



Beyond the Contract

*An analysis of
the business impact
of IT procurement
best practice*

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Introduction

Information Technology (IT) provides a vital function in nearly every organization today. Whether commercially focused or publicly funded, the amount of money being spent on IT continues to increase both in real value as well as percentage of total expenditure. At the same time organizations are under increasing pressure to streamline operations and reduce costs as European markets encourage greater competition, and public expenditure is being trimmed and more closely scrutinized.

Organizations need effective tools that allow them to properly manage their IT investments. We know that the decisions surrounding the procurement of a new IT system can fundamentally affect the success and value a new system provides, and there are several guides and methodologies available to assist European organizations in making better procurement decisions. These range from executive guides describing procurement strategy and management principles, to detailed methodologies, which dictate specific actions to be followed at each phase of procurement.

Organizations wishing to make use of these guides and methodologies are often faced with difficult questions:

- Should they make dramatic changes to their procurement procedures in order to adopt one of the recommended procurement methodologies?
- Which of the recommended actions should they focus on if they want to address a specific concern?
- Do the recommended actions actually make a measurable difference in the results achieved?

Answering these questions, and others like it was why this project was established.

We set out to identify which of the myriad of recommendations made by the various procurement guides and methodologies actually have an impact on the success of an IT implementation. But more importantly, we wanted to identify the specific type of impact associated with each individual recommendation.

The approach was to study actual procurements conducted by many organizations. Specific recommendations or proposed 'best practices' made by fourteen of the most popular procurement guides and methods were analyzed and their impact measured. The results of these studies are presented in a format that allows organizations to identify actions and improvements specific to their needs and situation.

While it is clear that none of today's guides or methods can completely address the challenges of IT procurement, this report brings together the best recommendations available and shows what really works.

If you are looking for a "hands-on" guide to implementing the practices and changes recommended in this report, you should look at 'IT Purchasing: a guide to getting more value from your IT purchases.' This workbook is a step-by-step guide to implementing the best practices that have the highest priority in your organization. It comes with a PC based software tool that will analyze your procurement practices, make recommendations where to start with improvements and then lead you through each improvement.

Find it fast!

If you're looking for	Find it here
Practices with the most positive impact on procurement results	Best performing practices is where you will find the practices associated with many improvements in procurement performance. These were shown to be the best of the best practices.
How to improve a specific procurement problem or concern	Practices that improve results is a listing of the procurement practices associated with improvements in each of the performance measures. Find Practices that improve results in the Table of Contents, lookup the specific performance measure you would like to improve, and then follow the practices indicated.
Practices for building a procurement improvement program	Practices for improvement indicates for each procurement practice whether an improvement was seen in economic, effort, functionality, and performance measures.
Examples of implementing practices associated with improved results	Case studies of best practices provides examples of how four organizations implement practices associated with improved results in several areas.
All the best practices recommended by 14 popular guides and methods	Reference set of best practices provides a complete listing of the practices recommended by the leading procurement guides and methodologies.
Where to get the best practice guides and methods used in the study	Best practice source references lists where you can obtain each procurement best practice guide or method used in the study.

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Using this report

This report is based on empirical studies of actual procurement projects conducted across Europe. The studies first involved the assessment of the procurement best practices being used by organizations, followed by the collection of metrics to measure procurement project results. The relationship between these two data sets was then analyzed to identify the procurement practices associated with improvements in specific project results.

The information contained in this report is not a substitute for the existing procurement best practice guides and methods. It is intended to be a companion document allowing organizations to quickly identify procurement practices and topic areas that address specific needs or interests. The authors have maintained references to each of the sources of the best practices analyzed in this study, and the reader is encouraged to use the referenced guides and methods to obtain further information concerning the implementation of the best practices identified in this report.

IT procurement improvement is a relatively new discipline and there are many new tools recently introduced to assist organizations that want to obtain better value from IT purchases. While this document provides suggested actions, it is recommended that improvements be undertaken as a project that is managed within an organization.

Often, external support is useful as a neutral and objective source for guidance and assisting management in introducing and implementing new procurement practices.

Target audience

The target user of this report is any person who has responsibility for or is involved with the activities associated with purchasing IT systems or components. It is especially well suited for organizations that wish to improve their IT procurement activities or that are experiencing chronic problems with procurement projects or procured IT systems. These organizations may be

- public or private
- from any industrial sector
- any size, from a small or medium enterprise to a large multinational

Some practices analyzed within the study are only feasible in larger organizations. However, there was no bias in selecting best practices for study based on applicability to organization size, purchase magnitude or IT application. The reader, regardless of organization size or IT application, will benefit from this report.

Individuals who reference this report will typically have one or more of the following responsibilities within their organization:

- Determining requirements for systems and software being purchased
- Selecting IT technology and suppliers
- Approving IT expenditures
- Negotiating contracts with IT suppliers
- Ensuring supplier deliveries

- Bringing purchased systems and software into operation
- Managing IT procurement projects

This report will assist these individuals to improve their results, to solve problems, and to identify well-proven procurement best practices.

Different uses

This report is unique in its variety of possible uses. All of the data contained within it is based on empirical studies of actual procurements. The presentation of this data was designed so the reader can use it in three different ways:

1 Process definition

All of the best practices collected from the leading procurement guides and methods are included in this report. This best practice reference set as well as the procurement process structure presented can be used by an organization as a basis to establish overall procurement policies or guidelines.

2 Problem solving

This report is organized to allow easy identification of the procurement best practices associated with specific improvements in a large number of project results. Organizations that have already identified a specific procurement problem can quickly identify the procurement practices that have been shown to improve the same problem for other European organizations.

3 Improvement

The procurement best practices that have been shown to lead to the greatest improvements in project performance are identified within this report. As part of a procurement improvement initiative, organizations can reference these high benefit procurement practices and ensure that these practices are being implemented in their own organization.

This report provides the information needed to define a more formal procurement process, address a specific procurement issue or problem area, or to identify actions for a procurement process improvement action when an organization already has well-defined procurement procedures.

Application of results

The results presented in this report can be used in several ways depending on the needs of an organization and the existing procurement practices already established. The primary objective of the study was to provide practical information to organizations seeking to obtain better value from their IT procurements and supporting activities. The different approaches for obtaining value from this report are described below.

Process definition

Every organization has to identify and establish an appropriate procurement process or approach to determine the responsibilities and activities to be carried out for a major purchase. The various roles or participants for IT procurement could be summarized as follows:

- top management
- management board
- procurement project team
- administrative staff

- IT staff, and
- users

These roles and the activities related to each are addressed by the identified best practices summarized in *Reference set of best practices*. In order to develop an organization specific approach to procurement in a step-wise manner, the process structure must first be determined. The structure found in *Reference set of best practices* will give you a framework of possible procurement processes to help organize your own thinking and development of procedures in each area.

This structure can first be filled with best practices and the high value best practices identified in this report deemed applicable to the reader's organization. Additional organization specific practices can then be added and the entire procurement process and practices then communicated to all the affected parties.

When defining or redefining a procurement process for your organization, it is often valuable to get external support. Often, experts familiar with many different procurement practices can suggest and aid in identifying those most appropriate for your specific situation and business objectives.

Problem solving

Most managers involved in IT purchases today can articulate the top two or three problems they are experiencing in implementing new IT systems. The project performance metrics used within the study relates to common problems and areas that are often targeted for improvement. The study data showed that many problems could be substantially improved if not altogether solved by the application of appropriate procurement practices. While this is intuitive to most, the challenge has been identifying which specific practices should be applied.

You will find in the *Table of Contents* under *Practices that improve results* a listing of procurement project results or performance measures. The procurement best practices associated with improvements in each result are listed in this chapter. The practices listed for a specific problem or desired improvement should be the first set of actions to consider, as each of these practices has been shown to be associated with an improvement in the specific project result.

In addition to taking positive action by following the best practices identified with a desired project improvement, you should also review the practices that have been shown to be of the highest 'value'. These practices are found in *Best performing practices* and are practices associated with significant and consistent improvements across a number of project results. Practices to be avoided or to cause concern are found in *Least performing practices* and are listed along with an explanation as to why their impact on results was negative.

Improvement

The report indicates in *Practices that improve results*, how each of the best practices studied was associated with improvements in project results grouped into the following four categories:

- **Economic** - relates to the pricing and financial impact of specific practices.
- **Functionality** - addresses the content and usability of the IT purchased systems or components
- **Effort** - relates to the resources used to purchase and bring the system into operation
- **Performance** - the effectiveness of the project and the way it is managed

By using the indicators in this chapter the best practices associated with improvements in each category are easily identified. They allow the reader to establish an objective to improve organizational performance in one or more of the four categories and they provide a list of the actions to be taken. The full statement of these practices and references to their source guide or methodology are listed in *Reference set of best practices*.

Best practice sources

The source references for all of the best practices analyzed within the study are described in *Summary of best practice sources*, to facilitate the selection as to which specific guide or methodology is appropriate. The referenced best practices are often abstractions of more detailed information and principles given by the available methods and guides, which are too voluminous to be included within this report. Referencing the original guide or methodology source will facilitate the implementation of best practices with additional information and will provide a better understanding.

The description of the study method and analysis to obtain the results is given in *Study method*.

Limitations

Considerable effort has been invested by many organizations, both government and commercial, in defining procurement guidelines and methodologies. However, consistently successful IT procurement processes are still difficult to achieve and for most organizations, many practices are required to fully implement an IT procurement that are not identified in any of the procurement methodologies and guides.

This report is based on 14 readily available and well-known procurement methods and guidelines. It identifies the best practices recommended by these guides and methodologies that have been validated by European users conducting actual procurements. This report covers only those practices addressed by today's current guides and methods. The areas not sufficiently covered in the existing procurement guides (and therefore not analyzed in this study) are primarily areas related to the day to day management and conflict resolution of projects, such as monitoring supplier performance, ensuring supplier quality, establishing procurement procedures and tracking, and supplier conflict resolution.

It's worth noting that an omission of a specific best practice from the recommendations of this report does not necessarily mean a practice the reader follows should be discontinued. It only indicates that a practice was either not part of the study, or not shown to have a strong relationship to the project results and performance metrics measured.

Best performing practices

The primary objective of the study was to identify practices that were associated with improvements in specific project performance areas. However, through the analysis it also became possible to rank order each procurement practice according to the number of project performance measures (see *Practices that improve results*) that were improved when each practice was present. The result is a list of ‘high-value’ procurement practices which when present are associated with improvements in many project measures.

These highest value procurement best practices are described below. They were associated with strong improvements for between 10 and 23 of the project performance measures studied.

Identify training requirements within requests for proposals

Complex IT systems depend mostly on human resources to achieve successful implementations. Normally people do not have the time or will to attend formal training and prefer to maintain the daily routine to which they are more accustomed. Addressing the training issue within the Request for Proposal from suppliers’ means that this is an issue that is considered and addressed from the project start. This forces procurement teams to consider the human impact of a new system, to better estimate the costs of introducing a system, and by having sufficient training addressed and budgeted, makes for a more successful system introduction.

The other consequence is that the suppliers are aware of the needed resources for the whole implementation, which reduces the hidden costs of the project for both supplier and purchaser. When the training issue is addressed only at later phases of a project the risk of misunderstandings is higher leading to additional risks in cost and time overruns.

Identify and analyze procurement failures

IT purchasing activities rarely are organized in a way that allows for analysis and improvement. Instead, organizations often establish procurement practices or guidelines that are not routinely analyzed and updated to achieve better performance. Often it takes a major purchasing crisis before change is introduced. The studies showed that organizations that take the time to understand why issues arose or failures occurred within a completed project have better performing projects on several measures. A post procurement analysis becomes a learning tool for procurement teams to improve their performance for subsequent purchases. When procurement failures are routinely analyzed, it forms the basis for continuous improvement in procurement practices, processes and personnel.

Analyzing procurement failures also has an additional effect on project management. In order to analyze failures it is necessary to record project data, and maintain documentation so that an analysis can be performed. Such an *a posteriori* analysis is a key element in avoiding re-inventing work already completed (i.e. saving time) as well as in effective reuse of corporate knowledge (i.e. effective communication within the team).

Utilize standards to evaluate software capabilities

Software development is a high-risk activity with regard to cost and time. Contract terms can be used to penalize a supplier should cost overruns or schedule delays occur, but a better approach is to avoid such conflicts by evaluating and understanding the software development capabilities of a supplier. By doing so, a purchaser can rate and rank suppliers based on their abilities and associated risks so that proper trade-offs can be made.

There are many actions a software development organization can undertake which have been shown to reduce or mitigate development risks. There are software quality standards (e.g. ISO 9000), software process assessment methods (e.g. ISO 15504), and technology skill set evaluations that can be utilized to assess and evaluate a supplier's software development capability. Organizations that utilize these techniques as part of the supplier selection process show significant improvements in project schedules, required resources, quality of deliverables, and user satisfaction.

Obtain proof of supplier's capabilities

The diversity of IT usage often leads to purchases of custom applications and systems that are uniquely tailored to a specific organization. Development work of unique systems is inherently more risky in that there are few comparisons to determine if schedule and resource estimates are realistic. Suppliers often time commit to deliverables that are unique to a purchaser without having a full understanding of the effort involved, the technology to be used, or a complete specification for the system being purchased.

Purchasers can reduce risks and the likelihood that schedules and resources are overrun by requiring suppliers to prove their abilities. A supplier's abilities must cover a range of topics including technical knowledge, project management skills, financial resources, and ongoing support of the delivered systems. Requesting suppliers to prove their abilities by showing for example, satisfied customers of projects of similar size and complexity, financial statements, etc., leads to a more informed supplier selection process and projects that are less likely to have problems, even for unique or customer IT systems development.

Maintain training records throughout procurement

Recording training activities is associated with the high-value best practice of including training requirements in Requests for Proposals. It can often be a driver for including training requirements in Requests for Proposals as knowledge of skills and abilities of the user, development, operational, and support personnel motivates a purchaser to address any new skills required for a system being purchased. The benefits of doing so are further described above.

Recording training activities also provides an important link to the users of a new system in that tracking their training requirements forces a close working knowledge of the users and their abilities and needs. This leads to systems that are better defined and more appropriate for the users. Recording training activities is also associated with organizations that maintain good internal quality management standards. The practice when present drives several actions that led to improved project performance.

Quickly establish a usable system

Most IT development organizations when creating a new system or substantially modifying an existing system will organize their work functionally. This is a natural order as development is organized by technical challenges that must be solved. It is also a natural order because most organizations have individuals who are skilled and experienced in certain functional areas, such as networking, user interface, database management systems, etc.

This natural order for the developer was shown not to be optimal for the purchaser. The approach that was associated with more successful projects was based on first establishing a working or usable system. This may entail only partial development of several functional areas of the new system, and the initial core system may have only a small portion of the entire system capabilities. Once the core usable system is established, additional layers are added incrementally building up the target capabilities of the complete system.

This best practice results in many benefits to the purchaser. A partial system is available early on in the project allowing for the purchaser to identify areas that need to be modified or revised from the original requirements. The earlier these modifications are identified within a project, the lower the modification costs and effort. Another aspect is that users are able to quickly see the intended system abilities and the procurement team can get early support and commitment to the success of the project. The users have the opportunity to affect the system design and to suggest improvements or identify concerns. This is much more effective than to suddenly introduce a complete or nearly complete system to the user population when there is little chance from a cost standpoint to make significant changes.

List and track all objects of a procurement

IT procurements often time involve several components or must be integrated with one or more existing systems. Most systems are developed through structured approaches of developing individual modules and then integrating various modules at different stages of the development activities. The tools used for development, or the environment in which a system or module has been developed or tested, can affect the stability of the development and reliability of the testing or integration activities.

As suppliers make deliveries it is essential that the components transmitted, the environment in which they are intended to operate, and the components and environment in which they will be integrated are all clearly tracked and managed. The activity of keeping track of all of the elements of the system being developed or delivered is configuration management. Purchasers who require suppliers to provide a clear configuration management plan had projects with far fewer technical issues and much stronger and positive interactions with suppliers as there were fewer surprises. When a supplier conducts configuration management as a routine activity, they are able to provide better information on project status, and to clearly state how deliverables have been tested. There is also less chance of installation and integration problems for the new system.

Explicitly document acceptance criteria in contract

Defining acceptance criteria for the supplier in the contract has several positive effects on procurement projects. When the practice is followed, the purchaser must state in writing what are the project objectives for the procurement. These generally form the first level of acceptance criteria for the system and when defined result in more focused projects and decision making by the purchaser.

At the same time, defining the acceptance criteria in the contract provides clear targets for the supplier so that they are able to more reliably estimate the effort and schedule to complete the project at the acceptable levels. Better contractual terms are obtained from the supplier as suppliers can reduce the safety margins normally included for unknown project factors. A further benefit is the ability of the purchaser to shift the burden of proving initial compliance with the acceptance criteria to the vendor. This does not eliminate the purchaser's need to verify supplier's deliverables, but it can significantly reduce the effort required for verification.

Use standards for evaluating suppliers

As discussed above, there is significant benefit in evaluating a supplier's software development capabilities and obtaining proof of a supplier's abilities to deliver the purchased system. When evaluating suppliers, the use of standards for evaluation provides important project benefits. Fewer resources are expended on the project creating customized or newly defined methods and techniques for evaluating suppliers. Standards are usually better documented so that having a policy of evaluating suppliers can be more readily implemented by different procurement teams without requiring substantial training on custom or internally defined evaluation methods.

A standard for evaluating suppliers also gives the supplier a clear statement as to what is required and how they will be measured. Suppliers over time will undertake improvements in order to better satisfy the standards used for evaluation and be considered for further invitations to tender proposals. Standards also make comparison of alternative suppliers easier as there is a common benchmark used for evaluation. Organizations that used standards for supplier evaluations also had more formal procedures for evaluating and selecting suppliers. This resulted in higher satisfaction with supplier performance.

Risk management integral to procurement project

Introducing IT into an organization has many elements of risk associated with it. There are risks related to the technology choice, the supplier, interruption to the business, usability of the system, costs associated with maintaining the new system, etc. Organizations that have procedures that acknowledge and actively seek to manage these risks have projects that are substantially more successful.

There are several areas that benefit from including risk management within procurement procedures. The activity of identifying risks even if little can be done to mitigate the risks results in more realistic assessment of project schedules and required resources. It also serves as an important factor for supplier discussions as it results in a more informed position for the purchaser during contract negotiations. For procurement teams, an environment where risks are routinely identified makes for more open and direct communications about procurement projects when issues arise. The largest benefit to the projects comes from the actions that are taken to reduce risks. Organizations that identified and managed risks had projects that more closely met expectations.

Payment on delivery

While a common practice for many organizations, the study showed that making payments on delivery was associated with project improvements in several areas. The most intuitive was the confirmation that schedules were more likely to be met by suppliers when payments were tied to delivery. However, other effects were also seen. When payments are tied to delivery, both the purchaser and supplier require that the deliverables be well defined. This process of defining the deliverables clearly creates procurement projects where the objectives and schedules are better understood.

When implemented with the above-described high-value practice of defining acceptance criteria in the contract, it provides a means for corrective actions to be taken so that user satisfaction increases and the unexpected need for additional resource from the purchaser is also reduced.

Least performing practices

The project study focused on analyzing the impact or relationship between the best practices recommended by the most popular procurement guides and methodologies. There was no attempt in this study to assign value or to discriminate against any *a priori* particular practice. However, the study did show that there were recommended practices which were associated with substantially poorer performance in procurement projects across several different performance measures.

The practices associated with poorer performing procurement projects are described below. It is important to point out that these practices are divided into two categories:

- Practices that seem to cause poorer performing projects, which should therefore be avoided
- Practices that are only symptoms or indicators of challenging or complex procurement projects (which generally exhibit poorer performance). These practices should still be followed

When these symptomatic or indicator practices are utilized, their presence should serve as a warning signal that the procurement is a high-risk project and likely to achieve poorer than expected results in several of the project measurement areas. An explanation of each practice is provided below.

Give preference to commercial off-the-shelf software

Many organizations in recent years have adopted a policy of purchasing commercial off-the-shelf software (COTS) as a means of reducing costs. Standard components generally cost less, are more widely available and are easier to support. It is also more likely that there are multiple suppliers able to provide products and support services. The procurement data indicates that for purchases of important systems where substantial investments are being made, a COTS policy results in poorer project performance in many areas.

A COTS policy may reduce the cost of the individual components of an IT system, but it was shown to increase the costs related to integration as the COTS components don't always work well together. It also reduces the user satisfaction for the system as the functionality delivered is often limited or constrained to what's available in COTS products. Often these products impose a generic or generalized approach that may be in conflict or require substantial modifications to existing or desired business processes. While there are times when a COTS policy is appropriate such as the purchase of office automation systems, using a COTS policy for major procurements that impact an organization was shown to create many challenges for a project.

Split procurement into several contracts

This practice is often followed within public procurement organizations and is in compliance with directives related to open competition. The requirement is that when possible, purchases should be split into several contracts where each contract provides opportunities for other suppliers to participate. This prevents suppliers from being locked out of public projects for long periods and it is intended to ensure competitive bidding for each phase of a project thereby reducing costs to the purchasing organization.

Splitting procurement projects into several projects was shown to reduce project performance in several areas. The effort involved in the procurement was much higher than expected, as the purchaser becomes arbitrator for issues that arise between different phases of the procurement. There was also a substantial amount of rework required as components delivered in later contracts required modifications to components already delivered and accepted under earlier contracts. The integration effort was much higher than had been planned and as the system is being delivered from different suppliers the documentation quality varied. Often there was not a single documented view of the system or how it is to be used. Once the system components have been delivered and put into operation the purchaser continued to have issues as responsibility for maintenance issues once again put the purchaser in the position of arbitrator between different suppliers.

Benchmark the existing systems

Benchmarking existing systems was not found to be a routine activity amongst purchasers. The view of the study was that benchmarking existing systems was a best practice but it was also a symptom of other issues for procurement. Benchmarking existing systems seems to occur not for measurement and management reasons but more often when there is quite a bit of uncertainty regarding a new system being procured. The benchmarking may be performed to justify decisions already taken. It may also be performed when the expected improvements from a new system are not immediately obvious or are becoming questionable based on early deliveries.

Benchmarking existing systems if done routinely and as part of a measurement program to monitor and improve system performance is a best practice. As it is not practiced routinely by most organizations unless there are concerns about the procurement, its presence was associated with a number of negative performance issues.

Supplier is informed of selection criteria

Purchasers today are often striving to establish closer relationships with suppliers so that suppliers are better informed about the needs of the purchaser and the intended business benefits expected from a new system. Purchasers who utilize formal call for tenders often try to give some indication of the decision criteria that will be used in selecting a supplier. The primary reason for providing this information is to ensure each supplier addresses the points of most interest, and to show a neutral approach to supplier selection.

The study indicated that providing the assessment criteria used for supplier selection to the suppliers themselves resulted in poorer performing projects. The performance problems often occurred in the later stages of the procurement such as integration, meeting performance requirements, providing maintenance and with documentation. What appears to occur is that suppliers focus on demonstrating their abilities to meet the specific assessment criteria but in fact do not provide proposals that consider the whole system lifecycle. Nor do they adequately factor in potential issues and problems that might occur during development.

