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SAP Standard Job Scheduling Management

Whitepaper

Active Global Support
SAP AG

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1 Management Summary

The business of a company requires the execution of online and background activities on the one hand and the fulfillment of maintenance and administration tasks for the hardware and software components on the other hand. Given only a certain limited time frame (at least limited by 24 hours per day) one would like to execute all these activities all at once and all at the same time. Unfortunately, this is usually not possible as the available hardware resources (CPU, main memory, network capacity, etc.) are limited as well. Hence there are two main reasons for scheduling restrictions – one is **time** and the other is **hardware resources**. Additional restrictions might be given due to existing dependencies between different activities (e.g. invoices can only be created after the corresponding goods issue is posted, or back order processing and material requirements planning should not run at the same time).

Automation is also an important aspect of and motivation for **job scheduling management**. All processing that has to be executed regularly in the same way should be executed automatically by scheduling the respective background programs to run at a given time.

Hence Job Scheduling Management comprises the **planning**, **scheduling** and **monitoring** of all background activities in order to automate business processes as much as possible while considering all factors that limit the efficient processing (e.g. time, hardware and dependencies) of data.

Experience at several different SAP customers shows that often there is a lot of room for improvement when it comes to Job Scheduling Management. It already starts with the Job Scheduling Management concept that which should holistically support a complete job request process end to end.

This paper provides a detailed description what SAP recommends as a standardized formal process in order to support a job request process, including an end user job request form and an approval process. This integrated process will avoid error-prone and time intensive manual processes of copying redundant data from one data source to another (e.g. MS excel to MS Excel or MS Excel to job scheduling tool).

In the context of this process, it is also explained what methodologies and tools support such a process and which people are needed within the customer's support organization in order to implement the provided SAP standard.

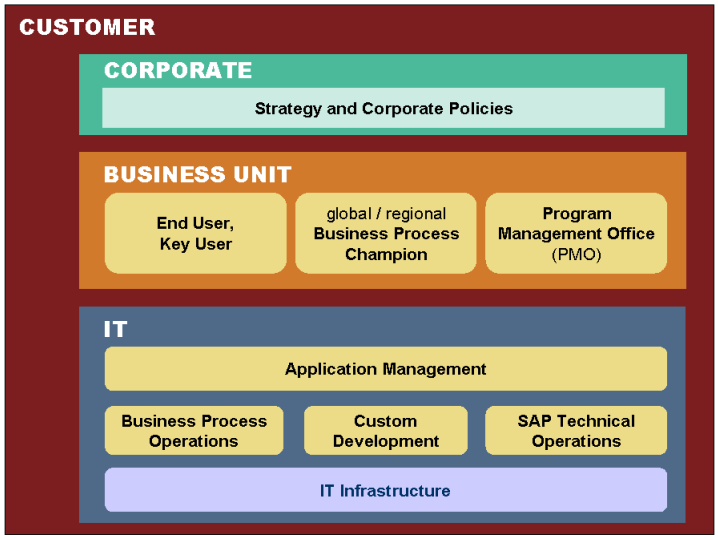
Many customers developed Z-transactions and Z-tables during initial implementation of these methodologies and tools. These developments might have got obsolete or can be replaced by SAP standard functions. Additionally, the incident/problem resolution time should be sped-up by making use of the recommended central documentation of error-handling procedures, responsibilities and escalation procedures.

Finally, this paper lists some possibilities for measuring the success of the implementation of the SAP standard job scheduling management.

2 SAP Standards for E2E Solution Operations

Mission-critical operations is a challenge. While the flexibility of SAP-centric solutions rises, customers have to manage complexity, risks, costs, as well as skills and resources efficiently. Customers have to run and incrementally improve the IT solution to ensure stable operation of the solution landscape. This includes the management of availability, performance, process and data transparency, data consistency, IT process compliance, and other tasks.

