Comprehensive Application Integration

The key to building a successful mobile interface for existing systems is having a high-speed, low-impact, non-intrusive approach to access exposedl business logic and data contained within them for reuse. Adapters for multiple backend technologies as well as for Oracle's E-Business Suite enterprise application are included as part of the Oracle Mobile Suite. The adapters provide comprehensive, bi-directional, standards-based, real-time connectivity to a variety of enterprise application systems. The Adapters use industry standard protocols to create open and reusable service-oriented based backend access for mobile applications.

Scalability and Performance

The Oracle Mobile Suite service bus provides extreme performance and scalability for all dimensions of your architecture. Applications need to scale in many dimensions—vertically, horizontally, with user numbers, and with message size. Scalability with an increasing number of services is an important and often ignored dimension of mobile architectures. Oracle's service bus has the ability to scale easily to thousands of services, via sophisticated techniques such as preprocess parsing to split large messages into smaller packets, as well as near linear scalability on clustered deployments.

Applications built with the mobile framework can perform better on mobile devices comparedto other hybrid approaches since their code is executed in a multi-threaded JVM compiled as a native library.

Secured Solution

Security is a key requirement for mobile applications with unique challenges that stem from the fact that mobile devices can be used outside the office and can easily be misplaced or stolen. The Oracle Mobile Suite includes built in security features for every layer. The mobile development framework can create secured mobile applications with support for both authentication and authorization. Specific features and components of the application can be limited to specific users and roles. The framework also supports authentication when the application is offline against a local encrypted credentials repository. For storing data locally in a secured way, the framework includes an encrypted SQLite database. This ensures that even if the device is lost, data can't be accessed by un-authorized users.

In addition the framework encrypts the network traffic between the device and the servers. The service bus includes a unified security layer that supports authentication and authorization as well as strict governance and management of the services that are exposed through the bus.

kOracle Database Enterprise Edition

Oracle Database is the first database designed for enterprise grid computing, the most flexible and cost-effective way to manage information and applications. Enterprise grid computing creates large pools of industry-standard, modular storage and servers. With this architecture, each new system can be rapidly provisioned from the pool of components. There is no need to provide extra hardware to support peak workloads, because capacity can be easily added or reallocated from the resource pools as needed.

Oracle Database 11g Release 2 is proposed for the database consolidation on Exadata, Oracle Database is proposed for HAAD with a group of database options that provide functionalities required by HAAD. In the following sub section we will describe in details these options we propose for HAAD:

High Availability

Databases and the Internet have enabled worldwide collaboration and information sharing by extending the reach of database applications throughout organizations and communities. This reach emphasizes the importance of high availability in data management solutions. Both small businesses and global enterprises have users all over the world who require access to data 24 hours a day. Without this data access, operations can stop, and revenue is lost. Users, who have become more dependent upon their solutions, now demand service-level agreements from their Information Technology (IT) departments and solution providers. Increasingly, availability is measured in dollars, euros, and yen, not just in time and convenience.

Enterprises have used their IT infrastructure to provide a competitive advantage, increase productivity, and empower users to make faster and more informed decisions. However, with these benefits has come an increasing dependence on that infrastructure. If a critical application becomes unavailable, then the business can be in jeopardy. Revenue and customers can be lost, penalties can be owed, and bad publicity can have a lasting effect on customers and a company's stock price. It is important to examine the factors that determine how your data is protected and maximize availability to your users.

Availability is the degree to which an application, service, or function is accessible on demand. Availability is measured by the perception of an application's end user. End users experience frustration when their data is unavailable or the computing system is not performing within certain expectations, and they do not understand or care to differentiate between the complex components of an overall solution. Performance failures due to higher than expected usage create the same havoc as the failure of critical components in the solution.

Reliability: Reliable hardware is one component of a high availability solution. Reliable software—including the database, Web servers, and applications—is just as critical to implementing a highly available solution. A related characteristic is resilience. For example, low-cost commodity hardware, combined with software such as Oracle RAC, can be used to implement a very reliable system, because the resilience of an Oracle RAC database allows processing to continue even though individual servers may fail.

Recoverability: Because there may be many choices for recovering from a failure, it is important to determine what types of failures may occur in your high availability environment and how to recover from those failures in a timely manner that meets your business requirements. For example, if a critical table is accidentally deleted from the database, what action should you take to recover it? Does your architecture provide the ability to recover in the time specified in a service level agreement (SLA)?

Timely error detection: If a component in your architecture fails, then fast detection is essential to recover from the unexpected failure. While you may be able to recover quickly from an outage, if it takes an additional 90 minutes to discover the problem, then you may not meet your SLA. Monitoring the health of your environment requires reliable software to view it quickly and the ability to notify the database administrator of a problem.

Continuous operation: Providing the ability for continuous access to your data is essential when very little or no downtime is acceptable to perform maintenance activities. Activities, such as moving a table to another location in the database or even adding CPUs to your hardware, should be transparent to the end user in a high availability architecture.

More specifically, high availability architecture should have the following traits:

- Tolerate failures such that processing continues with minimal or no interruption

- Be transparent to—or tolerant of—system, data, or application changes
- Provide built-in preventative measures
- Provide proactive monitoring and fast detection of failures
- Provide fast recoverability
- Automate detection and recovery operations
- Protect the data so that there is minimal or no data loss
- Implement the operational best practices to manage your environment
- Achieve the goals set in SLAs (for example, recovery time (RTO) and recovery point (RPO)) for the lowest possible total cost of ownership.

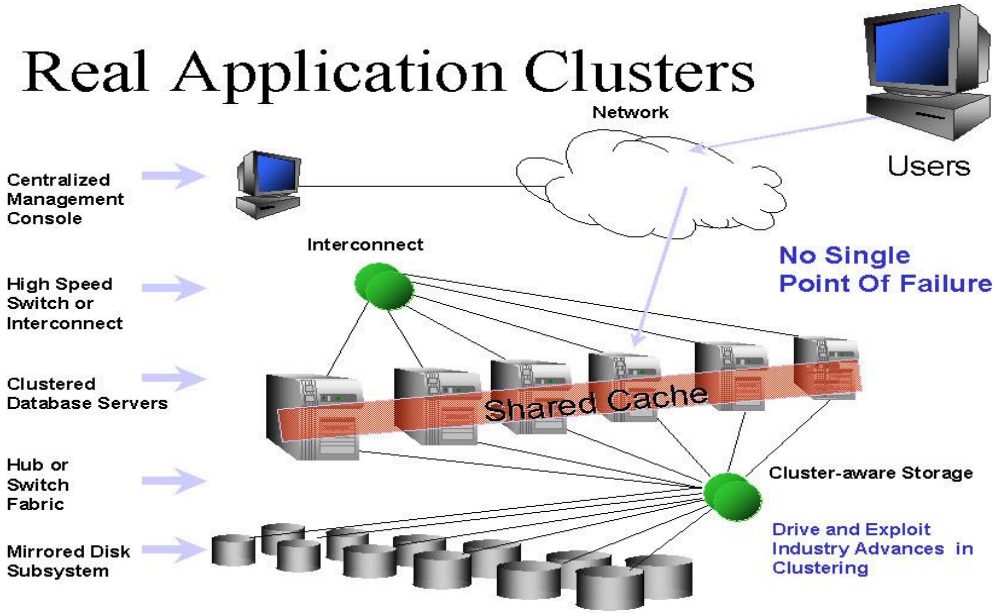
Oracle Real Application Clusters (RAC)

Oracle RAC extends Oracle Database so that you can store, update, and efficiently retrieve data from multiple instances on different servers at the same time. Oracle RAC provides the software that allows the servers to work together in what is called a cluster. The physical structures that make up the database must reside on shared storage that is accessible from all servers that are part of the cluster. Each server in the cluster runs the Oracle RAC software.

Single-instance Oracle databases have a one-to-one relationship between datafiles and the instance. Oracle RAC environments, however, have a one-to-many relationship between datafiles and instances. In Oracle RAC environments, multiple cluster database instances form a single database. The instances can be on different servers, referred to as hosts or nodes. The combined processing power of the multiple servers provides greater throughput and scalability than is available from a single server.

Each cluster database instances in an Oracle RAC cluster uses its own memory structures and background processes. Oracle RAC uses Cache Fusion to synchronize the data stored in the buffer cache of each cluster database instance. Cache Fusion moves current data blocks (which reside in memory) between database instances, rather than having one database instance writes the data blocks to disk and requiring another database instance to reread the data blocks from disk. When a data block located in the buffer cache of one instance is required by another instance, Cache Fusion transfers the data block directly between the instances using the interconnect, enabling the Oracle RAC database to access and modify data as if the data resided in a single buffer cache.

The Oracle RAC infrastructure is also a key component for implementing the Oracle enterprise grid computing architecture. Having multiple cluster database instances accessing a single database prevents the server from being a single point of failure. Any packaged or custom application that ran well on a single-instance Oracle database will perform well on an Oracle RAC database without requiring code changes.



Real Application Cluster Architecture

Oracle Clusterware

Oracle Database 11g includes Oracle Clusterware, a complete, integrated cluster management solution available on all platforms supported for Oracle RAC 11g Release 2. Oracle Clusterware includes mechanisms for cluster messaging, locking, failure detection, and recovery. For most platforms, no 3rd party clusterware management software needs to be purchased. Oracle will, however, continue to support selected 3rd party clusterware products on specific platforms. Oracle Clusterware includes a High Availability API to make applications highly available. Oracle Clusterware can be used to monitor, relocate, and restart any application. In an Oracle RAC environment, Oracle Clusterware automatically manages all Oracle processes.

Benefits for Oracle Real Application Cluster are mainly High Availability & Scalability:

High Availability

Oracle Real Application Clusters 11g provides the infrastructure for datacenter high availability it is also an integral component of Oracle's High Availability Architecture, which provides best practices to provide the highest availability data management solution. Oracle Real Application Clusters provides protection against the main characteristics of high availability solutions.

Reliability: Oracle Database is known for its reliability, Real Application Clusters takes this a step further by removing the database server as a single point of failure. If an instance fails the remaining instances in the cluster are open and active.

Recoverability: Oracle Database includes many features that make it easy to recover from all types of failures. If an instance fails in a RAC database, it will be recognized by another instance in the cluster and recovery automatically takes place. Fast Application Notification, Fast Connection Failover and Transparent Application Failover make it easy for applications to mask component failures from the user.

Error Detection: Oracle Clusterware automatically monitors RAC databases and provides fast detection of problems in the environment. Also it automatically recovers from failures often before anyone has noticed a failure has occurred. Fast Application Notification provides the

ability for applications to receive immediate notification of cluster component failures and mask the failure from the user by resubmitting the transaction to a surviving node in the cluster.

Continuous Operations: Real Application Clusters provides continuous service for both planned and unplanned outages. If a node (or instance) fails the database remains open and the application is able to access data. Most database maintenance operations can be completed without down time and are transparent to the user. Many other maintenance tasks can be done in a rolling fashion so application downtime is minimized or removed. Fast Application Notification and Fast Connection Failover assist applications in meeting service levels and masking component failures in the cluster.

Scalability

Oracle Real Application Clusters provides unique technology for scalability applications. Traditionally when the database server ran out of capacity, it was replaced with a new larger server. As servers grow in capacity, they are more expensive. For databases using RAC, there are alternatives for increasing the capacity. Applications that have traditionally run on large SMP servers can be migrated to run on clusters of small servers. Alternatively, you can maintain the investment in the current hardware and add a new server to the cluster (or to create a cluster) to increase the capacity. Adding servers to a cluster with Oracle Clusterware and RAC does not require an outage and as soon as the new instance is started, the application can take advantage of the extra capacity. All servers in the cluster must run the same operating system and same version of Oracle but they do not have to be exactly the same capacity. Customers today run clusters that fit their needs whether they are clusters of servers where each server is a 2 CPU commodity server to clusters where the servers have 32 or 64 CPUs in each server.

Oracle Real Application Clusters architecture automatically accommodates rapidly changing business requirements and the resulting workload changes. Application users, or mid tier application server clients, connect to the database by way of a service name. Oracle automatically balances the user load among the multiple nodes in the cluster. The Real Application Clusters database instances on the different nodes subscribe to all or some subset of database services. This provides DBAs the flexibility of choosing whether specific application clients that connect to a particular database service can connect to some or all of the database nodes. Administrators can painlessly add processing capacity as application requirements grow. The Cache Fusion architecture of RAC immediately utilizes the CPU and memory resources of the new node. DBAs do not need to manually re-partition data.

Another way of distributing workload in an Oracle database is through the Oracle Database's parallel execution feature. Parallel execution (I.E. parallel query or parallel DML) divides the work of executing a SQL statement across multiple processes. In an Oracle Real Application Clusters environment, these processes can be balanced across multiple instances. Oracle's cost-based optimizer incorporates parallel execution considerations as a fundamental component in arriving at optimal execution plans. In a Real Application Clusters environment, intelligent decisions are made with regard to intra-node and inter-node parallelism. For example, if a particular query requires six query processes to complete the work and six CPUs are idle on the local node (the node that the user connected to), then the query is processed using only local resources. This demonstrates efficient intra-node parallelism and eliminates the query coordination overhead across multiple nodes. However, if there are only two CPUs available on the local node, then those two CPUs and four CPUs of another node are used to process the query. In this manner, both inter-node and intra-node parallelism are used to provide speed up for query operations.

Managing Your Oracle Real Application Clusters Database

Oracle Real Application Clusters provides a single system image for easy configuration and management. The Oracle RAC database can be installed, configured, and managed from a single location. All tools and utilities provided to manage the database are cluster-aware from the Oracle Universal Installer (OUI), to Enterprise Manager including the database configuration assistant (DBCA), the database upgrade assistant (DBUA), the network configuration assistant (NETCA), and the command line interfaces such as srvctl.

Oracle Enterprise Manager: Oracle Enterprise Manager Cloud Control is the recommended management interface for an Oracle environment. Oracle Enterprise Manager is proposed as a central management tool for the entire solution and more details about EM will be provided in next coming sections.

Oracle Enterprise Manager Database Control is the graphical management tool provided by Oracle to manage your Oracle Database. Oracle Enterprise Manager Database Control can be automatically configured by the DBCA when a database is created. Alternatively, the database can be automatically registered with Oracle Enterprise Manager Grid Control at the time of creation. Both Enterprise Manger products are cluster-aware and can be used to manage Oracle RAC and server pools created with Oracle Clusterware.