Conduct external quality reviews

Use of external quality reviews is a practice that should be followed if needed but is actually a symptom of a larger problem with procurement. It is likely to be used when the purchaser's procurement team does not have the required skills or system knowledge to review and assess the systems being delivered. Organizations that are purchasing systems whose complexity is beyond the purchaser's own abilities to assess and validate are likely to be having many other project issues. External reviews may in addition be used as a last attempt to save projects that are already having troubles.

Use of external quality reviews occurs more frequently in public procurements. In this case it is being used as a management tool to ensure proper relationships between purchaser and supplier and to ensure public spending is being used properly. However, one also finds that because of this policy the procuring organizations come to rely entirely on the use of external quality reviews and lack the internal knowledge to assess and validate the system themselves. One effect of this practice is that supplier financial terms are often less favorable when external quality reviews are used as suppliers assume this will require more effort and resources to satisfy an individual or organization that is a third party to the supplier/purchaser agreement.

While this practice is clearly recommended when there are no internal resources capable of reviewing supplier quality, a better approach would be to maintain sufficient internal application and technical knowledge of what is being procured. In this way external quality reviews become a reaffirmation for management reasons or to safeguard public trust, rather than the normal method of reviewing or accepting supplier deliverables.

Establish a risk management plan

This is an especially unusual practice to appear in this chapter in that one of the ‘high-value’ best practices is to include risk management as part of a purchaser’s procurement procedures. The reason it does appear is that this practice is actually a symptom of a complex or high-risk project. Higher risk projects are more likely to have problems and issues. Therefore, the need to establish a risk management plan is better considered a predictor that challenges are ahead rather than a practice to be avoided.

Since the existence of a risk management plan did not in fact result in better performing projects, one can also conclude that the risk management plans were either 1) not adequate, or 2) sufficient mitigation actions were not taken, or 3) risks associated with some new systems are beyond many purchaser’s abilities to assess and manage, or some combination of these.

Procurement teams are aware of user practices

Those involved with bringing a new system into operation should clearly be aware of user practices and how the users will make use of the system. The reason that this practice was associated with poorer performing projects was that it was also associated with organizations where the users and purchasing group or procurement team were quite separate and often in completely different organizations. The practice of formally determining user practices as part of procurement is a symptom of a procurement team that is not closely linked to the actual users of the procured system.

The study showed that more successful procurements result when the actual users of a system being procured are leading or heavily involved in the procurement team. The users themselves are committed to the results and the purchasing, legal, and technology personnel are providing a supporting role. What often occurs when the users and procurement teams are in different organizations is that a formal user liaison is assigned to the team. While this is an improvement, the study showed that there were still many project issues when those making the purchasing decisions have so little personal knowledge about the user’s practices that the procurement teams need to take formal actions to make team members aware of user practices.

Document issue resolutions

Documenting issue resolutions was viewed as a symptom of procurement projects that were either complex or had experienced problems and issues that involved the entire procurement team. It was also common to find issue resolutions being documented when there were very large procurement teams involved with very large or complex systems.

The practice is one that should be followed and when issues occur, or when projects are large and complex, tracking and documenting issue resolutions is essential.

Areas without improvement

The study looked at a broad range of recommended procurement best practices based on many of the most popular procurement guides and methods. It is worth noting that there were several important areas where the study showed that none of the recommended practices resulted in any consistent improvements. Areas without improvement were:

- Supplier responsiveness
- Supplier co-operation
- Problems with contracting
- Problems with development
- Adequacy of planning documentation

As the guides and methods deal primarily with the earlier stages of the procurement life-cycle such as planning, defining needs, and organizing procurement, it perhaps can be understood that there were not any recommended practices that improved development issues.

It is interesting to note that even with many practices related to suppliers, none were shown to improve supplier responsiveness or the level of supplier co-operation as perceived from the purchaser's standpoint. None were also shown to improve the adequacy of supplier documentation during the planning phase of the project.

Finally, while there are many recommended practices concerning how contract terms are requested from a supplier and contract structure, none of these practices were shown to reduce the number of problems associated with establishing a contract with a supplier.

The fact that improved supplier responsiveness and co-operation remain illusive for many organizations may be an indication of an inherent problem in procuring IT. It may also however indicate the inadequacy of today's procurement guides and methods.

Practices that improve results

The focus of the study was to determine which practices have an impact on procurement projects that can be measured and validated during actual procurements. The project identified a set of measurements that provide various indicators of procurement project performance. Most measures or metrics were performance related, however some measures were included that indicated the degree to which certain widely accepted practices were having any affect. The measurements were organized in four main categories shown below.

Financial

- Supplier discount
- Supplier penalties
- Project extensions
- Payment terms
- Return on investment
- Time to obtain return on investment
- Value for money
- Additional funding requests
- Unexpected purchases
- Budget overruns
- System cost

Infrastructure

- Staff satisfaction
- Procurement team cooperation
- Decision making
- Procurement team satisfaction
- IT staff turnover
- User satisfaction
- User participation
- Training

Process related (by phase)

- Performance
- Project satisfaction
- Problems detected
- Rework and corrections
- Completeness
- Person effort
- Project scheduling

Supplier related

- Complaints
- User relationship
- Supplier dependency
- Supplier responsiveness
- Supplier information
- Supplier cooperation

The process related measures were further broken out into the typical phases of procurement in order to identify practices that had an impact on particular areas or procurement activities. These are described as follows:

- **Planning** - defining business needs, requirements, supplier strategy and policies
- **Contracting** - call for tenders, supplier selection, contract negotiation
- **Development** - development and delivery of the purchased components by the supplier
- **Testing** - verification and validation that deliveries meet the purchaser's requirements

- **Integration** - combining components into a single system as well as bringing the system into operation alongside existing systems
- **Maintenance** - modifications and minor enhancements and updates to maintain or increase the value and benefit of the system to the purchaser
- **Overall** - aggregate or averaged view or perception across the entire procurement lifecycle

Each of these measures is further described and the procurement practices associated with improvements in each measurement are listed below. Some practices appear more than once as they were shown to be associated with improvements in more than one measure.

Please note that all of the procurement practices listed for a given measure were strongly associated with improvements in that measure. Practices with bold text indicate an exceptionally strong association.

Supplier discount

Supplier discount indicates the price reduction obtained from the supplier as compared to normal or publicly stated prices. This amount is easily calculated for standardized projects or purchases, and is stated in terms of percentage reduction. For single and unique developments, there may be no public prices that allow an indication of discounting; therefore not all organizations were able to state a discount level for each procurement.

Practices associated with improved supplier discounts are:

- **Define performance requirements both for normal operations and for extreme situations that may occur** [Source: SOTIP] (A2.1.33)
- **Organize collection of feedback from users** [Source: PA] (A2.1.15)
- **Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement program** [Source: CCTA, SA-CMM, EURAP] (08.1)
- **Align supplier and procurer expectations periodically to avoid conflicts** [Source: BuyIT] (08.11)
- **Define the responsibility for maintenance and upgrades** [Source: SOTIP] (A2.2.13)
- **Do not approve the procurement program to proceed beyond program initiation unless sufficient resources, including manpower, are already identified and available** [Source: R5000] (07.3)
- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- **Define requirements for security services to minimize the security risks** [Source: EPHOS, SOTIP] (A2.1.42)

Penalties paid by supplier

Supplier penalties are sometimes incurred when deliveries are late or performance and functionality was not delivered at the level required and agreed with the purchaser. The level of supplier penalties was stated as a percentage of the overall purchasing budget.

Practices associated with reduced supplier penalties are:

- **Ensure that new systems cope with the existing business processes and existing hardware, links and other systems** [Source: BuyIT] (A2.1.54)

Project extensions

Project schedules may be revised from time to time for a number of reasons. These may be due to a supplier being late in making required deliveries, technology that requires additional effort for integration, or the supplier and purchaser may have agreed to additional functionality that might require extending the project schedule. This measure was stated in terms of percentage of the original project plan.

Practices associated with reducing project extensions are:

- Involve potential prime suppliers during the feasibility phase in a competitive or collaborative manner [Source: EURAP] (A1.1.25)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Maintain a list of potential suppliers for systems and development [Source: EURAP] (A3.2.12)
- Design quality indicators for user satisfaction [Source: PA] (M3.2)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)

Payment terms and conditions

This is a subjective measure in that specific payment terms and conditions vary dramatically depending on the supplier, technologies and products. However, most purchasing professionals have an opinion as to whether they are obtaining favorable terms and conditions from suppliers. This measure was an indication of the degree to which the terms and conditions were viewed as being favorable.

Practices associated with more favorable terms and conditions are:

- Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)
- Plan specific management resources for system management and configuration control [Source: PA] (M2.10)
- Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)
- Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (O3.9)
- Include evaluation of the supplier's software engineering capabilities in the evaluation criteria [Source: EPHOS] (A1.2.28)

- **Maintain training records throughout the procurement program** [Source: SA-CMM] (01.6)
- **Utilize standards for process assessment and quality management to evaluate suppliers** [Source: EM] (A3.1.5)
- **Do not approve the procurement program to proceed beyond program initiation unless sufficient resources, including manpower, are already identified and available** [Source: R5000] (07.3)

Return on investment

Return on investment is a business measurement indicating the level of benefit obtained from the resources invested in the procurement of a new system. While some organizations don't calculate precise calculations, many have a sense of the benefits a new system provides as compared to the resources required to put it into operation. The measurement taken was a relative scale of the level of return on investment for the procurement studied.

Practices associated with increased return on IT procurement investments are:

- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- **Utilize standards for process assessment and quality management to evaluate suppliers** [Source: EM] (A3.1.5)
- **Define program deliverables in the main body and attached schedules of the contract** [Source: BuyIT] (A3.3.10)
- **Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM** [Source: BuyIT, TAP] (M1.16)
- **Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay** [Source: EURAP] (03.12)
- **Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs** [Source: BuyIT] (02.1.3)

Time to obtain return on investment

The level of return on investment is an important measure of the success of a procurement project. However, projects vary substantially in the amount of time required to obtain a significant return on the investment being made. The sooner a return on investment is achieved the better for the organization and the lower the risks associated with the project. This measure indicates the time in years required to obtain a significant return on investment from the system procured.

Practices associated with reducing the time to obtain return on IT procurement investments are:

- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19) *
- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (01.3) *
- **Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured** [Source: BuyIT] (A1.3.12) *
- **Perform planned evaluations on the procured system prior to acceptance for operational use** [Source: SA-CMM] (S3.8) *

- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Establish general models for structuring business and organizational needs in a common language [Source: SOTIP] (A1.1.18)
- Establish testing and acceptance plans for the interfaces between new and existing systems [Source: BuyIT] (S4.8)
- Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Do not approve the procurement program to proceed beyond program initiation unless sufficient resources, including manpower, are already identified and available [Source: R5000] (07.3)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Establish program goals for cost, schedule, and performance parameters for every procurement program [Source: R5000] (A1.1.2)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)

Value for money

Value for money is another measure of the benefit being obtained from a procured system. However, value is a more subjective term in that a system can provide a proper return on investment while not being of particularly high value to the organization. Organizations tend to seek projects that provide high value to the business in addition to a high return on investment. The measure taken was the degree to which the procured systems provided value for money.

Practices associated with increase value for money from IT procurements are:

- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (02.3.6)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.2T)

- Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (O3.9)
- Ensure clear documentation of the business objectives that the procurement program must support [Source: BuyIT] (S1.8)

Additional funding requests

During the lifecycle of a procurement project it is not uncommon for a supplier to make requests for additional funding. This can occur due to a number of factors such as the supplier under estimating the effort required to deliver the contracted system, or requests for additional functionality by the purchaser as prototypes or early deliverables are received. The measure is taken as a percentage of the originally planned budget that was requested by the supplier in additional funding.

Practices associated with reduced requests for additional funding are:

- **Make supplier payments upon agreed results** [Source: EURAP, TAP] (A2.3.6)
- **Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program** [Source: EURAP] (A1.2.35)
- **Use a defined structure for documents which is suitable for a very wide range of procurement types** [Source: TAP] (O6.IT)

Unexpected purchases

A common concern amongst purchasing organizations is whether a system contracted is in fact complete. Sometimes additional components are required, or the environment in which the delivered system is intended to operate may require upgrades or additional components not originally foreseen. Some organizations budget for miscellaneous purchases, others may try to ensure the supplier is responsible for any unexpected costs. The measure is taken in terms of the percentage of total expenditure for a procurement utilized for unexpected purchases.

Practices associated with reducing unexpected purchases are:

- **Make supplier payments upon agreed results** [Source: EURAP, TAP] (A2.3.6)
- **Use the experience and skills of third parties to support management decisions in a clearly specified manner** [Source: BuyIT] (M2.36)
- **Baseline system requirements as part of the contract and manage any changes** [Source: SA-CMM] (A2.4.6)
- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- **Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability** [Source: R5000, BuyIT, TAP] (A3.2.5)
- **Specify an individual with the responsibility and authority for acceptance criteria and testing procedures** [Source: BuyIT] (A2.2.28)
- **Manage and control any problems discovered during the procurement program** [Source: SA-CMM] (M2.23)
- **Identify and deal with risk in a positive manner such that identification is recognized and rewarded** [Source: SA-CMM] (M4.22)

- **Maintain ongoing communication and agree commitments between the procurement team and the supplier** [Source: SA-CMM] (S6.4)

Budget overruns

This measure indicates whether the total expenditure for a project met or exceeded the original budget established for purchasing and bringing a system into operation. The total budget includes the purchase of systems and components but also other costs such as training, facilities, additional support personnel, and so forth. The measure is stated in terms of the percentage that the total costs exceeded the original project budget.

Practices associated with reduced budget overruns are:

- **Manage and control any problems discovered during the procurement program** [Source: SA-CMM] (M2.23)
- **Use openly specified communications and information processing standards that are available to all potential suppliers** [Source: EURAP] (A1.1.22)
- **Link within the contract the major proportion of supplier payment to successful completion of acceptance testing** [Source: BuyIT] (A1.1.30)
- **Baseline system requirements as part of the contract and manage any changes** [Source: SA-CMM] (A2.4.6)
- **Make supplier payments upon agreed results** [Source: EURAP, TAP] (A2.3.6)
- **Specify an individual with the responsibility and authority for acceptance criteria and testing procedures** [Source: BuyIT] (A2.2.28)
- **List and formally track all objects of a configuration** [Source: EURAP] (S2.8)

Employee satisfaction

There is a wide range of methods for collecting employee satisfaction data and not every organization conducts such internal surveys. For the study, each organization that utilized internal employee surveys and satisfaction measures was asked to indicate their overall results from the most recent survey. As employee satisfaction surveys utilize different techniques to present their results, the data collected was normalized using a common scale from 1 to 10.

Practices associated with higher employee satisfaction are:

- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (O1.3)
- **List and formally track all objects of a configuration** [Source: EURAP] (S2.8)
- **Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages** [Source: EPHOS, EM] (A3.2.10)
- **Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs** [Source: PA, EURAP] (A1.2.6)
- **Promote the procured system to the users** [Source: EURAP, EM, PA] (A1.2.30)
- **Establish a timetable for regular procurement project reviews** [Source: CCTA] (S6.2)

- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)

Procurement team co-operation

This is a subjective measure and as other projects have shown, there is often some variance between staff and management perceptions as to the level of procurement team co-operation. The data collected was from a manager's perspective and they were asked to rate the level of co-operation amongst procurement team members.

Practices associated with increased procurement team co-operation are:

- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.2T)
- Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Manage training as an integral part of the procurement process [Source: SA-CMM] (01.4)
- Involve users in system evaluation to determine requirements satisfaction [Source: SA-CMM, EURAP, R5000, BuyIT] (A4.1.10)
- Maintain training records throughout the procurement program [Source: SA-CMM] (01.6)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for all criteria [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Use openly specified communications and information processing standards that are available to all potential suppliers [Source: EURAP] (A1.1.22)
- Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)
- Facilitate the procurement of equipment and services from various suppliers and operators by demanding the same functionality [Source: SOTIP] (A3.1.7)

Procurement team member decision making

Decision-making concerning procurements is performed many ways ranging from a single senior manager or executive making the final decision on all important matters, to very consensual approaches where each procurement team member has an equal say in the direction the project will take. The measure collected was an indication of the degree to which procurement team members themselves were performing the procurement project decision-making.

Practices associated with increased decision-making by the procurement team are:

- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: *BuyIT*] (A1.1.30)
- Advise procurement program teams of current user practices [Source: *EURAP*] (O3.7)

Procurement team satisfaction

This measure compliments the employee satisfaction measure but it is directed specifically to the procurement team members and for the specific procurements that were studied. The measure is the level of satisfaction that the procurement team had with the procurement project overall. This covers a number of factors such as how well the team performed to the procurement team's perception of how successful the system delivery and implementation were managed.

Practices associated with higher procurement team satisfaction are:

- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: *EURAP*] (A1.2.35)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: *EURAP*] (O3.12)
- Make supplier payments upon agreed results [Source: *EURAP, TAP*] (A2.3.6)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: *R5000, BuyIT, TAP*] (A3.2.5)
- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: *BuyIT*] (A1.1.30)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: *BuyIT*] (O2.1.3)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: *EURAP, TAP, SA-CMM*] (A2.2.19)

Annual IT staff turnover

This figure is usually well understood in most organizations, as there are high demands for IT professionals. Annual staff turnover indicates the number of IT professionals that leave the organization each year, and are replaced or intended to be replaced. (Reductions due to downsizing or redundancies are not included in this figure.) The measure is stated in terms of the percentage of total IT staff that leaves the organization each year.

Practices associated with reduced IT staff turnover are:

- **Keep procurement management personnel informed about new technologies through meetings with key suppliers** [Source: SA-CMM] (02.3.6) *
- Select program team members on the basis of required skills and expertise [Source: EURAP, PA, BuyIT] (M2.20) *
- Manage programs by integrated program teams with participants empowered and authorized to make commitments for the organization or the functional area they represent [Source: R5000] (M1.1) *
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (03.12) *
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10) *
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Advise procurement program teams of current user practices [Source: EURAP] (03.7)
- Ensure clear documentation of the business objectives that the procurement program must support [Source: BuyIT] (S1.8)
- Use openly specified communications and information processing standards that are available to all potential suppliers [Source: EURAP] (A1.1.22)
- Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
- Ensure that new systems cope with the existing business processes and existing hardware, links and other systems [Source: BuyIT] (A2.1.54)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Specify only standards that exist or are soon to exist in generally available products [Source: SOTIP] (A1.2.19)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.27)
- Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (03.9)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Manage training as an integral part of the procurement process [Source: SA-CMM] (01.4)

User satisfaction

This measure is an indication usually collected from a user or user representative involved in the procurement project studied. The measure provides an overall view of the user's satisfaction with the system delivered both from a usability standpoint as well as whether it improves their processes and job functions.

Practices associated with increased user satisfaction are:

- Ensure that new systems cope with the existing business processes and existing hardware, links and other systems [Source: BuyIT] (A2.1.54)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)
- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)
- Define program deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: EURAP] (A1.2.35)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Involve all interested parties in the decision analysis to ensure realistic expectations [Source: BuyIT] (A4.2.5)

User participation

There are a broad set of recommended procurement practices that have a common theme of increasing the level of user involvement in procurement projects and decision-making. This measure indicates the level of which users participated in procurement team activities, requirement definition, supplier selection and acceptance of the delivered system.

Practices associated with higher levels of user participation are:

- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)
- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)

Number of complaints

It is common that when a new system is introduced there are areas that need minor improvements or adjustments. These may relate to many factors including usability or human interface issues, or changes in business processes that may not be fully accepted by the users of the new system. An important measure of the degree to which a system is

suited for its intended purpose is the number of complaints received from users during the initial stages of operation. This measure must be on a relative scale as organization, culture, application, and technology may tend to increase or decrease the number of complaints. The measure indicates the level of complaints as compared to what would normally be expected for the introduction of a new system.

Practices associated with reducing the number of complaints about a new system are:

- **Use openly specified communications and information processing standards that are available to all potential suppliers**
[Source: EURAP] (A1.1.22) *
- **Manage training as an integral part of the procurement process** [Source: SA-CMM] (O1.4)
- **Select program team members on the basis of required skills and expertise** [Source: EURAP, PA, BuyIT] (M2.20)
- **Link within the contract the major proportion of supplier payment to successful completion of acceptance testing** [Source: BuyIT] (A1.1.30)
- **Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs** [Source: BuyIT] (O2.1.3)
- **Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements** [Source: PA, BuyIT] (A2.1.18)
- **Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs** [Source: PA, EURAP] (A1.2.6)
- **Make supplier payments upon agreed results** [Source: EURAP, TAP] (A2.3.6)
- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (O1.3)
- **At program initiation the procurement manager should propose the appropriate milestones, the level of decision for each milestone, and the documentation needed for each milestone** [Source: R5000, EURAP, BuyIT] (M2.3)
- **Maintain a list of potential suppliers for systems and development** [Source: EURAP] (A3.2.12)
- **Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract** [Source: BuyIT] (O8.7)
- **Maintain training records throughout the procurement program** [Source: SA-CMM] (O1.6)
- **Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability** [Source: R5000, BuyIT, TAP] (A3.2.5)
- **Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales** [Source: TAP] (O3.2T)

User or Customer relations

Many organizations utilize specialized groups or departments for managing purchasing activities. In some cases the end user for the system is internal to the organization, in other situations such as in public or defense procurements, the end users are in a wholly separate organization and are viewed as customers by those responsible for managing procurements. This measure is an indication of the degree to which a particular procurement

created conflicts and issues with the end users of the system thereby jeopardizing relations with the users for future procurement activities.

Practices associated with improving user/customer relations are:

- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (O1.3) *
- **Maintain training records throughout the procurement program** [Source: SA-CMM] (O1.6)
- **Use openly specified communications and information processing standards that are available to all potential suppliers** [Source: EURAP] (A1.1.22)
- **Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs** [Source: BuyIT] (O2.1.3)
- **Use the experience and skills of third parties to support management decisions in a clearly specified manner** [Source: BuyIT] (M2.36)
- **List and formally track all objects of a configuration** [Source: EURAP] (S2.8)
- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- **Baseline system requirements as part of the contract and manage any changes** [Source: SA-CMM] (A2.4.6)
- **Manage training as an integral part of the procurement process** [Source: SA-CMM] (O1.4)
- **Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales** [Source: TAP] (O3.2T)
- **Involve users in the detailed specification work** [Source: BuyIT, EURAP] (A2.1.58)
- **Analyze results of the phased evaluations and compare them to contractual requirements** [Source: SA-CMM] (S3.9)
- **Use a multiphase tendering process when uncertainty and/or complexity is high** [Source: EM] (A3.1.3)
- **Design for the future insertion of commercial off-the-shelf equipment or components** [Source: R5000] (A1.2.1)
- **Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract** [Source: BuyIT] (O8.7)
- **Have a plan for interaction with suppliers** [Source: EM] (A3.1.6)

Single supplier dependency

This measure indicates the number of suppliers that were involved with delivering the procured system. Different approaches are used for suppliers. A purchaser may obtain the entire system from a single supplier, or they may use a single supplier that manages and subcontracts the various system components, or the purchaser may enter into multiple contracts and either perform internally or subcontract the integration work of the system components. The measure indicates the degree to which a single supplier was used for the system purchase.

