IT Procurement Guidance Note 3

Complex Systems Engineering/Integration

Contractor Continuation Options

December, 2001

Contents

I. The Process of Complex Systems Engineering 2
II. Issues Facing Bank Borrowers and the IT Industry 2
III. Conflict of interest in Consulting Contracts. 4
   A. Bias in System Specifications 5
   B. Information Asymmetries 5
   C. Personal or Early Knowledge 5
IV. Proposed World Bank Guideline 6
   A. Specify-and-Engineer Option 6
   B. Specify-and-Integrate Option. 8
V. Implementation Safeguards 9
   A. Common Safeguards 9
   B. Upstream Contract Safeguards 9
   C. Downstream Contract Safeguards 9
VI. Conclusion 10
VII. Reader’s Feedback 11

I. The Process of Complex Systems Engineering

It is widely acknowledged that large, complex systems engineering (SE) work should be done in phases to maximize chances of success and minimize the possibility that undetected problems escalate out of control. A typical phasing strategy consists of:

1. project strategy and system scope
2. RFI, pre-qualification, and RFP
3. system engineering (SE)
4. system implementation
5. system maintenance

Along this temporal dimension, there are four different procurement tracks in large IS projects:

a. system specification and project management support services.

b. system engineering/integration services;

c. supply and maintenance of technology;

d. independent technical audit services.

Figure 1 below portrays the phases, procurement-tracks and outputs of complex SE projects. For a more detailed discussion of this topic see the companion “Guidance Note 2, IT Procurement Design Options”, available at the Bank’s IT Procurement Web Page: http://www.worldbank.org/ITProcurementforum

II. Issues Facing Bank Borrowers and the IT Industry

Expertise in developing systems for complex application areas such as payment clearing/processing, plant/process control, tax administration, public financial management, utility administration, etc. is usually acquired by firms through involvement in all phases of the project cycle. Thus, firms best able to formulate the scope and functional design\(^1\) of a complex application system are often among the most competent to engineer and implement the system.

When expert SE firms can infer the scope, functional design and technical solution of a complex system based only on business requirements, a two-stage, single responsibility contract may be the best course of action. Two-stage procurement is discussed in more detail in IT Procurement Guidance Note 8 on Selection of SBD for IT Procurement\(^2\).

In most cases, however, the unknowns of complex information system contracts are too numerous for either the government agency or potential bidders to want to enter right from the start into a single responsibility contract, however conditional it may be.

---

1 A functional design specifies "what" business results a system must produce and what data it needs to obtain or keep to do so. It does not specify "how" the system is to work. Thus, a functional design includes system definition at the level of entity-relationship diagrams and data flow diagrams of essential business functions.

2 Available, as all other guidance notes at the Bank’s IT Procurement web page at http://www.worldbank.org/ITProcurementforum
The preferred course of action is to contract first for formulation of project strategy, system scope, and system functional design; to make strategic decisions at that point regarding financing, organization, phasing, scheduling, and internal procedural reforms for the new system; and then to competitively contract for system engineering and implementation, either in conjunction with, or separately from, the supply and maintenance of needed technology.

Bank borrowers dealing with complex systems projects often face a counterproductive impact from Bank conflict of interest guidelines\(^3\) similar to that observed in utility privatization projects\(^4\):
Expert firms best able to develop the scope and functional design of the system abstain from participation in the requirements phase not to disqualify themselves from the engineering and implementation phases. This may deprive Bank Clients of a significant, often the best, talent pool at a time when such talent has the most impact on project success. As a result, the requirements for complex systems are often prepared by domain practitioners, not by systems experts knowledgeable on the full engineering cycle of the system to be developed.

III. Conflict of interest in Consulting Contracts.

The potential for conflict of interest exists between any two contracts in information systems projects. However, if disallowing continuation has a negative economic impact larger than allowing continuation under safeguards, as seems to be the case in complex systems projects, this must be seriously considered.

A time-tested management approach to complex systems projects is to divide them in phases and enter into no wholesale commitment with a single contractor. This minimizes the possibility that problems in one contract escalate out of control, or that litigation may impede completion of strategic projects. Division of projects into phases, however, should not be at the expense of acquiring the best expertise for each phase, and competition has long been established as the tool of choice for this purpose.