Oracle Enterprise Manager Grid Control provides a Cluster Page for viewing the cluster hardware and operating system as a whole. This is particularly useful when the cluster is supporting multiple databases. Overall cluster platform status can be readily accessed with easy drill down capabilities to individual databases when needed. It provides a utility that automates the conversion of a single instance Oracle Database to a RAC Database. Oracle Enterprise Manager 10g Release 2 Grid Control provides additional capabilities to make the provisioning of Real Application Clusters databases easier. The initial creation of a cluster including lying down of Oracle home and the configuring of the clusterware can be easily done through Enterprise Manager.

Rolling Patch Application: Oracle supports the application of patches to the nodes of a RAC database in a rolling fashion with no downtime. Patches are applied one node at a time while the other nodes in the RAC system are up and operational. This requires that each node has a separate Oracle Home. Patches will be labeled as being qualified for install on as rolling upgradeable, or not, depending on the changes being made by the patch. Some patches that modify common structures shared between instances, or the contents of the database, will not be. In addition, only individual patches – not patch sets – will be rolling upgradeable. This capability supported beginning with Oracle 9.2.0.2. All Oracle Clusterware patches can be applied in a rolling fashion.

Rolling Release Upgrade Support: Oracle Clusterware supports rolling upgrades. This provides the ability to upgrade the clusterware without taking the cluster out of service and therefore enables 24x7 operation of business. Once you have upgraded Oracle Automatic Storage Management to 11g, you will be able to do rolling upgrades.

Workload Management with Oracle Real Application Clusters

Applications using an Oracle RAC database need to manage workload across a server pool. Oracle Real Application Clusters includes innovative technologies to manage workloads while providing the best application throughput given the configuration and high availability for the application. Oracle RAC 11g Release 2 introduces a simplified management of Oracle RAC databases within server pools to ease the consolidation of applications into a pool of servers, while maintaining resource allocation and role separated management at the same time.

Automatic Workload Management: With Oracle Database 11g Release 2, application workloads can be individually managed and controlled using managed services. The Database Administrator controls which processing resources are allocated to each service during normal operations and in response to failures. Users connecting to a service are load balanced across the server pool. Performance is tracked on a per-service-basis by the Oracle Database 11g Automatic Workload Repository facility. Thresholds on performance metrics can be set to automatically generate alerts when hit. Services are integrated with the Database Resource Manager, Oracle Streams, and the Scheduler.

To provide the best possible throughput of application transactions, the Oracle Database 11g Universal Connection Pool (UCP) provides intelligent load balancing for applications called Runtime Connection Load Balancing.

Services: Workload Management relies on the use of Services, a feature of Oracle Database. Services hide the complexity of a RAC database by providing a single system image to manage workload. Services allow applications to benefit from the reliability of a cluster.

Connection Load Balancing: Oracle Net Services provides connection load balancing for database connections. Client side load balancing which balances connection requests across all listeners for the cluster, is achieved by listing all servers in the cluster in the address list of the client connect string.

Fast Application Notification (FAN): Fast Application Notification provides integration between the RAC database and the application. It allows the application to be aware of the current configuration of the cluster at any given time so that application connections are only made to instances that are currently able to respond to the application requests. The Oracle RAC HA framework posts a FAN event immediately when a state change occurs within the cluster.

Load Balancing Advisory: Database workloads change over time as well as the cluster configuration can change, it is important to create and allocate database connections based on the most up to date information. RAC constantly monitors the workload being executed for each service by each instance providing the service. This information is published to the Automatic Workload Repository and published to the application using FAN events.

WebLogic Suite

Oracle WebLogic Suite is the cornerstone Oracle Fusion Middleware offering that forms the basis of application grid computing. It provides the best Java foundation for Oracle infrastructure and applications, enabling enterprises to outperform their competitors while minimizing operational costs.

Whether the business needs scale-out IT systems to meet increasing customer demand or just greater efficiency, the components of Oracle WebLogic Suite are engineered to adapt to ever-changing business conditions.

The benefits provided by WebLogic Suite include:

- Ideal consolidation platform—a unified management console allows you to combine the functionality of Oracle WebLogic Server and Oracle Application Server for custom, legacy, and/or packaged applications.
- Foundation for application grid—Pool and share resources with dynamic adjustment across multiple applications to lower operational costs and outperform competitors.
- Scale-out performance—Cache data in memory for consistently high responsiveness at any scale of users and transactions.
- Predictable runtime—Swap in the Oracle WebLogic Real Time Java Virtual Machine to instantly achieve predictability in application responsiveness with no code changes.
- Superior Oracle integration—Configure and connect to Oracle Database, Oracle Fusion Middleware, and Oracle Applications with ease.
- Oracle Platform Security Services—the foundation for Service-Oriented Security, the industry's first declarative security framework, which simplifies the process of writing highly secure applications.

The core of WebLogic Suite is Oracle WebLogic Server Enterprise Edition, which is described in the next section.

Oracle WebLogic Server

Oracle WebLogic Server Enterprise Edition is the application server of choice for modern data centers. It takes full advantage of the latest hardware architectures including 64-bit addressable memory, multi-core computing systems and high-speed networks. Enterprise IT teams can now consolidate and standardize applications and services onto a pool of highly available, fast, and easy-to-manage instances of Oracle WebLogic Server to gain more agility, efficiency, and business alignment.

Oracle WebLogic Server Enterprise Edition helps enable IT infrastructure that keeps running even as load on the system fluctuates. To ensure superior application performance, unmatched deep diagnostics capabilities can be used on production systems without affecting runtime performance. These and other features of Oracle WebLogic Server Enterprise Edition are engineered to support modern data centers with maximum uptime at minimum cost.

The WebLogic Server infrastructure supports the deployment of many types of distributed applications and is an ideal foundation for building applications based on Service Oriented Architectures (SOA).

#1 in the Application Server Market

Oracle continues to lead the application server market in market share and performance according to industry analysts and third party benchmarks. The WebLogic Server complete implementation of The Sun Microsystems' Java EE 5.0 specification provides a standard set of APIs for creating distributed Java applications that can access a wide variety of services, such as databases, messaging services, and connections to external enterprise systems. End-user clients access these applications using Web browser clients or Java clients. It also supports the Spring Framework, a programming model for Java applications which provides an alternative to aspects of the Java EE model.

High Availability

Easy configuration changes, incremental update (FastSwap), and rolling upgrades are just a few of the capabilities that help keep systems available even while making changes. Sophisticated yet easily managed is another hallmark of Oracle WebLogic Server Enterprise Edition. Clustering instances of Oracle WebLogic Server together enables many capabilities that kick in when a server abruptly goes offline. Features such as whole-server migration, automatic service migration, and the transaction recovery service are invoked when server health degenerates. Built-in software load balancing, server self-monitoring, and overload protection help avoid failure altogether. If necessary, Oracle WebLogic Server Enterprise Edition can failover across metropolitan area networks (MANs) and wide area networks (WANs) in support of disaster recovery procedures. And supporting active-active application deployments, Oracle GridLink for Oracle Real Application Clusters (RAC) adds advanced new capabilities to integrate Oracle RAC with Oracle WebLogic Server Enterprise Edition. Active-active deployments offer the highest levels of application availability.

Enterprise-wide system messaging

Reliable messaging between systems is critical for applications and modern data centers. Oracle Enterprise Grid Messaging builds on the Java Message Service (JMS) standard to include high performance and reliability as well as connectivity to non-Java clients such as C#/.NET. Advanced features include automatic migration of JMS-related services from a failing server to a healthy server, reliable messaging via store-and-forward, and unsurpassed performance when persisting

messages to disk. Further, JMS now interacts with Oracle's database-integrated messaging via Oracle Streams Advanced Queuing (AQ). When coupled with Oracle RAC, Oracle AQ offers even higher levels of messaging performance.

Monitoring and Management

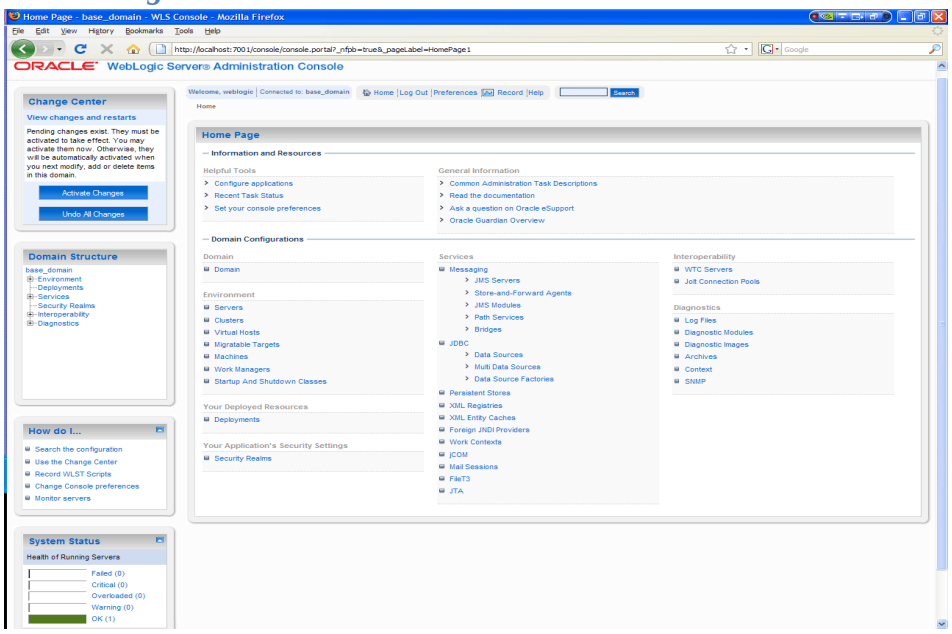


Figure 2: WebLogic Server Console

The Oracle WebLogic Server Administration Console is the starting point for essential operations, administration, and management. It enables simplified access to all the functions of Oracle WebLogic Server and includes built-in intelligence to help prevent human configuration errors. For those averse to graphical user interface (GUI) tools, Oracle WebLogic Scripting Tool (WLST) enables command-line control over Oracle WebLogic Server. Oracle Fusion Middleware Real Operations Insight augments the Console to further monitor and manage Oracle WebLogic Server Enterprise Edition. The included Enterprise Manager Diagnostics Pack for Oracle Middleware improves availability and performance while providing in-depth diagnostics for Java applications with low overhead. It enables administrators to monitor application performance and learn about problems ahead of time. Administrators can diagnose the root cause of problems such as application crashing and application hanging in production environments, which may impact businesses severely. In addition, the Composite Application Manager delivers sophisticated composite application performance management. This is particularly useful when deploying services in support of service-oriented architecture (SOA).

Security

The WebLogic Server security architecture provides a comprehensive, flexible security infrastructure designed to address the security challenges of making applications available on the Web. WebLogic security can be used standalone to secure WebLogic Server applications or as part of an enterprise-wide, security management system that represents a best-in-breed security management solution. See Overview of the WebLogic Security Service.

Diagnostic Framework

The WebLogic Diagnostic Framework is a monitoring and diagnostic service that lets you create, collect, analyze, archive, and access diagnostic data generated by a running server and its deployed applications. This data provides insight into the run-time performance of WebLogic Server instances and deployed applications and lets you isolate and diagnose faults and performance bottlenecks.

Project Management Tool – ProjeQtOr SW

ProjeQtOr is a Quality based Project Organizer, as a web application. ProjeQtOr focuses on IT Projects, but is also compatible with all kinds of Projects.

Its purpose is to propose a unique tool to gather all the information about the projects.

The fact is that many Project Management softwares just focus on planning. But it is a much too restrictive point of view. Of course planning is an important activity of Project Management and is one of the keys to Project success, but it is not the only one.

Project Managers need to foresee all what can happen, measure risks, build action plan and mitigation plan. It is also important to track and keep traces of all what is happening to the Project: incidents, bugs, change requests, support requests, etc.

In this objective, ProjeQtOr gives visibility at all levels of Project Management. At lower level, the Project follow-up consists in gathering all information, and maintain it up to date. This involves all the operational team. At upper level, Project Steering uses the follow-up data to take the decisions and build the action plan. This allows to bring the adjustments needed to target on the objectives of the project.

The goal of ProjeQtOr is to be Project Management Method independent. Whatever your choice on the method, you can use ProjeQtOr.

Planning Management

ProjeQtOr provides all the elements needed to build a planning from workload, constraints between tasks and resources availability.

The Project is the main element of ProjeQtOr.

It is also the highest level of visibility and definition of access rights based on profiles.

You can define profiles, some have visibility on all projects, and others only on the projects they are assigned to.

You can also define sub-projects of a project and sub-project of sub-projects without limit to this hierarchical organization.

This allows for example to define projects that are not real projects, but just a definition of the structure for your organization.

An activity is a task that must be planned, or includes other activities.

This is usually a task that has a certain duration and should be assigned to one or more resources.

Activities appear on the Gantt Planning view.

A milestone is an event or a key date of the project.

Milestones are commonly used to track delivery dates or force a start date of activity.

They can also be used to highlight the transition from one phase to the next one.

Unlike activities, milestones have no duration and no work.

Resources can be assigned to activities.

This means that some work is defined on this activity for the resource.

Only the resources affected to the project of the activity can be assigned to the activity.

Resources enter their time spent on the Real work allocation screen.

This allows for a real-time monitoring of work.

Moreover, updating the left work allows to recalculate the planning taking into account the actual progress on each task.

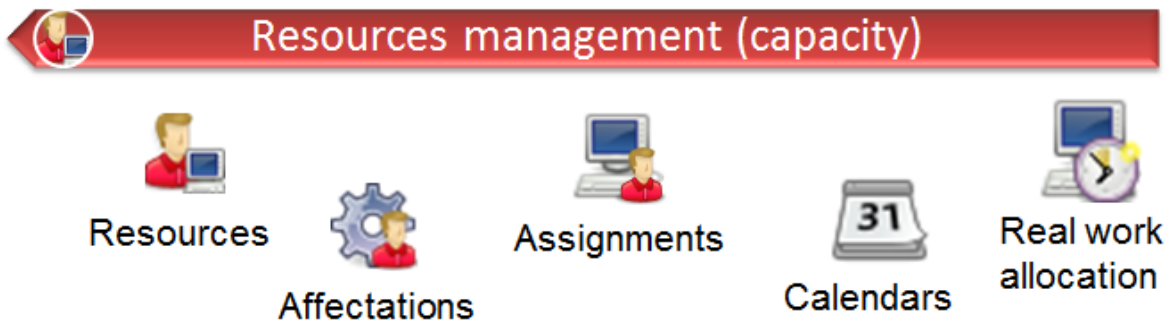
The planning is based on all the constraints defined:

- left work on each activity
- availability of resources
- rate of resource affectation to projects and assignment rate of resources to activities
- planning mode for each activity (as soon as possible, fixed duration, ...)
- dependencies between activities
- priorities of activities and projects

The planning is displayed as a Gantt chart.