Practices associated with reduced dependency on a single supplier are:

- Do not allow a supplier that has participated (or is participating) in the development, production, or testing of a system for a user to be involved in any way in the establishment of criteria for data collection, performance assessment, or evaluation activities [Source: R5000] (A4.2.2)
- Use off the shelf products whenever possible when defining system architectures [Source: PA] (A1.1.15)
- Plan program evaluation and post implementation reviews [Source: TAP] (S6.3T)

Supplier responsiveness

The degree to which a supplier is responsive to purchaser issues and requests during procurement can affect many elements of a procurement project. While supplier responsiveness is a subjective measure, most purchasers have strong views as to whether a supplier was responsive during procurement. This measure indicates the level of supplier responsiveness as perceived by the purchaser.

- No practices were shown to be associated with improved supplier responsiveness.

Supplier information

Suppliers are generally expected to provide information during procurement, but the level of the information provided by suppliers for different procurement projects varies. This measure indicates from the purchaser's standpoint the level of information provided during the procurement.

Practices associated with improving the level of information received from the supplier are:

- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)

Supplier co-operation

During procurement, some level of co-operation with the supplier is usually established. This may be established through a single contact, across multiple contacts, and at different levels within both the purchasing and supplier organizations. Technical and business issues may be combined when interfacing with the supplier or these may be separated amongst various procurement team members. A supplier should be able to adapt and become an integral part of the procurement project. This measure indicates from a purchaser's standpoint the level of co-operation experienced with the supplier.

- No practices were shown to be associated with improvements in supplier cooperation.

Performance requirements met

The ability of technology to deliver a required solution is sometimes difficult to predict. Systems sometimes must be re-engineered or modified as implementations prove not to provide the responsiveness, capacity or reliability required to meet the needs of the purchasing organization. This measure provides an indication how well the supplier was able to satisfy the performance requirements with the delivered system.

Practices associated with procured systems better meeting performance requirements are:

- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)

- **Baseline system requirements as part of the contract and manage any changes** [Source: SA-CMM] (A2.4.6)
- **Define the responsibility for maintenance and upgrades** [Source: SOTIP] (A2.2.13)

Total system cost

The cost of the system is measured not by the purchase price but also through many other factors such as effort involved in procuring the system, testing the system, training the system's users, managing and maintaining the system during operation and so forth. There may be many costs that are difficult to estimate or are not quantified at the time a purchase decision is made. The measure of total system cost shows the level to which the full cost of bringing a purchased system into operation was in line with expectations.

Practices associated with reducing the total system cost are:

- **Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs** [Source: BuyIT] (02.1.3) *
- Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36) *
- **Baseline system requirements as part of the contract and manage any changes** [Source: SA-CMM] (A2.4.6) *
- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (01.3)
- **List and formally track all objects of a configuration** [Source: EURAP] (S2.8)
- **Utilize standards for process assessment and quality management to evaluate suppliers** [Source: EM] (A3.1.5)
- **Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis** [Source: R5000] (S4.4)
- **Identify and deal with risk in a positive manner such that identification is recognized and rewarded** [Source: SA-CMM] (M4.22)
- **Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract** [Source: BuyIT] (08.7)
- **Involve users in the detailed specification work** [Source: BuyIT, EURAP] (A2.1.58)
- **Maintain training records throughout the procurement program** [Source: SA-CMM] (01.6)
- **Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay** [Source: EURAP] (03.12)
- **Define channels of communication with suppliers at multiple levels, especially within a complex procurement** [Source: BuyIT] (08.9)
- **Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations** [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- **Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for all criteria** [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)

- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Establish general models for structuring business and organizational needs in a common language [Source: SOTIP] (A1.1.18)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Establish a risk management program for each procurement program to identify, quantify and control performance, cost, and schedule risks [Source: R5000, EURAP, SA-CMM, BuyIT, TAP] (M4.1)
- Define program deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)
- Identify, categorize and prioritize mandatory user requirements [Source: EM, TAP] (A2.1.11)
- Maintain ongoing communication and agree commitments between the procurement team and the supplier [Source: SA-CMM] (S6.4)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)

Required training

Training related to procurement is often focused towards the users and the operational staff responsible for managing or maintaining the new system. However, training may also be required for the procurement team, especially when procurements involve new technologies. The measure shows the degree to which the training required was consistent with the expectations for the procurement project.

Practices associated with reducing the amount of unexpected training required are:

- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)

Satisfaction

This measure provides an indication of the level of satisfaction of the purchaser with the procurement during the different stages of the procurement lifecycle. The level of satisfaction is a measure of the degree to which the supplier in carrying out the various project activities met the purchasing organization's expectations.

Practices associated with increased satisfaction in each procurement phase and overall are identified below.

Level of satisfaction - Planning

- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)
- Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)
- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Establish performance benchmarks and defined measures for the existing system, against which the new system's performance can be assessed [Source: BuyIT] (O5.17)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Involve all interested parties in the decision analysis to ensure realistic expectations [Source: BuyIT] (A4.2.5)
- Use common guidelines and references to defined or standardized procurement procedure [Source: SA-CMM] (A1.1.19)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Define a complete plan for all tests to be conducted [Source: BuyIT] (S1.9)
- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Include evaluation of the supplier's software engineering capabilities in the evaluation criteria [Source: EPHOS] (A1.2.28)
- Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)
- Maintain contacts with alternative suppliers [Source: PA] (O8.6)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)

Level of satisfaction - Contracting

- Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured [Source: BuyIT] (A1.3.12)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)

Level of satisfaction - Development

- Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)

Level of satisfaction - Testing

- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Maintain training records throughout the procurement program [Source: SA-CMM] (01.6)

Level of satisfaction - Integration

- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Involve users and other affected groups in developing and maintaining contractual requirements [Source: SA-CMM] (A2.4.5)

Level of satisfaction - Maintenance

- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)

Level of satisfaction - Overall

- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Involve all interested parties in the decision analysis to ensure realistic expectations [Source: BuyIT] (A4.2.5)
- Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)

- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: EURAP] (A1.2.35)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)
- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.1T)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)

Problems

This measure provides an indication of the number of problems or unexpected issues the purchaser faced during the various phases of the procurement. The number of problems in each phase will vary according to the type of procurement, the technology used, the complexity of the system, and so forth. Therefore this measure is normalized against the expectations of the purchaser. The measure shows the degree to which the procurement was more or less difficult than was expected during each phase of the lifecycle.

Practices associated with reducing unexpected problems in each procurement phase and overall are identified below.

Number of problems - Planning

- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Have a plan for interaction with suppliers [Source: EM] (A3.1.6)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)
- Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis [Source: R5000] (S4.4)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (O8.7)

Number of problems - Contracting

- No practices were shown to be associated with reduced problems in contracting activities.

Number of problems - Development

- No practices were shown to be associated with reduced problems in development activities.

Number of problems - Testing

- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Maintain training records throughout the procurement program [Source: SA-CMM] (01.6)

Number of problems - Integration

- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)

Number of problems - Maintenance

- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (03.12)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: EURAP] (A1.2.35)
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)
- Define program deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)

- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (08.9)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Record any problems or issues found during contract tracking in the appropriate corrective action system and track them to closure [Source: SA-CMM] (S6.8)
- Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (06.1T)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.2T)
- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)
- Identify, categorize and prioritize mandatory user requirements [Source: EM, TAP] (A2.1.11)
- Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)

Number of problems - Overall

- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Maintain training records throughout the procurement program [Source: SA-CMM] (01.6)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)

- Undertake data management issues early in the procurement program
[Source: EURAP] (A1.2.34)

Rework Effort

An important measure of the efficiency of a procurement project is the amount of effort expended reworking project deliverables. Defining a system that meets the needs of the purchaser is a challenging task, especially when procuring large or complex systems, so it is not uncommon to have some level of rework. The level of rework in each phase will vary according to the type of procurement, the number of suppliers, and the environment in which the system will operate, and so forth. Therefore this measure is normalized against the expectations of the purchaser. The measure shows the degree to which the procurement required more rework than was expected during each phase of the lifecycle.

Practices associated with reducing unexpected rework effort in each procurement phase and overall are identified below.

Amount of rework effort - Planning

- Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM *[Source: BuyIT, TAP] (M1.16)*
- Perform planned evaluations on the procured system prior to acceptance for operational use *[Source: SA-CMM] (S3.8)*
- Develop and maintain guidelines and criteria for a program's selection and tailoring of the standard procurement process *[Source: SA-CMM] (M1.12)*
- Establish testing and acceptance plans for the interfaces between new and existing systems *[Source: BuyIT] (S4.8)*

Amount of rework effort - Contracting

- Manage and control any problems discovered during the procurement program *[Source: SA-CMM] (M2.23)*
- Include procurement risk management as an integral part of the program's defined process *[Source: SA-CMM] (M4.21)*
- Involve the user or user's representative in documenting thresholds and objectives as measures of system performance at each milestone *[Source: R5000] (M2.5)*

Amount of rework effort - Development

- Appraise the supplier's software engineering process according to the program's defined procurement process *[Source: SA-CMM] (A4.1.7)*
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs *[Source: PA, EURAP] (A1.2.6)*

Amount of rework effort - Testing

- Identify training requirements within the request for proposals and plan an appropriate training program *[Source: SA-CMM] (O1.3)*
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs *[Source: PA, EURAP] (A1.2.6)*
- Utilize standards for process assessment and quality management to evaluate suppliers *[Source: EM] (A3.1.5)*

- Align supplier and procurer expectations periodically to avoid conflicts
[Source: BuyIT] (08.11)

Amount of rework effort - Integration

- Identify training requirements within the request for proposals and plan an appropriate training program *[Source: SA-CMM] (01.3)*
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program
[Source: EURAP] (A1.2.35)
- Utilize standards for process assessment and quality management to evaluate suppliers *[Source: EM] (A3.1.5)*
- List and formally track all objects of a configuration *[Source: EURAP] (S2.8)*
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs *[Source: PA, EURAP] (A1.2.6)*

Amount of rework effort - Maintenance

- **Include procurement risk management as an integral part of the program's defined process** *[Source: SA-CMM] (M4.21) **
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program
[Source: EURAP] (A1.2.35)
- List and formally track all objects of a configuration *[Source: EURAP] (S2.8)*
- Use a defined structure for documents which is suitable for a very wide range of procurement types *[Source: TAP] (06.1T)*
- Record any problems or issues found during contract tracking in the appropriate corrective action system and track them to closure *[Source: SA-CMM] (S6.8)*
- Define channels of communication with suppliers at multiple levels, especially within a complex procurement *[Source: BuyIT] (08.9)*
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay *[Source: EURAP] (03.12)*
- Establish test and evaluation objectives for each phase of a procurement program *[Source: R5000, PA, TAP] (S3.1)*
- Manage and control any problems discovered during the procurement program *[Source: SA-CMM] (M2.23)*
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews *[Source: BuyIT] (S6.12)*
- Define program deliverables in the main body and attached schedules of the contract *[Source: BuyIT] (A3.3.10)*
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded *[Source: SA-CMM] (M4.22)*
- Utilize standards for process assessment and quality management to evaluate suppliers *[Source: EM] (A3.1.5)*
- Identify, categorize and prioritize mandatory user requirements *[Source: EM, TAP] (A2.1.11)*

- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)
- Manage each change across the acquisition lifecycle under a well-documented change request procedure [Source: EURAP, BuyIT] (S2.9)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for all criteria [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)

Amount of rework effort - Overall

- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (02.1.3)
- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)

Documentation adequacy

Documentation, in whatever format, is an important element of the procurement project either for the system being procured or for the successful management of the project. The documentation adequacy measure provides an indication as to whether the documentation developed within the project, delivered by the supplier, or otherwise available during each phase of the procurement lifecycle was deemed to be adequate and complete.

Practices associated with improved documentation in each procurement phase and overall are identified below.

Documentation adequacy - Planning

- No practices were shown to be associated with improved adequacy of documentation during the planning activities.

Documentation adequacy - Contracting

- Use exploratory prototyping and simulation techniques to clarify requirements and to test and evaluate technical feasibility [Source: EURAP, PA] (A2.1.46)
- Use a quality review to measure consistency between the terms and conditions and across all schedules of the draft contract [Source: TAP] (M3.4T)

Documentation adequacy - Development

Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)

- Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Establish a timetable for regular procurement project reviews [Source: CCTA] (S6.2)
- Define requirements for new interfaces to existing systems and plan data conversion [Source: BuyIT] (A2.1.52)
- Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (O2.3.6)

Documentation adequacy - Testing

- Define performance requirements both for normal operations and for extreme situations that may occur [Source: SOTIP] (A2.1.33)

Documentation adequacy - Integration

- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (O8.11)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (O8.7)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement program [Source: CCTA, SA-CMM, EURAP] (O8.1)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Have a plan for interaction with suppliers [Source: EM] (A3.1.6)
- Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)

Documentation adequacy - Maintenance

- **Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs** [Source: PA, EURAP] (A1.2.6)*
- Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement program [Source: CCTA, SA-CMM, EURAP] (O8.1)
- Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)
- Maintain a list of potential suppliers for systems and development [Source: EURAP] (A3.2.12)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Establish general models for structuring business and organizational needs in a common language [Source: SOTIP] (A1.1.18)
- Organize collection of feedback from users [Source: PA] (A2.1.15)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Ensure that functional and performance requirements are traceable to higher-level requirements [Source: R5000, PA, TAP] (A2.1.3)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)

Documentation adequacy - Overall

- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: EURAP] (A1.2.35)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (O8.11)

Person effort

Human resources for implementing a procurement project can be substantial. Often the financial evaluation or budgeting of a procurement project doesn't adequately reflect the total resources required to put a system into operation. This measure provides an indication of the people effort required to complete or implement each phase of the procurement lifecycle. What is of most concern is the degree to which unexpected resources were required during procurement, so the measure is collected relative to the purchaser's expected effort for each lifecycle phase.

Practices associated with reducing unexpected person effort in each procurement phase and overall are identified below.

Person effort - Planning

- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Use common guidelines and references to defined or standardized procurement procedure [Source: SA-CMM] (A1.1.19)
- Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)
- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)
- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)
- Include one or more users from the organization in the procurement team [Source: BuyIT] (M1.15)
- Manage each change across the acquisition lifecycle under a well-documented change request procedure [Source: EURAP, BuyIT] (S2.9)
- Specify only standards that exist or are soon to exist in generally available products [Source: SOTIP] (A1.2.19)

Person effort - Contracting

- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)

Person effort - Development

- **Establish a timetable for regular procurement project reviews** [Source: CCTA] (S6.2)*
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)*

- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
- Ensure user acceptance through motivation, involvement, communication and training of all the staff affected [Source: BuyIT] (A1.2.39)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (O2.3.6)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)
- Organize collection of feedback from users [Source: PA] (A2.1.15)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Use openly specified communications and information processing standards that are available to all potential suppliers [Source: EURAP] (A1.1.22)
- Define program deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Involve users in the detailed specification work [Source: BuyIT, EURAP] (A2.1.58)

Person effort - Testing

- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)
- Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement program [Source: CCTA, SA-CMM, EURAP] (O8.1)
- Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Establish general models for structuring business and organizational needs in a common language [Source: SOTIP] (A1.1.18)

- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Maintain a list of potential suppliers for systems and development [Source: EURAP] (A3.2.12)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)
- Involve potential prime suppliers during the feasibility phase in a competitive or collaborative manner [Source: EURAP] (A1.1.25)

Person effort - Integration

- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured [Source: BuyIT] (A1.3.12)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)

Person effort - Maintenance

- **Identify training requirements within the request for proposals and plan an appropriate training program** [Source: SA-CMM] (01.3) *
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Maintain training records throughout the procurement program [Source: SA-CMM] (01.6)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.2T)
- Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (08.9)
- Use openly specified communications and information processing standards that are available to all potential suppliers [Source: EURAP] (A1.1.22)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)

- Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)
- Involve users in the detailed specification work [Source: BuyIT, EURAP] (A2.1.58)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)

Person effort - Overall

- **Define channels of communication with suppliers at multiple levels, especially within a complex procurement** [Source: BuyIT] (O8.9)*
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (O8.7)
*
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis [Source: R5000] (S4.4)
- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)
- Establish program goals for cost, schedule, and performance parameters for every procurement program [Source: R5000] (A1.1.2)
- Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Use extended guidelines to identify problems and avoid the potential mistakes that have characterized failed programs [Source: BuyIT] (O2.1.3)
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: EURAP] (A1.2.35)

- Involve users in risk analysis [Source: PA] (M4.10)
- Involve users in system evaluation to determine requirements satisfaction [Source: SA-CMM, EURAP, R5000, BuyIT] (A4.1.10)
- Identify, categorize and prioritize mandatory user requirements [Source: EM, TAP] (A2.1.11)
- Use common guidelines and references to defined or standardized procurement procedure [Source: SA-CMM] (A1.1.19)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)

Project schedule

Substantial procurements require planning and scheduling in order to be managed properly. Scheduling of procurements and introduction of newly purchased systems or technology within an organization is challenging. Often there are unforeseen circumstances that impact a procurement project schedule. This measure indicates the degree to which schedules were maintained during each phase of the procurement lifecycle.

Practices associated with improvements in meeting schedules in each procurement phase and overall are identified below.

Project schedule - Planning

- Develop and maintain guidelines and criteria for a program's selection and tailoring of the standard procurement process [Source: SA-CMM] (M1.12)
- Undertake data management issues early in the procurement program [Source: EURAP] (A1.2.34)

Project schedule - Contracting

- Facilitate the procurement of equipment and services from various suppliers and operators by demanding the same functionality [Source: SOTIP] (A3.1.7)
- Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.1T)

Project schedule - Development

- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)

- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)

Project schedule - Testing

- **Utilize standards for process assessment and quality management to evaluate suppliers** [Source: EM] (A3.1.5) *
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)

Project schedule - Integration

- Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (08.9)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (01.3)

Project schedule - Maintenance

- **Define channels of communication with suppliers at multiple levels, especially within a complex procurement** [Source: BuyIT] (08.9) *
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12) *
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)

- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Use common guidelines and references to defined or standardized procurement procedure [Source: SA-CMM] (A1.1.19)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)
- Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.1T)
- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Define and maintain the standard procurement process in accordance with documented process definition and maintenance plans [Source: SA-CMM] (M1.9)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)

Project schedule - Overall

- Establish a risk management program for each procurement program to identify, quantify and control performance, cost, and schedule risks [Source: R5000, EURAP, SA-CMM, BuyIT, TAP] (M4.1)
- Ensure the commitment of both the procurer and supplier's top management to the relationship [Source: BuyIT] (A2.4.12)

Ranking of procurement practices

The study analyzed within actual procurements the relationship between specific procurement practices and the resulting project performance for the purchase and implementation of the IT system. The study looked at project performance across a large number of measures and was able to identify many significant correlations between specific practices and specific project performance measures.

Certain practices were identified as being associated with improvements in many project measures. The number of improved performance measures associated for a given practice could be considered the *value* of that practice. Those practices that are associated with many performance improvements would therefore be of higher value to an organization than those associated with only a few. However, caution should be exercised when applying value criteria in that value as stated in this report does not have any organizational or situational context. A practice that improves only one project measure may be of highest real value if the improved performance measure is of most urgent concern to a particular organization.

The following provides a rank order listing of the value of each practice that was associated with an improvement in one or more performance measures. The number of performance measures that were positive is indicated for each practice by its value ranking.

Value Ranking	Procurement Practice
23	Identify training requirements within the request for proposals and plan an appropriate training programme [Source: SA-CMM] (O1.3)
18	Use extended guidelines to identify problems and avoid the potential mistakes which have characterised failed programmes [Source: BuyIT] (O2.1.3)
16	Utilise standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
15	Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (O8.7)
15	Maintain training records throughout the procurement programme [Source: SA-CMM] (O1.6)
15	Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
14	List and formally track all objects of a configuration [Source: EURAP] (S2.8)
13	Define performance metrics for the specified requirements [Source: EPHOS, SOTIP] (O5.3)
10	Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
10	Include procurement risk management as an integral part of the programme's defined process [Source: SA-CMM] (M4.21)
10	Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
9	Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)
9	Involve staff responsible for the operation of a system in preparing for introduction into service to ensure transition without delay [Source: EURAP] (O3.12)
9	Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)

Value Ranking	Procurement Practice
9	Produce a plan for management of system maintenance at the start of the procurement programme, and update it regularly during the programme [Source: EURAP] (A1.2.35)
8	Manage and control any problems discovered during the procurement programme [Source: SA-CMM] (M2.23)
7	Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (O8.11)
7	Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (O8.9)
7	Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programmes and status reviews [Source: BuyIT] (S6.12)
7	Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)
7	Identify and deal with risk in a positive manner such that identification is recognised and rewarded [Source: SA-CMM] (M4.22)
7	Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)
7	Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
7	Use openly specified communications and information processing standards which are available to all potential suppliers [Source: EURAP] (A1.1.22)
6	Analyse results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
6	Appraise the supplier's software engineering process according to the programme's defined procurement process [Source: SA-CMM] (A4.1.7)
6	Define programme deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)
6	Establish test and evaluation objectives for each phase of a procurement programme [Source: R5000, PA, TAP] (S3.1)
6	Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
6	Update the identified requirements as necessary throughout the procurement programme, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
6	Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.11)
6	Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)
5	Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)
5	Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)
5	Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
5	Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)
4	Establish general models for structuring business and organisational needs in a common language [Source: SOTIP] (A1.1.18)
4	Identify, categorise and prioritise mandatory user requirements [Source: EM, TAP] (A2.1.11)
4	Involve users in the detailed specification work [Source: BuyIT, EURAP] (A2.1.58)
4	Maintain a list of potential suppliers for systems and development [Source: EURAP] (A3.2.12)
4	Manage training as an integral part of the procurement process [Source: SA-CMM] (O1.4)
4	Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement programme [Source: CCTA, SA-CMM, EURAP] (O8.1)
4	Use common guidelines and references to defined or standardised procurement procedure [Source: SA-CMM] (A1.1.19)
4	Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)

Value Ranking	Procurement Practice
3	Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2I)
3	Do not approve the procurement programme to proceed beyond programme initiation unless sufficient resources, including manpower, are already identified and available [Source: R5000] (O7.3)
3	Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (O3.9)
3	Ensure that new systems cope with the existing business processes and existing hardware, links and other systems [Source: BuyIT] (A2.1.54)
3	Establish a timetable for regular procurement project reviews [Source: CCTA] (S6.2)
3	Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)
3	Have a plan for interaction with suppliers [Source: EM] (A3.1.6)
3	Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis [Source: R5000] (S4.4)
3	Involve all interested parties in the decision analysis to ensure realistic expectations [Source: BuyIT] (A4.2.5)
3	Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for each criteria [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)
3	Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured [Source: BuyIT] (A1.3.12)
3	Organise collection of feedback from users [Source: PA] (A2.1.15)
2	Define performance requirements both for normal operations and for extreme situations that may occur [Source: SOTIP] (A2.1.33)

Practices for improvement

The tables in this chapter indicate how each of the best practices studied were associated with project results in the following four categories:

- **Economic** – the pricing and financial impact of specific practices.
- **Effort** – the resources used to purchase and bring the system into operation.
- **Functionality** – the content and usability of the IT purchased systems or components.
- **Performance** – the effectiveness of the project and the way it is managed.