Bank procurement guidelines already acknowledge that continuation of downstream consultant contracts is often in the interest of the Borrower, and even prescribe in some cases a competitive process where the “consultant carrying out the initial work is not excluded from consideration if it expresses interest”\(^5\). The concept of competitive continuity in consulting services is thus already established and the issue here is whether it can be applied to solve the problems described above for complex SE contracts.

If system engineering or system integration contracts are viewed as goods contracts, Bank policy on conflict of interest is unequivocal: “A firm which has been engaged by the Borrower to provide consulting services for the preparation or implementation of a project, and any of its affiliates, shall be disqualified from subsequently providing goods or works for the same project”\(^6\).

However, from a business perspective software engineering and systems integration contracts are more properly considered as complex consulting services contracts with enhanced delivery obligations and liability on the part of the contractor. This is so because the critical success factors in complex IS procurement are the professional judgment and expertise of the contractor’s team, rather than the compliance with stated product or works specifications which are rarely possible.

The following are three inter-related concerns regarding conflict of interest between upstream system specification, and downstream system engineering or integration contracts, and the way they can be alternatively addressed in complex systems procurement.

\(^5\) Consultant Guidelines, Single Source Selection, par. 3.11.
\(^6\) Procurement Guidelines, Eligibility, par. 1.8, (b)
A. Bias in System Specifications

The first, obvious concern is about the potential rigging of the system specification in favor of the incumbent’s own substandard solution.

The growing tendency in complex systems engineering is to use a generic software platform to build the system upon rather than to start from ground zero, although this is still needed in some cases (certain tax systems, for example). Designing with a given platform in mind is therefore a very real concern.

Fortunately, engineering of complex application systems is the domain of expert firms that can rapidly demonstrate the bias in a rigged system specification, provided that the bidding process facilitates this. Encouraging expert review of system specifications by the IT industry may therefore help to hold go a long way to creating an environment of accountability for system designers.

Nevertheless, since bidders will sometimes prefer not to challenge a clearly biased specification publicly, particularly when doing so might cast doubt on the Client’s impartiality, there is also a need for preventive safeguards against specification bias. Most of these safeguards center on raising disclosure and documentation standards, and they are common to all types of conflict of interest. They are discussed in Section V.

B. Information Asymmetries

Information asymmetries about the client’s business requirements or key personnel can translate into unfair advantage for downstream bid preparation and bid evaluation.

The significance of information asymmetries about the business requirements, however, is inversely to the quality of documentation and disclosure.

Therefore, concern for these asymmetries can be addressed through disclosure obligations, high documentation standards, allowance of sufficient bid preparation time, and a flexible clarification process that allows bidders to bridge any relevant information gaps.

These practices are recommended whether or not contractor continuation is contemplated, since insider knowledge can be gained from many other types of contacts between the client organization and bidding firms. It may be from a past assignment not related to the Bank project, from existence of other commercial or personal relations, from political pressures, from national affiliations, etc. The Guidelines cannot and do not disqualify firms for these reasons.

Provided that bidders perceive the evaluation process as being fair, they will not be discouraged from bidding if: i) they believe to have full information on the problem to be solved; ii) they feel to have better implementation capacity than the incumbent; and iii) they deem their superiority to be sufficient to overcome any personal or early knowledge advantages of the incumbent firm (more on this).

In the private sector where Bank guidelines do not apply and competition is not mandatory, companies periodically re-bid major contracts and bidders who can provide better value for money not only participate but often win in these competitions.

C. Personal or Early Knowledge

Personal or early knowledge advantages of the incumbent firm are also forms of information asymmetries that are discussed
here separately because they are more difficult to deal with, regardless of the approach taken. Personal knowledge is knowledge of the client’s key personnel and early knowledge is knowledge of the system requirements before than competitors.

When this type of advantages operate in dishonest ways, and of course depending on the stakes, they are neutralized neither by existing conflict of interest guidelines of the Bank nor by the alternative approach proposed in this Note. The exercise of personal influence and knowledge is notoriously difficult to contain, whether in the procurement process or in the government of nations.

