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A Manifold and Multi-Phase Framework for Bulk IT Procurement

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Abstract

This paper presents a multi-variate and multi-phase deterministic framework for IT acquisition on a very-large scale. The conventional approach of IT acquisition through open tenders or contractual negotiations invariably elicits different kinds of fallacies. The deployment of the deterministic framework minimizes the shortcomings associated with the conventional IT acquisition approach. The salient factors for ensuring procurement success for very-large-scale IT acquisition are discussed and the notion of "acquisition preparedness" is delineated. Finally, the tangible benefits of the framework are further discussed in and illustrated by an actual example of very-large scale IT acquisition undertaken by a federal government department in Canada.

Keywords: Bulk Procurement, Manifold, Multi-Phase, Framework, Acquisition Preparedness, Large-scale Acquisition, Fallacies.

1 Rationale underlying the need of very large-scale IT acquisition

In times of economic recession, business enterprises and different levels of governments strive to minimize their capital expenditures for IT hardware (HW) and software (SW) acquisition [5]. Traditionally, very-large scale or bulk purchases have offered a unified and standard approach for enterprises and governments to not only gain the best values for the capital expenditures but also minimize the administrative costs incurred in contracting [14]. The most impactful challenges that have plagued IT acquisitions over the last two decades have been examined recently [16, 17]. The importance of competitive negotiation is information technology procurement has also been highlighted in some research [18].

Typically, a very-large scale IT acquisition is characterized by the purchase of IT HW or SW on a multiple-million-dollar consumption level in US currency with the following objectives [9]:

- Satisfying customer's needs in terms of low cost, best quality, and expedient delivery;
- Minimizing administrative or operating costs;
- Conducting transactions with integrity, fairness, consistency and openness; and
- Fulfilling other enterprise or departmental objectives.

Over the past decades, enterprises have been utilizing a business strategy of acquiring other companies [2, 10] as a means of creating a competitive advantage in offering new products, reaching new markets and generating new revenues. Arising from such an "acquisition" undertaking, there is an ever-increasing need in merging and integrating dissimilar networks, systems and applications inherited from the acquired companies [1, 11]. The establishment of a common computing environment (architecture, processing platforms, networking technologies, support infrastructure, etc.), invariably facilitates data flows and further streamlines system interoperability [3]. As a result, large volume of HW and SW needs to be purchased to homogenize or consolidate various computing architectures.

Consequently, open tenders (RFPs) separately issued by individual governmental agencies or various departments in an enterprise can be consolidated into a very-large acquisition so as to leverage more buying power or negotiation advantage for better pricing schemes, merchandise delivery, support services or training offerings in IT acquisition.

However, as a result of the inflexible nature of procurement process in accommodating the "uncertainties of complex systems", it is always a formidable challenge faced by governmental or corporate enterprises in IT acquisitions [15].

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2 Conventional framework for very large-scale IT acquisition

Traditionally, in order to obtain "open and fair" competitive proposals from the vendor community, an enterprise or the governmental agency issues an RFP to the vendor community with a list of stipulated requirements and associated deadlines. Competition is normally carried out on the basis of:

(a) Pricing quotes; or

(b) Pricing quotes as well as details of proposed solution.

To ensure the fairness and confidentiality of the process, vendors are typically asked to submit their bids either through (1) sealed bidding; or (2) controlled, competitive negotiation.

Sealed bidding is characterized by a more rigid adherence to formal procedures. Those procedures aim to provide all bidders an opportunity to compete for the contract on an equal footing. In a sealed bidding acquisition, an enterprise normally awards the bidder with the lowest responsive bid (price). In contrast, competitive negotiation is a more flexible process that enables the enterprise to conduct discussions, evaluate offers, and award the contract using price and other pre-determined factors.