Organizations seeking to improve their performance in one or more of these categories can quickly identify the practices that should be followed and those that should be avoided. The full statement of these practices and references to their source guide or methodology is provided in *Reference set of best practices*.

The practices are grouped by functional areas within a typical procurement. In some organizations, there may be a different individual responsible for each function; in others, one individual may be responsible for multiple functions. The functional areas are as follows:

- **Management** – oversees the procurement activity and allocates the resources and provides support to the procurement project.
- **Technical** – ensures the technology being selected and the technical work within the project is performed in a way that meets the needs of the business.
- **Administrative** – provides support in negotiating and establishing contracts with suppliers.
- **User** – represents the needs and interests of the user community for which the products or systems are being procured.

The study showed that practices had impacts on multiple functional areas, so some practices below appear in more than one functional area. The impact of the practice also varied in some cases depending on the functional area responsible for its implementation.

Management practices

The following summarizes the impact of individual practices when the management function was involved in their implementation:

Management Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Ensure clear documentation of the business objectives that the procurement programme must support [Source: BuyIT] (S1.8)	✓			✓
Establish programme goals for cost, schedule, and performance parameters for every procurement programme [Source: R5000] (A1.1.2)	✗		✓	✗
Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)	✓		✓✓	✓
Establish general models for structuring business and organisational needs in a common language [Source: SOTIP] (A1.1.18)	✓		✓	✓
Produce a plan for management of system maintenance at the start of the procurement programme, and update it regularly during the programme [Source: EURAP] (A1.2.35)	✓✓	✓✓	✓✓	✓✓
Consider alternative solutions when the programme risks are likely to outweigh the expected benefits [Source: BuyIT] (A1.3.14)				
Perform cost/time estimates and risk analysis of requirements and re-iterate these activities throughout the procurement programme [Source: PA] (A2.1.13)	✓			
Update the identified requirements as necessary throughout the procurement programme, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)	✓	✓	✓	✓
Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)	✓	✓	✓	✓
Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)	✓	✓✓	✓	✓✓
Ensure the commitment of both the procurer's and supplier's top management to the relationship [Source: BuyIT] (A2.4.12)				✓
Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)	✓		✓	✓
Use a multiphase tendering process when uncertainty and/or complexity is high [Source: EM] (A3.1.3)	✓			✓
Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)	✓	✓	✓✓	✓
Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)	✓			✓
Include evaluation of the supplier's software engineering capabilities in the evaluation criteria [Source: EPHOS] (A1.2.28)	✓	✓	✓	✓

Management Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Involve all interested parties in the decision analysis to ensure realistic expectations [Source: BuyIT] (A4.2.5)	✓	✓	✓	✓
Manage programmes by integrated programme teams with participants empowered and authorised to make commitments for the organisation or the functional area they represent [Source: R5000] (M1.1)	✓		✗	✓
Define and maintain the standard procurement process in accordance with documented process definition and maintenance plans [Source: SA-CMM] (M1.9)	✗			✓
Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)	✓	✓	✓	✓
Include one or more users from the organisation in the procurement team [Source: BuyIT] (M1.15)		✓	✓	✗
Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)	✓	✓	✓	✓
Select programme team members on the basis of required skills and expertise [Source: EURAP, PA, BuyIT] (M2.20)	✓	✓		✓
Manage and control any problems discovered during the procurement programme [Source: SA-CMM] (M2.23)	✓✓	✓	✓✓	✓✓
At programme initiation the procurement manager should propose the appropriate milestones, the level of decision for each milestone, and the documentation needed for each milestone [Source: R5000, EURAP, BuyIT] (M2.3)	✓	✓		✗
Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)	✓	✓	✓	✓
Establish a cross-functional procurement team that brings together business, technical and purchasing skills [Source: BuyIT, EURAP] (M2.37)	✗	✗		✗✗
Design quality indicators for user satisfaction [Source: PA] (M3.2)	✓		✓	✗
Conduct an external quality review when the strategy is initially defined or undergoes significant revision [Source: TAP] (M3.2.2T)	✗	✗	✗	✗
Establish a risk management programme for each procurement programme to identify, quantify and control performance, cost, and schedule risks [Source: R5000, EURAP, SA-CMM, BuyIT, TAP] (M4.1)	✗		✗	✗
Identify external threats via external communications such as those related to security [Source: EPHOS] (M4.14)	✗			✗
Include procurement risk management as an integral part of the programme's defined process [Source: SA-CMM] (M4.21)				✗
Identify and deal with risk in a positive manner such that identification is recognised and rewarded [Source: SA-CMM] (M4.22)	✓			✓
Manage training as an integral part of the procurement process [Source: SA-CMM] (O1.4)	✓	✓		✓
Identify training requirements within the request for proposals and plan an appropriate training programme [Source: SA-CMM] (O1.3)	✓	✓	✓✓✓✓	✓✓✓✓
Maintain training records throughout the procurement programme [Source: SA-CMM] (O1.6)	✗	✗	✓	✗

Management Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Use extended guidelines to identify problems and avoid the potential mistakes which have characterised failed programmes [Source: BuyIT] (02.1.3)	✓✓✓	✓✓	✓✓	✓✓✓
Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (02.3.6)	✓			✓
Involve staff responsible for the operation of a system in preparing for its introduction of the system to ensure transition without delay [Source: EURAP] (03.12)	✓	✓	✓✓	✓
Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (03.2T)	✓	✓	✓	✓
Advise procurement programme teams of current user practices [Source: EURAP] (03.7)	✗	✓		✗
Establish performance benchmarks and defined measures for the existing system, against which the new system's performance can be assessed [Source: BuyIT] (05.17)		✓		✓
Define performance metrics for the specified requirements [Source: EPHOS, SOTIP] (05.3)	✓		✓	✓
Exploit software reuse opportunities, government and commercial, before beginning new software development [Source: R5000] (06.1)				✗
Document problems in managing complex programmes to prevent the same mistakes in the next programme [Source: BuyIT] (06.6)	✓	✓	✓	✓
Do not approve the procurement programme to proceed beyond programme initiation unless sufficient resources, including manpower, are already identified and available [Source: R5000] (07.3)	✓			✓
Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)	✓		✓✓	✓
Establish close partnerships with key suppliers [Source: BuyIT] (08.12)	✓	✓	✓✓	✓
Maintain contacts with alternative suppliers [Source: PA] (08.6)	✓	✓		✓
Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)	✓	✓	✓✓✓	✓✓
Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (08.9)	✓	✓	✓✓	✓
Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programmes and status reviews [Source: BuyIT] (S6.12)	✓	✓	✓✓	✓
Establish a timetable for regular procurement project reviews [Source: CCTA] (S6.2)		✓	✓	
Plan programme evaluation and post implementation reviews [Source: TAP] (S6.3T)	✗		✗	✗

Technical practices

The following summarizes the impact of individual practices when the technical function was involved in their implementation:

Technical Practices Key: ✓ = Positive impact X = Negative impact	Economic	Effort	Functionality	Performance
Give preference to off the shelf products which cover a complete functional area [Source: PA, R5000, TAP] (A1.1.12)	XX	XX	XX	XX
Use off the shelf products whenever possible when defining system architectures [Source: PA] (A1.1.15)			X	✓
Use openly specified communications and information processing standards which are available to all potential suppliers [Source: EURAP] (A1.1.22)	✓	✓	✓	✓
Involve potential prime suppliers during the feasibility phase in a competitive or collaborative manner [Source: EURAP] (A1.1.25)	✓	✓	✓	✓
Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)	✓	✓	✓✓	✓✓
Specify only standards which exist or are soon to exist in generally available products [Source: SOTIP] (A1.2.19)	✓	✓	✓	✓
Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)	✓	✓	✓	✓✓
Include evaluation of the supplier's software engineering capabilities in the evaluation criteria [Source: EPHOS] (A1.2.28)	✓✓✓	✓✓	✓✓✓	✓✓✓
Put implemented and usable parts of the system into service without waiting for the whole system to be completed [Source: EURAP] (A1.2.31)	✓			X
Undertake data management issues early in the procurement programme [Source: EURAP] (A1.2.34)	✓	✓	✓	✓
Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)	✓	✓		✓
Use exploratory prototyping and simulation techniques to clarify requirements and to test and evaluate technical feasibility [Source: EURAP, PA] (A2.1.46)	X			✓
Define performance requirements both for normal operations and for extreme situations that may occur [Source: SOTIP] (A2.1.33)	✓		✓	✓
Define requirements for security services to minimise the security risks [Source: EPHOS, SOTIP] (A2.1.42)	✓			✓
Define requirements for new interfaces to existing systems and plan data conversion [Source: BuyIT] (A2.1.52)	✓	✓	✓	✓
Facilitate the procurement of equipment and services from various suppliers and operators by demanding the same functionality [Source: SOTIP] (A3.1.7)		✓		✓
Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)	✓	✓	✓	✓✓
Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for each criteria [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)	✓	✓	✓	✓

Technical Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)	✗			✗
Include one or more users from the organisation in the procurement team [Source: BuyIT] (M1.15)	✗		✗	✓
Plan specific management resources for system management and configuration control [Source: PA] (M2.10)	✓	✓	✓	✓
Manage and control any problems discovered during the procurement programme [Source: SA-CMM] (M2.23)	✓	✓	✓	✓
Design quality indicators for user satisfaction [Source: PA] (M3.2)		✗	✗	
Conduct an external quality review when the strategy is initially defined or undergoes significant revision [Source: TAP] (M3.2.2T)	✗			
Use a quality review to measure consistency between the terms and conditions and across all schedules of the draft contract [Source: TAP] (M3.4T)			✓	✓
Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)	✓		✓	✓
Establish a risk management programme for each procurement programme to identify, quantify and control performance, cost, and schedule risks [Source: R5000, EURAP, SA-CMM, BuyIT, TAP] (M4.1)	✓			✓
Conduct an external quality review when the strategy is initially defined or undergoes significant revision [Source: TAP] (M3.2.2T)	✓	✗	✗	✗
Include procurement risk management as an integral part of the programme's defined process [Source: SA-CMM] (M4.21)	✓✓	✓	✓✓✓	✓
Identify and deal with risk in a positive manner such that identification is recognised and rewarded [Source: SA-CMM] (M4.22)	✓	✓	✓✓	✓
Identify training requirements within the request for proposals and plan an appropriate training programme [Source: SA-CMM] (O1.3)	✓			✗
Maintain training records throughout the procurement programme [Source: SA-CMM] (O1.6)	✓✓	✓✓	✓✓✓	✓✓
Use extended guidelines to identify problems and avoid the potential mistakes which have characterised failed programmes [Source: BuyIT] (O2.1.3)	✓		✓	✓
Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (O2.3.6)			✓	
Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)	✓			✗
Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (O3.9)	✓			✗
Establish performance benchmarks and defined measures for the existing system, against which the new system's performance can be assessed [Source: BuyIT] (O5.17)	✗	✗	✗✗	✗✗
Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.1T)	✓	✓	✓	✓
Document problems in managing complex programmes to prevent the same mistakes in the next programme [Source: BuyIT] (O6.6)	✗	✗	✗	✗
Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (O8.11)	✓		✓	✓

Technical Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)			✗	✗
List and formally track all objects of a configuration [Source: EURAP] (S2.8)	✓✓	✓✓	✓✓✓✓	✓✓
Define a complete plan for all tests to be conducted [Source: BuyIT] (S1.9)	✓	✓		✓
Archive all programme documentation and make it accessible to the team members, if appropriate [Source: EURAP] (S2.7)	✓			✗
Manage each change across the acquisition lifecycle under a well documented change request procedure [Source: EURAP, BuyIT] (S2.9)		✓	✓	✗
Establish test and evaluation objectives for each phase of a procurement programme [Source: R5000, PA, TAP] (S3.1)	✓			✗
Conduct compatibility testing of hardware and software when procuring a system in fragments [Source: BuyIT] (S3.1T)	✗		✗	✗
Perform planned evaluations on the procured system prior to acceptance for operational use [Source: SA-CMM] (S3.8)	✓		✓	✓
Analyse results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)	✓	✓	✓	✗
Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis [Source: R5000] (S4.4)	✓		✓	✓
Establish testing and acceptance plans for the interfaces between new and existing systems [Source: BuyIT] (S4.8)	✓			✓
Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programmes and status reviews [Source: BuyIT] (S6.12)		✗		
Establish a timetable for regular procurement project reviews [Source: CCTA] (S6.2)	✓			✗
Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)	✗			✗
Plan programme evaluation and post implementation reviews [Source: TAP] (S6.3T)	✓	✓	✓	✗
Maintain ongoing communication and agree commitments between the procurement team and the supplier [Source: SA-CMM] (S6.4)	✓			✗
Conduct periodic reviews and interchanges with the supplier [Source: SA-CMM] (S6.6)				✗
Record any problems or issues found during contract tracking in the appropriate corrective action system and track them to closure [Source: SA-CMM] (S6.8)	✓	✓	✓	✓
Ensure that functional and performance requirements are traceable to higher level requirements [Source: R5000, PA, TAP] (A2.1.3)		✓	✓	

Administrative practices

The following summarizes the impact of individual practices when the administrative function was involved in their implementation:

Administrative Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Use common guidelines and references to defined or standardised procurement procedure [Source: SA-CMM] (A1.1.19)	✗	✓	✓	✓
Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)	✓	✓	✓	✓
Define the responsibility for maintenance and upgrades [Source: SOTIP] (A2.2.13)	✓	✓		
Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)	✓	✓	✓	✓
Divide the procurement programme into several contracts when uncertainty is high [Source: EM] (A2.2.5)	✗	✗	XXX	XX
Clarify the responsibilities of the procurer and supplier and the basis for payments [Source: EM] (A2.2.6)				
Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)	✓	✓✓	✓	✓
Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)	✓	✓	✓	✓
Notify suppliers of the basis on which they will be assessed and ranked by identifying evaluation criteria and their relative priorities, indicated by ranking or weighting [Source: BuyIT, TAP] (A3.1.13)	✗	✗	XX	✗
Utilise standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)	✓	✓	✓✓	✓✓
Have a plan for interaction with suppliers [Source: EM] (A3.1.6)	✓		✓	✓
Define programme deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)	✓	✓	✓	✗
Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)	✓	✓	✓✓	✓✓
Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement programme [Source: CCTA, SA-CMM, EURAP] (O8.1)	✓		✓	✓
Appraise the supplier's software engineering process according to the programme's defined procurement process [Source: SA-CMM] (A4.1.7)		✓	✓✓✓	✓
Do not allow a supplier that has participated (or is participating) in the development, production, or testing of a system for a user to be involved in any way in the establishment of criteria for data collection, performance assessment, or evaluation activities [Source: R5000] (A4.2.2)	✓			✗
Develop and maintain guidelines and criteria for a programme's selection and tailoring of the standard procurement process [Source: SA-CMM] (M1.12)	✓			✓
Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)	✗			✗

Administrative Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Use a quality review to measure consistency between the terms and conditions and across all schedules of the draft contract [Source: TAP] (M3.4T)	✗			✗
Identify training requirements within the request for proposals and plan an appropriate training programme [Source: SA-CMM] (01.3)	✗		✓	✗
Define performance metrics for the specified requirements [Source: EPHOS, SOTIP] (05.3)	✓✓	✓	✓✓	✓✓
Establish test and evaluation objectives for each phase of a procurement programme [Source: R5000, PA, TAP] (S3.1)	✓	✓	✓	✓
Analyse results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)	✓	✓	✓	✓
Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)	✗			✗

User practices

The following summarizes the impact of individual practices when the user function was involved in their implementation:

User Practices Key: ✓ = Positive impact ✗ = Negative impact	Economic	Effort	Functionality	Performance
Provide the maximum level of service to users, while meeting their requirements [Source: SOTIP] (A1.2.15)			✗	✗
Ensure user acceptance through motivation, involvement, communication and training of all the staff affected [Source: BuyIT] (A1.2.39)	✓	✓		✓
Involve users and other affected groups in developing and maintaining contractual requirements [Source: SA-CMM] (A2.4.5)		✓	✓	✓
Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)	✓	✓	✓	✓
Involve the user or user's representative in documenting thresholds and objectives as measures of system performance at each milestone [Source: R5000] (M2.5)		✓		✓
Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured [Source: BuyIT] (A1.3.12)				
Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)	✓			✗
Analyse the requirements of each user or group based upon their role in the business rather than their position in the hierarchy [Source: SOTIP] (A2.1.28)				
Advise procurement programme teams of current user practices [Source: EURAP] (O3.7)	✓	✓	✓	✓
Agree new system increment dates with users [Source: PA] (A1.2.10)	✗		✗	✗
Identify, categorise and prioritise mandatory user requirements [Source: EM, TAP] (A2.1.11)		✗		
Organise collection of feedback from users [Source: PA] (A2.1.15)			✗	
Ensure that new systems cope with the existing business processes and existing hardware, links and other systems [Source: BuyIT] (A2.1.54)	✓		✓	
Involve users in the detailed specification work [Source: BuyIT, EURAP] (A2.1.58)	✓			✓
Involve users in system evaluation to determine requirements satisfaction [Source: SA-CMM, EURAP, R5000, BuyIT] (A4.1.10)		✓	✗	✓
Design quality indicators for user satisfaction [Source: PA] (M3.2)	✗	✗	✗	✗✗
Involve users in risk analysis [Source: PA] (M4.10)				✓
Identify and deal with risk in a positive manner such that identification is recognised and rewarded [Source: SA-CMM] (M4.22)			✓	✓

Case studies of best practices

During the study of the relationship between procurement best practices and project performance, several ‘high value’ practices were identified. The presence of these practices was shown to be associated with improvements in many of the project measures. The highest value practices are described in *Best performing practices* and a rank order listing of the best practices according to the number of improved measures is provided in *Ranking of procurement practices*.

This chapter provides four short case studies documenting how some of the practices shown to be higher value practices are implemented within actual organizations that participated in the project. The organizations, the topics and the best practices addressed are outlined as follows:

Topic/Practices

Ericsson Microwave Systems: Managing supplier relations

- Maintain contacts with strategic suppliers
- Regular strategic supplier meetings
- Multiple channels of supplier communication

Feuerwehr Hamburg: Managing training for new systems

- Training in request for proposals
- Record training activities

Instituto de Informática: Supplier selection procedures

- Proof of supplier abilities
- Analyze supplier differences
- Evaluate supplier’s software capabilities
- Use standards for evaluating suppliers

Lantik Managing: transition to operational system

- Operational staff part of hand-over
- System maintenance plan
- Problem tracking
- Configuration management plan

The project partners would like to acknowledge the important contribution made by these organizations in allowing their internal practices and procedures to be documented for the benefit of other organizations using this report. The information contained in the case studies is intended as a guide and the actions recommended should be tailored to the reader’s particular organization and procurement approach.

Supplier relations: Ericsson Microwave Systems

Ericsson Microwave Systems AB, with headquarters in Sweden, manufactures products and components in the areas of high-speed microelectronics, radar and communications systems. Ericsson Microwave Systems designs, develops and manufactures advanced defense electronics for army, navy and air force applications. They also maintain extensive facilities for research in these and other technology areas. Their production includes surveillance systems, combat aircraft avionics, airborne early warning and control systems and tactical telecommunications systems. They employ approximately 4700 employees most of which are located at their Gothenburg, Sweden facilities.

The typical customers for Ericsson Microwave Systems defense divisions are the Swedish government and other governments that require advanced electronic defense systems, which are provided subject to specific Swedish government export restrictions. The customers for civil products from Ericsson Microwave Systems are telecommunication companies and different government procurement organizations around the world, with Asia being of particular importance.

Ericsson Microwave Systems is mainly a system supplier, however they procure substantial amounts of information and communication technology as components within their products. This includes both hardware and software technologies. A large amount of their procurement budget is also utilized for internal IT systems, development technology and production systems. In the last 2 years, the procurement strategy has been to purchase more off-the-shelf solutions in order to try to decrease life cycle costs in their developed products.

Description of best practice area

Ericsson Microwave Systems has showed good results in implementing practices related to managing supplier relationships. In particular they have established consistent and successful procedures for maintaining contacts with strategic suppliers and for conducting regular strategic supplier meetings. They also have put in place procedures allowing for multiple channels of supplier communications with both potential suppliers and those already under contract.

Ericsson Microwave Systems has long recognized that managing supplier relationships is fundamental to their business and continued success. One of the main challenges in the area of procuring military grade components and systems is to find good and reliable partners, and to establish a relationship that benefits both parties. Communicating with suppliers is fundamental to avoiding conflicts and to ensuring procurements are successful. These tasks must be proactively managed in a coordinated fashion across the whole of the organization.

Military projects are often very long, running to as much as 10 or 20 years and sometimes even longer. Customers require a very good and economical maintenance process and the ability to include future development and upgrades to their existing systems. In order to provide customers with these facilities, Ericsson Microwave Systems must establish supplier relations that allow for access to new or upgraded components long after the original procurement has been completed. Ericsson Microwave Systems has learned that to be on the leading edge with their product portfolio they have to manage their supplier relationship for the whole lifecycle. Without such a mindset, life cycle costs would increase substantially impacting the financial position of both Ericsson Microwave Systems and their customers.

Best practice implementation

Ericsson Microwave Systems believes that to manage supplier relationships successfully one must focus on activities that ensure good human relationship and understanding

between staff involved from Ericsson Microwave Systems, suppliers and end users in the procurement process. Over the years, Ericsson Microwave Systems has established an environment and culture that is based on exceeding expectations, continuous process improvement, and involvement in meeting these objectives from each individual in the organization. Within this environment, specific actions are undertaken to ensure successful supplier relationships.

The actions Ericsson Microwave Systems implements to successfully manage supplier relationships are as follows:

- Experienced and socially competent people are used within procurement teams to establish a positive and co-operative team spirit. The team takes time to get to know the supplier and their policies, market approach and value propositions, as well as their technical and financial situation. The team finds out at regular intervals if a supplier has any problems or is trying to hide anything. They try to establish an open and friendly discussion about a supplier's problems or concerns and try to show that the team cares and might be willing to help.
- Each procurement project has organized contacts and meetings with each supplier at different management levels. The supplier contacts are tracked and organized between levels so that opportunities to co-ordinate discussions with a supplier and to press for issues or specific items are done at multiple levels using both technical and business arguments and motivations.
- The roles within the procurement team are clearly defined. The teams consist of a unit manager, project manager, technical staff, administrative/contracting, business lawyer, production staff and user representative if possible. Each team member understands their role and their responsibilities or limitations concerning interactions with suppliers.
- Information is explicitly pointed out to potential suppliers concerning potential conflict areas. In particular the contractual terms clearly define the following areas:
 - Arbitration regulations such as definitions of location, involved partners, state of law followed
 - Policy for handling any infringement to avoid legal actions against each other and instead to negotiate
 - Definitions of warranty and maintenance service
 - Property rights and rights to export or sell products to third parties
 - Escrow commitment for supplier's software source code as a safety and security measure
- Suppliers must commit to specific terms and conditions as part of their purchase agreement with Ericsson Microwave Systems.
- All business decisions in the procurement are clearly documented and presented to Ericsson Microwave Systems' high-level management for their approval and understanding. Each economic decision is often tested against other possibilities, supplier risk analysis, business benefits, etc. Ericsson Microwave Systems has learned that being an informed and prepared party to an agreement greatly increases the success of the supplier relationship.
- Single source contracts are avoided as these often lead to poorer supplier relationships. One of the procurement objectives should be to have multiple suppliers within procurement. If this is not possible, then facilities should be included which allow for the future inclusion of additional suppliers.