Typically, multiple teams in the customer organization are involved in the fulfillment of these requirements. They belong to the key organizational areas Business Unit and IT. While the names of the organizations may differ from company to company, their function is roughly the same. They run their activities in accordance with the corporate strategy, corporate policies (for example, corporate governance, compliance and security), and the goals of their organizations.



The different teams specialize in the execution of certain tasks: On the business side, **end users** use the implemented functionality to run their daily business. **Key users** provide first-level support for their colleagues. **Business process champions** define how business processes are to be executed. A **program management office** communicates these requirements to the IT organization, decides on the financing of development and operations, and ensures that the requirements are implemented.

On the technical side, the **application management** team is in direct contact with the business units. It is responsible for implementing the business requirements and providing support for end users. **Business process operations** covers the monitoring and support of the business applications, their integration, and the automation of jobs. **Custom development** takes care of adjusting the solution to customer-specific requirements and developments. **SAP technical operations** is responsible for the general administration of systems and de-

tailed system diagnostics. And the **IT infrastructure** organization provides the underlying IT infrastructure (network, databases, …). Further specialization is possible within these organizations as well. For example, there may be individual experts for different applications within SAP technical operations.

Efficient collaboration between these teams is required to optimize the operation of SAP-centric solutions. This becomes even more important if customers engage service providers to execute some of the tasks or even complete processes. Customers have to closely integrate the providers of outtasking and outsourcing services into the operation of their solutions.

Key prerequisite for efficient collaboration of the involved groups is the clear definition of processes, responsibilities, service level agreements (SLAs), and key performance indicators (KPIs) to measure the fulfillment of the service levels. Based on the experiences gained by SAP Active Global Support while serving more than 36,000 customers, SAP has defined process standards and best practices, which help customers to set up and run End-to-End (E2E) Solution Operations for their SAP-centric solutions. This covers not only applications from SAP but also applications from ISVs, OEMs, and custom code applications integrated into the customer solution.

There are 16 standards for solution operations defined by SAP:

- **Incident Management** describes the process of incident resolution
- **Exception Handling** explains how to define a model and procedures to manage exceptions and error situations during daily business operations
- **Data Integrity** avoids data inconsistencies in end-to-end solution landscapes
- **Change Request Management** enables efficient and punctual implementation of changes with minimal risks
- **Upgrade** guides customers and technology partners through upgrade projects
- **eSOA Readiness** covers both technical and organizational readiness for enterprise service-oriented architectures (eSOA)
- **Root Cause Analysis** defines how to perform root cause analysis end-to-end across different support levels and different technologies
- **Change Control Management** covers the deployment and the analysis of changes
- **Minimum Documentation** defines the required documentation and reporting regarding the customer solution
- **Remote Supportability** contains five basic requirements that have to be met to optimize the supportability of customer solutions
- **Business Process and Interface Monitoring** describes the monitoring and supervision of the mission critical business processes
- **Data Volume Management** defines how to manage data growth
- **Job Scheduling Management** explains how to manage the planning, scheduling, and monitoring of background jobs

- **Transactional Consistency** safeguards data synchronization across applications in distributed system landscapes
- **System Administration** describes how to administer SAP technology in order to run a customer solution efficiently
- **System Monitoring** covers monitoring and reporting of the technical status of IT solutions

Out of this list, this white paper describes the job scheduling management standard.

3 Job Scheduling Management Standard at a Glance

Within a highly complex and distributed landscape, **job scheduling management** is important to manage data and its processing. Even in today's more real-time data environment, the need for having jobs running in the background is high. Further, jobs are concatenated to huge job chains, usually containing many **dependencies** on the sequence of jobs. If one or several jobs abort and cancel, the alert system has to inform the appropriate support level, or has to be in a position to start an automatic error handling procedure and restart the job(s). Another aspect of job scheduling management is the efficient use of the available system resources (for example, CPU and memory). A typical requirement is the coordination of activities of concurrent online users and background jobs that need the same time window and system environment. This requirement needs to be managed to avoid system or performance bottleneck situations or delay in the business data processing.

