

Toward Innovative Model Based Enterprise IT Outsourcing

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Abstract. There are signs that cost arbitrage model of outsourcing engagement between enterprises and service providers will have to change to one based on value generation. Automation decisions taken by siloized businesses under cost arbitrage models have led to complex cost-ineffective situations. Both these situations may be addressed by an innovative business model based on product family concepts that systematically targets transactional and transformational needs of enterprises with focus on value generation using analysis and operational world views of enterprise IT systems. We motivate and elaborate such an approach. Our contributions are innovation that leads to mutual win-win situation by enabling service providers to service IT needs of multiple enterprises of same vertical and by enabling enterprises to reap value-oriented benefits with analysis and operational world views of IT systems thus serviced.

Keywords: Outsourcing, Enterprise Modeling, Enterprise Architecture, Analysis, Operationalization.

1 Introduction

A large portion of enterprise's operational processes are today automated through the use of IT systems. The as-is state of the enterprise is largely the result of a sequence of automation decisions each taken in specific contexts. These specific contexts come into existence due to siloized nature of businesses [1], which leads to several problems with the enterprise's IT systems such as- a) either partial or complete overlap of business functionality, b) sub-optimal design of operational processes, c) sub-optimal implementation of operational processes, d) plethora of non-interoperable technology platforms, and so on [2]. Given the tight economic environment, enterprises can stay viable only if the IT costs are reduced by a factor. This calls for a whole new approach to service the IT needs of enterprises.

The present headcount based labor and cost arbitrage model through which enterprises engage with IT service providers (SPs) either for managing bottom-line or adding to the top-line seems to have ceased to provide the desired value. We believe that enterprises would want to increasingly focus on their core competencies and look for an IT SP who can be the single source catering to all transactional and transformational IT needs. Enterprises will soon start demanding outcome-based

pricing thus making IT SPs share some of the operational risks. Minimally, this necessitates that IT SPs shift from labor-based to asset-based service delivery. Thus, it is becoming imperative that IT SPs invest, safeguard and nurture business assets in a manner that IT needs of a set of enterprises be met with little modification if at all.

Owing to our expertise in model-driven engineering of large enterprise applications [3-6] in cost effective manner [7, 8], we propose a model-driven take on conceptualizing and realizing a new outsourcing business model that enables servicing of transactional and transformational needs of enterprise IT systems with outcome-based pricing and on operational risk sharing basis. The set of interacting IT systems, the technology infrastructure they use, and the hardware infrastructure used for execution together can be viewed as an *IT Plant* for the enterprise. Our key contributions with regards to servicing IT plants of enterprises are twofold- one, we propose a new IT plant family (product-line) driven business model and show that this innovative model can prove beneficial in catering to needs of enterprises thus creating a win-win situation for both SPs and enterprises; and second, we provide two kinds of support to realize the proposed business model namely, analysis and operationalization. While analysis level support provides demonstrable evidence of functional and non-functional characteristics required of the IT plant, operationalization level support plans to use the insights obtained from analysis in the actual implementation of the IT plant.

The rest of the paper is organized as follows. Section 2 presents motivation and outline of the proposed solution. Section 3 elaborates why innovation may be the only way outsourcing of future will take place. In Section 4, we describe how value-oriented benefits apart from cost benefits may be obtained using analysis and operational world views of IT plants. In Section 5, we put forth several work-packages needed in order to realize IT plant family for enterprises in the same vertical and prove beneficial to both enterprises and SPs. Section 6 reviews the key related work. Section 7 concludes the paper.

2 Motivation and Outline

Enterprises use IT systems to derive mechanical advantage through automation of operational processes catering to their strategic, tactical and operational needs [14]. The needs could either be transactional or transformational thus leading to run-the-business (RTB) and change-the-business (CTB) costs respectively. The set of interacting IT systems, the technology infrastructure they use, and the hardware infrastructure used for execution of an IT plant, in addition to people constitute principal levers for managing IT cost to business. For example, cost-arbitrage outsourcing model has brought down costs significantly by transferring development and maintenance of IT systems to low cost geographies i.e. replace enterprise's people with SP's; consolidation and rationalization of hardware infrastructure led to significant cost savings; harmonization of technology infrastructure further accentuated the benefits derivable from hardware consolidation; and transformation of IT system implementation in response to these and other changes has brought down the costs even further.