The planning can also be viewed as a Project Portfolio, which is a Gantt planning view restricted to one line per project, plus optionally selected milestones.

Resource Management



ProjeQtOr manages the availability of resources that can be affected to multiple projects. Tool calculates a reliable, optimized and realistic planning.

Resources are the persons working on the project activities.

A resource can also be a group of persons (team) for which you do not want to manage individual detail.

You can manage this through the capacity of the resource, that can be greater than 1 (for a group of people) or less than 1 (for a person working part-time).

The first step is to affect each resource to the projects on which it has to work, specifying the affectation rate (% of maximum weekly time spent on this project).

Then you can assign resources to project activities.

This means that some work is defined on this activity for the resource.

Only the resources affected to the project of the activity can be assigned to the activity.

To manage off days, you have a global calendar.

This calendar can be split into multiple calendars, to manage distinct availability types:

⇒ you can create a calendar "80%" with every Wednesday as off day

⇒ You can manage distinct holidays when working with international teams.

Each resource is then assigned to a calendar.

Resources enter their time spent on the Real work allocation screen.

This allows for a real-time monitoring of work.

Moreover, updating the left work allows to recalculate the planning taking into account the actual progress on each task.

Tickets Management

ProjeQtOr includes a Bug Tracker to monitor incidents on your projects, with possibility to include work on planned tasks of your projects.

A Ticket is any intervention not needing to be planned (or that cannot be planned).

It is generally a short activity for which you want to follow advancement to describe (and possibly provide) a result.

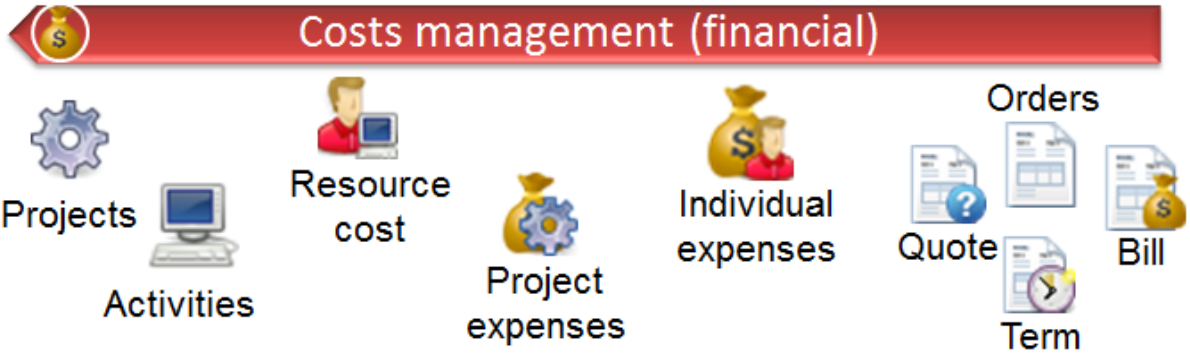
For example, bugs or problems can be managed through Tickets:

- You cannot schedule the bugs before they are identified and registered
- You must be able to give a solution to a bug (workaround or fix)

Simple tickets are just simplified representations of Tickets for users that will "create" tickets but not "treat" them.

Elements created as simple tickets are also visible as Tickets, and vice versa.

Costs Management



All elements related to delays can also be followed as costs (from resources work) and managing other expenses all costs of the project are monitored and can generate invoices.

The Project is the main entity of ProjeQtOr.

In addition to tracking work on projects, ProjeQtOr can track the costs associated with this work.

An Activity is a task that must be planned, or includes other activities.

Work assigned to resources on activities is converted into associated costs.

To calculate the cost of expenses ProjeQtOr defines the Resources cost.

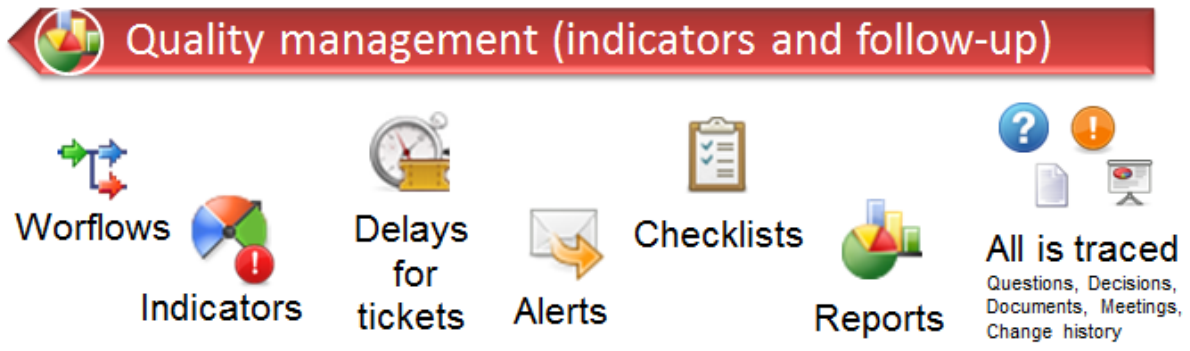
This cost may vary depending on the role of the resource and may change over time.

Projects expenses can also record expenses not related to resource costs (purchase, lease, sub-contracting)

Individual expenses can record expenses generated by a given resource.

ProjeQtOr can manage various financial elements found on a project: Quotation (proposals), Orders (received from customers), the invoicing Terms and Bills.

Quality Management



The specificity of ProjeQtOr is that it is Quality Oriented: it integrates the best practices that can help you meet the quality requirements on your projects.

This way, the approval stage of your Quality Systems are eased, whatever the reference (ISO, CMMI, etc.).

Workflows are defined to monitor changes of possible status.

This allows, among other things, to restrict certain profiles from changing some status.

You can, for instance, limit the change to a validation status to a given profile, to ensure that only an authorized user will perform this validation.

You can define Delays for ticket. This will automatically calculate the due date of the Ticket when creating the Ticket.

Indicators can be calculated relative to respect of expected work, end date or cost values.

Some indicators are configured by default, and you can configure your own depending on your needs.

Non respect of indicators (or the approach of non-respect target) can generate Alerts.

It is possible to define custom Checklists that will allow, for instance, to ensure that a process is applied.

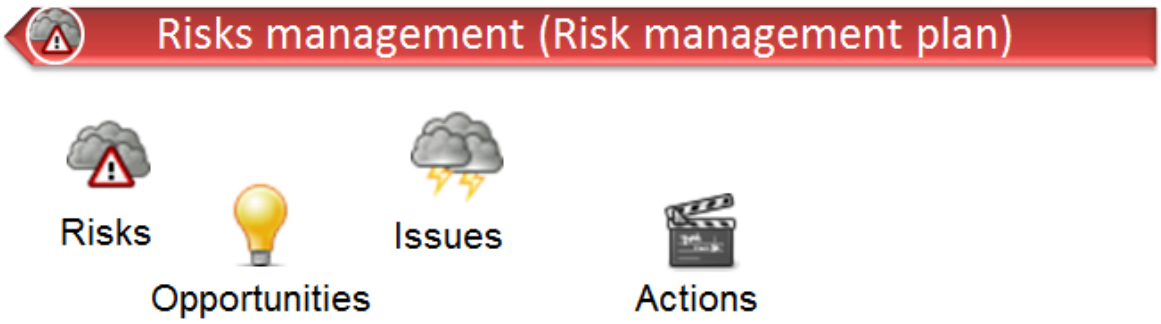
Many Reports are available to track activity on projects, some displayed as graphs.

Finally, thanks to ProjeQtOr, everything is traced.

You can follow-up, in a centralized and collaborative way, the various elements you used to follow-up (or not) in many Excel sheets : list of Questions & Answers, recording Decisions impacting the project, management of documents configuration, follow-up of meetings ...

In addition, all updates are tracked on each item to keep (and display) a history of the life of the item.

Risks Management



ProjeQtOr includes a comprehensive risks and opportunities management, including the action plan necessary to mitigate or treat them and monitoring occurring problems.

A Risk is a threat or event that could have a negative impact on the project, which can be neutralized, or at least minimize, by predefined actions.

The risk management plan is a key point of the project management. Its objective is to :

- identify hazards and measure their impact on the project and their probability of occurrence,
- identify avoidance measures (contingency) and mitigation in case of occurrence (mitigation),
- identify opportunities,
- monitor the actions of risks contingency and mitigation,
- identify risks that eventually do happen (so they become issues)

An Opportunity can be seen as a positive risk. This is not a threat but an opportunity to have a positive impact on the project.

They must be identified and followed-up not to be missed out.

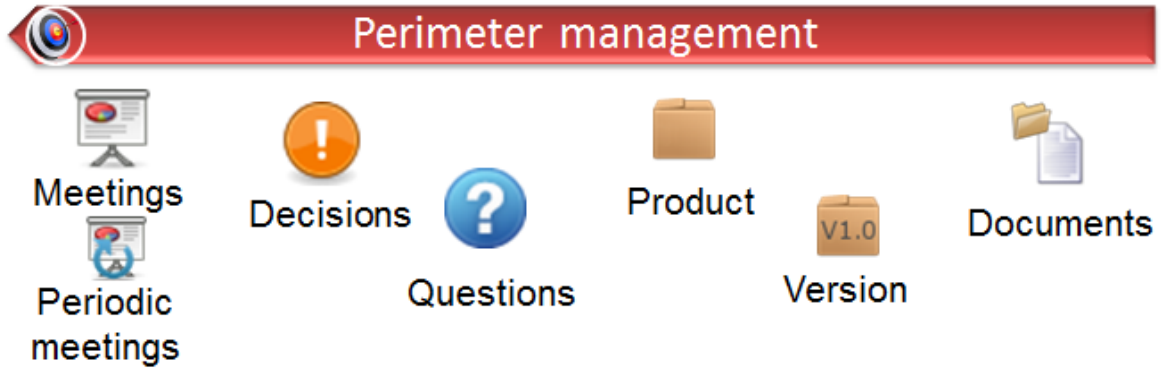
Issue is a risk that happens during the project.

If the risk management plan has been properly managed, the issue should be an identified and qualified risk.

Actions shall be defined to avoid risks, not miss the opportunities and solve issues.

It is also appropriate to provide mitigation actions for identified risks that did not occur yet.

Perimeter Management



ProjeQtOr allows you to monitor and record all events on your projects and helps you in managing of deviations, to control the perimeter of projects.

Follow-up and organize Meetings, track associated action plans, decisions and easily find this information afterwards.

You can also create Periodic meetings, which are regularly recurring meetings (steering committees, weekly progress meetings, etc.)

Decisions follow-up allows you to easily retrieve the information about the origin of a decision:

- who has taken a particular decision ?
- when?
- during which meeting ?
- who was present at this meeting?

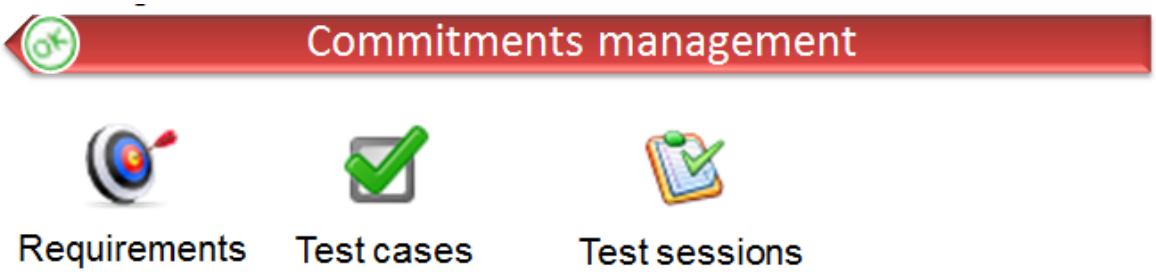
Not revolutionary, this feature can save you many hours of research in case of dispute.

Tracking Questions / Answers can also simplify your life on such exchanges, which often end up as a game of Ping - Pong with a poor Excel sheet in the role of the ball (when it is not a simple email exchange...).

ProjeQtOr includes Product management and Product Versions. Each version can be connected to one or more projects. This allows you to link your activities to target version. This also allows to know, in the case of Bug Tracking, the version on which a problem is identified and the version on which it is (or will be) fixed.

Finally, ProjeQtOr offers integrated Document Management. Not replacing a business ECM, this tool is simple and efficient to manage your projects and / or products documents.

Commitments Management



ProjeQtOr allows you to follow the requirements on your projects and measure at any time coverage progress, making it easy to reach your commitments.

In addition to the standard functionalities to manage your projects and monitor costs and delays, ProjeQtOr provides elements to monitor commitments on products.

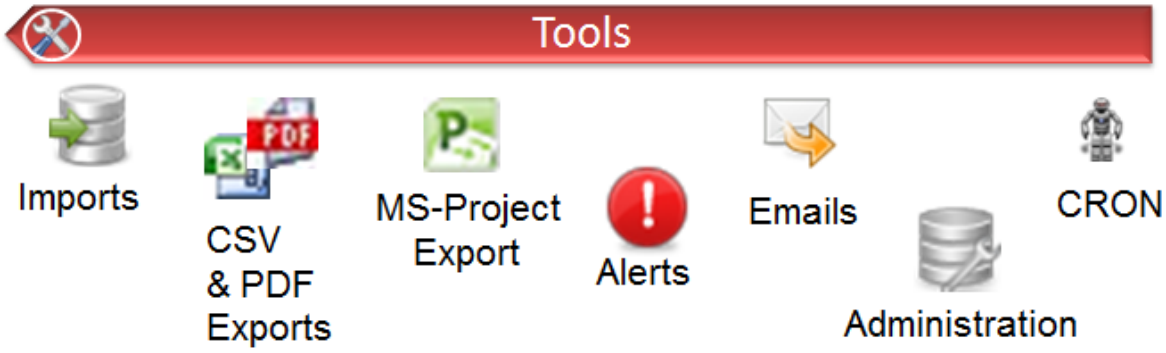
Requirements management helps in describing requirements explicitly and quantitatively monitor progress in building a product.

The definition of Test cases is used to describe how you will test that a given requirement is met.

Test sessions group test cases to be executed for a particular purpose.

By linking these three elements, you can obtain a requirements covering matrix, simply, efficiently and in real time.

