GRafP Technologies

Auditor's Handbook

Audit and Assessment Services with the X:PRIME Methodology

X: Probabilistic Risk Identification, Mapping and Evaluation (X:PRIME) is a methodology to carry out probabilistic risk audits and assessments, identify consequences of non-conformances and potential remedial actions, and predict the likelihood of project or service deliveries in the X domain

X:PRIME

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Introduction

Figure 1 – Audits and Assessments

It has become increasingly necessary to verify objectively the operational status of individual projects and service deliveries in organizations, small and large, in order to communicate to management important issues that require their immediate attention. There are several reasons for this:

1. There is a growing trend toward making projects and services an integral part of an organization's operations, revenues, equipment and systems. The undetected presence of non-conformances in such projects and services can have serious consequences. A significant number of problems (e.g. Volkswagen) have already been documented, and professionals in the field readily concur that unless preventive measures are taken, the growing number initiatives and their operational complexity will increase the likelihood of more frequent problems.

2. Not only have projects and services become vital in many areas, they have undergone a prolific growth in volume. As they become more complex and broader in scope, the infrastructure required for their undertaking and delivery increases in size, and the concepts put forward in management, project execution and service delivery models and standards become particularly relevant.

3. The introduction of various models and standards have been were key factors in catalyzing the move toward improving the capability of managing initiatives, carry out projects and providing services, since they underscored the efforts required to provide high quality products and services at an affordable price. The fact that some of models and standards have gained wide international acceptance, and that they are being used increasingly as a criteria by purchasers of goods and services to select suppliers, has heightened market awareness of the concepts put forward in those models and standards.

The X:PRIME methodology was developed with the purpose of supporting audits, assessments and operational risk management. Two checklists are provided in Annexes specifically adapted to development project audits and development or maintenance service audits. X:PRIME also supports the development of other models for audits and assessments in different domains with the appropriate templates. As of October 2018,

more than 150 audits and assessments had been performed in Canada, Chile, France, Germany, Switzerland and the United States.

If one wanted to summarize the goal of X:PRIME, one could say that it is the verification projects and services, in order to increase the likelihood of achieving successful deliveries. The term “verification” used here includes the identification and assessment of situations susceptible to deteriorate, since these two steps are required for effectively managing projects and services, in the sense of control or prevention of problems that decrease the profitability of a business. The premise on which X:PRIME is based is that if one implements sound controls and appropriate remedial actions in response to non-conformances, then the risks one faces will be reduced, and if the risks are reduced, then there will be fewer problems; if there are fewer problems, then the chances of success will be increased. From another perspective, X:PRIME integrates risk management in terms of their correlation with the activities performed to develop products or provide services. This is what is meant by the word “Mapping” in the X:PRIME acronym.

As such, X:PRIME does not dwell on maturity level or certification. On the other hand, improving existing controls and current practices with remedial actions or introducing sound ones to increase the likelihood of successful deliveries will certainly help in obtaining such a maturity level or a certification, if this is an objective. X:PRIME promotes a pragmatic approach with respect to maturity level that can be summarized as follows: “You should be at the maturity level that makes you successful, whatever that level may be, while planning ahead so that if you ever decide to diversify and expand, the process that you have in place will be adequate to support those efforts”.

The present document describes the approach to follow in order to perform an assessment or an audit with the X:PRIME methodology. Nevertheless, it is also worth mentioning that the X:PRIME Resolver (X:PRIMER) neural network solution that supports the methodology, as well as the focus placed on audits and assessments, are not infallible; nothing can effectively replace the user’s judgment.

The present document is divided into 11 chapters and four annexes. It describes a simplified implementation of the methodology that does not require the use of a neural network for performing probabilistic risk audits and assessments.

Following the introduction, chapter 2 explains the scope of the X:PRIME methodology and its underlying focus on audits and assessments.

Chapter 3 introduces the pitfalls and the benefits of establishing a Quality Management System and presents essential concepts associated with such a system.

Chapter 4 describes the field of assessments and audits supported by the X:PRIME methodology. If one wanted to have an overview of the entire methodology and its principles, this is the chapter to read first.

Chapter 5 provides an overview of the conduct of an audit or an assessment using the X:PRIME methodology and, in essence, an overview of chapters 6 through 11 inclusively. It addresses start-up considerations that are critical to initiating an audit or an assessment in a project or a service.

Chapter 6 describes the first step of an audit or an assessment performed with the X:PRIME methodology, that is: selecting the project or service scope, as well as the individuals who will participate, conducting awareness sessions with those individuals, and tailoring the two checklists to the needs and characteristics of the assessed or audited project or service.

Chapter 7 addresses the checklist pertaining to desirable and undesirable actions and explains the meaning of each item, and the points to take into consideration when filling it out.

Chapter 8 addresses the checklist pertaining to desirable and undesirable situations and explains the meaning of each item, and the points to take into consideration when filling it out.

Chapter 9 deals with consolidating and analyzing the collected information. Guidelines are provided on how to perform this analysis and to come up with the findings.

Chapter 10 addresses the findings presentation and the points to pay attention to during the presentation. A template presentation is also provided to facilitate its preparation.

Chapter 11 introduces the development of remedial action plans to address the findings that will have come out of the assessment or the audit. It provides guidelines on how to go about it and includes a template for preparing them.

Annexes A and B contain the checklists pertaining to desirable and undesirable situations and actions, respectively, that can be used for conducting an audit or an assessment of a project dealing with the development of a product or a service dealing with the maintenance of such a product. These provided checklists can then be adapted to the needs and characteristics of the assessed or audited project or service.

Annex C contains the slides recommended to be used to present the assessment or audit process to clients.

Annex D describes the guidelines to develop models suitable to conduct audits and assessments in various domains.

Chapter 2

Scope of the X:PRIME Methodology

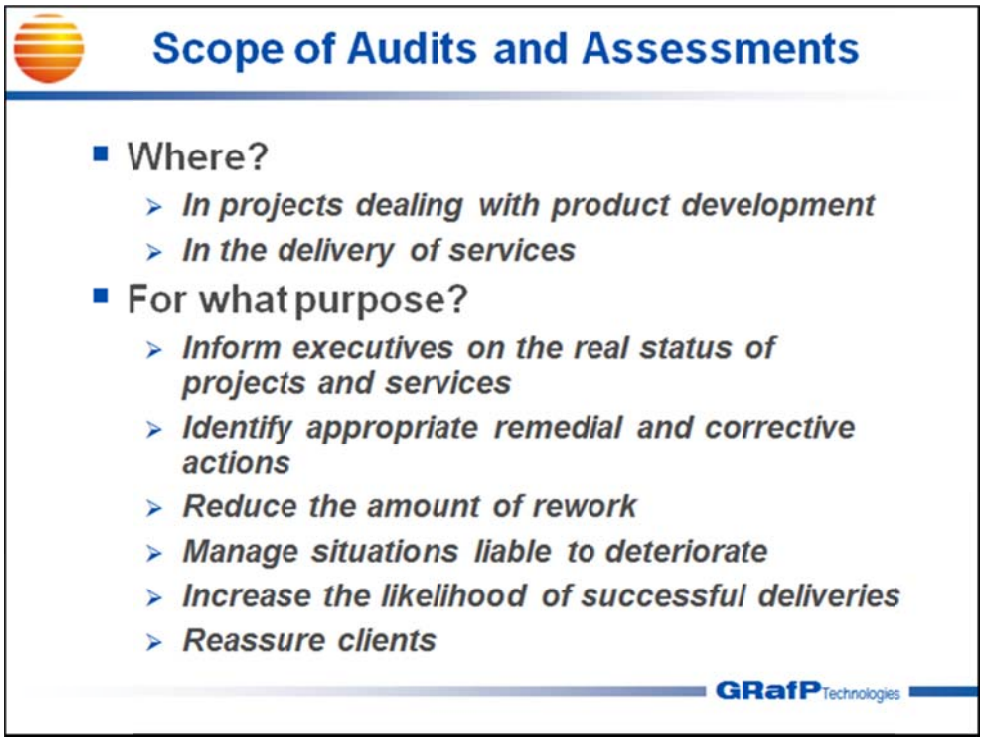


Figure 2 – Scope of audits and assessments conducted with the X:PRIME methodology

X:PRIME is a methodology that helps perform assessments and audits in the development of products or in the delivery of services in terms of non-conformances, of situations liable to deteriorate and of the adequacy of solutions to manage them. If one accepts the premise that the success of an initiative largely depends on the means by which people, procedures, methods, equipment and tools are integrated to obtain the final results, then reduction in the number and importance of undesirable situations liable to deteriorate or of desirable situations susceptible of not materializing will increase the probability of success. Indeed, collected data for accidents in industry indicate that prevention costs are on average 10 times lower than correction costs.

In other words, elimination of non-conformances in order to reduce the frequency of problems that occur when people, procedures, methods, equipment and tools are integrated to develop a product or to provide a service increases the probability of successfully delivering the product or the service. Relating success with operations is not such a difficult premise to accept when one thinks about it. To use an analogy one could state, without risking raising eyebrows that the quality of a family vacation is largely dependent on the activities performed and the actions taken to prepare them. The relationship can be established in countless other human activities.

Another reason for verifying the state of a project or a service, and assessing and managing quality is that the best way to reduce costs and increase productivity, in any other undertaking, is to use components that have already been built and tested. On the other hand, such components will not be available unless activities have been deliberately performed and actions taken to produce them. The definition and implementation of such activities and actions constitute an integral part of a Quality Management System.

The X:PRIME methodology addresses operational topics that are behind 70% of the problems experienced in product development and service delivery, as opposed to routine, day-to-day issues. The latter vary from project to project or service to service. However, it is unlikely that such issues will properly be managed if the infrastructure and governance are not in place to make it possible. More specifically, we mean by that the management and control functions that are, or should be, part of either a project or a service.

Where can assessments and audits be performed with the X:PRIME methodology?

Basically, the X:PRIME methodology is suitable for any type of product development or service delivery with the use of appropriate models.

When used in individual projects or services, some care must be taken to ensure that the practices improved or introduced as a result of performing the assessment or audit survive the life of the project or the service. That is, performing an assessment or an audit at the end of a legacy project or service for which no follow-up is envisioned may not appear to be very useful. Conversely, performing an assessment or an audit at the end of a project or service for which follow-ups, such as maintenance or warranty, are envisioned can prove quite beneficial, as long as there is a mechanism in place to ensure that the recommended corrective actions are implemented in the course of future phases.

For what purpose can the X:PRIME methodology be used?

The X:PRIME methodology can be used to perform assessments and audits, manage quality at the project or service level and establish the infrastructure required to manage quality at the organizational level. It basically addresses the question that any manager has to deal with, that is, what non-conformances can be accepted and which need to be corrected because they have a high likelihood of becoming serious problems and deteriorating into crises later on?

The most common consequences of ineffective or no Quality Management System are the excessive time spent by managers in dealing with unanticipated difficulties and losses that prevent them from attending to other important issues, the deterioration in public image, the loss of customers, the reduction in forecasted growth and cash flow, and the abandonment of strategically desirable projects because of an inherent inability to manage loss exposures, not to mention the frustration of personnel who carry out their activities in an atmosphere of impending doom. Yet, the establishment of a Quality Management System is easier said than done, because it is often carried out on the basis of guesses and vague estimates. In the absence of a reliable infrastructure and periodic audits or assessments, the establishment of a Quality Management System is susceptible

to looping indefinitely in the identification and planning stage, and, ultimately, to be abandoned as personnel come to the conclusion that the monitoring, corrective and prevention activities are not effectively conducted. Operational challenges that can undermine the establishment of a Quality Management System are precisely those that the use of the X:PRIME methodology can help identify, assess and manage. Once appropriate steps have been implemented or corrective actions taken, which are essential to a Quality Management System, its establishment can then proceed on more solid ground.

A second use of the X:PRIME methodology, somewhat broader in scope, is connected with internal verification. The intent here is to improve the means by which people, procedures, methods, equipment and tools are integrated to develop products and provide services, by identifying the areas where non-conformances are most severe, assessing and prioritizing corresponding consequences, and managing them by introducing corrective actions that are most likely to reduce the probability of their occurrence.

The X:PRIME methodology can also be used by organizations that outsource or subcontract the development of products or the delivery of services. In this scenario, the client organization quantitatively characterizes, with the X:PRIME methodology, what it expects when work is outsourced or subcontracted. Concurrently, the contractor uses the X:PRIME methodology to quantitatively assess the state or work performed and its capacity to undertake it, calculated from its understanding of the subcontracted or outsourced work and the results of assessment or audits carried out in its locales. Faking good and faking bad algorithms in X:PRIMER prevent optimistic and pessimistic perspectives and remove biases. Subsequently, the client organization will be in a better position to conduct meaningful meetings and reviews with the subcontractor to assess the differences between the two data sets obtained with the X:PRIME methodology, since the subcontractor profile should be similar to the profile expected by the client organization. Large differences are indicative of problems to come.

Chapter 3

Establishment of a Quality Management System

Figure 3 – Evolution of Quality Management Systems

Typically, one of the most difficult challenges of establishing a Quality Management System consist of carrying out assessments and audits in order to communicate to management operational issues that need to addressed to prevent the occurrence of problems. The main challenge stems essentially from the fact that it is not a matter of analyzing data but of analyzing information. This information is unstructured, subjective and largely resides in people's minds. As a result, it is difficult to obtain, to remove individual biases and to agree on what corrective actions are required, on what the means of achieving the agreed upon improvements should be, and of implementing the agreed upon means in the same way in order to achieve the desired end result. If the establishment of a Quality Management System is viewed as moving from a lower maturity state to a higher one in reference to developing products or providing services, two common myths on how to go about it are unrelentingly resurfacing:

1. All conditions are present in the organization in its lower maturity state to make it evolve to the higher maturity state.
2. A sufficient definition for the higher maturity state is "cheaper", "faster" and "better".

The first myth is wishful thinking. The second one will never motivate anybody but the individual who makes the statement.

Nevertheless, the establishment of a Quality Management System has considerable benefits. The most important, or at least the one that gets the attention of senior management, is probably the return on investment. Empirically, the successful implementation of a Quality Management System leads, on average, to a 5-to-1 return on investment over a 3.5-year span. This 5-to-1 ratio has also been observed in the manufacturing and human resources development sectors, where some initiatives have been started based on models relevant to the domain of application.

Principles of a Quality Management System

One premise and three principles can accurately describe the management of quality. Ten common barriers encountered also help in understanding what can impede its establishment. Any of those 10 barriers represents a potential pitfall for a service or a

development initiative where a reduction in the frequency of problems being experienced is being sought.

Premise

Everyone involved in providing a service or developing a product wishes to do a good job and to perform up to his or her potential.

In other words, very few people, if any, come into work with the intent of wreaking havoc in the service or in the project to which they have been assigned. If they do, it is unintentional, and likely be the consequence of not having all the information required, lacking experience and/or training, or lacking adequate support.

First principle - Commitment

Senior management must engage/commit themselves and fully support the establishment of a Quality Management System. This responsibility starts from the top and should extend throughout all levels of the organization, the service or the project.

Without senior management's active involvement, initiatives carried out to implement the steps or to take the corrective actions for establishing a Quality Management System will, at best, vegetate, and are likely to fail in the short to medium term.

Second principle - Participation

Each individual, at every level, should feel the need to participate in the establishment and sustainment of a Quality Management System since quality is everyone's responsibility.

In the absence of global staff participation, there will likely be pockets of excellence in developing a product or providing a service, but they will remain confined to their respective areas.

Third principle - Management

The Quality Management System should be managed as a service broken up into work packages that have been assigned to specific groups or individuals.

The visibility of the work carried out as part of managing quality should be promoted and progress should be tracked and reviewed.

Barrier 1 - No itinerary

If this has not been done before, how do we know what to do ? What should be done first ? What is the approach to follow ? What problems have we had in the past anyway ?

Barrier 2 - No model to follow

People, by and large, tend not to seek what is available and what has already been done in establishing Quality Management Systems. They are doomed to reinvent the wheel. This is liable to lead to time-consuming and costly trial and error approaches that could ultimately be abandoned as no significant results are achieved.

Barrier 3 - Waiting for senior management

Quality management initiatives are started by senior management. Middle managers are, therefore, inclined to wait for directions from higher-level management before initiating anything on their own.

Barrier 4 - No leverage

Individuals may feel that they have no leverage to initiate quality management activities or that they lack influence to make changes.

Barrier 5 - Lack of time

People are too busy or have higher priorities to address.

Barrier 6 - Misconceptions about process engineering

People may not understand the concepts of a Quality Management System. They may have developed an erroneous interpretation on what quality implies, what quality is all about, and how these concepts can be applied to their situation.

Barrier 7 - Just another management fad

The “If we are not enthusiastic, maybe it will go away by itself” attitude. Quality management is seen as activities that have no start and no end and that can always be

used by management to claim that corporate objectives have not been met, thereby affecting salaries and bonuses.

Barrier 8 - No incentives

People may feel they have no incentives to change things and to see to the quality of their products and services, and perceive their participation in sustaining the Quality Management System as a background task to which no career progression has ever been linked. Firefighting gets rewarded, not fire prevention.

Barrier 9 - No relationship to the organization's strategic plan

The product or the service is the all-important topic. Quality is perceived as an intangible that is acquired by osmosis for which objectives may be defined but for which neither resources nor time are allocated.

Barrier 10 - No apprenticeship culture

People are not trained in the methods, procedures, tools and equipment used to develop products or provide services. Everyone has his or her own understanding of what characterizes quality is all about and an individualistic culture prevails.

Is commitment, participation or management the most important? Without commitment or participation one would not get very far, and management would be futile. However, commitment and participation without management may not be very productive. Yet, the one leading conclusion that achieved consensus in all organizations that established a Quality Management System, whether they failed or succeeded, is that if it is not important to senior management, it will not be important to middle managers and likewise, it will not be important to personnel in general. If senior management does not periodically reinforce topics related to quality and if assessments or audits are not periodically conducted, interest will fade rapidly.

Strategy of establishing a Quality Management System with the X:PRIME methodology

The strategy that the X:PRIME methodology promotes to establish a Quality Management System in product development or in the provision of services relies on a three-phase approach, as represented in Figure 4. The strategy focuses on improving the chances of success at the project or at the service level, and then moving on to establish the Quality Management System at the organizational level. In its simplest expression, the three phases are envisioned to be implemented sequentially.

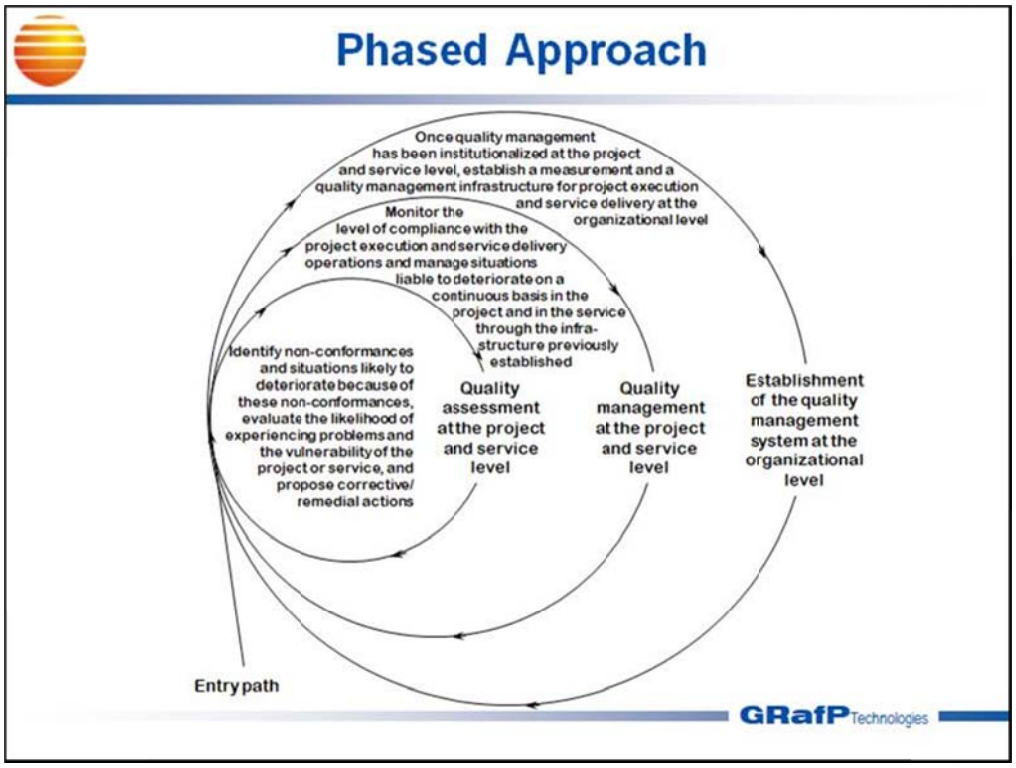


Figure 4 – Strategy to establish a Quality Management System

The first phase of this strategy consists in using the X:PRIME methodology to identify non-conformances and situations liable to deteriorate as a result of those non-conformances. If a given non-conformance does not have a significant impact on the development or on the service, it is not retained. The primary objective of this phase is to increase the likelihood of successful development or service outcome by reducing the frequency of problems experienced in the means by which people, procedures, methods,

equipment and tools are integrated to carry out the work. This involves assessing the likelihood of failure, the vulnerability of the project or the service, and expected losses if corrective actions are not implemented. If required by management, a rating can also be generated that represents the quality level of the product development or service delivery in accordance with a scale similar to the one used in rating the quality of financial instruments. In Figure 4, this phase is represented by taking the entry path and circling on the "Quality assessment at the project and service level".

After this infrastructure has been established, the transition to phase 2, which consists in managing quality to prevent problems from occurring. This phase reflects data collection and analysis in industry demonstrating that problem prevention is four to ten times less costly than correction after a problem has occurred. This is represented in Figure 4 by moving from the inner loop to the "Quality management at the project and service level" loop at the point where the two meet.

Finally, after quality management is institutionalized in product development and service delivery, a transition to phase 3 can then take place, where appropriate. This third phase consists in establishing the Quality Management System in the form of standard audits and assessments at the organizational level. Typically, transitioning to phase 3 make sense since economies of scale can be achieved by consolidating audit and assessment approaches implemented in individual projects and services. Nevertheless, this transition is not absolutely necessary, especially in small organizations where dissemination of information is achieved more easily. This is represented in Figure 4 by moving from the "Quality assessment at the project and service level" inner loop directly to the "Establishment of the quality management system at the organizational level" where the three loops intersect.

This strategy is consistent with the principle on which statistical quality control is based, whereby a local system needs to be stabilized before an organization can proceed both to define and to improve the system at the organizational level.

Variations of this implementation strategy can be expected, based on the specific needs of each product development project or service. For instance, a given project may shorten or

bypass phase 1 (Quality assessment at the project and service level) altogether before moving on to phase 2 (Quality management at the project and service level) if all the conditions are present for effectively managing non-conformances whose identification is the focus of phase 1. On the other hand, some projects and services, especially smaller ones, may have some flexibility in transitioning to the "Establishment of the quality management system at the organizational level" loop once an adequate system has been established in phase 1 to identify and correct non-conformances. In that case, it could be assumed that periodic audits and assessments conducted with the X:PRIME methodology, along with planning and implementation of corrective actions, would be sufficient to sustain an efficient and effective quality management at the organizational level. In other projects an services still, the number of people involved may be so large that phase 1 (Quality assessment at the project and service level) would be more appropriately performed through the "Establishment of the quality management system at the organizational level" that incorporates the mechanisms needed to create the momentum for initiating changes. This could possibly be followed by audits and assessments with the X:PRIME methodology for periodic progress monitoring, before moving on to phase 2 (Quality management at the project and service level).

The implementation strategy, therefore, leaves some flexibility for organizations, depending on their particular situation and project or service suite. In that sense, it is important that managers do not perceive that a rigid approach,, which does not take into account the specific attributes and constraints of their projects or services, is being imposed on them.

Chapter 4

Verification Based on the X:PRIME Methodology

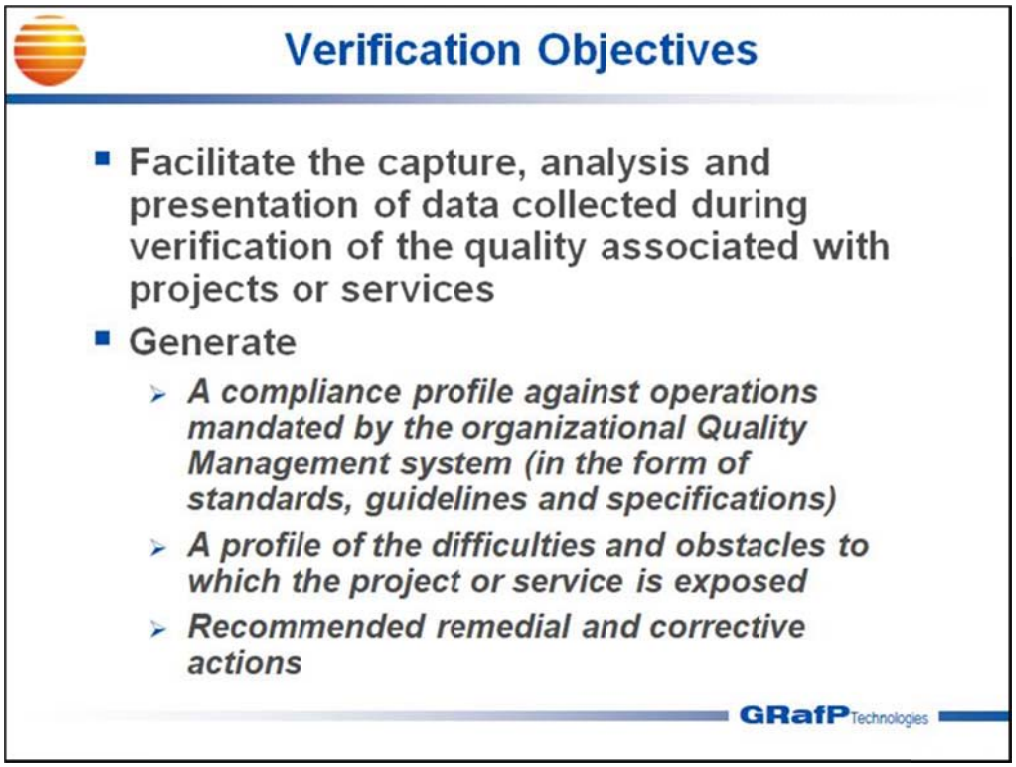


Figure 5 – Objective of verification based on the X:PRIME methodology

X: PRIME is a methodology supported by checklists for the purpose of facilitating the capture, analysis and presentation of data gathered during quality audits and assessments related to services or product development projects. It can also be applied to organizations where several projects or services are being carried out simultaneously.

The objective of this an approach is to conduct a verification of the status of a development project or the delivery of a service. In other words, it deals with the identification of non-conformances in a development project or the delivery of a service, prediction of the probability of experiencing significant problems as a result of identified non-conformances, identification of the actions required to reduce this probability or the impact of those non-conformances. Therefore, no focus is placed on non-conformances that do not have a major impact on the success of the project or the service; rather, focus is placed on the correction of those non-conformances needed to achieve successful deliveries.

The mechanism defined in this way can be used repeatedly with the same model to monitor the advances or with different models to get a different perspective of the project or service. Verification in the form of audits or assessments conducted with the X:PRIME methodology can also be complemented with a corrective action planning approach once the non-conformances have been identified and evaluated. As part of corrective action planning, recommendations are generated to reduce the likelihood of experiencing problems or their impact, and are validated with project and service personnel. Validated recommendations are then refined into corrective actions that are specifically developed to handle the most pressing problems.

Overview of the methodology

This manual includes a model adapted to development project audits and development or maintenance service audits. Annex D describes the approach to develop models adapted to other disciplines or other domains. The methodology involves using two checklists with different but complementary groups of participants. Existing generic versions of these checklists are used as a starting point and are adapted to the needs of the assessed or audited service or project. The purpose of the first checklist is to identify the non-

conformances against desirable operations (in the form of standards, guidelines, specifications or others) and compliances with undesirable operations (e.g. actions to avoid) in the assessed or audited project or service for the following 12 areas:

Operations related to managing requirements;

Operations related to work planning;

Operations related to work monitoring;

Operations related to suppliers management;

Operations related to quality assurance;

Operations related to configuration management;

Operations related to process engineering;

Operations related to training;

Operations related to work execution;

Operations related to coordination;

Operations related to reviews and inspections;

Operations related to customer service.

The purpose of the second checklist is to identify undesirable situations liable to occur or desirable situations liable no to materialize in the assessed or audited project or service against the following seven pre-defined categories of situations that are typically encountered in the course of developing a product or providing a service:

Situations arising from requirements;

Situations arising from work execution;

Situations arising from the environment used to carry out the work;

Situations arising from processes applied to carry out the work;

Situations arising from management;

Situations arising from personnel resources;

Situations arising from external constraints.

Compilation of the information collected by the auditor/assessor with this checklist indicates the difficulties and obstacles anticipated in the project or the service along those seven categories.

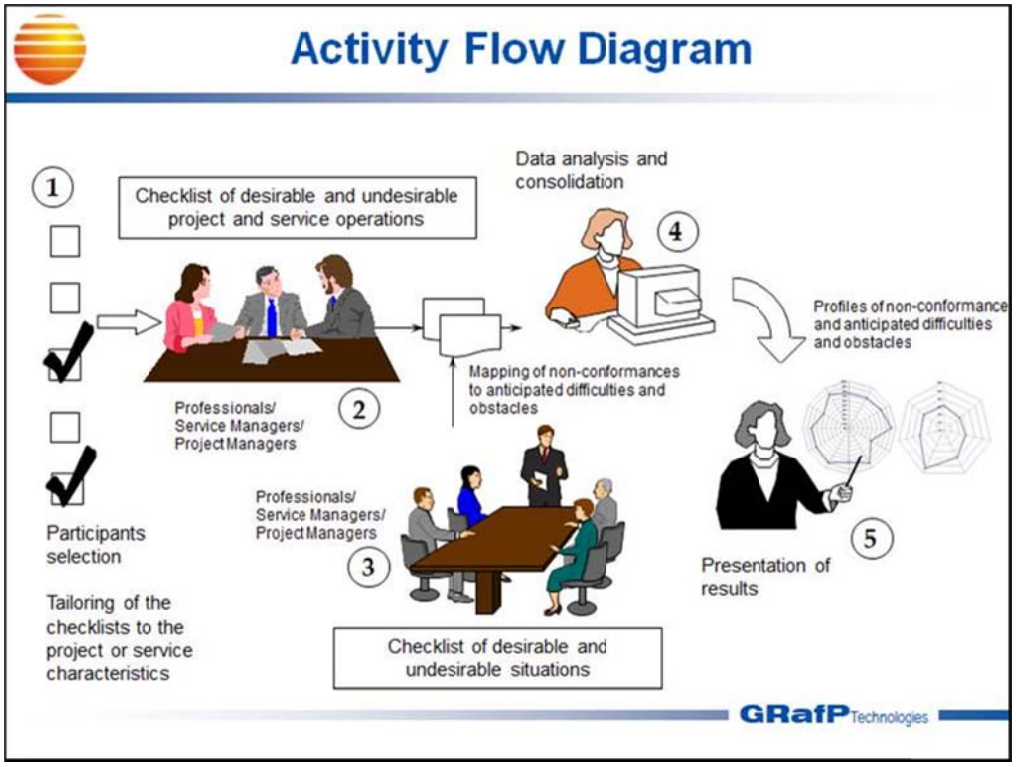


Figure 6 – Audit or assessment flow diagram

The flow of activities for an audit or an assessment performed using the X:PRIME methodology is depicted in Figure 6 and can be summarized as follows:

1. Adapt the checklists taking into account the characteristics of the project or service where an audit or an assessment will be conducted (step 1).
2. Select a sample of participants in the assessed or audited project or service who have the knowledge to provide meaningful information on the topics addressed by the checklists (step 1).

3. Schedule meetings and reviews of artifacts and activities with the purpose of completing and quantifying each item of the checklists (steps 2 and 3).

4. Compile and analyze the information collected with the checklists (step 4); this step comprises the following activities:

    - Determination of the compliance level of operations performed in the project or the service also referred to as Risk Mitigation Compliance (RMC).

    - Determination of the level of difficulties and obstacles anticipated in the project or the service also referred to Risk Perception Level (RPL).

    - Estimation of the Quality Index and the Risk rating characterizing the project or the service. QI is calculated with the relation

$$QI = \log e\,[1+(RMC/(RPL \bullet LEP))]$$

      for which values are shown in the table below as a function of the compliance level of operations and the level of difficulties and obstacles anticipated in the project or the service.

      QI theoretically ranges from 0 to infinity, but in practice, QI typically ranges from 1 to 5. RPL tends to be higher with low values of RMC and lower for high values of RMC. Nevertheless, RPL is rarely higher than 0.5. QI can be interpreted as the expected quality over a short time frame (e.g. the duration of the project or a specific service delivery, whereas a Risk Rating can be interpreted as performance over a long time frame (e.g. several projects or service deliveries).

      Values shown in the table below are provided for all values of RPL and RMC ranging from 0.1 to 0.9, even though some combinations are not realistic. For instance, it would be unlikely to observe a project or a service characterized by an anticipated level of difficulties and obstacles equal to 0.9 (i.e. 90%), which borders on paranoia, and a compliance level

of operations equal to 0.3 (i.e. 30%), which is not particularly good, resulting in a QI of 2 and an equivalent rating of C.

RPL	RMC	QI	RATING	RPL	RMC	QI	RATING	RPL	RMC	QI	RATING
0.1	0.1	0	E	0.1	0.4	1	D	0.1	0.7	2	C
0.2	0.1	0	E	0.2	0.4	1	D	0.2	0.7	2	C
0.3	0.1	0	E	0.3	0.4	1	D	0.3	0.7	2	C
0.4	0.1	0	E	0.4	0.4	0	E	0.4	0.7	2	C
0.5	0.1	0	E	0.5	0.4	0	E	0.5	0.7	2	C
0.6	0.1	0	E	0.6	0.4	0	E	0.6	0.7	3	B
0.7	0.1	0	E	0.7	0.4	1	D	0.7	0.7	5	A+
0.8	0.1	0	E	0.8	0.4	1	D	0.8	0.7	5	A+
0.9	0.1	0	E	0.9	0.4	4	A	0.9	0.7	5	A+
0.1	0.2	1	D	0.1	0.5	1	D	0.1	0.8	2	C
0.2	0.2	0	E	0.2	0.5	1	D	0.2	0.8	2	C
0.3	0.2	0	E	0.3	0.5	1	D	0.3	0.8	3	B
0.4	0.2	0	E	0.4	0.5	1	D	0.4	0.8	3	B
0.5	0.2	0	E	0.5	0.5	1	D	0.5	0.8	4	A
0.6	0.2	0	E	0.6	0.5	1	D	0.6	0.8	5	A+
0.7	0.2	0	E	0.7	0.5	1	D	0.7	0.8	5	A+
0.8	0.2	0	E	0.8	0.5	3	B	0.8	0.8	5	A+
0.9	0.2	0	E	0.9	0.5	5	A+	0.9	0.8	5	A+
0.1	0.3	1	D	0.1	0.6	2	C	0.1	0.9	3	B
0.2	0.3	1	D	0.2	0.6	1	D	0.2	0.9	4	A
0.3	0.3	0	E	0.3	0.6	1	D	0.3	0.9	5	A+
0.4	0.3	0	E	0.4	0.6	1	D	0.4	0.9	5	A+
0.5	0.3	0	E	0.5	0.6	1	D	0.5	0.9	5	A+
0.6	0.3	0	E	0.6	0.6	2	C	0.6	0.9	5	A+
0.7	0.3	0	E	0.7	0.6	3	B	0.7	0.9	5	A+
0.8	0.3	0	E	0.8	0.6	5	A+	0.8	0.9	5	A+
0.9	0.3	2	C	0.9	0.6	5	A+	0.9	0.9	5	A+

- Mapping of the non-conformances in each operational area against the difficulties and obstacles in each category of situations in order to identify non-conformances that need to be corrected in order to reduce the likelihood that the most pressing situations will in the project or the service.

5. Present and discuss the results, compiled in graphic form, to the project's or the service's management personnel (step 5).

The time required to carry out an audit or an assessment with the X:PRIME methodology ultimately depends on the service's or the project's scope and participants' availability. For the initial assessment or audit, some effort must also be allocated to adapt the

checklists to fit the needs of the assessed or audited project or service. Typically, this activity requires one day's effort on the part of management. Overall, an audit or an assessment performed with the X:PRIME methodology can effectively be carried over a period varying between one and two weeks by an auditor/assessor. If the scope of the audited project or service is large, it is recommended to carry out the audit or the assessment with two auditors/assessors.

Once the audit's or assessment's results have been validated, remedial action planning can then start, as described in the last section of this chapter.

Relationship between non-conformances and difficulties

This section briefly describes the concept of mapping non-conformances against difficulties and obstacles, and in particular, the fact that non-conformances are not all equal. In order to fully understand and characterize this concept, exhaustive analyzes of data collected through audits, evaluations and operational risk assessments were carried out manually, and several years of effort, numerous approaches and expert advice were required.

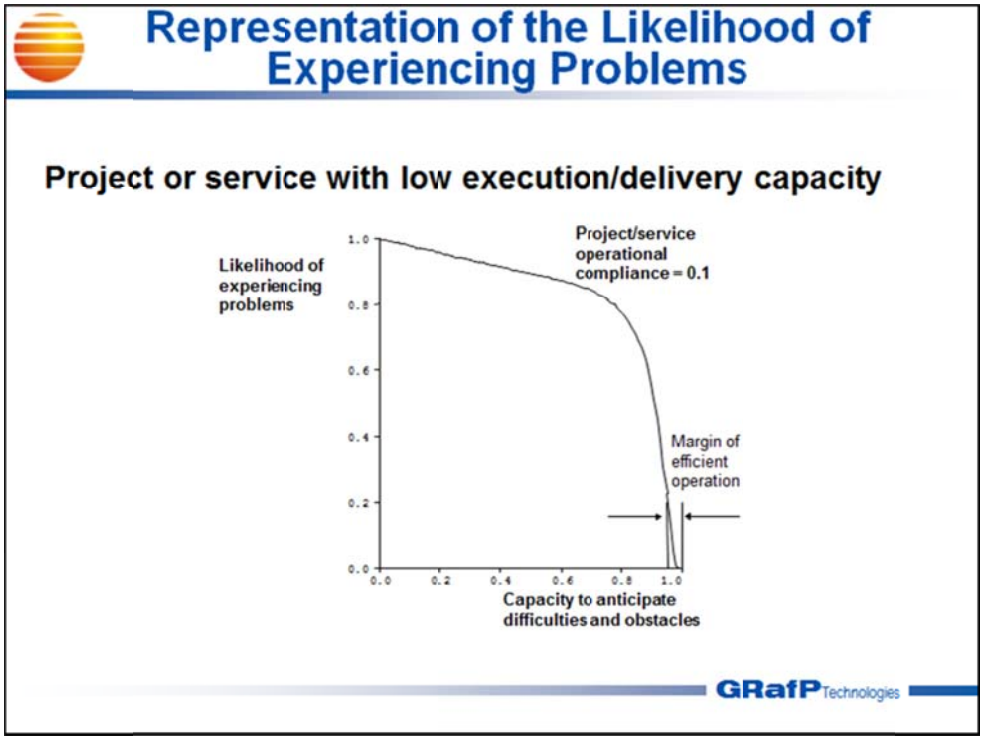
The two graphs shown in Figure 7 map the expected Likelihood of Experiencing Problems as a function of Capacity to Anticipate Problems for two specific values of Level of Operational Compliance.

A project or a service characterized with a high operational capacity is not necessarily successful since it may continuously have to overcome problems resulting from the high level of difficulties and obstacles it faces, whereas a project or a service characterized with a low operational capacity is not necessarily unsuccessful because it may be very efficient at avoiding or managing the difficulties and obstacles it faces.

The previous plots show, however, that a project or a service characterized with a high operational capacity is much more likely to be successful than a project or a service characterized with a low operational capacity simply because the latter must operate within a very narrow margin of Capacity to Anticipate Problems to maintain the Likelihood of Experiencing Problems at a low level.

It is, nevertheless, theoretically possible for an organization to implement a minimum set of operations that are nearly perfectly matched to the difficulties and obstacles to which a project or a service is exposed, in the sense that the set of operations maximizes the Capacity to Anticipate Problems. An analogy can be drawn with information theory, namely Shannon's theorem, which states that it is possible, at least in principle, to devise an encoding scheme whereby a communication system will transmit information with an arbitrarily small probability of error, provided that the information rate is less than or equal to the communications channel capacity.

Likewise, such a theorem applied to avoiding or managing difficulties and problems would state that it is possible, at least in principle, to devise a set of operations whereby a project or a service operates at an arbitrarily low probability of experiencing problems, as long as the project or the service has the capacity of implementing these operations. Unfortunately, whereas Shannon's theorem had only to deal with physical factors, avoidance and management of situations liable to deteriorate has to deal with physical, psychological, social and economic factors.



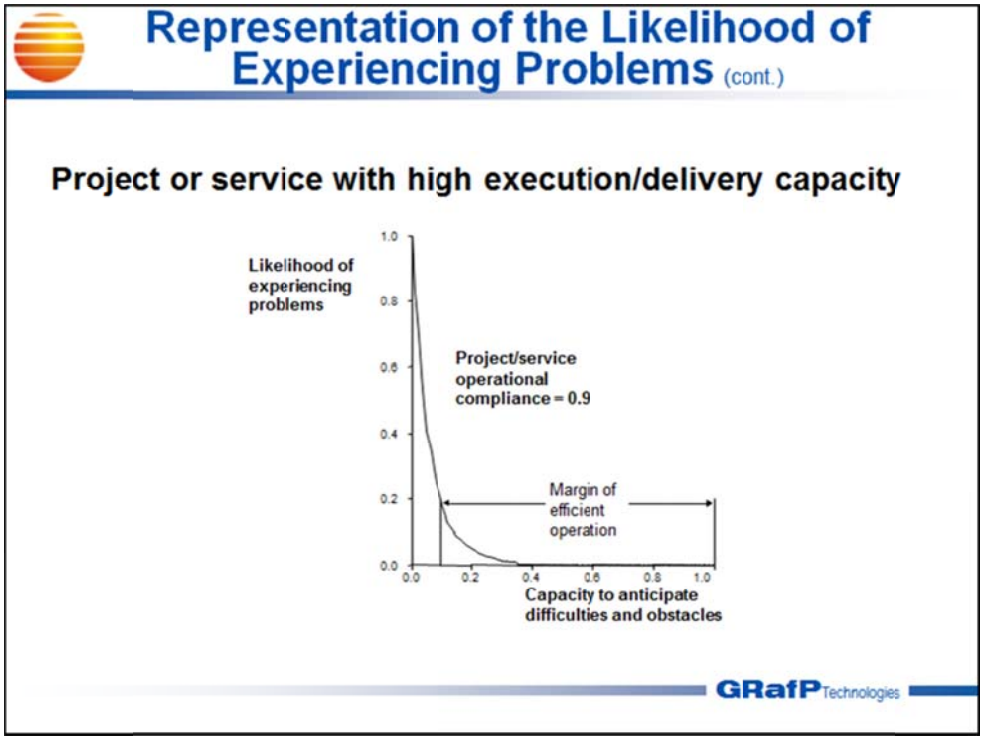


Figure 7 – Expected Likelihood of Experiencing Problems in projects or services as a function of a low and a high Level of Operational Compliance

There is, therefore, no easy way to define such a set of operations, even though some organizations may have more or less one in place without being able to fully characterize it. In fact, any attempts to do so may have an impact on the operations to the point where this may make the project or the service fall outside its "safe" margin of operation, somewhat akin to the Heisenberg uncertainty principle in quantum physics. In addition, it can be assumed that such a set of operations is not static but is organization-dependent and time-dependent, and will have to be modified as the context in which the project or the service operates evolves. Any significant deviations in the Capacity to Anticipate Problems, which may result from the set of operations having lost its synchronization with the situations that must be overcome, and which in turn may have been caused by the loss of a few key personnel, is likely to result in the Likelihood of Experiencing Problems suddenly increasing to an unacceptable value.

This highlights the importance of identifying and correcting non-conformances that have a high potential to increase the ability to manage or at least anticipate the difficulties and

obstacles to which a project or service is exposed. Residual non-conformances may have some importance in obtaining a certification, but they will not contribute to the performance of the project or service due to the fact that they do not contribute significantly in reducing the likelihood of experiencing problems and obstacles.

Remedial actions planning

This section introduces the remedial action planning methodology adopted as part of the X:PRIME methodology. Scrum, the agile method commonly implemented in software development, constitutes an efficient approach for planning and implementing remedial actions. With the Scrum method, small teams are established and are assigned individual or groups of audit or assessment findings. The Scrum Master's role consists of facilitating planning and implementation of remedial actions carried out by each team and of removing obstacles. The remedial action planning phase normally immediately follows the audit or assessment phase. The typical remedial action planning schedule is represented in Figure 8.

The audit or assessment findings are reviewed with personnel involved in the project or the service, possibly with the participation of personnel from Quality Assurance, and a remedial action plan made up of several work packages is developed, along with schedule and effort estimates. Several review sessions are held to ensure that buy-in is obtained from the project's or the service's staff, until the final remedial action plan is prepared and presented at the end of Phase 3. Each period can last fractions of hours, hours, days or weeks, depending on the findings and the scope of the project or service.

Remedial actions can be directly derived from the non-conformances resulting from the audit or assessment but at times, various approaches may be available to correct identified non-conformances and to reduce the Likelihood of Experiencing Problems.

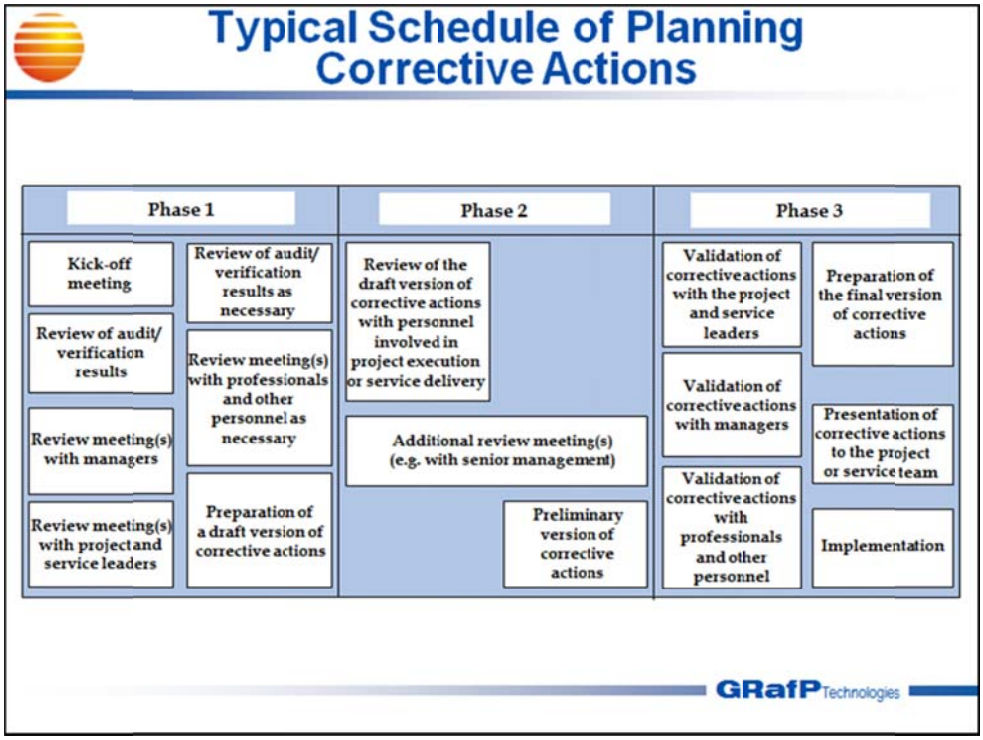


Figure 8 – Remedial action planning flow of activities

The sequence of activities during this planning phase is as follows:

Phase 1

1. Kick-off meeting held with the personnel involved in the project or the service, in order to describe the remedial action planning steps and to review the non-conformances and recommendations that came out of the audit or assessment conducted with the X:PRIME methodology.