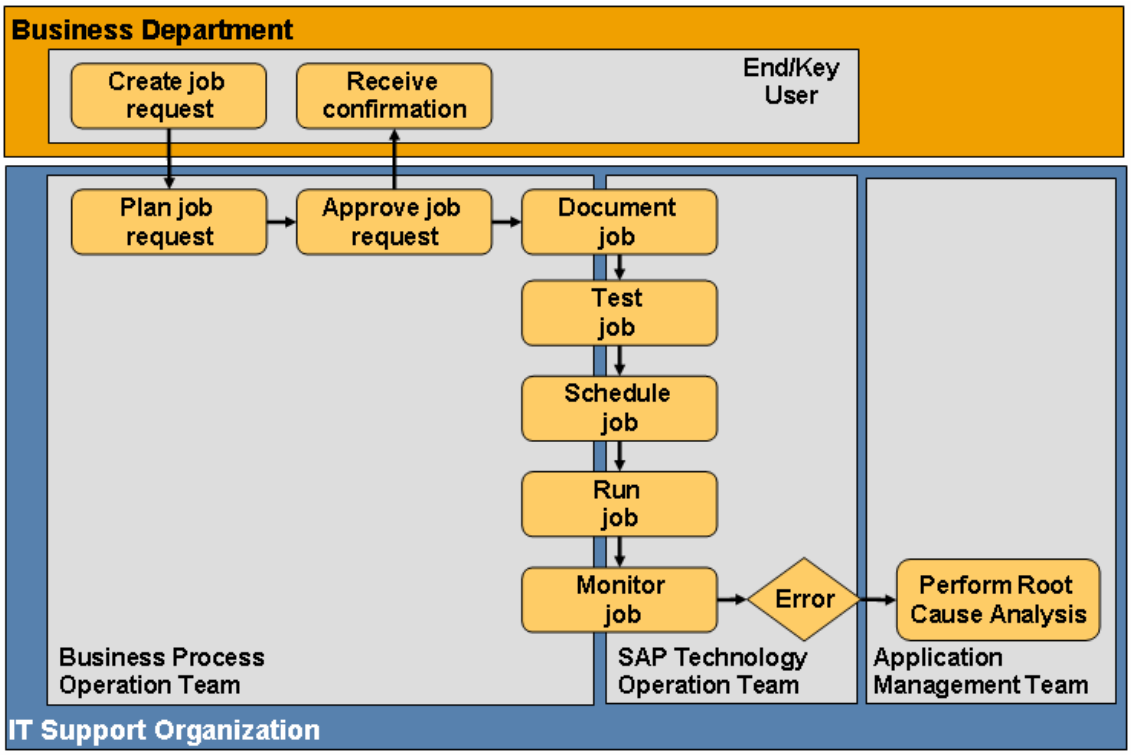
The **job scheduling management standard** explains how to manage the planning, scheduling, and monitoring of jobs. The job scheduling management process starts with request for a new job or to change the schedule of an existing job or job chain. This request needs to be planned, scheduled and integrated into the monitoring procedures and alert mechanisms and checked that it was successfully fulfilled. The standard also recommends setting up a dedicated team for job scheduling management as part of the business process operations or support organization. This team is responsible for the central management of the job schedule concept.

Job scheduling management is owned by business process operations, which executes the required tasks mainly in cooperation with the business process champion and SAP technical operations. The main benefits of job scheduling management are the automation and acceleration of business processes and the prevention of business process interruptions.

4 What is the Basic Concept of the Job Scheduling Management Standard?

This chapter describes how SAP defines the basic job scheduling management standard for operations. It describes the basic process flow from an initial job request from an End or Key user to the final job scheduling in the productive environment. Besides the process flow, it is also described which roles within the customer support organization are involved and what their respective tasks and responsibilities are. For every process step, tools are mentioned which should support the corresponding work step and which should reduce the manual effort to a minimum.