Tools



ProjeQtOr includes some tools to generate alerts, automatically send emails on chosen events, import or export data in various formats.

ProjeQtOr includes an import feature for almost all elements of project management, from CSV or XLSX files.

All lists of items can be printed and exported to CSV and PDF format.

The details of each item can be printed or exported in PDF format.

The Gantt planning can be exported to MS-Project format (XML) .

Internal alerts can be generated automatically based on defined events.

These alerts can also be dispatched as emails.

It is also possible to manually send emails from the application, attaching the details of an item.

It is also possible to retrieve answers to this type of email to save the message in the notes of the relevant item.

ProjeQtOr provides administrative features to manage connections, send special alerts and manage background tasks treatments.

Moreover, the tool features its own CRON system, independent of the operating system and able to handle the PHP stop and restart.

Response to Business Specifications

#	Requirements Description	Our response
1.	Bidder must specify the Project Management Methodology he will use to execute the project.	Our proposed Project Management Methodology is based upon the PMI's Project Management Body of Knowledge (PMBOK) and has been streamlined to supply enough valuable detail to guide our project managers through the process. Our goal is to institute a scalable process of industry standard best practices to support and promote the successful delivery of projects (i.e. MOSA Portal project); to raise the project management maturity level; and to improve performance. For further details please refer to the Project Concept and Approach section.
2.	Bidder must provide as part of his submittal a project plan based on the proposed project management methodology to execute this project. A project plan limited to milestones will not be accept and shall deem the offer as a "Non-Responsive" leading to disqualify the offer.	Detailed project plan, time line schedule and milestones are included as part of our response. For further details please refer to project plan section.
3.	Bidders must install two environments, the production environment and the development environment including licenses while hardware will be provided by MoSA. Detailed BOQ must be specified in 0.	It is expected that we will utilize the existing production and testing environments. However, we are committed to re-install the environments in case required. Our recommended BoQ also included as part of our response, please refer to the solution requirements section for further details.
4.	Provided solution should be designed for high performance, high reliability and 99.99% availability. The term "High" refers to redundancy, clustering, etc.	Our proposed solution will be high available base on Oracle best practices.
5.	Bidder must submit a clear training program as an ongoing service during project execution. Contractor is expected to conduct training session to end users and IT users on regular bases until the sign-off of the project. Train the Trainer program shall be conducted after the implementation sign-off only.	Comprehensive and detailed training program is included as part of our response. For further details please refer to the training section.
6.	At the end of the project period, Bidders are expected to handout all project	We are committed to provide a detailed technical hand over along with all required

	components wherever applicable (such as hardware/software/documentation/ Manuals, etc.…) in its final updated shape. Bidders shall carry all incurred cost of such services. The following are examples for guidance only:	documentations. For further details about the project outcomes please refer to the project deliverables section.
	Latest version and updates of all installed Software Products (i.e.: OS, Database, backup…etc.).	We are committed to fulfill this requirement
	Latest Firmware version for all hardware components (if any)	We are committed to fulfill this requirement
	Any faulty part should be fixed prior to sign-off.	We are committed to fulfill this requirement
	Contractor must demonstrate in their proposal their approach towards Change Management (i.e. must describe the procedures, processes, workflow, etc. in which it will be used during the course of the project).	We follow the following change management methodology that establish the governance process and stage gates with deliverables and activities. For further details please refer to the change management section.

Training

We will provide intensive training for users at all levels and during project duration.

Comprehensive manuals compiled specific to the buildup applications and will be supplied in two versions Arabic & English.

We will provide the following trainings on site provided that MOSA will provide required facilities and equipment:

Training Course	Duration
Administration Training	5 Days
End-User Training	2 Days / 5 Departments
Train-the-Trainer	5 Days

End-User Training Approach

We recommend three approaches to end-user training.

- First, we offer an eLearning rich media material.
- Second, we offer a Train-the-Trainer program in which an instructor coaches your trainer on providing the instructor-led Using Content Server class.
- Third, we provide training class, tailored to each process specific requirements, at your location.

Train-the-Trainer Approach

The most popular approach is a Train-the-Trainer program designed to equip your instructors with the skills and knowledge to train your organization's MOSA users. In short, this program prepares your instructor either to deliver the training class that we also offer or to serve as a knowledgeable resource in your organization to those who complete the eLearning module, if you chose to use that to train your end users.

Our Train-the-Trainer approach follows these steps:
First, your instructor attends our end user course(s). Second, your instructor studies the course materials and the software with access to our instructor. Third, our instructor assists your instructor as a subject matter expert as your instructor delivers the initial course(s).
Accordingly, this will confirm and ensure providing a trainer and training manual to MOSA as required

We will assess your organization's intent and requirements, and then we will recommend an approach that will assure your success.

Below is description of the BPM related courses that will be provided as part of the project.

Course title	**Portal Administration Training**

Number of days	5
Max number of attendees	3
Who should attend?	System Admin

Course title	**End-User Training**
Number of days	4 Sessions, 4 Hours/Session
Max number of attendees	10 per Session
Who should attend?	Department users, Trainers

Course title	**Train-the-Trainer**
Number of days	5
Max number of attendees	5
Who should attend?	Trainers

Training Manuals

We will document site-specific items to supplement our standard documents. So we will document our findings in a set of documentation to include business requirements specification, use cases (as appropriate), and specifications for new features and enhancements required for this project. Also, Documentation remains an on-going process, it accompanies the first prototype that the users sees and extends throughout the development stages. We will prepare extensive and useful documentation outputs throughout the system development life-cycle. We will also carry out tests on the documentation to ensure its validity, currency, suitability and usability.

We will provide comprehensive tailored training manuals on different levels in soft copy. Standard admin and user manuals developed by Oracle will be provided also in soft copy.

Change Management

We follow the following change management methodology that establish the governance process and stage gates with deliverables and activities. We use the below project management governance process with a stage-gate review at each step:

In each stage, there will be project-management activities and deliverables and change-management activities and deliverables:

	DEFINE	MEASURE	ANALYZE	IMPROVE	CONTROL
Change Management Activities	• Assess change • Assess impacted group • Assess group sponsors • Define the change as part of the charter	• Assess sampling of impacted individuals • Assess communications • Design the communications feedback processes/tools	• Assess sampling of impacted individuals • Assess impacted group • Identify the sources of resistance	• Assess sampling of impacted individuals • Assess communications • Identify new roles, tasks, tools	• Assess behavior change • Identify implementation issues
Change Management Deliverables	• Assessment results • Change definition • Change management strategy • Risk management plan • Communications plan	• Assessment results • Sponsor plan • Updated Communications plan	• Assessment results • Resistance Plan • Updated Communications plan	• Assessment results • Training plan	• Training plan and tools • Recognition and rewards program • Integrate into performance management system

Stage One: Define

In the first stage of the project, we develop a business case that defines the business objective. Often we generate this documented in an A3 format. During this first stage, the change management activity includes several assessments with a deliverable of a change management strategy.

These assessments take place after the change has been defined, at least at a high level. The purpose of the assessments is to determine the level of change management effort required to mitigate the risks. We will assess the scope of the changes and the change experience for impacted groups. An evaluation of the sponsors and supervisors is included because they are the primary messengers of change.

The assessments yield a specific change management strategy that defines the level of effort required to prepare the sponsors, integrate change management with the project management activities, and drive adoption, utilization, and proficiency in the new processes and tools. A preliminary assessment of the risk of not changing and the most significant risks to meeting the business objectives will be completed.

Sponsor communications will begin at this stage. The business reasons for the change and the risk of not changing should begin to be communicated by leadership — the sponsor.

In the “define” stage, the change management activities and deliverables we will include:

- We will write a change management strategy
- We will assess change and organization
- We will identify all stakeholders (including MOSA team Committee) and seek out innovators/early adopters
- We will assess sponsor change competence
- We will create a risk management plan
- We will identify and prepare the change management resources and team
- We will start the communications plan.

Stage Two: Measure

In the second stage, we will focus on defining the current state. Project communication continues from the sponsors focused on the business need and then we will include the MOSA Management focused on the individual impact. Impacted MOSA managers and employees are engaged in the process. Change management focuses on sponsor and manager engagement, identifying resistance, and communications.

The sponsor is the primary communicator of the need for change. Sponsors are willing, even eager to do this when they are prepared. But for many this does not come naturally. They need a plan with specific directions on where to go, what to do, and what to say. We will include a

specific plan in the change management plans for the MOSA sponsor that includes activities, dates, goals, and supporting documentation.
Now that the business case for change has been communicated and people are engaged in identifying the current state, the natural resistance will be evident. There will be employee resistance. It is a natural reaction to change. Mitigating this resistance is the primary reason we invest in change management for our Clients (i.e. MOSA in this case). Change agents and managers will assess individual reactions to the change. This data is used to identify resistance and update the communications plan.

In the "measure" stage the change management activities and deliverables that we include are:

- We will create a sponsor plan
- We will assess communication efficacy
- We will identify areas of resistance
- We will discover and work to win over opinion leaders
- We will update the communications plan.

Stage Three: Analyze

In the "analyze" stage, we will design the future state and we will begin developing the implementation plan. Using the assessment data on communications and individual reactions to the change, we will design detailed plans for driving the behavior change and tracking resistance.

All the plans will by this stage be in place. The level of effort required for communication, sponsor support, and resistance management will be scoped and planned. The investment is based on the risk assessments completed through the first two phases.

In the "analyze" stage, the change management activities and deliverables that we include are:

- We will define survey processes and sample groups
- We will create resistance plans
- We will update change management plans with roles, tasks, and dates.

Stage Four: Improve

In the "improve" stage, the new system is tested and implementation begins. We will implement the plans developed in the previous stage and we will update these plans to reflect the changing reactions to the implementation.

Performance will drop initially. This is widely recognized in change management circles. The objective of the change management plans is to minimize the time in this transition state of confusion and anxiety. It will feel like a valley of despair, but we will be ready with a resistance management plan and a structured process for the ongoing assessment of individual and group acceptance of the changes.
Our change management plans will include training, but not training using the traditional event-focused, "check the block" approach. Learning is change. Change is learning. Most of the learning

will take place outside the classroom, driven by accountability and support on the job. Change management will achieve this through a learning process that is integrated into the next stage.
In the "improve" stage the change management activities and deliverables that we will include are:

- We will define survey processes and sample groups
- We will update resistance plans
- We will update change management plans with roles, tasks, and dates.
- We will create training plan.

Stage Five: Control

It is in the final "control" stage that most Projects initiatives fail. The project team completes the end-of-project reports and lessons learned. We will implement activities, systems, and structure that reinforce the behavior change.

There will be specific reinforcement plans that reward desired behavior with recognition, money, or power.

Sponsors and managers will set clear objectives, will publish good information, and will provide immediate feedback will sustain the changes. If the leaders aren't interested, the followers will not be. This is one of the biggest challenges. The three biggest obstacles to continuous improvement are top management, middle management, and first line supervision.

In the "control" stage, the change management activities and deliverables that we will include are:

- We will survey employees to identify adoption and implementation issues
- We will finalize ongoing training program.

Response to Technical Specifications

Detailed Scope of Work

The proposed solution is scalable, reliable, and technology proven solution. The project scope of work is as follows:

- Study & Analysis of MoSA's requirements for the new portal which is built on the strategic vision of service-oriented government in Kuwait. This will be done as a first phase of the project to provide a proper design and implementation approach.
- Clear documentation of conducted GAP analysis and end user requirements.
- Detailed project plan covering all aspects of project execution. Bidders must fill Annex G forms.
- Portal Solution Application Infrastructure installation, configuration.
- Portal Solsution development and implementation in accordance to agreed GAP Analysis.
- Develop and publish MoSA online services (defined later in this tender document).
- Online users (public users) Profile and credential management, who will be using MoSA online services.
- Online services have to adhere to CAIT standards; Please refer to (https://www.cait.gov.kw/PDFFiles/CAIT-KGO-Connected-eServices-Standard-Document_V1- .aspx) for further information about CAIT eServices standards.
- Online services must be published on CAIT website (https://www.e.gov.kw) in accordance to CAIT website's themes and standards.
- Integrate MoSA Portal with existing application to publish their services.
- Training services as explained in chapter 8 in the RFP.
- Warrant and maintain the portal for a period of 2 years starting of project sign-off. Refer to the RFP - chapter 7 for further details.
- Complete testing and commissioning services prior to GOLIVE. Bidders must provide a detailed testing and commission plan as part of their project plan
- Provide complete project documentation as indicated in the RFP - Chapter 10.

Project Concept and Approach

Overview

Each of the bidder project, and possibly phases of its very large projects, will consist of six processes:

1. Pre-Initiation
2. Initiating
3. Planning
4. Executing
5. Monitoring & Controlling
6. Closing

Integrated within these six processes is information that covers the nine knowledge areas of project management: integration, scope, time, cost, quality, human resources, communications, risk and procurement.

Project Management Body of Knowledge (PMBOK)

The bidder PMI Project Management Methodology is based upon the PMI's Project Management Body of Knowledge (PMBOK) and has been streamlined to supply enough valuable detail to guide our project managers through the process. Our goal is to institute a scalable process of industry standard best practices to support and promote the successful delivery of projects (i.e. MOSA Portal); to raise the project management maturity level; and to improve performance.

Project Roles and Responsibilities in our PM Methodology

- Project Sponsor (or Initiator) – Person who provides support and approvals throughout the life of the project. They may also have initiated the project.
- Steering Committee – For very large projects, the sponsor role is performed by the committee. This group provides support and approvals throughout the life of the project.
- Stakeholder – Persons or organizations that are involved in and influence the project.
- Project Manager – Person who has overall responsibility for managing the project from the first formal documentation of the project's initiation to its formal conclusion,
- Project Team – Team responsible for performing project tasks as defined by the project manager.
- Functional Manager – Person who provides management oversight for administrative work of the project.
- Operational Manager – Person who is responsible for some facet of the agency's processes.
- Business Lead – Person who provides business expertise and leadership for the project.
- Technical Lead – Person who provides technical expertise and leadership for the project.
- Legal Lead – Person who provides legal expertise and leadership for the project.

OA/OIT Project Management Process

When managing a project, PMI suggests using five processes. The bidder adds a process to this list and suggests the use of the following six processes for managing a project:

- **Pre-Initiation** – an idea or initiative is evaluated to move into a "Project" status. A feasibility study is conducted; a business case is created; high level requirements are developed and cost estimates are established concerning the project. The agency must complete a *Project Scaling Worksheet* and a *Project Request Form*, and submit them to

bidder. Upon approval these documents will be made available to the project manager to aid in the development of project documents.