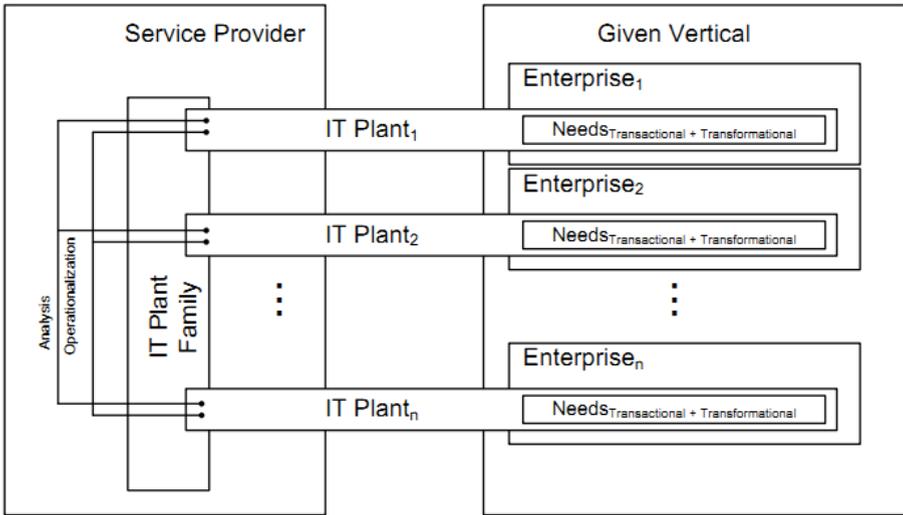


Fig. 1. IT Plant Family Servicing Needs of Multiple Enterprises in Given Vertical via Analysis and Operationalization

Outsourcing and hardware consolidation are fast approaching the point of diminishing returns and harmonization of software infrastructure can bring in only so much benefit [15]. Since an IT system typically comes into existence to service enterprise functional need in local and specific context, any amount to improvement of the IT system is unlikely to guarantee improvement in the IT plant as a whole. Thus, the current practice seems to be approaching its limits in terms of cost effectiveness. It is being realized that beyond the old world labor and cost arbitrage model, an outsourcing model is required that can deliver value based on current business objectives and outcomes. Our proposal in this regard is illustrated in Fig 1.

Achieving scale through common software infrastructure is an important objective for us. Since needs of no two enterprises are likely to be exactly the same, ability to derive implementation of the desired IT plant from its high level specification is necessary. Simplistic strategy of clone-n-own will lead to a plethora of IT plant specifications exhibiting high degree of redundancy (as a result of the commonality) and hence maintenance and evolution problems. Thus, there is a need to manage the related set of IT specifications as a single entity from which the desired specification can be automatically derived under human guidance. This is indicated in Fig. 1 as product line/family concept [8] applied to IT plants for enterprises in same vertical. The key elements of the enterprise IT outsourcing business model and its realization as illustrated in Fig 1 are as follows:

1. It should be possible for an SP to cater to IT needs of multiple enterprises through a single multi-tenant IT plant. It essentially means that an SP can use IT plant specification and implementation in product-line like manner for catering to needs of enterprise in the same vertical. IT plant of an individual enterprise should be easily configurable to meet a priori known specificities of an enterprise.

- It should be possible for an enterprise to get a feel for the IT plant being offered by an SP both in terms of functional and non-functional characteristics. It should be possible for SP to know the IT needs of enterprise so that they can be demonstrably met by the IT plant being offered.

In the following section, first we elaborate the reasons that necessitate innovation in enterprise IT outsourcing and then describe our proposed solution in detail.