However, when this type of advantages operate as a result of normal business practices, such as prior engagements outside the scope of the Bank’s loan, it is considered fair game in competitive procurement both from the viewpoint of the competitors and of Bank guidelines.

Competing bidders know that if past performance had not been acceptable to the Client, the incumbent firm would have rather a disadvantage in being selected for a subsequent assignment. If the performance was satisfactory, competing firms know that this is a fair advantage and that disqualification of such rival firm is a competitive bonus derived only from the rules of the Bank, not from the fairness of the process or the interest of the Client.

From the point of view of Bank guidelines, personal or early knowledge of the client or the business problem is not “per se” a condition of conflict of interest. Unless this knowledge fraudulently acquired or used, Bank guidelines do not construe this knowledge to be a condition of conflict of interest, and do not prohibit it being used even as a qualification criterion.

In conclusion, the concerns about personal or early knowledge split into two areas: narrows the area of concern on incumbent’s to the same area that has been discussed above for specification bias and information asymmetries

IV. Proposed World Bank Guideline

Continuation of the incumbent between upstream system specification and downstream system engineering or system integration contracts will be allowed as an IT procurement design choice acceptable under World Bank Procurement Guidelines under circumstances explained below, and subject to the safeguards described in Section V.

A. Specify-and-Engineer Option

Under this type of continuation, a SE firm may provide consulting services to develop the specification and/or the functional design of a complex system and continue to perform the engineering of the same system (detailed design, construction, testing, and deployment), under two scenarios:

(a) The incumbent qualifies for, and wins, a subsequent competitive procurement of the system engineering services7.

(b) The Borrower, in agreement with the Bank, decides to forfeit competitive bidding of the downstream systems engineering contract and assign it directly to the incumbent.

7 System Engineering services may include the supply of specialized hardware or software that is used in the process of development of the system.
This continuation option facilitates procurement of complex, technology neutral information systems because neither the Client nor the Contractor are forced, at the time of the upstream system specification contract, to make decisions related to the downstream SE contract for which neither party typically has sufficient information.

Technology neutral systems are most data processing and back office systems such as taxation, public financial management and management information systems. If properly designed, this type of systems can be implemented in any of the major software/hardware platforms available in the market.

Under the Specify and Engineer option, procurement of the technology platform must occur separately and the incumbent firm is disqualified from that procurement.

Other procurement design options may be indicated for technology neutral systems. They are discussed in the companion Guidance Note no. 2 on IT Procurement Design Options.

Figure 2 below, portrays the “Specify and Engineer” contractor continuation option described above and the situations of conflict of interest under it.
B. Specify-and-Integrate Option.

Under this type of continuation, a firm may develop the specification and/or the functional design of a system and then compete for the system integration contract for the same system, including system engineering (detailed design, construction, testing, and deployment); supply of the hardware and commercial software; and installation, conversion, training, and testing services to achieve operational acceptance of the system.

This continuation option will facilitate procurement of certain complex information systems such as process control, payments processing, environmental monitoring, and electronic government systems. In these and similar systems, technology integration problems are of paramount importance, and expertise on the entire project life cycle resides most frequently with specialized systems integration firms.

Figure 3 below, portrays the “Specify and Integrate” contractor continuation option described above and the situations of conflict of interest under it.

<table>
<thead>
<tr>
<th>PROJECT PHASE</th>
<th>PROCUREMENT TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>System Specification &amp; Project Mgmt.</td>
</tr>
<tr>
<td></td>
<td>System Engineering/Integration</td>
</tr>
<tr>
<td></td>
<td>Supply &amp; Maintenance of Technology</td>
</tr>
<tr>
<td></td>
<td>Independent Audits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
<th>Phase V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Strategy &amp; System Requirements</td>
<td>RFI &amp; Pre-Qualification</td>
<td>System Engineering</td>
<td>Implementation</td>
<td>Maintenance</td>
</tr>
</tbody>
</table>

Figure 3. Specify and Integrate Option
V. Implementation Safeguards

Both Contractor Continuation Options (CCOs) need special safeguards to avoid real or apparent conflict of interest. The objective of these safeguards is to prevent the exercise of bias in the upstream contract and to ensure that any remaining unfair advantages of the incumbent is rapidly identified and corrected during procurement for the downstream contract.