- **Initiating** – the project officially begins. The Project Manager is assigned, the *Project Charter* is completed, project governance is established, project stakeholders are identified and in many cases the detailed requirements are identified.
- **Planning** – describes the actions taken to execute the project and identifies the level of effort to be administered through the life of the project. The key deliverable is the *Project Management Plan* which may consist of multiple subsidiary plans covering such topics as Scope, Change, Time, Cost, Quality, Resource, Communications, Risk, Procurement, Requirement, Issues and Document Management.
- **Executing** – the Project Management Plan is executed. Product Deliverables are built, completed, tested, and accepted and other Deliverables are managed. In addition to completing deliverables, this process focuses on managing project resources following the *Project Management Plan* and distributing information using *Meeting Agenda/Minutes and Status Reports.* .
- **Monitoring and Controlling** – the progress and performance of the project is tracked, reviewed, and regulated. Product deliverables are compared and verified against the *Project Management Plan* and the Requirements document. Any changes to the plan are identified and initiated. These activities are performed throughout the project with most of the effort performed concurrently with the Executing process.
- **Closing** – all activities across all processes are finalized to close the project or phase using the *Project Close Out Checklist*. During Closing, lessons learned are documented, project documents are archived, contracts are closed out and team members are released to work on other assignments.

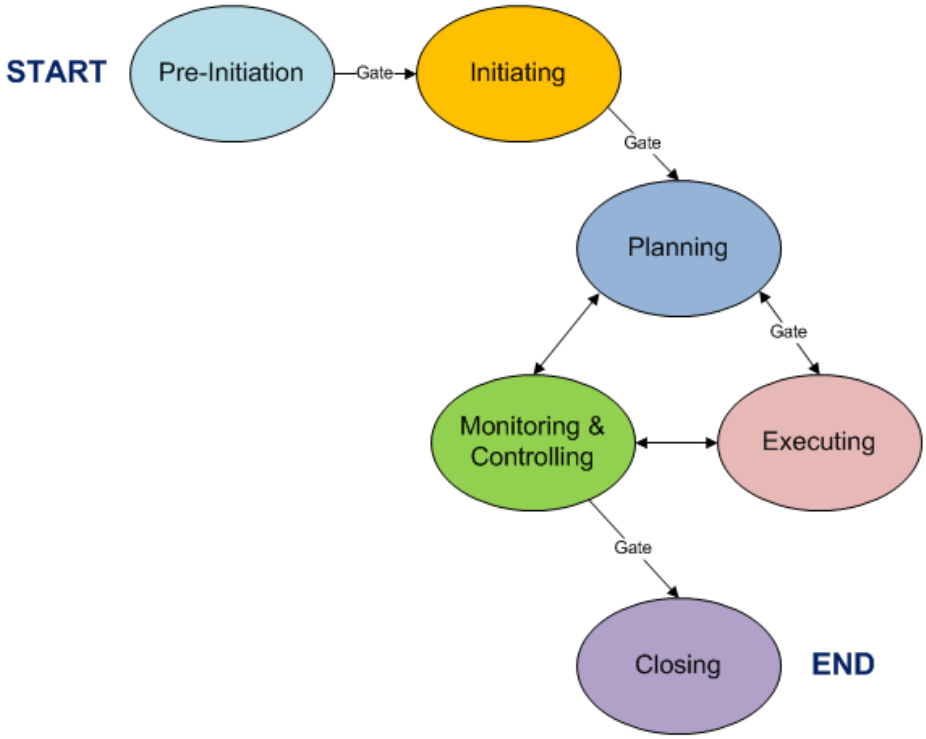


Figure 1: Bidder Project Management Process

Figure 1 depicts the relationships between the six processes. The figure shows that project management is not a single-threaded process. Although identified as distinct processes, in

practice, the processes interrelate with portions being iterative. As an example, as the project is being monitored & controlled, after the project planning is complete and execution is in progress, the project manager may have to go back and re-plan based on how the project is performing. There is a natural loop in the process because most projects don't execute 100% according to the plan.

In some cases all the processes may be used within individual phases of a project. For example, in an application development project this could be the Systems Development Life Cycle (SDLC) phases. This usually occurs with very large, complex projects that have a lot of risk associated with them. In these situations the conclusion of each phase is a gate where the steering committee decides whether to continue with the project or to shut it down. This helps ensure all the information is present and all the work is completed before a decision by the steering committee is rendered.

Gates are placed at the conclusion of some processes to allow for a "Go/NoGo" decision to take place on behalf of the project. A "Go" decision means to continue with the project while a "NoGo" decision means to discontinue the project. Depending on the complexity and nature of the project, the group making the "Go/NoGo" decision may be a large steering committee, or it could simply be the project's sponsor. Each gate lists certain information that should be provided by the project manager to help with the decision making process. This information is contained within the *Project Gate Checklist.*

During the "Go/NoGo" decision process for the Initiation and Planning gates, special emphasis should be placed on reviewing the project's feasibility study to make sure it is being satisfied, which was the driving force for creating the project. Included in the *Business Case* review is an analysis of cost, schedule and scope, to make sure they are being effectively managed. If the business case is being satisfied, this is a reason to deliver a "Go" decision at that gate. Conversely, if the business case is not being satisfied, the agency can re-evaluate the project to determine if the best option is to discontinue the project and render a "NoGo" decision.

A project can receive a "Go" decision with certain conditions. This means the project continues, but it must be tightly managed, with reports going to the project's governing body on a regular and frequent basis, such that a project termination can be rendered if conditions are not met within a specified time period. The time period must be short, but reasonable, and it should be determined at the time when the "Go" decision with conditions is made.

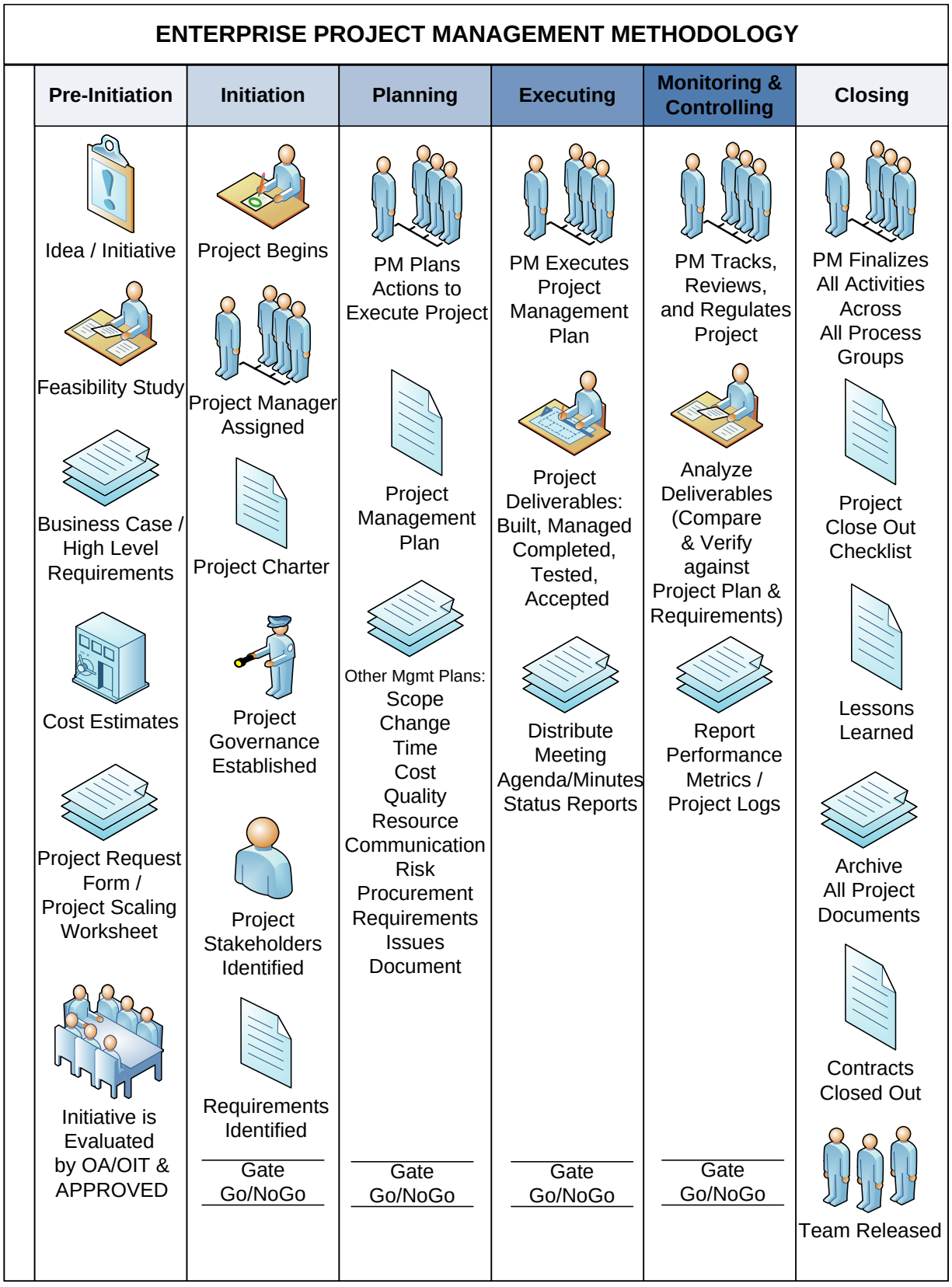


Figure 2: Bidder PMI PROJECT MANAGEMENT METHODOLOGY DRAWING

Pre-Initiation

The Pre-Initiation process consists of the work performed to define a new project within an agency. It is where an idea or initiative begins the process to become a project. A project can be initiated from any number of sources and often begins with a Stakeholder contacting its IT organization on behalf of an agency or department. Stakeholders are persons or organizations who are involved in and influence the project. Their interests may be affected by the performance or completion of the project.

Prior to a project becoming active several things must take place.

- Bidder will perform strategic planning when appropriate, establishing a vision and direction for what they want to accomplish in the short term and in the long term.
- The strategic plan is a place to contain the goals, objectives and outcomes desired by the bidder, which then would be supported by a list of required projects. These projects should align with the strategic plan and be prioritized for execution.
- Bidder develops a *Business Case*, which is created as a result of a feasibility study, for each project. The business case identifies the goals, objectives, risks and desired outcomes the project will satisfy and include a list of high level deliverables, general timeline and projected costs for the project.

Project Scaling Worksheet

The bidder project manager and the project team review the scale and complexity of the project, and estimate the level of impact on the organization. The nature and type of project can have characteristics that define the complexity of the project. Simple projects can have very little impact on the organization and more complex projects, as defined by the sponsor or agency can have large impacts on the organization.

The *Project Scaling Worksheet* is used to evaluate projects based on a range of criteria to assign a value to projects: level 1, level 2 or level 3. A level 1 scoring project is the least complex and a level three project is the most complex. Factors such as complexity, visibility, and costs are used to determine an overall score.

Initiating

The Initiating process consists of activities performed to officially kick off a project (i.e. MOSA Portal). The bidder project manager is assigned during this process. The project manager reviews the documents that were produced during the Pre-Initiation process, and then begins to take the project through its life cycle. The following are the major items associated with the project Initiating process:

- Project Charter
- Project Governance
- Kickoff Meeting
- Detailed Requirements

Project Charter

Once the bidder project manager has been assigned and the Pre-Initiation documents reviewed, best practices dictate that a Project Charter be created. The *Project Charter* defines and describes the project at a high level and is a record of the initial understanding of the project. It involves gathering and documenting information from people who requested the project.

The *Project Charter* addresses the business opportunity, project description, benefits, project organization, constraints that may impact the project, funding, and high-level project timeline with milestones. It is a high-level management agreement and authorization to perform work. In its final state, it is a documented and approved agreement that becomes the basis for planning and authorizing the project.

Project Scope

Using the information from the Project Charter, the *Project Scope* document establishes the parameters for what is to be included in the project. This document helps further establish the direction of the project and is used to keep the project moving in the proper direction. The *Project Scope* document should include a list of the various deliverables that should be produced throughout the project, and have a brief description of the acceptance criteria for each deliverable.

The bidder PM document what is NOT included in the scope for a project. Again, the purpose of the *Project Scope* is to determine the parameters for the project, often times folks can misinterpret information and create a scope for the project that is more broad than desired. Including information that specifically states things NOT included in the scope of the project helps solidify the boundaries for the project.

Project Governance

Project Governance establishes the management and authority structure for the project. A successful project includes establishing a proper understanding of the authority structure within the project team, identifying individuals participating in the project and designating the decision making authority they possess for the project. There is an escalation process included in *Project Governance* for when individuals are unable to make a decision within a defined timeframe. At the very top of the authority structure is the project sponsor, or in the case of large projects the steering committee. The remaining stakeholders in the governance structure must be defined, including the roles and responsibilities, and needs to be documented and communicated to all participants on the project.

Kickoff Meeting

The Project Kickoff Meeting formally marks the beginning of the project. It is most likely the first opportunity for the project manager to assemble the entire project team to discuss the vision for the project, show support for the project, and advocate project success. Project team members are introduced and given the opportunity to discuss their areas of expertise and how they will contribute to the project. The *Project Charter* is presented and discussed to foster a mutual understanding of the project. The review of the *Project Charter* contents ensures that expectations for the project and its results are in agreement. At the conclusion of the meeting, project team members and stakeholders will understand next steps and what is expected of them. A *Project Kick Off* template is used to document meeting activities.

Detailed Requirements

The *Requirements Document* is a decomposition of the high-level requirements captured in the Project Charter. These requirements contain the detailed information (features, capabilities, deliverables, etc.) the project will produce. This information is captured in the *Requirements Document* template Detailed requirements should be reviewed and approved by the project sponsor, stakeholders or the governing body (i.e. MOSA) overseeing the project.

Upon approval, the *Requirements Document* is copied into a *Requirements Traceability Matrix*. This matrix, used later in the project, aligns the requirements to the quality control activities to ensure the product being delivered provides the customer with the desired features, capabilities, deliverables, etc.

Planning

The Planning process consists of processes performed to plan and manage a project. It establishes the total scope of the effort, defines and refines the objectives, and develops the course of action required to attain those objectives. Time spent in up-front planning for the project requirements and defining the structure for organizing and managing projects will prevent rework later in the project.