4.1 Architecture and Process Flow



Prerequisite: We assume that a holistic job scheduling management concept (including an appropriate operations handbook) is already in place as a result from an initial implementation project. If this is not the case, the creation of such a holistic concept has to be the first step. A roadmap for creating Job Scheduling Management concept can be found in the best practice document "Program Scheduling Management". An enhanced version of this document will be included in the SAP Solution Manager enhancement SAP Solution Support Enablement package.

The main process with regard to Job Scheduling looks as follows:

The end user or more likely the key user in the business department sees the need for an additional background job or the change of an existing job. Hence he creates a request for a new job or a request for changing an existing one. This request is forwarded to the business process operation team within the IT support organization. This team will evaluate the request with the data provided from the business department. Then the job request is either disapproved so that the end or key user has to refine the request or create a new (different) one or the request is approved, which leads to a confirmation sent to the appropriate user in the business department.

For every approved job, the business process operations team completes the (detailed) documentation of every job. Depending on the type of job, the job is then tested in the development and/or quality assurance environment. Once it is clear that the job is working correctly from a functional point of view, the job is scheduled in the production environment by the sap technical operations team. The job should then run at the right (scheduled) time. If this is not the case the exception should be identified during the monitoring of the job. The monitoring could be performed manually or automatically and it consists of two parts – technical and functional monitoring.

Resolving the error situation (incident) is one thing. In addition to this, it should always be evaluated which root cause led to the error situation. Has it really just been an incident or has it been a problem that might persist?

Besides the initial end or key user request, there is of course also the possibility that some system operator requests for a change of a job, e.g. a job should be rescheduled in order to avoid hardware bottlenecks. This process is not shown in the graphics above as, besides of the different process entry point, the overall process flow stays the same.

An additional process which is not mentioned in the graphics is the process of continuous improvement. This could be the technical optimization of some job runtime or the optimization of the overall job schedule so that hardware resources are used more efficiently or hardware bottlenecks are avoided. The continuous improvement can also contain the discontinuation of jobs that are no longer needed, hence running as little jobs as possible and as many jobs as necessary.

The above mentioned process is supported by different tools. The central documentation of jobs (including business related information and error-handling procedures) will be supported by SAP Solution Manager in the future. It will then also be possible to make use of a structured web form that the end or key user can fill out in an Intranet or Portal environment. This form will then be forwarded to the SAP Solution Manager where the Change Request Management will support the required approval process. The filled-out form will build the basis for further job documentation.

Additionally, the SAP Solution Manager will provide integration with the job scheduler “SAP Central Job Scheduling by Redwood” which is part of the SAP Netweaver 2004s JAVA-stack. The scheduler will be automatically filled with the job documentation from SAP Solution Manager so that basically only the precise scheduling information has to be additionally maintained in the scheduler.

The business process monitoring within SAP Solution Manager provides already today the possibility to monitor selected background jobs automatically and bring them in the business process context. Again, the integration with the job scheduler “SAP Central Job Scheduling by Redwood” will further enhance the ease of maintaining necessary information and providing additional possibilities for job monitoring.

4.2 Create job request

In the process step “Create job request”, an end or key user initially requests a new background job or he/she requests a change to an existing job. For this purpose, there should be a structured form that can be easily accessed by the corresponding end or key user. The user provides the basic data for the job to be run (e.g. purpose and business requirement of the job, data to be processed and needed output, required time for data).

Probably, the most convenient place for such a job request form is in the customer’s Enterprise Portal or Intranet.

SAP will provide such a web form in the future where the filled-in data will then be transported to the SAP Solution Manager.

4.3 Plan job request

Based on the basic data provided by the end or key user, a respective business process expert in the business process operations team evaluates the validity and meaningfulness of the job request. The evaluation is based on the experience of the business process expert. The business relevance should be one evaluation criteria.