2. Review meetings conducted with team leaders, managers and practitioners in order to compile their comments on those recommendations, their relative priority, and suggestions on their implementation. The remedial action planning methodology adopted in the X:PRIME methodology suggests that those meetings allow free flow of information and at times, as a function of the culture of the organization where the project or the service is taking place, it may be necessary to maintain the confidentiality of comments and suggestions collected as part of those meetings.

3. Preparation of a draft remedial action plan incorporating the comments and suggestions compiled as part of the previous interviews.

Phase 2

1. Review meetings with the personnel involved in the project or the service to obtain their comments on the draft remedial action plan.

2. Complementary review meetings with additional participants in order to obtain rough order of magnitude figures on the effort estimates regarding the remedial action plan implementation.

3. Additional review meetings and discussions to fine tune the remedial action plan. One such meeting is planned with senior management personnel to obtain their opinion of the plan and any other information that could relate it to the objectives of the organization, and the project or the service, and the constraints they face.

4. Preparation of a preliminary version of the remedial action plan based on the collected information.

Phase 3

1. As appropriate, sessions held with team leaders, managers and practitioners to validate the remedial action plan. The objectives of these sessions are:

    a. To fine tune the effort and schedule estimates;

    b. To carry out a last verification of the remedial action plan with the project's or the service's staff;

    c. To identify the skills required for implementing the plan's work packages.

2. Preparation of the final version of the remedial action plan based on the information gathered as part of the validation sessions.

3. Presentation of the remedial action plan and its work packages to the project's or the service's staff, and kick-off of the next steps. One of these steps will consist in identifying who will assume sponsorship and implementation responsibility of specific work packages. With the Scrum method, the team(s) having developed the remedial action plan(s) will also implement them.

Chapter 5

Audit/Assessment Overview

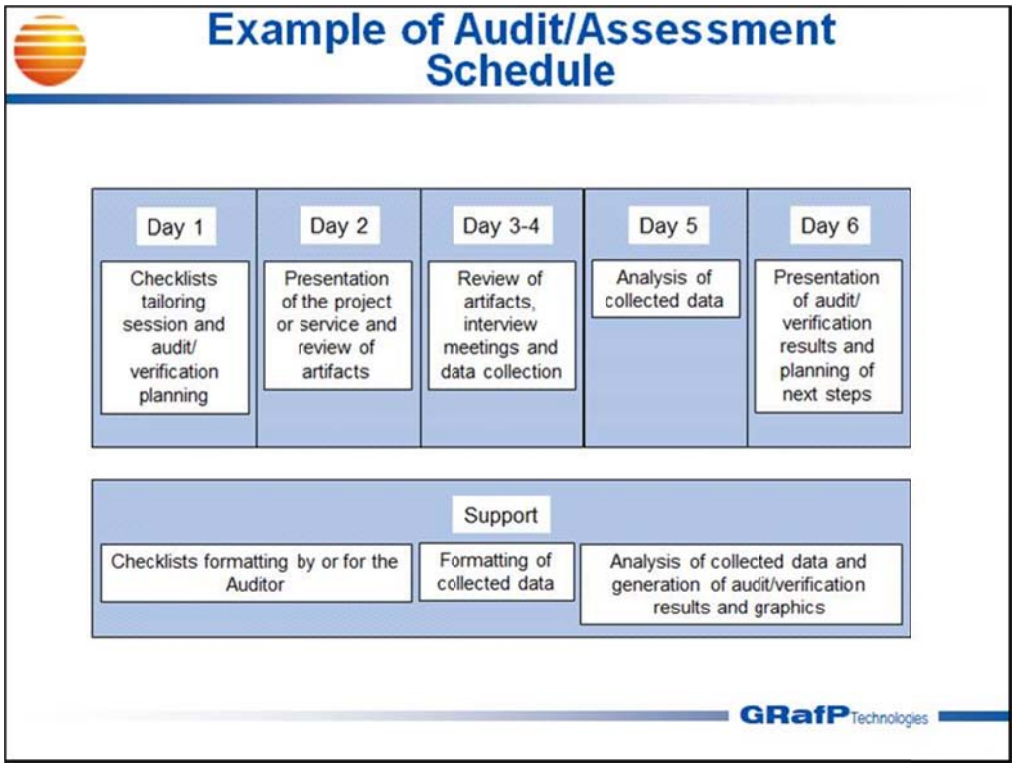


Figure 9 – Schedule of an audit or assessment conducted with the X:PRIME methodology

This chapter provides an overview of an audit or an assessment performed with the X:PRIME methodology one can expect in real life. The details of each step associated with this type of audit or assessment are presented in chapters 6 through 11, inclusively. Figure 10 represents a schedule typical of the first time an audit or an assessment is conducted. An audit or an assessment performed with the X:PRIME methodology is typically conducted by one individual (the assessor), assisted by a coordinator who is essentially responsible for the logistics aspects of the verification and who inevitably comes from the assessed project or service.

In an audit or an assessment conducted with the X:PRIME methodology, checklists are used to collect the information that will be analyzed with the X:PRIMER application or with a different tool, such as an Excel spreadsheet to compile data and generate graphics, and from which the findings will be derived. The use of checklists is one way to acquire data relatively quickly and inexpensively, and this is the main reason they have been adopted. The X:PRIME methodology does not preclude other data collection mechanisms (e.g. surveys, real-time random sampling, etc.), but no others have been found that provide the flexibility and the low cost that checklists offer. Surveys also of efficiency but the collected information is biased and require the use of specialized algorithms to remove this subjectivity. The main advantage of checklists is that they can be used to gather both factual information and opinions, and there is evidence that people do try to provide honest information when the confidentiality of their responses is assured.

Audits and assessments conducted with the X:PRIME methodology do not have other characteristics that are important to state at this point. In such verification, the momentum for change will be built during remedial action planning, and mechanisms to achieve this objective are introduced at that point. Under normal circumstances, an audit or an assessment performed with the X:PRIME methodology will typically require the participation of three or four people plus a coordinator to obtain the required information.

Under certain conditions, it could be risky to raise the expectations of personnel before knowing what the findings are going to be. In such cases, audits or assessments can still be performed: first, an initial audit/assessment to take the “pulse” of the project or the

service, and to implement the most pressing remedial actions in order to bring the "pulse" down to an acceptable level; second, a follow-up audit/assessment with a broadened scope.

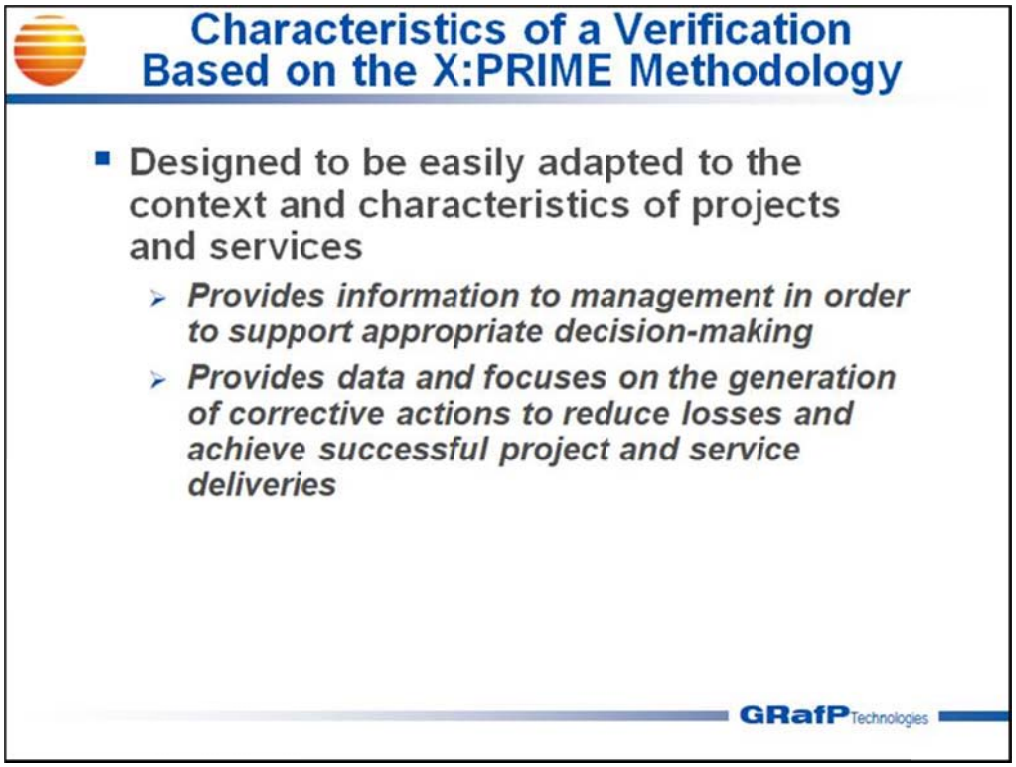


Figure 10 – Characteristics of an audit or assessment performed with the X:PRIME methodology

The first step of an audit or an assessment conducted with the X:PRIME methodology consists of explaining the approach to senior management. In any project or service, audits and/or assessments are necessary but do not constitute activities that are welcome. As a result, they are frequently carried out without rigor and are often short of quality. In addition, the cost of maintaining resources to perform them is high. Therefore, there are many advantages of subcontracting or outsourcing their execution. A subset of the overheads provided in Annex C, of which Figure 10 is a sample, can be used to describe the approach to senior management. Once senior management has been informed of the implications of such an approach, particularly of the necessity to act on the findings even if the audit or the assessment is conducted with limited participation of personnel, an agreement can then be negotiated.

The next step consists in tailoring the two checklists used in the audit or assessment to the context of the examined project or service. For instance, if a project or a service must comply with special standards or internal norms, specific checklists must be prepared, possibly derived from the templates provides in Annexes A and B, or developed from scratch. In this case, the agreement will need to include a checklist definition phase. In a narrower scope, checklists can be developed to evaluate the Likelihood of Experiencing Problems during the delivery/operation of the solution developed as part of the project or during the delivery of the service. This type of verification with the X:PRIME methodology is based on the requirements of the service or of the developed solution and the situations associated with the service or operation of the solution.

The next step usually involves identifying the person who will act as a coordinator to help access artifacts and schedule meetings with project or service team members.

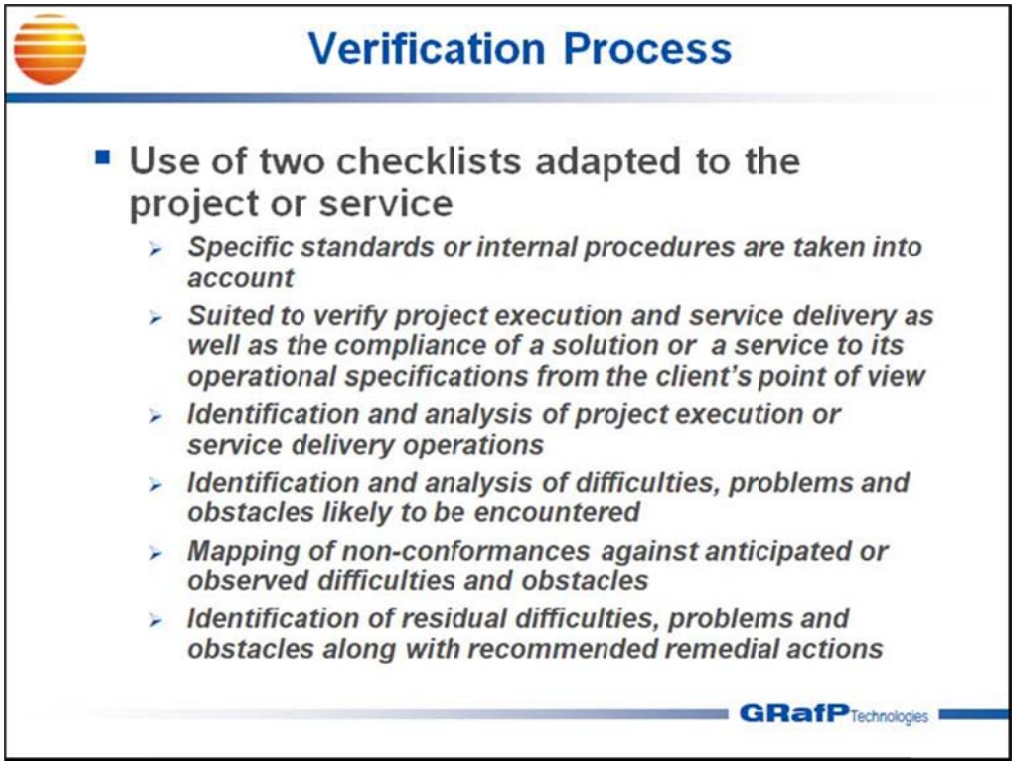


Figure 11 – Summary of an audit or assessment performed with the X:PRIME methodology

After the project or the service work packages have been selected, artifact review and meeting sessions are scheduled with some members of the project or service team.

Usually, during these sessions, only the auditor/assessor and selected participants are involved.

During these meetings and artifact reviews, the auditor/assessor generates observations in the checklists and scores each item on a scale between 0 and 5.

After information has been registered, typically in an Excel spreadsheet, the analysis phase can then be initiated. The results are generated by the auditor/assessor who analyzes them, taking into account his or her knowledge of the project or service and identifies the most important non-conformances, situations likely to deteriorate and recommendations from which remedial actions will be derived. This analysis is performed taking into account the observations that the auditor/assessor recorded during meetings and artifact reviews. Note that sometimes, it may happen that a non-conformance has not been identified even though it is related to a situation liable to deteriorate into major problems. In this case, the auditor/assessor will have to rely on his judgment and the comments collected by the interviewees to identify corrective actions. However, a set of non-conformances can often be combined to address this situation.

After the analysis has been completed, the auditor/assessor will start preparing the audit or assessment findings. This is typically done by extracting non-conformances and situations impacted by these con-compliances, and generating the operational compliance profile and the level of difficulties and obstacles to which the project or the service is exposed. In some cases, further clarification may be required from the participants to interpret correctly specific findings. Review meetings can then be held with participants most likely to have the required information and documentation reviews can be conducted to that effect. This may be followed by the preparation of an assessment report in which those findings can be further elaborated.

The final step consists in presenting the findings to senior management. At times, it may be desirable to present the findings to the project or service team but this should be negotiated as part of the initial agreement with senior management.

The presentation of the findings and the submission of the assessment report, if required, complete the verification phase. The findings constitute the agenda for the interview meetings that will take place for preparing the remedial action plan. During the remedial action planning phase, a particular effort will be made to create a common understanding of what has to be done to address the findings that will have surfaced during the audit or assessment.

For the auditor or assessor, the verification phase represents a 5-day to 10-day effort on site, depending on the magnitude of the project or service and on the need to adapt the checklists or to develop new ones. The effort required to prepare the checklists, format them and analyze the data collected must also be taken into account. The 5- to 10-day effort can therefore be doubled, taking into account that approximately 50% of the additional effort can occur in parallel with the onsite audit or assessment activities.

Chapter 6

Step 1: Awareness, Selection and Tailoring

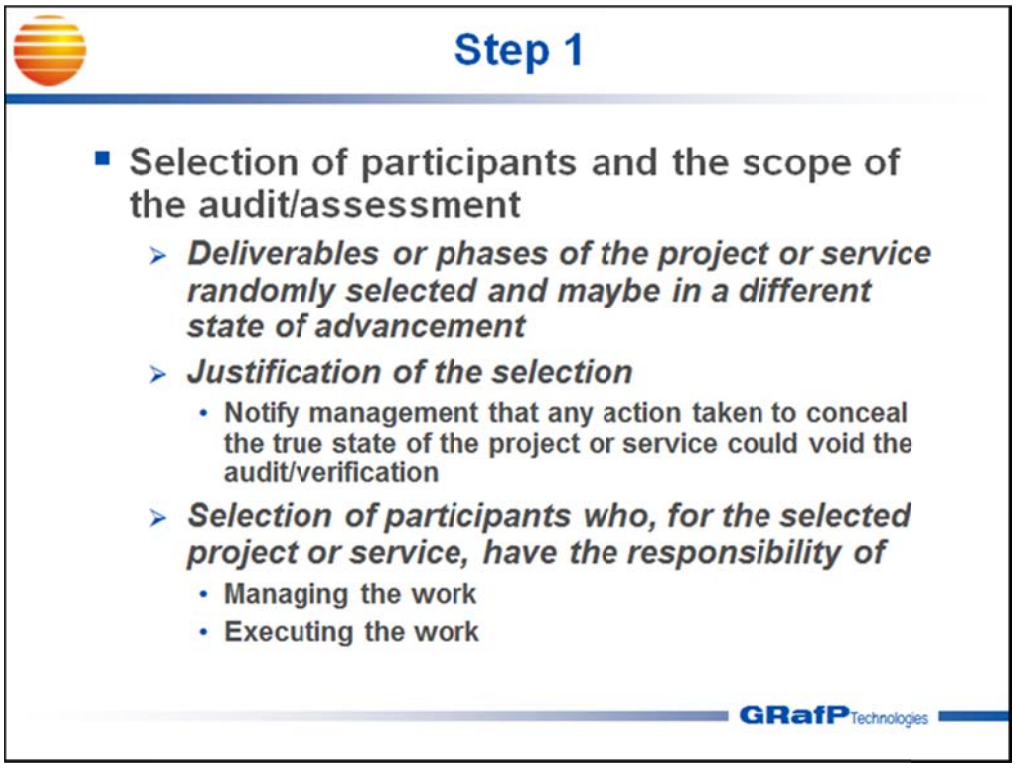


Figure 12 – First step of audits/assessments performed with the X:PRIME methodology

This chapter presents the first step of an audit or assessment performed with the X:PRIME methodology, namely the awareness of senior management, the scope selection of the project or service to be audited or assessed, along with identification of participants, and the tailoring of the checklists to the particularities of the project or the service.

Awareness of senior management

The initial step of an audit or assessment conducted with the X:PRIME methodology consists of obtaining the authorization to proceed from senior management. This authorization will take the form of a contract or an agreement, as appropriate, with the sponsor who can be a manager in the organization where the audit/assessment will take place or the client's representative.

It is essential to clarify the outcome with senior management before proceeding, as involvement of senior management personnel is essential to the success of the whole exercise. It is recommended that a meeting be held with senior management to present an overview of the audit/assessment, and to discuss any constraints to which the target project or service is currently facing, which would make such an audit or an assessment unwise at that point in time.

Once authorization has been granted, project or service team members should attend an induction session on the focus and scope of the verification. This session generally precedes the selection of personnel who will participate in the interviews. This meeting is important since it allows the auditor/assessor to acquire a better idea of the status of the project or the service he or she has to verify.

The following is a list of items that should be taken into account in connection with the awareness of senior management.

1. In order to present an overview of audits or assessments conducted with the X:PRIME methodology to senior management, it is suggested to use slides 1, 3, 4, 5, 7, 8, 9, 12, 13, 21, 22 and 23. This presentation should last approximately 30 minutes.

2. Remember that senior management personnel are normally busy and that they typically have to dedicate a limited amount of time to a large number of issues. Therefore, go to the point and avoid getting into technical details unless specific questions arise.

3. After the presentation, discuss with senior management any constraints that may preclude the conduct of an audit or an assessment. For example, if personnel are under stress because a critical phase is underway, wait until things are quieter. On the other hand, keep in mind that there will always be a good reason to delay an audit or an assessment, and that one has to make the jump at one point or another, especially if the client requests it or if is needed to secure the client's acceptance of work performed.

4. Discuss with senior management the objective of the verification, expectations they may have and the anticipated use of the findings. Remind senior management that an audit or an assessment conducted with the X:PRIME methodology deals with the most important and structural difficulties and obstacles that the project or service that have an impact on the probability of experiencing significant problems, and not with small daily issues. This is like checking the foundations of a house, its plumbing, its roof and its electrical wiring; not the color of the rooms or the size of the windows. If the roof is found to be leaking, it will have to be repaired; the audit/assessment phase of the assessment will provide recommendations to that effect and those will have to be implemented as part of the remedial action plan.

5. If senior management personnel wish to create a momentum for change, then they will have to be actively involved during the preparation phase to inform personnel of what is coming up.

6. Stress that only consolidated results will be presented. That is, it will not be possible to trace findings back to information provided by specific individuals.

7. Finally, point out that an audit or an assessment performed with the X:PRIME methodology does not provide a maturity level, to use an expression currently

widespread. However, both result in a rating that gives senior management the perspective that the customer will eventually gain or the information that the client wishes to be provided about the likelihood of experiencing problems liable to prevent the project or service from being successful. Ideally, the objective is to ensure that such perspective is acceptable and on the contrary, to improve it before it is communicated to the client. Expressed differently, it can be said that "forewarned is forearmed". Otherwise, if the audit or assessment results communicated to the client indicate that the project or the service is unlikely to be completed or provided successfully, then it will be necessary to demonstrate that required remedial actions will implemented.

Selection of the verification scope and selection of participants

The following step of an audit or assessment with the X:PRIME methodology is to establish the scope of the examined project or service and the potential participants in the verification. It is essential that care be taken in the selection process, since this will constitute the sample on which the verification results will be based. The analysis assumes that the sample is both representative of the project or the service being assessed.

Participants in the audit or the assessment are either managers (e.g. project or service managers, functional managers, etc.) or team leaders (e.g. personnel assigned the responsibility of a subset of deliverables), and practitioners (e.g. test personnel, personnel assigned to quality assurance, developers, system engineers or system architects, consultants, service representatives, etc.) involved in the examined project or service.

The following is a list of items that should be taken into account in connection with the scope selection of the examined project or service and the selection of participants.

1. Select four to six random deliverables or phases of the project or service. More could actually be selected, but the verification cost will also be higher. Experience has shown that this range will provide fairly accurate results.

2. The deliverables or phases may be in different stages of execution. Recently completed deliverables or phases are acceptable, as well as those that have just

been initiated. However, the set of selected deliverables or phases ideally should span the entire project or service life cycle.

3. Two or more resources of the selected project or service should participate in order to allow the auditor or assessor to collect as much information as possible during artifact reviews and interviews, with the objective of reliably characterizing each operation and each situation of the checklists.

4. Participants in the audit or assessment should include managers or team leaders and practitioners/professionals in order to generate a global and accurate perspective of the work performed or planned to be carried out.

5. Managers or team leaders may request that they be the ones selected to participate in the audit or assessment but this is not encouraged. There may be situations where practitioners/professionals may not be qualified to provide information on topics such as planning, progress monitoring and administration. Likewise, there may be situations where managers and team leaders may not be qualified to provide information on technical or specialized topics.

6. Be prepared to substantiate the selection of deliverables and phases of the examined project or service, along with the selection criteria, especially if management is involved in this step.

Awareness of participants

The following is a list of items that should be taken into account in connection with the awareness of participants in the audit or assessment.

1. It is suggested to conduct an awareness session in which participants selected to provide information should attend. The purpose of this session is to explain the verification process and the details of their involvement. The participation of senior management, which is also encouraged, is to demonstrate, for the project or service and for the organization, the importance of the audit or assessment and the need for participants to collaborate.

2. If it is not the first time an audit or assessment is conducted with the X:PRIME methodology, the awareness session can be skipped or reduced.

3. It is recommended to use slides 1, 7, 9, 14, 15, 16, 17, 18 and 19 of Annex C for the awareness session of a first audit or assessment. It should also include a presentation of the scope of the verification and what is expected of the participants.

4. The awareness session also provides an opportunity to become familiar with the terminology used in the project or in the service. The session can also give the chance to participants of presenting themselves and a description of their involvement in the project or service. This will greatly facilitate the data analysis later on in order to generate findings and to recommend remedial actions.

5. Stress that only consolidated results will be presented. That is, it will not be possible to trace responses back to specific individuals.

6. Do not underestimate the threatening impression that certain participants may have of such an audit or assessment. Keep in mind that the project or the service may have initiated similar efforts in the past, which ended in failure. It may therefore be desirable to have senior management introduce the awareness session to alleviate some of those concerns.

9. Finally, do not underestimate the might of the rumor mill and the detrimental effects it may have in the project or service, and in the organization. Be sure to control the information that will filter out of the audit or assessment.

Tailoring the checklists

Audits or assessments conducted with the X:PRIME methodology rely on predefined models instantiated in checklists. Annexes A and B include two checklists to perform audits or assessments of development and maintenance projects or services. Models are usually simplified representations of reality; therefore, it is essential that they be adapted to the project and the service. This section describes some of the points that should be

taken into account when adapting the checklists so as to remain consistent with the examined project or service.

Adapting the questionnaires can be done via two approaches: by tailoring out some areas or categories from the checklists, some items of each area or category or by editing specific items to make them more meaningful given the environment in which the project or the service takes place. One must be careful that the editing is done so as not to change the intent of the items of each operations area or situations category. The rationale provided for each item of the checklists in chapters 7 and 8 can be used as an aid to carry out this tailoring. The adaptation includes assigning a level of importance for each area/category and each item, as shown in Annexes A and B, on a scale from 1 (Low) to 5 (High).

The terminology in the checklists is reasonably clear, but the different organizational structures, cultures, process implementations, technologies, methodologies, etc., mean that it is necessary to map the concepts addressed in each item of each area/category to specific methodologies and technologies of the project or service. Recasting the checklists in the language of the project or service can significantly contribute to the quality of the audit or assessment and their results. However, this should not be carried too far since there is a risk of providing the answer with the checklists items. By and large, it is preferable to tailor the checklists to make them understandable by the participants, using the terminology they are used to, without getting too specific. At times, little adaptation is required when the terminology used in the checklists is basically the same as the one used in the examined project or service.

In different domains of development and maintenance, or different fields altogether, the auditor or assessor will need to develop the checklists with the guidance provided in Annex D.

The following is a list of items that should be taken into account in connection with the tailoring of the checklists.

1. In the awareness session, take advantage of the opportunity to acquire a better understanding of the project or service, its characteristics and the roles of the participants.

2. It is suggested no to add items in the checklists; they can only be tailored out or modified. If items need to be added, it will be necessary to use the guidance provided in Annex D and more effort will be required to perform the verification.

3. Keep in mind, while tailoring the checklists, that the terms “artifact” and “documented” may take various forms in a project or a service (e.g. electronic mail, notes, memos, checklists, tool, report generated by a tool, etc.). Likewise, procedures may be on-line or in hard-copy format, and may consist of a checklist or a step-by-step description of what or how specific activities have to be performed.

4. Terms such as “periodic” and “as appropriate” may need to be defined or interpreted to be meaningful in a particular environment.

5. For a small organization, say less than 20 people, the operations and operation compliance might be the responsibility of the president of the company. There might not be an independent Quality Assurance group; individuals from other projects might fulfill the quality assurance function as part of a peer review system. However, if the project or service has to meet an industry standard, it is likely that a customer will not accept such a way of performing quality assurance and may expect that quality assurance be under the responsibility of an independent group. Policies, standards, and procedures might be combined into a single, short document, perhaps in a loose-leaf binder or a poster on a wall.

6. Many large organizations integrate multiple environments with very different characteristics. There are often small project environments within a large organization that have more in common with a small company environment than they have with large project or service environments within their own organization.

7. In commercial environments, the terms “customer” and “user” need to be translated into something meaningful. For example, the single customer contract that specifies the system requirements might refer to the analysis performed by the marketing department specifying the desired product or service features and functionality.

8. “Group” may mean a team, an individual or a department.

Chapter 7

Step 2: Checklist of Desirable and Undesirable Operations

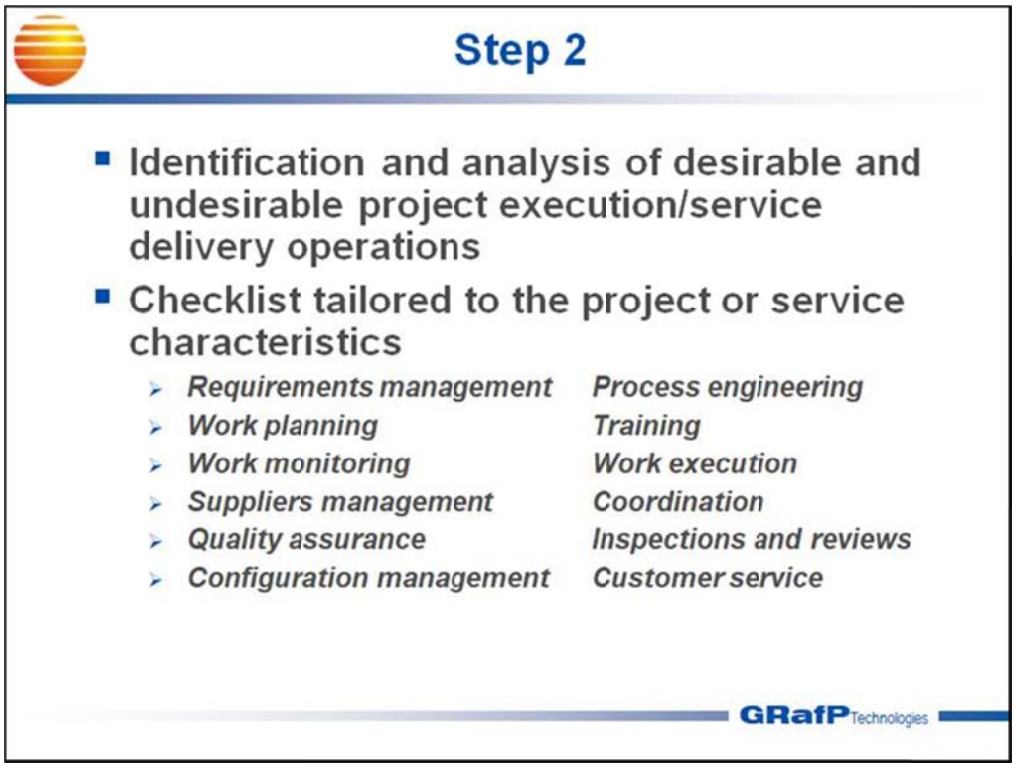


Figure 13 – Operations areas checklist example

The second step of an audit or an assessment with the X:PRIME methodology consists in using the checklist of desirable and undesirable operations adapted to the context of the examined project or service. The auditor/assessor rates each item on a scale between 0 and 5 using the checklists and generates observations to justify the assigned value.

The following list enumerates the aspects that should be taken into account when using the checklist of desirable and undesirable operations.

1. Introduce yourself and the assessment coordinator, who is from the organization, project or service where the audit or assessment is taking place, and who is essentially responsible for the logistical aspects of the verification.
2. Prior to initiating the audit or the assessment, it is recommended to present to the coordinator the operations areas that need to be examined so that he or she can identify the artifacts related to those categories and the participants who will participate in the interviews to supplement the information acquired by the review of the artifacts.
3. Among the artifacts most useful for the checklist of desirable and undesirable operations are processes, artifacts resulting from project or service execution (documents, emails, meeting minutes, etc.) and demonstrations in the use of methods, standards, procedures and tools.
4. Enter at least one observation that reflects what is being done in the project or service. Identify the artifact and/or the interviewee(s) from which collected information support the text of the observation. The execution of previous projects or service deliveries can be used to evaluate an operation relevant to the examined project or service, but that has not yet been implemented.
5. From the entered observations, use the following scale to assign a value to the examined observation:
    a) 5 (Strongly Agree) – In total agreement with the description of the operation.
    b) 4 (Agree) – In agreement with the description of the operation.

c) 3 (Somewhat Agree) - More in agreement than in disagreement with the description of the operation.

d) 2 (Somewhat Disagree) - More in disagreement than in agreement with the description of the operation.

e) 1 (Disagree) - In disagreement with the description of the operation.

f) 0 (Strongly Disagree) – In total disagreement with the description of the operation.

The following values can be used to characterize the examined operation. In this case, the affected operations will not have an impact on the level of compliance until they are resolved.

g) Out of domain - You do not have all the information to qualify an operation because it is not in your field of expertise or in the participants' field of expertise.

h) Unknown - You do not have all the information to qualify an operation within your area of expertise or in the participants' field of expertise.

i) Not Applicable - Does not apply to the examined project or service.

6. You can notify interviewees that they may be contacted later, if necessary, in order to obtain additional information to interpret the audit's or the assessment's results. If this happens, the necessary arrangements will be made with the verification coordinator.

7. You may also tell the participants that the results will be presented to them as soon as they are available. However, make sure that you have cleared that with senior management beforehand and that it is part of the agreement you have negotiated.

8. Don't underestimate the urge of interviewees to find out the results. They will come back either to you or to the coordinator later on to find out. Again, you should have negotiated with senior management something to that effect.

9. Finally, do not underestimate the curiosity of those who did not participate in the audit or in the assessment. This may turn into a pressing issue if it has not been addressed by senior management beforehand.

Checklist items and justifications with respect to operations

Items pertaining to desirable and undesirable operations are listed hereinafter. An elaboration in terms of benefits of implementing the operation or avoiding it follows each statement. This elaboration is also provided as a help to the auditor or assessor during the awareness sessions and the tailoring of the operations checklist.

Operations related to requirements management

The purpose of this category of operations consists in establishing a common understanding, between the party issuing the requirements (e.g. the customer, the marketing department, the program manager, etc.) and the project or service team, of the requirements that will be addressed by the project or the service.

1.1 The project or service team participates in the review of the requirements before they are incorporated into the project or the service.

If the project or service team participates in the review of the requirements before they are incorporated into the project or the service, then the team will be better prepared to identify incomplete or missing requirements, to determine their feasibility, their clarity, their testability and their coherence, to identify needed changes, and to negotiate commitments with other groups participating in the effort. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

1.2 The requirements used as the starting point for planning the project or the service.

If the requirements are used as the starting point for planning project or service activities, then the team will be better prepared to develop meaningful plans that focus on the work to be accomplished. The project or service team members, on

the other hand, will be able to develop a more accurate understanding of the project or service objectives. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

1.3 The requirements used as the starting point for developing or delivering the items included in the project or the service (e.g. working documents, detailed documentation, user documentation).

If the requirements are used as the starting point for developing or delivering the items included in the project or the service (e.g. working documents, detailed documentation, user documentation), then it will enable the project or service team to focus its effort on developing or delivering items that satisfy those requirements and to reduce costly rework. The organization will then be in a better position to deliver products that satisfy the customer/users within budget and on schedule.

1.4 The requirements used as the starting point for support activities (other than the executing the project or delivering the service itself, e.g. formal version control) for the project or the service.

If the requirements are used as the starting point for support activities (other than the executing the project or delivering the service itself, e.g. formal version control) needed by the project or the service, then it will enable the project or service team to carry out its work more efficiently and the team members to perform closer to their potential, while reducing the likelihood of wasted time and effort on their part. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

1.5 Changes to the requirements are reviewed.

If changes to the requirements are reviewed, then the project or the service team will avoid potentially serious difficulties by giving the team members the

opportunity to assess the impact of those changes on current commitments, to evaluate the risk of proceeding with their implementation, and to negotiate new commitments if required. The organization will then benefit from a better coordination of its activities with other groups participating in the effort and will face better odds of delivering quality products within budget and on schedule.

1.6 Approved modifications are incorporated into the project or the service.

If approved modifications are incorporated into the project or the service, then the team will then be in a better position to ensure that approved modifications are not left out or overlooked, and to be able to track them to completion. The organization, in turn, will gain a better confidence in the quality of the products it delivers.

1.7 There is a documented organizational policy establishing how requirements must be addressed.

If there is a documented organizational policy establishing how requirements must be addressed, then it will help senior management clarify its expectations regarding requirements and establish a common vision to that effect in the project, in the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how the requirements are to be addressed. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

1.8 The responsibilities for analyzing and managing requirements have been assigned to a specific individual or group.

If the responsibilities for analyzing and managing requirements are assigned to a specific individual or a specific group, then this will ensure that requirements and changes to requirements are properly addressed as personnel responsible for this task will presumably have more time to dedicate to it and will have a better overview of the topic. The project or service team will benefit from a source of expertise in an area critical to the success of the project or delivery of the service.

The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule, especially if mechanisms are in place to spread the core of that expertise to other project or service team members.

1.9 Personnel assigned to the analysis and management of requirements have received training to fulfill the needs of the project or the service.

If personnel assigned to the analysis and management of requirements are trained to fulfill the needs of the project or the service, then it will ensure that personnel assigned to this task have sufficient knowledge of the application domain, of requirements analysis techniques and of the process adopted by the team to perform its work, in order to maximize their efficiency at fulfilling their responsibilities. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of avoiding costly rework and of delivering quality products and services to the customer/users.

1.10 Requirements are documented and available to the personnel directly and indirectly involved in the project or the service.

If the requirements are documented and available to the personnel directly and indirectly involved in the project or the service, then it will enable the team members to gain better insight into the intended end product or service, and to increase the likelihood of identifying incomplete or missing requirements, incoherence between requirements and unfeasible requirements. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule.

1.11 The status of requirements analysis and management activities is measured and communicated to the appropriate personnel.

If the status of requirements analysis and management activities is measured and communicated to the appropriate personnel, then it will enable the project or service team members to be more efficient at coordinating their activities and to

avoid making assumptions that result in costly rework, while providing management with progress status and with the information required to improve the planning and estimating of future requirements management activities and future projects and services. The organization, in turn, will face better odds of delivering within budget and on schedule and will be better equipped to improve its overall performance.

1.12 There is a point of contact for negotiating with the customer or the suppliers regarding the requirements.

If there is a point of contact for negotiating with the customer or the suppliers regarding the requirements, then it will enable the project or service team to streamline questions, clarifications and information requests through an individual or a group more apt to establish a good working relationship with the customer or the suppliers, thereby reducing the risk of obtaining conflicting data from several sources and reducing the likelihood of wasted time and effort on the part of the team members. The organization will then benefit from a better coordination of its activities and will face better odds of delivering quality products and services.

1.13 There is a mechanism for personnel directly or indirectly involved in the project or the service to propose modifications to the requirements or to suggest alternatives.

If a mechanism is available for personnel directly or indirectly involved in the project or the service to propose modifications to the requirements or to suggest alternatives, then the project or service team members will have better opportunities to clarify their understanding of the requirements while increasing the likelihood of achieving buy-in on the part of the team. The organization will benefit from a potential increase in productivity, possible innovative solutions and increased odds of delivering quality products and services.

1.14 Personnel assigned to quality assurance are involved in verifying that the requirements management activities and results satisfy the standards and procedures applicable to the project or the service.

If personnel assigned to quality assurance are involved in verifying that the requirements management activities and results satisfy the standards and procedures applicable to the project or the service, then the team, and particularly personnel having the responsibilities of analyzing and managing requirements, will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of a possible lack of confidence in the team's adherence to a previously agreed upon process. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

1.15 Tools (e.g. word processors, databases, spreadsheets) are available to carry out requirements management activities.

If tools (e.g. word processors, databases, spreadsheets) are available to carry out requirements management activities, then it will enable personnel having the responsibility of analyzing and managing requirements to have a better control over the requirements and over the changes to those requirements, and to measure and communicate the status of requirements management activities more effectively. The organization will be in a better position to ensure that the delivered products and services will be accepted by the customer/users.

1.16 Tools used to carry out requirements management activities are adequate.

If it is ensured that tools (e.g. word processors, databases, spreadsheets) available to carry out requirements management activities are adequate, then it will enable personnel having the responsibilities of analyzing and managing requirements to achieve a better productivity level and to reduce the amount of wasted time and effort resulting from the use of inadequate tools. The organization, in turn, will be in a better position to deliver within budget and on schedule.

1.17 The requirements management activities and results are reviewed with management.

If the requirements management activities and results are reviewed with management, then the project tor service team members, and particularly personnel having the responsibilities of analyzing and managing requirements, will have the opportunity to request specific support from management, to voice concerns on particular requirements management issues and to be informed of events or decisions that may affect them. Management, on the other hand, will gain a more precise idea of the project or service delivery status and will be in a better position to make the right decisions at the right time. The organization will benefit from a better coordination of its activities, and will be in a better position to deliver within budget and on schedule.

Operations related to work planning

The purpose of category of operations consists in establishing reasonable plans for carrying out and for managing the project or the service.

2.1 The project or service team participates in defining the work to perform (e.g. preparing the project or service proposal in response to a Request for Proposal).

If the project or service team participates in defining the work to perform (e.g. preparing the project or service proposal in response to a Request for Proposal), then the team will be better prepared to identify incomplete or missing requirements, to determine their feasibility, their clarity, their testability and their coherence, to identify needed changes, and to negotiate commitments with other groups participating in the effort. The organization will then benefit from a better coordination of its activities and will face better odds of submitting a successful bid and/or of defining a realistic and feasible project or service.

2.2 The project or service team participates, along with the other affected groups, in planning the overall project or service.

If the project or service team participates, along with the other affected groups, in planning the overall project or service, then the team will be in a better position to generate realistic estimates, to devise feasible implementation approaches and to ensure that plans and anticipated results will match the overall project or service plan and will satisfy its objectives. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

2.3 A life cycle made up of pre-defined stages of manageable size either are identified or defined as part of the planning activities.

If a life cycle made up of pre-defined stages of manageable size either are identified or defined as part of the planning activities, then participants in the project or the service, including the customer, will develop a more precise understanding of the framework in which the work takes place and a visualization of its phases. In addition, it will help the project or service team break down the work into manageable pieces, prepare realistic estimates and develop coherent and achievable plans. The organization, in turn, will benefit from the resulting clarity and will face better odds of delivering within budget and on schedule.

2.4 A work plan is prepared.

If a work plan is prepared, then it will enable the project or service team to coordinate more efficiently the activities that need to be carried out, to communicate the project objectives to all participants more clearly, thereby avoiding costly and time-consuming misinterpretations, and to identify potential problems and inconsistencies beforehand. The organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering within budget and on schedule.

2.5 The work plan is prepared in accordance with a defined process.

If the preparation of the work plan is done in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist, etc.),

then it will enable the project or service team to prepare plans that are more coherent and understandable by all project participants, while helping the group or the individual preparing it to focus on the most important issues. In addition, institutionalizing the preparation of a work plan will be facilitated. The organization, in turn, will be better equipped to extract relevant information from the resulting plan, and to provide more useful feedback on its contents.

2.6 The work plan is documented and available to the personnel directly or indirectly involved in the project or service delivery.

If the project plan is documented and available to the personnel directly or indirectly involved in the project or service delivery, then it will enable the team members to gain better insight into the work to accomplish, the process adopted by the project or the service and the intended end results, while increasing the likelihood of identifying incomplete or missing activities, incoherence between activities and unfeasible tasks. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

2.7 The elements necessary to establish and maintain control of the work are identified.

If the elements necessary to establish and maintain control of the work are identified, then the project or service team members will benefit from an identification of intermediate products or services to deliver and activities to complete that will help establish a common understanding of what needs to be accomplished. Management will be in a better position to manage the effort more efficiently and other project participants will be better equipped to plan their own activities more effectively. The organization, in turn, will face better odds of delivering within budget and on schedule.

2.8 Cost and effort estimates are prepared.

If cost and effort estimates are prepared, then it will enable the project or service team to prepare realistic plans that take into account the available resources and the work to accomplish broken down into manageable pieces, and to anticipate the need for additional resources or potential problems. Management will be able to assess more effectively the financial and schedule risks associated with the effort, to devise alternative courses of action and to track progress of the work. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

2.9 Cost and effort estimates are derived in accordance with a defined process.

If the preparation of cost and effort estimates is done in accordance with a defined process, which could take several forms (e.g. a checklist, a group mechanism to validate the estimates, etc.), then it will enable the project or service team to prepare estimates that are more coherent and closer to the actual cost and effort, while helping the group or the individual preparing them to focus on the most important issues. In addition, institutionalizing the preparation of cost and effort estimates will be facilitated. The organization, in turn, will have access to more reliable figures and will be better equipped to prepare usable strategic plans.

2.10 A work schedule is prepared.

If a work schedule is prepared, then it will enable the project or service team to prepare realistic plans that take into account the estimated cost and effort and to anticipate delivery problems. Management will be able to assess more effectively the schedule risks associated with the effort, to devise alternative courses of action and to track progress of the work. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

2.11 The work schedule is derived in accordance with a defined process.

If the preparation of a work schedule is done in accordance with a defined process, which could take several forms (e.g. the use of an automated tool, a mechanism to translate cost and effort into a schedule and to validate the end result, etc.), then it will enable the project or service team to prepare a schedule that is more meaningful and closer to the reality, while helping the group or the individual preparing it to focus on the most important issues. In addition, institutionalizing the preparation of a work schedule will be facilitated. The organization, in turn, will have access to more reliable information and will be better equipped to prepare usable strategic plans.

2.12 The risks associated with the cost, the resources, the schedule and other technical aspects of the work are identified and evaluated.

If the risks associated with the cost, the resources, the schedule and other technical aspects of the work are identified and evaluated, then it will enable the project or service team to identify potential problems and to minimize the expected occurrence of disruptive crises. Management will be able to devise alternative courses of action and to track the status of those risks. The organization, in turn, will be in a better position to avoid or to take into account undesirable resource and time-consuming situations, and will face better odds of delivering within budget and on schedule.

2.13 The risks associated with the cost, the resources, the schedule and other technical aspects of the work are documented.

If the risks associated with the cost, the resources, the schedule and other technical aspects of the project are documented, then it will enable the project or service team members to gain better insight into the difficulties facing the project, and to increase the likelihood of identifying incomplete or missing risks and to come up with possible risk-reducing solutions. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule.

2.14 The plans related to the development or the acquisition of auxiliary resources (e.g. equipment, software applications) and support tools necessary for performing the work are prepared.

If plans related to the development or the acquisition of auxiliary resources (e.g. equipment, software applications) and support tools necessary for performing the work are prepared, then it will enable the project or service team to communicate the approach for acquiring specific resources more clearly to all participants, thereby avoiding costly and time-consuming duplication of effort, to identify potential problems and inconsistencies beforehand, and to carry out its work more efficiently. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

2.15 Work planning data are recorded.

If work planning data are recorded, along with the contextual information required to interpret that data, then it will enable the project or service team to reconstruct the estimates and to assess their reasonableness, while providing management with the information required to improve planning and estimating future activities and projects or services. The organization, in turn, will face better odds of delivering within budget and on schedule and will be better equipped to improve its overall performance.

2.16 There is a documented organizational policy establishing how work planning must be carried out.

If there is a documented organizational policy establishing how work planning must be carried out, then it will help senior management clarify its expectations regarding work planning and establish a common vision to that effect either in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how work planning is to be performed. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

2.17 The responsibilities for preparing the work plan been have assigned to a specific individual or group.

If the responsibilities for preparing the work plan are assigned to a specific individual or a specific group, then this will ensure that the project or service plan and its associated elements are properly addressed as personnel responsible for this task will presumably have more time to dedicate to it and will develop a better understanding of the issues. The project or service team will benefit from a source of expertise in an area critical to the success of the project or service delivery. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule, especially if mechanisms are in place to familiarize other team members with the subject.

2.18 Personnel assigned to work planning have received training to fulfill the needs of the project or the service.

If personnel assigned to work planning have received training to fulfill the needs of the project or the service, then it will ensure that personnel assigned to this task have sufficient knowledge of planning techniques, of planning issues that need to be taken into account and of the process adopted by the project or service team to perform its work, in order to maximize their efficiency at fulfilling their responsibilities. The project or service team will benefit from a source of expertise in an area critical to the success of the project or service delivery. The organization, in turn, will have access to more reliable plans in preparing usable strategic plans and will face better odds of delivering within budget and on schedule.

2.19 The status of work planning activities is measured and communicated to the appropriate personnel.

If the status of work planning activities is measured and communicated to the appropriate personnel, then this will enable the project or service team members to be more efficient at coordinating their activities, thereby avoiding wasting time

and effort in unproductive tasks, while providing management with progress status and with the information required to improve estimating future project or service planning activities. The organization, in turn, will face better odds of delivering within budget and on schedule and will be better equipped to improve its overall performance.

2.20 There is a mechanism for personnel directly or indirectly involved in performing the work to propose modifications to the plan or to suggest alternative approaches to its implementation.

If a mechanism is available for personnel directly or indirectly involved in performing the work to propose modifications to the plan or to suggest alternative approaches to its implementation, then the project or service team will have better opportunities to clarify its understanding of the planned activities and of their expected outcome, while increasing the likelihood of achieving buy-in on the part of the team members. The organization will benefit from a potential increase in productivity, possible innovative solutions and increased odds of delivering quality products and services within budget and on schedule.