These processes define and mature the project scope, project cost, and schedule the project activities that occur within the project. As new project information is discovered, additional dependencies, requirements, risks, opportunities, assumptions, and constraints will be identified or resolved. Due to the many dimensions of a project, the Planning process may be revisited throughout the project. As more project information is understood, additional planning may be necessary.

Rolling Wave Planning acknowledges the fact that we can see more clearly what is closer to us in proximity, and as we look further ahead, our vision becomes less clear. Depending upon the project's length and complexity, we may be able to plan as much as a few weeks or months in advance with a fair amount of clarity. This requires that we elaborate work packages in greater detail over time. As we progress through a project, we provide the elaborated detail that was missing for work packages that appears on the horizon.

The Planning process describes the actions taken to carry out the project and identifies the level of effort to be administered during the life of the project. The key deliverable is the *Project Management Plan* which consists of multiple, subsidiary plans. The purpose of the Project Management Plan is to guide project execution and control. It is a compilation of all the planning efforts and identifies all the work required to complete the project and define how the work is to be performed. The Project Management Plan provides the following subsidiary management plans:

- Scope Management Plan
- Change Management Plan
- Time Management Plan
- Cost Management Plan
- Quality Management Plan
- Resource Management Plan
- Communications Management Plan
- Risk Management Plan
- Procurement Management Plan
- Requirements Management Plan
- Issue Management Plan
- Document Management Plan

Scope Management Plan

During the planning process, a *Scope Management Plan* is created to describe how scope will be managed, what work is required for the project, and to ensure only that work is completed. The Scope Management Plan includes the following sections:

- Scope Management Process
- Roles and Responsibilities
- Project Scope
- Major Deliverables
- Affected Organizations
- Affected Business Processes and Technologies
- Timeline/Milestones
- Legislation
- Supporting Documentation

The *Scope Management Plan* describes the process to manage scope. While scope can be managed using various techniques throughout the project, it is important for project managers to document scope and how it is verified and controlled. The *Scope Management Plan* also includes roles and responsibilities as they relate to the scope management process.

The business area that requested the project and the project team should agree to the scope of the project. The Scope Management Plan includes a description of scope which is captured in the *Project Scope* document. The Scope Management Plan includes a description of the implementation approach. Project scope is the work that needs to be completed to deliver the product from the project. Further, a Scope Management Plan is used in conjunction with the System Development Life Cycle (SDLC) where IT systems or software is being developed.

Scope is determined from information provided by the project initiator or sponsor. It was initially described in the *Project Charter* and is further refined and detailed by the project team in the *Project Scope* document. The description of scope may vary depending upon the business area and complexity of the project. Its purpose is to provide common understanding among the stakeholders about the work to be performed. It can be used to translate the project objectives into project deliverables, the basis to measure project performance against. The Project Scope section of the Scope Management Plan identifies the products and/or services delivered by the project and establishes the boundaries of the project, describing products and/or services that are outside of the project scope. This section contains information specifying what is included and excluded in the project

Bidder Project managers use the *Scope Management Plan* to outline the results their project will produce and any influences under which the work will be performed. The plan should include the major phases for the project, decomposed down to a list of the deliverables to be produced during each phase. The major phases should represent the different phases of a SDLC. The list of deliverables will serve as the lowest level of the project's Work Breakdown Structure (WBS). Acceptance criteria are also included in the plan for each deliverable.

The *Scope Management Plan* identifies the internal and external organizations directly affected by this project. It also identifies affected organizations, processes, and technologies. Business processes and technologies affected, enabled and/or replaced by the technology solution produced by this project are included in the Scope Management Plan.

The *Scope Management Plan* provides a timeline for significant events for the project. Major milestones initially documented in the *Project Charter* are further detailed in this plan. The plan also includes any legislation either pending or enacted that may impact the project. It is important for the project team and business areas to be aware of any legislation that may impact or constrain the project.

Change Management Plan

The *Change Management Plan* describes the approach that is followed to effectively manage changes throughout the life of a project. A change is any factor that will modify the original project baseline. To address project changes, the *Change Management Plan* is divided into the following sections:

- Change Management Process
- Roles and Responsibilities
- Rules/Procedures
- Change Impact Analysis Approach
- Tools

It is the responsibility of the bidder project manager to establish a change management process to address any and all changes (explained in details in another document of this proposal). Even when organizations or government body have standard change control processes in place, projects need to specify what process they will follow. The change control process must be reviewed with the project stakeholders so they understand how changes are addressed. When a scope variance or project change goes through the approved change control process, a decision is made as to whether or not the project should be re-baselined. The change control process tracks the submission, coordination, review, evaluation, categorization, and approval for release of all changes to the project baseline.

The *Change Management Plan* includes the process to track change requests from submittal to final disposition. The plan is a reference for submitting change requests, if change request forms are used, and discusses the escalation process if changes cannot be resolved by the review team. It also describes the methods used to communicate change requests and their status (approved, deferred, or rejected) using a *Change Request Form.*

The *Change Management Plan* has a section to discuss roles and responsibilities. Changes can originate from any of the stakeholders. The project manager must be prepared for any change, to control change as much as possible, and manage changes as they occur. It is critical that stakeholders understand how they can request changes and how these change requests are handled. Addressing these questions also provides the project team with a tool for managing expectations and communicating risks that can potentially undermine a project‘s success. The *Change Management Plan* identifies the level of authority included within a change review team (sometimes known as a Change Control Board) to review and make change decisions during the project. The review team approves, defers, or rejects any changes that occur during the project.

The Change Management Plan describes any rules or procedures for the project team to follow when logging, managing, and assessing changes. The procedures address items such as the requirement to submit all changes to the project manager and a description of the mechanism used to log changes.

There is a section in the *Change Management Plan* that describes the approach to analyze the impact from changes. It is important to determine and document the impact a change will have on the project. Change requests may impact schedule (days added to the schedule), cost (dollars added to the cost), scope (functionality added to the system), quality (how quality of the product will be affected), and resource availability (are there adequate resources to make the change). Every change request must include a reason for the requested change. This helps both the requestor and the review team to evaluate changes. A minimum of two categories can be used to group changes:

- Must Have – a change that is necessary for functional viability
- Nice to Have – a change that would enhance ease of use.

The *Change Management Plan* includes a section to list any tools that are used to track and manage changes for the project. Off-the-shelf change management tools can be used for this purpose. A Change Log is provided in the *Project Log* template.

Time Management Plan

The Time Management Plan describes the process used to manage all project work and the schedule through the life of the project. It is divided into the following sections:

- Time Management Process
- Role and Responsibilities
- Tools
- Work Plan
- Work Plan Schedule Progress

Bidder Project managers document the process they use to manage the project in the *Time Management Plan*. It describes the process to develop the Work Breakdown Structure (WBS), define activities, identify and assign resources, and capture project updates and status. It provides the frequency at which the project schedule is updated and also addresses any performance metrics that may be monitored such as the variance in “planned” versus “actual" schedule.

The *Time Management Plan* includes roles and responsibilities as they relate to the time management process. A tools section identifies any tools that are used to track work, schedule, and time. The bidder PM tool that will be described in another section can be used to track and maintain the work to be performed and scheduled. Bidder Project managers are responsible for tracking and reporting staffing levels. Time tracking systems, if available, can be used to track time spent on all project activities.

The *Time Management Plan* includes a work plan that consists of a list of detailed activities and the scheduled dates for those activities. The activity list is a further decomposition of the deliverables identified in WBS within the scope definition. These activities represent the work necessary to complete each deliverable. Activity information includes a description, dependencies, estimated durations, and resources. Tools such as Microsoft Visio and Microsoft Project allow for the creation of a project network, a graphical representation of all the activities and their dependencies across the project. Tools like Microsoft Project and Project Workbench can then calculate the early and late start/finish schedule dates for each activity within the network, and then display the critical path(s) for the project.

The critical path is the longest path of activities in the network, such that any delay in one of these activities means a delay in the completion of the project. This schedule information is not only used to determine when activities are planned from start to finish, but it also identifies what resources are needed to complete the work, and where in time those resources are required.

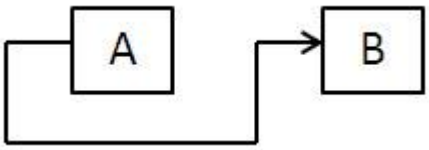
To build the work plan, the following process is followed:

1. Build Activity List – List the detailed activities required to produce each deliverable. Be sure to use an action verb (build, test, define, analyze, etc.) as the first word for each activity description.
2. Specify Resource Assignments, Effort, and Duration – Assign roles or team members to the activities and determine the amount of effort required to fulfill the activity. Then determine, based on resource availability, the duration (total elapsed time) for each activity. An activity requiring 40 hours of effort may take longer than 5 business days to complete due to resource availability. Duration always uses business days/weeks (5 days)/months (average is 21 days) unless there is a special calendar for the project.
3. Build Project Schedule – Each activity in the work plan should have a preceding and succeeding activity (except the first and last activity). There are four types of dependency relationships between activities:

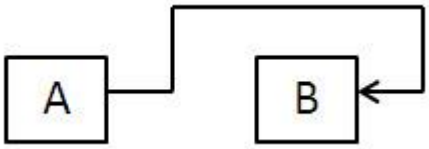
    a. Finish-to-Start: activity ‘A’ must finish before activity ‘B’ can start.

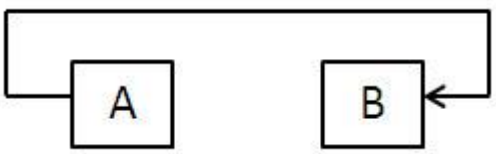
    b. Start-to-Start: activity ‘B’ can start as soon as activity ‘A’ starts

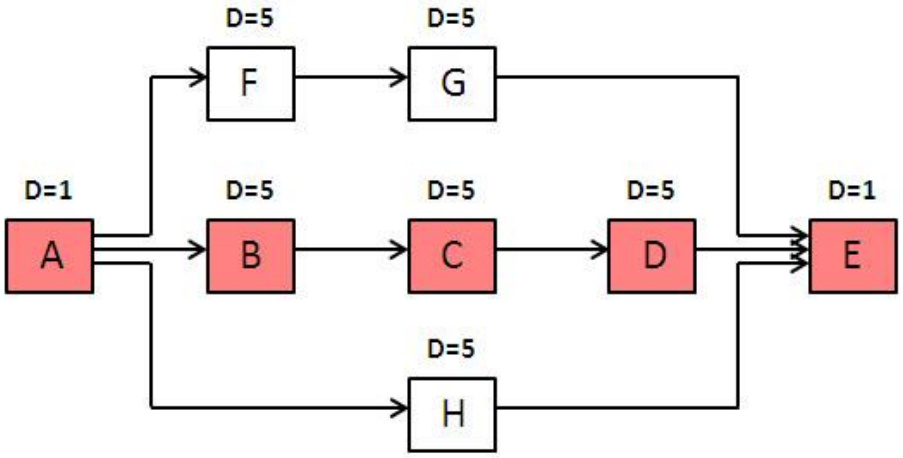
    c. Finish-to-Finish: activity ‘B’ can finish as soon as activity ‘A’ finishes

    d. Start-to-Finish: activity ‘B’ can finish as soon as activity ‘A’ starts

4. Depending on the types of dependencies, the scheduling tool will calculate the early and late start/finish dates and provide a critical path for the project. The following is a sample project network diagram using Finish-to-Start dependencies (D = Duration).



Activity	Duration	Early Start (Day #)	Early Finish (Day #)	Late Start (Day #)	Late Finish (Day #)	Total Float
A	1	1	1	1	1	0
B	5	2	6	2	6	0
C	5	7	11	7	11	0
D	5	12	16	12	16	0
E	1	17	17	17	17	0
F	5	2	6	7	17	5
G	5	7	11	12	17	5
H	5	2	6	12	17	10

The Critical Path activities are usually highlighted in **RED** so the user can easily identify them.

An important element of the project schedule is the Float (or Slack) calculations. There are two types of float for each activity:

1. **Free Float:** The amount of time that a schedule activity can be delayed without delaying the early start date of any immediately following schedule activities. Activities G and H in the diagram above have Free Float.
2. **Total Float:** The total amount of time that a schedule activity may be delayed from its early start date without delaying the project finish date. All activities have Total Float. Critical Path activities have a Total Float equal to zero (0). Because Total Float influences the Critical Path most frequently, this form of float is mostly used when analyzing a projects schedule.

To calculate the float value for an activity, subtract the Early Schedule from the Late Schedule. For example, Activity 'H' has a Late Start day of 12 and an Early Start day of 2. Therefore, Activity 'H' has 10 days of Total Float without impacting the Critical Path. Understanding the float for a given activity can help identify opportunities for the project manager to delay work without impacting the Critical Path. A delay may be caused by any number of things, most often they are caused by resource availability.

The project schedule (time) is one of the critically measured success factors for every project. The project schedule should be detailed enough to show each activity to be performed, the name of the persons responsible for completing the task, the start and end date of each task, and the expected duration of the task. The initially approved version of the schedule is known as the baseline schedule. A baseline is a snap shot copy of the dates for each activity and summary element of the WBS.

During the life of the project, actual progress is posted to activities, and this information can be compared to the baseline schedule to understand if the project is ahead, behind or on-schedule. If approved changes occur within a project, the project manager should consider creating a new baseline, or re-baseline the project, to include these changes. Also, during certain phases of a project, such as completion of gathering requirements, a project manager may want to re-baseline the project based on this information. A *Time Management Plan* template can be found in the Templates section of the EPMO website.

Cost Management Plan

The *Cost Management Plan* describes the approach used to plan for and control the costs associated with the project. The plan is divided into the following sections:

- Cost Management Approach
- Roles and Responsibilities
- Planning and Estimating
- Measuring Cost Performance
- Reporting
- Tools

The *Cost Management Plan* identifies all planned expenditures for the project and the approach to be used to manage those costs, if specific processes are to be utilized and if certain technologies will be in place to capture cost. The project manager can use the WBS from the project scope to plan and capture cost at any level of the WBS. As an option, the project manager may capture costs at the deliverable level, the lowest level of the WBS. It is also possible to create a cost account level within the WBS, which is usually a level above the deliverable level, and plan and manage costs at the cost account level. The following is a list of possible costs to a project:

- Direct labor internal & external (contractors)
- Direct materials and equipment
- Other direct costs – travel, incidentals
- Indirect costs (overhead) incurred during the project
- Administrative costs (leases, depreciation)
- Cost of quality
- Risk mitigation, including contingency funds

The cost estimate, budget information and project work plan are used to create the project budget (cost baseline). After requirements have been finalized, the project manager should consider creating a cost baseline for the project. Having a cost baseline provides the project manager with something to compare against actual costs as they occur and understand if the project is spending more or less than planned. This may not apply to deliverables based contracts.