- Regularly planned meetings are conducted with a supplier on different staff levels to help them understand the business needs of Ericsson Microwave Systems, or to get an early understanding of potential supplier problems. When problems do occur Ericsson Microwave Systems offers the possibility of assistance (e.g. through joint reviews, auditing, problem resolution meetings, etc.) in order to stabilize the business relationship.

These actions have been shown to provide a sound basis for establishing stronger and more successful supplier relationships.

Challenges and recommendations

Some major challenges that Ericsson Microwave Systems experienced in managing supplier relations are in the area of teamwork with suppliers. It is essential that both sides of the procurement have a team attitude for the entire procurement process, in order to have a long-standing supplier relationship providing business benefits for all involved. This is particularly important for military product development, which depends upon a long and reliable business relationship.

Team working within a supplier relationship is not always easy to organize. Common problems arise often in direct human relations because of culture difference, language or because of company culture. Be aware that it takes time to understand each other. It's like a marriage. Social behavior or competence is just as essential in the negotiations and purchasing process as for non-work activities. Ericsson Microwave Systems sometimes provides training personnel in this area, especially to those responsible for managing relationships with Asian suppliers or purchasers.

Teamwork for procurement activities inside Ericsson Microwave Systems is viewed as a continuous improvement area. One success factor seems to be that in order to establish good teamwork, it is extremely important to commit an experienced project leader to take the responsibility for managing supplier relations.

Another major challenge is that it takes time for all parties to understand that a "win-win" procurement solution is the best business relationship for everyone. Despite being stated as an objective, this is not always truly supported by everyone involved. Some suppliers just want to win a contract and to get their money. All involved in procurement should be aware of this short-term mind set and to beware of the supplier who doesn't want to commit to written legal statements concerning arbitration and infringement.

Training for new systems: Feuerwehr Hamburg

The fire brigade provides services to the area of Hamburg in northern Germany, with a total population of 1.8 million. There are 2,300 fire-fighters and 2,500 volunteer fire-fighters working at 105 fire stations. The fire brigade has approximately 210,000 deployments per year. These are distributed on average as 10,000 fires, 25,000 special services and technical assistance and 180,000 cases of emergency. These deployments are announced by 400,000 emergency telephone calls per year. This immense number of incoming calls must be managed under high safety and performance aspects (i.e. the system reaction time must be within a maximum of 10 seconds) to ensure the necessary services are provided.

The first computer based communication, control and co-ordination center combined with a rescue station for ambulances was installed in 1977. This system could not be maintained after 1996/1997 and a project to acquire a new system was established in 1988. The detailed specification as a basis for the request for proposals contained 2,000 pages to ensure the delivery of the following:

- Data processing system consisting of:
 - hardware and software (for the fire brigade center and the task forces),
 - load tests for the system and the LAN, and
 - requirements for system reaction time, supplier independence, redundancies and safety aspects.
- Communication and alert system consisting of:
 - radio systems,
 - telecommunication systems,
 - external display for showing car status (i.e. available, on duty), and
 - vehicle location system (GPS).

The starting date to realize the development of the system was September 1994. The new system was to be introduced in a test mode to allow for optimal use and high maturity as from March 1997. The contract was given to one general supplier that had to handle on average 4 subcontractors.

Description of best practice area

The computer based communication, control and co-ordination center and the rescue station for ambulances are designed to support the fire brigade staff to optimize the time required (i.e. of the incoming emergency call up to the departure of qualified fire-fighters). However, the supporting system does not release the operational staff from their responsibility to ensure the 'delivery' of services in time. Every failure in service execution may result in the loss of life. Therefore, the staff must be equally familiar with the different systems and the organizational processes and issues related to delivering services.

To ensure a high standard of services, the project team considered the following in the request for proposal (RFP):

- a stepwise fall back architecture that allows components to be taken out of service should a failure occur
- an interactive operation, and
- control functions in the scope of time and technical issues

In addition to these more technical functions, it was decided that adding specific training elements to the RFP would increase the success of the system. The reason was that a suf-

efficient number of operators had to be trained at the start of operation of the new system to guarantee the safety of the public and other relevant services. The best practices, which were followed to manage training for the new system, were:

- Training elements to be addressed in the response to the RFP from the supplier.
- Training activities recorded and their results documented at the end of the procurement process.

Since training must be performed during normal operational working time and no interruption of services is allowed, more than 3 months of training were planned to ensure the optimal introduction of the new system. This required the harmonization and scheduling of normal shifts, training events, holidays, development status of the product, and schedules of the development activities.

This continuous process could only be handled by applying formal procedures to generate and maintain training plans, because changes to the project plan, the project handbook, the available documentation and the regular administrative planning could require an update to the training plan. Moreover a close partnership and clear communication channels with the supplier were necessary to manage and organize the training with respect to joint objectives and status-oriented activities. This was needed as changes in the product development also entailed a different product deliverable and it became necessary to develop further training courses and add new elements of training for new functions.

Successful and effective management of training requires clear communication channels, a common goal, high motivation and the commitment of all the parties involved.

Best practice implementation

To manage training for the new system, the training elements were addressed in the request for proposal. Therefore, the detailed specification contained a specific training section, which considered the following items:

- target group
- structure, contents and characteristics of the different courses of training
- matrix of courses of training and target groups
- schedule for training
- organizational issues, and
- technical organization.

The selected supplier had to deliver a training plan for approximately 300 users in the early implementation phase with respect to the training elements as specified, and also had to consider which training courses are prerequisites for others. The concept and structure of the training documentation was given within the training plan. Since the project plan was changed during the project, all impacts had to be reflected in the training plan.

In order to ensure that failures did not arise in the delivery of special services, the system users had to understand the following:

- the background functionality,
- levels of operation,
- connections of system modules,
- interdependencies, and
- order of events

The courses were planned and prepared in close co-operation with the supplier to achieve appropriate training in functionality. Separate training using realistic and practical exercises was also performed.

An incremental system development approach was used to achieve a subset of the final product as early as possible. This enabled the training activities to start early, in parallel with the development process. Since development was ongoing, training could also be used as a beta-test of the system. The detection of faults and incorrect functions were communicated to the supplier and were then integrated into new versions of the system. This approach was very useful in saving time between the development and introduction phases of the system, and even allowed for recovery some of development delays with respect to the original plan.

To benefit from this approach in terms of time and costs, the customer and supplier must be able to:

- perform bug fixing and corrections in short time periods to provide a usable version for the next training sessions,
- apply an efficient and effective configuration management approach to issue and maintain one current, correct version, and
- distinguish between serious faults/incorrect functioning and desirable adaptations in order to minimize the rework effort.

The above stated approach resulted in a delay of the planned 3-month training period. However, in the scope of a combined development, testing and training phase, the total project time was actually reduced. In addition, the users were trained on the latest versions and could influence the development with suggested improvements.

Responsibility for follow-up training was taken over by the fire brigade. Preparation of training was carried out in close co-operation with the supplier resulting in adaptable training documentation (i.e. new exercises and solutions added, the system handbook changed) and the courses were delivered by trainers from both the supplier and customer. The technical infrastructure to perform in-house training was also planned from the beginning of the project. Therefore the planned client-server architecture was designed to separate several clients from the main system to simulate exercises that can be immediately changed online, as needed.

One acquisition policy of the fire brigade was to acquire off-the-shelf products for general tasks (e.g., MS-Word for documentation or MS-Access for databases). Training necessary to use these products was mostly organized with additional suppliers experienced in this domain.

Challenges and recommendations

The experience gained throughout the acquisition project indicates that in addition to specific best practices to be applied, close co-operation with the contractors/suppliers is a prerequisite to prepare, plan and perform efficiently and effectively. Moreover the importance of the interaction of the factors of human resources, organization and the system must be carefully considered to ensure the success of the project.

The following recommendations are given with respect to training activities, to ensure greater success within a procurement or acquisition:

- Training courses should be planned, prepared and performed by the responsible staff of both parties and the 'vocabulary' of the user should be used.
- When multiple training sessions of the same sub-system are planned, feedback from participants after the first training session(s) should be used to check the validity of the course and revise as necessary.
- For specific training, only one fireman of the decentralized fire stations was instructed and transferred his knowledge to the entire staff of a fire

station. These multiplying training effects were used to minimize the duration and efforts of the whole training phase.

- A telephone hotline to answer questions at each training phase increases efficiency, especially in decentralized organizations.
- Combining the development, testing, integration and training phases by applying an incremental development approach, allows for the early introduction of a sub-system with a high maturity level.
- Fast interim software releases require an efficient and effective configuration management approach to issue and maintain only one current and consistent version.
- Define mechanisms for efficient and effective bug fixing of incorrect functions in order to deliver a usable version as soon as possible for the next training.
- Ensure close co-operation with the supplier to distinguish between faults/incorrect functionality and desirable changes, to define common criteria to be applied, and to minimize the rework effort. This will result in an efficient and effective continuous improvement process.
- Define formal procedures to plan, prepare and deliver further training sessions for later versions of the system when using an incremental development approach. These procedures should be combined with an appropriate configuration management approach to use only one defined and valid version of the system.
- Faults, incorrect functionality and desirable changes identified during training sessions should be taken into consideration for the continuous improvement process, during the implementation of the system, as part of the process.
- If prototyping is planned, users should be involved and trained as necessary to identify improvements.
- When acquiring complex systems, the users should be involved in every development step in order to benefit from their experience. Appropriate training sessions or briefings must be planned to enable the staff responsible for operational tasks to contribute.

By keeping these actions and recommendations in mind as training needs and procedures are identified, organizations will obtain greater value from their training investment and obtain better project performance.

Supplier selection procedures: Instituto de Informática

Instituto de Informática is a large Portuguese information systems and technology development organization supporting the technology needs of all Portuguese public administrations. As a government agency, it provides procurement support and technical consulting across a broad range of technology platforms and a very diverse set of application domains. Instituto de Informática supports public administration agencies mainly in consultant activities such as:

- Information Systems strategic planning
- IT management
- Support for public procurement procedures
- Data processing service bureau
- Applications development
- Technical information center and library
- Operational exploitation of IT applications

These services are provided by a large staff of internal engineers, procurement specialists, and planners as well as by external consultants for specific projects.

Description of best practice area

Instituto de Informática provides support for public administrations undertaking procurement, implementation of new IT systems and evaluating infrastructure, technologies, and needs of the procuring agency. Based on these needs it makes specific recommendations concerning the choice of suppliers. They play a critical role in that the supplier selection process can greatly impact the success of the project and the value the new system will provide to the organization.

A set of procedures has been established for selecting suppliers to improve decision-making. While each supplier making a proposal or bid will state they can provide the system or components that have been requested, it is necessary to look beyond what is being proposed to understand how the supplier operates and any associated risks. By analyzing the deliverables being proposed and the suppliers themselves, their situation, and their skills and abilities, it is possible to make a better assessment of the likely performance of each supplier.

Instituto de Informática looks at several different dimensions when evaluating suppliers. The first and most obvious is a comparison of the proposed solutions from competing suppliers. Beyond this comparison, the suppliers must show they have the abilities to deliver what they've proposed. This relates to technical ability, financial resources, and the capacity of the organization to undertake the development being proposed. Utilizing standards for evaluating suppliers provides a common benchmark for comparison and ensures that evaluations are done on an objective basis.

Best practice implementation

The acquisition process starts with a call for proposals issued to a list of suppliers. As Instituto de Informática is a public agency, certain requirements must be met for large procurements that ensure fair and open competition amongst suppliers. The supplier's proposals are reviewed and evaluated based upon a predefined set of evaluation criteria agreed by the agency purchasing the system.

The evaluation criteria used in evaluating suppliers includes the following:

- financial resources
- technical capability

- past performance
- proposed pricing
- any additional items proposed by the supplier that may be advantageous for the agency making the purchase

An important technique used during the evaluation process is analyzing the differences between supplier proposals. Each proposal must first be evaluated to determine if it is adequate, and once this qualification is complete effort is invested in analyzing the differences between each supplier's proposal. Doing this uncovers specific differences that are fundamental decision points for the technology being purchased. In some cases the analysis uncovers specific areas where further information is required from suppliers. Instituto de Informática maintains regular contacts with suppliers during the evaluation process so that issues can be clarified.

In addition to evaluating suppliers prior to awarding contracts, the supplier is further evaluated during the implementation process where results are analyzed and compared to the contract's requirements and the actual needs. At these implementation evaluations, the possibility of new acquisitions is also considered. Regular meetings with suppliers' results in better service from them.

Instituto de Informática always presents their standard contract to the suppliers. The contract contains specific terms related to possible changes during the procurement process, performance metrics, acceptance criteria, payment basis, penalties, deliverables, schedules, training if required, and establishes test and evaluation objectives. Suppliers that commit to the standard terms proceed to the later stages of supplier selection. When suppliers have difficulties with the contract terms, meet with them to try and find a solution. If this is not possible then the supplier is eliminated from the selection process.

Technical and financial capabilities

In analyzing the financial capability of a supplier, Instituto de Informática determines:

- the degree to which the accounting functions are well organized and the availability of financial reporting information
- the financial resources of the suppliers in terms of being able to solve any kind of financial crisis

Financial resource requirements are scaled to the size of the system being acquired. Large complex systems require the supplier to have substantially more financial reserves due to the level of risk and the possibility of overruns as compared to a smaller or more generic system. It is also required that the supplier use analytical accountancy methods so they can better control all project related financial and human resources information.

Organizations that have been certified ISO 9000 compliant, or who have undergone other standards based evaluations (e.g. Bootstrap and SPICE) that indicate abilities in managing projects are preferred. However, it is not necessary to be a certified company as long as the supplier can clearly show that they use well-defined and documented development methodologies. There is a strong bias on process related methodologies for quality assurance such as CMM from the Software Engineering Institute.

People are critical to the success of most IT implementations. For this reason the supplier's technical capability is analyzed in terms of:

- the composition of the technical team involved in the delivery process
- the individual skills of the team members, to the level of requiring resumes of individual's experience to be formally presented with the proposal
- experience of the team or individuals in delivering similar systems

Whenever any doubt exists of a supplier's capability a demonstration of their proposal, or in some cases a prototype, is required.

When acquiring a new software system, it is usual that, before external procurement starts, a thorough review of the current system is performed. This is done in order to evaluate the actual need for a new system or the upgrade or improvement. This also provides an important baseline for evaluating suppliers and their abilities to deliver a substantial improvement over existing systems.

Challenges and recommendations

Although quality related procedures could be enforced, some challenges do arise. These include:

Lack of team involvement - decisions for large projects are made at a very high level. Due to this fact and to the above-mentioned lack of resources, the technical staff is in many cases overlooked, leading to unjustified expenditures.

Lack of internal resources - resources are scarce and tend to be over committed. This situation leads to a level of support that is less than may be needed to ensure project success.

Lack of external resources - the actual end user department frequently does not have enough technical skill available both to interface with Instituto de Informática and to provide the internal support for the system being purchased. This situation leads to a requirement of additional resources from the Instituto de Informática team, which they can seldom provide.

The resource shortages brings about specific risks in the supplier evaluation process: a) bias on the part of non-technical staff towards less sophisticated solutions that may not adequately meet the needs of the organization, b) delays in the project as the purchasing organization has difficulty making decisions, and c) expectations regarding schedules and resource requirements frequently being too optimistic.

For organizations wishing to improve their supplier selection process the following is suggested:

- have stronger technical involvement in the decision-making
- adopt training programs for the project team in order to improve team working and create technology and/or methodology awareness
- utilize quality models both for evaluating supplier's abilities and for managing projects
- utilize additional tools such as configuration and project management tools at the tender specification level in order to track and document the supplier selection process

Transition to operational system: Lantik

Lantik is a limited company established to serve the IT needs of the Bizkaia Regional Council, which is the governing body of the Historical Territory of Bizkaia, of which Bilbao is the capital and main city. Lantik provides software development work for the applications used within local administration. In addition, Lantik manages the IT infrastructure and delivers training on new systems and establishes the underlying information architecture used throughout the local government offices.

Lantik applications support local administration services including taxation, social security and the personnel systems for government employees. The procured systems are very diverse: from personal computers and standard software, to very specific tailored applications for both centralized and distributed systems. During this period, procurements have been distributed equally between hardware and software. Standard software represented 30% out of the total, while the remaining 70% has been tailored software.

The end-users to which the procured systems are targeted belong to the different departments of the Bizkaia Regional Council. Approximately 70% of these systems are destined to support several hundred users each. The remaining 30% will be utilized by a smaller number of users (between 10 and 50).

Description of best practice area

Once the contract with the supplier has been signed, there are many different activities to be carried out during the procurement project aimed at assuring that the final system is properly installed and made fully operational. The best practice area covered by this case study is related to managing transition from supplier handover to the system being operational, and includes the following types of activities:

- Management and control of problems discovered during the procurement project
- Assuring a corrective action system for the identification, recording, tracking, and correction of problems
- Ensuring that the operational staff is included in the procurement team from the very first phases of the project
- Allocating resources for planning of configuration control activities
- Planning a maintenance plan so that functions and responsibilities are clearly identified

A large amount of effort is needed to follow up supplier work items, including the establishment of periodic milestones or partial deliveries, which are subject to acceptance by the project manager. The technician's participation through the whole procurement process is essential for Lantik, and these technical functions are also responsible for exploitation and maintenance after implantation of the system.

Recording not only the problems but also the problem resolutions is a key factor that can be used as a negotiation element and should be taken into account for other projects. It helps to eliminate risks in future projects to maintain a repository of lessons learnt, and problem resolution from procurements. On the other hand, proper diffusion of this information, beyond the project scope, means additional effort for the project team. The demands of daily work can often prevent the necessary resources to enable this level of tracking and if not addressed, limit the ability of the whole organization to take advantage of past lessons.

Best practice implementation

The main activities and actions implemented by Lantik during the delivery and transition phases of a procurement project are described below.

Operational staff participation

The technical operational staff that know both the context of end users and the technology involved participate in the projects from the initial phase. Once the warranty period required from the supplier expires, these are the people responsible for exploitation of the system (maintenance and service to the users). This approach results in strong involvement and commitment of operational staff to the project.

The operational staff participates in carrying out the project requirements, starting with the 'call for tenders'. They translate the user needs into technical language and describe the characteristics and standards to be fulfilled by the system. They also participate in tender evaluation and selection of suppliers and are involved in project follow-up activities including meetings with suppliers and approval of milestones. Operational staff co-operate with the supplier during implementation and testing phases. However, they do not participate in legal and administrative issues related to suppliers, such as contracting.

This involvement of operational staff is a common practice established in all procurement projects. On one hand, operational staff know the customer needs very well and on the other, they understand the technology of the system to be installed. This leads to a better post-installation service to the user.

System maintenance plan

A specific warranty period that varies depending on the type of procurement is required from suppliers. After this warranty period, Lantik assumes the responsibility for maintaining all the installed systems. An annual maintenance plan is defined to achieve this, with allocation of sufficient resource that all the systems are maintained and work properly.

An improvement process is established that is aimed at modification or improvement of current working systems. The operational staff participates in this process through improvement proposals and new functionality change requests. Once these are approved the operational staff remain involved in the implementation of the proposed solutions. The maintenance management includes an incident management system focused on error compilation, effort and time invested in the corrective actions and reporting. This information is particularly useful for review and re-planning of required maintenance resources.

Problem tracking

All problems found during the procurement process life cycle are recorded and documented in the project dossier. The problems are analyzed in order to find their causes and responsibility for the proper corrective actions. All problems are tracked until resolved.

There are some guidelines and suggestions that help in identifying problems and avoiding possible characteristic risks of past unsuccessful projects. Nevertheless, more effort must be invested in dissemination of the lessons learned in past projects so that they can be of use in future projects.

Configuration management plan

Depending on the procurement type and size, Lantik requires a Configuration Management Plan from its suppliers. This is an important tool that helps assure correct operation of the system when installed. This is essential in distributed systems, where different software and hardware versions can increase the number of problems that occur.

Before approval of interim milestones, the supplier is required to provide a status and the updated configuration list, with detailed information about each component.

With shorter life cycles for technology, it is proving more and more difficult to avoid the problems related with rapid changes in hardware and base software versions. Having a flexible and easy to use configuration management system is fundamental to managing this situation.

Challenges and recommendations

There are many challenges to face when putting in place strong procedures for managing the transition to full installation and operation. Recommendations that can help to establish these best practices are as follows:

- The procurement project team must include operational or technical staff from the initial definition stages. The most favorable situation is when this staff knows very well the end user needs as well as the applied technology. This helps in designing the new system with an objective view, which is indispensable in assuring the quality of the final product.
- If the right technical staff is not available, it's recommended that the procurement be split into different phases. The first phase would be a prototype that can demonstrate the supplier's capability of satisfying the requirements and that the system meets the organization's real needs.
- Define a maintenance plan that's adequate for the organization, including the necessary resources for its management and development.
- Develop good maintenance management to avoid budget overruns. This is very important in companies that rely heavily on computer systems.
- Define criteria and metrics that track maintenance status and identify issues. For example, after one year, the maintenance interventions should decrease for a system that is stable. If this doesn't happen, i.e. the number of errors doesn't stabilize, it is necessary to stop to analyze the root cause of the problem. On the other hand, if the maintenance cost of a system is lower than average, this may also be a warning sign. Perhaps the system is not actually being fully utilized for its intended purpose.
- Ensure that the users know the real cost of maintaining the actual system for a long period of time.
- There are no accepted methods that are helpful in defining, establishing and managing the maintenance process. Therefore, every organization must assign resources to establish a good maintenance process fitted to its particular needs.
- Maintain a repository with information about problems found and the solutions that were adopted. Define a facility that allows all the organization levels access to this repository in order to reduce risks in future projects. The bigger the organization where verbal communication is more difficult to all parties involved, the more useful this is.
- Use a checklist with possible risks and update it with newly encountered problems. This is particularly useful in the initial phase of the project where the new system is defined.
- Whenever the procurement is complex or involves multiple system platforms, demand a configuration management plan from the supplier.
- Establish a flexible and efficient configuration management system and make sure that the system is developed according to the established configuration.

The transition to operation is an area where it is possible to have many surprises, both technically and from the standpoint of resources required to maintain the system. By following the above recommendations Lantik has shown that these surprises can be substantially reduced.

