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# SWISS BANK CORPORATION

## ZURICH, SWITZERLAND

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### EUROPEAN EXCELLENCE AWARDS: IMAGING, GOLD

#### EXECUTIVE SUMMARY

Swiss Bank Corporation (SBC) had a vision for a fully integrated electronic securities trading system in the Swiss financial service market. This was the motivation for the SBC to reorganize their business area of securities settlement, custody and corporate actions. One result out of this reorganisation was the decision to develop a new information system called the *LFBneu Project* for the Securities Management of SBC.

Up to 50,000 transactions are processed daily by this division. The business value of this transaction volume is several hundred million to some billion dollars a day. Ten percent must be handled based on highly complex processes by some 100 SBC security delivery experts. As every individual business transaction not just moves documents, but values in the millions, this IT demands the highest degree of reliability, speed and transparency. The application can be identified by the following characteristics:

- 1) Deployment of workflow technology for business processes automation in the Securities Management area.
- 2) Use the existing mainframe environment as data and business application server for the LFBneu application. The business application consists of approx. 150 business functions which can be initiated by workflow-enabled CICS transactions.
- 3) Process-oriented, event-driven integration of mainframe-based line-of-business applications in the workflow-enabled Securities Management application by IEF modules.
- 4) 200 business processes had to be identified and mapped, giving 250 workflow procedures.
- 5) High volume system processing 50,000 orders a day, resulting in 20'000 workflow cases.
- 6) Integration of the customers and partner processes in the workflow case processing.
- 7) Highly innovative and system architecture based on workflow, and CASE technologies.
- 8) Integration of many different types of hardware and operating software (IBM 390 MVS, HP 210 Dual Unix Servers, Compaq servers, IBM RS6000 Aix, 100 standard Pentium PCs)

One critical success factor in the implementation of the application is the project-related methodology. Therefore a practical and evolutionary method called Workflow Automation Method (WAM) was developed for approaching the workflow part of LFBneu. They were therefore left with the challenge of integrating this method into the project-specific context, meaning to combine WAM with the

CASE-tool COOL:Gen. Beside the methods integration another great challenge of this project was to engage and coordinate specialists with various skills that could never have been found in individual persons. This was essential for enabling the design and development of the LFBneu solution.

The migration to the new system has a large associated risk portfolio (new technology, new process-centric way of thinking and working; mass data processing, direct contact with customer) that must be managed carefully. A step-by-step-based migration concept, which includes a parallel operation of the old and new system, is the key for the successful migration in the new environment.

The project's impact on SBC after the first releases is quite impressive. The following key points show that the project was well worth its effort:

- The overall reorganization of the business area of settlement, custody and corporate actions results in cost saving on personnel of 30 million dollar.
- The workflow technology for securities custody and settlement processing will result in annual savings of 3--5 Million dollars in this area.
- With this workflow solution, the same order volume can be processed with markedly fewer personnel. Approximately 30 percent of personnel could be released for other tasks, despite a 50 percent increase in order volume.
- The processing time for the delivery process is reduced by approx. 30 percent.
- The implementation of the workflow system will dramatically increase the capacity of the Securities Management.

## SYSTEM DESCRIPTION

### ***Introduction to the Business Area***

The Swiss Bank Corporation (SBC) reorganized the business area of securities settlement, custody and corporate actions. The motivation for the reorganisation of this business area was the vision to set up a fully integrated electronic securities trading system in the Swiss financial service market. New founded companies like SOFFEX (Swiss Options and Financial Futures Exchange), InterSettle (Swiss Corporation for International Securities Settlement) or Swiss Electronic Stock Markets with new developed systems like SECOM oder EBS are also part of this vision to ensure faster, cheaper and better securities trading.

One result of the SBC reorganisation was the decision to develop a new information system which guarantees the straight through processing of all security deliveries in SBC.

The backoffice department for securities settlement, custody and corporate actions called Securities Management is now centralized in Zürich, Switzerland. There had been five different Offices (Basel, Bern, Geneva, Lausanne and Zurich ) before the reorganisation took place. Up to 50,000 stock market and over-the-counter transactions are processed daily by the Securities Management Department. The business value of this volume is several hunderd million to some billion dollars a day, depending on stock exchange conditions. Ninety percent of these transactions are now processed straight through (untouched by human hand) using workflow technology to fully automate these business processes. The other 10 percent (about 5,000 transactions per day) is handled based on highly complex processes by some

100 SBC security delivery experts which are assisted by the interactive part of the workflow-solution.

The complexity and variety of internal bank processes with its various customer and partner interactions is enormous. The business in all its countless variations and constellations comprises about 200 business processes which offers a complete and very efficient customer service in the Security Management area. This includes:

- securities remittance and withdrawal
- custody account transfer
- electronic and physical handling of securities
- processing of registered shares
- reverse splitting to cum
- vault management
- custody of individual and omnibus accounts and securities
- security netting
- fee calculation
- cancellation processes

As every individual business transaction moves not just documents, but values in the millions, this IT demands the highest degree of reliability, speed and transparency.