Roles and responsibilities for cost management are important parts of the *Cost Management Plan*. Each role concerning the measurement and monitoring of cost can be identified in the plan. If certain portions of the project are monitored by specific roles, these roles should also be identified in the plan.

PMI identifies several methods for estimating costs. For high level cost estimating, "analogous estimating" is often used. This is the process of estimating a project based on another project that is similar in size and complexity. Another option is "parametric estimating), which calculates cost by using the statistical relationship between historical data and variables (e.g., square footage in construction) to calculate an estimate. The project manager simply multiplies the different variables together (square feet multiplied by the amount of time to cover 1 square foot) to develop an estimated cost. As a final option, project managers could use a "bottom-up estimating" approach, which is completed by assigning a cost to each of the detailed activities within a Work Plan Schedule, and summarizing the detailed cost to the desired level of the WBS.

Cost planning should include time oriented project expenses, which shows when project costs occur over time. This is possible by using the schedule from the work plan and associating costs to detailed activities in the work plan. The schedule places the cost of work in time, which helps the project manager understand when certain costs occur for the project. The project manager works with the project stakeholders, including the agency's financial department, to establish the project's estimated budget. This is very important for projects that span across multiple fiscal years.

Measuring costs is a vital part of managing a project and should be included in the *Cost Management Plan*.
The plan includes the different tools that are used to capture and report the costs for the project.

Quality Management Plan

The *Quality Management Plan* describes the approach used to address Quality Assurance (QA) and Quality Control (QC) during the life of the project. QA is the set of activities that ensure that the development and/or maintenance process is adequate so the delivered product will meet its objectives. QC is the set of activities to evaluate the developed work product. An example of QA would be the activities of an Independent Verification and Validation (IV&V) group to evaluate the development and test processes and an example of QC would be the periodic evaluation of product defects and rework through the life of the project.

It is important to include quality assurance and control activities into the project costs and schedule. Quality activities may include design reviews, technical inspections or specific testing. The Quality Management Plan is divided into the following sections:

- Quality Management Process
- Roles and Responsibilities
- Tools
- Quality Standards

The *Quality Management Plan* identifies the quality processes and practices that are crucial to the success of a project. These may include design reviews and a testing strategy for key deliverables. Periodic quality reviews and audits are described in the *Quality Management Plan*.

This requires naming the deliverables that require a quality review, stating the criteria by which quality is measured, determining the timing of the review, stipulating the resources needed for the review, and describing the review procedures. The testing strategy should also be described. On large projects, testing may be accomplished by an independent group. Customer acceptance testing is required to ensure deliverables are what the customer requested and are within the defined scope.

Along with scope, schedule, and cost, quality is one of the project performance metrics reported to the stakeholders throughout the project. The *Quality Management Plan* documents the tolerances required of product and project deliverables and how compliance is measured. It also addresses what is done whenever quality measures are out of tolerance or compliance. Examples of quality performance metrics include the percentage of test procedures exited successfully without workarounds and the number and severity of defects recorded. Product quality is reported as part of the overall project performance and evaluated on a regular basis to provide confidence that project outcomes will satisfy all quality objectives.

The *Quality Management Plan* includes roles and responsibilities as they relate to the quality process. A tools section identifies any tools that are used to track product quality, such as defect tracking software. There is also a section in the plan to list any quality standards applicable to the project. Additionally, a Quality Log, within the *Project Log* is used to track those issues.

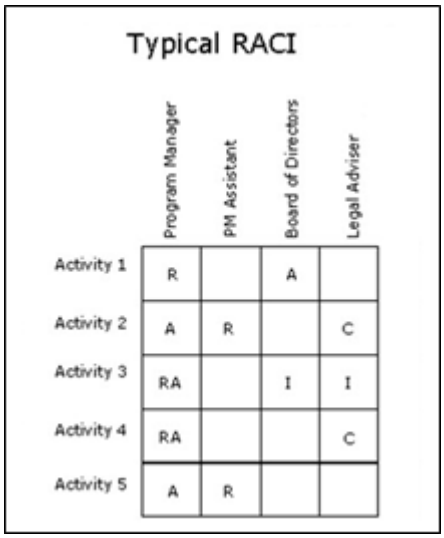
Resource Management Plan

As the project is planned, the project manager creates a Resource Management Plan. This usually occurs in parallel with developing the detailed activities as part of the Time Management Plan. The Resource Management Plan describes the process used to manage resources to complete the project. It is divided into the following sections:

- Resource Management Process
- Roles and Responsibilities
- Physical Resources
- Tools
- Staffing Plan.

The project manager describes the process or approach used to obtain and manage resources which can include personnel, facilities, equipment, materials, and tools. The plan also addresses the methods used to communicate resource related information.

The Resource Management Plan includes which personnel roles and responsibilities are required to perform project activities and produce deliverables. This information is displayed in a Responsible, Accountable, Consulted and Informed (RACI) table. The following is an example of a RACI table.



Clearly defined roles allow all project team members to understand what they are responsible for and to determine any deficits in required skills or knowledge. Successful projects have people with the right set of skills and experiences. The Physical Resources section identifies items such as facilities, computers, materials, and other physical resources that are required to support the project. The tools section identifies any special tools necessary to complete the project. Tools may include software such as extraction, transformation, and load products.

Staffing is dependent upon the skills required to support the project. The roles and skills necessary to complete assigned deliverables are identified in the Resource Management Plan. In resource planning, those skills are matched to the appropriate people. Depending on the staff currently available, the resources may come from a specific area within the organization. Often there is a mixture of dedicated and shared staff. For some projects, the cost and expertise might need to come from contracted resources. A Resource Management Plan assists the project manager in defining resource types and levels needed and how long those resources will be involved on the project.

Project managers should know where people are located, what type of role they play, when their expertise is required, and when they can be released from the project. The *Resource Management Plan* helps Project Managers by describing the required resource roles, role description, location, timeframe and release criteria.

Communication Management Plan

The *Communications Management Plan* describes all communications flow and is used as a reference through the life of the project. It is used to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information. The *Communications Management* Plan is created by the project manager to match the *right* information to the *right* audience in the *right* format at the *right* time. It helps facilitate decision making and ensures the overall success of the project.

Key stakeholders (including the project team) must receive timely and accurate information about the project's progress helping them understand expectations and their expected contributions to the success of the project. The project manager determines the information and communication needs of the project stakeholders: who they are, their level of interest and influence on the project, who needs what information, when they need it, and how it is given to

them. The *Communications Management Plan* addresses this need and is reviewed with the key stakeholders. It is divided into the following sections:

- Communications Management Process
- Roles and Responsibilities
- Project Organization
- Project Team Directory
- Communications Plan Details
- Supporting Documentation

The communications management process described in the plan can be formal or informal, written or verbal, depending on the situation, need or influence of the stakeholders and the type of information to be conveyed. Communication can take the form of e-mails, meetings, documentation, status reports, variance reports, and anything that is done to keep all stakeholders informed. Projects with few stakeholders may use less formal forms of communication compared to projects with a large number of stakeholders.

All project meeting minutes, status reports, and other descriptive information generated during the project are considered forms of communication. It is important to keep these and other project records for purposes of tracking actual events and lessons learned. The project manager determines where to keep project data in both written and electronic format.

The *Communications Management Plan* includes roles and responsibilities as they relate to the communication process. The project manager will always have a role concerning communicating information about the project. In some cases, large projects may have a person solely dedicated to manage the communication role for the project. The *Communications Management Plan* also includes the project organization structure and team directory. Project organization was initially identified in the *Project Charter* and updated in the *Communications Management Plan*. The *Project Directory* contains member information offering a single place to look up and contact team members. The project organization and team directory are used to facilitate communication, to define the roles and responsibilities of team members, and coordinate the activity of the team.

The *Communications Management Plan* addresses the following:

- The information required by stakeholders, who sends it, and who receives it.
- The frequency (daily, weekly, or monthly) of various types of information being distributed and if intermediate status updates are required.
- The form and content of communication for the various types of information to be distributed (presentations, status reports, status meetings, team meetings).
- The technology or distribution method and format to be used (e-mail, handouts, shared network directory, collaboration website).

Risk Management Plan

The *Risk Management Plan* describes the approach used to manage risk during the life of the project. It identifies the initial set of project risks and what actions a project manager will take to manage risks. A risk is any future factor that may potentially interfere with the project. A risk is the recognition that a threat or opportunity may occur. The practice of risk identification focuses on reducing the probability and impact of a threat while increasing the probability and

impact of an opportunity. An example of a threat may be spending the budget prior to completion of the project. An example of an opportunity may be acquiring resources that may be freed up resulting from the completion of another project. By recognizing potential problems, project managers can avoid problems through proper actions. The *Risk Management Plan* is divided into the following sections:

- Risk Management Process
- Roles and Responsibilities
- Rules/Procedures
- Risk Impact Analysis Approach
- Tools
- Supporting Documents

The *Risk Management Plan* documents the process used to manage risks. It addresses how risks are tracked throughout the project, how contingency plans are implemented, and how project reserves are allocated to handle risk. The process also includes methods to communicate risk information. The plan has a section for the roles and responsibilities as they relate to the risk management process. Risk identification is the responsibility of all members of the project team. The project manager is responsible for tracking risks and for documenting response strategies as determined by the project team.

The *Risk Management Plan* describes any rules or procedures the project team follow when logging, managing, and assessing risks. The procedures address items such as submitting all risks to the project manager, the mechanism used to log risks, and how the project team determines response strategies. Response strategies include avoiding, transferring, mitigating, and accepting risks. Avoidance strategies attempt to overcome the risk by trying to stay away from or eliminating the risk. This may require a change to the *Project Management Plan* so the risk is addressed by reducing scope, adding resources, or acquiring additional expertise. An example of transferring risk is to outsource effort that was originally intended for internal resources.

Mitigation reduces the probability or impact of a threat that cannot be avoided. For example, selecting a tried and proven technology may lessen a risk compared to using new technology. If new technology cannot be avoided, then selecting a contractor experienced in the technology can assist with mitigating the risk. Accepting a risk may be a good choice if the effects on the project are minimal or if it is difficult, time consuming or expensive to influence the risk.

The *Risk Management Plan* includes a section to document the risk impact analysis approach. This is used to assess the impact of each risk. The risks are often ranked by risk score to highlight the highest priority risks. The plan includes tools used to track risks which are typically entered into a risk log or risk register along with the response strategy. The response strategy is a pre-defined action plan that can be implemented if necessary. The risk log acts as a central repository for all risks identified in the project. It can be reviewed, and updated as necessary, every time the project status is recorded. The risk log includes:

- Risk Identity Number
- Description of the Risk Event
- Type of Risk
- Date Opened
- Category
- Probability of Occurrence

- Impact, Should The Event Occur
- Risk Score
- Risk Response
- Detailed Risk Response
- Risk Trigger(s)
- Timing
- Risk Owner
- Close Date

The risk description can contain an IF-THEN statement within the description. See the following example concerning a Common Operational Picture:

Requirement: Use Common Operational Picture (COP) in DII COE Release 1.5
Identified Risk: availability of DII COE version 1.5 when needed
IF - DII COE version 1.5 is more than 1 month late
THEN - Program xyz release 1 will experience a day for day schedule slip

Typical risks include the following:

- User Involvement – This is listed as the number one reason for project failure! If the users are not intimately involved in planning the project, they may add requirements or change specifications later in the project, when it causes time delays and cost increases to your project. Be cautious of the person that claims to "know what the user really wants." Often the easiest answer is not the right answer.

- Executive Support – While user involvement is key, executive support is just as critical to your project. There are several things a project manager can do to gain support for our project 1) Make sure you know who your project sponsor is and 2) make sure that the sponsor knows what it means to be the sponsor. When starting your project, during the earliest phases, make sure the project sponsor knows they are the sponsor and what that means to you as the project manager.

- Uncontrolled Requirement Inflation – Some requirements changes are necessary, however they need to be controlled to meet project objectives. Be sure to get requirements input from all stakeholders up front, otherwise they will seek to add requirements later in the project. Also, be on guard for "gold plating" which is when the development team wants to provide the best product possible and adds little extras to the product as they are developing it. This is inappropriate because it uses precious time and resources that could be applied to other approved requirements.

- Schedule Flaws – The schedule sets expectations for what work is to be completed, when the work is planned to be completed, what resources are needed to complete the work, and helps establish a time phased view of project costs. Poor scheduling can lead to many problems for a project. Project managers need to have good discipline to make sure a realistic project schedule is in place to help reduce risks of project failure.

- Unrealistic Expectations – Managing expectations, assuming they will impose a risk to the project, will improve the project's success and ensure the deliverables meet expectations. Within a project's life-cycle expectations have the potential to keep changing and growing if left un-managed. If the client and user are not kept abreast of project progress, issues and resolutions, they may be expecting something completely different than what is developed. The end result will be a product that isn't what they want and the development team will be back re-developing it after it has been rejected by the customer.

- Staff Turnover – Movement of staff, both internally and externally, can have an impact on a project. Cross training and clear role definitions for a project can help mitigate this risk. If staff changes are likely, prepare contingency plans, begin a cross training plan prior to actually losing the staff member and add it to the risk management plan and state that significant staff changes will impact both the budget and schedule. Understand that bringing a resource onto a project midstream will require ramp-up and training time. This again means delays and increased costs. Use the project sponsor to help locate replacement staff.

- Technology and Uncertainty - We can't ignore technology when we're talking about Information Technology projects. Every IT project has some level of risk just because of the nature of IT projects. Every project manager and sponsor needs to ask some specific questions to help them uncover risks associated with technology and uncertainty: Have we done this before? How familiar are we with the platform/environment? Do we have experience with the software, the network, and the interfaces to the customers? Are the functions we are trying to get the technology to perform reasonable? If you are trying to install a new platform, using new software, with new interfaces to perform new functions the level of uncertainty (RISK) goes way up. Cost, schedule and quality estimates all have to be adjusted accordingly.

Procurement Management Plan

The *Procurement Management Plan* describes the approach to manage contracts through the life of the project. Many times, the commonwealth is unable to create or supply all the resources or products necessary to complete a project internally. In those circumstances, it is necessary to procure products or services from external sources and enter into contracts with outside vendors.