Reference set of best practices

This chapter contains over three hundred suggested procurement best practices, taken from a variety of sources. It is structured into four key areas:

- Procurement program procedures and planning
- Selecting suppliers for procurement programs
- Managing procurement programs
- Implementing and evaluating procurement programs

Each of these four areas includes a number of suggested best practices, categorized into several discrete topics. Each of these categories is a complete entity and can be referenced independently of others. When a best practice applies to more than one topic, it is included under each of the relevant topics. In addition to referring to appropriate topics as needed, this entire chapter can be read for a better overall understanding of procurement best practice guidelines.

Each best practice guideline generally includes its original source. Guidelines have only been modified for readability and consistency. The best practice guideline sources referenced in this chapter are as follows:

Abbreviation	Guide or Methodology
EC	European Commission Directives for Public Procurement of Goods and Services
BuyIT	Buy-IT Guidelines Chapters 1-11
CCTA	CCTA Catalogue of Standards and Practices for use in IT Procurement
EPHOS	European Procurement Handbook for Open Systems – Version 1.1
EURAP	European Requirements for the Acquisition Process
EM	Euromethod Procurement Methodology
ISO/IEC 14598-4	Information Technology – Software product evaluation Part 4 – Process for Acquirers
PA	Guidance on the Use of Progressive Acquisition
R5000	US Department of Defence Directive R5000-2
SA-CMM	Software Acquisition Capability Maturity Model
SOTIP	The Swedish Government Open Telecommunication Systems Interconnection Profile
TAP	Total Acquisition Process Systems Guide and Services Guide

The identification of best practices was made using the following selection criteria:

- Must be a concise statement
- Must give specific direction and identify an action that should be followed

- Must describe an action that can be verified
- Should exclude highly subjective words (or these words can be removed without affecting the statement)

While there were in many cases hundreds of pages of background information and philosophy contained within some sources, the project focused on practices on which action could be taken.

The reviewing of each of the above guidelines or methodologies resulted in the identification of over 900 best practices. After removing the duplicate practices there were just over 300 practices that are identified in this chapter. Traceability of all practices in this document to their original source has been maintained.

Procurement program process and planning

This section provides procurement best practice guidelines for the procurement process for each procurement program in the organization:

- the overall organizational procurement process
- planning procurement programs
- analyzing the benefits of proposed procurement programs
- capturing requirements for procured systems
- involving users in procurement programs
- establishing and improving the organization's procurement process

Procurement process

- Define, manage and control standard procurement processes and maintenance activities for the organization [Source: SA-CMM, EPHOS] (M1.6)
- Use common guidelines and references to defined or standardized procurement procedure [Source: SA-CMM] (A1.1.19)
- Written procedures describing the acquisition process are collected, analyzed, and made accessible [Source: SA-CMM] (M1.8)
- Provide flexibility in tailoring procurement procedures to the needs and circumstances of a particular program [Source: TAP] (A1.1.3T)
- Include an environmental, safety, and health (ESH) evaluation in the procurement process [Source: R5000] (A1.1.5)
- Establish formal procedures for ensuring interoperability of separately procured systems [Source: EPHOS] (A2.1.40)
- Analyze the business when considering the long term goals of the procurement process [Source: SOTIP] (A1.2.25)
- Establish close partnerships with key suppliers [Source: BuyIT] (O8.12)
- Maintain contacts with alternative suppliers [Source: PA] (O8.6)
- Maintain a list of potential suppliers for systems and development [Source: EURAP] (A3.2.12)

Procurement planning

- Examine a range of alternative ways of procuring the proposed system [Source: TAP] (A1.2.22T)
- Identify three feasible options ranging from a comprehensive (satisfying every requirement) approach to a minimum solution which addresses only the most serious problems [Source: TAP] (A1.3.6T)

- Assess the options of each possible solution by using a consistent analytic framework and defined tools and methods to consider specific risks, costs and benefits [Source: *BuyIT*] (05.13)
- Base all procurement programs on identified, documented, and validated mission needs that cannot be satisfied by non-material solutions [Source: *R5000, BuyIT*] (A1.1.1)
- Establish program goals for cost, schedule, and performance parameters for every procurement program [Source: *R5000*] (A1.1.2)
- Plan which portion, if any, of the specification, procurement, implementation and operation will be outsourced [Source: *BuyIT*] (A1.1.31)
- Identify any necessary organizational changes and how they will be managed [Source: *TAP*] (A1.2.11T)
- Involve all interested parties in the decision analysis to ensure realistic expectations [Source: *BuyIT*] (A4.2.5)
- Produce a plan for management of system maintenance at the start of the procurement program, and update it regularly during the program [Source: *EURAP*] (A1.2.35)
- Undertake data management issues early in the procurement program [Source: *EURAP*] (A1.2.34)

Analyzing benefits of proposed procurements

- Use quantified analysis for assessing benefits [Source: *EPHOS, BuyIT*] (A1.3.8)
- Conduct cost/performance trade-off analyses before finalizing the procurement approach [Source: *R5000*] (A1.2.2)
- Consider alternative solutions when the program risks are likely to outweigh the expected benefits [Source: *BuyIT*] (A1.3.14)
- Analyze non-technical benefits of solutions in addition to purely technical benefits [Source: *EPHOS*] (A1.3.7)
- Analyze benefits from a user perspective, taking interaction between users into account [Source: *SOTIP*] (A1.3.5)
- Identify benefits that are wholly dependent on the supplier performance [Source: *SOTIP*] (A1.3.6)
- Consider any additional benefits to the organization that a procured system could provide, in addition to its primary purpose [Source: *TAP*] (A2.1.5T)

Establishing requirements

- Use defined end user types to describe the functional requirements [Source: *SOTIP*] (A2.1.37)
- Classify requirements into functional areas [Source: *PA*] (A2.1.14)
- Define functional, data and event requirements within the requirement specification [Source: *TAP*] (A2.1.7T)
- Define the functionality of the required system, the design constraints imposed on any solution, and the scope of the required supporting services [Source: *TAP*] (A2.1.9T)
- Use requirements to trace architectural entities in the procurement program [Source: *PA*] (S1.2)
- Reuse standard requirement profiles for pre-defined functional areas [Source: *PA*] (06.4)

- Distinguish clearly between background information and system requirements [Source: TAP] (A2.1.17T)
- Update the identified requirements as necessary throughout the procurement program, while maintaining rigorous control of evolving requirements [Source: PA, BuyIT] (A2.1.18)
- Establish human factors engineering requirements to develop effective human-machine interfaces [Source: R5000, PA] (A2.1.9)
- Use exploratory prototyping and simulation techniques to clarify requirements and to test and evaluate technical feasibility [Source: EURAP, PA] (A2.1.46)
- State user needs in terms of deficiencies in current capabilities and expected benefits from new systems [Source: R5000, BuyIT] (A1.3.1)
- Identify, categorize and prioritize mandatory user requirements [Source: EM, TAP] (A2.1.11)

Defining business needs

- Specify requirements in terms of business needs and expected benefits [Source: BuyIT, TAP] (A2.1.57)
- Structure and prioritize current and new requirements according to their business importance [Source: TAP] (A2.1.15T)
- Translate business requirements into functional requirements, showing what is technically possible and what the business needs [Source: BuyIT, TAP] (A2.1.51)
- Define capability or operational requirements instead of specific technical solutions and specifications at all stages of procurement programs, including acceptance [Source: TAP, R5000] (A1.2.3T)
- Define requirements in terms which enable and encourage potential suppliers to supply commercial and non-developmental items [Source: R5000, TAP] (A2.1.2)
- Perform cost/time estimates and risk analysis of requirements and re-iterate these activities throughout the procurement program [Source: PA] (A2.1.13)
- Underpin the business strategy by other strategies, for example, those covering information systems, marketing and training [Source: TAP] (A1.1.5T)

Standards and Models

- Use open systems standards when defining functional requirements [Source: EPHOS] (A2.1.41)
- Establish general models for structuring business and organizational needs in a common language [Source: SOTIP] (A1.1.18)
- Establish standard specification techniques for describing requirements [Source: PA, SOTIP] (A2.1.13)
- Use a well-defined requirement engineering process agreed by all program participants [Source: PA, TAP] (A2.1.12)
- Use a procurement guide to simplify the requirements specification [Source: SOTIP] (A1.2.24)
- Define the future aims of standards to encourage product development [Source: SOTIP] (A1.1.17)

Include in the requirements

- Construct an evaluation model in parallel to defining the requirements such that the solutions offered by suppliers can be tested [Source: TAP] (05.17)
- Define requirements for new interfaces to existing systems and plan data conversion [Source: BuyIT] (A2.1.52)
- Define requirements for security services to minimize the security risks [Source: EPHOS, SOTIP] (A2.1.42)
- Define requirements for system installation [Source: EM] (A2.1.10)
- Define requirements for system supportability [Source: PA] (A2.1.24)
- Define performance metrics for the specified requirements [Source: EPHOS, SOTIP] (05.3)
- Define performance requirements both for normal operations and for extreme situations that may occur [Source: SOTIP] (A2.1.33)

User Involvement

Scope of user involvement

- Involve users and other affected groups in developing and maintaining contractual requirements [Source: SA-CMM] (A2.4.5)
- Involve users in developing and refining cost objectives and critical schedule dates [Source: R5000] (07.1)
- Involve users in risk analysis [Source: PA] (M4.10)
- Involve users in the detailed specification work [Source: BuyIT, EURAP] (A2.1.58)
- Agree new system increment dates with users [Source: PA] (A1.2.10)
- Involve users in system evaluation to determine requirements satisfaction [Source: SA-CMM, EURAP, R5000, BuyIT] (A4.1.10)
- Obtain agreement with the users of the expected benefits and cost analysis of the system to be procured [Source: BuyIT] (A1.3.12)
- Include user and customer needs in the quality requirements for the procured system [Source: EURAP] (A2.1.44)

Analyzing user requirements

- Analyze the requirements of each user or group based upon their role in the business rather than their position in the hierarchy [Source: SOTIP] (A2.1.28)
- Define any differences between organizational requirements and user requirements [Source: SOTIP] (A2.1.36)
- Ensure that user requirements are independent of the procurement process [Source: SOTIP] (A2.1.29)
- Classify user behavior to simplify the analysis [Source: SOTIP] (A2.1.35)
- Identify a smaller number of functional groupings of users, which are valid in any business organization [Source: SOTIP] (A1.2.18)
- Identify the supplementary services (functional requirements) which should be considered for all users and for each functional grouping of users [Source: SOTIP] (A2.1.34)

- Use a generalized functional user requirements model to simplify the requirement specification [Source: SOTIP] (A1.2.17)
- Provide the maximum level of service to users, while meeting their requirements [Source: SOTIP] (A1.2.15)

User acceptance

- Ensure user acceptance through motivation, involvement, communication and training of all the staff affected [Source: BuyIT] (A1.2.39)
- Promote the procured system to the users [Source: EURAP, EM, PA] (A1.2.30)
- Organize collection of feedback from users [Source: PA] (A2.1.15)
- Involve the user or user's representative in documenting thresholds and objectives as measures of system performance at each milestone [Source: R5000] (M2.5)
- Advise procurement program teams of current user practices [Source: EURAP] (O3.7)
- Advise supplier teams of current user practices [Source: EURAP] (O3.8)

Establishing and improving the procurement process

Establishing a formal procurement process

- Establish, manage, control and maintain a repository of procurement process information to support process definition and maintenance activities [Source: SA-CMM] (M1.13)
- Develop and maintain guidelines and criteria for a program's selection and tailoring of the standard procurement process [Source: SA-CMM] (M1.12)
- Support system life cycle management and software development by a formal life cycle methodology, based on an agreed life cycle model [Source: EURAP] (O4.1)
- Co-ordinate organization and program activities for defining and maintaining procurement processes at the organization level [Source: SA-CMM] (M1.11)
- Define and maintain the standard procurement process in accordance with documented process definition and maintenance plans [Source: SA-CMM] (M1.9)
- Quantitatively control the performance of each program's defined procurement process [Source: SA-CMM] (O5.4)

Evaluating the procurement process

- Conduct causal analysis of each program's defined procurement process on a periodic basis to determine root causes of variances from the program's plans, and develop action plans to address the findings of the appraisal [Source: SA-CMM] (O5.7)
- Establish a monitoring and reporting system to track all performance changes [Source: BuyIT] (O2.2.2)
- Have a written policy for analysis of the capability of the standard procurement process [Source: SA-CMM] (A1.1.29)
- Record experiences for use in future procurements [Source: EM] (O2.3.1)

Improving the Procurement Process

- Document problems in managing complex programs to prevent the same mistakes in the next program [Source: BuyIT] (06.6)
- Enable wide-wide participation in continuous process improvement activities [Source: SA-CMM] (02.3.2)
- Handle process improvement proposals according to a written procedure [Source: SA-CMM] (02.3.4)
- Maintain a procurement process repository of information regarding process improvement activities [Source: SA-CMM] (02.3.5)
- Identify, document and enter procurement lessons learned into the procurement process repository [Source: SA-CMM] (M2.35)
- Document the findings of studies to provide a framework for improving the procurement process [Source: TAP] (S1.1T)
- Eliminate barriers between information systems to enable exchange of business information within the organization and its wider business environment [Source: EPHOS] (A1.2.27)
- Select integrated methods and tools that build a foundation for continuous improvements in productivity, teamwork and communications beyond initial implementation [Source: BuyIT] (02.3.7)
- Keep procurement management personnel informed about new technologies through meetings with key suppliers [Source: SA-CMM] (02.3.6)
- Use extended guidelines to identify problems and avoid the potential mistakes which have characterized failed programs [Source: BuyIT] (02.1.3)
- Exploit software reuse opportunities, government and commercial, before beginning new software development [Source: R5000] (06.1)

Selecting suppliers for procurement programs

This section provides best practice guidelines for the process of selecting suppliers to implement a procurement program:

- inviting tenders
- evaluating tenders
- contracting with the chosen supplier

Inviting suppliers to tender

Open competition

- Advertise public procurement programs when estimated costs exceed a pre-defined threshold, excluding national security reasons, either in a contracts bulletin or the Official Journal of the European Community [Source: EURAP] (A3.1.10)
- Provide for full and open competition in invitations to tender [Source: R5000, EURAP, TAP, PA] (A3.1.2)
- Organize and sequence competition such that no supplier can become the sole organization realistically positioned to undertake later stages of any procurement program [Source: EURAP, PA, SOTIP] (A3.1.11)
- Facilitate the procurement of equipment and services from various suppliers and operators by demanding the same functionality [Source: SOTIP] (A3.1.7)
- Involve potential prime suppliers during the feasibility phase in a competitive or collaborative manner [Source: EURAP] (A1.1.25)

Provide sufficient information

- Communicate the documented procurement requirements to suppliers [Source: BuyIT, TAP] (A3.1.12)
- Specify the format required for tenders [Source: TAP] (A3.1.11T)
- Structure invitations to tender to motivate the suppliers to meet or exceed cost objectives [Source: R5000] (A3.2.4)
- Provide an in-depth understanding of the business to enable suppliers to offer the specified solution [Source: BuyIT] (A3.3.6)
- Notify suppliers of the basis on which they will be assessed and ranked by identifying evaluation criteria and their relative priorities, indicated by ranking or weighting [Source: BuyIT, TAP] (A3.1.13)
- Stipulate a timetable to allow suppliers specified times to respond to the invitation to tender and to the receipt of tenders [Source: TAP] (A3.1.2T)
- Have a plan for interaction with suppliers [Source: EM] (A3.1.6)

Evaluating tenders

- Define boundaries between in-house and external services and prime and sub-contractor relationship before beginning the selection process [Source: BuyIT] (A2.4.13)
- Plan specific procurement management resources to analyze tenders [Source: PA] (M2.15)
- Use a two stage evaluation process to reduce suppliers to a shortlist of suppliers who are invited to tender [Source: CCTA, TAP] (A3.1.8)

- Use a multiphase tendering process when uncertainty and/or complexity is high [Source: EM] (A3.1.3)
- Ensure traceability of the outcome of a tendering process [Source: EURAP] (S7.3)

Evaluation criteria

- Determine relevant, weighted and qualitative supplier selection criteria [Source: EM, TAP] (A3.1.4)
- Make a systematic overall comparison of all alternative supplier aspects and agree on an evaluation score for each criteria [Source: EM, EURAP, BuyIT, TAP] (A3.2.8)
- Ensure that the process for selecting the suppliers is communicated to and understood by all of those involved in the program [Source: BuyIT, R5000] (A2.4.14)
- Develop a method for evaluating the risk of the supplier or the proposed solution [Source: TAP] (A3.2.1.2T)
- Include ISO 9001 certification in the evaluation criteria [Source: EURAP] (A3.2.11)
- Include evaluation of the supplier's software engineering capabilities in the evaluation criteria [Source: EPHOS] (A1.2.28)
- Utilize standards for process assessment and quality management to evaluate suppliers [Source: EM] (A3.1.5)
- Include service capability in the evaluation criteria [Source: IEC] (A4.1.3)
- Use quantitative criteria to provide substantive evidence for analysis of system maturity and readiness to proceed through the procurement process [Source: R5000] (S4.2)

Tender evaluation

- Demand background information from suppliers and their products which allows assessment of the supplier's capability to successfully implement the proposed solution [Source: TAP] (O5.3T)
- Select suppliers based on experience, successful past performance record, documented proof and a demonstrable mature software development capability [Source: R5000, BuyIT, TAP] (A3.2.5)
- Focus attention on differences between suppliers' tenders, documenting their relative advantages and disadvantages [Source: EPHOS, EM] (A3.2.10)
- Use incentive pricing of tenders for selecting suppliers [Source: EURAP] (A3.2.14)
- Assess the sensitivity of each tender to possible changes in key assumptions or variables [Source: R5000] (A3.2.3)
- Select suppliers with reasonable scores across the board, rather than those with the highest aggregate score within an evaluation, to reduce potential areas of risk [Source: TAP] (A2.2.2T)
- Do not reveal actual scores of any supplier evaluation, only broad comparative scores [Source: TAP] (O5.4T)
- Invite the supplier to make a best and final offer after the final assessment [Source: TAP] (A3.3.12T)

Contracting

- Establish an wide-wide strategy for contracting with suppliers [Source: PA] (A1.2.12)
- Involve users and other affected groups in developing and maintaining contractual requirements [Source: SA-CMM] (A2.4.5)
- Divide the procurement program into several contracts when uncertainty is high [Source: EM] (A2.2.5)
- Ensure proof of the supplier's capability to meet the requirements and defined standards before negotiating the contract [Source: BuyIT] (08.7)
- Devise a contract which is likely to facilitate a good relationship with the supplier [Source: PA] (A3.3.2)
- Divide the contract into two parts: the contract conditions (clauses) and the program schedules [Source: TAP] (A3.3.7T)
- Use a separate maintenance or support agreement if the supplier is providing maintenance or support [Source: EURAP, TAP] (A2.2.18)
- Contract a series of increments as open options [Source: PA] (A2.2.11)
- Use established standards where available to describe technical requirements [Source: BuyIT] (A3.3.7)
- State contract requirements in terms of performance rather than design-specific procedures [Source: R5000] (A2.2.2)

Content of contract

- Agree formal contract terms for a successful program [Source: BuyIT] (A3.3.11)
- Specify contract duration, particularly with reference to maintenance and support [Source: BuyIT] (A2.2.26)
- Specify how any areas of technical risk from the supplier will be treated [Source: BuyIT] (A2.2.27)
- Ensure the supplier delivers a quality management plan, a management plan and a configuration management plan [Source: EURAP] (A2.2.16)
- Define program deliverables in the main body and attached schedules of the contract [Source: BuyIT] (A3.3.10)
- Agree a plan for documentation which conforms to appropriate standards [Source: EURAP] (A2.2.20)
- Define the responsibility for maintenance and upgrades [Source: SOTIP] (A2.2.13)
- Include an agreement about adjudication or arbitration for dispute resolution [Source: BuyIT] (A3.3.8)
- Maintain warranty rights [Source: PA] (A3.3.1)
- Specify an individual with the responsibility and authority for acceptance criteria and testing procedures [Source: BuyIT] (A2.2.28)
- Explicitly document evaluation requirements and acceptance criteria, including acceptance trials as contractual obligations [Source: EURAP, TAP, SA-CMM] (A2.2.19)
- Define specific intellectual property rights for every element of the procured system [Source: BuyIT] (A3.3.5)
- Define intellectual property rights so as to preserve the procurer's rights to modify or evaluate the procured system [Source: EURAP, PA] (A2.2.17)

- Incorporate quantitative objectives for the procured system into the solicitation package and resulting contract according to the program's defined procurement process [Source: SA-CMM] (05.10)

Review and sign-off of contract

- Independently review contract cost and schedule estimates to ensure they are comprehensive and realistic [Source: SA-CMM] (A2.2.23)
- Involve trained contracts staff and legal advisers in quality reviews of the draft contract [Source: TAP] (A2.2.1T)
- Ensure review and sign-off of the draft contracts by the procurement authority after the final assessment [Source: TAP] (A3.3.11T)
- Use a quality review to measure consistency between the terms and conditions and across all schedules of the draft contract [Source: TAP] (M3.4T)

Cost and payments

- Link within the contract the major proportion of supplier payment to successful completion of acceptance testing [Source: BuyIT] (A1.1.30)
- Clarify the responsibilities of the procurer and supplier and the basis for payments [Source: EM] (A2.2.6)
- Define payment details only when both parties are clear about the amount of work required [Source: BuyIT] (A2.2.25)
- Use fixed price contracts whenever possible [Source: EURAP] (A2.2.14)
- Define upper costs bounds where fixed price contracts cannot be agreed [Source: EURAP] (A2.2.15)

Contractual changes

- Outline the contractual change control process within the contract [Source: EM, PA] (A2.2.7)
- Baseline system requirements as part of the contract and manage any changes [Source: SA-CMM] (A2.4.6)
- Establish the software-related contractual requirements and place them under change control prior to release of the solicitation package [Source: SA-CMM] (A2.4.7)
- Establish procedures for agreement of change requests and approval processes [Source: BuyIT] (A3.3.9)
- Agree any changes in schedule, price or system performance by a formal contract amendment [Source: EURAP, SA-CMM] (A3.3.4)
- Maintain bi-directional traceability between the software-related contractual requirements and the supplier's software work products and services-throughout the procurement program [Source: SA-CMM] (A2.4.10)

Managing procurement programs

This section provides best practice guidelines about all aspects of managing a successful procurement program:

- program management
- financial management
- risk management
- configuration management and auditing
- documentation management
- training management
- managing the relationship with the supplier

Program management

Procurement Manager

- The procurement manager must be an individual who has accepted responsibility and understands the required changes in business processes [Source: BuyIT] (M2.38)
- The procurement manager must be recognized as the formal point of contact by all staff involved in the procurement [Source: EURAP] (M2.19)
- The procurement manager must ensure that all relevant legislation concerning safety is taken into consideration during the procurement program [Source: EURAP] (M1.4)
- At program initiation the procurement manager should propose the appropriate milestones, the level of decision for each milestone, and the documentation needed for each milestone [Source: R5000, EURAP, BuyIT] (M2.3)