3 An Example for Very Large-Scale IT acquisition

A major federal government department [8] in Canada with responsibility for the provision and oversight of a safe and efficient transportation system employs more than 20,000 employees operating more than 200 facilities from coast to coast. The department operates over one hundred coast guard ships, a fleet of fixed wings and rotary wing aircrafts and many motor vehicles. It has responsibility for technical regulation, and for infrastructure, in the air, land and marine modes, providing regulation and oversight. In terms of computing architecture, the department has a heterogeneous and distributed computing environment with a myriad of computing machines ranging from main frames, minicomputers, supermicros, PCs and laptops. As a result of processing needs for ever increasing application transactions, the department undertakes to issue a very-large scale of IT acquisition with an award of a supply contract over a period of five years for meeting several hundred requirements in the following categories:

(1) Portability of applications among dissimilar systems;

(2) Interoperability of applications over various computing platforms currently in use or deployed in the future;

(3) Flexibility in replacing HW or SW components of a vendor by a different vendor;

(4) Continuity of support from vendors in operating and maintaining the computing environment;

(5) Commitment from vendors to continually develop and upgrade/update the proposed HW/SW technologies;

(6) The best pricing to reflect the ever-diminishing HW/SW pricings over the duration of the awarded contract;

(7) The expedient availability of parts/components in HW and SW (without substitutions) to be supplied throughout the duration of the contract;

(8) The commitment to jointly develop a standardized operating system environment with the governmental agency; and

(9) The training of system personnel in installing, operating, maintaining and upgrading the required system.

The winner of the contract award is required to supply, over a period of five years, the proposed system (HW, SW, installation, integration, maintenance, optimization, enhancement, and training services) to the federal government department.

4 Fallacies of the conventional Acquisition Framework

It is customary in conventional RFP award whereby winner primarily takes all. As a result, there is an imminent danger of technology lock-ins with the winning vendor. Despite the proliferation of open technologies over the past decades, different vendors still employ different kinds of proprietary "hooks" to induce involuntary lock-ins on the part of their customers. This proves to be "expensive" technologically and administratively for an enterprise.

Technological advances progress at great speed in both HW and SW. Consequently, in later stages of a multiple-year contract award, an enterprise will end up with the not-so-up-to-date HW/SW technologies or sometimes obsolete technologies of the vendor. This lagging behind in the state-of-the-art technology, nevertheless, needs to be circumvented.

HW/SW prices at the time of the contract award can be competitive. However, as time goes by, both the prices of HW and SW are dropping. The gradual drops in pricing are not normally factored into the acquisition of HW/SW in later years of the contract. As a matter of fact, the contract turns out to be an obstacle for an enterprise to get the best price for each HW/SW acquisition from the award contractor.

Delays in delivery or availability of HW/SW products are frequent in a very-large scale acquisition as there is a wide range of components to be provided by a bidding vendor which often forms partnerships with other auxiliary suppliers. The occurrence of mere minor delays in the delivery, installation, integration and testing, when all added up, can potentially be very costly for an enterprise and its operation.

Should a contractual dispute occur with the award contractor and its auxiliary partners, it is very costly for an enterprise to embark on any legal proceedings to iron out or ascertain the actual contractual responsibility of the award contractor and its auxiliary partners. The litigation will become very complex and time-consuming, particularly, when consequential damages are involved.

5 Multi-phase Framework for Very-Large Scale IT Acquisition

In view of the aforementioned limitations and fallacies of the conventional approach in IT acquisition, a deterministic and multi-phase framework, as shown in Figure 1, is deployed to issue a RFP to the vendor community by the Canadian government department.

This deterministic and multi-phase framework entails the following salient elements.