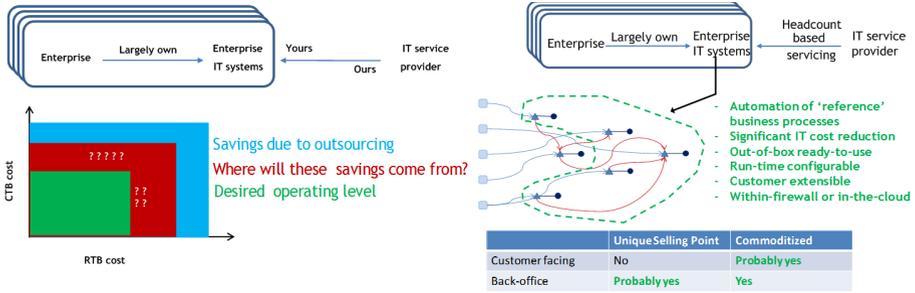


Fig. 2. Costs of Enterprise IT Systems & What is usually automated in an Enterprise?

3 Reasons for Innovation in Enterprise IT Outsourcing

Enterprises have been using IT systems to obtain mechanical advantage through automation of their operational processes. Over the years the dependence of enterprises on their IT systems has been increasing rapidly and there are no signs evident of this changing. Enterprises have traditionally maintained their own IT departments to service IT needs of the business. IT departments have traditionally been viewed as cost centers and evaluated mainly based on RTB and CTB costs to the enterprise.

Outsourcing provided a major lever for reducing RTB costs through replacement of 'your' people (enterprise's) with 'ours' (IT SP's) as shown in Fig 2 (Left). Large enterprises have traditionally been operating in a siloized manner for ease of management and control. As a result, IT needs of an enterprise become apparent *in parts* with a dedicated IT application getting implemented to cater to each *in part* need. To a large extent these needs are of back office with commodity nature as shown in Fig 2 (Right). This leads to plethora of IT applications servicing almost the same IT needs within an enterprise resulting in following problems-

- Widespread redundancy of IT systems is arguably the single largest cause for highly escalated cost of IT to business.
- Another side-effect of the same is sub-optimal implementation of business processes that typically spread across many departments. Moreover, current practice of siloized operation makes it very hard for the complete enterprise wide picture depicting its IT systems and how they interact with each other to emerge.

3. In the absence of complete information regarding the as-is state of enterprise's IT systems, the transformational decisions are typically taken putting faith in the ability of *gurus* to predict which of the many possible states will be the most beneficial. Latency of validating such predictions is typically in terms of months if not years and comes with high system development costs that may have to be completely written off.

Faced with these consequences, an enterprise, in absence of the complete picture, has no option but to live with the as-is state that is destined to get increasingly sub-optimal over time as local fixes keep on getting introduced. Increased business dynamics, highly connected nature of IT systems, rapid rate of technology advance / obsolescence, heterogeneity and wide variety of technology platforms used by an enterprise, and sheer number of business applications all further contribute to making the management of CTB costs an involved and almost an intractable problem. Clearly a new approach for managing CTB costs with certainty is needed. We describe our proposal for such approach in the next section.

4 Analysis and Operationalization of IT Plants

We describe our proposal by looking at enterprise IT outsourcing in terms of two related worlds namely, analysis and operational. We propose further that both these worlds can be realized as being model-centric as shown in Fig 3.

Analysis world would represent an enterprise in terms of its goals, operational processes, organizational structure etc. These models are closer to the business domain and yet machine-manipulable so as to be able to establish a specific property and/or explore answers pertaining to questions regarding efficacy of the as-is state, a set of possible states, most desirable among the possible states with regards a given criterion etc.

Though models pertaining to this world might be created from a restricted perspective of IT systems automating the enterprise, they do not model the IT systems per se. Analysis world enables (data-driven) decision making thus reducing dependence on experts' intuition and/or expertise. Analysis world is essentially supposed to come up with interesting possibilities for improving the current state of enterprise and also outline a path from as-is state to the desired to-be state. Enterprises operate in a dynamic environment and hence needs to change continuously along with its IT plant. Response to a change needs to be fast and accurate. To check what happens when a specific response is chosen, models for supporting what-if and if-what scenario playing would be required. These models need to be domain-specific; rather, there is a need to model the domain itself to enable its automated analysis. Analysis world would represent an enterprise in terms of its goals, operational processes, organizational structure etc. These models are closer to the business domain and yet machine-manipulable so as to be able to establish a specific property and/or explore answers pertaining to questions regarding efficacy of the as-is state, a set of possible states, most desirable among the possible states vis-à-vis a given criterion etc.