Program planning and management

- Do not approve the procurement program to proceed beyond program initiation unless sufficient resources, including manpower, are already identified and available [Source: R5000] (O7.3)
- Agree and use a chosen management method or structured approach with the supplier, such as PRINCE or SSADM [Source: BuyIT, TAP] (M1.16)
- Revise the procurement process as necessary to remain consistent with current program objectives [Source: SA-CMM] (M2.29)
- Develop and document a procurement plan from program initiation through to post-production support [Source: R5000, SA-CMM, BuyIT] (M2.1)
- Decompose the procurement program into manageable phases and plan for a series of iterative upgrades of the procured system [Source: EM, BuyIT, PA, EURAP] (A1.2.4)
- Adjust the number of phases and decision points according to the complexity of the system, the risks, and the urgency of the user's need [Source: R5000] (M2.4)
- Identify, negotiate and manage any critical dependencies [Source: SA-CMM] (M2.32)
- Perform all procurement management activities in accordance with the program management plan [Source: SA-CMM] (M2.28)

- Manage and control any problems discovered during the procurement program [Source: SA-CMM] (M2.23)
- Implement a corrective action system for the identification, recording, tracking, and correction of problems discovered during the procurement program [Source: SA-CMM] (M2.24)
- Establish an integrated data management system to capture and control the technical information, data correlation and traceability among the different aspects of planning, development and delivery [Source: R5000, SA-CMM] (M2.9)
- Incorporate the assessment of achievements and continued delivery of business benefits into the regular management reporting process [Source: BuyIT] (O5.18)
- Prepare and distribute reports documenting the results of the quantitative process management activities [Source: SA-CMM] (O5.6)
- Define, measure and control performance, cost, and schedule objectives throughout the procurement program [Source: SA-CMM] (M2.22)

Procurement team and human resource issues

- Include one or more users from the organization in the procurement team [Source: BuyIT] (M1.15)
- Ensure the procurement team experiences operational activity [Source: PA] (M2.14)
- Identify people requirements in the procurement plan and provide the required resources and the necessary skills to achieve the planned procurement time scales [Source: TAP] (O3.2T)
- Establish a cross-functional procurement team that brings together business, technical and purchasing skills [Source: BuyIT, EURAP] (M2.37)
- Each individual in the team must bear specific responsibility for their work and be accountable to the procurement manager for their performance [Source: EURAP] (O3.9)
- Select program team members on the basis of required skills and expertise [Source: EURAP, PA, BuyIT] (M2.20)
- Use measurements to determine program team performance and analyze performance trends [Source: SA-CMM, BuyIT] (M2.34)
- Manage programs by integrated program teams with participants empowered and authorized to make commitments for the organization or the functional area they represent [Source: R5000] (M1.1)
- Prepare a manpower estimate indicating the total number of personnel needed to operate, maintain, support, and provide training for the program upon full operational deployment [Source: R5000] (O7.7)
- Periodically review the program resource requirements and usage [Source: BuyIT] (S6.10)
- Plan specific management resources to study interoperability with other systems [Source: PA] (M2.16)
- Plan specific management resources to support feedback collection [Source: PA] (M2.17)
- Plan specific management resources for system management and configuration control [Source: PA] (M2.10)
- Plan suitable procurement management resources to carry out functional configuration management [Source: PA, SOTIP] (S2.5)

- Advise procurement program teams of current user practices [Source: EURAP] (03.7)
- Advise supplier teams of current user practices [Source: EURAP] (03.8)
- Co-ordinate activities with other organizations and activities supporting the program [Source: SA-CMM] (M2.30)
- Identify the skills to manage third parties involved in the program [Source: BuyIT] (03.14)
- Use the experience and skills of third parties to support management decisions in a clearly specified manner [Source: BuyIT] (M2.36)
- Ensure legal competence and resources are available to program management teams [Source: EURAP] (03.6)

Milestones and reviewing

- Review supplier planning baselines after contract award [Source: R5000] (A4.1.1)
- Establish a timetable for regular procurement project reviews [Source: CCTA] (S6.2)
- Structure the procurement program into logical phases separated by major decision points (milestones) [Source: R5000] (M2.2)
- Reassess cost objectives and progress towards achieving user needs at each milestone review [Source: R5000, SA-CMM] (M2.7)
- Involve the appropriate level of management in reviewing the procurement program on a periodic basis [Source: SA-CMM, BuyIT] (M1.5)
- Establish performance metrics to provide measures of how well the technical development and design are evolving relative to what was planned [Source: R5000] (S4.1)

Financial management

- Agree a cost reporting process with the supplier [Source: EURAP] (A2.3.7)
- Define value-for-money assessment measures at the beginning of the program [Source: BuyIT] (05.14)
- Share the financial risk with the supplier [Source: BuyIT] (07.15)
- Identify costs of all necessary processes [Source: EM, TAP] (A1.3.2)
- Plan procurement programs based on projections of funding available in the current and future years of the program [Source: R5000] (07.2)
- Prepare a life-cycle cost estimate at program initiation and at all subsequent milestone reviews [Source: R5000, SA-CMM, PA, EURAP, TAP] (07.4)
- Prepare a component cost analysis estimate in addition to the life-cycle cost estimate for programs with significant cost risk [Source: R5000] (07.6)
- Ensure independent review of life cycle cost and schedule estimates [Source: SA-CMM] (A1.3.10)
- Ensure separate funding approval for each phase of the procurement program [Source: PA] (07.9)
- Make supplier payments upon agreed results [Source: EURAP, TAP] (A2.3.6)
- Discontinue programs which are shown not to be cost-effective [Source: EURAP] (07.12)

Risk Management

Risk analysis

- Establish a risk management program for each procurement program to identify, quantify and control performance, cost, and schedule risks [Source: R5000, EURAP, SA-CMM, BuyIT, TAP] (M4.1)
- Include identification of the risk areas of the program and a discussion of how these risks will be managed [Source: R5000, TAP] (M4.2)
- Undertake risk analysis periodically during the procurement program [Source: EM, TAP] (M4.8)
- Identify a prime contractor to reduce complexity and risk, if more than one supplier is necessary [Source: BuyIT] (M4.29)
- Identify and deal with risk in a positive manner such that identification is recognized and rewarded [Source: SA-CMM] (M4.22)
- Track and control risk handling actions until the risks are mitigated [Source: SA-CMM] (M4.25)
- Encourage specific risk reduction processes such as exploratory activities, modeling and simulation, prototyping and technical demonstration, subject to proper cost-benefit justification [Source: EURAP] (M4.17)
- Involve users in risk analysis [Source: PA] (M4.10)

Types of risk

- Manage risk across several dimensions including technical risks, financial risks, and contractual risks [Source: PA, R5000] (M4.11)
- Include procurement risk management as an integral part of the program's defined process [Source: SA-CMM] (M4.21)
- Analyze the higher risks of using a customized solution [Source: BuyIT] (M4.28)
- Undertake a formal risk analysis at the beginning of the program, regularly updated during the program, to identify safety critical functions [Source: EURAP] (M4.15)
- Specify in the contract how any areas of technical risk from the supplier will be treated [Source: BuyIT] (M4.30)
- Identify external threats via external communications such as those related to security [Source: EPHOS] (M4.14)
- Discuss with the involved staff the risks and the business problems that should be solved [Source: BuyIT] (M4.26)
- Address risks related to interactions with other programs or systems [Source: PA] (M4.9)
- Address staff resource risks [Source: EURAP] (M4.18)
- Manage risks due to potential change of suppliers [Source: PA] (M4.13)
- Monitor the supplier's approach to risk management [Source: PA] (M4.12)
- Place the responsibility for the management and control of risk as far as possible on the supplier [Source: EURAP] (M4.19)

Configuration management and auditing

- Ensure traceability of the outcome of a tendering process [Source: EURAP] (S7.3)

- Ensure that functional and performance requirements are traceable to higher level requirements [Source: R5000, PA, TAP] (A2.1.3)
- Plan suitable procurement management resources to carry out functional configuration management [Source: PA, SOTIP] (S2.5)
- List and formally track all objects of a configuration [Source: EURAP] (S2.8)
- Manage each change across the acquisition lifecycle under a well documented change request procedure [Source: EURAP, BuyIT] (S2.9)
- Appraise system requirement change requests for their impact on the system being procured [Source: SA-CMM] (A2.4.8)
- Provide a complete audit trail of decisions and design modifications [Source: R5000] (S2.1)
- Include site management in configuration management [Source: PA] (S2.4)
- Oversee the configuration control of the procured systems throughout the transition from supplier supported to user supported [Source: SA-CMM] (A4.1.11)
- Assess the procurement program by a post-implementation audit [Source: BuyIT, TAP] (S7.4)
- Record any problems or issues found during contract tracking in the appropriate corrective action system and track them to closure [Source: SA-CMM] (S6.8)

Documentation management

- Formally manage all documentation [Source: PA] (S1.3)
- Use a defined structure for documents which is suitable for a very wide range of procurement types [Source: TAP] (O6.1T)
- Ensure documentation conforms to specifically defined program standards [Source: EURAP] (S1.4)
- Prepare procurement program planning documents early in the procurement program and prior to contractual actions [Source: SA-CMM] (S1.5)
- Include life cycle support of the procured system in planning documentation [Source: SA-CMM] (S1.7)
- Ensure clear documentation of the business objectives that the procurement program must support [Source: BuyIT] (S1.8)
- Document the procurement program planning and maintain the documentation over the life of the program [Source: SA-CMM] (S1.6)
- Archive all program documentation and make it accessible to the team members, if appropriate [Source: EURAP] (S2.7)

Training management

- Manage training as an integral part of the procurement process [Source: SA-CMM] (O1.4)
- Identify training requirements within the request for proposals and plan an appropriate training program [Source: SA-CMM] (O1.3)
- Maintain training records throughout the procurement program [Source: SA-CMM] (O1.6)
- Use measurements to determine the quality of the training program [Source: SA-CMM] (O1.7)

Managing the relationship with the supplier

- Appoint a supplier manager for each new supplier relationship [Source: CCTA] (08.3)
- Define supplier performance criteria and ways to measure, test and link them to the payment schedule [Source: BuyIT] (05.15)
- Plan, maintain and regularly review and quality appraise the formal relationship with suppliers throughout the procurement program [Source: CCTA, SA-CMM, EURAP] (08.1)
- Set objectives for supplier relationships which take into account future organizational direction [Source: CCTA] (A1.2.5)
- Allow suppliers the flexibility to define and use their preferred quality management process that meets program objectives [Source: R5000] (A4.1.2)
- Ensure the commitment of both the procurer's and supplier's top management to the relationship [Source: BuyIT] (A2.4.12)
- Establish agreement on a statement of work and clearly articulated methods of working with others, supported by regular review meetings with managers of other programs and status reviews [Source: BuyIT] (S6.12)
- Review existing roles and responsibilities and procedures for supplier relationship [Source: CCTA] (S6.1)
- Conduct periodic reviews and interchanges with the supplier [Source: SA-CMM] (S6.6)
- Define channels of communication with suppliers at multiple levels, especially within a complex procurement [Source: BuyIT] (08.9)
- Separate the supplier relationships into overall supplier relationship and specific program relationships [Source: BuyIT] (08.10)
- Examine and define the roles of the user with the supplier relationship [Source: CCTA] (08.2)
- Maintain ongoing communication and agree commitments between the procurement team and the supplier [Source: SA-CMM] (S6.4)
- Align supplier and procurer expectations periodically to avoid conflicts [Source: BuyIT] (08.11)
- Plan, execute, review and systematically improve the supplier relationship within an organization [Source: BuyIT] (M3.9)
- Maintain direct or indirect contact with the suppliers of strategic technologies used in the procured system [Source: EURAP, PA] (A1.1.24)

Implementing and evaluating procurement programs

This section provides best practice guidelines for implementing and evaluating procurement programs and procured systems:

- technical guidelines for specifying procured systems
- quality systems
- evaluating the procured system
- evaluating supplier performance

Technical guidelines for specifying procured systems

Solution design

- Assess package solutions against new developments [Source: BuyIT] (A2.1.55)
- Consider potential solutions offered on the international market to provide alternative options to the procurement program [Source: EURAP] (A1.1.23)
- Design for the future insertion of commercial off-the-shelf equipment or components [Source: R5000] (A1.2.1)
- Ensure that new systems cope with the existing business processes and existing hardware, links and other systems [Source: BuyIT] (A2.1.54)

Reuse

- Establish a reuse policy from the beginning of a procurement program [Source: PA] (06.2)
- Reuse proven system designs where possible [Source: PA] (06.5)
- Exploit software reuse opportunities before beginning new software development [Source: R5000] (A1.1.9)
- Reuse the experience gained in developing and enhancing the existing systems [Source: BuyIT] (A2.1.53)
- Reuse results from previous product and supplier evaluations [Source: IEC] (A2.1.39)

Open systems and standards

- Follow an open systems approach for hardware and software for the whole of the procured system [Source: R5000, PA, SOTIP, BuyIT] (A1.1.7)
- Use open system architectures that result in supplier independence [Source: EPHOS, SOTIP] (A1.1.20)
- Use openly specified communications and information processing standards which are available to all potential suppliers [Source: EURAP] (A1.1.22)
- Use commercial standards before national or international domain-specific standards [Source: EURAP] (A1.1.21)
- Specify only standards which exist or are soon to exist in generally available products [Source: SOTIP] (A1.2.19)
- Select commercial off the shelf products that conform to standards [Source: PA] (A1.1.11)
- Develop software using standards which allow portability to other platforms [Source: PA] (A1.1.13)

Using off the shelf Products

- Make the decision to use off the shelf products at the earliest stage possible [Source: EURAP] (A1.2.37)
- Use off the shelf products whenever possible when defining system architectures [Source: PA] (A1.1.15)
- Define the criteria that will be used for selecting off the shelf products, including conformance to standards [Source: PA] (A1.1.10)
- Give preference to off the shelf products which cover a complete functional area [Source: PA, R5000, TAP] (A1.1.12)
- Reuse the same off the shelf products across procurement phases and system updates when possible [Source: PA] (O6.3)
- Make experiences gained from the application of off the shelf products available to other programs [Source: EURAP] (A1.2.36)

Implementation

- Use software engineering methods and integrated CASE tools throughout the procurement program [Source: EURAP] (A1.1.26)
- Conduct supportability analyses as an integral part of the systems engineering process [Source: R5000] (O3.1)
- Quickly establish a usable system from the supplier, which addresses an initial but validated statement of needs [Source: PA, EURAP] (A1.2.6)
- Put implemented and usable parts of the system into service without waiting for the whole system to be completed [Source: EURAP] (A1.2.31)
- Use a software measurement process to assess and improve the software development process and associated software products [Source: R5000] (O2.2.1)
- Ensure that all analyzed problems are addressed within the customized solution and can be monitored by the customer [Source: BuyIT] (M3.8)
- Involve staff responsible for the operation of a system in preparing for its introduction into service to ensure transition without delay [Source: EURAP] (O3.12)

Quality systems

- Allow suppliers the flexibility to define and use their preferred quality management process that meets program objectives [Source: R5000] (A4.1.2)
- Define architectural quality factors [Source: PA] (M3.3)
- Conduct an external quality review when the strategy is initially defined or undergoes significant revision [Source: TAP] (M3.2.27)
- Include user and customer needs in the quality requirements for the procured system [Source: EURAP] (A2.1.44)
- Design quality indicators for user satisfaction [Source: PA] (M3.2)
- Monitor the quality processes followed by system suppliers [Source: EURAP] (A4.1.4)

Evaluating the procured system

Test and evaluation planning

- Begin test and evaluation planning at the beginning of the procurement program [Source: R5000] (A2.4.4)
- Define a complete plan for all tests to be conducted [Source: BuyIT] (S1.9)
- Establish test and evaluation objectives for each phase of a procurement program [Source: R5000, PA, TAP] (S3.1)
- Include test objectives, measures of effectiveness, planned operational scenarios, threat simulation, resources, test limitations, and methods of data gathering, reduction, and analysis [Source: R5000] (S4.4)
- Do not allow a supplier that has participated (or is participating) in the development, production, or testing of a system for a user to be involved in any way in the establishment of criteria for data collection, performance assessment, or evaluation activities [Source: R5000] (A4.2.2)
- Include modeling and simulation as an integral part of test and evaluation planning [Source: R5000] (S4.3)
- Establish performance benchmarks and defined measures for the existing system, against which the new system's performance can be assessed [Source: BuyIT] (O5.17)
- Develop evaluation requirements in conjunction with developing the technical requirements [Source: SA-CMM] (S3.4)
- Plan evaluations to provide an integrated approach which satisfies all evaluation requirements and maximizes efficiency of the activities [Source: SA-CMM] (S3.3)
- Establish testing and acceptance plans for the interfaces between new and existing systems [Source: BuyIT] (S4.8)
- Plan program evaluation and post-implementation reviews [Source: TAP] (S6.3T)
- Plan reviews for all required tests [Source: BuyIT] (S6.13)

Testing and evaluation

- Conduct compatibility testing of hardware and software when procuring a system in fragments [Source: BuyIT] (S3.1T)
- Ensure that the program is regularly tested against business requirements [Source: BuyIT] (S4.7)
- Perform all tests under realistic conditions [Source: BuyIT] (S4.9)
- Establish performance metrics to provide measures of how well the technical development and design are evolving [Source: R5000] (S4.6)
- Analyze results of the phased evaluations and compare them to contractual requirements [Source: SA-CMM] (S3.9)
- Verify each phase of the deliverables against the final system requirements [Source: PA] (M3.6)
- Measure, analyze and compare each procured system against the program's established quantitative objectives [Source: SA-CMM] (O5.11)

- Evaluate whether the procured system achieves the value for money targets planned and specified in the business case for the program [Source: TAP] (A4.2.2T)
- Ensure continual satisfaction of non-functional requirements throughout the procurement program [Source: PA] (M3.4)
- Review and track the development of the software engineering environment required to provide life cycle support for the procured system [Source: SA-CMM] (S6.7)
- Ensure that all established business objectives of the organization are supported by the program [Source: BuyIT] (A1.3.11)
- Ensure a successful phase review is prerequisite for the entrance into the next phase [Source: EURAP] (S6.3)
- Conduct a post-implementation review when the system has been accepted and has been in use for reasonable period of time [Source: TAP] (S6.2T)
- Archive tests to reuse them for further increments [Source: PA] (M3.7)
- Perform planned evaluations on the procured system prior to acceptance for operational use [Source: SA-CMM] (S3.8)
- Confirm the system's capability through final integration testing [Source: BuyIT] (A4.2.6)
- Do not approve full rate production of a system until the system's design has been stabilized, the manufacturing processes have been proven, and the production facilities and equipment are in place (or are being put in place) [Source: R5000] (A1.2.3)

Evaluating supplier performance

- Use measurements and analyze trends to appraise supplier performance [Source: SA-CMM] (A4.1.8)
- Appraise the supplier's software engineering process according to the program's defined procurement process [Source: SA-CMM] (A4.1.7)
- Assess supplier performance for compliance with evaluation requirements [Source: SA-CMM] (S3.7)
- Review required supplier software planning documents which, when satisfactory, are used to oversee the supplier's software engineering effort [Source: SA-CMM] (S6.5)

Study method

This chapter summarizes how the results of the project have been developed including the methodology used to work with the organizations conducting procurements that participated in the project. The focus of the project was to determine a set of recommended procurement practices, which had an actual effect on project results. The first step was to collect the latest knowledge and recommendations from the leading procurement methods and guides. Having established the reference set of procurement practices, the project needed to be able to measure the results of actual procurements. As there were no common measurement criteria, the project designed a set of procurement result metrics or measures.

After having defined both the practices and the result metrics to be collected from actual procurement, a set of common methods were defined which described how all of the information would be collected so as to ensure consistency. Once the data was collected the final step was to carry out the analysis looking for significant relationships between the recommended best practices and the procurement project results.

More detailed information describing the project work is provided below.

Compilation of procurement best practices

The project collected and examined many different procurement standards and guidelines, available from a diverse set of European and US industrial companies, consortia and Government bodies. The detailed information about these best practice sources is described in *Summary of best practice sources*. Extracting the specific practices recommended by each source resulted in a reference set of about 900 best practices as a starting point for the project.

The project reviewed the identified best practices in order to eliminate duplicates and structured them in accordance with a defined acquisition process model that was developed as an extension to the ISO 15504 (also known as SPICE) standard. Once this revision was completed, the number of practices still numbered more than 300. There were too many practices to individually assess within the time and resources available for the project. The project team further refined the procurement best practices into a smaller set by selecting those which were likely to have an impact, either positive or negative, on project success based on the project partner's expertise in the software, procurement and quality fields. In addition, the team included specific practices related to standards and European Commission procurement directives. A subset of about 120 practices was chosen as the study set for the project.

Identification of the result metric set

Once the set of best practices to be analyzed had been identified, it was necessary to decide on the metrics to be used to measure the results achieved in the actual procurement projects. Following the same approach as the EFQM model, the result metrics were grouped in the following categories:

Financial: procurement financial goals are included in this category, together with the metrics that can facilitate their measurement. A 3 to 5 point scale is used to define more precisely the range of the answer.

Infrastructure: financial indicators show the historical evolution of the company and its present state, but are not sufficient for making estimations about the future. There are other indicators that can give more information about critical factors in today's companies, like those regarding customer and people satisfaction and relationship with suppliers. These usually are better indicators of the company's expected benefits in the long term.

Processes: three main aspects in the purchasing process are considered in this group: quality, cost and schedules. Even though the costs were also included in the financial indicators, more detailed information is collected, organized by functional area and following the different phases of the procurement process: initial planning, contracting, development, testing and validation, integration and maintenance.

Assessing best practices utilization

The first data set to be collected from the organizations being studied in the project was an assessment of their utilization of each of the best practices. This data was collected through the development of a survey instrument and on-site interviews. Personnel to be interviewed were grouped by their functions in their organizations:

- **Managing** - in charge of the company's procurement policies and the managing and co-ordination of procurements at a senior level.
- **Technical** - in charge of technical analysis and planning of development and acceptance phases of the project.
- **Administrative** - in charge, together with the CEO, of all the administrative, legal and financial matters.
- **Users** - representing the end users of the purchased system.

By structuring the questionnaire and interviews in this way, all the questions about a group of specific practices could be asked to those who had the most knowledge about them. In some organizations one individual was responsible for more than one functional area.

Other techniques followed in the best practice assessment process were as follows:

- Teams with procurement knowledge conducted assessment interviews. The teams were composed of a leader, responsible for the majority of interactions with the interviewee, and an assistant, responsible for tracking the responses and ensuring that all topics were fully covered.
- A natural conversation style was used instead of a question and answer format. The assessor team met after the interview to reconcile any differences in opinions concerning the utilization of specific practices and created a single assessment data set for each procuring organization.
- The answers during the interview should reflect the practices followed at the time of the interviews and during the last 12 to 18 months. This time frame should coincide with timing of the procurements for which result metrics would later be collected.
- Although a 'Don't know' answer was possible, assessors were directed to avoid using it and attempt to get the interviewee to either take a position on each question or seek out more personnel if necessary to answer the question.

These were established through documentation and training of all individuals conducting assessments within the project.