The check if a similar or identical request already exists from another user should be another criterion. As all jobs should be documented centrally this check should be a simple database check.

The business process expert would also check if the new job request would fit into the current job schedule. For this purpose, it is of course helpful if you use a scheduling tool which provides the graphical display of the existing job schedule (e.g. SAP Central Job Scheduling by Redwood). Alternatively, you can make use of the tool “BATCH_JOB_ANALYSIS” provided in every SAP system with transaction ST13.

4.4 Approve job request & Receive confirmation

Once the business process expert checked all the different criteria described in the last process step, he/she has to decide whether the job request is approved or disapproved. The disapproval could be just temporary, e.g. there is just additional information needed from the end or key user in order to further proceed with the request or in order to finally evaluate the request. It could be also a final disapproval as the data that the end user requested won’t be provided or is already covered by another job.

In case of an approval, the job request will be further processed in subsequent steps described below.

In both cases (approval/disapproval) the end or key user should get a notification about the decision and a short explanation what led to the result. In case of approval, this notification could be just an automatically generated email. In case of disapproval, it should be an email or service desk message with some personal explanation from the corresponding Business Process Expert.

SAP will provide a service desk and change request management integration within 2007. So the filled-out web form described in step 4.2 “Create job request” will be attached to an automatically generated service desk message in the SAP Solution Manager. Out of this message a change request can be created which can then be approved or disapproved.

4.5 Document job

Now that the initial job request is approved by the appropriate business process expert, the job documentation has to be completed. This is also done by some business process expert who has knowledge about the business requirements of the job and knows the technical details as well. This documentation should be centrally stored and easy accessible.

SAP Solution Manager will provide the possibility to centrally maintain, store and retrieve job documentation. The information already maintained from the end or key user in the web form (see process step 4.2 “Create job request”) will be transferred and will automatically fill the corresponding fields in the job documentation.

4.6 Test job

Before a job is finally scheduled in the productive environment, it should be tested, especially if the underlying program contains customer coding. On the one hand, it should be tested if the program is working correctly from a functional point of view. On the other hand, one should test how much resources a job consumes (CPU time, memory) in order to make the job fit as good as possible into the existing job schedule.

4.7 Schedule job

Once the job is completely documented and properly tested, the SAP technical operations team can finally schedule the new or changed job in the productive environment. The schedule has to fulfill the given business requirements and should make use of the given hardware resources as efficiently as possible. Jobs are either scheduled by time or by event.

The scheduling itself is performed via transaction SM36, the SAP Central Job Scheduling by Redwood or via an external scheduling tool.

4.8 Run job

This should be normally an automated process step without performing any manual steps. At the specified scheduling date and time or reacting on a specifically raised event the appropriate job should run in the productive environment. In an SAP system, the CCMS infrastructure supports this process step. It is either controlled by the settings made in transaction SM36 or it is controlled by an external scheduling tool, e.g. via the certified XBP interface.

4.9 Monitor job

For every job, there should be at least one basic technical monitoring in place. This could be an automated alert monitoring or at least a regular manual check if jobs cancelled (aborted abnormally). Another technical monitoring would be to check for job runtimes that exceed an expected maximum value. This kind of monitoring is more or less just an exception based monitoring.

Additionally, the most important jobs should also be monitored from a functional point of view. Therefore, you would check specific log files for error messages (e.g. job log, spool file or application log). Or you check manually if certain insert, update or delete operations have been performed.

Automated monitoring is provided via different tools, e.g. using standard CCMS functionality monitoring or business process monitoring in SAP Solution Manager. External scheduling tools usually provide some automated monitoring functionality as well.

4.10 Perform Root Cause Analysis

Once an error situation is detected via manual or automatic monitoring, the incident should be resolved as soon as possible. In order to solve the incident as quickly as possible, one should make use of documented error-handling procedures, responsibilities and escalation procedures that are part of the job documentation described in process step 4.5 “Document Job”.