A. Common Safeguards

At a basic level, CCOs must be:

- agreed upon between the Borrower and the World Bank in advance of the RFP for the upstream contract. Ideally this would happen as part of the project procurement plan or at the earliest time during design of procurement strategy for the IT component of the project.

- announced as part of general and specific procurement notices and Invitations to Bid.

B. Upstream Contract Safeguards

The Terms of Reference for the upstream contract must include the following provisions to neutralize the information asymmetry advantages of the incumbent in competing for the second-phase contract:

Contractor must be clearly obligated to develop a system specification suitable for implementation with technology provided by a majority of the relevant industry suppliers. wide that can be and to document explicitly any design aspect that may operate in favor of their own downstream solution.

Incumbent Contractor must be required to document all critical parameters of the Client’s business that affect the subsequent design of a technical solution, and (optionally) to have them audited by an independent auditor. There should be an explicit understanding that these reports will eventually be shared with other bidders, as part of the Technical Specifications for the downstream system engineering or integration contract.

For system specification and functional design outputs (including entity-relationship diagrams, data flow diagrams, data dictionary entries, and display output specifications), Incumbent Contractor must adhere to industry-standard documentation and diagramming conventions and include all essential business functions (i.e., those directly addressing business requirements irrespective of technology constraints).

Incumbent Contractor is disqualified from participating in all work related to the preparation of bidding documents for the downstream contract (Phase II in figures 2 and 3).

C. Downstream Contract Safeguards

Preventive safeguards discussed for the upstream contract must be complemented during procurement for the downstream contract.

Two medium-term policy decisions of governments and the World Bank would be strong safeguards for fairness in CCOs, and help improve IT procurement across the board. They are:

- Encourage the use of Internet-based public procurement systems that allow communication among the parties in a
bidding process at any time, from anywhere in the world.  

- Establish a fast-acting dispute-resolution mechanism, such as a standing panel of experts from several countries charged with resolving disputes through virtual deliberations over the Internet.

Other safeguards can be implemented immediately for all cases of Contractor continuation in complex systems procurement:

- Liberal bid clarification and site visit provisions.
- Full documentation, as part of the Technical Specifications, of the Client’s technology strategy, business operations, condition and repair history of any existing technology to be used with the new system, and peak transaction volumes. The documentation should be consistent with the related requirements for the upstream contract specified in B. Upstream Contract Safeguards above.
- Unless fraud is alleged, hold bidders accountable for raising issues of specification bias exclusively through the bid clarification process.

VI. Conclusion

The new guideline proposed in this Note is not expected to be a panacea but only one of the change elements introduced by the World Bank to simplify IT procurement of complex systems.

The enhanced documentation standards and process safeguards specified in this note are likely to facilitate contractor continuation options in complex systems engineering procurements, when these options would be to the advantage of Bank Borrowers.

Some of the items included in the guideline above must be implemented at the time of drafting the Terms of Reference for the upstream system specification contract, and they require no change to the Bank’s Standard Bidding Documents.

Other items involve changes to the Invitation for Bids and the Instructions to Bidders in the downstream system engineering or integration contract. Those changes are to be implemented in the Standard Bidding Document for Information Engineering that the Bank will issue during the first half of Year 2002.

---

8 See IT Procurement Guidance Note 5 on Electronic Government Procurement Systems.

9 For a list of all elements, see report on Progress on IT Reform Strategy in the Bank’s IT procurement web page.
VII. Reader’s Feedback

The Bank welcomes any feedback on this Guidance Note or any other document in the IT Procurement Forum [http://worldbank.org/itprocurementforum](http://worldbank.org/itprocurementforum). Please channel your comments through the Procurement Policy and Services Group of the World Bank:

Procurement Policy and Services Group
Operation Policy and Country Services Network
The World Bank
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.

e-mail: Pdocuments@worldbank.org