2.21 Commitments made to the customer and suppliers are reviewed with senior management.

If commitments made to the customer and suppliers are reviewed with senior management, then it will enable senior management to be aware of the issues facing the project or the service while preventing the team from agreeing to commitments without having all the information in hand. The organization, in turn, will be in a better position to avoid or to take into account undesirable resource-consuming and time-consuming situations, and will face better odds of delivering within budget and on schedule.

2.22 Commitments made to the customer and suppliers are reviewed in accordance with a defined process.

If the review with senior management of commitments made to the customer and suppliers is done in accordance with a defined process, then this will enable the project or service team to be aware of the steps to take before making such commitments, and to conduct these reviews more efficiently. In addition, institutionalizing the review with senior management of commitments made to the customer and suppliers will be facilitated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

2.23 Individuals and groups directly or indirectly involved in performing the work are informed of commitments that affect them.

If individuals and groups directly or indirectly involved in the work are informed of commitments that affect them, then the project or service team will be in a better position to coordinate its activities and to avoid resource contention problems. The project or service team members, in return, will be more sensitive to the need of informing management of the work status and of events that could affect the organization. As a result, the organization will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

2.24 Tools (e.g. databases, spreadsheets, specialized applications) are available to carry out work planning activities.

If tools (e.g. databases, spreadsheets, specialized applications) are available to carry out work planning activities, then this will enable personnel having the responsibility of planning the project or the service to have better control over the various interactions between participants and between activities, and to measure and communicate the status of work planning activities more effectively. The organization, in turn, will be in a better position to have access to up-to-date information for coordinating its activities.

2.25 Tools to carry out work planning activities are adequate.

If it is ensured that tools available to carry out work planning activities are adequate, then this will enable personnel having the responsibilities of planning the project or the service to achieve a better productivity level and to reduce the amount of wasted time and effort resulting from the use of inadequate tools. The organization, in turn, will benefit from access to more useful and timely information.

2.26 Personnel assigned to quality assurance are involved in verifying that the work planning activities and results satisfy the standards and procedures applicable to the project or the service.

If personnel assigned to quality assurance are involved in verifying that the work planning activities and results satisfy the standards and procedures applicable to the project or the service, then the project or service team, and particularly personnel having the responsibility of planning the work, will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of a possible lack of confidence in the team's ability to adhere to the process it has adopted. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

2.27 The work planning activities and results are reviewed with management.

If the work planning activities and results are reviewed with management, then the project or service team members, and particularly personnel having the responsibility of planning the work, will have the opportunity to request specific support from management, to voice concerns on particular planning issues and to be informed of events or decisions that may affect them. Management, on the other hand, will gain a more precise idea of the project or service status and will be in a better position to make the right decisions at the right time. The organization will benefit from a better coordination of its activities, and will be in a better position to deliver within budget and on schedule.

Operations related to work monitoring

The purpose of this category of operations consists in establishing adequate visibility into actual progress achieved in the project or service delivery so that management can take effective actions when the performance deviates significantly from the plans.

3.1 A plan is used for tracking project or service activities and communicating status.

If a plan is used for tracking project or service activities and communicating status, then it will enable the project or service team to coordinate more efficiently the work activities, to measure progress more objectively and to assess the likelihood of completing the project or the service as planned. Management will be more apt to make informed decisions, and individuals and groups participating in the work will be in a better position to assess the impact on their own activities and products or services. The organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering within budget and on schedule.

3.2 Changes to commitments made to the customer and suppliers are reviewed with senior management.

If changes to commitments made to the customer and suppliers are reviewed with senior management, then this will enable senior management to be aware of the issues facing the project or the service while preventing the team from agreeing to changes in commitments without having all the information in hand. The organization, in turn, will be in a better position either to avoid or to take into account undesirable resource-consuming and time-consuming situations, and will face better odds of delivering within budget and on schedule.

3.3 Changes to commitments made to the customer and suppliers are reviewed in accordance with a defined process.

If the review with senior management of changes to commitments made to the customer and suppliers is performed in accordance with a defined process, then

this will enable the project or service team to be aware of the steps to take before making such changes in commitments, and to conduct these reviews more efficiently. In addition, institutionalizing the review with senior management of changes in commitments made to the customer and suppliers will be facilitated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.4 Individuals and groups directly or indirectly involved in performing the work are informed of changes to commitments that affect them.

If individuals and groups directly or indirectly involved in the work are informed of changes to commitments that affect them, the project or service team will be in a better position to coordinate its activities and to avoid resource contention problems. The team members, in return, will be more sensitive to the need of informing management of the project or service status and of events that could affect the organization. As a result, the organization will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.5 Cost and effort are tracked.

If cost and effort are tracked, then this will enable the project or service team to anticipate either the need for additional resources or potential problems, while avoiding excessive deviations from the planned activities. Management will be able to assess more effectively the likelihood of completing the work as planned, and to devise alternative courses of action if necessary. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

3.6 Corrective actions are taken when cost and effort deviate significantly from their estimates.

If corrective actions are taken when the actual cost and effort deviate significantly from their estimates, this will ensure that problems facing the project or the

service do not deteriorate into crises. The project or service team, on the other hand, will be in a better position to carry out the work in accordance with revised, realistic plans that take into account the currently available resources and the work remaining to be accomplished. The organization will then face better odds of delivering on budget and within schedule, or will be able to negotiate an acceptable solution with the customer/users, in addition to having access to up-to-date information for strategic planning.

3.7 The work schedule is tracked.

If the work schedule is tracked, then this will enable the project or service team to anticipate either the need for additional resources or potential delivery problems, while avoiding excessive deviations from the planned activities. Management will be able to assess more effectively the likelihood of completing the project or the service on schedule, and to devise alternative courses of action if necessary. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

3.8 Corrective actions are taken when the work schedule deviates significantly from the plan.

If corrective actions are taken when the actual work schedule deviates significantly from the planned schedule, then this will ensure that scheduling problems facing the project or the service do not deteriorate into crises. The project or service team, on the other hand, will be in a better position to carry out the work in accordance with a revised, realistic schedule that takes into account both the work remaining to be accomplished and the funding and effort currently allocated to complete it. The organization will then face better odds of delivering on budget and within schedule, or will be able to negotiate an acceptable solution with the customer/users, in addition to having access to up-to-date information for strategic planning.

3.9 Project or service delivery activities (e.g. consulting, analysis, design, construction, testing) are tracked.

If the project's or service's delivery activities (e.g. consulting, analysis, design, construction, testing) are tracked, then this will enable the project or service team to identify unforeseen difficulties and to anticipate the need for additional support, while avoiding excessive deviations from the planned delivery activities. Management will be able to assess more effectively the likelihood of completing the work as planned, and to seek alternative courses of action if necessary. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

3.10 Corrective actions are taken when the project or service delivery activities deviate significantly from the plan.

If corrective actions are taken when progress deviates significantly from the plan, then it will ensure that delivery problems facing the project or the service do not deteriorate into crises. The project or service team, on the other hand, will be in a better position to carry out the work in accordance with a revised, realistic plan that takes into account the delivery activities that have yet to be completed, the current schedule, and the funding and the effort currently allocated to complete them. The organization will then face better odds of delivering on budget and within schedule, or will be able to negotiate an acceptable solution with the customer/users, in addition to having access to up-to-date information for strategic planning.

3.11 Risks associated with the cost, the resources, the schedule and other delivery aspects of the project or the service are tracked.

If the risks associated with the cost, the resources, the schedule and other delivery aspects of the project or the service are tracked, then this will enable the team to assess the evolution of the risks facing the project or the service, to identify new ones and to minimize the likelihood that they materialize. Management will be

able to devise alternative courses of action and to make allowances for those risks that are most likely to occur. The organization, in turn, will be in a better position to avoid or to take into account undesirable resource-consuming and time-consuming situations, and will face better odds of delivering within budget and on schedule.

3.12 Actuals and replanning data relative to the project or the service are recorded.

If actuals and replanning data relative to the project or the service are recorded, along with the contextual information required to interpret that data, then this will enable the project or service team to reconstruct the estimates and to assess their reasonableness, while providing management with the information required to improve planning and estimating future activities and projects or services. The organization, in turn, will face better odds of delivering within budget and on schedule and will be better equipped to improve its overall performance.

3.13 The project or service team periodically holds internal reviews in order to track progress with respect to the established plans.

If the project or service team periodically holds internal reviews in order to track progress with respect to the established plans, then the team members will have the opportunity to gain insight into how work is proceeding and, if necessary, to discuss possible solutions to improve the odds of completing the project or deliver the service on schedule and within budget. Such internal reviews will also allow the project or service team to coordinate its efforts more closely in order to meet the cost and schedule objectives and to document lessons learned.

3.14 The project or service team periodically holds internal reviews in order to track the quality of the work products and deliverables with respect to the established plans.

If the project or service team periodically holds internal reviews in order to track the quality of the work products and deliverables with respect to the established

plans, then the software team members will have the opportunity to gain insight into how work products and deliverables measure up in terms of functionality and number of defects and, if necessary, to discuss possible solutions to improve the odds of delivering quality products and services to the customer/users. Such internal reviews will also allow the project or service team to coordinate its efforts more closely in order to achieve the envisioned quality objectives and to document lessons learned.

3.15 The project or service team periodically holds internal reviews in order to track productivity with respect to the established plans.

If the project or service team periodically holds internal reviews in order to track its performance in carrying out work activities with respect to the established plans, then the team members will have the opportunity to gain insight into how the project or service team measures up in terms of productivity and, if necessary, to discuss possible solutions to increase the odds of improving the team's efficiency and effectiveness. Such internal reviews will also allow the project or service team to coordinate its efforts more closely in order to achieve or exceed the planned productivity level and to document lessons learned.

3.16 The project or service team periodically holds internal reviews in order to track outstanding issues.

If the project or service team periodically holds internal reviews in order to track issues still outstanding in the course of performing the project or service delivery activities, then the team members will have the opportunity to discuss the status of these outstanding issues, to assess possible solutions and to assign the responsibility of monitoring them to closure. Such internal reviews will also allow the project or service team to coordinate its efforts more closely in order to close off action items and to document lessons learned.

3.17 Formal reviews are held at selected milestones during which the accomplishments and results are examined.

If formal reviews are held at selected milestones during which the accomplishments and results are examined, then this will enable the project or service team to get feedback from the customer/users on the products delivered so far and to gain insight into the overall project or service. Senior management, on the other hand, will have the opportunity to assess progress and to impart new directions, resources and funding to the work if required, in order to satisfy the organization's strategic plans. The organization will then be in a better position to coordinate activities currently in progress, to establish priorities and to deliver quality products and services to the customer/users on schedule and within budget.

3.18 Formal reviews of accomplishments and results are conducted in accordance with a defined process.

If the conduct of formal reviews, during which the accomplishments and results are examined, is performed in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist, a step-by-step specification, etc.), then this will enable the project or service team to be aware of the steps to take in order to prepare for these reviews, and to conduct them more efficiently. In addition, institutionalizing the conduct of formal reviews will be facilitated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.19 There is a documented organizational policy establishing how work tracking and oversight must be carried out.

If there is a documented organizational policy establishing how work tracking and oversight must be carried out, then this will help senior management to clarify its expectations regarding work tracking and oversight and establish a common vision to that effect in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how work tracking and oversight is to be performed. The organization, in turn,

will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.20 The roles and responsibilities of the groups and individuals directly and indirectly involved in performing the work have been clearly established.

If the roles and responsibilities of the groups and individuals directly and indirectly involved in performing the work have been clearly established, then this will enable all participants to know who has authority for what, to know who to contact in order to get action on specific issues, and to communicate status and work information at the appropriate level of detail to personnel who can make use of it. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.21 Personnel assigned to work tracking and oversight have received an orientation on the specific delivery aspects of the project or the service.

If an orientation on the specific delivery aspects of the project or the service is provided to personnel assigned to work tracking and oversight, then this will enable personnel responsible for these activities to conduct them in light of the application domain, the technical issues, the process adopted by the project or the service to perform the work and the delivery tasks that need to be carried out. The project or service team members will be in a better position to interpret the progress information communicated to them and to act on it. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

3.22 The responsibility of work tracking and oversight has been assigned to a specific individual or group.

If the responsibility of work tracking and oversight is assigned to a specific individual or a specific group, then this will ensure that work tracking activities are properly carried out as personnel responsible for this task will presumably have more time to dedicate to it and will develop a better understanding of the

issues. The project or service team will benefit from a source of expertise in an area critical to the success of the project or service delivery. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule, especially if mechanisms are in place to familiarize other team members with the subject.

3.23 There is a mechanism for personnel directly or indirectly involved in the project or the service to propose either corrective actions or alternative approaches to its implementation.

If a mechanism is available for personnel directly or indirectly involved in the project or the service to propose either corrective actions or alternative approaches to its implementation, then the project or service team will have better opportunities to discuss its understanding of the status of activities currently in progress and of their expected outcome, while increasing the likelihood of improving buy-in on the part of the team members. The organization will benefit from a potential increase in productivity, possible innovative solutions and increased odds of delivering quality products and services within budget and on schedule.

3.24 Tools (e.g. specialized applications, databases, spreadsheets) are available to carry out work tracking and oversight activities.

If tools (e.g. specialized applications, databases, spreadsheets) are available to carry out work tracking and oversight activities, then this will enable personnel having the responsibility of tracking the project or the service to gain a better understanding of the work status and the possible corrective actions by examining possible scenarios, and to measure and communicate the status of work tracking and oversight activities more effectively. The organization, in turn, will be in a better position to have access to up-to-date information for coordinating its activities.

3.25 The tools or methods used for tracking and oversight facilitate the modification of the work plan when necessary.

If it is ensured that the tools or methods used for tracking and oversight facilitate the modification of the work plan when necessary, then this will enable personnel having the responsibilities of tracking the project or the service to revise the plan with actual performance results and to incorporate corrective actions. The project or service team, on the other hand, will be in a better position to carry out the work in accordance with a realistic plan that takes into account the most current status data. The organization, in turn, will benefit from access to more useful and timely information.

3.26 Personnel assigned to quality assurance are involved in verifying that the work tracking activities and achieved results respect the work plan and satisfy the standards and procedures applicable to the project or the service.

If personnel assigned to quality assurance are involved in verifying that the work tracking activities and achieved results respect the work plan and satisfy the standards and procedures applicable to the project or the service, then the project or service team, and particularly personnel having the responsibilities of tracking progress, will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of a possible lack of confidence in the team's ability to adhere to the process it has adopted. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

Operations related to subcontract management

The purpose of this category of operations consists in selecting qualified subcontractors and managing them effectively.

4.1 The work to be subcontracted is defined and planned.

If the work to be subcontracted is defined and planned, then the project or service team will be better prepared to identify incomplete or missing requirements, to determine their feasibility, their clarity, their testability and their coherence, and to ensure that the work statement transmitted to the supplier and the anticipated results will match the overall work plan and will satisfy its objectives. The organization will then benefit from a better coordination of its activities and will face better odds of obtaining the deliverables it needs and in turn, of delivering within budget and on schedule.

4.2 The work to be subcontracted is defined and planned in accordance with a defined process.

If the definition and planning of the work to be subcontracted is done in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist, etc.), then it will enable the project or service team to prepare a work statement that is more coherent and understandable by the supplier and all participants, while helping the group or the individual preparing it to focus on the most important issues. In addition, institutionalizing the definition and planning of the work to be subcontracted will be facilitated. The organization, in turn, will be better equipped to provide more useful feedback on work statement contents and to avoid costly misinterpretations on the part of the supplier.

4.3 The suppliers are selected according to an evaluation of their ability to perform the work.

If suppliers are selected according to an evaluation of their ability to perform the work, then this will enable the project or service team to be more productive and to focus its efforts on its own activities, without constantly having to check on the supplier and verify its output. The organization will face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule, while reducing the likelihood of having to take on the work that had initially been subcontracted as a result of the supplier’s failure to deliver.

4.4 The evaluation and selection of suppliers is done in accordance with a defined process.

If the evaluation and the selection of suppliers is done in accordance with a defined process, which could take several forms (e.g. a checklist, a spreadsheet, a group mechanism to validate the evaluation and the selection, etc.), then this will help ensure that the process used to evaluate and to select suppliers is consistent, and that deviations can be justified. In addition, institutionalizing the evaluation and the selection of suppliers based on their ability to perform the work will be facilitated. Even if the recommended supplier is not selected, for whatever reason, the organization will be better prepared to assess the risks of selecting a different one.

4.5 The contractual agreements with the suppliers constitute the basis on which the subcontracted effort is managed.

If the contractual agreement with the suppliers is used as a basis to manage the subcontracted effort, then this will enable the project or service team to develop a common understanding of the way to subcontract work and to manage that work, thereby helping prevent the occurrence of conflicting directives originating from different sources being issued to the supplier. Management, in turn, will feel more confident about subcontracting work and will expect fewer undesirable surprises. The organization will then face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.6 A work plan is prepared and submitted by each supplier.

If a work plan is prepared and submitted by each supplier, then this will help the project or service team ensure that the supplier understands the statement of work, the tasks to accomplish and the products that are expected on completion of the subcontract, while allowing the team to coordinate its own activities with those of the supplier. The organization will then face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.7 The work plans submitted by the suppliers are documented, reviewed and approved.

If the work plans submitted by the suppliers are documented, reviewed and approved, then this will enable the project and service team members to gain better insight into the subcontracted work, the process adopted by the supplier and the intended end product or service, while increasing the likelihood of identifying incomplete or missing activities, incoherence between activities and unfeasible tasks. Management will also be more confident that the subcontract satisfies the project or service objectives, and that the supplier's management is aware of the responsibilities it is assuming. The organization will then face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.8 The work plans submitted by the suppliers are used for tracking subcontracted activities and communicating status.

If the work plans submitted by the suppliers are used for tracking subcontracted activities and communicating status, then this will enable the project or service team to coordinate more efficiently its activities with those of the supplier, and from the perspective of both the supplier and the prime contractor, to measure progress more objectively and to assess the likelihood of completing the project or to deliver the service as planned. Management will be more apt to make informed decisions, and individuals and groups participating in the work will be in a better position to assess the impact on their own activities, products and services The organization will then face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.9 Changes to the work statement issued to the suppliers, the contract terms and conditions, or any other commitment are made when necessary.

If changes to the work statement, the contract terms and conditions, or any other commitment are made when necessary and these changes are transmitted to the

supplier, then this will help ensure that the activities of the project or service team are always synchronized with those of the supplier, thereby avoiding costly rework and possible schedule delays. The organization will then face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.10 Changes to the work statement issued to the suppliers, the contract terms and conditions, or any other commitment are made in accordance with a defined process.

If changes regarding the work statement, the contract terms and conditions, or any other commitment are made and are issued to the suppliers in accordance with a defined process, which could take several forms (e.g. approval by senior management, group review to validate that changes are indeed required, etc.), then this will enable the software team to be aware of the steps to take before making such changes, while helping ensure that management is aware that such changes have been properly evaluated beforehand. In addition, institutionalization of managing changes properly will be facilitated. The organization will reduce the likelihood of possible future conflicts with the supplier while facing better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.11 Progress and coordination reviews are held with the suppliers' management personnel.

If progress and coordination reviews are held with the suppliers' management personnel, then management, and particularly personnel having the responsibilities of managing the subcontract, will gain a more precise idea of the status of the subcontracted work, while having the opportunity to voice concerns on particular subcontract issues and to be informed of events or decisions that may affect the organization. Management will then be in a better position to make the right decisions at the right time. The organization will benefit from a better

coordination of its activities, and will face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.12 Suppliers periodically participate with the project or service team in reviews and information exchanges.

If the suppliers periodically participate with the project or service team in reviews and information exchanges, then this will ensure that the team members gain adequate insight into the progress of the subcontracted work, the quality of the work products and deliverables, the difficulties possibly being experienced by the suppliers, and anything else that may have an impact on the project or the service. The organization will benefit from a better coordination of its activities, and will face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.13 Formal reviews are held with the suppliers at selected milestones during which the accomplishments and results are examined.

If formal reviews are held at selected milestones with the suppliers during which the accomplishments and results are examined, then this will enable the supplier to get feedback from the project or service team on the products and services delivered so far, to discuss outstanding issues and to gain insight into the customer's and the users' needs. Senior management from the prime contractor organization, on the other hand, will have the opportunity to assess progress and to determine if its involvement is required. The organization will then be in a better position to coordinate its activities, to establish priorities, to obtain the deliverables it needs and, in turn, to deliver within budget and on schedule.

4.14 Formal reviews are held with the suppliers in accordance with a defined process.

If the conduct of formal reviews with the suppliers at selected milestones, during which the accomplishments and results are examined, is done in accordance with a defined process procedure, which could take several forms (e.g. a checklist of

points to cover, a step-by-step specification, etc.), then this will enable the project team to be aware of the steps to take in order to prepare for these reviews, and to conduct them more efficiently. In addition, institutionalizing the conduct of formal reviews will be facilitated. The organization, in turn, will face better odds of obtaining the information it needs from the reviews and, ultimately, of obtaining the deliverables it expects.

4.15 Personnel assigned to quality assurance are involved in verifying quality assurance activities carried out by the suppliers.

If personnel assigned to quality assurance verify quality assurance activities carried out by the suppliers, then the project or service team and management will be more confident that the supplier respects the work plan and satisfies the standards and procedures applicable to the subcontract. The organization will then be better prepared to respond to queries from the customer/users and will face better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.16 Personnel assigned to configuration management (control and management of components, documentation, etc.) are involved in verifying configuration management activities carried out by the suppliers.

If personnel assigned to configuration management (control and management of components, documentation, etc.) verify configuration management activities carried out by the suppliers, then the project or service team will be more confident that the supplier has its critical work products and service deliveries under configuration management, that changes to those items are controlled, and, if applicable, that the configuration management system of the supplier is compatible with the prime contractor's system. The organization will then be better prepared to maintain the supplier's deliverables, to obtain the deliverables it needs and, in turn, to deliver within budget and on schedule.

4.17 Acceptance tests are performed on the suppliers' deliverables.

If acceptance tests are performed on the suppliers' deliverables, then this will help the project or service team ensure that the delivered items satisfy the work statement, that corrections are made when appropriate and that they can easily be integrated into the product or service to be delivered to the customer/users. The organization will reduce the likelihood of possible future conflicts with the supplier while facing better odds of obtaining the deliverables it needs and, in turn, of delivering within budget and on schedule.

4.18 Acceptance tests of suppliers' deliverables are performed in accordance with a defined process.

If the performance of acceptance tests of the suppliers' deliverables is carried out in accordance with a defined process, which could take several forms (e.g. a step-by-step review of the tests performed by the supplier, an acceptance test procedure prepared by the project or service team, etc.), then this will help ensure that the process followed to accept deliverables from suppliers is consistent, and that deviations can be justified. Management, in turn, will be in a better position to assess the progress of the subcontracted work. In addition, institutionalizing the conduct of acceptance tests will be facilitated.

4.19 The suppliers' performance is periodically evaluated.

If the suppliers' performance is periodically evaluated, then the project or service team, particularly personnel assigned to quality assurance and to the management of suppliers, will develop a better idea of the quality of the work carried out by the supplier and will be better prepared to report issues that senior management should address. Management, on the other hand, will be in a better position to assess objectively whether the organization is facing potential problems with its suppliers. The organization will be better equipped to devise corrective actions, to obtain the deliverables it needs and, in turn, to deliver within budget and on schedule.

4.20 Suppliers' performance evaluations are reviewed with the suppliers.

If the evaluation of the suppliers' performance is reviewed with the suppliers, then this will help ensure that they can take any required remedial actions in order to deliver as planned while enabling them to improve their overall performance. The organization will benefit from dealing with better and more responsive suppliers, while facing better odds of establishing a long term customer/supplier relationship profitable for both parties.

4.21 There is a documented organizational policy establishing how the selection and management of suppliers must be carried out.

If there is a documented organizational policy establishing how the selection and management of suppliers must be carried out, then this will help senior management clarify its expectations regarding the selection and management of suppliers and establish a common vision to that effect in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how the selection and management of suppliers is to be performed. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

4.22 The responsibility for selecting and managing suppliers is assigned to a specific individual or group.

If the responsibility for selecting and managing suppliers is assigned to a specific individual or a specific group, then this will ensure that activities connected with the selection and management of suppliers are properly carried out as personnel responsible for these tasks will presumably have more time to dedicate to it and will develop a better understanding of the issues that may or have come up. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule, especially if mechanisms are in place to familiarize other team members with the subject.

4.23 Personnel responsible for the selection and management of suppliers have received training to fulfill the needs of the project or the service.

If personnel responsible for the selection and management of suppliers are trained to fulfill the needs of the project or the service, then this will ensure that they have sufficient knowledge of contract management procedures, of work management, of selection issues to take into account, and of the process adopted by the project or service team to perform its work, in order to maximize their efficiency at fulfilling their responsibilities. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will benefit from a better pool of suppliers and will face better odds of delivering within budget and on schedule.

4.24 Personnel responsible for the selection and management of suppliers have received an orientation on the delivery aspects of the subcontract(s).

If an orientation on the delivery aspects of the project or the service is provided to personnel assigned to the selection and management of suppliers, then they will be able to conduct the selection and management activities in light of the application domain, the delivery issues, the process adopted by the project or the service team to perform the work, and the delivery activities that need to be carried out. The project or service team members will benefit from more relevant and usable information regarding subcontracted work. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

4.25 The project or service team is informed of the progress of the work performed by suppliers.

If the project or service team is informed of the progress of the work performed by suppliers, then the team will be in a better position to assess the risks of delayed deliveries to its own activities and to devise alternative courses of action, including informing senior management of critical issues or negotiating an

acceptable solution with the customer/users. The organization, in turn, will be better equipped to coordinate its own activities and will face better odds of delivering quality products and services within budget and on schedule.

4.26 There a mechanism for personnel directly or indirectly involved in the project or the service to propose modifications to the suppliers selection criteria.

If a mechanism is available for personnel directly or indirectly involved in the projector the service to propose modifications to the criteria for selecting suppliers, then this will help ensure that future suppliers are more able to perform subcontracted work, based on the opinion of personnel who had first-hand experience with subcontracted products and services. The organization will face better odds of selecting more suitable suppliers and of obtaining deliverables both with fewer defects and possibly at a lower cost.

4.27 Tools (e.g. specialized applications, databases, spreadsheets, work management software packages) are available to carry out the selection and management of suppliers.

If tools (e.g. specialized applications, databases, spreadsheets, work management software packages) are available to carry out the selection and management of suppliers, then this will enable personnel having the responsibility of selecting and managing suppliers to gain a better understanding of the status of the subcontracted work, and to measure and communicate the status of work tracking and oversight activities more effectively. The organization, in turn, will benefit from up-to-date information for coordinating its activities and for establishing priorities.

4.28 Tools to carry out the selection and management of suppliers are adequate.

If it is ensured that tools available to carry out the selection and management of suppliers are adequate, then this will enable personnel having the responsibility of managing the subcontracted work to achieve a better productivity level and to

reduce the amount of wasted time and effort resulting from the use of inadequate tools. The organization, in turn, will benefit from access to more useful and timely information.

Operations related to quality assurance

The purpose of this category of operations consists in providing management and the customer, as appropriate, with suitable visibility into both the process being used by the project or service and the products or services being delivered.

5.1 A quality assurance plan has been prepared for the project or the service.

If a quality assurance plan is prepared for the project or the service, then this will enable the personnel responsible for quality assurance to coordinate more efficiently the quality assurance activities, to communicate the quality assurance objectives more clearly to all participants, thereby avoiding misinterpretations that could constitute a source of friction, and to identify potential problems and inconsistencies beforehand. The organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering quality products and services within budget and on schedule.

5.2 The quality assurance plan has been prepared in accordance with a defined process.

If the preparation of a quality assurance plan is performed in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist, etc.), then this will enable personnel assigned to quality assurance to prepare plans that are more coherent and understandable by all project or service participants, and to focus on the most important issues. In addition, institutionalizing the preparation of a quality assurance plan will be facilitated. The organization, in turn, will be better equipped to extract relevant information from the resulting document, and to provide more useful feedback on its contents.

5.3 Quality assurance activities are carried out in accordance with the plan.

If quality assurance activities are carried out in accordance with the plan, then this will enable personnel assigned to quality assurance to measure progress more objectively and to help assure the customer/users and senior management that the project is satisfying the applicable standards and procedures. Management will be more apt to make informed decisions, and individuals and groups participating in the project or service may be better shielded from outside interference. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

5.4 Personnel assigned to quality assurance participate in the review of the work plan, standards and procedures applicable to the project or service.

If personnel assigned to quality assurance participate in the review of the work plan, standards and procedures applicable to the project or service, then the project or service team will be in a better position to devise plans and implementation approaches that have an improved likelihood of being accepted by the customer/users and by senior management, and to ensure that plans and anticipated results will match the overall project or service plan and will satisfy quality objectives. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

5.5 Personnel assigned to quality assurance review project or service delivery activities to verify their compliance with the applicable plans, standards and procedures.

If personnel assigned to quality assurance review project or service delivery activities to verify their compliance with the applicable plans, standards and procedures, then this will help attest to all participants in the project or the service, including the customer/users, that the project or service team members adhere to the agreed upon process, that deviations are identified, documented and tracked to closure, and that corrections are verified. The organization will then be

in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

5.6 Personnel assigned to quality assurance review project or service deliverables to verify their compliance with the requirements as well as with the applicable plans, standards and procedures.

If personnel assigned to quality assurance review project or service deliverables to verify their compliance with the requirements as well as with the applicable plans, standards and procedures, then this will help attest to all participants in the project or the service, including the customer/users, that the deliverables are verified before being transmitted to the customer/users, that deviations are identified, documented and tracked to closure, and that corrections are verified. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

5.7 Personnel assigned to quality assurance report their activities to other groups involved in the project or the service.

If personnel assigned to quality assurance report their activities to other groups involved in the project or service, then this will help ensure that these groups are aware of outstanding deviations so that corrective actions can be formulated and implemented. The organization will then be in a better position to coordinate its activities and will increase the odds of delivering products and services that satisfy the customer/users within budget and on schedule.

5.8 Non-compliant items are documented.

If non-compliant items are documented, then this will ensure that they can be reviewed, tracked and appropriately resolved. The project or service team and management personnel will then be in a better position to assess the level of adherence to the applicable plans, standards and procedures and to judge the quality of the resulting products or services. The organization will then face better

odds of delivering products and services that satisfy the customer/users within budget and on schedule.

5.9 Non-compliant items are addressed in accordance with a defined process.

If non-compliant items are addressed in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist of points to cover, a step-by-step specification on how to address them, etc.), then this will enable the originators to create non-conformance reports that are more coherent and understandable by all project or service participants, and the project or service team to be aware of the steps to take in order to resolve them. In addition, institutionalizing the treatment of non-compliant items will be facilitated. The organization will then face better odds of delivering products and services that satisfy the customer/users.

5.10 If need be, personnel assigned to quality assurance periodically review their activities and findings with the customer's quality assurance personnel.

If personnel assigned to quality assurance periodically review their activities and findings with the customer's quality assurance personnel, then this will help identify problems and inconsistencies beforehand while assuring the customer/users and senior management that the project or service is satisfying the applicable standards and procedures. The organization will then face better odds of delivering products and services that satisfy the customer/users within budget and on schedule.

5.11 There a documented organizational policy establishing how quality assurance must be carried out.

If there is a documented organizational policy establishing how quality assurance must be carried out, then this will help senior management clarify its expectations regarding quality assurance and establish a common vision to that effect in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how quality assurance

is to be performed and on its benefits. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

5.12 The responsibilities of quality assurance have been assigned to a specific individual or group.

If the responsibility of quality assurance is assigned to a specific individual or a specific group, then this will help ensure that quality assurance activities are properly carried out as personnel responsible for this task will presumably have more time to dedicate to it, will have the appropriate skills and will develop a better understanding of the issues that may or have come up. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule, especially if mechanisms are in place to familiarize other team members with the subject.

5.13 Personnel assigned to quality assurance have received training to fulfill the needs of the project or the service.

If personnel assigned to quality assurance are trained to fulfill the needs of the project or the service, then this will ensure that they have the particular skills needed to perform this task, sufficient knowledge of the work statement and of the contract terms and conditions, and of the process adopted by the project or service team to perform its work, in order to maximize their efficiency at fulfilling their responsibilities. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of delivering quality products and services within budget and on schedule.

5.14 Personnel assigned to quality assurance have received an orientation on the delivery aspects of the project or the service.

If an orientation on the delivery aspects of the project or he service is provided to personnel assigned to quality assurance, then this will enable personnel responsible for these activities to conduct them in light of the application domain, the contract particularities, the process adopted by the project or the service to perform the work, the delivery activities that need to be carried out and the expected products and services. The project or service team members will be in a better position to interpret the reported non-conformances and to act on them. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

5.15 Personnel directly or indirectly involved in the project or the service have received an orientation on the roles and responsibilities of personnel assigned to quality assurance.

If an orientation is provided to personnel directly or indirectly involved in the project or the service on the roles and responsibilities of personnel assigned to quality assurance, then this will help reduce from the onset the resistance to quality assurance usually found in a project or a service and identify how the team can take advantage of the services provided by personnel assigned to quality assurance. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of delivering quality products and services within budget and on schedule.

5.16 Tools (e.g. specialized applications, databases, spreadsheets) are available to carry out quality assurance activities.

If tools (e.g. specialized applications, databases, spreadsheets, work management software packages) are available to carry out quality assurance activities, then this will enable personnel having the responsibility of these activities to track deviations and implemented corrective actions more efficiently, to gain a better understanding of their status, and to measure and communicate the status of quality assurance activities more effectively. The organization, in turn, will

benefit from up-to-date information for coordinating its activities and for establishing priorities.

5.17 Tools to carry out quality assurance activities are adequate.

If it is ensured that tools available to carry out quality assurance activities are adequate, then this will enable personnel assigned to quality assurance to achieve a better productivity level, to maintain proper quality records and to reduce the amount of wasted time and effort resulting from the use of inadequate tools. The organization, in turn, will benefit from access to more useful and timely information.

5.18 The quality assurance activities for the project or the service are periodically reviewed with senior management.

If reviews of quality assurance activities for the project or the service are periodically held with senior management, then this will enable senior management to obtain an objective assessment of the project or service status, to be in a better position to make the right decisions at the right time regarding quality issues, and to impart new directions, resources and funding to the project or service if required, in order to satisfy the organization's strategic plans. The organization will then be in a better position to coordinate activities currently in progress, to establish priorities and to deliver quality products and services to the customer/users on schedule and within budget.

Operations related to configuration management

The purpose of this category of operations consists in establishing and maintaining the integrity of the components and documentation resulting from the products or services throughout the entire software life cycle.

6.1 A configuration management plan (control and management of components, documentation, etc.) has been prepared for controlling the deliverables and essential project or service items.

If a configuration management plan (control and management of components, documentation, etc.) is prepared for controlling the deliverables and essential project or service items, then this will enable the personnel responsible for configuration management to coordinate more efficiently the configuration management activities, to communicate the associated objectives more clearly to all participants, thereby avoiding costly and time-consuming misinterpretations, and to identify potential problems and inconsistencies beforehand. The organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of tracking and of maintaining the products and services delivered to the customer/users.

6.2 The configuration management plan has been prepared in accordance with a defined process.

If the preparation of the configuration management plan is done in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a checklist, etc.), then it will enable personnel assigned to configuration management to prepare plans that are more coherent and understandable by all project participants, and to focus on the most important issues. In addition, institutionalizing the preparation of a configuration management plan will be facilitated. The organization, in turn, will be better equipped to extract relevant information from the resulting document, and to provide more useful feedback on its contents.

6.3 Activities of personnel assigned to configuration management are carried out in accordance with the plan.

If configuration management activities are carried out in accordance with the plan, then this will enable personnel assigned to perform this task to measure progress more objectively and to help assure the customer/users and senior management that the essential components of the products and services are properly controlled. The project and service team will benefit from the added infrastructure established to support project or service deliveries. The organization

will then be in a better position to track and to maintain the products and services delivered to the customer/users.

6.4 The configuration management plan is documented and approved.

If the configuration management plan is documented, reviewed and approved, then this will enable the project or service team members to gain better insight into the process adopted to control the versions of delivered components while increasing the likelihood of identifying incomplete or missing activities, incoherence between activities and impractical implementations. Management will also be more confident that the essential components of the project or the service are properly controlled. The organization will then be in a better position to track and to maintain the products and services delivered to the customer/users.

6.5 A configuration management system has been established as a repository for the project or service baselines.

If a configuration management system is established as a repository for the project or service baselines (configurations of project or service items, documentation, records, tools, etc.), then the project or service team will face better odds of having a smooth operation regarding the sharing and transfer of essential components between the groups involved in the project or the service, the storage and retrieval of those components, their recovery in case of mishaps, and the correct creation of products and services from the baselined items. The organization, in turn, will then be in a better position to track and to maintain the products and services delivered to the customer/users.

6.6 Items to be placed under configuration management been identified.

If the items (components, documentation, records, tools, etc.) to be placed under configuration management are identified, then the project or service team will be better equipped to make proper use of items that are considered essential to the project or the service, especially if they are uniquely identified, their characteristics are specified, their status and the point at which they have been put

under configuration management are specified, and the sources of those items are identified. This will also help avoid placing too many or too few items under configuration management. The organization, in turn, will be in a better position to track and to maintain the products and services delivered to the customer/users.

6.7 Change requests and problem reports for all items placed under configuration management are prepared when necessary.

If change requests and problem reports for all items placed under configuration management are prepared when necessary, then it will ensure that needed changes are identified, that modifications to the configured items can be assessed and evaluated in terms of impact, and that defects are reported in order to maintain a log of problems to address. The organization, in turn, will be in a better position to deliver quality products to the customer/users, and to track and maintain those products.

6.8 Change requests and problem reports are prepared in accordance with a defined process.

If the preparation of change requests and problem reports is done in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a form to complete, a step-by-step specification on how to prepare them, etc.), then this will enable the originators to prepare change requests and problem reports that are more coherent and understandable by all project or service participants. In addition, institutionalizing the preparation of change requests and problem reports will be facilitated. The organization will then face better odds of actually implementing the needed changes and of processing the reported problems.

6.9 Change requests and problem reports are recorded.

If change requests and problem reports for all items placed under configuration management are recorded, then this will ensure that these requests and reports are not overlooked, that their author can be identified and contacted for additional

information, that their status can be assessed and that they can be retrieved for processing. The organization will then face better odds of actually implementing the needed changes and of processing the reported problems.

6.10 Change requests and problem reports are reviewed and approved.

If change requests and problem reports are reviewed and approved, then it will ensure that change requests are assessed in terms of their relevance and their impact on the project or service cost and schedule, that the problem reports are evaluated in terms of their pertinence and their impact on the products and services quality, and that all participants affected by these requests and reports are aware of their existence and of the priority of processing them. The organization, in turn, will be in a better position to coordinate its resources in planning future courses of action.

6.11 Approved change requests are the subject of a follow-up.

If a follow-up on approved change requests and problem reports is carried out, then it will help ensure that the approved change requests and problem reports are tracked to closure, that verification is made to that effect and that their status is known and recorded. The organization, in turn, will face better odds of delivering quality products and services to the customer/users.

6.12 Changes to baselines are controlled.

If changes to configuration baselines are controlled, then it will help ensure that only items approved by the configuration control board (or its equivalent) are entered into the baseline repository, that configured items are checked in and out in a manner that maintains the correctness and the integrity of the baseline repository, and that regression tests or verifications are performed to confirm that changes have not caused unintended effects on the baselines. The organization, in turn, will face better odds of delivering quality products and services to the customer/users and will be in a better position to track and maintain the products and services delivered to the customer/users.

6.13 Changes to baselines are controlled in accordance with a defined process.

If the control of changes to baselines is done in accordance with a defined process, which could take several forms (e.g. a checklist of points to verify, a step-by-step specification on how to check configured items in and out, etc.), then this will enable the change control process to be understandable by all project or service participants and to be applied in a more consistent manner. In addition, institutionalizing the change control process will be facilitated. The organization will then face better odds of adequately controlling the products and services it delivers to the customer/users.

6.14 The status of items placed under configuration management is recorded.

If the status of items placed under configuration management is recorded, then this will ensure that the configuration management actions are recorded in sufficient detail so that the content and status of each item placed under configuration management are known, that the current status and history of each of those items are maintained, and that previous versions can be recovered. The organization, in turn, will face better odds of delivering quality products and services to the customer/users and will be in a better position to track and maintain the products and services delivered to the customer/users.

6.15 Recording of the status of items placed under configuration management is performed in accordance with a defined process.

If the status recording of items placed under configuration management is done in accordance with a defined process, which could take several forms (e.g. the template of a form to complete with guidelines, a step-by-step specification on how to record the status of configured items, etc.), then this will enable personnel assigned to configuration management and/or project or service team members to record the status in a more consistent manner that is understandable by all project or service participants. In addition, institutionalizing the recording of that status will be facilitated. The organization will then face better odds of adequately controlling the products and services it delivers to the customer/users.

6.16 Reports summarizing configuration management activities and describing the baselines are prepared.

If reports summarizing configuration management activities and describing the baselines are prepared, then this will ensure that the revision history of the items placed under configuration management, and the status of change requests, problem reports, and changes made to the baselines are consolidated in a format understandable by all participants in the project or the service. The organization, in turn, will be better equipped to obtain more useful and relevant information, and to coordinate its activities more efficiently.

6.17 Reports summarizing configuration management activities and describing the baselines are made available to affected individuals and groups.

If reports summarizing configuration management activities and describing the baselines are made available to affected individuals and groups, then this will help ensure that all groups involved in the project or the service are informed of events or decisions affecting them, of the content and status of the baseline repository, of the activities that have been performed in connection with the baseline repository, and of the activities that are planned in the future. The affected individuals and groups will be better prepared to coordinate their own activities and the organization as a whole will operate more efficiently.

6.18 Baseline audits are conducted.

If baseline audits are conducted, then this will ensure personnel assigned to configuration management and project or service team members that the integrity of baselines is maintained, that the structure and facilities of the configuration management system is adequate, that the baseline repository contents are correct and complete, and that compliance with applicable configuration management standards and procedures is verified. This, in turn, will help assure the customer/users and senior management that the essential items of the project or service properly controlled. The organization will then be in a better position to deliver quality products and services to the customer/users.

6.19 Baseline audits are conducted in accordance with a defined process.

If the conduct of baseline audits is done in accordance with a defined process, which could take several forms (e.g. a checklist of points to verify, a step-by-step specification on how to perform them, etc.), then it will help ensure that such audits are carried out properly, while facilitating their institutionalization in the organization.

6.20 There is a documented organizational policy establishing how configuration management must be carried out.

If there is a documented organizational policy establishing how configuration management must be carried out, then this will help senior management clarify its expectations regarding configuration management and establish a common vision to that effect in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how configuration management is to be performed. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

6.21 The responsibilities of configuration management have been assigned to a specific individual or group.

If the responsibilities of configuration management are assigned to a specific individual or a specific group, then this will ensure that an adequate configuration management system is established as personnel responsible for that task will presumably have more time to dedicate to it and will develop a better understanding of the issues that may or have come up. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of delivering quality products and services, especially if mechanisms are in place to familiarize other team members with the configuration management of the items to be included in the project or the service.

6.22 Personnel assigned to configuration management have received training to fulfill the needs of the project or the service.

If personnel assigned to configuration management are trained to fulfill the needs of the project or the service, then this will ensure that they have the knowledge of configuration management tools and operations, and sufficient knowledge of the process adopted by the project or service team to perform its work, in order to maximize their efficiency at fulfilling their responsibilities. The project or service team will benefit from a source of expertise in an area critical to the success of the project or the service. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

6.23 Personnel assigned to configuration management have received an orientation on the delivery aspects of the project or the service.

If an orientation on the delivery aspects of the project or the service is provided to personnel assigned to configuration management, then this will enable the latter to conduct configuration management activities in light of the environment used in the project or the service, the project or service particularities and the process it has adopted to perform the work, the activities that need to be carried out and the expected results. The project or service team members will be in a better position to interpret the configuration management status reported to them and how to make use of it. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

6.24 Personnel directly or indirectly involved in the project or the service received an orientation on the roles and responsibilities of personnel assigned to configuration management.

If an orientation is provided to personnel directly or indirectly involved in the project or the service on the roles and responsibilities of personnel assigned to configuration management, then this will enable the project or service team to

become familiar with both the tools, standards, and procedures used for configuration management, how to take advantage of the services provided by personnel assigned to configuration management, and to determine what configuration management activities the team must perform by itself. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of delivering quality products and services within budget and on schedule.

6.25 Tools (e.g. databases, specialized applications) are available to carry out configuration management activities.

If tools (e.g. databases, spreadsheets, specialized applications) are available to carry out configuration management activities, then this will enable personnel having the responsibility of these activities to keep track of the versions of items to be included in the project or the service more efficiently, to gain a better understanding of their status, and to measure and communicate the status of configuration management activities more effectively. The organization, in turn, will benefit from up-to-date information for coordinating its activities and for verifying that the essential items of the delivered products and services are properly controlled.

Operations related to process engineering

The purpose of this category of operations consists in establishing the responsibility for operational activities that improve the overall delivery capability of a project or a service.

7.1 Processes used in the project or the service have been developed and are maintained.

If processes are developed and maintained in the project or the service, then this will enable the project or service team to rely on standard methods, tools, procedures, and other necessary artifacts to generate the project or service deliverables, to be more efficient at performing their tasks, as the team can then reduce the amount of time and effort required to develop and establish such

processes, and to be better equipped to share meaningful data, information and experiences as a result of operating on the basis of common concepts. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of improving its performance.

7.2 Development and maintenance of the processes used in the project or the service are performed in accordance with a defined process.

If development and maintenance of the processes used in the project or the service are performed in accordance with a defined process, which could take several forms (e.g. directives, guidelines, etc.), then this will enable personnel coordinating that effort to ensure that the resulting processes are coherent and understandable by all project or service participants, that they satisfy the policies, process standards, and product standards expected by the customer/users, and that they take into account all relevant considerations. In addition, institutionalizing the development, maintenance and adoption of processes in projects and services will be facilitated. The organization, in turn, will be better equipped to assess the usefulness and relevance of the resulting processes.

7.3 The life cycle adopted in the project or the service is defined and updated as needed.

If the life cycle adopted in the project or the service is defined and updated as needed, then personnel assigned to the coordination of this effort will face better odds of coming up with a realistic life cycle which, in turn, will establish a more precise understanding of the framework in which the project or service takes place and a visualization of its phases. In addition, the availability of a defined life cycle will help the project or service team to break down the work into manageable pieces, to prepare realistic estimates and to develop coherent and achievable plans. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of improving its performance.

7.4 Guidelines and tailoring criteria are prepared and updated as needed to adapt the processes used in the project or the service to the particularities of the work to accomplish.

If guidelines and tailoring criteria to adapt the processes used in the project or the service to the particularities of the work to accomplish are prepared and updated, then this will ensure that project and service particularities can be taken into account, and that unnecessary and/or inadequate tools, methods or procedures are not blindly adopted. The organization, in turn, will face better odds of delivering products and services on schedule and within budget, and will be better equipped to improve its performance.

7.5 A library of process-related documentation is established and maintained.

If a library of process-related documentation is established and maintained, which could contain various artifacts (e.g. descriptions of processes used in past and current projects and services, standards, procedures, delivery plans, measurement plans developed or used in past and current projects and services, training materials, etc.) either on-line or in hard copy format, then this will enable the project and service team to interpret and apply more consistently the defined processes in order to ensure an orderly delivery. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of improving its performance.

7.6 The status of activities dealing with development and improvement of the processes used in the project or service is measured and communicated to the appropriate personnel.

If the status of activities dealing with development and improvement of the processes used in the project or service is measured and communicated to the appropriate personnel, then this will enable the project or service team to be more efficient at coordinating its activities, thereby avoiding using up time and effort in unproductive tasks, while providing management with progress status and with

the information required to improve estimating the effort and resources required for future process development and maintenance activities. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

7.7 The processes currently in use in the project or the service are periodically assessed to harmonize results and performance with current and projected market needs, customers and end users.

If the processes currently in use in the project or the service are periodically assessed to harmonize results and performance with current and projected market needs, customers and end users, then this will enable the project or service team to identify its process strengths and weaknesses, to provide the opportunity for all personnel to describe how they could be more productive, to discuss desirable improvement actions, and to create an opportunity for change. The organization will be better prepared to initiate lasting improvement of its operational capability, and to develop a common vision of the current processes and of the desired ones.