### ***Application Architecture***

The LFBneu application architecture can be identified by three basic characteristics:

- Deployment of workflow technology for straight through business processes automation in the Securities Management area
- Use the existing mainframe environment as data and business application server for the new LFBneu application. The business application consists of approx. 150 business functions which can be initiated by workflow-enabled CICS transactions
- Process-oriented, event-driven integration of mainframe-based line-of-business applications in the workflow-enabled Securities Management application.

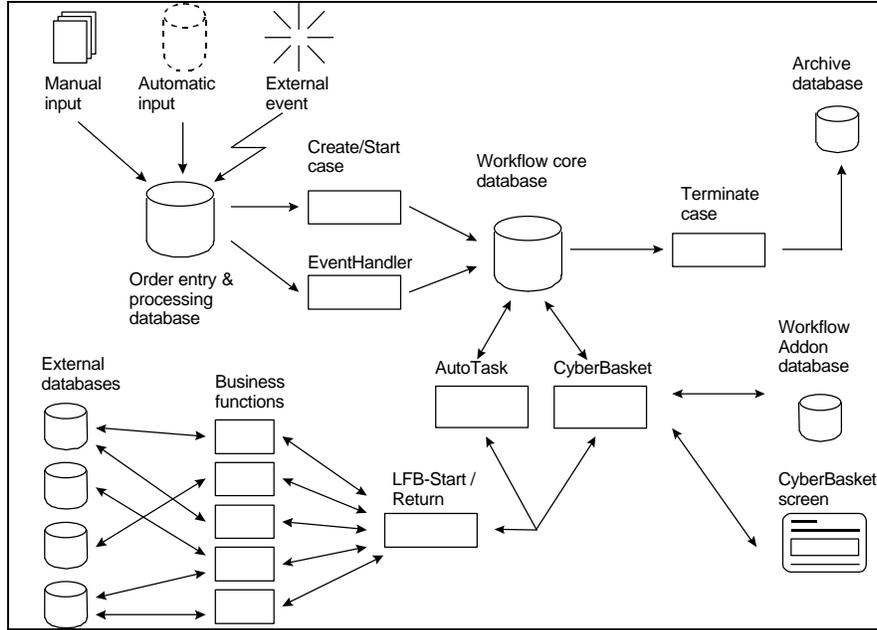


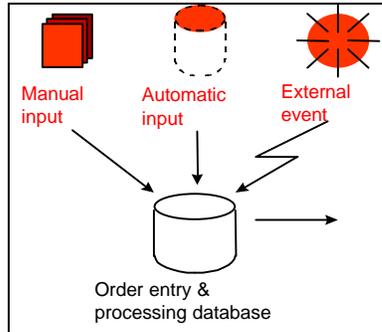
Chart 2: Architecture—Overview

The order entry and processing takes place in the mainframe environment. A central database is used to store the incoming orders, order processing (status tracking) and order specific events. Incoming orders are automatically assigned to a workflow procedure and an instance of this procedure—a workflow case is first created and then started in the workflow environment. The event handler assigns external events—generated by other line-of-business applications, customer and partners via SWIFT—to run workflow cases. The interactive processing of workflow cases takes place through the CyberBasket.

If there is no user interaction needed for the case processing the AutoTask will automatically process with the workflow case. The workflow data is stored in three different relational databases in a client/server environment. One of them (Eastman Software/Pace) is the workflow core database which is used to store the workflow procedure definition, workflow cases, roles, users, etc.

The second one (MS SQL-Server) stores additional run-time information about a workflow case like notes or events. The third database (MS SQL-Server) is an archive for terminated workflow cases (see Appendix 5). The numerous external modules work in the mainframe environment together with the order entry and processing database. They are initiated through one standard middleware component LFBstart/return which calls workflow-enabled CICS transactions on the mainframe.