After the immediate incident is resolved it should be checked if also the root cause is identified and resolved or if the incident could become a problem which might persist. Once the root cause of a problem has been identified and solved, the solution should be documented for reference purposes and a confirmation for the successful problem resolution should be logged. The root cause analysis should normally be performed by the Application Management team.

4.11 Request for Change (from operator)

The same process as described above can have another entry point than the end or key user. A request for changing an existing job, as mentioned in step 4.2 “Create job request”, could also be opened by a system operator from the SAP technical operations team. They would normally request for change in scheduling (because this would better fit the given

hardware resources) or for scheduling some basis related jobs (e.g. deleting old spool files or application logs). In the former case, the business process operations team has to cross-check if the new scheduling would still satisfy the given business requirements.

Otherwise, the process is basically the same as described above from step 4.3 to 4.10.

The request for change should normally be opened via a corresponding change request management tool or at least a ticket system.

In the future it will be possible to open a service desk message in the SAP Solution Manager directly out of the SAP Central Job Scheduling by Redwood tool. Out of this service desk message, one can generate a change request in the SAP Solution Manager.

4.12 Continuous improvement

One big topic in the Job Scheduling Management environment is the continuous improvement. This can consist of different activities which cannot be described as a strict process. The continuous improvement comprises basically the following areas:

- discontinuation of jobs that are no longer needed
- rescheduling of jobs to a different server or to a different point in time
- improving the performance of a single job with technical or application means

The main problem for discontinuing jobs is to identify those jobs that are no longer needed. This task can be simplified if a detailed job description is available for all jobs and if this documentation contains some information about the validity of jobs.

A decision for rescheduling is supported by the tool “BATCH_JOB_ANALYSIS” which is provided in every SAP system with transaction ST13.

The job runtime and its time components can be analyzed via standard SAP trace tools, especially transactions ST05 and ST12 for SQL and ABAP analysis respectively. The optimization can be further supported by SAP Solution Management Optimization services which can be ordered as part of SAP Premium Engagements like SAP MaxAttention, SAP Safeguarding or SAP Premium Support.

5 How to Implement the Job Scheduling Management Standard?

5.1 Methodology

The first step for implementing job scheduling is the creation of a holistic job scheduling management concept. A rough roadmap on how to create such a concept is provided in the Best Practice document "Program Scheduling Management".

This concept has to include the job documentation form that you want to use for central job documentation (see also process step 4.5 "Job documentation"). The job documentation should basically contain the following main elements of information:

- Technical parameters (e.g. job, program and variant name),
- Scheduling information (e.g. once, daily, weekly)
- Business information (e.g. business requirements, business area, business process)
- Error-handling (e.g. responsibilities, restart ability, monitoring information)

The Best Practice document "Program Scheduling Management" contains an example of how a complete job form could look like.

In many companies, this is today just one or several MS Excel spreadsheets. As said before, central job documentation functionality is planned to be available within the SAP Solution Manager.

Then you have to clarify how you get the information from the job documentation into the actual job scheduling tool, e.g. transaction SM36, SAP Central Job Scheduling by Redwood or any other external job scheduler. Nowadays, it is often done by manual effort duplicating the information from an MS Excel spreadsheet into job scheduling tool.

Again as said before, at the end of 2007 SAP will provide integration between the new job documentation in SAP Solution Manager and the SAP Central Job Scheduling by Redwood tool based on Netweaver 2004s.

Once the basic set of background jobs is identified, a process has to be established on how an end or rather key user can request a new job or how he/she can request for a change on an existing job. Today, such a process is often supported by individual customer developed solutions, either providing a web form that is "loosely" connected to some other infrastructure or providing some Z-transaction within SAP systems.

Together with the new job documentation in the SAP Solution Manager, SAP will also ship a configurable web form that can be used in an Intranet or Enterprise Portal and which integrates with other SAP Solution Manager functionalities.