7.8 Action plans have been developed to address the findings resulting from periodic assessment of the processes currently in use in the project or the service.

If action plans that address the findings resulting from periodic assessment of the processes currently in use in the project or the service are developed, then this will enable the project or service team to ensure that the findings are properly addressed, to coordinate more efficiently process improvement activities, to communicate the improvement objectives more clearly to all participants, and to identify potential problems and inconsistencies beforehand. The organization and the project or the service will then be able to track progress and to evaluate more objectively the effect of improvement activities.

7.9 The project or service team contributes information and data to develop and update the plan to develop and improve its delivery capability.

If the project or service team contributes information and data to develop and update the plan to develop and improve its delivery capability, then then will ensure that lessons learned are not lost, that improvement initiatives outlast the project or service in which they are initiated, that appropriate personnel and resources are allocated to take advantage of those lessons learned, that improvement activities are coordinated and monitored, and that improvement objectives are clear to all participants. This will help ensure that improvement at the organizational level and at the project or service level benefits from sustained resources and will not be abandoned at the first opportunity.

7.10 Activities to develop and improve processes used in the project or the service are coordinated with the project or service team.

If activities to develop and improve processes used in the project or the service are coordinated with the project or service team involved in performing the work, then this will help ensure that the team members acquire the experience and knowledge to improve their own capability, that they maintain interest in the subject and that, in turn, subsequent improvement initiatives benefit from the accumulated experience and knowledge. The improvement, both at the project or service level and at the organization level, will benefit from this bootstrapping effect and will face better odds of generating more significant results.

7.11 A database characterizing the processes used in the project or the service is established and maintained to support estimation.

If a database characterizing the processes used in the project or the service is established and maintained to support estimation, then this will ensure that future projects and services benefit from performance data (estimates, actuals, productivity, quality and reliability measurements, review/test coverage and efficiency, number and severity of defects, and contextual information for corresponding products and services) collected in past and current projects and services. The organization will be better equipped to build on the experience

gained in the past and to improve the processes used in connection with future projects and services.

7.12 A database characterizing processes is used to plan and monitor the project or the service.

If a database characterizing processes is used to estimate, plan and monitor the project or the service, then it will help ensure that the project or service team makes use of performance data (e.g. work estimates, work actuals, productivity, quality and reliability measurements, review/test coverage and efficiency, number and severity of defects, and contextual information for corresponding products and services) from past and current projects or services similar to the project or service currently in progress. The organization will be better equipped to build on the experience gained in the past, and will face better odds of delivering quality products and services within budget and on schedule, while being better equipped to measure and improve its performance.

7.13 A follow-up is done on new processes, methods and tools in limited use in the project or the service.

If a follow-up is done on new processes, methods and tools in limited use in the project or the service, then it will ensure that the effectiveness of those new processes, methods and tools is assessed and their applicability to other groups or other areas of the project or the service is evaluated. The organization will face better odds of improving productivity and of delivering its products and services on schedule and within budget.

7.14 If proven appropriate, new processes, methods and tools in limited use in the project or the service are transferred to other parts of the project or service.

If new processes, methods and tools in limited use in the project or the service are proven appropriate and are transferred to other parts of the project or service, then this will ensure that the benefits resulting from the limited use of those processes, methods and tools can be experienced on a more global scale, thereby

contributing to the capability improvement, both at the project or service level and at the organizational level.

7.15 Training on the use of processes is provided in the project or the service.

If on the use of processes is provided to the project or the service team members, then this will help ensure that project or service personnel are knowledgeable about the processes, and the tools, methods and procedures used to carry out the work, and about their instantiation in the project or the service. The project or the service will benefit from having its processes more consistently applied and the organization will also benefit from having projects and services that use processes which originate from a common source, thereby facilitating interpretation of reported progress.

7.16 Personnel involved in implementing processes in the project or the service are regularly informed of the progress of activities dealing with the development and improvement of these processes.

If personnel involved in implementing processes in the project or the service are regularly informed of the progress of activities dealing with the development and improvement of these processes, then this will help ensure that the project or service team members are up to date on capability improvement activities and results, while keeping improvement interest active. Mechanisms such as electronic bulletin boards, newsletters, process advisory boards, working groups, information exchange meetings, surveys, and improvement teams can be used for that purpose. The organization, in turn, will benefit from the participation and the feedback of project or service team members.

7.17 There a documented organizational policy establishing how the development and improvement of processes used in the project or the service must be coordinated.

If there is a documented organizational policy establishing how the development and improvement of processes used in the project or the service must be

coordinated, then this will help senior management clarify its expectations regarding capability improvement and establish a common vision to that effect in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how capability improvement is to be coordinated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

7.18 Senior management is involved in the activities dealing with the development and improvement of processes used in the project or the service.

If senior management is involved in the activities dealing with the development and improvement of processes used in the project or the service, then this will help demonstrate to the project or service team members, managers and administration in general its commitment to these activities. It will also ensure that long-term plans and commitments for funding, staffing, and other resources are prepared and that strategies for managing and implementing the activities for improving delivery capability are established. This will help ensure that capability improvement at the organizational level benefits from sustained resources and is not abandoned at the first opportunity.

7.19 The responsibilities for coordinating the development and improvement of the processes used in the project or the service have been assigned to a specific individual or group.

If the responsibility for coordinating the development and improvement of the processes used in the project or the service have been assigned to a specific individual or group, then this will ensure that the coordination of activities to improve the project or service delivery capability is properly carried out as personnel responsible for this task will presumably have more time to dedicate to it and will be in a better position to assure its continuity. Participation of personnel from project or service teams, on the other hand, will ensure that the real issues that is, project or service delivery issues, are addressed. The

organization, in turn, will face better odds of improving its performance, especially if mechanisms are in place to familiarize other project team members with the subject.

7.20 Personnel assigned to coordinate the development and improvement of processes have received training to fulfill the needs of the projects or the service.

If personnel assigned to coordinate the development and improvement of processes are trained to fulfill the needs of the project or the service, then this will ensure that they have the credibility and the particular skills needed to perform their tasks, sufficient knowledge of the disciplines applied in the project or the service, process control techniques, and of organization change management, in order to maximize their efficiency at fulfilling their responsibilities. The organization, in turn, will face better odds of improving its performance, especially if mechanisms are also in place to familiarize other project team members with the subject.

7.21 Personnel directly or indirectly involved in the project or the service have received an orientation on the roles and responsibilities of personnel assigned to coordinate the development and improvement of processes.

If an orientation is provided to personnel directly or indirectly involved in the project or the service on the roles and responsibilities of personnel assigned to coordinate the development and improvement of processes, then this will help reduce from the onset the usual response to capability improvement as an issue of secondary importance, especially if this orientation is directly sponsored by senior management. It will also help the project or service team members understand how they can take advantage of the services provided by personnel assigned to capability improvement. The organization, in turn, will be better equipped to operate in synchronization and will face better odds of improving its performance.

7.22 Activities dealing with the development and improvement of the processes used in the project or the service are periodically reviewed with senior management.

If reviews of activities dealing with the development and improvement of the processes used in the project or the service are periodically held with senior management, then this will enable senior management to obtain an assessment of the status of those activities, to be in a better position to make the right decisions at the right time regarding delivery capability improvement issues, and to impart new directions, resources and funding to the effort if required, in order to satisfy the organization's strategic plans. The organization then will be in a better position to coordinate activities currently in progress, to establish priorities and to persist in its aim to improve performance.

7.23 Personnel assigned to quality assurance are involved in verifying that the activities dealing with the development and improvement of the processes used in the project or the service satisfy applicable plans, standards and procedures.

If personnel assigned to quality assurance are involved in verifying that the activities dealing with the development and improvement of the processes used in the project or the service satisfy applicable plans, standards and procedures, then the project or service team, and particularly personnel having the responsibility of developing and improving processes, will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of their possible lack of confidence in the processes adopted by the team and their results. The project or service team will then be able to track progress and to evaluate the effect of delivery capability improvement activities more objectively.

Operations related to training

The purpose of this category of operations consists in developing the skills and the knowledge of individuals so that they can effectively and efficiently carry out the tasks to which they have been assigned in the project or the service.

8.1 A training plan has been developed in the project or the service that specifies its training needs.

If a training plan that specifies the project's or the service's training needs is developed, then this will help identify the set of skills needed and when those skills are needed, the skills for which training is required and the skills that will be obtained via other vehicles (e.g. seminars, on-the-job training, informal mentoring, guided self-study, etc.), the training that is required, for whom it is required, when it is required, and how training will be provided. The organization will be in a better position to have a workforce sufficiently skilled and knowledgeable to carry out the work it has undertaken.

8.2 The project's or service's training plan has been developed in accordance with a defined process.

If the project's or service's training plan is prepared and updated in accordance with a defined process, which could take several forms (e.g. a template with guidelines, senior management directives, etc.), then this will enable personnel responsible for training coordination to prepare plans that are more coherent and understandable by all participants, while helping the group or the individual preparing it to focus on the most important issues. In addition, institutionalizing the preparation of a training plan will be facilitated. The organization, in turn, will be better equipped to extract relevant information from the resulting plan, and to provide more useful feedback on its contents.

8.3 The project or the service training needs are taken into account in an organizational training plan.

If an organizational training plan takes into account the project or the service training needs, then this will help the organization establish training priorities, determine the required training budget, coordinate the training effort and the training approaches to be used to develop the needed skills, and achieve an economy of scale by consolidating all similar requests. The existence of an organizational training plan will also increase the odds that training is provided as needed. The organization, in turn, will be in a better position to efficiently provide its workforce with the skills and knowledge it needs to carry out the work it has undertaken.

8.4 Training provided in accordance with the project's or service's training plan.

If training is provided in accordance with the project's or service's training plan, then this will help the project or service teams acquire the skills they need to perform their work efficiently and effectively, and to avoid costly and time-consuming trial and error approaches, while contributing to conveying the message that training is important in the organization. The organization will then be in a better position to deliver quality products and services on schedule and within budget, while developing a more dedicated workforce.

8.5 Managers receive training on technical, administrative and personnel aspects in accordance with the needs of the project or the service.

If managers are trained on technical, administrative and personnel aspects in accordance with the needs of the project or the service, then this will ensure that they are knowledgeable about the tools to use, the methods to apply, the measurements to take and the procedures to follow in order to plan, estimate and manage the work, to manage the risks facing the project or the service, and to perform the administrative tasks called for by the tasks to carry out. The organization, in turn, will have the ability to manage its projects and services more efficiently, and will face better odds of delivering quality products and services within budget and on schedule, while being better equipped to measure and improve its performance.

8.6 Courses, seminars and awareness sessions used in the project or the service are developed in accordance with the organization's standards.

If courses, seminars or awareness sessions used in the project or the service are developed in accordance with the organization's standards, then this will facilitate the storage and retrieval of training material, its maintenance, its understandability by personnel being trained, and the reuse of the training material for other situations and environments, while preventing a duplication of effort. The organization, in turn, will be in a better position to efficiently provide its workforce with the skills and knowledge it needs to carry out the work it has undertaken.

8.7 A waiver is used to determine whether project or service team members already possess the knowledge and skills required to perform their designated tasks.

If a waiver is used to determine whether individuals already possess the knowledge and skills required to perform their designated tasks, then this will ensure that Project or service team members are not trained unnecessarily, while inciting verification of personnel training records by supervisors and managers, thereby allowing them to develop a better appreciation of the skills currently available. The organization, in turn, will be in a better position to efficiently provide its workforce with the skills and knowledge it needs to carry out the work it has undertaken.

8.8 Training records are maintained.

If training records are maintained, then this will enable supervisors and managers to develop meaningful training plans, and will enable project and service teams to determine who has the skills required to carry out the work they have either been assigned or undertaken. The organization, in turn, will be in a better position to synchronize its activities and achieving a higher level of efficiency and effectiveness.

8.9 There a documented organizational policy establishing how training needs must be satisfied.

If there is a documented organizational policy establishing how training needs must be satisfied, then this will help senior management clarify its expectations regarding training and establish a common vision to that effect in the project, the service or in the whole organization. Groups directly or indirectly involved in the project or the service will then be more likely to share the same basic notions on how training needs are to be satisfied. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

8.10 The responsibilities of satisfying (or coordinating) the training needs in the project or the service have been assigned to a specific individual or group.

If the responsibility of satisfying (or coordinating) the training needs in the project or the service is assigned to a specific individual or a specific group, then this will ensure that training and training coordination activities are properly carried out as personnel responsible for this task will presumably have more time to dedicate to it and will be in a better position to assure its continuity. Project and service teams, on the other hand, will benefit from support in that area, and their active participation in the development of training plans will ensure that the most important issues are addressed. The organization will then be in a better position to have a workforce sufficiently skilled and knowledgeable to carry out the work it has undertaken.

8.11 Personnel assigned to provide or coordinate training activities have received training to fulfill the needs of the project or the service.

If personnel assigned to provide or coordinate training activities are trained to fulfill the needs of the project or the service, then this will ensure that personnel assigned to this task have the credibility and particular skills needed to carry it out, sufficient knowledge of the disciplines applied in the project or the service, of

the organization's budget and strategic plans, and of human resources development, in order to maximize their efficiency at fulfilling their responsibilities. The organization will then face better odds of benefiting from an effective and efficient training program.

8.12 The status of training activities is measured and communicated to the appropriate personnel.

If the status of training activities is measured and communicated to the appropriate personnel, then this will enable the project or service team members to be more efficient at planning and coordinating their own activities, and it will enable management to be aware of the training status and of any additional details required to make adjustments on personnel workloads and personnel availability requirements, so that personnel can be trained as planned. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

8.13 The quality of training is assessed.

If the quality of training is assessed, then it will enable personnel who have the responsibility of providing or coordinating training activities to obtain feedback from both personnel having had training and their managers, in order to have the information and the data necessary to make the required adjustments to improve the acquisition of knowledge and skills. The organization will then face better odds of benefiting from effective and efficient training.

8.14 The relevance of provided training with respect to the project's or service's training needs is assessed.

If the relevance of provided training is assessed with respect to the project's or service's training needs, then this will enable personnel who have the responsibility of providing or coordinating training activities to verify that the training needs expressed in the project or the service training plans have been satisfied, and to obtain feedback from both personnel having had training and

their managers to that effect, in order to make the required adjustments to improve the acquisition of knowledge and skills. The organization will then face better odds of benefiting from effective and efficient training.

8.15 Training activities are periodically reviewed with senior management.

If reviews of training activities are periodically held with senior management, then this will enable senior management to obtain an assessment of the status of those activities, to be in a better position to make the right decisions at the right time regarding training issues, and to impart new directions, resources and funding to the effort if required, in order to satisfy the organization's strategic plans. The organization will then be in a better position to coordinate activities currently in progress, to establish priorities and to persist in its aim of developing a skilled and knowledgeable workforce.

Operations related to work execution

The purpose of this category of operations consists in consistently performing a well-defined process that integrates all project or service delivery activities in order to generate correct and uniform deliverables and services efficiently and efficiently.

9.1 The detailed project or service requirements are developed by systematically analyzing the customer's requirements in accordance with a defined process.

If the detailed project or service requirements are developed by systematically analyzing the customer's requirements in accordance with a defined process, then this will enable the project or service team to ensure, in a coherent way, that issues related to requirements analysis are identified and resolved, that effective methods for analyzing requirements are used to identify and derive detailed requirements, that the requirements are analyzed to ensure they are feasible and appropriate to implement, clearly stated, consistent with each other, testable, and complete, that the results of the requirements analysis and the rationale for the selected alternatives are documented, and that the detailed requirements can be traced back to the customer's requirements. The organization, in turn, will face

better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.2 The design of project or service deliverables is based on the detailed requirements and carried out in accordance with a defined process.

If the design of project or service deliverables is based on the detailed requirements and carried out in accordance with a defined process, then this will enable the project or service team to ensure, in a coherent way, that issues affecting the design of deliverables are identified and resolved, that effective methods are used to design them, that an architecture is developed both early and within the constraints of the project or service life cycle and technology being used, that the design is properly documented, and that the resulting deliverables can be traced back to the detailed requirements. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.3 The project or service deliverables are built or prepared based on the design specifications in accordance with a defined process.

If the project or service deliverables are built or prepared based on the design specifications in accordance with a defined process, then this will enable the project or service team to ensure, in a coherent way, that issues affecting the construction or preparation of deliverables are identified and resolved, that effective methods are used, that each deliverable is reviewed and/or is tested before it is considered complete, and that it can be traced back to its design specifications. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.4 The unit tests or verifications of the project or service deliverables are carried out in accordance with a defined process.

If the unit tests or verifications of the project or service deliverables are carried out in accordance with a defined process, then this will enable the project or

service team to ensure, in a coherent way, that testing and verifications criteria and coverage are developed and reviewed, that effective methods are used to test or verify the deliverables, that regression testing or verification is performed, as appropriate, at each level whenever deliverables or the environment in which they operate are changed, and that test or verification plans, procedures, and cases are appropriately modified whenever the customer's requirements, the detailed requirements, the design specifications, or the deliverables are changed. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.5 Testing or verification of the integrated project or service deliverables is planned and carried out in accordance with a defined process.

If testing or verification of the integrated project or service deliverables is planned and carried out in accordance with a defined process, then this will enable the project or service team members assigned to integration testing and verification to ensure, in a coherent way, that adequate time and resources are allocated to corresponding activities, that the integration test or verification cases and procedures are adequately documented, reviewed for completeness and workable, and that integration testing and verification is performed against the designated version of the detailed requirements and their design specifications. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.6 Acceptance testing or verification is planned and carried out with the aim of demonstrating that the project or service deliverables have met the customer requirements and satisfy the users' needs.

If acceptance testing or verification is planned and carried out with the aim of demonstrating that the project or service deliverables have met the customer requirements and satisfy the users' needs, then this will enable the project or service team responsible for conducting or supporting acceptance testing and verification to ensure, in a coherent way, that the necessary resources are assigned

early enough to provide for adequate preparation, that acceptance test or verification plans, procedures and cases are reviewed and approved for completeness, that acceptance testing or verification is performed with respect to approved customer's requirements and users' needs, that problems identified during testing and verification are documented and tracked to closure, and that test or verification results are documented and usable as the basis for determining if the project or service deliverables satisfy the customer requirements and users' needs. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.7 The operational and user documentation is developed in accordance with a defined process.

If the operational and user documentation is developed in accordance with a defined process, then this will enable project or service assigned to the development of that documentation to ensure, in a coherent way, that appropriate methods and tools are used, that documentation specialists participate in planning, developing, and maintaining the documentation, that preliminary versions of the documentation are developed and made available early in the project or service life cycle for review and comments, and that final versions of the documentation are verified against the baselined versions of the project or service deliverables and are approved by personnel having the authority to do so. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget.

9.8 Data related to defects identified during peer reviews, tests and verifications are collected and analyzed in accordance with a defined process.

If the data related to defects identified during peer reviews, tests and verifications are collected and analyzed in accordance with a defined process, then this will enable the project or service team to describe and categorize those defects, to assess their severity, to identify the problematic items and those affected by the defects, to determine what corrective actions should be implemented and, most of

all, to perform those tasks coherently. The organization, in turn, will face better odds of delivering quality products and services to the customer/users on schedule and within budget, and to be in a better position to quantify and to improve its performance.

9.9 Uniformity is maintained across the project's or service's work products and deliverables.

If uniformity is maintained across the project's or service's work products and deliverables, including plans, process descriptions, requirements, design specifications, product or service items, test or verification plans and procedures, then this will help the project or service team ensure that work products and deliverables are documented, that the requirements, design, product or service items, and test and verification cases are traced to the source from which they were derived and to the work products and deliverables resulting from subsequent activities, that customer's requirements are mapped to the detailed requirements, design specifications, deliverables, and test or verification cases that satisfy them, that items affected by future changes are easily identified and that those changes are tracked to closure. The organization, in turn, will face better odds of delivering quality products and services to the customer/users and will be in a better position to track and to maintain those products and services.

9.10 Appropriate methods and tools are integrated into the processes defined to carry out the project or the service.

If the appropriate methods and tools are integrated into the process defined to carry out the project or the service, then this will enable the project or service team to achieve a better productivity level, and to ensure that team members adhere to the defined processes, thereby making the review and the assessment of collected data, information and experiences meaningful. The organization will face better odds of operating efficiently and of delivering its products and services within budget and on schedule.

9.11 There a documented organizational policy establishing how the project or service delivery activities must be carried out.

If there is a documented organizational policy establishing how the project or service delivery activities must be carried out, then this will help senior management clarify its expectations regarding the use of and the adherence to processes, methods and tools, and establish a common vision to that effect in the project, the service or in the whole organization. Groups directly or indirectly involved in the project or the service will then be more likely to share the same basic notions on how the work is to be accomplished. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

9.12 Project or service team members receive the training required to perform their tasks.

If the project or service team members are trained to perform their tasks, then this will help them acquire the skills they need to perform their work efficiently and effectively, and avoid costly and time-consuming trial and error approaches in developing or preparing the project or the service work products and deliverables. The organization, in turn, will be in a better position to deliver quality products and services on schedule and within budget, while developing a more dedicated workforce.

9.13 Project or service team members receive an orientation on the disciplines called for in the project or the service other than their own area of expertise.

If an orientation is provided to the project or service team members on the disciplines called for in the project or the service other than their own area of expertise, then this will enable them to be aware of the application domain, the delivery and support environment used to carry out the project or deliver the service, their particularities, and the processes used by other groups to perform their work, along with the process-related activities and their expected outcome.

The organization, in turn, will benefit from a situation in which groups are more likely to cooperate and to exchange work products, information and data that are usable by each group.

9.14 The status of activities performed to carry out the project or deliver the service are measured and communicated to the appropriate personnel.

If the status of activities performed to carry out the project or deliver the service are measured and communicated to the appropriate personnel, then this will enable the project or service team to be more efficient at coordinating their activities, thereby avoiding using up time and effort in unproductive tasks, while providing management with progress status and with the information required to improve estimating effort and resources for future activities and new projects or services. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

9.15 Measurements are collected to determine the quality and functionality of the deliverables resulting from carrying out the project or delivering the service.

If measurements are collected to determine the quality and functionality of the deliverables resulting from carrying out the project or delivering the service, then the project or service team members will have the opportunity to gain insight into how work products and deliverables measure up in terms of functionality and number of defects and, if necessary, to propose possible solutions that are based on facts and not on impressions, in order to improve the odds of delivering quality products and services to the customer/users. The organization, in turn, will face better odds of quantifying and of improving its overall performance.

9.16 Measurements collected to determine the quality and functionality of the project or service deliverables are used.

If measurements collected to determine the quality and functionality of the project or service deliverables are used, then this will enable the project or the service team to coordinate its efforts more closely in order to achieve the envisioned

quality objectives, and to document lessons learned that will prove useful in connection with future activities and new projects or services. The organization, in turn, will be better equipped to build on the experience gained in the past and to improve its performance in connection with future projects and services.

9.17 Project or service delivery activities and results are reviewed with management.

If the project or service delivery activities and results are reviewed with management, then the project or service team members will have the opportunity to request specific support from management, to voice concerns on particular aspects of the work and to be informed of events or decisions that may affect them. Management, on the other hand, will gain a more precise idea of the project or the service status and will be in a better position to make the right decisions at the right time. The organization will benefit from a better coordination of its activities, and will be in a better position to deliver within budget and on schedule.

9.18 Personnel assigned to quality assurance are involved in verifying that the delivery activities and results satisfy the processes defined for carrying out the project or delivering the service.

If personnel assigned to quality assurance are involved in verifying that the delivery activities and results satisfy the processes defined for carrying out the project or delivering the service, then the project or service team members will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of a possible lack of confidence in the team's ability to adhere to the processes it has adopted. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule.

Operations related to coordination

The purpose of this category of operations consists in establishing a means for the various groups involved in the project or the service to coordinate their activities to be in a better position to satisfy effectively and efficiently the customer's needs.

10.1 The various groups involved in the project or the service participate with the customer and the end users in defining the requirements.

If the various groups involved in the project or the service participate with the customer and the end users in defining the requirements, then the members of each group will be better prepared to define the critical characteristics of the customer's and the end users' requirements, as appropriate, to point out incomplete or missing requirements, to assess their feasibility, clarity, testability or verifiability and coherence, and to negotiate commitments and critical dependencies. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

10.2 Representatives from each group cooperate in coordinating their activities to resolve problems.

If representatives from each group cooperate in coordinating their activities to resolve problems, then this will help establish an atmosphere of collaboration and trust, while ensuring that critical issues are taken care of and that the members of each group have a mechanism in place to resolve them and to coordinate their involvement in the project or the service. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

10.3 There a defined approach to communicate commitments and to track the activities performed in response to these commitments.

If a defined approach to communicate commitments and to track the activities performed in response to these commitments, then this will enable the members

of each group involved in the project or the service to communicate their commitments more clearly, to identify potential problems and inconsistencies beforehand, and to coordinate more efficiently their activities, thereby avoiding costly and time-consuming misinterpretations. The existence of a defined approach will also help establish a culture of respect for negotiated commitments. The organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering within budget and on schedule.

10.4 Critical dependencies between the groups involved in the project or the service are identified.

If critical dependencies between the groups involved in the project or the service are identified, then members of each group will have the ability to discuss and to define critical items and services to be provided, who will provide them, when they will be provided and how acceptance will be assessed. This will help avoid misinterpretations, and the organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering within budget and on schedule.

10.5 Critical dependencies between the groups involved in the project or the service are negotiated and tracked.

If critical dependencies are negotiated and tracked, then this will help ensure that both the receiving group and the group responsible for providing the critical items and services document, review and approve an agreement addressing each of those items and services, and that the impact of their early or late delivery is assessed. The organization will then be in a better position to manage the critical dependencies between the groups involved in the project or the service, and management will face better odds of being informed of problems before they deteriorate into crises.

10.6 Critical dependencies between the groups involved in the project or the service are managed in accordance with a defined process.

If critical dependencies are managed in accordance with a defined process, which could take several forms (e.g. directives from senior management, a step-by-step specification on how to address critical dependencies, etc.), then this will enable both the receiving group and the group responsible for providing the critical items and services to manage those dependencies in a way that is more coherent and understandable by all participants. The members of each group involved in the project or the service will then be better aware of the steps to take in order to resolve their interdependencies and institutionalizing the documentation of critical dependencies will be facilitated. This will help avoid misunderstandings, and the organization, in turn, will be better prepared to coordinate its activities and its resources, while facing increased odds of delivering within budget and on schedule.

10.7 Deliverables from one group to another are reviewed by the latter to verify that all its needs have been met.

If deliverables from one group to another are reviewed by the latter to verify that all its needs have been met, then this will help the receiving group ensure that the delivered items and services satisfy the agreement it had with the providing group, that they are usable, and that corrections are made when appropriate. This will reduce the likelihood of misunderstandings and possible future friction between members of each group involved in the project or the service. The organization will then benefit from a better coordination of its activities and will face better odds of delivering within budget and on schedule.

10.8 There is a mechanism to handle coordination issues in the project or the service that cannot be solved by the groups' representatives themselves.

If a mechanism exists to handle coordination issues that cannot be solved by the groups' representatives themselves, then it will enable the various groups involved in the project or the service to raise those issues to a higher level of authority where they can be adequately addressed, and to establish an atmosphere of openness between the groups. Management personnel will then be more

confident that important issues will be dealt with appropriately and that their intervention will be sought if required.

10.9 The mechanism to handle coordination issues in the project or the service that cannot be solved by the groups' representatives themselves is defined.

If the mechanism, which could take several forms (e.g. a step-by-step description on how to communicate those issues to higher levels of authority, a log of outstanding issues, etc.), used to handle coordination issues that cannot be solved by the groups' representatives themselves is defined, then it will enable the groups to handle coordination issues in a way that is more coherent and understandable by all participants, and the various groups involved in the project or the service to be aware of the steps to take in order to resolve them. In addition, institutionalizing the establishment of such mechanisms will be facilitated. The organization will then face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.10 Coordination meetings are conducted with the groups involved in the project or the service.

If coordination meetings and reviews are periodically conducted with representatives of the various groups involved in the project or the service, then these groups will have the opportunity to gain insight into how work is proceeding, to ensure that the groups' interpretation and implementation of the requirements conform to the customer's requirements, to discuss the status of outstanding coordination issues, to assess possible solutions and to assign the responsibility of tracking them to closure. Such reviews will also allow the various groups involved in the project or the service to coordinate their efforts more closely in order to meet the cost and schedule objectives of the project.

10.11 There is a documented organizational policy for establishing interdisciplinary teams in the project or service.

If there is a documented organizational policy stating how interdisciplinary teams should be established in the project or the service, then it will help senior management clarify its expectations regarding such teams and establish a common vision to that effect either in the project, the service or in the whole organization. Groups directly or indirectly involved in the project or service will then be more likely to share the same basic notions on how their activities are to be coordinated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.12 The tools used by the various groups involved in the projector the service are compatible.

If it is ensured that the tools used by the various groups involved in the project or the service are compatible, then it will help establish an environment in which the groups are more likely to cooperate and to exchange products, information and data that are usable by each group. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.13 Managers receive training in teamwork.

If managers are trained in teamwork, then this will help ensure that the managers who do not naturally possess the skills that make them good team players benefit from training on subjects such as team building, team management, establishing, promoting, and facilitating teamwork, and group dynamics. The training can take several forms, including seminars, tutoring, mentoring by a dynamic and experienced manager, and participation in the organization of social, cultural and sporting events. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.14 Representatives of each group involved in the project or the service receive an orientation on methods, procedures and standards used by the other groups.

If an orientation on methods, procedures and standards used by the other groups is provided to representatives of each group involved in the project or the service, then it will enable the groups' representatives to be aware of the process, along with the development and support environment, used by other groups to perform their work, the other groups' activities and the work products they typically develop or prepare. This will help establish an environment in which the groups are more likely to cooperate and to exchange products, information and data that are usable by each group. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.15 Members from each group involved in the project or the service receive an orientation on teamwork.

If an orientation on teamwork is provided to members from each group involved in the project or the service, then this will help ensure that the individuals who do not naturally possess the skills that would make them good team players benefit from having a reminder on the points to which they should pay attention when dealing with members from other groups. The holding of periodic social, cultural and or sporting events in which everyone has a chance to participate may also constitute a way of promoting teamwork. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.16 The status of activities involving the groups involved in the project or the service is measured and communicated to the appropriate personnel (e.g. actual effort and other resources expended by one group to support other groups).

If the status of activities involving the groups involved in the project or the service is measured and communicated to the appropriate personnel (e.g. actual effort and other resources expended by one group to support other groups), then this will enable those groups to be more efficient at coordinating their activities,

thereby avoiding wasting time and effort in unproductive tasks, while providing management with progress status and with the information required to improve estimating the effort and the resources related to coordination for future activities and new projects. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

10.17 The coordination activities and results are reviewed with management.

If coordination activities and results are reviewed with management, then personnel from the various groups involved in the project or the service will have the opportunity to request specific support from management, to voice concerns on particular coordination issues and to be informed of events or decisions that may affect them. Management, on the other hand, will gain a more precise idea of the project status and will be in a better position to make the right decisions at the right time. The organization will benefit from a better coordination of its activities, and will be in a better position to deliver within budget and on schedule.

Operations related to reviews and inspections

The purpose of this category of operations area consists in identifying and removing defects from the performed work and generated work products early and efficiently, in addition to developing a better understanding of what must be accomplished and of the defects that can be prevented.

11.1 Peer reviews are planned.

If peer reviews are planned, then this will enable the project or service team to identify the work products to be reviewed in order to detect the highest number of defects or required remedial actions as early as possible in the project or service life cycle, to estimate the effort required to conduct those reviews, to prepare a schedule of reviews to be conducted, and to negotiate with personnel from other groups their participation in those reviews. The organization will then be in a

better position to deliver products and services that satisfy the customer/users within budget and on schedule, and which contain as few defects as possible.

11.2 Peer reviews activities are documented in the work plan.

If peer reviews activities are documented in the work plan, then this will enable the project or service team members to gain better insight into the planned peer reviews, the process adopted by the project or the service to conduct them and their expected outcome, while increasing the likelihood of identifying missing work products or inadequate delivery steps that should be reviewed, incoherence between planned reviews and schedule conflicts. The organization, in turn, will be better equipped to coordinate its activities and will face better odds of delivering quality products and services within budget and on schedule.

11.3 Peer reviews are conducted in the project or the service.

If peer reviews are conducted, then this will enable the project or service team to remove defects from the work products or implement remedial actions in the delivery steps early and efficiently and to develop a better understanding of the work products and of the defects or inadequate delivery steps that might be avoided. Such reviews can effectively complement quality assurance activities and could include all artifacts or executed delivery steps in the project or service life cycle, from the requirements definition to acceptance testing or verification and delivery, as well as post-delivery items, or only a subset of these, depending on the characteristics of the project or the service. The organization will then be in a better position to deliver products and services that satisfy the customer/users within budget and on schedule, and which contain as few defects as possible.

11.4 Peer reviews are conducted in accordance with a defined process.

If peer reviews are conducted in accordance with a defined process, which could take several forms (e.g. a checklist of points to address before, during and after the review, a step-by-step specification describing the roles of the review participants and how to conduct the review, etc.), then it will enable the project or

service team to be aware of the steps to take in order to prepare for these reviews, to conduct them more efficiently and to track to closure action items resulting from these reviews. In addition, institutionalizing the conduct of peer reviews will be facilitated. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

11.5 Data on the conduct and results of peer reviews are recorded.

If data on the conduct and results of peer reviews, which could include various elements (e.g. identification of the reviewed step or item, its size or complexity, the size and composition of the review team, preparation time per reviewer, duration of the review, types and number of defects or inadequate delivery steps found and fixed, rework effort, etc.), are recorded, then it will help ensure that the value and effort associated with peer reviews can be assessed, that the actions that need to be performed to correct defects or inadequate delivery steps found during the reviews are tracked to closure, and that similar defects or inadequate delivery steps can be avoided in the future. The organization will then face better odds of actually benefiting from the conduct of peer reviews, of quantifying and improving its performance and of delivering quality products and services to the customer/users.

11.6 There is a documented organizational policy regarding the conduct of peer reviews.

If there is a documented organizational policy regarding the conduct of peer reviews, then it will help senior management clarify its expectations regarding peer reviews and establish a common vision to that effect either in the project, the service or in the whole organization. Project or service team members will then be more likely to share the same basic notions on how to plan and conduct peer reviews and what follow-up actions are required afterwards. The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

11.7 The peer review leaders receive training on how to conduct such reviews.

If the peer review leaders are trained on how to conduct such reviews, then this will enable them to understand the objectives, principles, and methods of peer reviews, to plan, organize and conduct a peer review, to track and confirm the rework required to address the actions identified in the review, and to collect and report the resulting data. This will also help the leaders to avoid the hostility that may develop either during or after peer reviews. The organization will then be better prepared to conduct peer reviews efficiently and will face improved odds of delivering quality products and services to the customer/users.

11.8 Participants in peer reviews receive training on the objectives, principles and methods regarding peer reviews.

If participants in peer reviews are trained on the objectives, principles and methods regarding peer reviews, then this will help ensure that they understand their roles in the review, that they can estimate the effort for preparing and participating in peer reviews, and that they are reminded of the points to which they should pay attention in order to avoid the hostility that may develop either during or after peer reviews. The organization will then be better prepared to conduct peer reviews efficiently and will face improved odds of delivering quality products and services to the customer/users.

11.9 The status of peer review activities is measured and communicated to the appropriate personnel.

If the status of peer review activities is measured and communicated to the appropriate personnel, then this will enable the project or service team and participants in peer reviews to be more efficient at coordinating their activities, thereby avoiding wasting time and effort in unproductive tasks, while providing management with progress status and with the information required to improve estimating efforts and resources related to the conduct of peer reviews as part of future activities and for new projects or services. The organization, in turn, will

face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

11.10 Personnel assigned to quality assurance are involved in verifying the peer review activities and results and that they satisfy the defined processes.

If personnel assigned to quality assurance are involved in verifying peer review activities and results and that they satisfy the processes defined in the project or the service, then this will help ensure the project or service team that the process for preparing for the peer reviews, conducting them, and performing the follow-up actions are adhered to, and that reporting of peer review data is complete, accurate, and timely. The project or service team will be better prepared to respond to queries from either the customer/users or senior management, while preventing undesirable interference from these parties as a result of their possible lack of confidence in the process defined for the project or the service and its results. The organization will then be better prepared to conduct peer reviews efficiently and will face improved odds of delivering quality products and services to the customer/users.

Operations related to customer service

The purpose of this category of operations a consists in providing quality products and services to the customers and end users along with the support they need to use the delivered product or to take advantage of the delivered service.

12.1 There is a documented organizational policy establishing how customer service must be provided.

If there is a documented organizational policy establishing how customer service must be provided, then this will help senior management clarify its expectations regarding customer service and establish a common vision to that effect in the project, the service or in the whole organization. Personnel will then be more likely to share the same basic notions on how customer service is to be provided.

The organization, in turn, will face better odds of operating in synchronization and achieving a higher level of efficiency and effectiveness.

12.2 Customers' comments are collected.

If customers' comments are collected, then this will help personnel in general, and members of the project or service team in particular, to focus their effort on issues that count, to gain insight into the customers' and the users' needs, to evaluate the quality of the work products and services delivered so far through an assessment of customers' satisfaction, and to plan and implement corrective actions if necessary. Management, on the other hand, will be in a better position to determine actions required for being more responsive to customers' requests and for harmonizing the project and service performance and results with current and projected needs of the market, customers and end-users. The organization, in turn, will face better odds of improving the quality of the services it provides and the products it delivers to the customers/users.

12.3 Customers' comments are collected in accordance with a defined process.

If the collection of customers' comments is done in accordance with a defined process, which could take several forms (e.g. the template of a survey form with guidelines on how to prepare and complete it, a step-by-step specification on the process to follow to collect customers' comments, etc.), then this will enable the individual or the group assigned to this activity to carry it out in a more consistent manner, and to collect meaningful comments from the customers that are understandable by all personnel and by the customers themselves. In addition, institutionalizing the collection of customers' comments will be facilitated. The organization will then be in a better position to extract useful data from the collected comments in order to improve its customer service.

12.4 There is a close relationship established with customers in order to get a good understanding of their needs.

If a close relationship is established with customers in order to get a good understanding of their needs, then this will enable personnel in general, and members of the project and service team in particular, to obtain information from the customers/users that will help them interpret, define and analyze requirements, while increasing their confidence that they are delivering the right products or services and contributing to the establishment of an atmosphere of trust that will likely facilitate business transactions. Management, on the other hand, will have a better ability to assess the demand for the resulting products and services, to initiate worthwhile project and service deliveries, and to devise ways of being more responsive to customers` requests. The organization, in turn, will face better odds of improving the quality of the services it provides and the products it delivers to the customers/users.

12.5 Customers' needs are documented.

If customers' needs are documented, then this will enable personnel in general, and members of the project or service team in particular, to have access to a more objective reference for interpreting, defining and analyzing requirements, thereby avoiding costly and time-consuming misinterpretations and false starts. Management, on the other hand, will have access to more reliable information in order to verify that the actions taken to devise ways of being more responsive to customers' requests, to satisfy customers' requirements, and to improve quality as a whole are addressing the right issues. The organization, in turn, will face better odds of improving the quality of the services it provides and the products it delivers to the customers/users.

12.6 There is a point of contact responsible for providing direct customer service.

If a point of contact responsible for providing direct customer service is established, then personnel in general, and members of the project or service team in particular, will benefit from a mechanism to streamline requests, clarifications and information inquiries from the customers/users through an individual or a group, thereby reducing the likelihood of wasted time and effort on their part. As

a result, personnel will be in a better position to be more responsive to requests from customers/users and to avoid providing the latter with conflicting data originating from several sources. The organization, in turn, will face better odds of improving the quality of the services it provides and the products it delivers to the customers/users.

12.7 Customer service is integrated with change requests and problem reports of items under configuration management.

If customer service is integrated with change requests and problem reports of items under configuration management, then this will ensure that requests from customers/users are not overlooked, that their source can be identified and contacted for additional information, that they can be reliably retrieved for processing, and that their status can be assessed and tracked to closure. The organization will then face better odds of actually responding to those requests and of providing quality services and products to the customers/users.

12.8 User documentation is prepared.

If user documentation is prepared, then this will help ensure that the customers/users are provided with all the information required to take advantage of the features and benefits included in the delivered products and services. As a result, this will likely reduce the number of requests, clarifications and information inquiries from the customers/users, thereby reducing the likelihood of excessive customer service costs. The organization, in turn, will face better odds of satisfying the customers' and the users' needs.

12.9 User documentation is prepared in accordance with a defined process.

If the preparation of user documentation is done in accordance with a defined process, which could take several forms (e.g. a template with guidelines, a step-by-step specification on the process to follow to prepare user documentation, etc.), then this will enable the individual or the group assigned to this activity to carry it out in a more consistent manner, and to ensure that appropriate methods

and tools are used, that documentation specialists participate in the activity, that preliminary versions of the documentation are developed and made available early for review and comments, and that final versions of the documentation are verified and approved by the right people. In addition, institutionalizing the preparation of user documentation will be facilitated. The organization, in turn, will face better odds of improving the quality of the services it provides and the products it delivers to the customers/users.

12.10 Customers are informed of modifications made to existing product or service versions.

If customers are informed of modifications to existing versions of delivered products or services, then this will help ensure that the customers/users are informed of changes and updates made to improve the performance and to correct the defects of existing products and services. The customers/users will be more likely to remain faithful to the products and services delivered by the organization and to acquire the conviction that they are being treated with the consideration they deserve.

12.11 Customers are informed of new available versions of products or services that they are currently using.

If customers are informed of newly available versions of products or services that they are currently using, then this will help ensure that the customers/users have access to up-to-date products and services that can help them be more productive and efficient. The customers/users will be more likely to remain faithful to the products and services developed by the organization and to acquire the conviction that they are being treated with the consideration they deserve.

12.12 A follow-up is done on customers' requests.

If a follow-up is performed on customers' requests, then this will help ensure that those requests are tracked to closure by the interested personnel, and particularly the interested members of the project or service team, that verification is made to

that effect and that their status is known and recorded. The customers/users will be more likely to remain faithful to the products and services delivered by the organization and to acquire the conviction that they are being treated with the consideration they deserve.

12.13 The follow-up on customers' requests is done in accordance with a defined process.

If the follow-up on customers' requests is done in accordance with a defined process, which could take several forms (e.g. a checklist of points to verify, a step-by-step directive on tracking customers' requests to closure, etc.), then this will enable the individual or the group assigned to follow up on those requests to do so in a more consistent and efficient manner. In addition, institutionalizing the follow-up of customers' requests will be facilitated. The organization will then be in a better position to attest that customers' requests have been properly addressed, thereby improving the quality of its customer service.

12.14 The confidentiality of customer information is assured.

If the confidentiality of customer information is assured, then this will help earn the confidence of customers that personnel in general, and the project or service team members in particular, benefit from the necessary support facilities to ensure that the protection of sensitive customer information and data is guaranteed, and that the measures in place match the nature of the information to protect. As a result, the customers/users will be more likely to rely on the services provided and the products developed by the organization.

12.15 Protection of confidential customer information is done in accordance with a defined process.

If assuring the confidentiality of customer information is done in accordance with a defined process, which could take several forms (e.g. a checklist of points to verify, step-by-step directives on how to handle sensitive information, the use of security-certified equipment, etc.), then this will enable the individual or the

group assigned to handle sensitive documents and data to do so in a more consistent and efficient manner. In addition, institutionalizing the handling of sensitive information and data will be facilitated. The organization will then be in a better position to attest that the confidentiality of customer information has been properly addressed, thereby improving the quality of its customer service.

Chapter 8

Step 3: Checklist of Desirable and Undesirable Situations

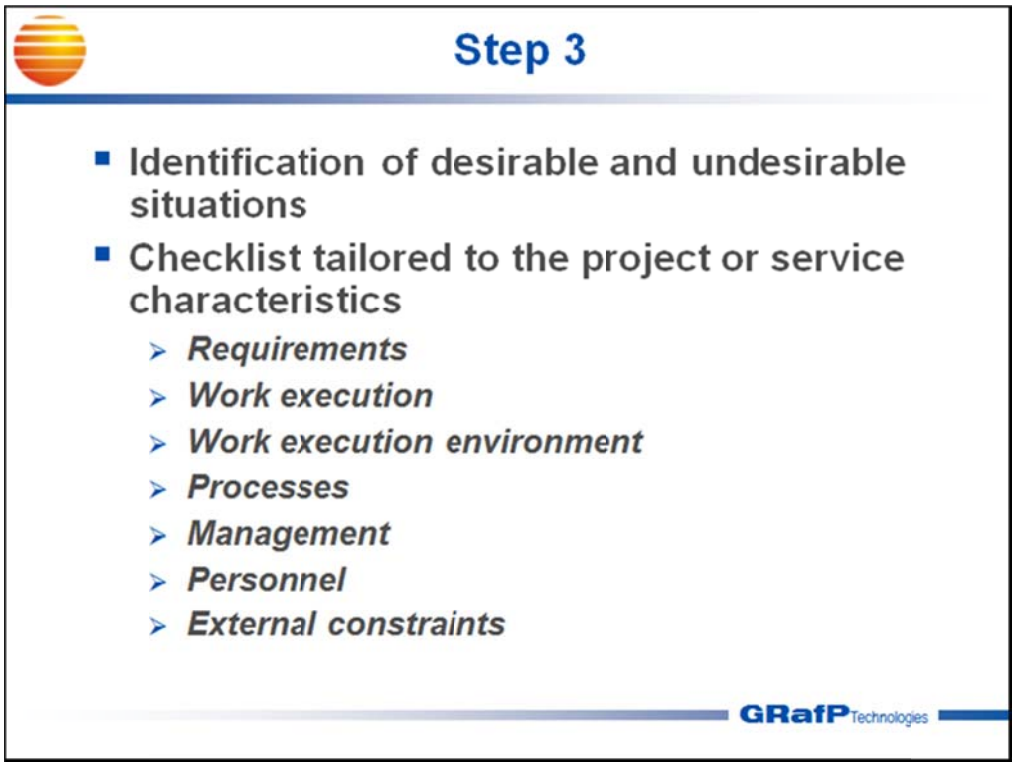


Figure 14 – Situations categories checklist example

The third step of an audit or an assessment with the X:PRIME methodology consists in using the checklist of desirable and undesirable situations adapted to the context of the examined project or service. The auditor rates each item on a scale between 0 and 5 in the checklist and generates observations to justify the assigned value.

The following list enumerates the aspects that should be taken into account when using the checklist of desirable and undesirable situations.

1. Introduce yourself and the assessment coordinator, who is from the organization, project or service where the audit or assessment is taking place, and who is essentially responsible for the logistical aspects of the verification.
2. Prior to initiating the audit or the assessment, it is recommended to present to the coordinator the situations categories that need to be examined so that he or she can identify the artifacts related to those categories and the participants who will participate in the interviews to supplement the information acquired by the review of the artifacts.
3. Among the artifacts most useful for the checklist of desirable and undesirable situations are emails, meeting minutes, problem logs and risk logs maintained as part of executing the project or delivering the service.
4. Enter at least one observation that reflects what is being done in the project or service. Identify the artifact and/or the interviewee(s) from which collected information support the text of the observation. The execution of previous projects or service deliveries can be used to evaluate a situation relevant to the examined project or service, but that has not yet occurred.
5. From the entered observations, use the following scale to assign a value to the examined observation:
    a) 5 (Strongly Agree) – In total agreement with the description of the situation.
    b) 4 (Agree) – In agreement with the description of the situation.
    c) 3 (Somewhat Agree) - More in agreement than in disagreement with the description of the situation.

d) 2 (Somewhat Disagree) - More in disagreement than in agreement with the description of the situation.

e) 1 (Disagree) - In disagreement with the description of the situation.

f) 0 (Strongly Disagree) – In total disagreement with the description of the situation.

The following values can be used to characterize the examined situation. In this case, the affected situations will not have an impact on the level of difficulties or obstacles facing the project or the service until they are resolved.

g) Out of domain - You do not have all the information to qualify a situation because it is not in your field of expertise or in the participants' field of expertise.

h) Unknown - You do not have all the information to qualify a situation within your area of expertise or in the participants' field of expertise.

i) Not Applicable - Does not apply to the examined project or service.