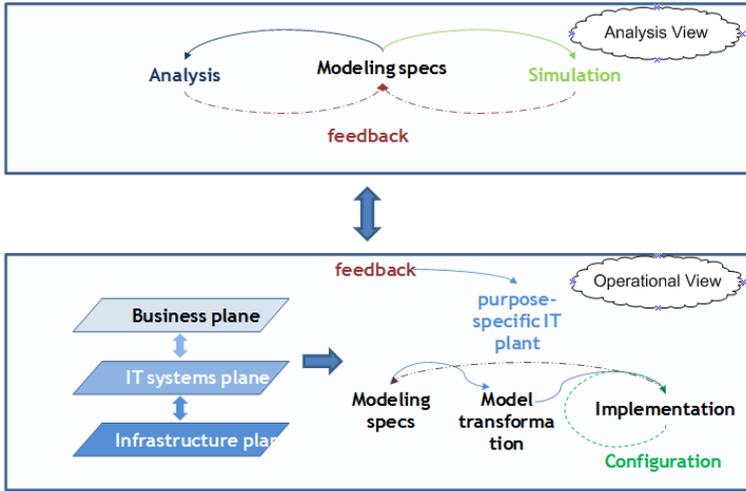


Fig. 3. Analysis and Operational Worlds of Enterprise IT Plants

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Operational world of enterprise IT systems would represent an enterprise in terms of models its business processes, applications used for automating the business process tasks, agents performing the assigned tasks, Technology and IT infrastructure needed for execution etc. In short, a model of the complete IT plant that automates a set of operational processes through a set of software systems ensuring correct operation of the enterprise both in functional and non-functional sense. Since the aim is to cater to the IT needs of multiple enterprises in a given vertical and IT needs of no two enterprises are likely to be exactly the same, purpose-specific IT plant seems required. However, this doesn't lead to a viable business model. As a result, it is imperative that the IT plant actually is a family of a set of related IT plants such that a purpose-specific IT plant can be easily derived. Ideally, the derivation process should be as simple as selecting one from the set of many a priori known well-formed and internally consistent configurations. Also, the derivation process should be user-controlled and be effectible at run-time for greater agility. In fact, every element that IT plant comprises of must also be configurable.