As support for the conceptual part, a SAP Business Process Management service can be ordered as part of SAP Premium Engagements like SAP MaxAttention, SAP Safeguarding or SAP Premium Support.

For optimizing the runtime of individual jobs, customers can order a SAP Business Process Performance Optimization service as part of a SAP Premium Engagement.

5.2 Tools

For sophisticated job scheduling, SAP recommends using a central job scheduling tool (for example, SAP Central Job Scheduling by Redwood which is part of any SAP Netweaver 2004 or 2004s license) instead of just using transaction SM36,.

SAP will provide a job documentation infrastructure within the SAP Solution Manager which allows the additional documentation of business information as well as error-handling and monitoring information. This infrastructure will be integrated with some structured web form provided for the end and key user requests as well as it will be integrated with the service desk, change request management and business process monitoring functionality.

Additionally SAP will provide integration between SAP Solution Manager and SAP Central Job Scheduling by Redwood (only for the integrated version as of SAP Netweaver 2004s), so that the complete process, as described in chapter 4, will be supported by SAP tools.

Additionally, SAP supports a (local) batch load analysis in the SAP environment with the tool “BATCH_JOB_ANALYSIS” which is provided in every SAP system (as of plug-in ST-A/PI 01G) with transaction ST13.

5.3 People

As described during the process in chapter 4, the following four roles are involved in the job scheduling management: End and key user, business process operations team, application management team and SAP technical operations team.

The end and key users only act in the initial part as job requestors. So basically, these users have just to be made aware of where and how to request a job. Normally, not much training should be required.

The business process operations team plays a very important role in the job scheduling management. This team is responsible for most part of the overall job documentations (business related jobs) and should play a major part in creating a holistic Job Scheduling Management concept. The members of the business process operations team have to be familiar with the overall job request process (as described in chapter 4) as well as with the tool used for working with change requests and the tool used for entering and storing the job documentation.

Another important role within the Job Scheduling Management process is covered by the SAP technical operations team which is responsible for the actual scheduling of jobs. Additionally, this team has to request, plan, document and schedule all basis related jobs (e.g. deleting old log files, backup runs or programs to be run on operating system level). Hence,

this team also needs knowledge about the overall job request process (as described in chapter 4) as well as knowledge about the tool used for working with change requests, the tool used for entering and storing the job documentation and the job scheduling tool itself.

The Application Management team does just play a supporting role in the job scheduling management process as this team is basically only responsible for the root cause analysis for problems. This would be probably done in close collaboration with the business process operations or SAP technical operations team (depending if it is a business or basis related job). Basically, this team has to know how to use their monitoring and diagnostics tool as well as the ticket system used.

6 How to Measure the Success of the Implementation?

By working with a (virtual) central scheduling team and implementing and using a central scheduling tool (e.g. SAP Central Job Scheduling by Redwood), you gain usually the following benefits:

- freeing-up human resources that had to perform redundant work before and by reducing administration efforts
- using hardware resources more efficiently
- speeding-up crucial background job processing, especially for complex job chains (processed during night) and hence reducing critical batch time windows
- enabling more real-time business by event-driven scheduling
- eliminating Z-programs that had to be programmed in order to realize complex scheduling dependencies just via transaction SM36

The additional usage of central documentation and making use of an approval/disapproval process bring the additional benefits of:

- avoiding redundant work of documentation
- avoiding unnecessary manual work to copy information from one source to another (e.g. from an MS Excel spreadsheet into a scheduling tool
- increasing transparency regarding what has been changed when and by whom

Making use of monitoring functionalities (within an external scheduler or of Business Process Monitoring in SAP Solution Manager) you gain:

- reducing the time for solving problems
- reducing time of escalations
- reducing the number of reported incidents by end-users as incidents are solved proactively
- end-user acceptance and satisfaction with SAP systems because of less malfunctions