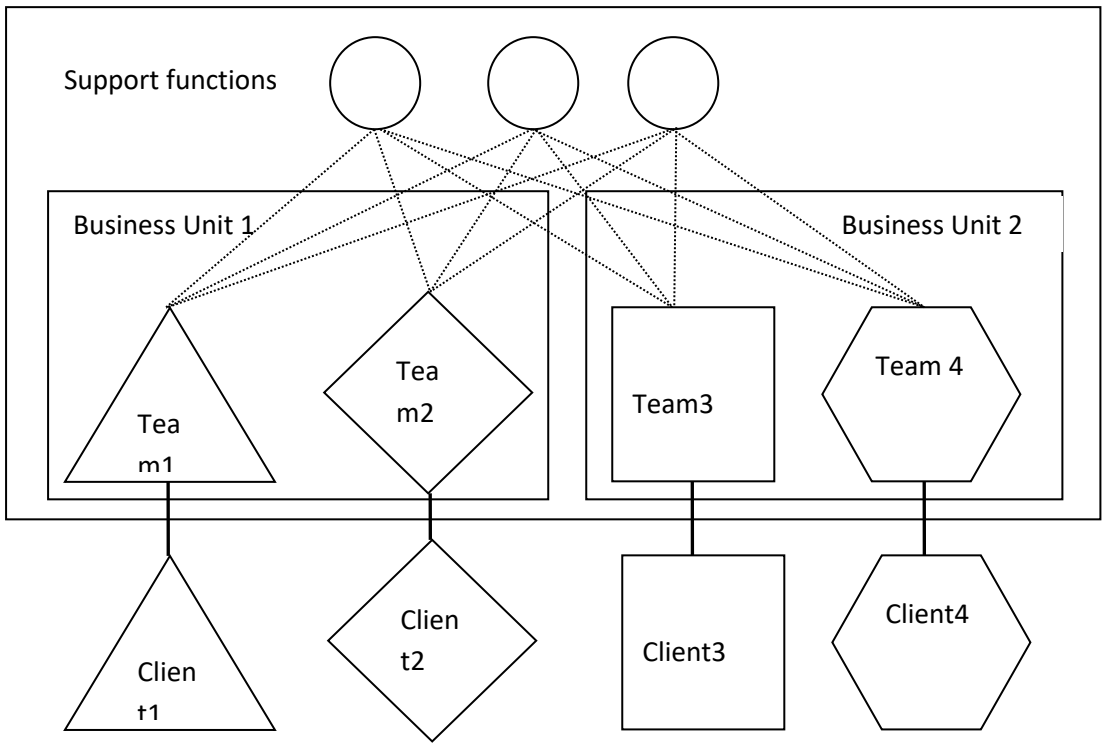

Table 1. Empirically derived Visible Design Rules in ISC

VISIBLE DESIGN RULES		
ARCHITECTURE		
Modules	**Functions**	**Features**
Account teams (Grouped under domain/geography based business units)	Taking care of all service needs of the client assigned to each of them	• Independent task responsibility • Independent profit responsibility (For account teams) • Process orientation • Resource self-sufficiency
Support units (Finance, Quality, HR etc.)	Monitoring or providing support services to account teams	
R&D units	Innovations in processes, IT tools etc.	
INTERFACES		
Interfacing modules	**Purpose**	**Tools**
Sales, business planning	Co-ordination	• Job roles with co-ordination responsibilities • Online systems • Interactions (e.g. Periodic meetings) • Artifacts (e.g. reports, documentations)
Finance	Monitoring Control	
R&D	Service provision	
Quality, HR	Mixed	
STANDARDS		
Type	**Purpose**	**Tools**
Performance indicators	• Monitoring the team • Comparison among teams	• Quality indicators • Project progress and milestones • Process indicators • Productivity indicators • Customer satisfaction measures
Process frameworks	• Ensuring process adherence • Enabling modularity by reducing task complexity and uncertainty	• CMM framework
Behavioral norms	• Lay out common behavioral expectations from organizational members across modules	• Corporate values • Employee identity anchor (‘ISCian’)

Table 2. Hidden design parameters in account teams

Hidden design parameters	**Decision Factors**	*Low*----------**Degree of integration**----------→ *High*				
		No integration effort	***Information interface*** (People, documentation, online systems)	***Matching& streamlining***	***Mirroring***	***Boundary breaching***
Client processes	• Client attitude to processes • Client process capability		All teams	Two teams (T1, T2)		
Client IT organization architecture	• Size of IT team • Structure of IT organization • Client desire for integration • Legal regulations	One team (T4)			One team (T1)	Two teams (T2, T3)
Client technological infrastructure	• Service type • Delivery stage • Client desire for control • Client security concerns		All teams		Partially in three teams (T1, T3, T4)	Partially in 3 teams (T1, T3, T4), fully in one (T2)
Client specific knowledge	• Business process knowledge Vs technical knowledge • Explicit Vs tacit knowledge		All teams			All teams

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