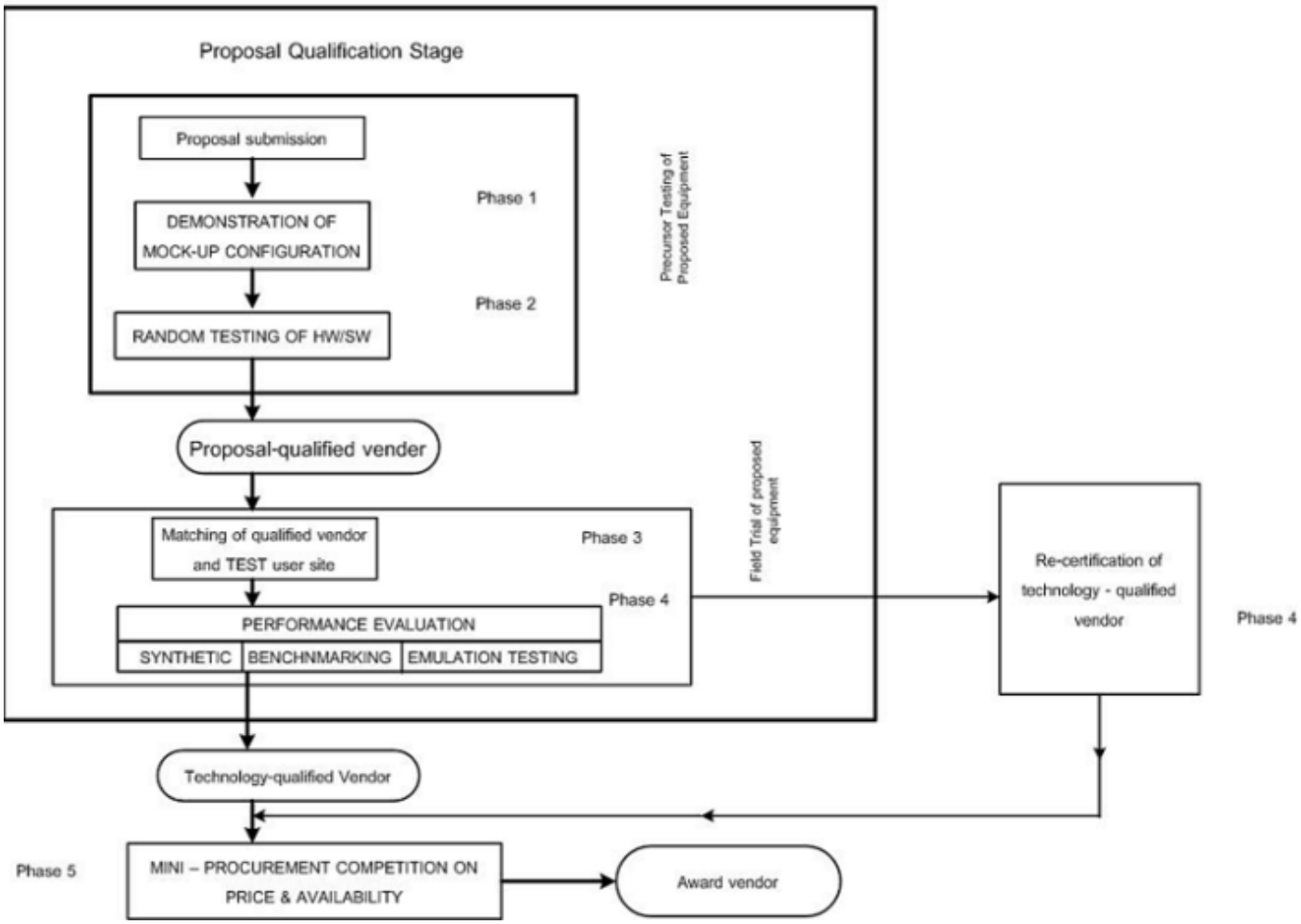

Figure 1: A Multi-Phase Large Scale IT Acquisition Cycle

5.1 Phase 1

Along with the submission of a proposal to fulfill the requirements of the RFP, each bidding vendor is required to further qualify and verify its technological capability by setting up a mock-up configuration at its company site(fully assembled at the expense of the bidding vendor) to prove the proper functioning of each proposed component, subsystem and integrated system.

5.2 Phase 2

Each bidding vendor is further required to be tested, on a random basis, over the supply of a specific HW/SW component from its partnering supplier, by the department so as to ascertain the efficiency and effectiveness with which the bidding vendor delivers the proposed component from its partner supplier. Test suites are designed and utilized by the government department to ascertain the proper functioning of the set-up systems in the specific context of simulated departmental operation.

5.3 Phase 3

The bidding vendor which has passed the previous two steps will be formally attained the "proposal-qualified" status which permits the bidder vendor to enter into the actual field trial evaluations. Each "proposal-qualified" vendor is randomly assigned to an actual user site within the department's operation to fully set up the proposed configuration (integrated systems and applications) under the normal system loadings of the user site for different kinds of performance evaluations (synthetic, benchmarking and user-transaction-emulated testing).

5.4 Phase 4

Those "proposal-qualified" vendors with attainment to pre-determined performance levels and proven capability to resolve assigned system problems within the pre-determined times will be upgraded to "technology-qualified" status.