The *Procurement Management Plan* addresses the key items needed by the project team to manage the work performed by contractors for the project. It is divided into the following sections:

- Procurement Management Process
- Roles and Responsibilities
- Procurement Strategy
- Procurement Timeline
- Constraints
- Assumptions
- Contract Information
- Contract Documents

The Procurement Management Plan documents the process used to manage procurements. It describes the approach to manage contract changes and an escalation path for contractual issues. The Procurement Management Plan addresses the methods that are used to communicate procurement related information. While the cost for internal resources is addressed in the Resource Management Plan, the Procurement Management Plan addresses contractor cost and ensures that spend related metrics are tracked, maintained, and documented.

The Procurement Management Plan lists the roles and responsibilities as they relate to the procurement management process. At times there is an opportunity for Project Managers to work with IT Procurement during pre-procurement activities. To help in understanding contractor costs, it is important to assign a project manager to the project as early as possible. If feasible, the project manager should be present during contract negotiations so they understand contractor cost drivers.

The Procurement Management Plan describes the project manager's responsibilities for managing and making decisions about contracts for products or services. It describes the project manager's decision authority and limitations, including budget, signature level, contract changes, negotiation, and oversight. At a minimum, the project manager is responsible for:

- Tracking receipt, review, and coordinating approval of invoices
- Associating invoices and scope to approved deliverables
- Managing deliverable approvals and escalation
- Reporting contracted spend as part of the total project cost
- Working with the Agency Purchasing Office to identify and purchase additional contract services if needed
- Coordinating the approval of contractor substitutions
- Identifying and tracking Service Level Agreements (SLAs) included in the project

Project managers are also responsible for working with agencies to monitor contractor performance throughout the project.

The Procurement Management Plan summarizes key contract options such as the commonwealth turnaround time to review and approve deliverables and acceptance criteria for each deliverable. It provides a management strategy which includes available options should there be a need to change or add to what is already contracted. Contract options may include SLAs to maintain a high quality of service from its suppliers. SLAs are contractual levels of service the supplier has agreed to provide during the life of the contract. If a vendor's performance is identified to be lower than the agreed upon levels, there is an agreed upon penalty, usually of a financial nature.

The Procurement Management Plan lists of applicable contract documents. The project manager should have access to copies of all contractual documents. The order of precedence of contract documents (PO, RFQ and Contractor's Proposal) is documented in the plan.

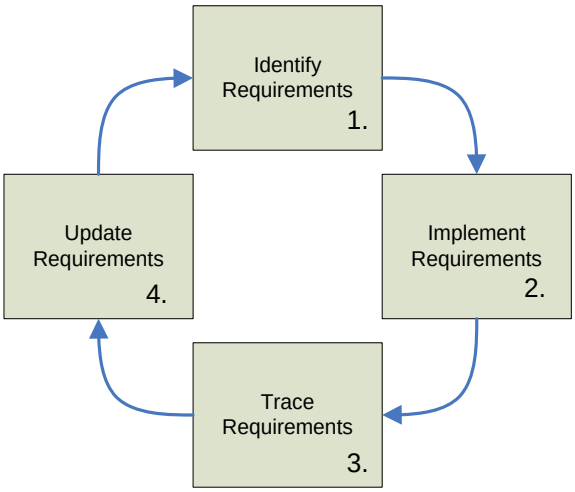
Requirements Management Plan

The Requirements Management Plan describes the process and approach to manage and address requirements through the life of the project. The Requirements Document establishes a common understanding of business, technical and project requirements that must be satisfied as a result of the project. The Requirements Management Plan may contain the following information:

- Requirements Management Process
- Roles and Responsibilities
- Rules/Procedures
- Other Project Documents
- Requirements Acceptance
- Supporting Documents

Capturing requirements can be accomplished through the use of four fundamental steps. It is the responsibility of the project manager to create and manage the requirement process flow throughout the project lifecycle. The approach to identifying, implementing, tracing and updating the requirements are all processes of requirements management for a project.

Requirements Management Process Flow



The Requirements Management process flow components are described further.

1. Identify - Requirements are identified and elicited during requirements gathering sessions, which includes the participation of project stakeholders. They are clarified to ensure understanding, broken down into manageable levels and detailed to support the required information.
    - Requirements are often validated to ensure that they are justified by the originator. The cost in resources and time of each requirement are estimated and the benefits and risks are assessed. If the budget for the project is limited, then the requirements can be prioritized.
    - Requirements are verified to ensure that they meet scope, timelines, budget and any quality constraints.
    - Most often requirements that are validated and verified are provisionally approved without further considerations except for those requirements that do not meet quality standards. Those requirements may be sent back for rework. Additionally, requirements that are outside of scope or budget, duplicated, or represent budget constraints may also be disapproved. All requirements that are approved and disapproved should be communicated in accordance with the *Communications Plan*.

2. Implement - Approved requirements should be implemented in accordance with the Project Management Plan.
    - Requirements should move through the project lifecycle and also be assessed for risk. Document how the requirements will be mitigated with any associated risk in the *Risk Management Plan*.
    - Requirements should also move through the project lifecycle and be managed for change. Document how a requirement change or new requirement is managed in the *Change Management Plan*.

3. Trace Requirements - requirements are traced through the project lifecycle using a *Requirements Traceability Matrix*. These requirements are also monitored through the *Project Management Plan*. The *Requirements Traceability Matrix* ensures that deliverables meet the requirements of the project. The matrix provides a common thread from the established and agreed upon project requirements through to completion/implementation. This ensures that the product specifications and features satisfy the requirements on which they were based.
4. Report – Requirements are generated and reported in accordance with the *Communications Plan*.
5. Update - Sometimes the product specifications and features do not satisfy the requirements in which they were based. If this occurs, then an update to the requirement is necessary so the problem can be resolved.

The tools used to document requirements are included in the *Requirements Management Plan*. Requirements should be documented so they are easily read and understood. The use of MS Excel spreadsheets has become a common practice because Excel cells can be formatted to easily capture different types of information. Some information may be number oriented and require calculations as requirements, while other requirements require free form textual information. Excel accommodates both styles of information. Also, Excel allows for the use of multiple spreadsheets within a single file. This allows project managers to maintain requirements for different aspects of the project without having to go to multiple files to see the information.

Storage of requirements information is an important part of the *Requirements Management Plan*. The use of a document management system is highly desirable for storing requirement information. Document management systems provide several benefits to the project manager.

- Aid in locating information – Documents are cataloged and help users find information quickly
- Control of information – Versions of documents are captured allowing for strong control of information
- Security of information – Document management systems allow librarians to control who has rights to read and/or modify documents

Issue Management Plan

The *Issue Management Plan* describes the approach the project manager uses to manage issues during the life of the project. The Issues Management Plan is divided into the following sections:

- Issues Management Approach
- Roles and Responsibilities

- Supporting Documentation

An issue is a point or matter in question or in dispute, or a point or matter that is not settled and is under discussion or over which there are opposing views or disagreements. The practice of issue identification and resolution helps keep the project moving forward and avoids unnecessary delays during the life of the project. Issues are captured and tracked within the issue log within the *Project Log* spreadsheet. The issue log captures the following information about each issue:

- Description
- Assigned
- Date Opened
- Due Date
- Date Closed
- Status
- Severity
- Impact
- Notes

The project manager is responsible for capturing all issues associated with the project and making sure each issue is being addressed by a member of the project team until the issue is closed. The project manager should report on the status of issues on a regular basis, providing the status on project issues as a part of regular communication. This includes weekly and monthly status reporting.

Document Management Plan

Document Management is an important part of managing and monitoring performance and results. The *Document Management Plan* controls how project documentation is stored, retrieved and archived. Project Collaboration is often used for larger projects and shared drives are often used for smaller projects. The Document Management Plan includes the following:

- Document Management Process
- Document Librarian
- Roles and Responsibilities

The document librarian is an important role for the project. This person is responsible for making sure the documents follow the document management process, and ensures all documents are properly cared for. This is critically important for projects where deliverables are documents. The librarian must make sure the signed-off documents are protected and not modified without prior approval, as described in the *Document Management Plan*. Also, it is important that the librarian organizes documents so they can be easily retrieved for reporting purposes. On small projects the project manager may fill this role, while for large projects this role may require a full time person to handle documents for the project.

The project team may elect to use a Collaboration site to contain all of the project's documentation. Collaboration sites are organized using different folders to represent a variety of project elements where documents are stored. The *Document Management Plan* lists the structure of Collaboration site as well as:

- Folders and sub-folder structure,
- File naming convention,

- Document templates,
- Version control
- Backup and retention policy.

Document management standards are used to provide a manner for naming and filing project documents. Documents should be stored where they are accessible to all team members and must be handled and named in a consistent manner. It is expected that the majority of project documents exist in an electronic format and are stored in a Collaboration site or document repository of some sort.

Executing

The Executing process consists of activities performed to execute the Project Management Plan.

The primary purpose is to manage communications, manage project resources and contractors, and to perform and complete the work. During execution, project managers coordinate the work while managing team members, managing stakeholder expectations, and providing project information to both sponsors and team members. Even though the Executing and the Monitoring & Controlling processes are defined separately, the tasks within these two groups are typically performed concurrently.

Project managers use the Communications Plan as the basis for the communication approach. It is important to communicate the progress of the project to all project participants, including internal and external stakeholders. ,. Project managers use the approach described in the Resource and Procurement Management Plans to manage internal and external resources during the life of the project. The work plan within the Time Management Plan is used by the project manager to manage -deliverables produced by the project. Deliverables are the tangible work products produced from the project as documented in the Project Management Plan. The Executing process includes the following activities:

- Managing Resources
- Managing Communications
- Managing Procurements
- Managing Deliverables

Managing Resources

Project managers are responsible for estimating and tracking time to manage resources using the *Resource Management Plan*. This includes managing both personnel and physical resources, such as material, office space, software tools, network access, computer equipment, and any other items necessary in support of the project. The logistics around acquiring the physical resources needed to accomplish the project is equally important as acquiring the staff necessary to perform the work.

Staff roles and responsibilities required to perform project activities and produce deliverables are defined within the Resource Management Plan. Project managers ensure the right people are assigned tasks for which they have the ability to perform. As resources are performing their tasks, work is sometimes reprioritized and schedules shifted and it becomes necessary to not over allocate the staff performing the work. Project managers direct staff using the work plan,

the Resource Management Plan, and team member availability. Project managers are also responsible for tracking and reporting staffing levels through the life of the project. Time keeping systems, if available, can aid in tracking time spent on all project activities.

Managing Communications

Project managers are responsible for estimating and tracking time to manage communications using the *Communications Management Plan*. This plan describes who, how, what, and when information will be distributed. Project information is disseminated using project management deliverables such as meetings and status reports. Meetings are structured around project related topics and can involve the project manager, project team members, project stakeholders, and agency management. The frequency and topics covered at these meetings is outlined in the *Communications Management Plan*. Meetings are a good way to bring visibility to all areas of the project. They provide an opportunity to discuss important issues and make management decisions on the project with input from several sources.

It is the project manager's responsibility during project execution to keep the stakeholders informed of project status. Information should be timely, and delivered with a level of detail that reflects the audience receiving the communication. For example, technical team members may need detailed information and action items where the customer and project sponsor may need a high level summary of the status of the project and its deliverables. A standard format for meetings should be followed for exchanging information concerning the progress of the project. Meetings are structured using an agenda, and minutes are produced as a result of the meeting. Meetings provide the means by which the project team and the stakeholders stay informed about the progress and key activities required to successfully complete the project.

The project team is expected to report project status to the project manager who then reports status to internal and external stakeholders. The *Project Status Report*, like status meetings, follow a standard format for the formal exchange of information on the progress of the project. Status reports are prepared by the project team detailing items captured while monitoring and controlling the project. S Status reports include:

- Activities completed during the current report period
- Activities scheduled for the next reporting period
- Review of key milestones
- Update on risks, action items, issues, and decisions found in the *Project Log*
- Update on project performance metrics (schedule, scope, cost, and quality)

Managing Procurements

Project managers are responsible for estimating and tracking time to manage procurements using the *Procurement Management Plan*. They must be familiar with all the contract terms and conditions associated with the project. Project Managers must know project contract options if it becomes necessary to add or replace contract staff. They must understand and recommend to the agency procurement vehicles. Project managers work with agency procurement to identify and purchase additional contract services or augment staff if needed.

Knowing contract elements such as order of precedence of contract documents (PO, RFQ, or Proposal), terms and conditions of the contract, any service level agreements with the vendor, the number of days required to review and approve deliverables are examples of important items

project managers must be aware of. Project managers know the process and methods that are used to change contracts and review contract changes with the sponsor, contracting agencies, and legal team. They have an understanding of which contract issues require escalation. Project managers are responsible for tracking receipt, review, and approval of invoices. They associate invoices to approved deliverables and report contracted spend as part of the total project spend. When applicable, they also manage project work performed at a contractor facility.

Managing Deliverables

Project managers are responsible for managing the development and delivery of products in accordance with the work plan included within the *Time Management Plan*. Deliverables are tangible products resulting from the work on the project. Deliverables can be any output from the project and can include prototypes, applications, pilot solutions, software source code, and analysis documents.

The *Scope Management Plan* describes deliverables and the work plan within the *Time Management Plan* shows the work necessary to develop and accept deliverables. Project managers lead the effort and manage resources to produce project deliverables. The work plan, created in the Planning process, is used throughout the Executing process as the primary tool to track and report progress on work performed. The work plan can also be used for "what if" analysis to display the impact from changes or issues and how they may affect the future of the project. For these reasons, it is important that the work plan remains up-to-date throughout the duration of the project.

Information Technology (IT) projects follow a System Development Life Cycle (SDLC). The SDLC is a series of development processes and milestones, and is further detailed in ITB-APP012 Systems Development Life Cycle Policy. ITB-APP012 states the SDLC framework will include the following at a minimum:

- Feasibility
- Requirements Management
- Design
- Build
- Testing & Validating
- Implementation
- Operations & Maintenance

Monitoring & Controlling

The Monitoring and Controlling process consists of processes that monitor and control risks, changes, quality, and reports the performance of a project. The primary purpose is to monitor the project so that corrective action can be taken to control the execution of the project. This is accomplished by measuring the project's progress and deliverables against established baselines. Baselines are determined during the project's planning activities and include schedule, scope, and cost.

Monitoring and Controlling processes occur simultaneously as activities in other processes. The activities are performed throughout the life of the project; however, the majority of work in this process happens concurrently with the Executing process. Project managers coordinate resources to carry out the *Project Management Plan* and ensure project objectives are met by monitoring and measuring progress. It is the responsibility of the project manager to observe