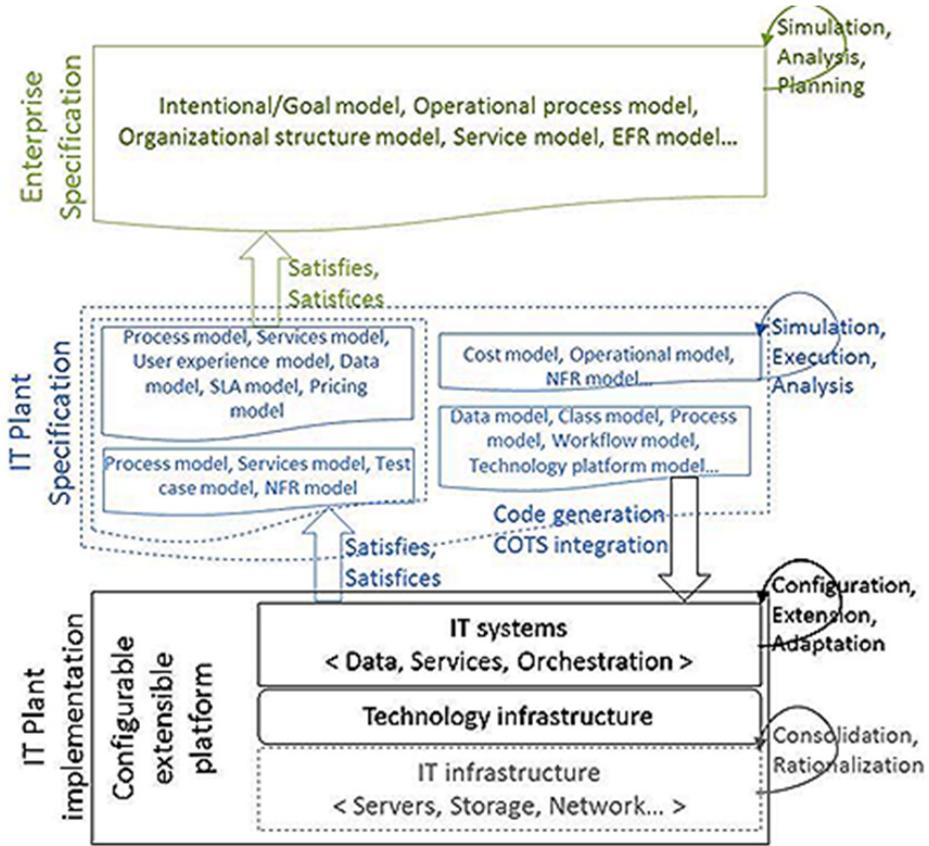


Fig. 4. Schematic Overview

The key challenge pertaining to operational world is that the IT plant should deliver the desired functional and extra-functional requirements and be realizable in terms of multiple technology platforms. The specification of the IT plant should be closer-to-problem-domain, intuitive and technology agnostic so that domain experts will find the notation easy to use. The specification should be complete in terms of its ability to address stakeholder needs on the user side of IT plant. Minimally, it is felt, the specification should cater to functionality, business processes, data and user experience aspects of IT plant and their inter-relationships.

Without a traceable link, possibly bi-directional, between analysis and operational worlds it would be impossible to utilize insights obtained in the analysis world in the operational world. Given the widely different nature of models (and meta models) belonging to analysis and operational worlds, this could be a hard problem. The next section elaborates the research challenges involved in realizing in concert the analysis and operational worlds of IT plant family for enterprise IT systems. Also, solutions to these research challenges can come together in multiple ways each possibly enabling a different opportunity for creating significant business impact.

5 Work-Packages for Realizing Enterprise IT Plants

This entire line of thought is represented in Fig 4 where we present what needs to be done in order to achieve analysis and operationalization of IT plants that address enterprise IT needs in terms of several work-packages:

Enterprise Specification. This work-package constitutes coming up with languages (and notations) to model the set of relevant concerns of an enterprise such as intent or goals, operational processes, organizational structure, services, etc. These are enterprise architecture-ish models but machine manipulable so as to support automated what-if, if-what, change impact analyses among others. It will also be possible to establish functional and extra-functional properties of an enterprise in qualitative and/or quantitative terms. We will also investigate possibility of arriving at a transformation plan from as-is state of enterprise to the desired to-be state. We already have early results in specifying and analyzing enterprise models using ontological representations [16]. Work on What-if, if-what scenario analysis [17] and scenario playing [18] is currently submitted.

Enterprise Simulation. At present, techniques and technology exist to simulate an enterprise architecture model or a specific set of concerns individually and independently. However, simulating an enterprise would need simulation of all its models in concert which is not possible today. System dynamical models are characterized by a small set of primitives and powerful simulation machinery [19]. This work-package constitutes evaluation of system dynamical models for enterprise modeling, developing simulation machinery for EA models that can be specified as above, and investigating if a link can be established between EA models and system dynamical models. Objective here is to advance state of art in simulation and applications/applicability of simulation techniques.

IT Plant Specification. This work-package constitutes specifying various concerns of IT plant so as to generate a configurable extensible platform implementation using it and to help monitor, evolve and adapt IT plant under human supervision. At present it is possible to specify the various concerns of a business application e.g. user interface, data and data access, online and batch functionality, reports etc in a model form from where an efficient implementation can be effectively and efficiently generated. It is also possible to specify interactions between applications as an orchestration or choreography. Early advance has taken place as regards design-time and run-time configuration of an application. However, little work is reported on application architecture to support a priori unknowable extensibility. Business Process Platforms (BPP) providing a set of business processes and their automation through a set of services *out of the box* was a buzzword in 2005 which has remained unrealized. Early advance in adaptation architectures is limited to individual applications. The adaptation concept needs to be extended to other constituents of IT plant such as business processes, batch programs etc individually and to the whole IT plant collectively. Objectives of this work-package are to come up with i) an implementation architecture for BPP with additional requirement of support for easy

configuration and a priori unknowable extensibility of the entire BPP, ii) the implementation machinery to realize an IT plant, and iii) adaptation architecture for individual components as well as the whole of IT plant.