Each "technology-qualified" vendor will annually be required to be evaluated by a technical team dispatched by the department particularly on the technological progress and new product developments. The purpose of this annual evaluation is to ensure that the "technology-qualified" vendors will continually provide the most-up-to-date technologies to the department.

At the end of the field trials in the second phase, each "technology-qualified" vendor will be upgraded to "award vendor" and be formally given a 5-year licence to supply the proposed technology (HW/SW) to the government department.

5.5 Phase 5

The actual purchase of HW/SW from each working unit of the government department will be subsequently administered through a mini-procurement, on pricing and availability only, among all the "award vendors" over the following 5-year contractual period. The award of such a multi-year license often saves significant administrative and contractual-award overheads in the procurements of IT systems. At the same time, this approach also centralizes the procurements of IT systems in accordance with the departmental guidelines and standards in terms of deployment of systems in governmental offices.

6 Salient factors ensuring success for enterprises in undertaking Very Large-Scale Acquisition

6.1 Transient Computer Markets

Computer market is constantly changing: regulatory changes (such as cyber law, telecommunication regulation, etc.); emergence of value-centered acquisition for users (best price, best availability and best technology) or an ever-changing technology (analog-digital, coaxial cable-optical fibre, baseband- broadband channel, etc.) [6]. This transience takes time to be transparent to the market and consequently creates an informational discrepancy in relation to targeted purchases to enterprises undertaking acquisitions. As a result, competing enterprises undertaking acquisitions must have the ability to comprehend the ramifications of this market transience and have the foresight (as opposed to their competitors) to preemptively acquire the best value targets. In order to develop an informational advantage surrounding potential target purchases over the competing enterprises, enterprises are required to possess a proficient knowledge of the entire value chain of the targeted market. This crucial knowledge is detrimental in deciding whether an enterprise will gain a competitive advantage in the target market and be successful in very-large scale acquisition.

6.2 Post-Contract Award Negotiation

One of the major fallacies of very-large-scale acquisitions is the overpaying of the values of acquired systems over the agreed period of contractual supply. Consistently overpaying for very-large scale acquisitions will doom any acquisition program. Enterprises undertaking very-large-scale acquisition must exercise the contractual right of negotiation with the supply vendors to iron out a differential pricing scheme that will benefit the enterprise over the whole period of the contractual award as both hardware and software depreciates in value every three to six months. In addition, a mechanism must be formulated to ensure that the supplied most up-to-date hardware and software will be delivered to the enterprises. This is in keeping with the best availability, best price and best-technology value proposition.

6.3 Preemptive Outlet and Field Testing

Given the nature and complexity of the very-large-scale acquisitions, many hardware, software and services suppliers with their affiliated subsidiaries are involved in an acquisition of this magnitude and size. As a result, there is a high probability of delays and mishaps in relation to the shipping, delivery, installation, integration and testing of the supplied hardware and software. It is therefore imperative to create a series of preemptive testing of all hardware and software at the manufacturing, supplying and shipping ends to ensure that the hardware and software are assembled in accordance with the stipulated technical specifications and standards. Corrective and remedial measures should be promptly formulated in the event of failure to adhere to the stipulated standards. This extra step will serve to eliminate any delays or mishaps in association with mal-functioning hardware or software after they are shipped to the enterprises. Further field trial testing can be done at the user sites to ensure the proper functioning of the acquired hardware and software in the actual user environments of realistic and simulated system loadings. The institution of these preemptive testing will not only minimize delays or mishaps in the shipping and delivery process but also eliminate the needs of incurring litigation against the suppliers and their subsidiaries for failed deliveries or mal-functioning of hardware or software. This will ultimately reduce unnecessary extra expenditures over the predetermined budgets and ensure success with the very-large-scale acquisition.

6.4 Streamlined System Integration

Most successful very-large-scale acquisitions need to address the following suite of questions with due diligence to ensure successful integration planning.

(1) What is the sequence by which various components or systems should be integrated?

(2) What are some of the foreseen or unforeseen obstacles in the process of system integration?

(3) What are the implications of the integration activities on users?

(4) What are our maximum points of leverage with minimum disruption in the acceptance testing of acquired HW/SW with the existing systems?