6. You can notify interviewees that they may be contacted later, if necessary, in order to obtain additional information to interpret the audit's or the assessment's results. If this happens, the necessary arrangements will be made with the verification coordinator.

7. You may also tell the participants that the results will be presented to them as soon as they are available. However, make sure that you have cleared that with senior management beforehand and that it is part of the agreement you have negotiated.

8. Don't underestimate the urge of interviewees to find out the results. They will come back either to you or to the coordinator later on to find out. Again, you should have negotiated with senior management something to that effect.

9 Finally, do not underestimate the curiosity of those who did not participate in the audit or in the assessment. This may turn into a pressing issue if it has not been addressed by senior management beforehand.

Checklist items and justifications with respect to situations

Items pertaining to desirable and undesirable situations are listed hereinafter. An elaboration in terms of consequences associated with situations liable or not to occur follows each statement. This elaboration is also provided as a help to the auditor or assessor during the awareness sessions and the tailoring of the situations checklist.

Situations resulting from requirements

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with requirements dealing with both their quality and the difficulty of implementing them as part of a project or a service, from either the perspective of in-house or subcontracted work.

1.1 The requirements are well defined in the specifications provided to suppliers.

If the requirements specifications, or elements of these specifications, are incompletely or poorly defined, this may result in a product or a service that does not meet the customer's or the users' needs. Project or service team members are then liable to make up for this deficiency by developing an erroneous interpretation of the requirements, and to spread this interpretation to all personnel directly or indirectly involved in the work, such that it could be both difficult and costly to implement corrective actions.

1.2 There are requirements that remain to be defined in the specifications provided to suppliers.

If specifications include undefined items liable to remain as is or liable to be defined late in the project or service life cycle, some of these items may have an impact which is much more significant than initially envisioned, and which may result in costly rework and serious schedule delays.

1.3 There are undocumented expectations toward suppliers.

If there are undocumented expectations toward suppliers, these expectations are likely not to be communicated to personnel who should be informed of this situation and, therefore, are liable not to be taken into account during project or service planning. This, in turn, may result in disgruntled customers and/or users, and in additional costs incurred in order to implement the necessary corrective actions.

1.4 The end-user, if different from the customer, is involved in the definition of requirements.

If the users' needs, when the users are different from the customer, are not reflected in the initial requirements, these situations are liable to result in specifications that include undefined items or specifications that poorly address the true needs, and ultimately, in a product or a service that does not satisfy them. In both cases, the project or service team, and the organization in which it operates, are exposed to the risk of assuming the consequences of delivering products and services of poor quality.

1.5 There are requirements that should be evaluated in order to determine if they are feasible.

If some requirements, either intrinsically or in relation to others, are nearly unrealizable, the project or service team is liable to bypass requirements evaluation reviews and feasibility analyses, and to underestimate the effort required to carry out the work. Consequently, the organization is exposed to the risk of assuming budget overruns and schedule delays, while delivering products and services that only partially satisfy the customer.

1.6 There are frequent modifications to the requirements or to interface specifications when the product or the service is in the development or delivery stage, respectively.

If frequent requirements and/or interface modifications are introduced, these situations are liable to ripple through the project or the service and to make management of the work extremely difficult because of the large number of parameters to control and the linkage between parameters. The project or service team is exposed to the risk of experiencing a significant reduction in efficiency as a result of the time and effort required to plan, coordinate and implement corrective actions.

1.7 Impact assessments are conducted when the requirements or the interface specifications are modified.

If requirements and/or interface modifications are introduced, these modifications are liable to be incorporated in the project or the service without having seriously reviewed or analyzed their impact, and may result in an effort which is much greater than that initially envisioned. Depending on whether the required effort is invested or not, this situation may entail severe budget overruns or may result in products of poor quality that are unlikely to satisfy the customer's or the users' needs.

1.8 There are reliability and availability requirements allocated to the product or service.

If reliability and availability requirements are allocated to the product or the service, the project or service team is liable to underestimate the effort and resources needed to satisfy these requirements. The organization, therefore, is exposed to the risk of assuming the consequences of either releasing products or services that do not satisfy the stated needs or investing additional effort and mustering additional resources in order to implement corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services generate significant losses for the customer.

1.9 There are confidentiality requirements (e.g. the management of personnel records) allocated to the product or service.

If confidentiality requirements are allocated to the product or service, the project or service team is liable not to be able to satisfy those requirements. The organization, in turn, is exposed to the risk of experiencing security breaches and losses of classified data in the course of the project or the service, or assuming the consequences of products and services that do not meet stated security requirements. In both cases, the organization may be faced with having to invest additional effort and to muster additional resources in order to implement costly corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services result in significant losses for the customer.

1.10 There are safety requirements allocated to the product or service (e.g. a vehicle braking system).

If personnel or material safety requirements are allocated to the product or service, the project or service team is liable not to be able to satisfy those requirements. The organization, in turn, is exposed to the risk of assuming the consequences of products or services that do not meet safety standards and may be faced with having to invest additional effort and to muster additional resources in order to implement costly corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services result in personnel injuries or material losses for the customer.

1.11 Interface requirements (e.g. software-software and software-hardware) are completely defined.

If interface requirements (e.g. software-to-software, software-to-hardware) are incompletely defined, project or service team members are liable to fill in the blanks independently and to complete the interface definitions in isolation, without taking into account all relevant conditions. The recurrence of such undesirable initiatives is likely to result in incompatible components or services that, in turn, may go undetected until late in the projector service life cycle and which necessitate costly rework.

1.12 There are requirements that are ambiguous.

If requirements, or parts of the requirements, are ambiguous, project or service team members are liable to resolve the ambiguities on their own by developing a personal and possibly erroneous interpretation of the requirements, and to spread this interpretation to all personnel directly or indirectly involved in the project or the service, such that it could turn out to be both difficult and costly to implement corrective actions.

1.13 There are conflicting requirements or requirements that are susceptible to being wrongly interpreted.

If some requirements are in conflict with each other or are susceptible to being misunderstood, and in the absence of a known process applied by the project or service team members to address these situations, team members are liable to resolve the conflict based on their personal comprehension of the requirements. In addition, if the requirements are prone to be misunderstood, this situation is likely to result in a multiplication of incompatible solutions and to delay the design of an acceptable solution until late in the project or service cycle, with the additional rework costs that this entails.

1.14 There is a process in place to ensure that all personnel involved in the project or the service (including the users and/or the customer) have the same understanding of the requirements.

If all the participants involved in the project or the service (including the customer and/or the users) do not have the same understanding of the requirements, the project or the service is liable to proceed without any apparent complications until deliveries are made to the customer or to the users. Consequently, the organization is exposed to the risk of experiencing costly rework and schedule delays, in addition to having to deal with a disgruntled customer and/or dissatisfied users.

1.15 There requirements for specific technologies, methodologies and/or procedures for which the project team has no expertise.

If the project team does not have the required expertise, in terms of technologies, methodologies, or development or delivery environments, in order to satisfy the requirements, the project team is liable either to overestimate its capability of delivering within the required schedule and to prepare unrealistic plans, or to develop non-competitive estimates that are likely to be cut back by management. In both cases, the organization is exposed to the risk of experiencing significant cost overruns and serious schedule delays.

1.16 The overall delivery effort (in terms of resources needed) and the complexity of the work is a concern for the project or service team.

If the project or service size and complexity constitute a concern for the project or service team, the infrastructure established to carry out the work is liable to be inadequate for that type of project or service, thereby making it ineffective. The organization, therefore, is exposed to the risk of experiencing serious difficulties that could jeopardize the project outcome.

1.17 The project team has realized or been involved in a project or service of similar size and complexity before.

If the project or service team has never been involved in an effort of similar size and/or complexity, the organization is liable to have to deal with a project or service team overtaken by events, where the accumulation of difficulties greatly exceeds the rate of problem resolution capability displayed by the team. Under such conditions, a chronic state of crisis management is likely to take root in the project or the service.

1.18 Testing or verification and integration personnel are involved in reviewing the requirements.

If the efforts required to verify that the resulting product or service satisfies the requirements are inadequate, the project or service team is exposed to the risk of operating in an environment where the verification effort largely exceeds the resources initially allocated to the work. The organization, in turn, is liable to assume either significant cost overruns and schedule delays or products and services of poor quality which are unlikely to satisfy the customer and/or users.

1.19 The acceptance criteria are defined, approved and documented for all the requirements.

If acceptance of the delivered product or service is contested, the project or service team is liable to have to negotiate a whole set of acceptance parameters after the fact and to find itself in a particularly weak position in relation to the customer (or the subcontractors). The customer (or the subcontractors) may, in addition, be tempted to take advantage of the situation in order to get more (or to deliver less) than what had initially been planned.

Situations resulting from work execution

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles related to the work execution itself.

2.1 The requirements specifications derived from the customer requirements are adequate for initiating work.

If the work relies on inadequate specifications, the project or service team members responsible for the work and subsequent phases of the project execution or service delivery are liable to invest substantial efforts in order to make up for the requirements shortcomings and the project or service is susceptible to serious schedule delays. In addition, some of these shortcomings may remain undetected or result in erroneous interpretations, and may ripple through until the costs of rework become prohibitive.

2.2 There a process to verify that the design specifications are feasible and satisfy the requirements.

If design specifications or elements of these specifications are hardly feasible and liable not to satisfy the requirements, the project or service team members responsible for delivering the solution, integration testing or verification and forthcoming work phases are exposed to the risk of having to invest substantial efforts in order to develop functions or execute additional steps that will ultimately need to be significantly reworked. The project or service, therefore, is particularly susceptible to important cost overruns and schedule delays.

2.3 The external interfaces (e.g. software-software and/or software-hardware) are defined, approved, and documented.

If the external interfaces are unstable and subject to future modifications, the project or service team is liable to carry out the work using different and incomplete versions of the interface specifications. Test or verification and integration activities are susceptible to being laborious and the organization is exposed to the risk of assuming costly rework as a result.

2.4 The internal interfaces between software or hardware components are defined, approved, and documented.

If the internal interfaces between software or hardware components are unstable and subject to future modifications, the project or service team is liable to carry out the work concurrently using different and incomplete versions of the interface description documents. Test or verification and integration activities are susceptible to being laborious and the organization is exposed to the risk of assuming costly rework as a result.

2.5 There are particularities for which verification of the solution cannot be done before operational tests, delivery or installation.

If some functions cannot be verified before operational tests have taken place or before the solution has been deployed in the field, the project or service team is liable to make last minute changes in an attempt to make these functions operate properly, and as a result, to introduce additional errors in the solution or in the service delivery. The organization, therefore, is exposed to the risks of assuming unplanned additional costs and not being able to deliver the product or the service in accordance with the negotiated schedule.

2.6 The design specifications are sufficiently detailed to start construction of the solution or execution of the delivery steps.

If construction of the solution components or execution of the delivery steps rely on inadequate design specifications, the project or service team members, responsible for the construction and verification of the solution components or execution of the delivery steps and forthcoming development or delivery phases, are exposed to the risk of investing substantial time and effort in making changes and being unable to meet the delivery deadlines. In addition, errors resulting from inadequate design specifications are liable to remain undetected and to ripple through until the costs of rework become prohibitive.

2.7 There are models or environments available that are similar to the operational site to verify the solution as it is developed or prepared.

If there is a lack of available environments similar to the site where the solution is to be used, the project or service team is liable not to be able to verify that the solution, as it is developed or prepared, will effectively operate as planned. Essential site characteristics may not be taken into account and the organization is exposed to the risk of dedicating costly resources in order to implement fixes in the field. As a consequence, the resulting product or service may exhibit a less than adequate performance and may be unsatisfactory to the customer/users.

2.8 The platform on which the solution is being developed or prepared is the same as the one on which the solution will be implemented.

If the platform on which the solution is developed or prepared is not the same as the one on which it will be implemented, the project or service team is liable not to be able to verify that the solution, as it is developed or prepared, will effectively operate as planned. Essential platform characteristics may not be taken into account, and the organization is exposed to the risk of dedicating costly resources in order to implement fixes in the field. As a consequence, the resulting product or service may exhibit a less than adequate performance and may fall short of the customer's and users' expectations.

2.9 Steps have been taken to ensure that all the solution components will function correctly at integration time.

If steps to maximize the chances that all the solution components will function correctly at integration time have not been taken, the project or service team may face difficulties and resource allocation problems that will make integration a trying experience. Project or service team members are liable to make last minute changes without assessing their impact on other components, and without keeping adequate records of these changes. The organization, therefore, is exposed to the risk of having to deal with frustrated personnel, cost overruns and schedule delays due to unplanned rework.

2.10 The test specifications allow for a complete verification of the solution.

If test specifications do not allow for a complete verification of the solution, the project or service team is liable to release the solution before it is ready, and the organization is exposed to the risk of dedicating costly resources in order to implement corrective actions in the field. Ultimately, the organization may have to invest additional resources to develop new versions of the solution in order to fix errors that should have been detected prior to initial product or service release.

2.11 There is enough time allocated to integration testing or verification.

If there is not enough time allocated to integration tests or verifications, the project or service team is liable to release the solution before it is ready, or to

perform a significant amount of unplanned overtime. The organization is exposed to the risk of either dedicating costly resources in order to implement corrective actions in the field or dealing with frustrated personnel who are susceptible to introducing additional errors in an attempt to meet a deadline. Ultimately, the organization may have to invest additional resources to develop new versions of the solution in order to fix errors that should have been detected during integration testing.

2.12 There are enough resources and equipment allocated to integration test or verification.

If there are not enough resources and equipment allocated to integration test and verification, the project or service team is liable to be significantly less efficient than initially planned and to be unable to meet the delivery deadlines. The organization is exposed to the risk of either assuming the cost of unplanned material procurement and resource allocation or facing a disgruntled customer and/or dissatisfied users, especially if the lack of resources result in a product of poor quality.

2.13 It possible to verify the solution's performance in a realistic environment before delivery to the customer.

If the solution cannot be verified in a realistic environment before it is delivered to the customer, the project or service team is liable not to be able to verify that the solution will effectively operate as planned. Essential environment characteristics may not be taken into account and the organization is exposed to the risk of dedicating costly resources in order to implement fixes in the field, as the resulting solution may exhibit a less than adequate performance and may be unsatisfactory to the customer/users. Ultimately, the organization may have to allocate additional funding and invest additional resources to develop new versions of the solution.

2.14 It is possible to verify if the solution's reliability and availability requirements, if applicable, are met.

If verification of reliability and availability requirements allocated to the solution cannot be easily accomplished, the project or service team is liable to make assumptions about the product or service and to release an inadequately tested or verified solution. The organization, in turn, is exposed to the risk of either assuming the consequences of products and services that do not satisfy the stated needs or investing substantial effort and muster costly resources in order to implement corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services generate significant losses for the customer.

2.15 It is possible to verify if the solution's confidentiality requirements, if applicable, are met.

If verification of confidentiality requirements allocated to the solution cannot be easily accomplished, the project or service team is liable to make assumptions about the security safeguards and to release an inadequately tested or verified solution. The organization, in turn, is exposed to the risk of assuming security breaches and losses of classified data as a result of an insufficiently secure solution deployed in the field. The organization may be faced with having to invest substantial effort and muster additional resources in order to implement costly corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services result in significant losses for the customer and/or the users.

2.16 It is possible to verify if the solution's safety requirements, if applicable, are met.

If verification of safety requirements allocated to the solution cannot be easily accomplished, the project or service team is liable to make assumptions about the safety features and to release an insufficiently tested or verified solution. The

organization, in turn, is exposed to the risk of assuming the consequences of products or services that do not satisfy the safety requirements, or else, may be faced with having to invest substantial effort and muster costly resources in order to implement corrective actions. Ultimately, the organization could be the subject of legal proceedings if the delivered products and services result in personnel injuries or material losses for the customer.

2.17 Suppliers are involved in the integration of the final product or service.

If all suppliers (external and internal) are not involved in the integration of the solution, the project or service team members are liable to take upon themselves the task of integrating components or execution steps about which they may not be sufficiently knowledgeable. The project or the service is then susceptible either to serious delays or to delivering a solution that does not have all the required functionality. In either case, the organization is exposed to the risk of having to deal with a disgruntled customer and/or dissatisfied users.

2.18 There a process assuring that the final product meets all the customer requirements.

If there is a lack of process to assure that the final product meets all the customer requirements, the project or service team is liable to release the solution without having verified that it satisfies all of the customer's requirements (or documented features or functionality). The organization is then exposed to the risk of facing rejection or return of the delivered product or service by the customer, unplanned additional costs to make the necessary changes and serious image problems.

2.19 Re-used or re-engineered existing components are integrated into the developed solution or the delivered service.

If the re-use or the re-engineering of existing components is an option that is not exercised, the project or service team is liable to develop a solution that has already been developed or delivered in the course of previous projects or services that could be either re-used as is or re-used with some modifications. The

organization, therefore, is exposed to the risks of requiring too much effort and resources to develop its solution, taking too long before introducing a product or a service on the market, and, as a result, to be at a disadvantage compared with its competitors.

2.20 The available documentation of re-used or re-engineered existing components is taken into account.

If existing components are re-used or the re-engineered in the project or the service, the team is liable to omit assessing the documentation available with these components and consequently, to underestimate the effort and the resources necessary to perform the work. The organization, therefore, is exposed to the risk of either experiencing cost overruns and schedule delays as a result of the unplanned additional effort, or facing customer/users dissatisfied with the documentation available with the delivered solution.

2.21 The performance achieved by re-used or re-engineered existing components is taken into account.

If existing components are re-used or the re-engineered in the project or the service, the team is liable to disregard analyzing the performance achieved by these components and consequently, to underestimate the effort and the resources necessary to perform the work. The organization, therefore, is exposed to the risk of either experiencing cost overruns and schedule delays as a result of unplanned rework, or facing customer/users dissatisfied with the poor performance of the delivered solution.

2.22 The compatibility of re-used or re-engineered existing components is taken into account.

If existing components are re-used or the re-engineered in the project or the service, the team is liable to overlook compatibility issues associated with these components and consequently, to underestimate the effort and the resources necessary to perform the work. The organization, therefore, is exposed to the risk of either experiencing cost overruns and schedule delays as a result of unplanned

rework, or facing customer/users dissatisfied with the lack of compatibility of the delivered solution.

2.23 The ease of modifying re-used or re-engineered existing components to satisfy specific requirements is taken into account.

If existing components are re-used or the re-engineered in the project or the service, the team is liable to underestimate the effort required to modify these components in order to satisfy specific requirements. As a result, the unsuitability of the re-used or re-engineered components is susceptible to being identified only at integration time and the organization, therefore, is exposed to the risk of either experiencing cost overruns and schedule delays, or delivering a solution that does not satisfy the customer's and/or the users' needs.

2.24 Commercially available components are used in the developed solution or delivered service.

If the use of commercially available components is not an option that has been considered for the delivered solution, the project or service team is liable to develop components that are already available off-the-shelf and could be integrated either as is or with some modifications. The organization, therefore, is exposed to the risks of requiring too much effort and too many resources for developing its solution, taking too long before introducing a product or a service on the market and, as a result, to be at a disadvantage compared to its competitors.

2.25 The available documentation describing the structure, interfaces, performance and functionality of commercially available components is taken into account.

If commercially available components are used in the project or the service, the team is liable to omit assessing the documentation available with these commercially-off-the-shelf components describing describes their structure, their interfaces, their performance and their functionality and, consequently, to underestimate the effort and the resources required to complete the work. The

organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the acquired components prove unsuitable and other components have to be acquired or developed in-house.

2.26 The resources (e.g. amount of memory, processing power) required by commercially available components are taken into account.

If commercially available components are used in the project or the service, the team is liable to omit systematically analyzing the resources (e.g. memory usage, space, power requirements) required by those components and, consequently, to underestimate the effort and the resources required to complete the work. The organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the acquired components prove unsuitable and other components have to be acquired or developed in-house, or facing customer/users dissatisfied with the poor performance of the delivered product or service.

2.27 The ease of integrating commercially available components into the solution is taken into account.

If commercially available components are used in the project or the service, the team is liable to underestimate the difficulties of integrating the commercially-off-the-shelf components into the solution and, consequently, to underestimate the effort and the resources required to complete the work. The organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the actual effort largely exceeds the planned effort.

2.28 The ease of integrating subsequent versions of commercially available components into the solution is taken into account.

If commercially available components are used in the project or the service, the team is liable to omit investigating the integration requirements of subsequent releases of the commercially-off-the-shelf components with respect to the existing solution. The organization, therefore, is exposed to the risks of introducing on the market a product or service susceptible to becoming obsolete too quickly, and

having to devise costly developments in the future in order to retain its market share or its user base.

2.29 The amount of testing or verification done on or with commercially available components is taken into account.

If commercially available components are used in the project or the service, the team is liable to omit investigating the amount of testing or verification done on or with those components and, consequently, to underestimate the effort and the resources required to complete the work. The organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the acquired components prove unsuitable and other components have to be acquired or developed in-house, or facing customer/users dissatisfied with the performance of the delivered product or service.

2.30 The number and the severity of known problems of commercially available components are taken into account.

If commercially available components are used in the project or the service, the team is liable to overlook investigating the number and the severity of known problems those commercially-off-the-shelf components and, consequently, to underestimate the effort and the resources required to complete the work. The organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the acquired components prove unsuitable and other components have to be acquired or developed in-house, or facing customer/users dissatisfied with the defects of the delivered product or service.

2.31 The support available from the suppliers of commercially available components is taken into account.

If commercially available components are used in the project or the service, the team is liable to omit looking at the level of support available from the supplier of those components and, consequently, to underestimate the effort and the resources required to complete the work. The organization, therefore, is exposed to the risk of experiencing cost overruns and schedule delays as the acquired components

prove to be more difficult to integrate into the product or the service than what was initially envisioned.

2.32 The supplier's willingness to modify its commercially available components to meet specific requirements is taken into account.

If commercially available components are used in the project or the service, the team is liable to overlook investigating the supplier's willingness to modify its components in order to satisfy specific requirements and, consequently, to underestimate the effort and the resources required to complete the work. As a result, the organization is exposed to the risk of initiating in-house developments with the cost overruns and schedule delays that this entails, investigating the suitability of other commercially-off-the-shelf components (also with a risk of cost overruns and schedule delays) or delivering a product or a service that does not satisfy the customer's and/or the users' needs.

2.33 Intellectual property issues have been stated for the components acquired commercially, re-used or newly developed.

If intellectual property issues associated with commercial-off-the-shelf, re-used or newly developed components have not been addressed, the project or service team is liable to underestimate those issues and the organization is exposed to the risk of facing unexpected additional costs in order to acquire the necessary licenses. In addition, schedule delays may also be incurred if the negotiation of license agreements drags on.

2.34 The documentation is sufficiently detailed for the customer or a third party to assume maintenance of the delivered solution.

If the documentation delivered with the solution is inadequate for the customer or a third party to assume its maintenance, the project or service team is liable to underestimate the costs and resources required to develop that documentation. The organization, therefore, is exposed to the risk of facing a dissatisfied

customer and possibly the rejection of the product or service, with the additional costs and image problems that this entails.

Situations resulting from the environment used to perform work

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with the environment used to carry out the project or to deliver the service. This environment is typically made up, among other items, of work management tools, development tools, compilers, simulators, test equipment and software, etc.

3.1 There are several programming languages or several environments used for carrying out the project or delivering the service.

If several programming languages or several environments are used, the project or service team is liable to lose track of the versions and to end up with incompatible components, and/or to lack expertise in the use of all these programming languages and environments. This is likely to result in unexpected training costs, schedule delays and costly rework as the errors are detected during integration testing, verification or after deployment of the product or delivery of the service.

3.2 The environment (version of the tools, compilers, simulators, etc.) used to perform the work is completely specified.

If the environment used to perform the work is incompletely specified, the project or service team is liable to waste time and effort rebuilding components, either in the course of carrying out the work or after the product or the service has been delivered, in order to implement modifications, or else to underestimate the cost of making the environment fully operational. The organization, in turn, is exposed to the risk of assuming an inefficient use of its resources and/or bearing unexpected costs and possible schedule delays.

3.3 The documentation for the environment used to perform the work is adequate.

If the environment used to perform the work is inadequately documented, the project or service team is liable to overestimate the environment capability or to use it inefficiently. As a result, the organization is exposed to the risk of assuming costly rework and serious schedule delays as project or service team members proceed in a trial and error fashion.

3.4 The tools and methods associated with the environment used to perform the work are appropriate for the project or the service.

If the tools and methods associated with the environment used to perform the work are inappropriate, the project or service team is liable to struggle with tasks too large and too complex for the environment's capacity, or with an environment too cumbersome and too complex for the tasks to perform. In both cases, the organization is exposed to the risk of experiencing serious schedule delays and facing customer/users dissatisfied with repeatedly postponed deliveries.

3.5 The environment used to perform the work supports the solution's requirements analysis.

If the environment used to perform the work does not support the solution's requirements analysis, the project or service team is liable either to have a low productivity or to improvise the task of analyzing requirements and thus overlook important aspects of the required functionality, cost, delivery schedule or performance. The organization is then exposed to the risk of assuming significant rework costs and schedule delivery problems, and having to deal with a disgruntled customer and/or dissatisfied users.

3.6 The environment used to perform the work supports the solution's performance analysis.

If the environment used to perform the work does not support the solution's performance analysis, the project or service team is liable either to make assumptions on the expected performance of the finished product or service or to neglect essential performance requirements. The organization is then exposed to

the risk of delivering a product that does not satisfy the customer's and/or users' needs, and of assuming significant rework costs and schedule delivery problems. Ultimately, the organization could face the rejection of the product or service by the customer/users.

3.7 The environment used to perform the work supports the solution's design.

If the environment used to perform the work does not support the solution's design, the project or service team is liable either to have a low productivity or to improvise the task of designing the solution. Project or service team members are susceptible to adopting inconsistent approaches that are likely to be the cause of problems later on. The organization is then exposed to the risk of assuming significant rework costs and schedule problems, and ultimately, delivering products and services of poor quality.

3.8 The environment used to perform the work supports construction of the solution.

If the environment used to perform the work does not support construction of the solution, the project or service team is liable either to have a low productivity or to perform construction of the components required by the product or the service in an inconsistent manner that will make the unavoidable modifications difficult to implement and post-delivery maintenance laborious. The organization is then exposed to the risk of assuming development and maintenance costs higher than initially estimated and significant schedule delivery problems.

3.9 The environment used to perform the work supports testing or verification of the solution.

If the environment used to perform the work does not support testing or verification of the solution, the project or service team is liable either to have a low productivity, to shorten the test or verification phase in order to meet the delivery deadlines or to release insufficiently tested products or verified services. The organization, in turn, is exposed to the risk of either assuming significant rework costs and schedule delays, or facing dissatisfied customer/users.

Ultimately, the organization could have to deal with the rejection of the product or the service by the customer/users.

3.10 The environment used to perform the work supports documentation of the solution.

If the development environment does not support software documentation, the project or service team is liable either to have a low productivity, to generate inadequate documentation or to postpone indefinitely documentation of the solution. The organization, in turn, is exposed to the risk of either delivering products or services for which the unavoidable modifications are difficult to make or for which the maintenance proves to be very laborious. Ultimately, the organization is liable to face development and maintenance costs higher than initially estimated, significant schedule delivery problems and dissatisfied customer/users.

3.11 The environment used to perform the work supports configuration management (version management and control of documentation, components, etc.).

If the development environment does not support configuration management (version management and control of documentation, components, etc.), the project or service team is liable to lose track of document and solution's components versions, to use concurrently different and possibly incompatible document and solution's components versions, to waste time and effort regenerating configurations with inappropriate tool versions, and to deliver incompatible solutions and/or documentation to the customer/users. The organization, in turn, is exposed to the risk of experiencing serious cost overruns and schedule delays, in addition to facing rejection of the product or service by the customer/users.

3.12 The environment used to perform the work supports management of the work.

If the development environment does not support management of the work, the project or service team is liable to face a situation in which progress reports and plans do not reflect the actual status of activities. At best, management and delivery activities may only lag each other and at worst, management may be misled into believing that things are going well whereas the project or the service is actually heading toward major difficulties. Management personnel are exposed to the risk of facing unpleasant surprises and the organization, in turn, is exposed to the risk of facing serious crises in terms of cost overruns, schedule delays and dissatisfied customer/users.

3.13 The environment used to perform the work supports traceability of requirements to work products or delivery activities.

If the development environment does not support traceability of requirements to work products or delivery activities, the project or service team is liable either to maintain traceability matrices manually, with the high risk of errors and the low productivity that this entails, or to deliver a solution that falls short of satisfying the customer's and/or the users' requirements. The organization, in turn, is exposed to the risks of wasting both time and effort trying to have the customer accept the delivered product or service and having the work drag on without revenues.

3.14 The number and availability of the environment-related resources used to perform the work are sufficient.

If the number and the availability of environment-related resources used to perform the work are insufficient, the project or service team is liable to have a low productivity and conflicts are bound to arise as a result of resources being monopolized for specific tasks. The organization is then exposed to the risk of either initiating the procurement of unplanned additional resources and facing a cost overrun, or accepting a schedule slippage with the consequences that this may entail.

3.15 The project or team members are familiar with the tools and the methods associated with the environment used to perform the work.

If the project or service team members are not familiar with the tools and the methods associated with the environment used to perform the work, the project or service team is liable to overestimate the environment capability or to use it inefficiently. As a result, the organization is exposed to the risk of assuming costly rework and serious schedule delays as project or service team members improvise their knowledge of the environment features at the time of performing the work and proceed in a trial and error fashion.

3.16 The project team members have received training on the environment tools used to perform the work.

If the project team members are insufficiently trained in the use of the environment tools used to perform the work, they are liable to waste time and effort attempting to familiarize themselves with the features of those tools and methods, and to learn their characteristics in a trial and error fashion. The organization is exposed to the risk of assuming costly rework as errors go undetected until late in the development cycle, in addition to cost overruns and schedule delays as a result of the low productivity.

3.17 There are experts readily available in connection with the tools and methods associated with the environment used to perform the work.

If no experts are readily available in connection with the tools and methods associated with the environment used to perform the work, the project or service team members are liable to overestimate the environment capability, to use it inefficiently or to introduce errors during elaboration of the solution as a result of mistakes that are made. The organization is then exposed to the risk of assuming costly rework and schedule delays as a result of the low productivity.

3.18 Training the customer in the use of the environment to perform the work constitutes a requirement (e.g. if the environment is itself a deliverable).

If training the customer in the use of the environment to perform the work constitutes a requirement, such as when the environment is itself a deliverable, the project or service team is liable to underestimate the level of organization and logistical support required to meet this requirement. The organization is exposed to the risk of experiencing cost overruns and serious schedule delays in the training delivery, in addition to being liable to provide poor quality training and to face dissatisfied customer/users.

3.19 The tools and methodologies used to perform the work constitute deliverables to the customer.

If the environment tools and methodologies used to perform the work constitute deliverables to the customer, the project or service team is liable to underestimate the level of organization and logistical support required to make such deliverables usable by another party. The organization is exposed to the risk of experiencing cost overruns and schedule delays as additional effort has to be invested in order to satisfy the customer and/or the user's needs.

3.20 The elaboration of the solution is carried out in separate sites.

If the elaboration of the solution is carried out in separate site, the project or service team is liable to underestimate the level of coordination and organization required in order to complete the work, especially if the sites are separated by large distances and cross cultural boundaries. The organization is exposed to the risk of experiencing cost overruns and schedule delays resulting from incompatible environments, the use of different tools and methodologies, and components that are more laborious to integrate than what was initially envisioned.

Situations resulting from processes

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with adopted processes in the project or

the service, that is the means by which people, procedures, methods, equipment and tools are integrated to perform the work and, in turn, to satisfy the customer's requirements.

4.1 There are approved and documented plans that address the project or the service.

If there is a lack of approved and documented plans addressing the project or the service, the project or service team members are liable to proceed haphazardly before the tasks to perform have been reviewed and without a common, global understanding of the requirements to satisfy. Management, in turn, is exposed to the risk of being unaware of the actual work status, and is susceptible to unpleasant surprises as the consequences of the lack of coordination and progress tracking that a documented plan guards against materialize.

4.2 The plans have been prepared from historical data relevant to the work to perform.

If plans have been prepared without referring to relevant historical data relevant to the work to perform, the project or service team is liable either to be optimistic and to underestimate the effort required to complete the work, or to be pessimistic and to come up with estimates that are non-competitive and that are susceptible to being arbitrarily cut back by management. The organization, on the other hand, is exposed to the risk of assuming cost overruns and schedule delays where the effort was underestimated or estimates were cut back, or of facing work cancellation where the effort was overestimated.

4.3 The project or service is managed according to the plan.

If the work is not managed according to the plan, the project or service team is liable to lose track of the objectives and to deviate dangerously from initial estimates, while the project or service team members are susceptible to becoming less coordinated as time goes on. Management is exposed to the risk of being unaware of the actual work status and is susceptible to unpleasant surprises as the consequences of these deviations and lack of coordination unravel. The

organization, in turn, is exposed to the risk of facing serious crises in terms of cost overruns, schedule delays and ultimately, dissatisfied customer/users.

4.4 Progress tracked and compared to the plan.

If progress is not tracked or not compared to the plan, the project or service team is liable to face a situation in which progress reports and plans do not reflect the actual project or service status. At best, management and delivery activities may only lag each other and at worst, management may be misled into believing that things are going well whereas the project or the service is actually heading toward major difficulties. Management personnel are exposed to the risk of facing unpleasant surprises and the organization, in turn, is exposed to the risk of experiencing serious crises in terms of cost overruns, schedule delays and ultimately, dissatisfied customer/users.

4.5 Progress reports are periodically submitted and reviews periodically held.

If there is a lack of periodic progress reports and/or periodic progress reviews, the project or service team is liable to be unaware of upcoming changes that could affect work products and project or service delivery activities. Management, in turn, is susceptible either to making decisions without having all the information in hand or to delay making decisions where action is imperatively needed. As a result, the organization is exposed to the risks of exhibiting poor performance and operating in a chaotic mode.

4.6 The project or service team members, at all hierarchical levels, are informed of the progress compared to the plan.

If there is a lack of information, at all hierarchical levels, on the progress compared to the plan, the project or service team is liable to be unaware of upcoming changes that could affect work products and project or service activities, and team members are susceptible to being unaware of events that affect them. Management, in turn, is liable either to make decisions without having all the information in hand or to delay making decisions where action is

imperatively needed. As a result, the organization is exposed to the risks of exhibiting poor performance and operating in a chaotic mode.

4.7 The development or delivery process is adapted to the needs of the project or the service, based on a uniform process used in the organization.

If the development or the delivery process is neither based on a uniform process used in the organization nor adapted to the needs of the project or the service, the project or service team is liable both to be unable to benefit from the experience of other initiatives and to follow a process ill-adapted to its particularities. Management, on the other hand, is susceptible to misinterpreting progress reports prepared by the team. As a result, the organization is exposed to the risk of being incapable of improving its performance and of operating in a less chaotic mode, while assuming a high level of risk at the onset of each project or service.

4.8 The development or delivery process is supported by appropriate tools, methodologies and procedures.

If the process is not supported by appropriate tools, methodologies and procedures, the project or service team is liable to struggle with either tasks too large and too complex for the tools, methodologies and procedures currently in place, or with tools, methodologies and procedures too cumbersome for the tasks to perform. In both cases, the organization is exposed to the risks of experiencing serious schedule delays and facing customer/users dissatisfied with repeatedly postponed deliveries.

4.9 All project or service team members adhere to the development or delivery process.

If the process is not adhered to by all project team members, the project or service team is liable to experience coordination problems and to operate chaotically. Managers are susceptible to wasting time and effort resolving crises that develop as a result of the lack of coordination in the project or the service. The organization, in turn, is exposed to the risks of delivering products and services of

poor quality and being incapable of improving its performance as the improvement activities are inconsistently implemented by project or service teams.

4.10 The project or service team members are experienced with the development or delivery process.

If the project or service team members lack experience with the development or delivery process, the project or service team is liable to apply the process and its underlying tools, methodologies and procedures incorrectly and to abandon it when it does not demonstrate tangible benefits. As a result, the organization is exposed to the risk of assuming costly rework and serious schedule delays as team members proceed in a trial and error fashion and eventually revert to a more chaotic mode of operation.

4.11 The quality assurance function is adequately established in the project or the service.

If the quality assurance function is inadequately established, the project or service team is liable to cut corners in order to meet the delivery deadlines and to isolate itself from an unbiased evaluation of its products, services and activities that could prove detrimental later on. In addition, the project or service team is liable not to be informed in time of events or directives issued by management and/or the customer that could affect it, and to shield itself from essential support should the schedule have to slip or additional funding be required in order to complete the work. In any case, the organization is exposed to the risks of delivering products and services of poor quality and being subjected to undesirable interference by the customer/users who distrust its capability.

4.12 The quality assurance function is carried out objectively or by personnel who are independent of the project or the service.

If the quality assurance function is not carried out objectively or by personnel who are independent of the project or the service, the project or service team's

credibility in terms of the quality of its products and services, and in terms of its adherence to the process it has adopted, is liable to be questioned. The project or service team, consequently, is susceptible to being frequently challenged by management. The organization, in turn, is exposed to the risk of being subjected to undesirable interference by the customer/users who distrust its capability.

4.13 The configuration management function (version management and control of documentation, components, etc.) is adequately established in the project.

If the configuration management function (version management and control of documentation, components, etc.) is not adequately established, the project or service team is liable to lose track of essential versions of documents and component, to use concurrently different and possibly incompatible versions of those items, to waste time and effort regenerating configurations with inappropriate tool versions, and to deliver incompatible products, services and/or documentation to the customer/users. The organization, in turn, is exposed to the risk of serious cost overruns and schedule delays, in addition to facing rejection of the products or services by the customer/users.

4.14 There is a formal process for controlling changes made to the solution.

If there is no formal process for controlling changes that are made to the solution, the project or service team is liable to operate in a continuous flow of changes, some justified and others unjustified. As a result, the team is susceptible to carrying out its tasks with multiple versions of documentation and components, some of them incompatible, and to lose track of the versions which are the most current. The organization, in turn, is exposed to the risk of experiencing serious cost overruns and schedule delays, in addition to delivering products and services of poor quality to the customer/users.

4.15 The change control process covers all the baseline versions of the requirements, design, construction and delivery specifications, and of documentation.

If the change control process does not cover all the baseline versions of the requirements, design, construction and delivery specifications, and of documentation, the project or service team is liable to lose track of current versions of essential project or service artifacts, to use concurrently different and possibly incompatible versions of those artifacts, and ultimately, to deliver incompatible products, services and/or documentation to the customer/users. The organization, in turn, is exposed to the risk of assuming costly rework to fix the discrepancies.

4.16 The configuration management systems used by the suppliers (external and internal) are compatible with the one used by the project or service team.

If the configuration management systems used by the suppliers (external and internal) are incompatible with the one used by the project or service team, the latter is liable to end up with artifacts and items for which the configuration cannot be managed and controlled like the other artifacts and items provided in-house. The organization, in turn, is exposed to the risks of delivering questionable products and services to the customer/users, assuming costly rework and delivering products and services that are difficult to maintain.

4.17 The deliverable product or service is installed or provided in many separate sites.

If deliverable products and services are installed or provided in many separate sites, the project or service team is liable either to be unable to control and manage the configuration applicable to each site and to experience serious maintenance difficulties, or to deliver future versions of the product or service that are incompatible with previous versions. The organization is exposed to the risk of assuming financial losses as either the maintenance costs soar or the updated versions are rejected by the customer/users.

4.18 Test or verification plans and procedures are modified as part of the change control process.

If the test and verification plans and procedures are not modified as part of the change control process, the project or service team is liable to waste both time and effort planning and carrying out testing and verification of solution's components in accordance with documents that are not matched to these components. The organization is exposed to the risks of delivering inadequately tested or verified products and services to the customer/users, and facing costly rework and dissatisfied customer/users.

4.19 The project or service team members are frequently interrupted in their work in order to solve urgent problems.

If personnel are frequently interrupted in their work in order to solve urgent problems, the project or service team is liable to be inefficient and to operate in an uncoordinated manner, with conflicting directives coming from different sources. The organization, therefore, is exposed to the risks of having to deal with frustrated personnel, cost overruns and schedule delays, and being incapable of improving its performance as project or service team members have little time to contemplate or implement improvement activities.

4.20 Planning is redone when significant delays or interruptions occur.

If replanning is not performed when significant delays or interruptions occur, the project or service team is liable to face a situation in which plans become entirely unrealistic and project or service team members pay no attention to them. The project or service team is susceptible to losing track of the objectives and to become less coordinated as time goes on. Management, in turn, is exposed to the risk of being unaware of the actual project or service status and is susceptible to unpleasant surprises as the consequences of these deviations and lack of coordination unravel.

4.21 There are ambiguities in the work statement transmitted to suppliers.

If there are ambiguities in the work statement transmitted to suppliers (external or internal), the suppliers' project or service team members are liable to resolve

these ambiguities on their own by developing a personal and possibly erroneous interpretation of the requirements, and to spread this interpretation to all of the suppliers' personnel directly or indirectly involved in the project or in the service. The organization that contracted out the work, in turn, is exposed to the risks of being unable to respect delivery deadlines and/or delivering products and services that do not satisfy the customer's or the users' needs.

4.22 The project or service tracking procedures put in place by the suppliers are different from those put in place by the project or service team.

If the project or service tracking procedures put in place by the suppliers (external or internal) are different from those put in place by the project or service team, the latter is liable to incorrectly interpret progress reports submitted by the suppliers. Management is susceptible to being misled into believing that things are going well whereas the subcontract is actually heading toward major difficulties. The organization that contracted out the work and the subcontractor, in turn, are exposed to the risk of facing serious crises as the subcontracted work is liable not to be delivered as expected.

4.23 It is difficult to obtain schedules and technical data from the suppliers.

If difficulties are experienced in obtaining schedules and technical data from the suppliers (external or internal), the project or service team is liable to proceed on the basis of assumptions and to have to absorb costly rework and schedule delays as the data and information, when it becomes available, does not match the assumptions which had been made. An atmosphere of mistrust may settle in and make interactions with the suppliers laborious and legal proceedings may ensue. Ultimately, the organization is exposed to the risk of facing dissatisfied customer/users.

4.24 It is difficult to obtain from the customer the data needed for the project.

If difficulties are experienced in obtaining the needed data and information from the customer, the project or service team is liable to proceed on the basis of

assumptions and to have to absorb costly rework and schedule delays as the data and information, when it becomes available, does not match the assumptions which had been made. An atmosphere of mistrust may settle in and make interactions with the customer laborious, and legal proceedings may ensue. Ultimately, the organization is exposed to the risk of being embroiled in protracted conflicts and is susceptible to having its image discredited.

4.25 The potential risks facing the project have been identified.

If risks facing the project or the service have not been identified, the project or service team is liable to experience major work disruptions as unexpected problems occur and team members are called upon to solve urgent problems. The development or delivery process adopted by the project or service team, including task coordination and progress tracking, is susceptible to being abandoned, which is likely to make matters worse. The organization, in turn, is exposed to the risk of experiencing cost overruns and serious schedule delays.

4.26 There are contingency plans to address anticipated risks and problems that result from risks that have materialized.

If there is a lack of contingency plans that address both anticipated risks and problems that result from risks having materialized, the project or service team is liable to be disoriented, at least temporarily, by the resulting difficulties and to waste time and effort in coordinating a suitable response to the situation. The organization, in turn, is exposed to the risks of absorbing unexpected additional costs and being unable to deliver as initially planned.

Situations resulting from management-related topics

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with the project or service management approach and, at a more general level as far as the project or the service is affected by it, the management approach of the organization in which the work takes place.

5.1 Managers are experienced in the fields of product development or service delivery.

If managers lack experience in the fields of product development or service delivery, they are liable either to proceed by trial and error and to issue directives that may lead to frustration, costly rework and schedule delays, or to postpone making decisions where action is imperatively needed. The project or service team members, on the other hand, are liable to be disheartened and to lack the team spirit which would make them perform well. The organization is exposed to the risk of experiencing cost overruns, late deliveries and work disruptions as managers are successively replaced.

5.2 Managers are experienced in project or service management.

If managers lack experience in project or service management, they are liable to get involved in technical details, to neglect the coordination of the project or service tasks and, subsequently, to waste time and effort resolving crises that have developed in the meantime. Senior management personnel, on the other hand, may lack the information that would enable them to support the project or the service more effectively. The organization, in turn, is exposed to the risk of experiencing cost overruns, late deliveries and work disruptions as managers are successively replaced.

5.3 Managers are experienced in the domain addressed by the project or the service.

If managers lack experience in the domain addressed by the project or the service, they are liable either to misunderstand requirements and to issue directives that may lead to costly rework and schedule delays, or to postpone making decisions where action is imperatively needed. The project or service team members, on the other hand, are liable to lose confidence in their managers' abilities and, consequently, to be deprived of the coordination that would help them perform well. The organization, in turn, is exposed to the risk of experiencing cost

overruns, late deliveries and work disruptions as managers are successively replaced.

5.4 Managers have experience with the process adopted by the project or the service.

If managers lack experience with the process adopted by the project or the service, they are liable to apply the process incorrectly, to abandon it when it does not demonstrate tangible benefits, and to improvise new approaches in connection with critical activities. As a result, the organization is exposed to the risk of assuming costly rework and serious schedule delays as project or service team members proceed in a trial and error fashion and eventually revert to a more chaotic mode of operation.

5.5 A process has been implemented by management to allow the identification and communication of problems within the organization.

If a process which allows the identification and communication of problems within the organization has not been implemented by management, problems that could be resolved relatively quickly if dealt with early enough are liable to turn into crises later on. The project or service team is then liable to experience major work disruptions as project or service team members are called upon to help solve those crises. The organization, in turn, is exposed to the risk of either assuming cost overruns and schedule delays or delivering products and services of poor quality as the team tries to make up for lost time.

5.6 The organization which is put in place for the project or service team is efficient.

If the way the project or the service team operates is not efficient, the project or service team is liable to display a poor coordination of its activities and to display a low level of productivity. Project or service team members are liable to operate in a more or less chaotic state, to perform redundant tasks and/or to make an unusually high number of errors. The organization is exposed to the risk of

experiencing cost overruns and schedule slippage as the actual effort expended greatly exceeds the planned effort.

5.7 Management involves affected members of the project or service team during reviews with the customer.

If management does not involve affected members of the project or service team during reviews with the customer, the team is liable to be unaware of upcoming changes that could affect work products and project or service activities. Project or service team members are susceptible to developing an incorrect perception of the customer's and/or users' needs and to being unaware of events that affect them. Management, in turn, is liable to make decisions without having all the information in hand. As a result, the organization is exposed to the risks of exhibiting poor performance and delivering products and services of mediocre quality.

5.8 Management has a precise idea of the project or service status.

If management does not have a precise idea of the project or service status, the project or service team is liable to lack the management support it needs to complete the work as planned and management is susceptible to believing that things are going well whereas the project or the service is actually heading toward major difficulties. The organization, in turn, is exposed to the risk of facing serious crises in terms of cost overruns, schedule delays and dissatisfied customer/users.

5.9 There is a process to resolve differences with the customer or the suppliers.

If there is no process to resolve differences with the customer or the suppliers (external or internal), the project or service team is liable to interact with the client or the suppliers in an atmosphere of mistrust and all parties are liable to strive to make things difficult for each other. Legal proceedings may ensue and, ultimately, the organization is exposed to the risk of facing customer/users either

dissatisfied with the poor performance of the work or who take sides in the conflicts.

5.10 It is considered good politics to present an optimistic picture to the customer or to management.

If it is considered good politics to present an optimistic picture to the customer or to management, the project or service team is liable to make things look good in order to prevent or to delay interference on the part of management or the customer. Management personnel are exposed to the risk of facing unpleasant surprises and the organization, in turn, is exposed to the risk of experiencing serious crises as hidden problems have built up in the meantime.

5.11 It is easy for the project or service team members to get management action.

If project or service team members have difficulty getting management action, the team is liable either to delay informing management of problems until they have turned into crises and immediate action has to be taken, or else to proceed on the basis of assumptions and to have to assume costly rework and schedule delays if and when an action is taken, it invalidates the assumptions that had previously been made. In both cases, the organization is exposed to the risk of exhibiting poor performance.