IT Plant Contract Specification. It should be possible to specify a set of concerns such as functional, operational, legal, monetary etc, and thus, in essence, forms a contract between IT plant provider and consumer. From IT plant consumer's perspective, it should be possible to specify the desired IT needs in terms of all the relevant aspects such as functionality, data, user experience, extra-functional characteristics [15] etc.

IT Plant Testing. At present it is possible to specify application behavior at a higher level from which test cases and test data for system testing with coverage related assurance can be generated. Early advance is underway as regards testing of a product line depicting a set of applications having high commonality and well-defined variability. Automation harnesses for regression testing have been around for years but incremental i.e. change-specific testing is still a problem. Objective of this work-package is to extend these concepts to cover the whole of IT plant i.e. a set of applications, a set of business processes, a set of batch programs, a set of interfacing channels etc. Another, and probably more important, problem is to establish testability of the IT plant. Another aspect of IT plant testing is in relation to satisfaction of contract.

IT Plant Deployment. It is highly unlikely that a consumer of IT plant won't already be using IT systems. Typically, IT plant will replace some of the IT systems in use. As systems being replaced (say A) might be interacting with the systems not being replaced (say B), B systems need to be modified as regards their dependence on A systems in terms of service calls, data in/out etc and the IT plant needs to be extended to cater to interfacing needs of A systems. Availability demand dictates these modifications need to be undertaken conforming to a partial order and in batches. Identifying both may need analysis of implementation of existing systems and/or execution logs. Having identified the partial order, B systems need to be suitably updated, IT plant suitably extended, and A systems decommissioned. These activities should be automated to the extent possible.

6 Related Work

Servicing of outsourced IT systems in an innovative way as we have suggested is novel in the sense that such business model and analysis and operational views of this business model have not been suggested/researched previously to best of our knowledge. We therefore take review of key works that we refer to, including online resources since the sentiment that something more than the prevalent cost arbitrage model is required for servicing outsourcing has started surfacing only recently.

What should enterprises outsource and what they should not and the benefits and risks involved was discussed in [9]. It was found that labor cost reduction is the most ranked benefit whereas political and legal issues including property rights and

contracts were counted as most ranked risks. In contrast to this study which was carried out in 2005, recent sentiment suggests that enterprises are looking beyond cost benefits, specifically to value generation [10, 11] something that analysis world view of IT plant may be able to provide to some extent [12].

How such value-oriented relationship might exist between enterprises and SPs is being researched as described in [1, 13]. Scoping and scaling of work to be performed by SP needs to be well defined [13] and can take form of strategic relations, co-sourcing alliance, or transaction exchange [1]. It is suggested in [1] that the relationships stated above evolve and that enterprise must transition from strategic relationship to transaction exchange in a step-by-step manner. This remains to be tested further. We on the other hand believe that once the suggested work-packages have been realized, it might be possible for us to get into any relationship with an enterprise aided by precise specification of IT plant and enterprise, and analysis and operationalization abilities.

7 Conclusion

It is quite evident in recent times that focus on outsourcing enterprise IT plants has shifted from traditional concerns like cost reduction, access to skilled workforce, continuous operations, agility and so on, to value generation. We have shown in what way such value-oriented IT plant may be realized. From SP's perspective, in a given vertical, it is quite possible to service IT plants of multiple enterprises as there ought to be much that is common and with few variations. We already have some early results with regards to various work-packages that we have specified. It is our belief that future IT plant outsourcing will be mainly value-driven and we have indicated how we and other SP's may benefit from a new business model and how enterprises might benefit with analysis and operational world views of their IT plants.

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