The migration and proliferation of the new integrated system into the production environment should be planned and executed incrementally in various phases to ensure a smooth and harmonized "roll-out" of the new system, interoperating in a streamlined manner, with existing systems within the enterprise.

6.5 Prior Procurement Experiences Converging to Established Procedure

Research on organizational learning suggests that procurement process stemming from experience guide organizational behavior in acquisition. Previous acquisition experience with a specific target system procurement provides opportunities to further improve the process and increases the probability of the process being utilized successfully in subsequent acquisitions [4, 12]. Empirical studies demonstrate that the more experience an enterprise's capability with a particular strategic action or direction over target system acquisition, the more likely they are to repeat acquisition with success [1]. In organizational learning theory, the resource-based view (RBV) advocates the notion that resources owned or controlled by the enterprise have the potential to provide a sustaining competitive advantage, particularly when they are not easily inimitable or substitutable [7]. The enterprise's acquisi¬tion experience can actually be viewed as a not-so-easily inimitable or construed as a non-substitutable resource. Some enterprises, based on their prior procure-

ment experience, promulgate standardized guidelines and processes for procurement, proposal qualification, bid evaluation of hardware or software acquisition [4]. The established processes and guidelines enhance the integrity, consistency and fairness of these very-large-scale acquisitions.

7 Acquisition Preparedness

Acquisition preparedness means an ongoing attempt on the part of an enterprise to establish an infrastructure whereby it is ready to embark on very-large-scale acquisition. The preparedness involves the development of a set of seven core capabilities that facilitate acquisition on a very-large-scale. The key thing is that the organization is ready to translate them into the context of very-large-scale procurement when an acquisition comes up. The seven core capabilities for this acquisition preparedness are as follows.

(1) Strategic agility: insightful understanding of market dynamics and ability to formulate procurement action plans expediently.

(2) Market Insight: ability to grasp the changing nature of the system markets and uncover the new possibilities this has to offer.

(3)Technological Tracking: constantly building the enterprise knowledge base of technological advancement in pertinent areas.

(4) Enterprise Culture building: to create and perpetuate the responsible leadership and responsive culture throughout the enterprise.

(5) Resources management: the ability to deploy resources efficiently, effectively and productively throughout the enterprise

(6) Standardized Project and Process Management: to formulate and develop a fair, open and homogeneous procurement process with accountability, transparency and consistency. It has been found that the standardized solutions may be most effective for technology acquisitions [13].

(7) Experiential Management: the ability to learn from previous procurements and to innovate on the new possibilities that fulfill the requirements of future acquisitions.

Establishing acquisition preparedness sets the stage for generative value proposition thereby enhancing very-large-scale acquisition success.

8 Conclusion

By employing this multi-variate, multi-phase framework in very-large scale IT acquisition, the government department is able to:

(1) Select multiple “award vendors” (instead of one) which are all technologically qualified to supply the proposed system to the government;

(2) Keep the risks in malfunctioning or delays in delivery, installation, and integration of SW/HW to a bare minimum, as a result of pre-delivery trials;

(3) Eliminate substantively any system mis-claims, incapability or unavoidable failures that might occur in the system production environment, because the field trials provide the best verifications of technical claims in each bidding vendor’s proposal;

(4) Get the best prices and most expedient delivery, for each working unit, from the most competitive “award vendor”, as a result of each mini-procurement. This has totally eliminated the disadvantage of not getting the best price from cost deteriorations or obsolete technology in HW/SW;

(5) Obtain continually the most up-to-date HW/SW technology from the award vendor, given the annual requirement of technological re-evaluation;

(6) Eliminate the risk of potential lock-ins with a particular vendor by awarding of the contract to more than one single vendor.

Contrasting the conventional approach and the multi-phase approach in very-large-scale acquisitions, the two major strategies in acquisitions is a choice between an “expense” synergy (also known as “cost savings”) strategy or a “growth” synergy strategy. The multi-variate and multi-phase approach described above embodies both strategies and has been adopted for very large-scale IT acquisition by government departments in Canada. With the identification of the salient factors for success in very-large-scale procurement and the establishment of acquisition preparedness for an enterprise, the probability of success for very large-scale IT acquisition will greatly be enhanced.

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