5.12 There is a process that ensures timely information exchanges between management and practitioners.

If there is no process that ensures timely information exchanges between management and practitioners, the project or service team is liable to lack the management support it needs to complete the work as planned, and management is liable to lack the information that would enable it to support the project more effectively. The organization, in turn, is exposed to the risks of being unable to take advantage of its potential and being noncompetitive.

5.13 Management is receptive to the information transmitted by the members of the project or service team.

If management is not receptive to the information transmitted by the members of the project or service team, the latter is liable to delay informing management of problems until they have turned into crises and immediate action has to be taken. Management, in turn, is liable either to make decisions without having all the information in hand or to delay making decisions where action is imperatively needed. In both cases, the organization is exposed to the risk of exhibiting poor performance.

5.14 The project or service team members have the possibility of identifying the sectors or activities at risk without having a solution in hand.

If project or service team members do not have the possibility of identifying the sectors or activities at risk without having a solution in hand, the project or service team is liable either to delay informing management of potential risks until they have materialized into problems, or else to proceed on the basis of incomplete information and to have to assume costly rework and schedule delays if and when a solution is proposed by management, it invalidates the assumptions that had previously been made. In both cases, the organization is exposed to the risks of exhibiting poor performance and operating chaotically, with the consequences that this entails.

5.15 Office politics in the organization, in the customer's organization or in the suppliers' organization affect the project or the service.

If office politics in the organization, in the customer's organization or in the suppliers' organization (external or internal) affect the project or the service, the project or service team is liable to operate in an overly suspicious atmosphere where distrust is a way of life. Management personnel, on the other hand, are unlikely to be able to win the trust of team members and are susceptible to feeling

constantly conspired against. The organization is exposed to the risk of experiencing chronic cost overruns, poor performance and schedule slippage.

5.16 Office politics affect technical decisions.

If office politics affect technical decisions, the project or service team members are liable to withhold proposals or solutions that are perceived as politically unsuitable but which could significantly improve the team performance and productivity. Project or service team members are liable to become less efficient and less motivated, and to develop a passive resistance approach as they perceive that they have little influence on decisions made by management. The organization, in turn, is exposed to the risk of displaying continued poor performance.

Situations resulting from personnel-related topics

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with personnel in the organization directly or indirectly involved in carrying out the project or delivering the service. These personnel-related topics typically include skills, responsibilities, the way people work together, etc.

6.1 The roles, responsibilities and reporting relationships are clear.

If the roles, responsibilities and reporting relationships are unclear, the project or service team is liable to be inefficient and to operate in an uncoordinated manner, with conflicting directives and project or service information originating from different sources. The organization, in turn, is exposed to the risk of delivering products and services of poor quality behind schedule and being incapable of improving its performance as the improvement activities are neither assigned to anyone nor tracked.

6.2 Everyone knows who has authority for what.

If not everyone knows who has authority for what, the project or service team is liable to be inefficient as decisions are made by personnel who neither have all the relevant information to make them nor the authorization to do so, and to operate in an uncoordinated manner, with conflicting directives and project or service information originating from different sources. The organization, in turn, is exposed to the risks of experiencing costly rework as a result of conflicting directives originating from different sources and being depicted as a chaotic operation by customers and suppliers.

6.3 The project or service team members have received the training needed for carrying out the project.

If team members have not received the training needed for carrying out the project or the service, they are liable either to waste time and effort attempting to learn the skills required to carry out the work on their own and as a result, to proceed in a trial and error fashion, or to procrastinate starting the tasks for which skills are lacking until crises develop. The organization is exposed to the risk of assuming costly rework as errors go undetected until late in the development cycle, in addition to cost overruns and schedule delays as a result of the low productivity.

6.4 The project or service team members are aware of the importance of keeping to the plan.

If the project or service team members are unconcerned with the importance of keeping to the plan, management personnel are liable to rely on plans that are neither followed nor taken seriously in connection with product or service deliveries to the customer/users. Constant replanning may, therefore, become a way of life, with the waste of time and effort that this entails. The organization is exposed to the risks of chronic schedule slippage, cost overruns and institutionalized mediocrity.

6.5 Personnel, at all hierarchical levels, have an attitude reflecting commitment toward quality.

If there is a lack of commitment toward quality from personnel at all hierarchical levels, project and service team members are liable to be unmoved by quality objectives established by management. Management personnel, on the other hand, are susceptible to having to deal with the consequences of products and services of poor quality generated by the project or service team. The organization is exposed to the risks of poor performance, dissatisfied customer/users and the loss of market share or the decline of influence that comes with it.

6.6 The various groups involved in the project or the service cooperate.

If there is a lack of cooperation between the various groups involved in the project or the service, each group is liable to lack common goals that transcend their immediate interests and, as time goes on, to erect barriers that will make collaboration more and more difficult. Disruptive intervention from senior management personnel is likely to be required regularly. The organization is exposed to the risk of experiencing divisional conflicts that result in poor performance and high operational costs.

6.7 The project or service team members are informed in a timely manner of any decisions or events that can affect them.

If project or service team members are not being informed in a timely manner of any decisions or events that can affect them, the project or service team is susceptible to resource contention problems and team members are liable to retaliate by consciously or unconsciously neglecting to provide management and their peers with an up-to-date status of the work in progress. The organization is exposed to the risks of operating in an environment where crisis management is the norm and being under constant pressure to meet deadlines.

6.8 There is a process that recognizes and rewards superior work.

If there is no process to recognize and reward superior work, the project or service team is liable to develop the impression that management does not care and project or service team members are susceptible to doing no more than what is strictly necessary. Management, on the other hand, may be at a loss on how to improve performance without being sneered at. The organization is exposed to the risks of exhibiting a low productivity and dealing with unmotivated staff.

6.9 The work atmosphere is conducive to creativity and productivity.

If the work atmosphere is not conducive to creativity and productivity, the project or service team members are liable to feel little incentive to do more than what is strictly necessary, to avoid taking initiatives and to be devoid of any kind of team spirit. Management personnel, on the other hand, are liable to have little or no latitude to reward superior work. The organization as a whole is exposed to the risks of displaying chronically low productivity and facing a slow decline as a result of its inability to take on tasks requiring a high level of teamwork.

6.10 Management intervention is periodically required in order to get people to work together.

If periodic management intervention is required in order to get people to work together, the project or service team is liable to operate in an overly suspicious environment where barriers erected between groups prevent any kind of productive collaboration. Project or service team members are liable to lack common goals that transcend their immediate interests. The organization is exposed to the risks of experiencing fruitless divisional conflicts that result in poor performance and low productivity.

6.11 Skills are lacking in requirements analysis and definition.

If skills are lacking in requirements analysis and definition, the project or service team is liable either to have low productivity or to improvise the task of analyzing requirements and thus overlook important aspects of the required functionality, cost, delivery schedule or performance. The organization is then exposed to the

risk of assuming significant rework costs, schedule delivery problems and a disgruntled customer and/or dissatisfied users.

6.12 Skills are lacking in algorithm development expertise.

If skills are lacking in the development of algorithms, the project or service team is liable to develop products or services exhibiting a high level of resource consumption and poor performance. Project or service team members, on the other hand, are susceptible to performing redundant tasks and/or to make an unusually high number of errors. The organization is then exposed to the risks of assuming significant rework costs, schedule problems and ultimately, delivering products and services of poor quality.

6.13 Skills are lacking in design and development or delivery methodologies.

If skills are lacking in design and development or delivery methodologies, the project or service team is liable either to have low productivity or to improvise the task of designing the product or the service. Project or service team members are susceptible to adopting inconsistent approaches that are likely to be the cause of problems later on. The organization is then exposed to the risks of assuming significant rework costs, schedule problems and ultimately, delivering products and services of poor quality.

6.14 Skills are lacking in programming languages and techniques.

If skills are lacking in programming languages and techniques, the project or service team is liable either to have low productivity or to construct the product or implement the service in an inconsistent manner that will make the unavoidable modifications difficult to implement and post-delivery maintenance of the product or the service laborious. The organization is then exposed to the risk of assuming development and maintenance costs higher than initially estimated and significant schedule delivery problems.

6.15 Skills are lacking in testing or verification and integration methodologies.

If skills are lacking in testing or verification and integration methodologies, the project or service team is liable either to have low productivity, to shorten the test or verification phase in order to meet the delivery deadlines or to release insufficiently tested or verified products. The organization, in turn, is exposed the risk of either assuming significant rework costs and schedule delays or facing dissatisfied customer/users. Ultimately, the organization could have to deal with the rejection of the product or the service by the customer/users.

6.16 Skills are lacking in reliability analysis methodologies.

If skills are lacking in reliability analysis methodologies, the project or service team is liable either to make assumptions on the expected reliability of the finished product or the delivered service, or to neglect analyzing essential reliability characteristics and implementing basic reliability features. The organization is then exposed to the risk of delivering a product or a service that does not satisfy the customer's and/or the users' needs, and assuming significant rework costs and schedule delivery problems. Ultimately, the organization could face the rejection of the product or the service by the customer/users.

6.17 Skills are lacking in techniques that facilitate maintenance.

If skills are lacking in development techniques which facilitate maintenance, the project or service team is liable to perform the development of the product or the delivery of the service in an inconsistent manner that will make the unavoidable modifications difficult to implement and post-delivery maintenance of the product or the service laborious. The organization is then exposed to the risk of assuming development, delivery and maintenance costs higher than initially estimated and significant schedule delivery problems.

6.18 Skills are lacking in man-machine interfaces and ergonomic aspects.

If skills are lacking in man-machine interfaces and ergonomic aspects, the project or service team is liable either to make assumptions on the users' abilities to exploit the functionality of the finished product or delivered service, or to neglect analyzing essential ergonomic characteristics and implementing user-friendly

features. The organization is then exposed to the risks of delivering a product or a service that does not satisfy the customer's and/or the users' needs, assuming significant rework costs and schedule delivery problems, and achieving poor market penetration. Ultimately, the organization could face the rejection of the product or service by the customer/users.

6.19 Skills are lacking in configuration management.

If skills are lacking in configuration management, the project or service team is liable to lose track versions of documents, artifacts or solutions, to use concurrently different and possibly incompatible versions of those items, to waste time and effort regenerating configurations with inappropriate tool versions, and to deliver incompatible solutions and/or documentation to the customer/users. The organization, in turn, is exposed to the risk of experiencing serious cost overruns and schedule delays, in addition to facing rejection of the product or service by the customer/users.

6.20 Skills are lacking in quality assurance.

If skills are lacking in quality assurance, the project or service team is liable to have an inadequately established quality assurance function in the project or in the service. Personnel having the responsibility of carrying out quality assurance activities are liable to be unproductive, and to be either feared or treated with contempt by the project or service team members assigned to the development of the solution or the delivery of the service. The organization is exposed to the risks of delivering products and services of poor quality and being subjected to undesirable interference by the customer/users who distrust its capability.

6.21 Skills are lacking in processing hardware or data storage equipment.

If skills are lacking in processing hardware or data storage equipment, the project or service team is liable to deliver a solution that will not operate as planned with the processing hardware or data storage configurations in which it is envisioned to run. Essential processing hardware or data storage characteristics may not be taken into account and the organization is exposed to the risk of either dedicating

costly resources in order to implement fixes in the field or developing new versions of the solutions. As a consequence, the resulting solution may exhibit a less than adequate performance and fall short of the customer's and the users' expectations. The organization, therefore, is exposed to the risk of achieving poor market penetration, with the financial losses that this entails.

6.22 Skills are lacking in commercial-off-the-shelf solutions.

If skills are lacking in commercial-off-the-shelf solutions, the project or service team is liable either to deliver a solution that is already available off-the-shelf and that could be integrated as is or with some modifications, or to deliver products and services that do not take into account essential attributes of the embedded commercial-off-the-shelf solutions and that will require costly fixes in the field later on. The organization, therefore, is exposed to the risks of requiring too much effort and too many resources for developing or delivering its solutions, taking too long before introducing a product or a service on the market, and/or achieving poor market penetration, with the financial losses that this entails.

6.23 Skills are lacking in operating systems.

If skills are lacking in operating systems, the project or service team is liable to deliver a solution that will not operate as planned with the operating system configurations under which it is envisioned to execute. Essential operating system characteristics may not be taken into account and the organization is exposed to the risk of either dedicating costly resources in order to implement fixes in the field or developing new versions of the solutions. As a consequence, the resulting solution may exhibit a less than adequate performance and may fall short of the customer's and the users' expectations. The organization, therefore, is exposed to the risk of achieving poor market penetration, with the financial losses that this entails.

6.24 Skills are lacking in the application domain addressed by the project or the service.

If skills are lacking in the application domain addressed by the project or the service, project or service team members are liable either to misunderstand requirements and to proceed with implementations that may lead to costly rework and schedule delays, or to postpone implementation until the schedule is jeopardized. The organization is then exposed to the risks of delivering a product or se service that does not satisfy the customer's and/or the users' needs, achieving poor market penetration and, ultimately, facing the rejection of the product or the service by the customer/users.

6.25 Skills are lacking in performance analysis.

If skills are lacking in performance analysis, the project or service team is liable either to make assumptions on the expected performance of the finished product or of the delivered service, or to neglect analyzing essential performance requirements. The organization is then exposed to the risk of delivering a product or a service that does not satisfy the customer's and/or the users' needs, and assuming significant rework costs and schedule delivery problems. Ultimately, the organization could face the rejection of the product or the service by the customer/users.

6.26 Skills are lacking in time critical solutions.

If skills are lacking in time critical applications, the project or service team is liable either to make assumptions on the expected response times of the finished product or of the delivered service, or to neglect analyzing key time-critical functions and implementing basic real-time constructs. The organization is then exposed to the risk of delivering a product or a service that does not satisfy the customer's and/or the users' needs, and assuming significant rework costs and schedule delivery problems. Ultimately, the organization could face the rejection of the product or the service by the customer/users.

6.27 The project or the service is strongly dependent on one or a few individuals.

If there is a strong dependence on one or a few individuals, the project or service team is liable to experience serious delivery problems as a result of the loss of one or a few of those key individuals. Other team members, on the other hand, are liable to feel that their contribution is considered insignificant and the team efficiency may be less than adequate. The organization is exposed to the risk of delivering products and services of poor quality as the demands made on those few key individuals exceed their capacity to fulfill them.

6.28 The project or the service is dependent, in terms of critical activities, on suppliers or consultants.

If there is a strong dependence, in terms of critical activities, on suppliers or consultants, the project or service team is liable to experience serious delivery problems as a result of the assignment of consultants to other tasks or the inability of suppliers to deliver as planned. The organization is exposed to the risk of being left without any options and experiencing cost overruns and serious schedule delays as it inherits responsibilities for which it has neither experience nor resources.

6.29 The project is strongly dependent on the expertise of the customer or the suppliers.

If there is a strong dependence on the expertise of the customer or the suppliers (external or internal), the project team is liable to find itself in a particularly weak position in relation to the customer (or the suppliers). The customer (or the suppliers) may, in addition, be tempted to take advantage of the situation in order to get more (or to deliver less) than what had initially been planned.

6.30 The knowledge acquired by the suppliers or consultants is transferred to the project team.

If the knowledge acquired by the suppliers or consultants is not transferred to the project or service team, the latter is liable to train personnel over whom it has no control and, consequently, to experience serious delivery problems as a result of

the assignment of those consultants or suppliers to other tasks. The organization is exposed to the risk of being left without any options and experiencing cost overruns and serious schedule delays as it inherits responsibilities for which it has no skilled resources.

6.31 The turnover of personnel assigned to the project or the service is stable and acceptable.

If the turnover of personnel assigned to the project or the service is either unstable or unacceptable, the project or service team is liable to experience either low productivity and high overhead costs as a result of the loss of expertise caused by a high personnel turnover, or poor performance and excessive aversion to change as a result of the low personnel turnover. The organization as a whole is then exposed to the risk of low productivity and poor performance.

Situations resulting from external constraints

The purpose of this category of situations consists in eliciting the difficulties, problems and obstacles resulting from situations associated with factors affecting the project or the service for which the project or service team has little or no control. On the other hand, the senior management personnel of the organization in which the project or the service takes place may have the influence and the authority to resolve or help resolve some of those issues.

7.1 There external constraints that may have a negative impact on the schedule, the budget, or the final product or service (e.g. conflicting commitments, rigid deadlines).

If external constraints have a potentially negative impact on the schedule, the budget, or the final product or service (e.g. conflicting commitments, rigid deadlines), the project or service team is liable to lack the means of getting the attention or timely action from the customer or from senior management on issues out of the team's control. Those constraints are then susceptible to deteriorating into crises and to create major disruptions for the project or the service. The

organization, in turn, is exposed to the risk of exhibiting poor performance and operating in a continuous state of impending doom.

7.2 It is difficult to assign qualified personnel resources to the project or the service at the time they are needed.

If difficulties are experienced in assigning qualified personnel resources to the project or the service at the time they are needed, the project or service team is liable to operate in an environment in which it has to assume the consequences of a lack of coordination and poor planning at the organizational level, and to lack the means of getting management's action on resource contention problems. The organization is exposed to the risk of experiencing schedule delays as the project team faces circumstances over which it has little or no control.

7.3 The expertise for this type of work exists within the company or the organization.

If there is a lack of expertise for this type of work in the organization, the project or service team is liable to lack the means of getting management's action with respect to the delivery problems it is facing as a result of being assigned responsibilities for which it has neither the required expertise nor access to skilled resources. As a consequence, the organization is exposed to the risk of experiencing significant cost overruns and serious schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.4 The type of contract or agreement governing the project or service constitutes a source of risk.

If the type of contract or agreement governing the project or service is a source of risk, the project or service team is liable to carry out the work in conditions that make delivery within budget and on schedule highly improbable. The project or service team members are liable to feel cheated in having been compelled to undertake a hopeless assignment, or to be unable to negotiate a reprieve with the

customer. Ultimately, the organization is exposed to the risk of being embroiled in protracted conflicts and is susceptible to having its image discredited.

7.5 The statement of work represents a burden for the project or service.

If the statement of work itself represents a burden for the project or the service, the project or service team is liable to be unable to negotiate a reprieve with the customer, or to lack the means of getting management's action with respect to an assignment that includes burdensome clauses and/or difficulties that are more substantial than those initially envisioned. The organization is exposed to the risk of experiencing cost overruns and schedule delays as the team faces circumstances over which it has little or no control.

7.6 Specifications represent a burden for the project or service.

If the specifications represent a burden for the project or the service, the project or service team is liable to be unable to negotiate a reprieve with the customer, or to lack the means of getting management's action with respect to an assignment for which the specifications that have been agreed upon are more difficult to satisfy than what had initially been envisioned. The organization is exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.7 Excessive interference from the customer represents a burden for the project or service.

If there is excessive interference from the customer, the project or service team is liable to assume the consequences of frequent and possibly major disruptions as project or service team members are called upon to satisfy high priority requests, as set by the customer or by senior management. The organization is exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.8 The lack of involvement from the users represents a burden for the project or service.

If there is a lack of involvement from the users, the project or service team is liable to lack the means of getting the attention or timely action from the customer or from senior management on being cut off from the users' input, and to rely on inadequate specifications to carry out the work. The project or service team is exposed to the risk of dealing with circumstances that are beyond its immediate control and the organization, in turn, is exposed to the risk of delivering products and services that inadequately satisfy the users' needs.

7.9 Imposition of an environment or of a development or delivery methodology represents a burden for the project or service.

If a development environment or a development or delivery methodology is imposed by the customer, the project or service team is liable to be unable to negotiate a reprieve with the customer, or to lack the means of getting management's action with respect to the difficulties it is facing as a result of its lack of expertise with the provided environment or with the provided methodology. The organization is exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances over which it has little or no control.

7.10 The excessive amount of documentation represents a burden for the project or service.

If there is an excessive amount of documentation required in connection with the project or the service, the project or service team is liable to be unable to negotiate a reprieve with the customer, or to lack the means of getting management's action with respect to the insufficient support and facilities required to generate that documentation. The organization, in turn, is exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.11 The long approval cycle for delivered items and services represents a burden for the project or service.

If there is an excessively long approval cycle for delivered items and services, the project or service team is liable to be unable to negotiate a faster response on the part of the customer, and either to proceed on the basis of assumptions and to experience costly rework and schedule delays as modifications are subsequently required, or to suspend work on the project until approval is received and risk losing its personnel resources. In both cases, the organization is exposed to the risk of experiencing cost overruns or schedule delays as the project or service team faces circumstances over which it has little or no control.

7.12 Intellectual property clauses represent a burden for the project or service.

If intellectual property clauses are not properly addressed, the project or service team is liable to take liberties, either knowingly or unknowingly, with components to which it does not have legitimate access, to suspend work until the proper authorizations are obtained and risk losing its personnel resources, or to invest time and effort in developing workarounds. The organization is exposed to the risk of either facing legal proceedings if the delivered products and services infringe on the rights of a third party or else, experiencing cost overruns and schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.12 Excessive confidentiality requirements represent a burden for the project or service.

If there are excessive confidentiality requirements in the project or the service, the project or service team is liable to be unable to negotiate a reprieve with the customer, or to lack the means of getting management's action with respect to the insufficient support and facilities required to satisfy those requirements. The organization, in turn, is exposed to the risk of either experiencing security breaches and losses of classified data, or assuming the consequences of products and services that do not meet stated security requirements. In both cases, the organization may be faced with having to invest additional effort and muster additional resources in order to implement costly corrective actions. Ultimately,

the organization could be the subject of legal proceedings if the delivered products and services result in significant losses for the customer.

7.14 The customer understands the technologies that are used in the solution.

If the customer does not understand the technologies that are used in the solution, the project or service team is liable to deal with requests that are practically unworkable and that may lead to frustration, costly rework and schedule delays. The customer, on the other hand, is liable to postpone making decisions where action is imperatively needed. The organization, in turn, is exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.15 The selection and administration of the suppliers in the project or the service are performed by a group different from the one responsible for the management of those suppliers.

If the selection and the administration of the suppliers in the project or the service is performed by a group different from the one responsible for the management of those suppliers, the project or service team is liable to inherit problems that are caused by conflicting directives issued to suppliers and to invest unplanned effort and resources to resolve those issues. The organization is exposed to the risk of experiencing cost overruns and serious schedule delays as the project or service team faces circumstances that are beyond its immediate control.

7.16 In dealing with the customer, it is necessary that the projector service team interact with two different groups for the management and administration of the work.

If it is necessary to interact with two different groups for the management and the administration of the work, the project or service team is liable to experience frequent and possibly major disruptions as project or service team members are called upon to address conflicting directives issued by the customer, and to invest unplanned effort and resources to resolve the resulting issues. The organization is

exposed to the risk of experiencing cost overruns and schedule delays as the project or service team faces circumstances over which it has little or no control.

7.17 The project or service team is dependent on critical components provided by suppliers.

If there is an excessive dependence on critical components provided by suppliers, the project or service team is liable to experience serious problems as a result of the inability of suppliers to deliver as planned, and either to be unable to negotiate a reprieve with the customer or to lack the means of getting management's action on issues out of the project or service team's control. The organization is exposed to the risk of being left without any options and experiencing cost overruns and serious schedule delays as it inherits responsibilities for which it has neither the experience nor the resources.

Chapter 9

Step 4: Data Consolidation and Analysis

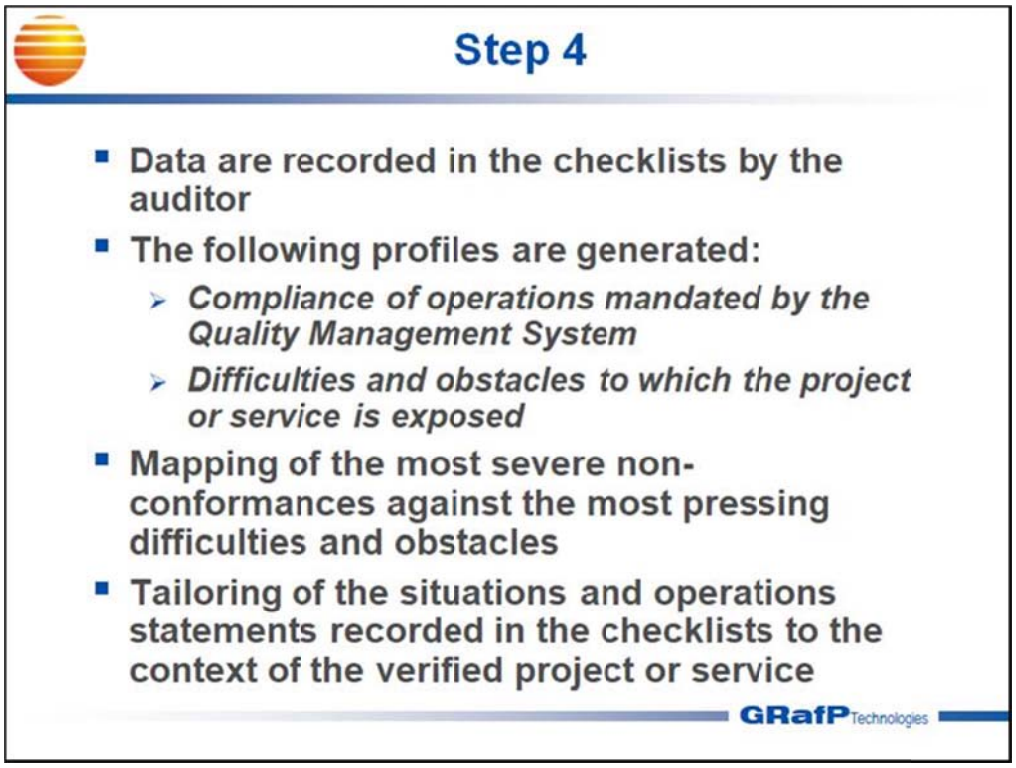


Figure 15 – Analysis of collected data

The fourth step of an X:PRIME assessment consists in importing data entered by the auditor or assessor in the Excel spreadsheets and analyzing them. This is the step that is typically carried offsite. However, a high-level description and the results transmitted to the auditor/assessor after its generation are included in this chapter.

The main activities performed in the course of audits or assessments are as follows:

1. Adapt the checklists or generate the model, as described in Chapter 6, from the information available for assessed or audited project or service.

2. If Excel is used, define the formulas to calculate the level of operational compliance and the level of difficulties and obstacles to which the project or service is exposed

   a) The maximum level of operational compliance and the maximum level of difficulties and obstacles, for each item of each checklist, in each category of operations and each category of situations are calculated as follows:

   $$\sum[2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}]$$

   The Importance factor is defined in accordance with the description provided in Chapter 6 - *Awareness, Selection and Tailoring*, where Importance[1] is the level assigned to the category of operations or the category of situations, and Importance[2] is the level assigned to each item (operation or situation) of a given category.

   b) The assessed level of operational compliance and the assessed level of difficulties and obstacles, for each category of operations and each category of situations, are calculated as follows:

   $$\frac{\sum\{(\text{Evaluated conformance level of an operation}) * 2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}\}}{\sum[2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}]}$$

   and

   $$\frac{\sum\{(\text{Evaluated difficulty level of a situation}) * 2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}\}}{\sum[2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}]}$$

The evaluated conformance level of an operation and the evaluated difficulty level of a situation correspond to the assessment of a situation or the assessment of an operation by the auditor/assessor during the verification.

3. Capture the information provided during the verification and particularly, the value assigned to each item of the checklists.

4. Start the analysis and generate the operational compliance profile and the profile of difficulties and obstacles to which the project or service is exposed using the expressions stated in 2.a) and 2.b). Figure 16 shows examples of generated profiles.

5. Review the categories of operations for which the assessed compliance is low and within these, the non-conformances for which the expression

$$\left\{(1 - \text{Assigned Value}/5) * 2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}\right\}$$

results in a high value (i.e. the non-conformance level is high).

6. Review the categories of situations for which the assessed level of difficulty is high and within these, the situations for which the expression

$$\left\{(\text{Assigned Value}/5) * 2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}\right\}$$

results in a high value (i.e. the level of difficulties and obstacles that these situations generate is high). In the event that a situation is expressed in desirable terms (instead of undesirable terms), the following expression is used to calculate the assessed level of difficulty[1]:

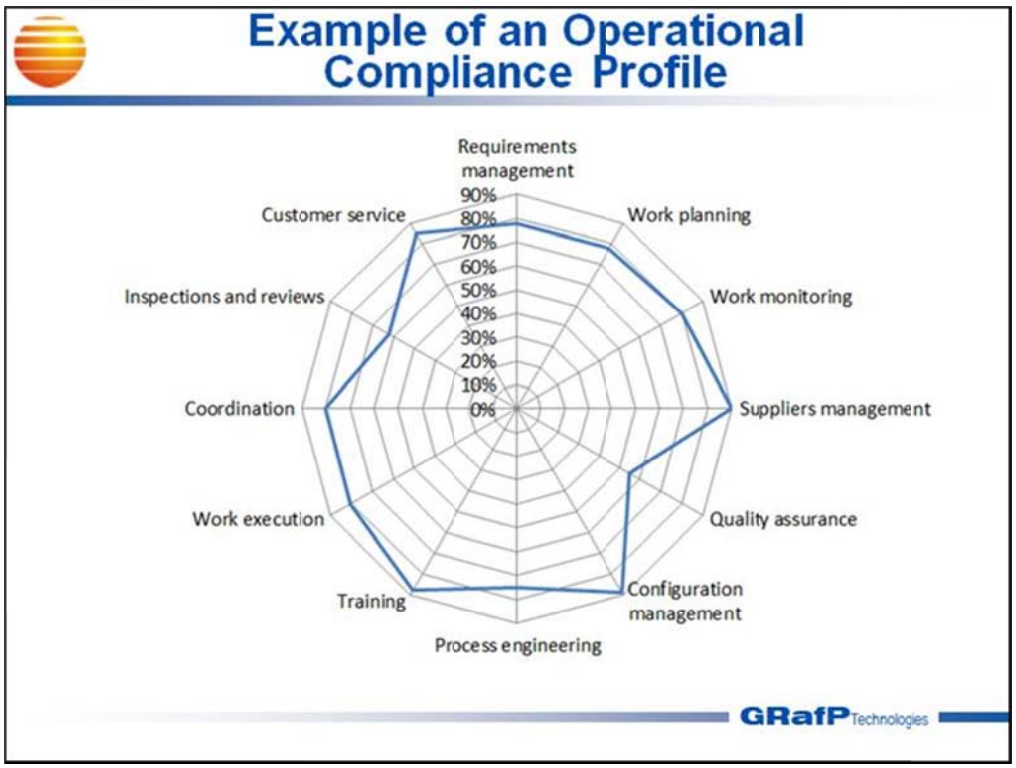
$$\left\{(1 - \text{Assigned Value}/5) * 2^{(\text{Importance}[1] + \text{Importance}[2] - 6)/2}\right\}$$

7. Extract the non-conformances that need to be corrected in order to reduce the likelihood that the reviewed situations will deteriorate.

[1] Note that to get around the desirability and undesirability of a situation to calculate the assessed level of difficulty, that situation can be characterized as “Never an Issue” or “Always an Issue” so that there is no need to differentiate between (Assigned Value/5) for an undesirable situations and (1 – Assigned Value/5) for a desirable situation.

8. Note that sometimes, it may happen that no particular non-conformance can be mapped to a situation that generates a high level of difficulties and obstacles. In this case, the auditor or assessor will have to rely on his or her judgment and the comments provided by the interviewees to identify corrective actions. However, a set of non-conformances can often be combined to address this situation.

9. Adapt the resulting statements of situations and operations to the context of the audited/assessed project or service.



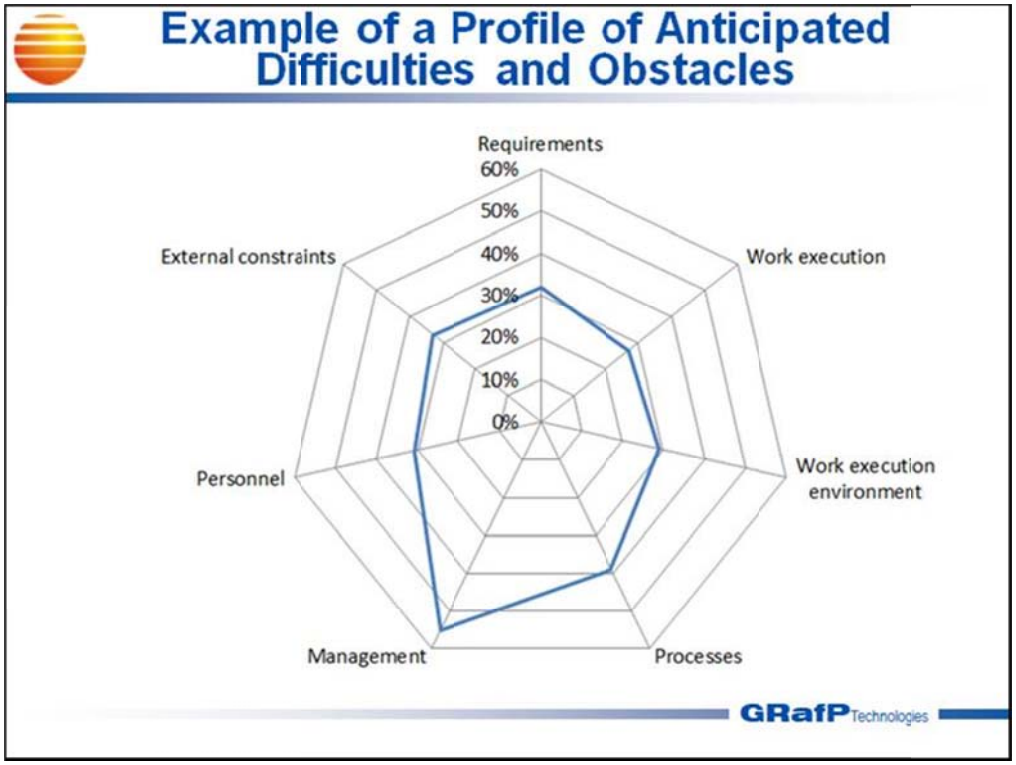


Figure 16 – Example of profiles generated from data collected with the checklist of operations and the checklist of situations

Chapter 10

Step 5: Presentation of Results

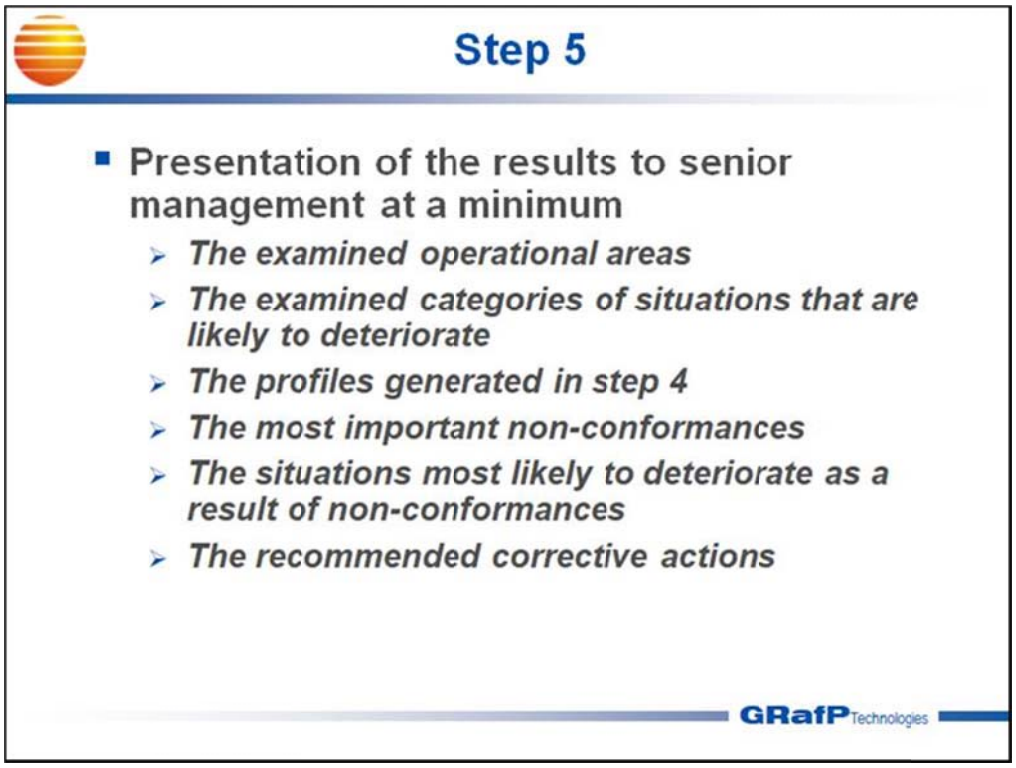


Figure 17 – Presentation of audit/assessment results

The final step of an audit or assessment conducted with the X:PRIME methodology consists in presenting the results that have been built up during step 4. A template is provided in order to help you prepare such a presentation.

The findings presentation may be an intermediate step which will be followed shortly thereafter by remedial action planning. Essentially, it is a review of the work that has been accomplished so far, and which constitutes an agenda for what will come later. Findings may or may not be presented to senior management, depending on the negotiated agreement; however, it is usually a good practice to include a presentation of results before moving on to remedial action planning.

In some cases, however, presenting the results will be the final deliverable and someone other than whoever conducted the audit or the assessment will conduct remedial action planning. In this situation, findings will usually be prepared and presented to senior management, and it is common practice to include validation sessions with participants before presenting the results to senior management, in order to ensure that they are accurate and complete, since validation sessions will not necessarily be conducted during remedial action planning. In fact, in this case, an assessment report is typically also prepared so that whoever will conduct remedial action planning will have all the information available needed to do so.

The following is a list of items that should be taken into account in connection with the presentation of results.

1. Results must be presented at least to senior management. If results are also to be presented to participants, this should be clarified with senior management, as described in Chapter 6.

2. When validation sessions are held, it is usually desirable to conduct several presentations. Practitioners may be ill at ease in a room with managers and senior managers, and vice versa. Managers may also be uncomfortable with senior management in the same room. Past experience has shown that having two or three presentations may be helpful in preparing remedial action planning as you may have more flexibility to guarantee the free flow of information.

3. A presentation of the results typically lasts around one hour.

4. Keep in mind that an audit or an assessment conducted with the X:PRIME methodology is not foolproof. Participants may disagree with some of the audit or assessment results. Do not change the results, since this may only be the opinion of a few individuals, but record their comments. Validation sessions which, at the very least, will be conducted in the course of remedial action planning will address those marginal findings. Take into account that there may have been a glitch in the process. It is also possible that participants have misunderstood certain operations or situations. This emphasizes the importance of tailoring the checklists properly.

5. It is usually desirable to start the presentation by stating that the findings will be validated as part of remedial action planning, in order to prevent long discussions on some of those findings. In any case, do not argue with participants. As mentioned in item 2, another approach is to hold validation sessions before conducting the presentation of results. However, this will make the audit or assessment longer and more expensive for the project or the service. In addition, experience has shown that the presentation of results generates a peak of interest in the audited or assessed entity. After the presentation is over, interest will inevitably start declining. Informing participants that validation sessions will be held has the advantage of proposing something they can contribute to in the short term, while providing a way to jump start remedial action planning.

6. The presentation of results essentially concludes the audit or assessment conducted with the X:PRIME methodology. It may also be desirable to write an audit or an assessment report that elaborates on the results of the verification. This, among other things, would allow keeping a more detailed trace of the findings and reducing the possibility that they be misinterpreted later on.

Presentation template

See next page.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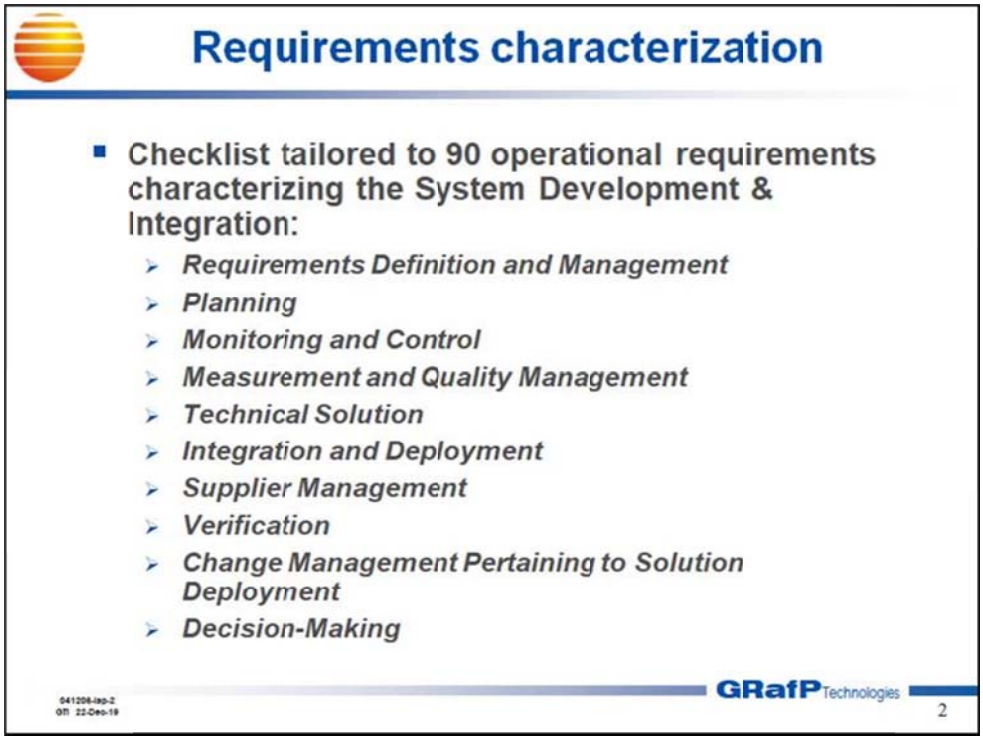
Remote Drone Operation
System Development
& Integration
041206-isp-1
on 22-Dec-19


Requirements characterization
Checklist tailored to 90 operational requirements characterizing the System Development & Integration:
Requirements Definition and Management
Planning
Monitoring and Control
Measurement and Quality Management
Technical Solution
Integration and Deployment
Supplier Management
Verification
Change Management Pertaining to Solution Deployment
Decision-Making
041206-isp-2
on 22-Dec-19
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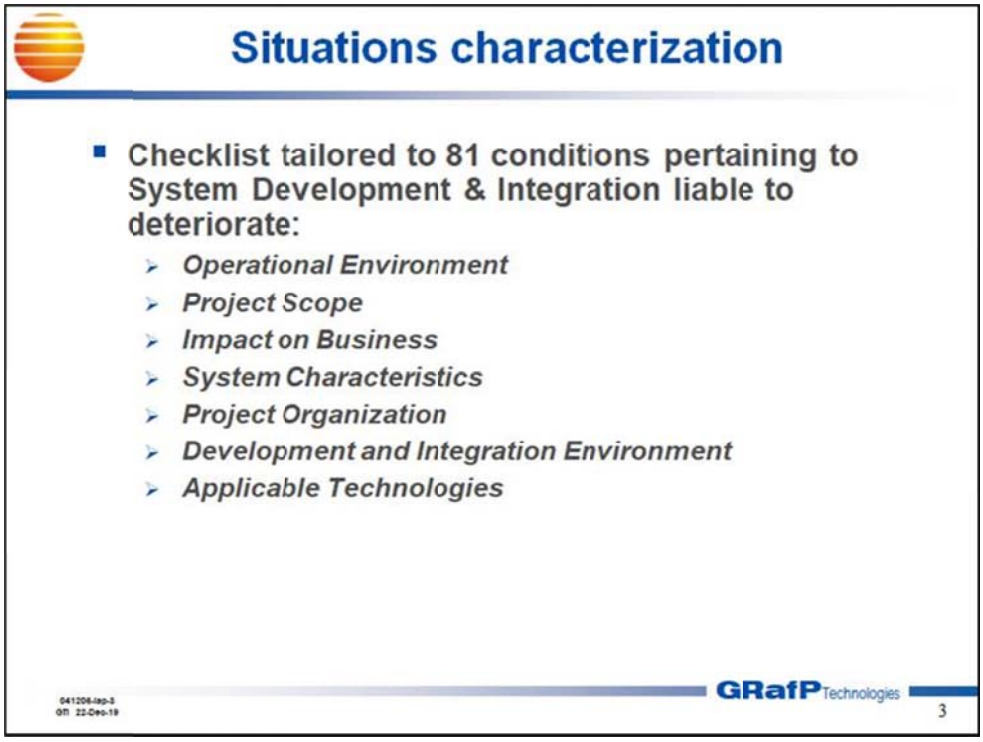
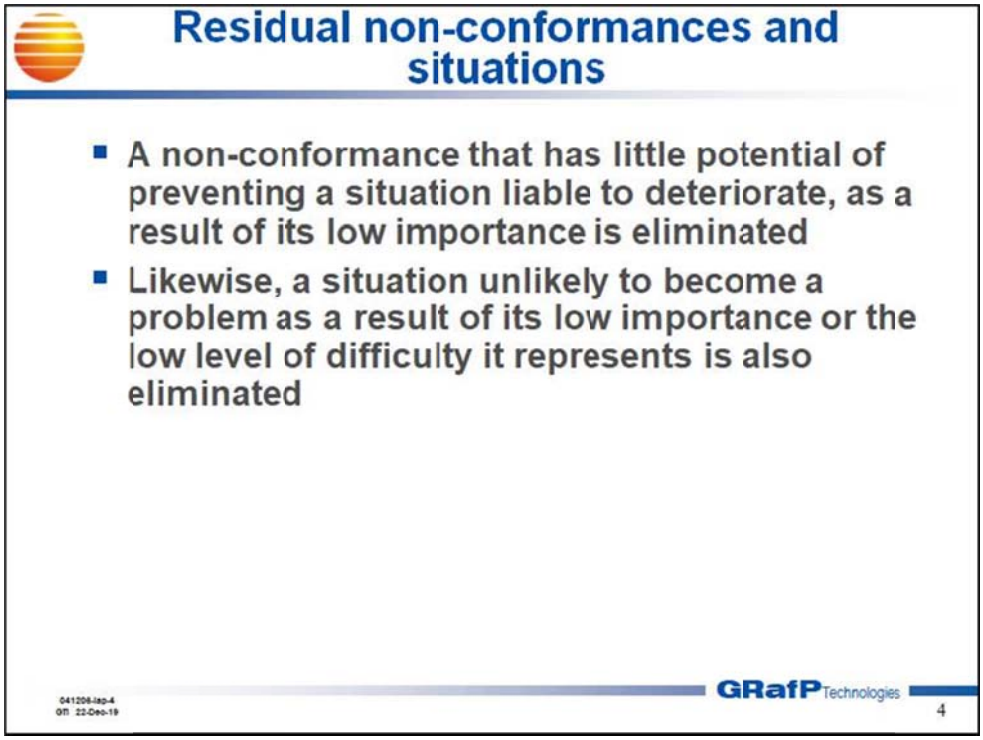
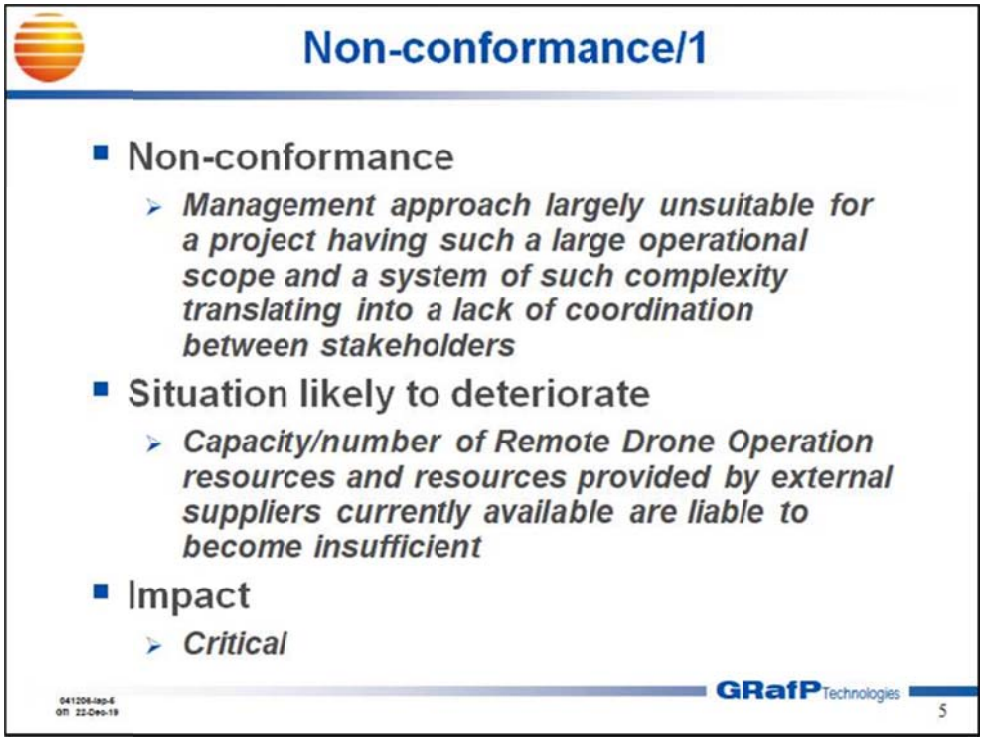
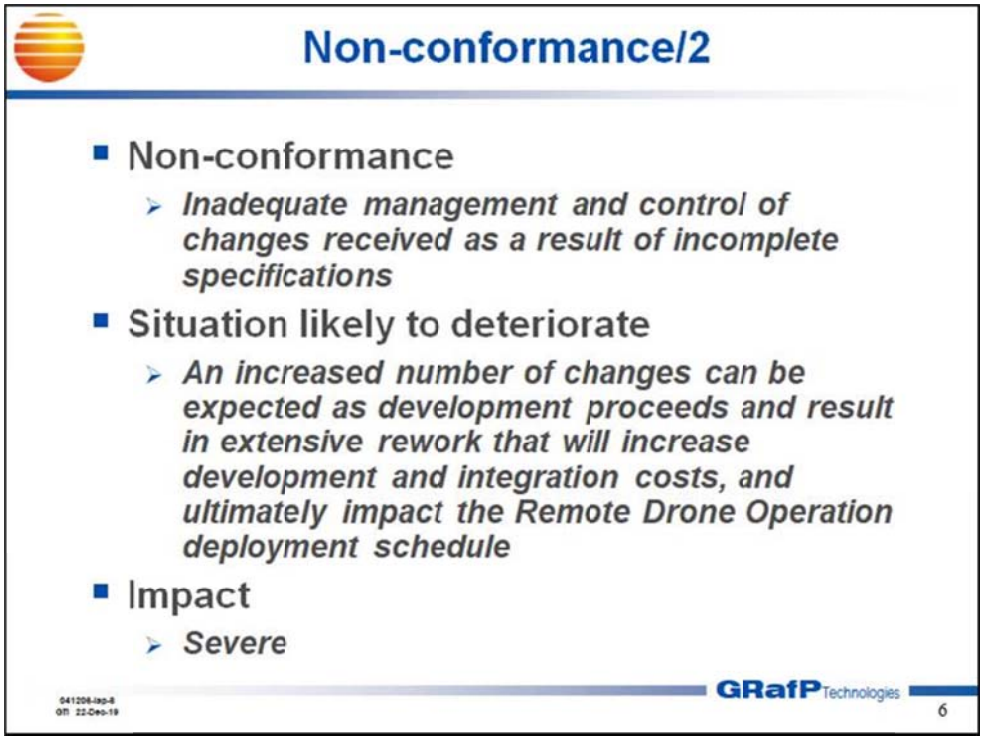
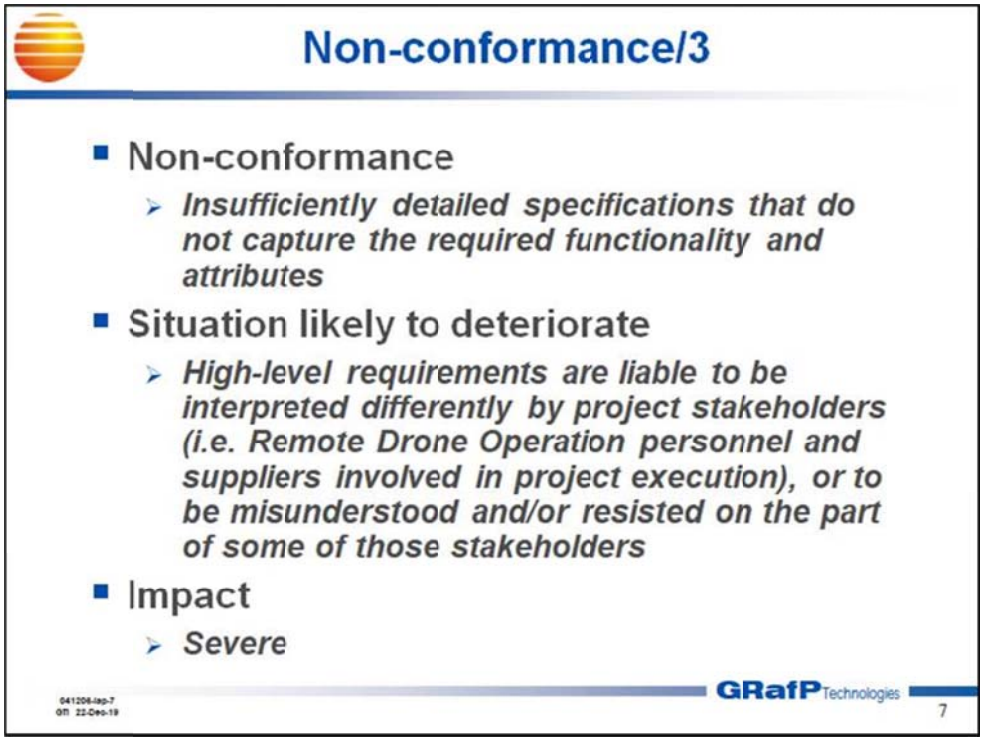
2