Result metrics collection

Three different projects were selected for every procurement user, two historical and one actual, so that the total targeted number of projects to be analyzed in the project was 39. Some procurement projects did not have sufficient data and others were deemed to be a long running single procurement rather than a series of individual procurements. The final number of procurements analyzed in the project was 32.

All of the result metrics data from the procurement projects was collected from the project managers. The project partners applied the following conditions in selecting the procurement projects to be studied:

- The projects should be of significant size, such that formal requirements and decision-making processes were used.
- There should be no choosing of 'good' or 'bad' procurement projects, so the statistical process would not be biased toward certain results.
- The historical projects had to be recent enough so that their results corresponded to the procurement practices assessed and they should be completed before the data collection interview.
- The actual procurement should have entered the contract-signed phase and had some deliverable from the supplier before the final collection of result metrics.

Only one interview was required for data collection of the historical procurements, while at least two interviews, one in the middle and the other later in the project, were needed for the actual procurement projects.

Statistical analysis techniques

Towards the end of the project, the partners had collected the following two data sets:

- Degree to which each best practice was followed within each procuring organization
- The result metrics for actual procurements from each procuring organization

These two data sets were collected from the procuring organizations at different times and often with different personnel in order to reduce the bias that might occur in the result metrics towards the expected results of the best practices identified.

A statistical software package (SPSS) was used to analyze if a correlation existed on a pair-wise basis between each practice and each result metric. The result was a substantial number of correlations. However, some correlations were relatively weak and a threshold level of 0.4 was established as a qualification level for a correlation to be considered noteworthy and included in this report.

The minimum significance level for the analysis was fixed at the 95% level with a 2-tailed distribution curve. This means mathematically that the chance that a relationship identified in this report between an improvement in a result metric and the presence of a specific best practice is accidental or erroneous is less than 1 in 40, or less than a 2.5% chance.

It is important to highlight that the statistical analysis carried out can only verify if a significant relationship or correlation exists between one practice and one result. If the correlation is present, it does not necessarily mean that only by following this practice that the specific result will be improved. Also, the analysis only indicates a relationship is present, but it cannot identify if the specific practice is the direct cause that creates the project improvement effect. There may be other factors within the organization than can

affect the result of the procurement, like the level of implementation of other practices included in this report.

Interpretation of statistical data

The project team further analyzed the data obtained from the statistical analysis phase of the project, so that all findings were completely understood and could be explained. Special attention was paid to exceptional or unexpected results in that specific characteristics of the selected projects and the sample size of the data sets could have resulted in unexplainable correlations. The project partners were able to explain each of the exceptional or unexpected results.

The view of the partners is that it is always desirable and necessary to get out of the mathematical frame and to interpret the resulting data from a subject expert's point of view. This was the final step carried out in preparing the project results documented in this report.

Summary of best practice sources

Considerable effort has been invested in defining procurement guidelines and methodologies, but successful procurement processes are still difficult to achieve. The application of guidelines and methodologies facilitate the organization and management of procurement projects, but do not directly identify the critical aspects or practices that ensure the achievement of the defined business benefits and implementation success. The purpose of the study was to quantify and categorize those procurement practices that clearly contribute to the implementation success of procured IT systems.

These procurement ‘best’ practices were identified from 14 well-known procurement guidelines and methodologies, applied by organizations throughout Europe and the US with respect to three significant points to be addressed:

- What are the key best practices proposed?
- Which best practices have proven successful in practical experience?
- Which best practices must be identified to assess whether a procurement activity can be deemed successful?

The 14 analyzed guidelines and methodologies are a selection amongst a vast number available from European and national organizations. They were chosen based on their suitability in different application domains, in the procurement of both software and hardware used by a large number of organizations, and the degree to which they were being used internationally.

The sources of procurement best practices can be organized into different categories:

- best practice guidelines,
- Defense Information Systems oriented best practice guidelines,
- procurement methodologies,
- standards for selection and evaluation, and
- assessment methodologies.

Moreover, the guidelines address different levels of target audience from the CEO to the user, and the different tasks associated with each level during procurement. They also are formulated on different abstraction levels. This was taken into consideration by reformulating and combining identified best practices with respect to the semantic and formal presentation.

The project partners identified over 900 best practices, which are summarized in *Reference set of best practices*. An analysis of the distribution of the identified best practices has shown that there are procurement areas that are not sufficiently covered in the existing procurement guides. These are primarily areas related to the day-to-day management and delivery and implementation stages of projects. Topics such as monitoring supplier performance, ensuring supplier quality, establishing procurement procedures and tracking, and supplier conflict resolution are processes in the later stages of a procurement where problems most often arise, yet none of these are substantively addressed by any of the guides or methodologies.

Based on the experience gained during the analysis and the studies of a number of actual IT procurements it can be concluded that:

- procurement guidelines have different objectives and are based on different intentions,
- following a procurement guideline or methodology does not guarantee success, and
- the majority of best practices are concerned mainly with the initial phases of the procurement life cycle, not addressing extensively the critical phase of implementation of IT systems

To provide guidance on the use of the guidelines and methodologies, this chapter describes the purpose and main target audience of the analyzed references shown below.

Abbreviation	Name	Source
BuyIT	BuyIT Guidelines 1-11	IT World Consultants
CCTA	CCTA Catalogue of Standards for use in IT Procurement	HMSO/CCTA The Government Centre for Information Systems, UK
EPHOS	European Procurement Handbook for Open Systems - Version 1.1	EU Member States IT Public Procurement Group
EURAP	European Requirements for the Acquisition Process	Western European Armament Group (WEAG) TA-13 Acquisition Programme
EC	Directives for Public Procurement of Goods and Services	European Commission
EM	Euromethod Procurement Methodology	European Commission SPRITE-S2 Programme
ISO/IEC	ISO/IEC 14598-4 Information Technology – Software product evaluation Part 4 – Process for Acquirers	International Standards Organisation
PA	Guidance on the Use of Progressive Acquisition	WEAG TA-13 Acquisition Programme
R5000	DoD Procurement Guide (DoD Directive R5000-2)	US Department of Defense
SA-CMM	Software Acquisition Capability Maturity Model	Software Engineering Institute - Carnegie Mellon University - Pittsburgh USA
SOTIP	Swedish Government Open Telecommunication Systems Interconnection Profile	Statskontoret – Government of Sweden
SPICE	ISO 15504 Standard for Software Process Capability Determination	International Standards Organisation
TAP	Total Acquisition Process Systems Guide and Services Guide	HMSO/CCTA The Government Centre for Information Systems, UK

An overview of each of the above guides or methodologies is provided below.

Buy-IT Guidelines

The Buy-IT Guidelines are a set of best practice notes to improve the way organizations specify, acquire and benefit from IT. They cover computing and telecommunication technologies and their exploitation. The main emphasis is in helping with the realization of the business benefits from IT, addressed to the CEO and the Board. The guidelines stem from the widespread concern in industry that investment in IT does not deliver value for money and that many projects do not meet business objectives. The Guidelines will help companies answer the questions:

- What are the key issues that should concern the CEO and the Board?
- What should be done to ensure success?
- What are the warning signs to look out for?

No prior knowledge of the technologies is assumed and a clear allocation of procurement function addressed to organization levels is given.

CCTA - Catalogue of Standards for use in IT Procurement

The CCTA catalogue provided by the Government Center for Information Systems, UK, aims to add value to the development and application of IT in central government by assisting departments towards an effective and efficient use of IT. It addresses a wide range of audiences, ranging from staff responsible at the technical level to the senior management of government departments. As to the procurement services of CCTA, the objectives are:

- To procure and contract for IT goods and services on behalf of departments, as quickly and cheaply as is compatible with government policies and international obligations on procurement
- To maintain the services at a high standard
- To seek continual improvements in speed and effectiveness of procurement.

The information systems guides are arranged in five sets, each with its own focused readership. Developing and implementing information systems relies upon the procurement of IT goods and services, where procurement is seen as the process of specifying requirements, agreeing with commercial companies solutions to those requirements – up to and including award of contracts for the supply of goods and/or services, and administering those contracts thereafter.

EPHOS - European Procurement Handbook for Open Systems

EPHOS (the European Procurement Handbook for Open Systems) provides guidance with regard to information technology and telecommunications (ITT) systems and services. EPHOS references European and international open systems standards. In this way the Handbook serves the needs of public procurement within the EU Member States, but is also useful for commercial organizations as well. The objectives of EPHOS are to ensure that:

- Public ITT procurers can precisely express their requirements for standards to be implemented in order to support their specific business needs which can be satisfied by open systems and express these needs in terms understood by vendors.
- Public ITT procurers are assisted in complying with legislative requirements.
- Interoperability of separately purchased systems from different suppliers is achieved.
- European-wide harmonization of guidance for key areas of IT serves the needs of users/consumers, suppliers, and providers of services.

EPHOS provides guidance on the selection of open systems standards (and of options and other variable elements within the standards) and on how to reference them by different modules (e.g. ISDN, LAN, FTAM), each divided into two parts. Part I of each module provides basic information and procurement advice. Part II of each module complements part I providing detailed guidance, explanations, and tutorial information, which may be relevant to particular requirements. The typical reader of Part II is a more technically com-

petent person seeking advice on behalf of the procurer, or a technically skilled procurer looking for additional information concerning technology and standards.

EURAP - European Requirements for the Acquisition Process

EURAP results from a co-operative effort of France, Germany, Italy and United Kingdom as part of the Western European Armaments Group (WEAG) TA-13 Acquisition Program. EURAP is the result of an analysis of the current approaches, perceived problems and improvement goals for Defense Information Systems (DIS) acquisition in the participating nations. All this information has been consolidated and shows a significant degree of commonality.

EURAP provides the following results:

- existing acquisition requirements, including requirements identified as common by the Participants and Nation specific requirements
- a description of the current Common Process Model and its graphical representation by means of Data Flow Diagrams
- perceived problems related to the current acquisition process, including problems identified as common by the Participants and Nations

As such, EURAP contains a large number of best practices as currently applied within DIS acquisitions in the participating nations.

European Commission Directives

The European Commission has issued several specific directives with regard to procurement by governments and government-supported agencies of EU member states. These directives encourage a free and open market for suppliers from across all EU countries to compete for potential products and services contracts to governmental organizations.

Requirements such as notification procedures of potential contract awards, procedures for avoiding single supplier situations, procedures for supplier evaluation, and other actions are specified within the Directives. Specific thresholds regarding the size of governmental purchases are established which determine the applicability of the Directives.

Euromethod

The open market for information system developments and related services within the European Union requires a good mutual understanding between the customers and the suppliers of information systems from the different EU countries. Euromethod was established with the support of the European Commission to assist public and commercial organizations by addressing three main areas related to information technology procurement:

- Facilitating mutual understanding between customers and suppliers,
- A harmonization between different development methods and
- Improving the quality and efficiency of the IS development process by promoting the flexibility of the methods and their adaptability to the various problem situations

Euromethod promotes an open market approach to IT procurement and emphasizes practices and procedures that improve the interactions between purchaser and supplier and which encourage competition in the delivery of IT systems in services within the EU.

ISO/IEC 14598-4

Part 4 of ISO/IEC 14598 named 'Process for Acquirers' contains requirements, recommendations and guidelines for the systematic measurement, assessment and evaluation of software product quality during the acquisition of off-the-shelf software products, custom software products or modifications to existing software products. It expands on the general process for evaluating software quality (defined in ISO/IEC 14598-1) and is intended for project managers, system engineers, software development and maintenance engineering staff, and end users that plan to acquire software products, and also suppliers who provide such products.

The objective of this part of the ISO/IEC 14598 standard is to be able to evaluate the quality of software products during acquisition or when making decisions on reusing an existing software product or component to avoid financial losses, unnecessary rework or negative impact on productivity.

PA - Guidance on the Use of Progressive Acquisition

PA is a strategy used to acquire a large and complex system, which is expected to evolve over its lifecycle. Overall, PA is an approach to reduce many of the risks associated with the acquisition of such systems. An essential goal of PA is to quickly find a first but usable system, which addresses an initial but validated statement of needs, while planning for iterative upgrades of system capability along a series of system increments. The main characteristics of PA are:

- support of the setting of requirements in a combined user-customer-supplier effort
- successive increments to provide operational versions of the system
- effective communications and particularly the provision of essential feedback from the user, and
- flexible planning of successive increments according to the specific needs of the project

Whilst adopting and benefiting from the common elements of the progressive acquisition approach, a specific acquisition may combine features based on either an incremental or evolutionary acquisition approach. The tailoring of PA determines to what extent a specific acquisition is incremental, and the extent to which it is evolutionary in nature.

Department of Defense Procurement Guide R5000-2

The R5000-2 acquisition guideline is published by the US Department of Defense to provide a simplified and flexible management framework for translating mission needs into stable, affordable and well-managed automated information systems. The report combines procurement best practices for IT and communication systems with strict governmental procedures and policies pertaining to major defense acquisitions. The R5000-2 Guidelines are an IT-specific requirements based on the larger R5000 Guidelines which describe policies pertaining to any type of military procurements for the US Government.

The guide is organized in sections covering the Acquisition Management Process, the Program Definition, the Program Structure, the Program Design, the Program Assessments and Decision Reviews, and the Periodic Reporting in accordance with the major acquisition tasks. The report is intended to provide a consistent management structure and approach to be followed for all procurements.

SA-CMM - Software Acquisition Capability Maturity Model

In order for organizations to make improvements, they must know the ultimate goal and what is required to achieve that goal. In addition, progress must be measurable. SA-CMM has been developed to provide a framework for this as it relates to software acquisition. SA-CMM describes the purchaser's role in the software acquisition process and presumes a definition of a system need. The scope of SA-CMM is such that it ends when the contract for software products and services is concluded.

- The SA-CMM identifies key process areas for four of its five levels of maturity
- A maturity level is achieved by mastering all of its key process areas
- SA-CMM applies to the acquisition of all types of embedded and stand-alone software applications, including those where commercial off-the-shelf and non-developmental software are being acquired

Each maturity level (except level 1) indicates capability to carry out a set of processes, defined as key process areas (i.e. project management, requirements development and management, contract performance management, acquisition risk management). These areas contain goals and five common features that indicate whether the implementation and institutionalization of a key process area can be effective, repeatable, and lasting.

SOTIP - Swedish Government Open Telecommunication Systems Interconnection Profile

In the competitive environment of an open market for telecommunications, the STAT-TEL-commission has developed SOTIP (the Swedish Government Open Telecommunication Systems Interconnection Profile). SOTIP is the profile for open systems in telecommunications for the Swedish Government administration. SOTIP is to be applied by Government Administration Agencies when analyzing telecommunications needs and purchasing telecommunication equipment and services. The objectives of SOTIP are:

- To achieve supplier independent communications based on open system solutions with standardized interfaces between system components
- To simplify the requirement specification of services and equipment with the aid of a generalized model for describing functional user requirements for telecommunications in Government Administration
- To simplify the requirement specification of services provided to the public in contact with Government Administration
- To create priorities for the standardization process based on a user and the public perspective, and the possibility to influence product development and the competitive situation

The experience shows that SOTIP performs the function of being a tool for analysis of needs as well as specifications not only for Government Administration Agencies but all types of organizations including private enterprises.

SPICE - ISO 15504

SPICE provides a model and specifications for determining the capability or maturity of software development organizations. This standard is being increasingly used as a standard benchmark for assessing software development organizations and identifying areas for improvement. The specification provides a structure for analyzing each process related to software development based on the existence and proper implementation of accepted best practice. As part of the overall development and management process for software development, the specification contains elements that relate to the acquisition of technol-

ogy and associated best practice. The procurement related elements of the SPICE standard are in the process of being substantially expanded to address in detail all of the procurement or acquisition related processes.

TAP - Total Acquisition Process

TAP is divided into two different Guidelines; the TAP Systems Guide and the TAP Services Guide. The procurement process of TAP provides a framework to:

- realize the benefits sought
- control the procurement costs
- avoid unnecessary bid-costs by suppliers, and
- handle international acquisitions

The TAP Services Guide follows the same methodology and objectives as the Systems Guide. Systems procurements could include any combination of standard and/or bespoke hardware and software and a variety of support services. Service procurements include outsourcing, consultancy, and maintenance. Some principles apply to the procurement of both services and systems, however; there are also significant differences, which is the rationale for producing separate Guides.

TAP is targeted at the acquisition of information systems and related services, with a value normally above the EC/GATT threshold, and which would commence with the issue of a formal call for tender. The overall aim of TAP is to improve the success rate of Government IS/IT projects and therefore increase their value for money.

Best practice source references

The source of each practice is identified throughout this report. In some cases there were multiple sources for the same practice in which case either multiple sources are referenced, or the most clearly stated source is provided.

It is recommended that organizations that utilize this guide to identify specific practices, should first consult the original source for these best practices before they are implemented. The original source provides the full context of the practice and a better understanding of how a practice is to be realized. The co-ordinates of each best practice source used within the study are provided below.

Buy-IT Guidelines

The BuyIT Guidelines is made available from the Best Practice Group, which is an independent IS purchaser-supplier forum, supported by the major trade and professional bodies and brought together by IT World Consultants with support from the UK Department of Trade and Industry. You may contact them at:

BuyIT Office
IT World Consultants
47 Catherine Place
London SW1E 6DY
England
Tel: +44 171 828 7300
Fax: +44 171 828 7990
E-mail: buyit@itworld.demon.co.uk

Further information is also available from the BuyIT web site at <http://www.itworld.co.uk/buyit/index.html>

CCTA - Catalogue of Standards for use in IT Procurement

Copies of the standards for IT procurement may be obtained by contacting the following:

CCTA Library
Rosebery Court
St Andrews Business Park
Norwich NR7 0HS
England
Tel: +44 1603 70 4567
Fax: +44 1603 70 4817
E-mail: info@ccta.gov.uk

You may also find further information at the CCTA web site by visiting: <http://www.ccta.gov.uk>

EPHOS - European Procurement Handbook for Open Systems

Requests for copies the EPHOS Handbook should be directed to:

The PPG Secretariat
EU Member States' IT Public Procurement Group (PPG)
European Commission
Directorate General III/B3
Room SC15-1-169
200 Rue de la Loi
1049 Brussels
Belgium
Tel: +32 2 2968985
Fax: +32 2 2991675

EURAP - European Requirements for the Acquisition Process

The EURAP document is publicly available through representatives to the Western European Armament Group (WEAG) TA-13 Committee. The French industrial representative is listed below:

Mr. Gilles M. Pitette
CR2A-DI
25, quai Gallieni
F-92158 Suresnes Cedex
Tel: +33 1 55 49 37 91
Fax: +33 1 55 49 37 01
E-mail: gpitette@cr2a-di.fr

European Commission Directives

There are a number of directives from the European Commission governing the procurement of supplies and services by EU member public administrations. The relevant documents are as follows:

Directive 98/4/EC amending directive 93/38/EEC
Directive 97/52/EEC amending directives 92/50/EEC, 93/36/EEC and 93/37/EEC
The Public Supplies Directive Council Directive 93/36/EEC
The Public Work Directive Council Directive 93/37/EEC
The Public Services Directives Council Directive 92/50/EEC
The Public Remedies Directives Council Directive 89/665/EEC
The Utilities Directives Council Directive 93/38/EEC

Each of these documents is available in several formats under the Rules and Guidance section of the following web site: <http://simap.eu.int/>

Euromethod

The European Software Institute acts as a distribution center for Euromethod and can be contacted at:

European Software Institute
Attn. Euromethod
Parque Tecnológico de Zamudio, #204
E-48016 Bilbao
Spain
Tel: +34 94 420 95 19
Fax: +34 94 420 94 20

Alternatively, a download of the official Euromethod version 1 reference book is available in PDF format from the following web site: <http://www.fast.de/Euromethod/index.html>

ISO/IEC 14598 - 4

The standard is developed and maintained within ISO/IEC JTC1/SC7/WG6 subcommittee. Copies can be obtained by contacting the national ISO representatives. A listing of the representatives and contact points can be found at the following web site: <http://www.iso.ch/>

Alternatively a copy can be obtained by contacting the convenor of the subcommittee at:

Professor Motoei Azuma (JISC, Japan)
Dept. Of Industrial and Management Systems Engineering
School of Science and Engineering
Waseda University
3-4-1, Okubo, Shinjuku-ku
Tokyo 169-50
Japan
E-mail: Azuma@azuma.mgmt.waseda.ac.jp

PA - Guidance on the Use of Progressive Acquisition

The Progressive Acquisition Guidance document is publicly available through representatives to the Western European Armament Group (WEAG) TA-13 Committee. The French industrial representative is listed below:

Mr. Gilles M. Pitette
CR2A-DI
25, quai Gallieni
F-92158 Suresnes Cedex
Tel: +33 1 55 49 37 91
Fax: +33 1 55 49 37 01
E-mail: gpitette@cr2a-di.fr

Department of Defense Procurement Guide R5000-2

The US Department of Defense (DoD) Directive R5000.2-R concerning acquisition of defense information systems is available for download at the following web site: <http://www.deskbook.osd.mil/>

The reference is DoD 5000.2-R, the version at the time of printing is Change 4.

SA-CMM - Software Acquisition Capability Maturity Model

Software Engineering Institute publications are available from the following:

Defense Technical Information Center
8725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060-6218
USA
Tel: +1 800 225 3842, or
+1 703 767 8222

A listing of all available documents may be obtained by visiting the SEI web site at: <http://www.sei.cmu.edu/>

SOTIP - Swedish Open Telecommunication Systems Interconnection Profile

The SOTIP document is available from the following:

Statskontoret
Box 2280
103 17 Stockholm
Tel: +46 8 454 46 43
Fax: +46 8 454 46 45

A downloadable version of the document is also available in PDF format at the following web site: <http://www.statskontoret.se>

SPICE - ISO 15504

The ISO 15504 official publication is available from each of the national representatives to ISO. A listing of the representatives and contact points can be found at the following web site: <http://www.iso.ch/>

The document reference for the complete SPICE specification is as follows:

ISO/IEC PDTR 15504 :1997 Software Process Assessment: Parts 1 - 9

Alternatively, you can direct request to the central ISO secretariat at the following:

ISO Central Secretariat
1, rue de Varambe
CH-1211 Geneve 20
Switzerland
Tel: +41 22 749 01 11
Fax: +41 22 733 34 30

You may also visit the official SPICE web site for further information: <http://www-sqi.cit.gu.edu.au/spice/>

TAP - Total Acquisition Process

The following Guides are available:

TAP Systems Guide: ISBN 0 11 330840 X
TAP Services Guide: ISBN 0 11 33083 96

Copies of the Guides may be obtained by contacting the following:

CCTA Library
Rosebery Court
St Andrews Business Park
Norwich NR7 0HS
England
Tel: +44 1603 70 4567
Fax: +44 1603 70 4817
E-mail: info@ccta.gov.uk

You may also find further information at the CCTA web site by visiting: <http://www.ccta.gov.uk>

European Commission SPRITE Program

For more information concerning the SPRITE-S² program of the European Commission and other projects within the program providing valuable tools for improving information and communication technology procurement, visit the web site: <http://www.opengroup.org/sprite>