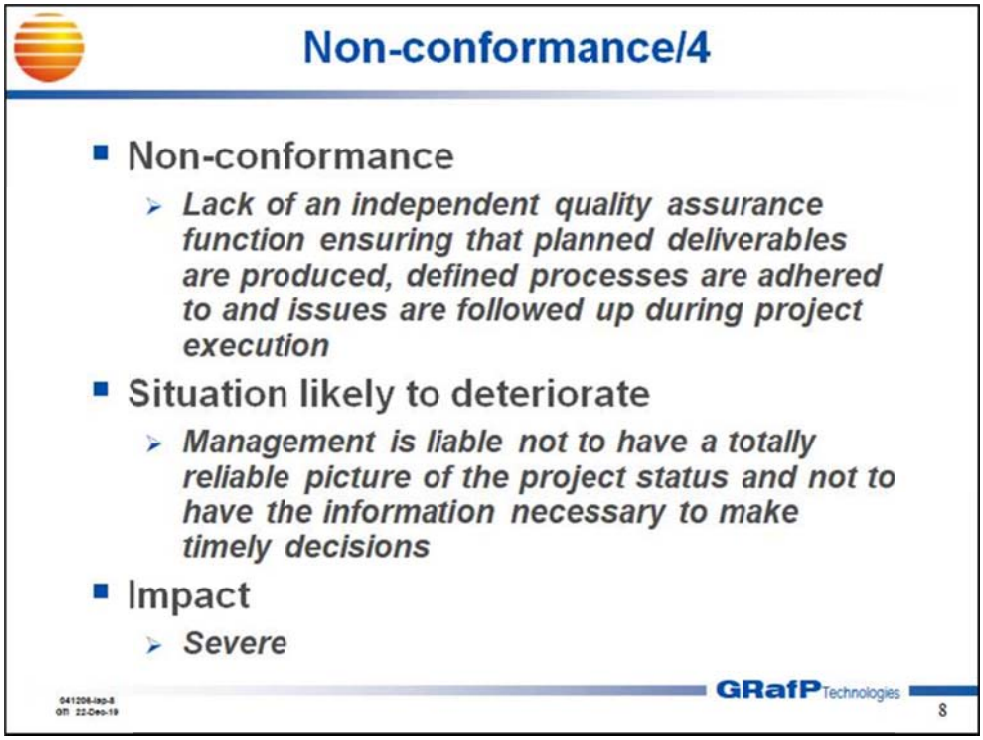

Situations characterization
Checklist tailored to 81 conditions pertaining to System Development & Integration liable to deteriorate:
Operational Environment
Project Scope
Impact on Business
System Characteristics
Project Organization
Development and Integration Environment
Applicable Technologies
GRafP Technologies
3

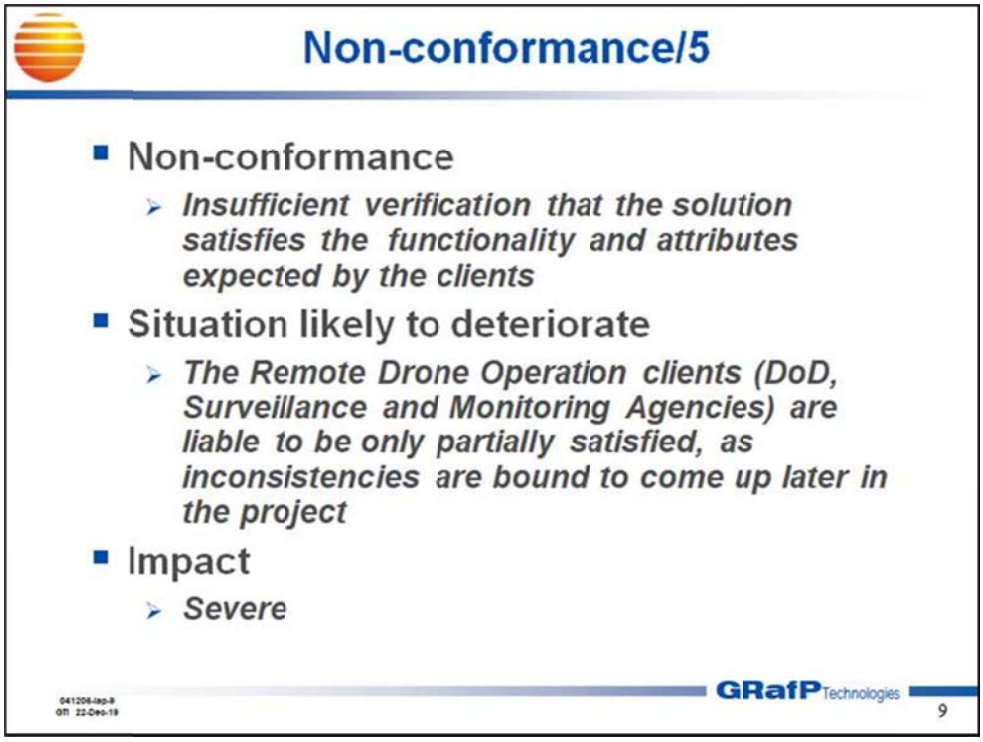

Residual non-conformances and situations
A non-conformance that has little potential of preventing a situation liable to deteriorate, as a result of its low importance is eliminated
Likewise, a situation unlikely to become a problem as a result of its low importance or the low level of difficulty it represents is also eliminated
GRafP Technologies
4

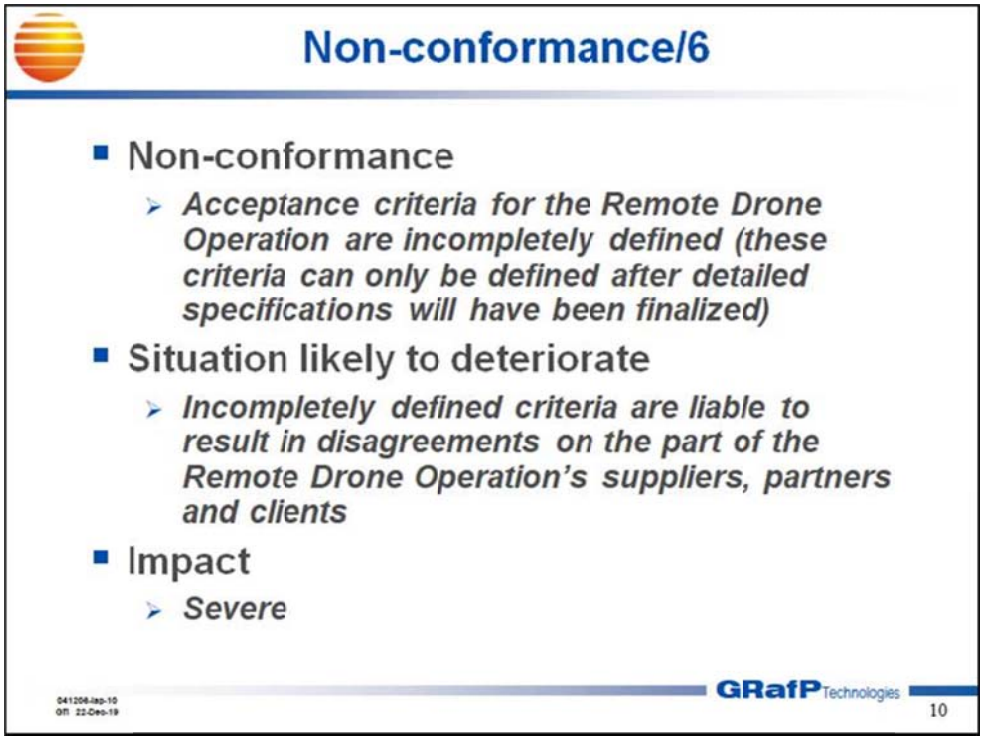

Non-conformance/1
Non-conformance
Management approach largely unsuitable for a project having such a large operational scope and a system of such complexity translating into a lack of coordination between stakeholders
Situation likely to deteriorate
Capacity/number of Remote Drone Operation resources and resources provided by external suppliers currently available are liable to become insufficient
Impact
Critical
GRaf Technologies
5


Non-conformance/2
Non-conformance
Inadequate management and control of changes received as a result of incomplete specifications
Situation likely to deteriorate
An increased number of changes can be expected as development proceeds and result in extensive rework that will increase development and integration costs, and ultimately impact the Remote Drone Operation deployment schedule
Impact
Severe
GRaf Technologies
6


Non-conformance/3
Non-conformance
Insufficiently detailed specifications that do not capture the required functionality and attributes
Situation likely to deteriorate
High-level requirements are liable to be interpreted differently by project stakeholders (i.e. Remote Drone Operation personnel and suppliers involved in project execution), or to be misunderstood and/or resisted on the part of some of those stakeholders
Impact
Severe
GRafP Technologies
7


Non-conformance/4
Non-conformance
Lack of an independent quality assurance function ensuring that planned deliverables are produced, defined processes are adhered to and issues are followed up during project execution
Situation likely to deteriorate
Management is liable not to have a totally reliable picture of the project status and not to have the information necessary to make timely decisions
Impact
Severe
GRafP Technologies
8


Non-conformance/5
Non-conformance
Insufficient verification that the solution satisfies the functionality and attributes expected by the clients
Situation likely to deteriorate
The Remote Drone Operation clients (DoD, Surveillance and Monitoring Agencies) are liable to be only partially satisfied, as inconsistencies are bound to come up later in the project
Impact
Severe
GRaf Technologies
9


Non-conformance/6
Non-conformance
Acceptance criteria for the Remote Drone Operation are incompletely defined (these criteria can only be defined after detailed specifications will have been finalized)
Situation likely to deteriorate
Incompletely defined criteria are liable to result in disagreements on the part of the Remote Drone Operation's suppliers, partners and clients
Impact
Severe
GRaf Technologies
10

Global results

- Assessed level of compliance (RMC): 79.6%
  - *Degree to which the project conforms with expected work products and activities that can prevent situations from deteriorating*
- Assessed level of difficulties (RPL): 34.7%
  - *Degree to which situations are liable to deteriorate*
- Quality Index (QI): 3 equivalent to a B rating
  - *QI = log e [1+(RMC/(RPL • LEP))] where LEP is Likelihood of Experiencing Problems estimated from RMC and RPL*
  - *QI theoretically ranges from 0 to infinity but practically ranges from 0 to 5*

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on 07-Sep-20

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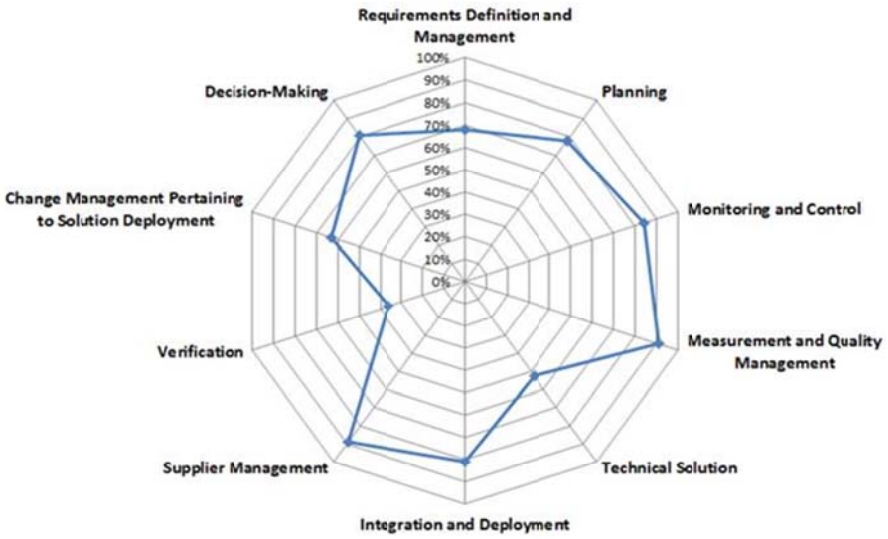
Operational requirements implementation profile characterizing the project



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on 22-Dec-19

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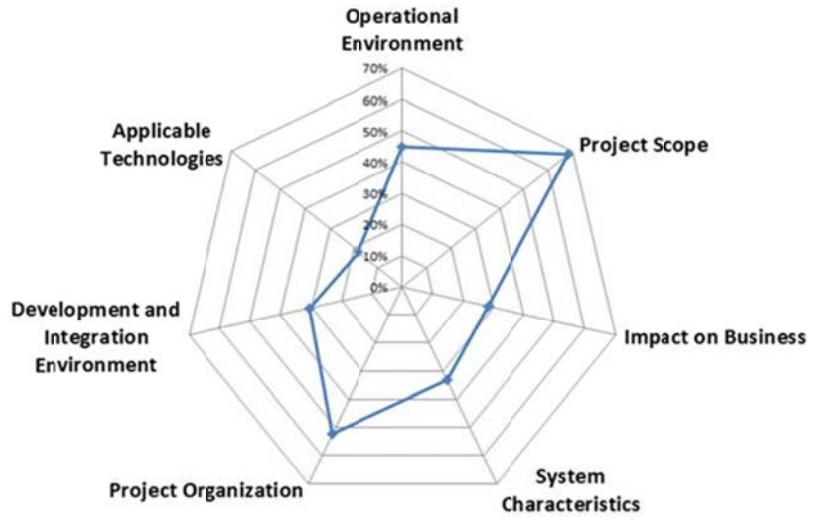
Profile of difficulties liable to affect the project



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Overall project profile

- Non-conformances observed in requirements pertaining to
  - *Requirements Definition and Management*
  - *Activities associated with the development and integration of the Technical Solution*
  - *Verification (test and integration)*
  - *Change Management Pertaining to Solution Deployment*
- And will most likely result in encountering difficulties during System Development & Integration of the Remote Drone Operation in areas related to
  - *Project Scope*
  - *Operational Environment*
  - *Project Organization*

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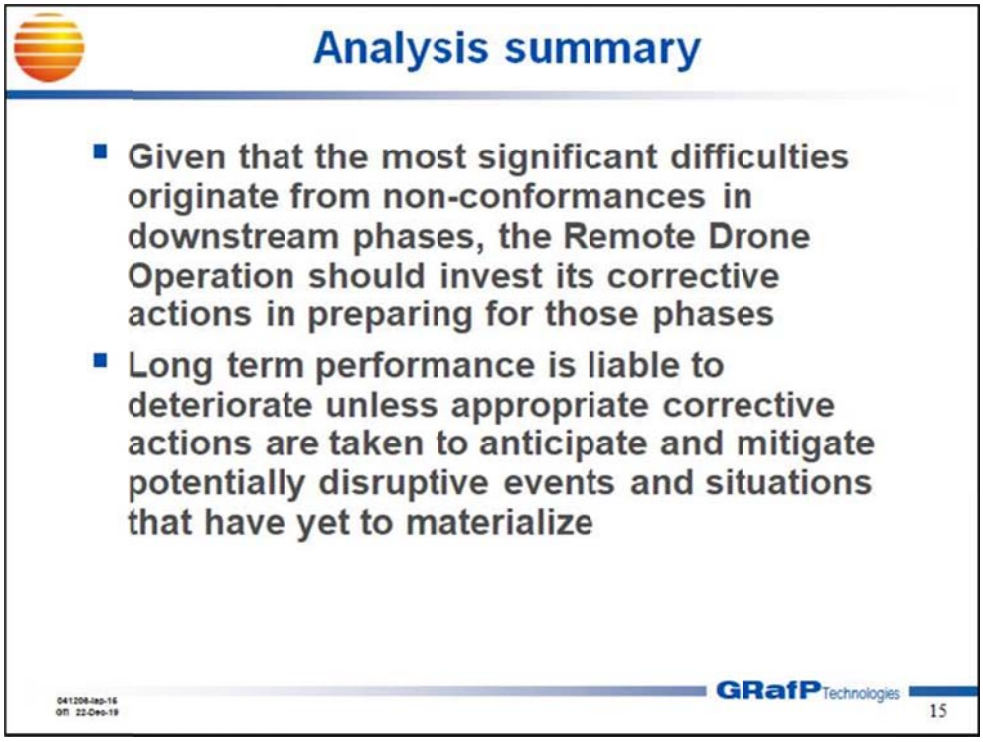
Analysis summary
Given that the most significant difficulties originate from non-conformances in downstream phases, the Remote Drone Operation should invest its corrective actions in preparing for those phases
Long term performance is liable to deteriorate unless appropriate corrective actions are taken to anticipate and mitigate potentially disruptive events and situations that have yet to materialize
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Chapter 11

Elements of Remedial Action Planning

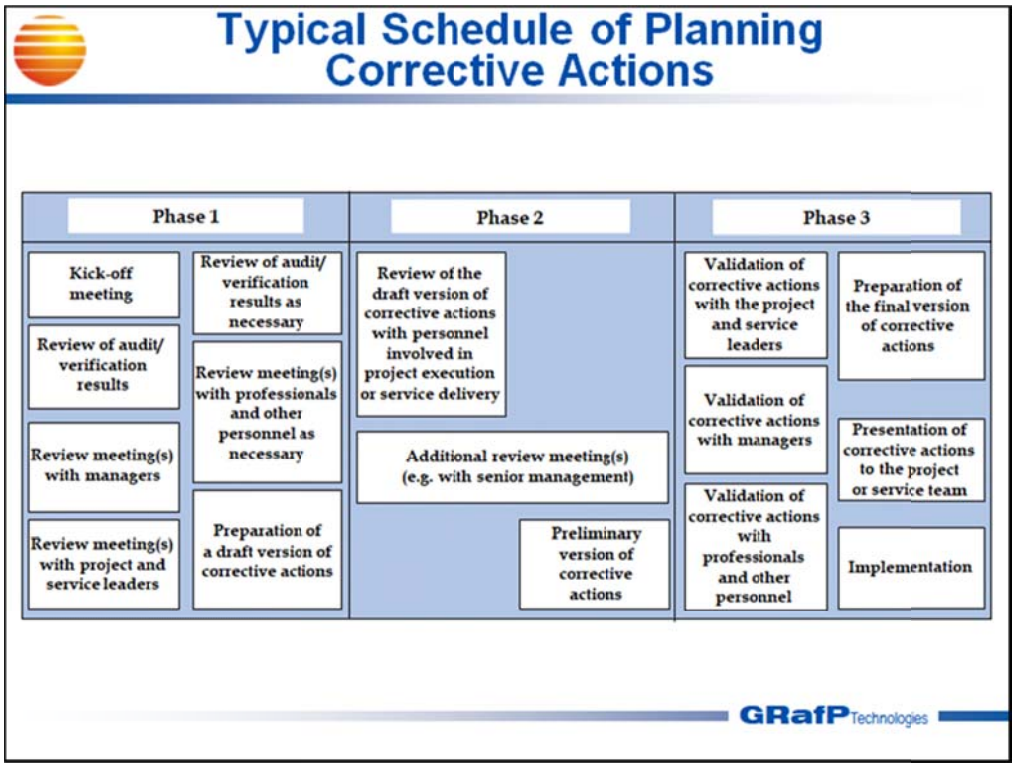

Figure 18 - Typical remedial action planning schedule

This chapter presents the most important elements associated with the development of a remedial action plan.

Following the audit or assessment, referred to as the verification phase, the next phase consists in preparing a remedial action plan to address the results that have been identified. Remedial action planning should come soon after the verification phase has been completed. A typical remedial action planning schedule following an audit or an assessment performed with the X:PRIME methodology is shown in Figure 18. It essentially takes place in three phases and will involve at least one person from the assessed project or service (e.g. the coordinator during the verification phase) and another person from either outside or inside the project or the service. The individual who led the audit or the assessment (hereinafter referred to as the remedial action plan facilitator) could be that second person; however, in that case, the role of that second individual will normally be limited to facilitating the development of the remedial action plan, if not at the beginning, certainly toward the end of the remedial action planning phase. The audit or assessment coordinator (hereinafter referred to as the remedial action plan coordinator), who was essentially responsible for the logistics aspects during the audit or the assessment and who is from the assessed project or service, should assume the leading role, if not at the beginning of the remedial action planning phase, certainly toward the end.

The risk of having the individual who led the audit or the assessment assume a leading role in the preparation of the remedial action plan, if he or she was not from the assessed project or service, is that the latter may become excessively dependent on someone off-site. In the long run, this would probably be counterproductive.

The two people (the remedial action plan coordinator and the remedial action plan facilitator) driving the remedial action planning phase will initially perform most of the work. Participants in this phase will provide the remedial action plan inputs that will be processed by the remedial action plan coordinator and the remedial action plan facilitator. The expected outcome of the remedial action planning phase consists of a remedial action plan broken up into work packages that are of manageable size. At the end of the remedial action planning phase, the objective is to have assigned those work packages to

the individuals who acted as participants in the development of the remedial action plan. At that point, the remedial action plan coordinator may remain as the coordinator of the implementation phase or may be replaced by someone else.

As in the case of the verification phase, the remedial action planning phase should be well planned. Numerous interviews will be conducted, and if participants are late or do not show up, the whole exercise will experience delays and will drag on. It can then be expected to become more and more difficult to interest individuals in participating in what appears to be a futile activity.

As mentioned in Chapter 4, preparation of the remedial action plan can benefit from using an Agile method like Scrum that has gained popularity in software development. The advantage of using a Scrum-like approach is that it makes participants in the remedial action planning preparation take ownership for the work packages that will be developed to address the audit's or the assessment's results. In that framework, the remedial action plan coordinator can be associated with the role or Product Owner and the remedial action plan facilitator with the role of Scrum Master.

The following is a list of items that should be taken into account and guidelines in connection with remedial action planning, using a three-phase approach. Each phase can require fractions of hours, hours, days or weeks, depending on the audit's or assessment's results and the magnitude of the audited project or service.

Phase 1

1. Start with a kick-off meeting where the participants in the remedial action planning phase will be informed of the sequence of activities to be conducted during this phase. It may be desirable to have senior management present at that meeting in order to increase the visibility of remedial action planning.

2. The remedial action plan coordinator and the remedial action plan facilitator should review the assessment findings before conducting the interviews in order to ensure that they understand them well and to elaborate on their significance if necessary. This is important, especially if there was a delay between the findings presentation and the start of the remedial action planning phase.

3. Conduct a group interview with middle managers of the organization. The agenda of this interview is essentially the presentation of the audit or assessment results. At the beginning of the meeting, state that all the notes taken during the meeting will be destroyed once the final version of the remedial action plan has been prepared. Keep in mind that confidentiality is important, since sensitive issues may be discussed during these interviews.

4. The primary objective of the interview is to validate the results, discuss the non-conformances that were recommended as part of the audit or assessment and their relevance to the assessed project or service, along with suggestions on how they could be implemented, and their relative priority. Seek suggestions from the participants in terms of specific approaches that would reduce the likelihood of experiencing identified problems.

5. The interview should be led by the facilitator, who presents the audit or assessment results, the non-conformances and the situations that are liable to deteriorate as a result of those non-conformances. The coordinator takes notes and especially comments made by participants.

6. Some additional findings (non-conformances and situations liable to deteriorate) may come up as part of these interviews. If they are corroborated in other interviews, they may have to be addressed in the remedial action plan if their priority and their nature justify it.

7. Conduct additional interviews with project or service managers, team leaders, and practitioners, always stressing the confidentiality of the information gathered as part of those interviews. The participants in these interviews should be selected so as not to impede the free flow of information. The remedial action plan coordinator, who typically is from the organization where the audit or assessment took place, should be able to provide some guidance on this.

8. It may be necessary to interview project or service managers and team leaders individually, since there have been instances where managers were reluctant to talk about non-conformances and situations liable to deteriorate that were

affecting their own work in front of other managers. Because of their particular position in the project or in the service, it may even be desirable to interview project managers, service managers or team leaders individually, in order to obtain independent views on the audit's or assessment's results.

9. Practitioners should preferably be interviewed in groups representing a functional responsibility, such as code and unit testing, service delivery, system engineering, test and integration, customer service, etc.

10. Toward the end of the first phase, start consolidating all the information collected as part of the interviews into work statements that will form the basis of the remedial action plan. A sample work statement template is shown below. At this point in time, the information collected so far will likely allow only sections A, B, and parts of sections C and D to be completed.

SAMPLE WORK STATEMENT

A. Statement of the Non-Conformance

< State the non-conformance to which the project or the organization is exposed, as per the assessment findings. >

B. Objectives

< State the objectives of the work statement. These may be extracted from the expected difficulties and obstacles identified in the audit or assessment as a result of situations liable to deteriorate. >

C. Proposed Approach

< Describe the envisioned approach to satisfy the objectives. These should describe the what, not the how. The proposed approach should be sufficiently detailed to allow whoever will take responsibility for the work statement to refine it further and to proceed to its implementation. >

D. Prerequisites – Constraints

< Identify any activities (e.g. another work statement) that have to be performed before this work statement can be started or conditions that must be satisfied in order to initiate work. Identify constraints that may need to be taken into account before initiating the work statement or while carrying it out (e.g. available resources, critical activities going on at the same time). >

SAMPLE WORK STATEMENT

E. Responsibility – Interactions - Resources in personnel and funding

< Identify the individuals(s) assigned the responsibility of implementing the work statement. Identify any dependencies with other teams having the responsibility of specific work statements. Include effort and cost estimates (if there is no material procurement, effort estimates may be directly translated into cost), with sufficient context to allow revisiting those estimates later on, if necessary. >

F. Deliverables - Anticipated results

< List the deliverables that will be generated in the course of carrying out the work statement and the results that are expected after its implementation. If an Agile approach is used, this is equivalent to the Product Backlog. >

G. Schedule - Milestones

< Include a schedule (e.g. a Gantt chart) along with the main milestones against which progress will be assessed. If an Agile approach is used, this is equivalent to the Sprint Backlog. >

Phase 2

1. After the draft version of the work statements has been prepared, you should conduct feedback sessions with project managers, service managers or team leaders to obtain their comments and additional suggestions. Project or service managers are singled out for these feedback sessions because of their median position in an organization, whereas team leaders are selected because of their median position in a project or a service. Keep in mind that confidentiality is again important, since sensitive issues may yet be discussed during those feedback sessions.

2 The facilitator should lead the sessions and the remedial action plan coordinator should take notes. A flip chart may be useful for that purpose as the participants will be able to see what is being noted. The same end result can be achieved by using a multimedia projector connected to a computer on which work statements are displayed and edited on line. You should also take advantage of the experience in estimating of project managers, service managers or team leaders in order to try to obtain rough order of magnitude figures regarding the work

statements. These estimates may be validated later on with other participants. Again, individual feedback sessions with project managers, service managers or team leaders may prove useful in obtaining a range of independent estimates.

3. Try also to establish the relative priority of the work statements that you are presenting to the project managers, service managers or the team leaders. Some work statements may be considered nice to have, while others are liable to be judged critical.

4. Do not leave a copy of the work statements or the presentation material pertaining to the remedial action plan with the project managers, service managers or the team leaders, as those are still very preliminary, and some of the tasks in a work statement, or the work statements altogether, may be left out of the remedial action plan. If copies of such preliminary work statements are circulated, false expectations may be created that could undermine the implementation phase. This may not be an issue in some organizations, but it will be in others and it is better to play it safe.

5. Conduct additional interviews as needed to refine the work statements, always stressing the confidentiality of the information gathered as part of those interviews. One such additional interview should be conducted with senior management personnel to obtain their comments and suggestions on the work statements. This interview is particularly important since there may exist constraints and strategic issues that the project managers, service managers and team leaders are not aware of that may have a determining impact on the remedial action plan.

6. Toward the end of this phase, start consolidating all the information collected as part of the interviews and feedback sessions into updated versions of the work statements that will form the basis of the remedial action plan. At this point in time, the information collected so far will likely allow sections A, and B, most of section C, and parts of sections D, E and F to be completed.

Phase 3

1. After the updated version of the work statements has been prepared, you should conduct validation sessions with middle managers, project managers, service managers or team leaders, and practitioners. The validation sessions have, among other objectives, the establishment of a consensus among participants on what has to be done in order to resolve non-conformances and to reduce the likelihood of experiencing problems in the project or the service.

2. As part of these sessions, try to refine the estimates, to verify the completeness and the feasibility of the work statements, and to identify who would be the most qualified to undertake the responsibility of implementing them or the skills required to do so.

3. Keep in mind that, ultimately, the remedial action plan coordinator will have to assume the role of coordinating the implementation phase, so the transition of the remedial action plan coordinator to a leadership role has to be made. This often turns out to be a good place to make such a transition (it may even be desirable to make the transition earlier on, for instance, after two or three feedback sessions have been held with project managers, service managers or team leaders, or immediately prior to conducting the interview with senior management). The remedial action plan coordinator should then take on the leading role and present the work statements, while the facilitator should take notes. A flip chart may be useful for this purpose, as the participants will be able to see what is being noted.

4. Do not leave a copy of the work statements or the presentation material pertaining to the remedial action plan with the participants yet, as they are still not complete. Some of the tasks in a work statement may still change and it is safer to maintain control over their distribution.

5. Consolidate the information collected from the validation sessions into the final version of the work statements. You may also want to have another session with senior management personnel to offer them the possibility of making final changes.

6. At this point, the remedial action plan coordinator will prepare the remedial action plan presentation, which he or she should present to the project's or the service's staff, and kick off the next steps, namely the remedial action plan implementation. Senior management should be present at this meeting in order to increase the visibility of remedial action planning implementation, and to assign the responsibility and/or the sponsorship of the work statements to specific individuals. Remember that what is not important to senior management is unlikely to be important to the rest of the organization.

Annex A

Blank Checklist of Desirable and Undesirable Operations

Operations Category	Weight of the Category 1: Low 5: High	ID	Operation	Weight of the Operation 1: Low 5: High
Requirements Management		1	The project or service team participates in the review of the requirements before they are incorporated into the project or the service.	
Requirements Management		2	The requirements used as the starting point for planning the project or the service.	
Requirements Management		3	The requirements used as the starting point for developing or delivering the items included in the project or the service (e.g. working documents, detailed documentation, user documentation).	
Requirements Management		4	The requirements used as the starting point for support activities (other than the executing the project or delivering the service itself, e.g. formal version control) for the project or the service.	
Requirements Management		5	Changes to the requirements are reviewed.	
Requirements Management		6	Approved modifications are incorporated into the project or the service.	
Requirements Management		7	There is a documented organizational policy establishing how requirements must be addressed.	
Requirements Management		8	The responsibilities for analyzing and managing requirements have been assigned to a specific individual or group.	
Requirements Management		9	Personnel assigned to the analysis and management of requirements have received training to fulfill the needs of the project or the service.	
Requirements Management		10	Requirements are documented and available to the personnel directly and indirectly involved in the project or the service.	
Requirements Management		11	The status of requirements analysis and management activities is measured and communicated to the appropriate personnel.	
Requirements Management		12	There is a point of contact for negotiating with the customer or the suppliers regarding the requirements.	
Requirements Management		13	There is a mechanism for personnel directly or indirectly involved in the project or the service to propose modifications to the requirements or to suggest alternatives.	
Requirements Management		14	Personnel assigned to quality assurance are involved in verifying that the requirements management activities and results satisfy the standards and procedures applicable to the project or the service.	

Requirements Management		15	Tools (e.g. word processors, databases, spreadsheets) are available to carry out requirements management activities.	
Requirements Management		16	Tools used to carry out requirements management activities are adequate.	
Requirements Management		17	The requirements management activities and results are reviewed with management.	
Work Planning		18	The project or service team participates in defining the work to perform (e.g. preparing the project or service proposal in response to a Request for Proposal).	
Work Planning		19	The project or service team participates, along with the other affected groups, in planning the overall project or service.	
Work Planning		20	A life cycle made up of pre-defined stages of manageable size either are identified or defined as part of the planning activities.	
Work Planning		21	A work plan is prepared.	
Work Planning		22	The work plan is prepared in accordance with a defined process.	
Work Planning		23	The work plan is documented and available to the personnel directly or indirectly involved in the project or service delivery.	
Work Planning		24	The elements necessary to establish and maintain control of the work are identified.	
Work Planning		25	Cost and effort estimates are prepared.	
Work Planning		26	Cost and effort estimates are derived in accordance with a defined process.	
Work Planning		27	A work schedule prepared.	
Work Planning		28	The work schedule is derived in accordance with a defined process.	
Work Planning		29	The risks associated with the cost, the resources, the schedule and other technical aspects of the work are identified and evaluated.	
Work Planning		30	The risks associated with the cost, the resources, the schedule and other technical aspects of the work are documented.	
Work Planning		31	The plans related to the development or the acquisition of auxiliary resources (e.g. equipment, software applications) and support tools necessary for performing the work are prepared.	
Work Planning		32	Work planning data are recorded.	
Work Planning		33	There is a documented organizational policy establishing how work planning must be carried out.	
Work Planning		34	The responsibilities for preparing the work plan been have assigned to a specific individual or group.	

Work Planning		35	Personnel assigned to work planning have received training to fulfill the needs of the project or the service.	
Work Planning		36	The status of work planning activities is measured and communicated to the appropriate personnel.	
Work Planning		37	There is a mechanism for personnel directly or indirectly involved in performing the work to propose modifications to the plan or to suggest alternative approaches to its implementation.	
Work Planning		38	Commitments made to the customer and suppliers are reviewed with senior management.	
Work Planning		39	Commitments made to the customer and suppliers are reviewed in accordance with a defined process.	
Work Planning		40	Individuals and groups directly or indirectly involved in performing the work are informed of commitments that affect them.	
Work Planning		41	Tools (e.g. databases, spreadsheets, specialized applications) are available to carry out work planning activities.	
Work Planning		42	Tools to carry out work planning activities are adequate.	
Work Planning		43	Personnel assigned to quality assurance are involved in verifying that the work planning activities and results satisfy the standards and procedures applicable to the project or the service.	
Work Planning		44	The work planning activities and results are reviewed with management.	
Work Monitoring		45	A plan is used for tracking project or service activities and communicating status.	
Work Monitoring		46	Changes to commitments made to the customer and suppliers are reviewed with senior management.	
Work Monitoring		47	Changes to commitments made to the customer and suppliers are reviewed in accordance with a defined process.	
Work Monitoring		48	Individuals and groups directly or indirectly involved in performing the work are informed of changes to commitments that affect them.	
Work Monitoring		49	Cost and effort are tracked.	
Work Monitoring		50	Corrective actions are taken when cost and effort deviate significantly from their estimates.	
Work Monitoring		51	The work schedule is tracked.	
Work Monitoring		52	Corrective actions are taken when the work schedule deviates significantly from the plan.	

Work Monitoring		53	Project or service delivery activities (e.g. consulting, analysis, design, construction, testing) are tracked.	
Work Monitoring		54	Corrective actions are taken when the project or service delivery activities deviate significantly from the plan.	
Work Monitoring		55	Risks associated with the cost, the resources, the schedule and other delivery aspects of the project or the service are tracked.	
Work Monitoring		56	Actuals and replanning data relative to the project or the service are recorded.	
Work Monitoring		57	The project or service team periodically holds internal reviews in order to track progress with respect to the established plans.	
Work Monitoring		58	The project or service team periodically holds internal reviews in order to track the quality of the work products and deliverables with respect to the established plans.	
Work Monitoring		59	The project or service team periodically holds internal reviews in order to track productivity with respect to the established plans.	
Work Monitoring		60	The project or service team periodically holds internal reviews in order to track outstanding issues.	
Work Monitoring		61	Formal reviews are held at selected milestones during which the accomplishments and results are examined.	
Work Monitoring		62	Formal reviews of accomplishments and results are conducted in accordance with a defined process.	
Work Monitoring		63	There is a documented organizational policy establishing how work tracking and oversight must be carried out.	
Work Monitoring		64	The roles and responsibilities of the groups and individuals directly and indirectly involved in performing the work have been clearly established.	
Work Monitoring		65	Personnel assigned to work tracking and oversight have received an orientation on the specific delivery aspects of the project or the service.	
Work Monitoring		66	The responsibility of work tracking and oversight has been assigned to a specific individual or group.	
Work Monitoring		67	There is a mechanism for personnel directly or indirectly involved in the project or the service to propose either corrective actions or alternative approaches to its implementation.	

Work Monitoring		68	Tools (e.g. specialized applications, databases, spreadsheets) are available to carry out work tracking and oversight activities.	
Work Monitoring		69	The tools or methods used for tracking and oversight facilitate the modification of the work plan when necessary.	
Work Monitoring		70	Personnel assigned to quality assurance are involved in verifying that the work tracking activities and achieved results respect the work plan and satisfy the standards and procedures applicable to the project or the service.	
Suppliers Management		71	The work to be subcontracted is defined and planned.	
Suppliers Management		72	The work to be subcontracted is defined and planned in accordance with a defined process.	
Suppliers Management		73	The suppliers are selected according to an evaluation of their ability to perform the work.	
Suppliers Management		74	The evaluation and selection of suppliers is done in accordance with a defined process.	
Suppliers Management		75	The contractual agreements with the suppliers constitute the basis on which the subcontracted effort is managed.	
Suppliers Management		76	A work plan is prepared and submitted by each supplier.	
Suppliers Management		77	The work plans submitted by the suppliers are documented, reviewed and approved.	
Suppliers Management		78	The work plans submitted by the suppliers are used for tracking subcontracted activities and communicating status.	
Suppliers Management		79	Changes to the work statement issued to the suppliers, the contract terms and conditions, or any other commitment are made when necessary.	
Suppliers Management		80	Changes to the work statement issued to the suppliers, the contract terms and conditions, or any other commitment are made in accordance with a defined process.	
Suppliers Management		81	Progress and coordination reviews are held with the suppliers' management personnel.	
Suppliers Management		82	Suppliers periodically participate with the project or service team in reviews and information exchanges.	
Suppliers Management		83	Formal reviews are held with the suppliers at selected milestones during which the accomplishments and results are examined.	
Suppliers Management		84	Formal reviews are held with the suppliers in accordance with a defined process.	

Suppliers Management		85	Personnel assigned to quality assurance are involved in verifying quality assurance activities carried out by the suppliers.	
Suppliers Management		86	Personnel assigned to configuration management (control and management of components, documentation, etc.) are involved in verifying configuration management activities carried out by the suppliers.	
Suppliers Management		87	Acceptance tests are performed on the suppliers' deliverables.	
Suppliers Management		88	Acceptance tests of suppliers' deliverables are performed in accordance with a defined process.	
Suppliers Management		89	The suppliers' performance is periodically evaluated.	
Suppliers Management		90	Suppliers' performance evaluations are reviewed with the suppliers.	
Suppliers Management		91	There is a documented organizational policy establishing how the selection and management of suppliers must be carried out.	
Suppliers Management		92	The responsibility for selecting and managing suppliers is assigned to a specific individual or group.	
Suppliers Management		93	Personnel responsible for the selection and management of suppliers have received training to fulfill the needs of the project or the service.	
Suppliers Management		94	Personnel responsible for the selection and management of suppliers have received an orientation on the delivery aspects of the subcontract(s).	
Suppliers Management		95	The project or service team is informed of the progress of the work performed by suppliers.	
Suppliers Management		96	There a mechanism for personnel directly or indirectly involved in the project or the service to propose modifications to the suppliers selection criteria.	
Suppliers Management		97	Tools (e.g. specialized applications, databases, spreadsheets, work management software packages) are available to carry out the selection and management of suppliers.	
Suppliers Management		98	Tools to carry out the selection and management of suppliers are adequate.	
Quality Assurance		99	A quality assurance plan has been prepared for the project or the service.	
Quality Assurance		100	The quality assurance plan has been prepared in accordance with a defined process.	
Quality Assurance		101	Quality assurance activities are carried out in accordance with the plan.	

Quality Assurance		102	Personnel assigned to quality assurance participate in the review of the work plan, standards and procedures applicable to the project or service.	
Quality Assurance		103	Personnel assigned to quality assurance review project or service delivery activities to verify their compliance with the applicable plans, standards and procedures.	
Quality Assurance		104	Personnel assigned to quality assurance review project or service deliverables to verify their compliance with the requirements as well as with the applicable plans, standards and procedures.	
Quality Assurance		105	Personnel assigned to quality assurance report their activities to other groups involved in the project or the service.	
Quality Assurance		106	Non-compliant items are documented.	
Quality Assurance		107	Non-compliant items are addressed in accordance with a defined process.	
Quality Assurance		108	If need be, personnel assigned to quality assurance periodically review their activities and findings with the customer’s quality assurance personnel.	
Quality Assurance		109	There a documented organizational policy establishing how quality assurance must be carried out.	
Quality Assurance		110	The responsibilities of quality assurance have been assigned to a specific individual or group.	
Quality Assurance		111	Personnel assigned to quality assurance have received training to fulfill the needs of the project or the service.	
Quality Assurance		112	Personnel assigned to quality assurance have received an orientation on the delivery aspects of the project or the service.	
Quality Assurance		113	Personnel directly or indirectly involved in the project or the service have received an orientation on the roles and responsibilities of personnel assigned to quality assurance.	
Quality Assurance		114	Tools (e.g. specialized applications, databases, spreadsheets) are available to carry out quality assurance activities.	
Quality Assurance		115	Tools to carry out quality assurance activities are adequate.	
Quality Assurance		116	The quality assurance activities for the project or the service are periodically reviewed with senior management.	

Configuration Management		117	A configuration management plan (control and management of components, documentation, etc.) has been prepared for controlling the deliverables and essential project or service items.	
Configuration Management		118	The configuration management plan has been prepared in accordance with a defined process.	
Configuration Management		119	Activities of personnel assigned to configuration management are carried out in accordance with the plan.	
Configuration Management		120	The configuration management plan is documented and approved.	
Configuration Management		121	A configuration management system has been established as a repository for the project or service baselines.	
Configuration Management		122	Items to be placed under configuration management been identified.	
Configuration Management		123	Change requests and problem reports for all items placed under configuration management are prepared when necessary.	
Configuration Management		124	Change requests and problem reports are prepared in accordance with a defined process.	
Configuration Management		125	Change requests and problem reports are recorded.	
Configuration Management		126	Change requests and problem reports are reviewed and approved.	
Configuration Management		127	Approved change requests are the subject of a follow-up.	
Configuration Management		128	Changes to baselines are controlled.	
Configuration Management		129	Changes to baselines are controlled in accordance with a defined process.	
Configuration Management		130	The status of items placed under configuration management is recorded.	
Configuration Management		131	Recording of the status of items placed under configuration management is performed in accordance with a defined process.	
Configuration Management		132	Reports summarizing configuration management activities and describing the baselines are prepared.	
Configuration Management		133	Reports summarizing configuration management activities and describing the baselines are made available to affected individuals and groups.	
Configuration Management		134	Baseline audits are conducted.	
Configuration Management		135	Baseline audits are conducted in accordance with a defined process.	

Configuration Management		136	There is a documented organizational policy establishing how configuration management must be carried out.	
Configuration Management		137	The responsibilities of configuration management have been assigned to a specific individual or group.	
Configuration Management		138	Personnel assigned to configuration management have received training to fulfill the needs of the project or the service.	
Configuration Management		139	Personnel assigned to configuration management have received an orientation on the delivery aspects of the project or the service.	
Configuration Management		140	Personnel directly or indirectly involved in the project or the service received an orientation on the roles and responsibilities of personnel assigned to configuration management.	
Configuration Management		141	Tools (e.g. databases, specialized applications) are available to carry out configuration management activities.	
Process Engineering		142	Processes used in the project or the service have been developed and are maintained.	
Process Engineering		143	Development and maintenance of the processes used in the project or the service are performed in accordance with a defined process.	
Process Engineering		144	The life cycle adopted in the project or the service is defined and updated as needed.	
Process Engineering		145	Guidelines and tailoring criteria are prepared and updated as needed to adapt the processes used in the project or the service to the particularities of the work to accomplish.	
Process Engineering		146	A library of process-related documentation is established and maintained.	
Process Engineering		147	The status of activities dealing with development and improvement of the processes used in the project or service is measured and communicated to the appropriate personnel.	
Process Engineering		148	The processes currently in use in the project or the service are periodically assessed to harmonize results and performance with current and projected market needs, customers and end users.	
Process Engineering		149	Action plans have been developed to address the findings resulting from periodic assessment of the processes currently in use in the project or the service.	

Process Engineering		150	The project or service team contributes information and data to develop and update the plan to develop and improve its delivery capability.	
Process Engineering		151	Activities to develop and improve processes used in the project or the service are coordinated with the project or service team.	
Process Engineering		152	A database characterizing the processes used in the project or the service is established and maintained to support estimation.	
Process Engineering		153	A database characterizing processes is used to plan and monitor the project or the service.	
Process Engineering		154	A follow-up is done on new processes, methods and tools in limited use in the project or the service.	
Process Engineering		155	If proven appropriate, new processes, methods and tools in limited use in the project or the service are transferred to other parts of the project or service.	
Process Engineering		156	Training on the use of processes is provided in the project or the service.	
Process Engineering		157	Personnel involved in implementing processes in the project or the service are regularly informed of the progress of activities dealing with the development and improvement of these processes.	
Process Engineering		158	There a documented organizational policy establishing how the development and improvement of processes used in the project or the service must be coordinated.	
Process Engineering		159	Senior management is involved in the activities dealing with the development and improvement of processes used in the project or the service.	
Process Engineering		160	The responsibilities for coordinating the development and improvement of the processes used in the project or the service have been assigned to a specific individual or group.	
Process Engineering		161	Personnel assigned to coordinate the development and improvement of processes have received training to fulfill the needs of the projects or the service.	
Process Engineering		162	Personnel directly or indirectly involved in the project or the service have received an orientation on the roles and responsibilities of personnel assigned to coordinate the development and improvement of processes.	

Process Engineering		163	Activities dealing with the development and improvement of the processes used in the project or the service are periodically reviewed with senior management.	
Process Engineering		164	Personnel assigned to quality assurance are involved in verifying that the activities dealing with the development and improvement of the processes used in the project or the service satisfy applicable plans, standards and procedures.	
Training		165	A training plan has been developed in the project or the service that specifies its training needs.	
Training		166	The project's or service's training plan has been developed in accordance with a defined process.	
Training		167	The project or the service training needs are taken into account in an organizational training plan.	
Training		168	Training provided in accordance with the project's or service's training plan.	
Training		169	Managers receive training on technical, administrative and personnel aspects in accordance with the needs of the project or the service.	
Training		170	Courses, seminars and awareness sessions used in the project or the service are developed in accordance with the organization's standards.	
Training		171	A waiver is used to determine whether project or service team members already possess the knowledge and skills required to perform their designated tasks.	
Training		172	Training records are maintained.	
Training		173	There a documented organizational policy establishing how training needs must be satisfied.	
Training		174	The responsibilities of satisfying (or coordinating) the training needs in the project or the service have been assigned to a specific individual or group.	
Training		175	Personnel assigned to provide or coordinate training activities have received training to fulfill the needs of the project or the service.	
Training		176	The status of training activities is measured and communicated to the appropriate personnel.	
Training		177	The quality of training is assessed.	
Training		178	The relevance of provided training with respect to the project's or service's training needs is assessed.	

Training		179	Training activities are periodically reviewed with senior management.	
Work Execution		180	The detailed project or service requirements are developed by systematically analyzing the customer's requirements in accordance with a defined process.	
Work Execution		181	The design of project or service deliverables is based on the detailed requirements and carried out in accordance with a defined process.	
Work Execution		182	The project or service deliverables are built or prepared based on the design specifications in accordance with a defined process.	
Work Execution		183	The unit tests or verifications of the project or service deliverables are carried out in accordance with a defined process.	
Work Execution		184	Testing or verification of the integrated project or service deliverables is planned and carried out in accordance with a defined process.	
Work Execution		185	Acceptance testing or verification is planned and carried out with the aim of demonstrating that the project or service deliverables have met the customer requirements and satisfy the users' needs.	
Work Execution		186	The operational and user documentation is developed in accordance with a defined process.	
Work Execution		187	Data related to defects identified during peer reviews, tests and verifications are collected and analyzed in accordance with a defined process.	
Work Execution		188	Uniformity is maintained across the project's or service's work products and deliverables.	
Work Execution		189	Appropriate methods and tools are integrated into the processes defined to carry out the project or the service.	
Work Execution		190	There a documented organizational policy establishing how the project or service delivery activities must be carried out.	
Work Execution		191	Project or service team members receive the training required to perform their tasks.	
Work Execution		192	Project or service team members receive an orientation on the disciplines called for in the project or the service other than their own area of expertise.	
Work Execution		193	The status of activities performed to carry out the project or deliver the service are measured and communicated to the appropriate personnel.	

Work Execution		194	Measurements are collected to determine the quality and functionality of the deliverables resulting from carrying out the project or delivering the service.	
Work Execution		195	Measurements collected to determine the quality and functionality of the project or service deliverables are used.	
Work Execution		196	Project or service delivery activities and results are reviewed with management.	
Work Execution		197	Personnel assigned to quality assurance are involved in verifying that the delivery activities and results satisfy the processes defined for carrying out the project or delivering the service.	
Intergroup Coordination		198	The various groups involved in the project or the service participate with the customer and the end users in defining the requirements.	
Coordination		199	Representatives from each group cooperate in coordinating their activities to resolve problems.	
Coordination		200	There a defined approach to communicate intergroup commitments and to track the activities performed in response to these commitments.	
Coordination		201	Critical dependencies between the groups involved in the project or the service are identified.	
Coordination		202	Critical dependencies between the groups involved in the project or the service are negotiated and tracked.	
Coordination		203	Critical dependencies between the groups involved in the project or the service are managed in accordance with a defined process.	
Coordination		204	Deliverables from one group to another are reviewed by the latter to verify that all its needs have been met.	
Coordination		205	There is a mechanism to handle intergroup issues in the project or the service that cannot be solved by the groups' representatives themselves.	
Coordination		206	The mechanism to handle intergroup issues in the project or the service that cannot be solved by the groups' representatives themselves is defined.	
Coordination		207	Coordination meetings are conducted with the groups involved in the project or the service.	
Coordination		208	There is a documented organizational policy for establishing interdisciplinary teams in the project or service.	

Coordination		209	The tools used by the various groups involved in the projector the service are compatible.	
Coordination		210	Managers receive training in teamwork.	
Coordination		211	Representatives of each group involved in the project or the service receive an orientation on methods, procedures and standards used by the other groups.	
Coordination		212	Members from each group involved in the project or the service receive an orientation on teamwork.	
Coordination		213	The status of activities involving the groups involved in the project or the service is measured and communicated to the appropriate personnel (e.g. actual effort and other resources expended by one group to support other groups).	
Coordination		214	The intergroup coordination activities and results are reviewed with management.	
Inspections and Reviews		215	Peer reviews are planned.	
Inspections and Reviews		216	Peer reviews activities are documented in the work plan.	
Inspections and Reviews		217	Peer reviews are conducted in the project or the service.	
Inspections and Reviews		218	Peer reviews are conducted in accordance with a defined process.	
Inspections and Reviews		219	Data on the conduct and results of peer reviews are recorded.	
Inspections and Reviews		220	There is a documented organizational policy regarding the conduct of peer reviews.	
Inspections and Reviews		221	The peer review leaders receive training on how to conduct such reviews.	
Inspections and Reviews		222	Participants in peer reviews receive training on the objectives, principles and methods regarding peer reviews.	
Inspections and Reviews		223	The status of peer review activities is measured and communicated to the appropriate personnel.	
Inspections and Reviews		224	Personnel assigned to quality assurance are involved in verifying the peer review activities and results and that they satisfy the defined processes.	
Customer Service		225	There is a documented organizational policy establishing how customer service must be provided.	
Customer Service		226	Customers' comments are collected.	
Customer Service		227	Customers' comments are collected in accordance with a defined process.	

Customer Service		228	There is a close relationship established with customers in order to get a good understanding of their needs.	
Customer Service		229	Customers' needs are documented.	
Customer Service		230	There is a point of contact responsible for providing direct customer service.	
Customer Service		231	Customer service is integrated with change requests and problem reports of items under configuration management.	
Customer Service		232	User documentation is prepared.	
Customer Service		233	User documentation is prepared in accordance with a defined process.	
Customer Service		234	Customers are informed of modifications made to existing product or service versions.	
Customer Service		235	Customers are informed of new available versions of products or services that they are currently using.	
Customer Service		236	A follow-up is done on customers' requests.	
Customer Service		237	The follow-up on customers' requests is done in accordance with a defined process.	
Customer Service		238	The confidentiality of customer information is assured.	
Customer Service		239	Protection of confidential customer information is done in accordance with a defined process.	

Annex B

Blank Checklist of Desirable and Undesirable Situations

Annex C

Overview Slides of Audits or Assessments


GRafP Technologies
X:PRIME-Based
Audit and Assessment
Services
GRafP Technologies


What is Quality Management?
Independent of any discipline
Developed in parallel with the industrial revolution
In the information age, it has been extended to non-traditional areas outside the scope of manufacturing
Notable events
Quality control to achieve the development of interchangeable parts by Eli Whitney in the early nineteenth century
Birth of industrial engineering in the early twentieth century based on the concepts established by Frederick Taylor
Statistical quality control established by Walter Shewhart between the two world wars
Application of quality concepts in information management and big data
GRafP Technologies

Objectives of the Service

- Verify the status of projects and services to increase the likelihood of a successful delivery
  - *Identify non-conformances against organizational procedures and industrial standards when those result in significant consequences*
  - *Provide senior management with the actual state of the audited project or service*
  - *Generate the information needed to make timely decisions*
  - *Reassure the client about the supplier's ability to complete the project or to provide the service successfully*

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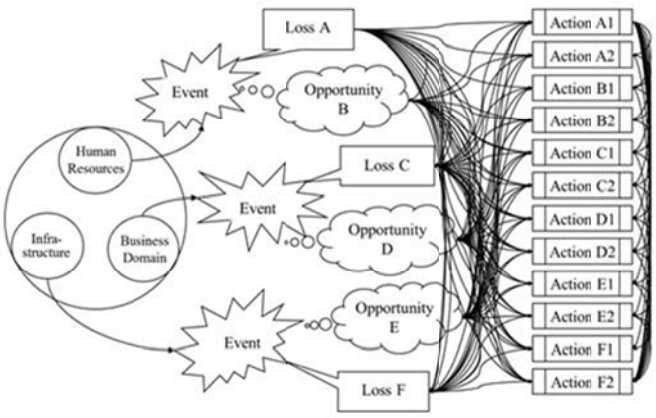
Representation of Challenges Facing a Project or a Service



- Any non-conformance against Action A1, Action A2, etc. is liable to affect the project's or service's capability of preventing losses or taking advantage of opportunities

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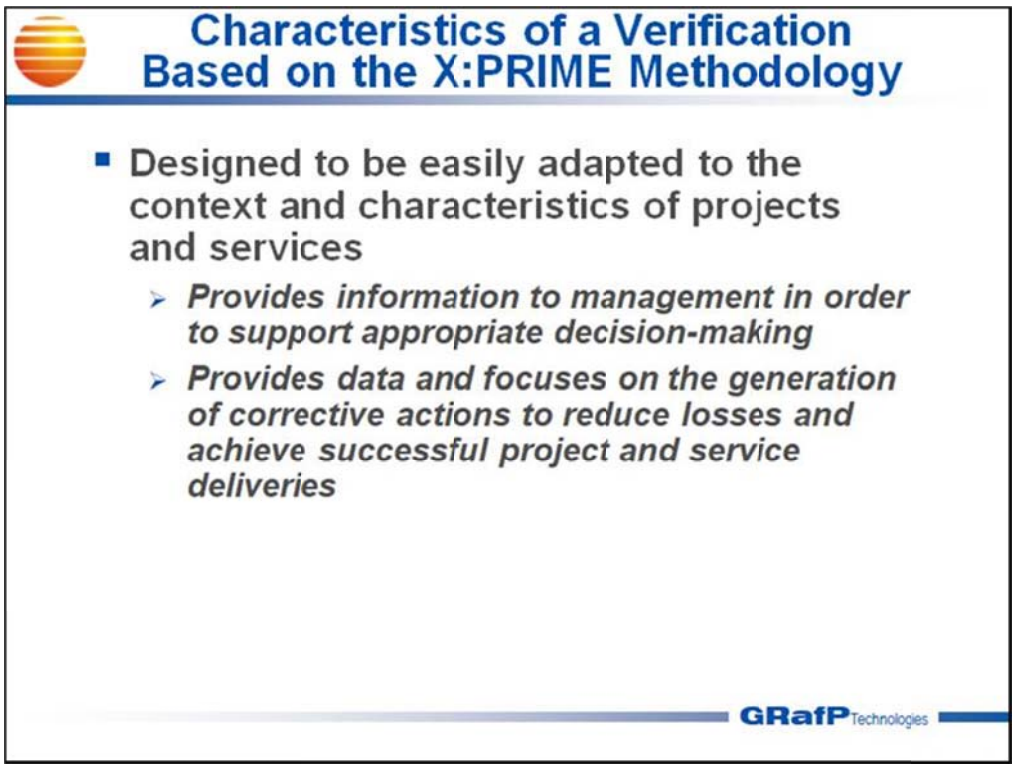
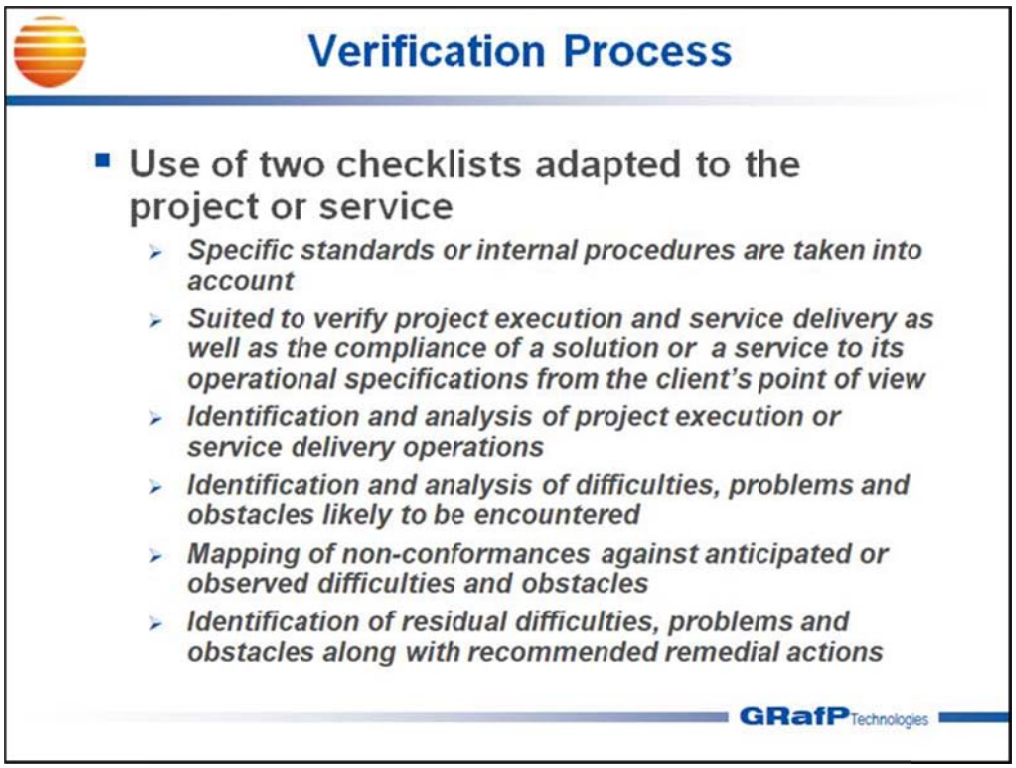
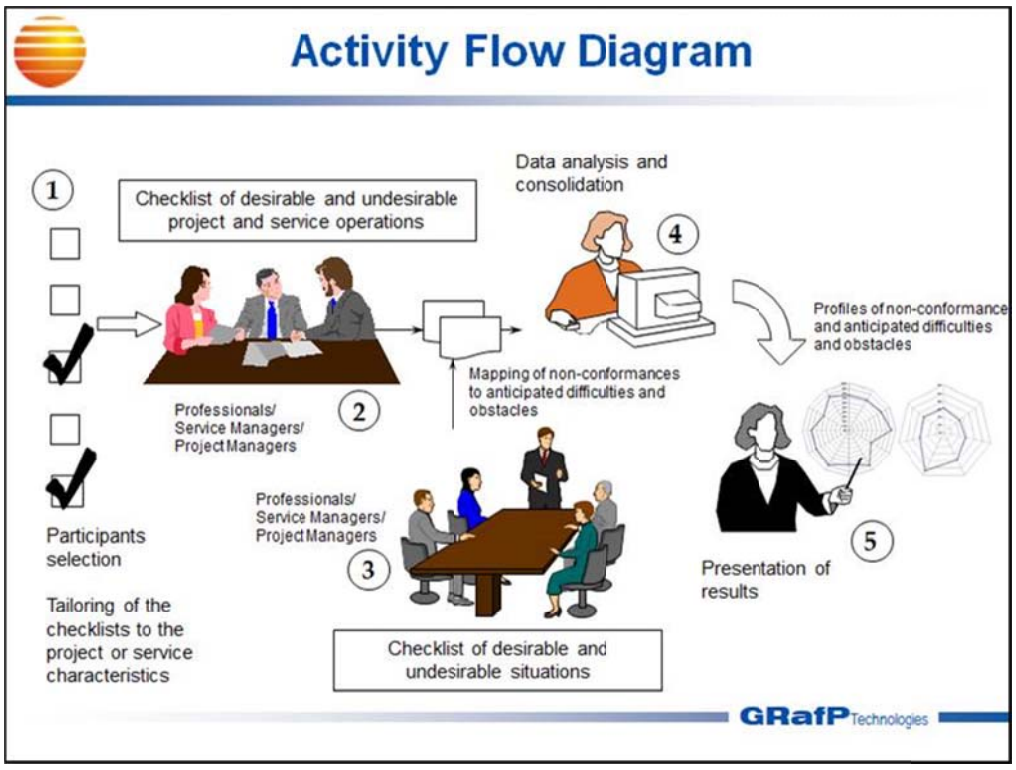
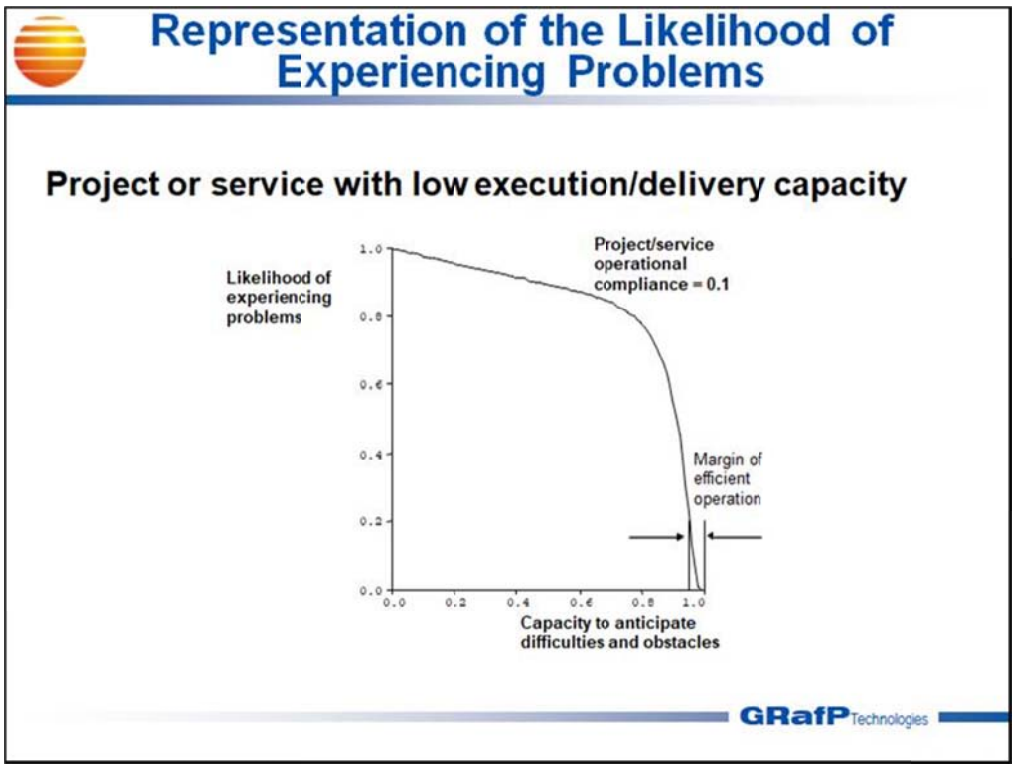
Verification Objectives
Facilitate the capture, analysis and presentation of data collected during verification of the quality associated with projects or services
Generate
A compliance profile against operations mandated by the organizational Quality Management system (in the form of standards, guidelines and specifications)
A profile of the difficulties and obstacles to which the project or service is exposed
Recommended remedial and corrective actions
GRafP Technologies


Characteristics of a Verification Based on the X:PRIME Methodology
Designed to be easily adapted to the context and characteristics of projects and services
Provides information to management in order to support appropriate decision-making
Provides data and focuses on the generation of corrective actions to reduce losses and achieve successful project and service deliveries
GRafP Technologies


Verification Process
Use of two checklists adapted to the project or service
Specific standards or internal procedures are taken into account
Suited to verify project execution and service delivery as well as the compliance of a solution or a service to its operational specifications from the client's point of view
Identification and analysis of project execution or service delivery operations
Identification and analysis of difficulties, problems and obstacles likely to be encountered
Mapping of non-conformances against anticipated or observed difficulties and obstacles
Identification of residual difficulties, problems and obstacles along with recommended remedial actions
GRafP Technologies


Scope of Audits and Assessments
Where?
In projects dealing with product development
In the delivery of services
For what purpose?
Inform executives on the real status of projects and services
Identify appropriate remedial and corrective actions
Reduce the amount of rework
Manage situations liable to deteriorate
Increase the likelihood of successful deliveries
Reassure clients
GRafP Technologies


Activity Flow Diagram
1
Checklist of desirable and undesirable project and service operations
Data analysis and consolidation
4
Profiles of non-conformance and anticipated difficulties and obstacles
Mapping of non-conformances to anticipated difficulties and obstacles
Professionals/ Service Managers/ Project Managers
2
Participants selection
Tailoring of the checklists to the project or service characteristics
Professionals/ Service Managers/ Project Managers
3
Checklist of desirable and undesirable situations
5
Presentation of results
GRafP Technologies


Representation of the Likelihood of Experiencing Problems
Project or service with low execution/delivery capacity
Likelihood of experiencing problems
Project/service operational compliance = 0.1
Margin of efficient operation
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Capacity to anticipate difficulties and obstacles
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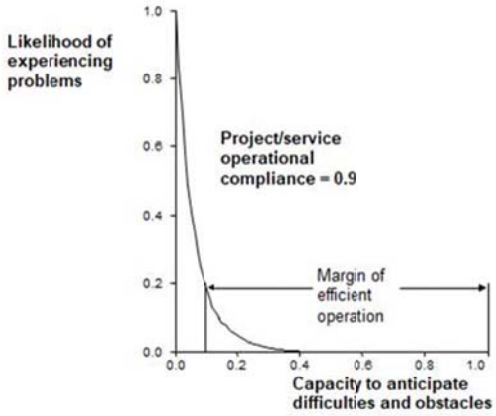
Representation of the Likelihood of Experiencing Problems (cont.)

Project or service with high execution/delivery capacity



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Example of an Operational Compliance Profile

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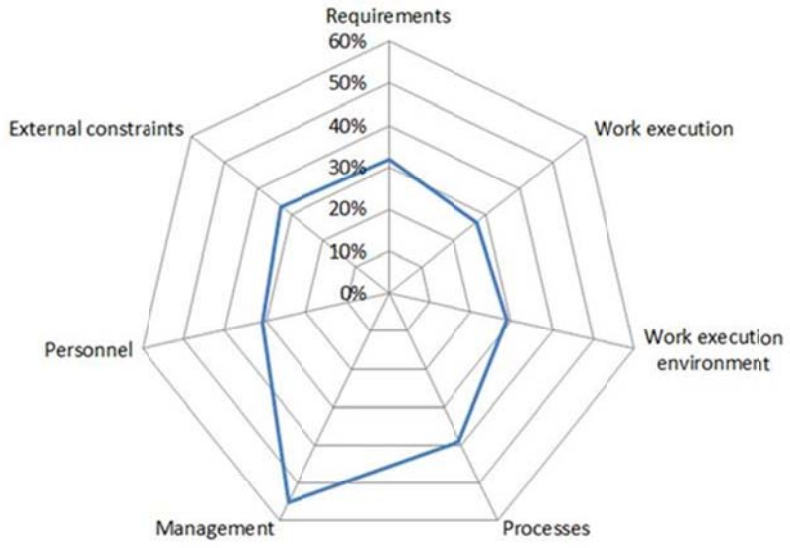
Example of a Profile of Anticipated Difficulties and Obstacles



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Step 1

- Selection of participants and the scope of the audit/assessment
  - *Deliverables or phases of the project or service randomly selected and maybe in a different state of advancement*
  - *Justification of the selection*
    - Notify management that any action taken to conceal the true state of the project or service could void the audit/verification
  - *Selection of participants who, for the selected project or service, have the responsibility of*
    - Managing the work
    - Executing the work

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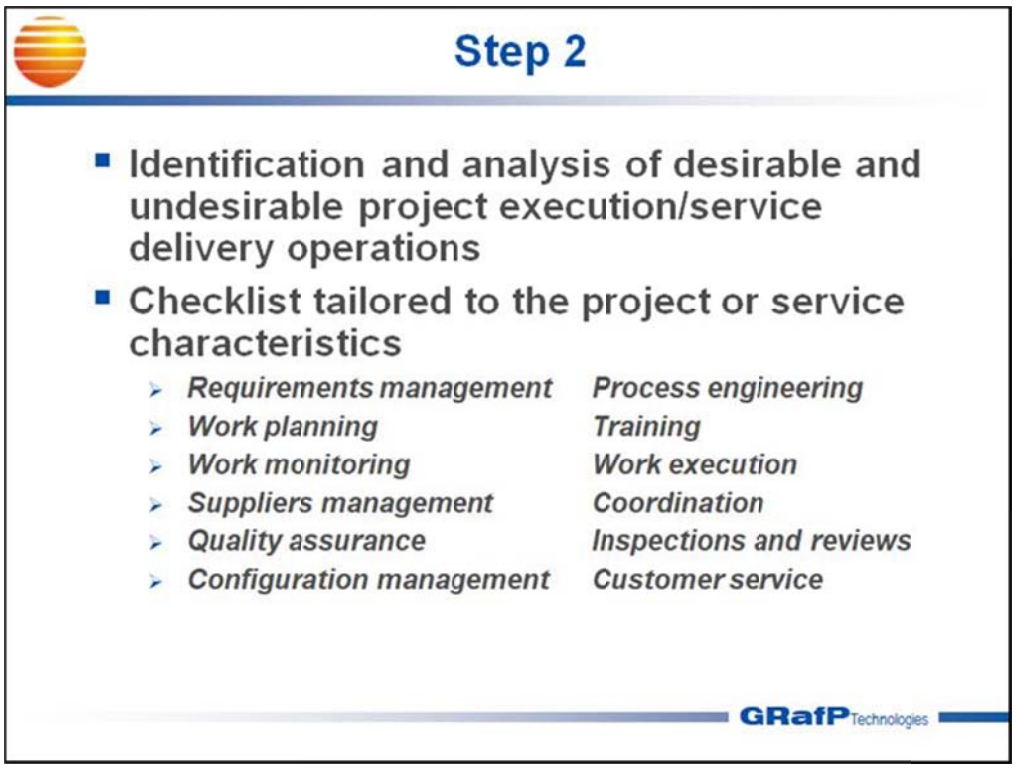
Step 2
Identification and analysis of desirable and undesirable project execution/service delivery operations
Checklist tailored to the project or service characteristics
Requirements management
Work planning
Work monitoring
Suppliers management
Quality assurance
Configuration management
Process engineering
Training
Work execution
Coordination
Inspections and reviews
Customer service
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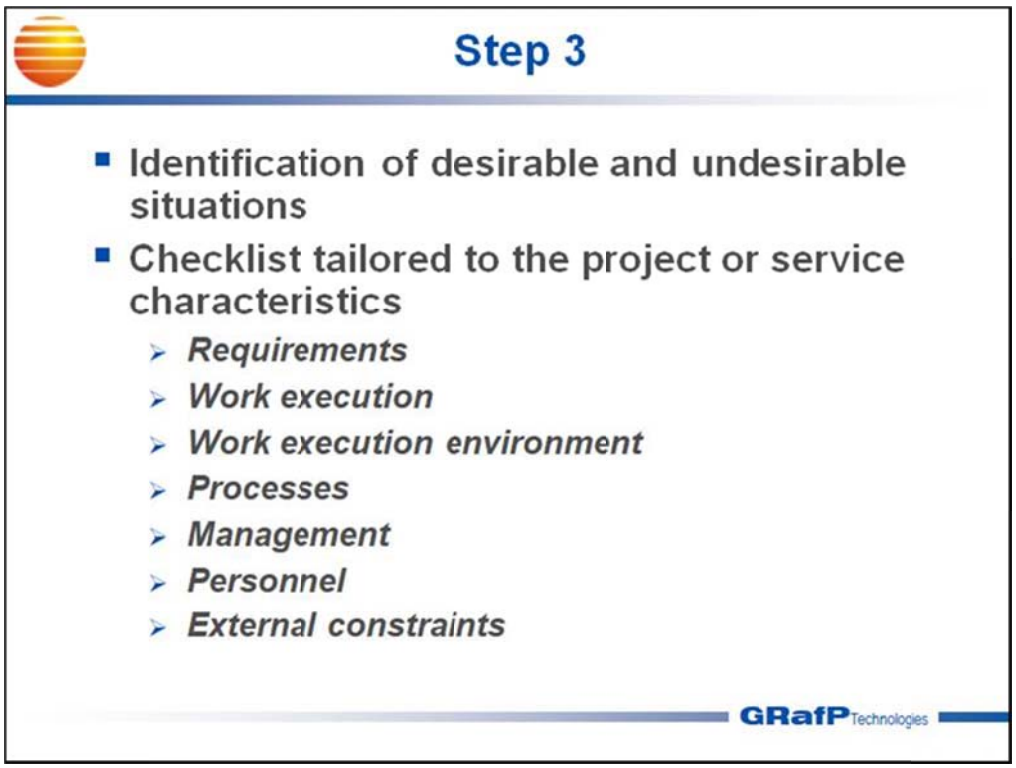
Step 3
Identification of desirable and undesirable situations
Checklist tailored to the project or service characteristics
Requirements
Work execution
Work execution environment
Processes
Management
Personnel
External constraints
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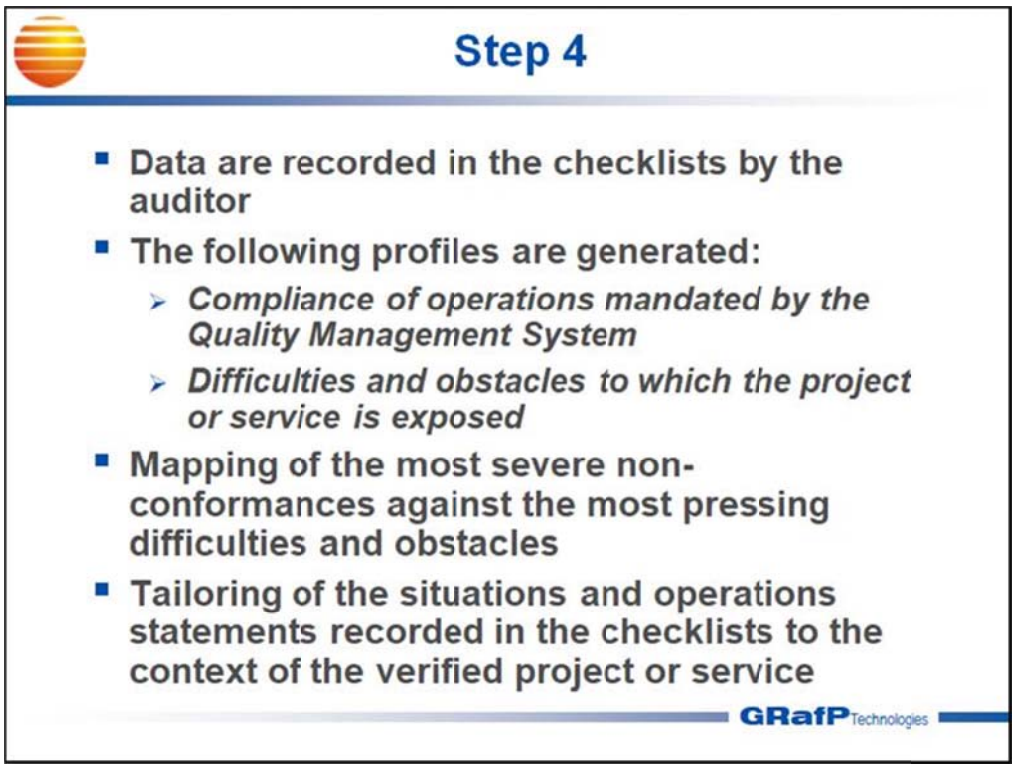
Step 4
Data are recorded in the checklists by the auditor
The following profiles are generated:
Compliance of operations mandated by the Quality Management System
Difficulties and obstacles to which the project or service is exposed
Mapping of the most severe non-conformances against the most pressing difficulties and obstacles
Tailoring of the situations and operations statements recorded in the checklists to the context of the verified project or service
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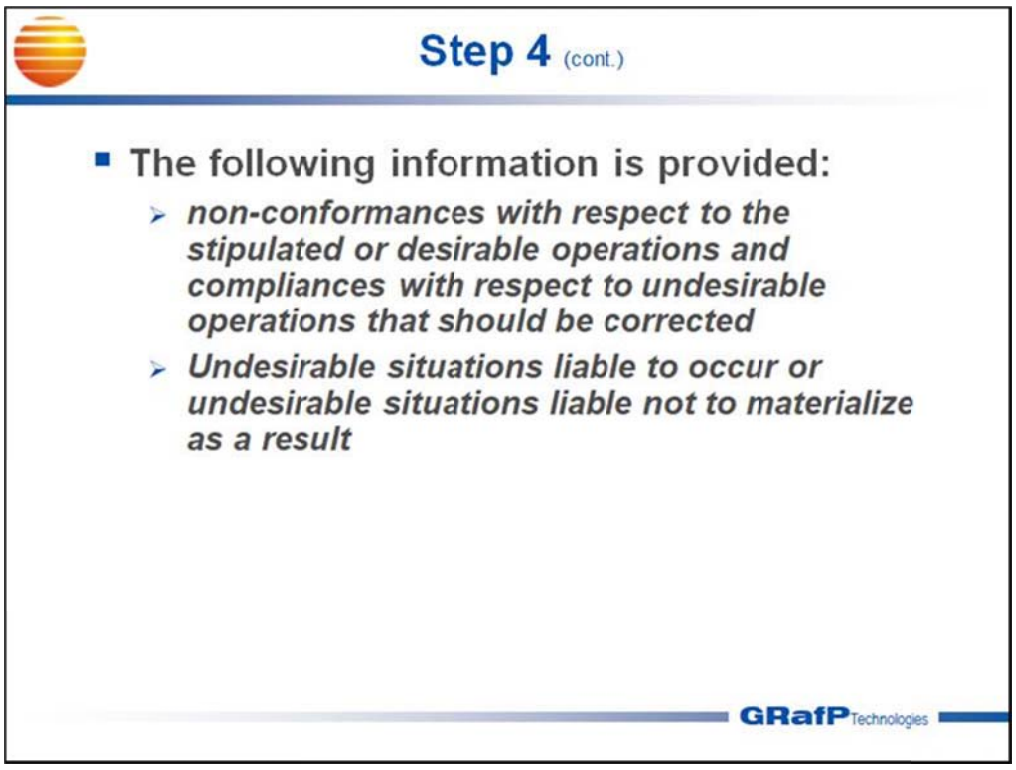
Step 4 (cont.)
The following information is provided:
non-conformances with respect to the stipulated or desirable operations and compliances with respect to undesirable operations that should be corrected
Undesirable situations liable to occur or undesirable situations liable not to materialize as a result
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Step 5

- Presentation of the results to senior management at a minimum
  - *The examined operational areas*
  - *The examined categories of situations that are likely to deteriorate*
  - *The profiles generated in step 4*
  - *The most important non-conformances*
  - *The situations most likely to deteriorate as a result of non-conformances*
  - *The recommended corrective actions*

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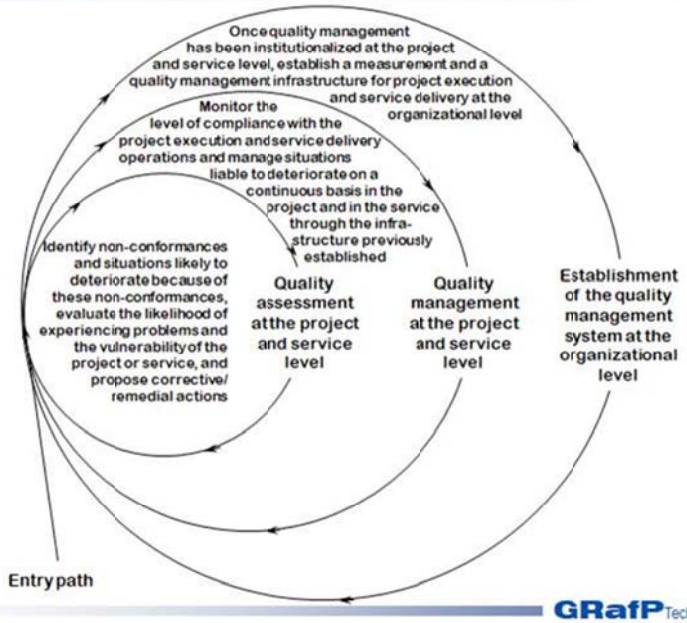
Phased Approach



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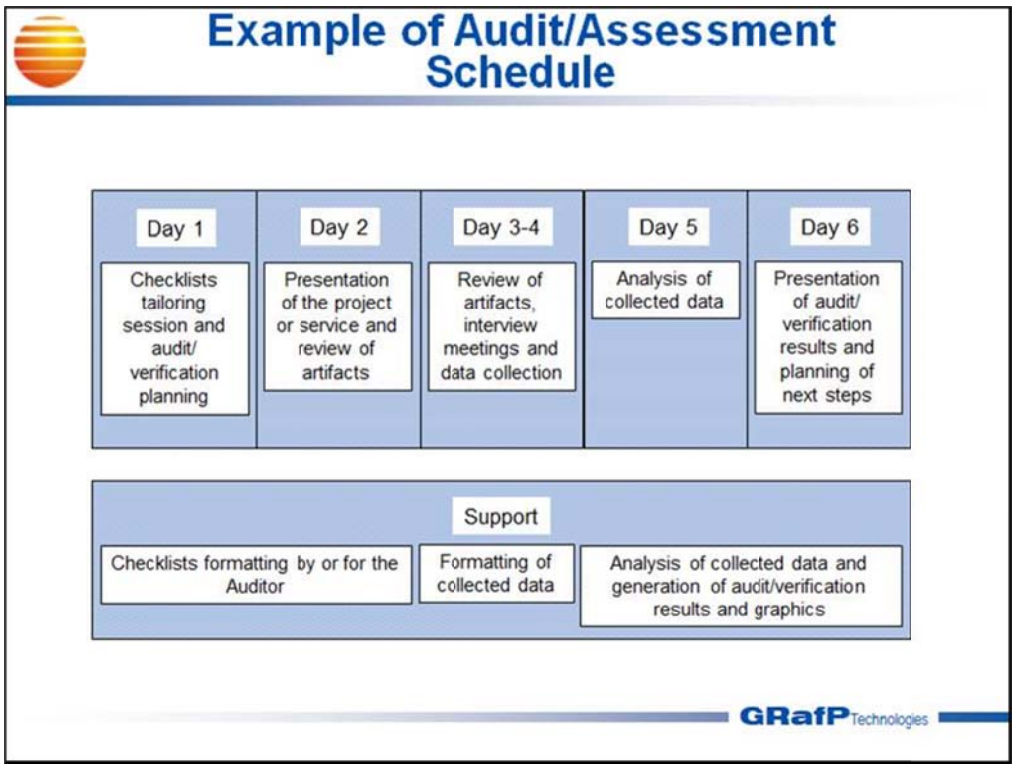
Example of Audit/Assessment Schedule
Day 1
Checklists tailoring session and audit/ verification planning
Day 2
Presentation of the project or service and review of artifacts
Day 3-4
Review of artifacts, interview meetings and data collection
Day 5
Analysis of collected data
Day 6
Presentation of audit/ verification results and planning of next steps
Support
Checklists formatting by or for the Auditor
Formatting of collected data
Analysis of collected data and generation of audit/verification results and graphics
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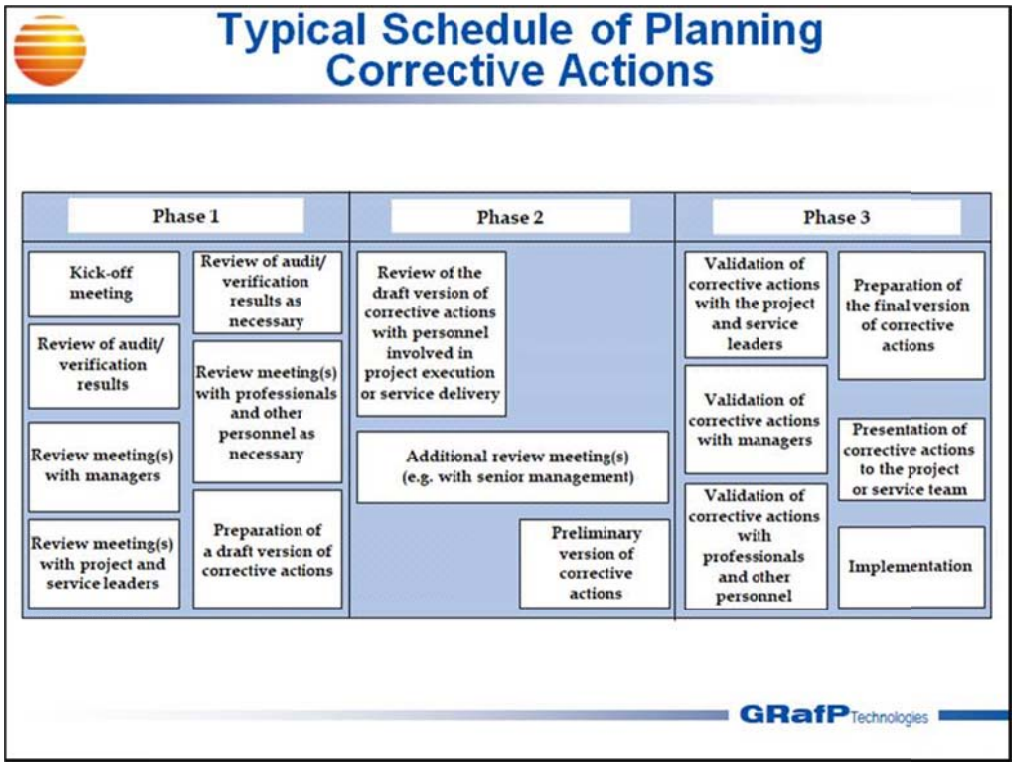
Typical Schedule of Planning Corrective Actions
Phase 1
Kick-off meeting
Review of audit/ verification results
Review meeting(s) with managers
Review meeting(s) with project and service leaders
Review of audit/ verification results as necessary
Review meeting(s) with professionals and other personnel as necessary
Preparation of a draft version of corrective actions
Phase 2
Review of the draft version of corrective actions with personnel involved in project execution or service delivery
Additional review meeting(s) (e.g. with senior management)
Preliminary version of corrective actions
Phase 3
Validation of corrective actions with the project and service leaders
Validation of corrective actions with managers
Validation of corrective actions with professionals and other personnel
Preparation of the final version of corrective actions
Presentation of corrective actions to the project or service team
Implementation
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"The price to pay for not verifying is having to improvise short-term actions and generate more problems"
Trust but verify
Old Russian proverb
"The price to pay for failing to manage risks is to fall into the same problems over and over again"
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Annex D

Guidelines for Developing Models

Overview of process to develop models in other domains

Modeling starts with identifying operations that should be implemented or avoided in order to ensure the success of a project or a service and eliciting situations that should be promoted or avoided with respect to a given domain.

Operations in this context can be several things and depend on the domain under consideration: at one extreme, they can consist of 'good' practices that one should adopt or improve, or clauses of an industrial standard.

The first step consists of identifying operations that should be performed or avoided with respect to the domain being modeled. To do so, ask yourself the question:

"What should be done or avoided (e.g. by individuals, by the organization, by the system) in order to obtain conclusive results with respect to the domain under consideration?"

The second step consists of identifying situations liable to translate into desirable or undesirable outcomes. In order to identify these situations with respect to a given domain, ask yourself this question:

"What situations would one (e.g. senior management, customers, an operator) like to see or not to see with respect to the domain under consideration?"

In a first attempt, only information is collected without trying to classify it. Categorization will come later after inventories of operations and situations have been completed.

Operations and Situations models should be developed by two different parties to ensure that there is no inherent bias in the process. Otherwise, the individual(s) developing the Situations model will have the natural inclination to simply address the inventoried situations when developing the Operations model, and vice-versa. The consequence is that some operations will likely be left out only because some situations have not been thought of. It is better to use an independent approach, and filter out unrealistic situations and operations that exhibit low usefulness potential.

When identifying a situation, it is also recommended to describe its consequence (its expected outcome, which will be qualified by its impact) if it materializes (assuming that it is undesirable) or if it does not (assuming that it is desirable). If no consequences can readily be identified, it may not be worth recording it. Likewise, when identifying an operation, it is recommended to describe the expected benefit of taking it (assuming that it is a desirable operation) or of avoiding it (assuming that it is undesirable).

Also keep in mind that thousands of models have been developed over the years and it is worth doing a bibliographic research before undertaking the development of a new model. Some of these models are quite old but are still very relevant to modern times. For instance, Sun Tzu's Art of War was developed by a Chinese military strategist 2,400 years ago and is still being taught in military schools around the world. The Prince, from Nicolo Machiavelli, after having been banned from publication in the 16th century, is a 500-year old model still widely used in politics.

When the inventories have been prepared, review both lists and try to group situations and operations along themes, also referred to as key areas.

Return On Investment

The Return On Investment (ROI) can be thought of as the losses avoided as a result of devising appropriate operations that contribute to preventing problems from occurring.

Efficiency and productivity are improved by minimizing the number and severity of problems a project or a service has to deal with in the course of pursuing its objectives. A problem may consist of a residual defect that customers will eventually find, resulting in costly rework after the product has been released. It may also be the excessive time it takes a service team to execute its delivery steps, resulting in customers' complaints and poor revenues, or worse, loss of market share.