**Order entry**



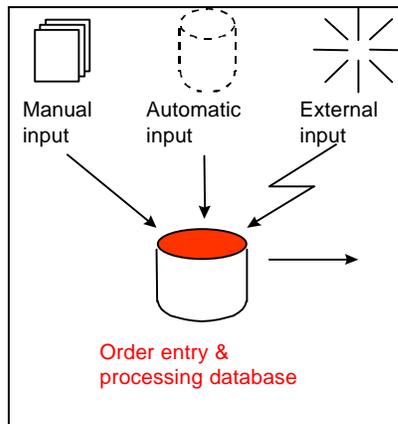
Securities delivery transactions are placed as orders in a central order database. Orders can be issued by three different means:

1. through every SBC branch office of the bank or the central securities management department using an on-line frontend order entry application.
2. through the SBC securities trading batch application
3. through SWIFT messages

The issued orders are automatically (without user interaction) assigned to workflow procedures and processed as workflow cases (straight through processing). Customers of SBC can issue orders through SWIFT message-based customer applications so the workflow-enabled processing begins even on the finger tips of the customer. An intelligent module identifies all incoming orders as initial events for creating and starting workflows and assigns them to workflow procedures based on the specific attributes of every order (i.e. international or domestic securities).

After a successful assignment each order runs through a central validation modul. The modul validates the order to make sure that no data is missing, incorrect or inconsistent which would cause problems in the further workflow-enabled order processing. Finally all orders which passed succesfully the validation are processed on the workflow server. From this time on, orders were known as workflow cases.

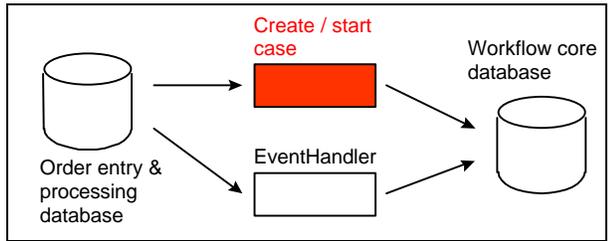
**The order entry and processing database**



Each securities trading transaction like buying or selling shares generates a securities delivery transaction for the Securitites Management backoffice which are

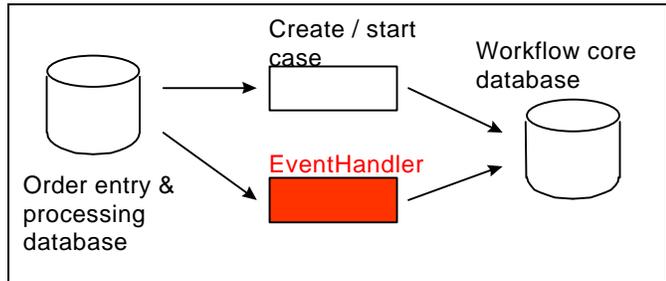
stored in this database. There are about 50,000 new orders a day. When the order is processed in the workflow solution the order processing status is logged in the database to keep track what's going on in the system which is required by the securities banking standards. The processing of the order is event-driven which means that for workflow cases completion events are expected, otherwise the workflow case will not be processed further more. These events are generated by line-of-business applications, partners (i.e. clearing houses, share registers) and bank customers. Per day 10,000 events are stored in this database and assigned to orders. Ninety percent of all events are automatically issued through SWIFT. The rest are entered manually through the order entry application (i.e. customer letter arrives, physical securities delivery on the workplace).

**Create and Start Case Module**



For every validated order arriving at regular intervals in the order entry and processing database the Create/Start Case Module create and start a workflow case on the workflow core database. To comply with the high security requirements of banking, the case status is reported back to the entry order and processing database. Once the Create process is successfully concluded, it is released. From now on the order processing is under control of the workflow solution.

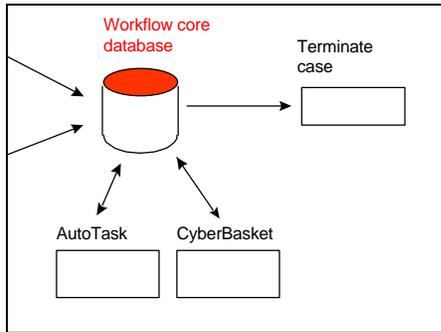
**EventHandler Module**



The above-mentioned 10,000 events are assigned to the correct workflow case by the EventHandler. Furthermore this module knows what action must take place for a specific event. All events coming either automatically via SWIFT (e.g. settlement order status of a clearing house) or manually entered through order entry application (e.g. entry of a signature for the approval of an account withdrawal) are stored in the order entry and processing database.

On certain time intervals the EventHandler will be informed about new incoming events and its assigned case, so it can take the appropriate action for them (like unsuspend a workflow case or suspend again the case for a certain time period or send message to case supervisor).

### **Workflow Core Database**

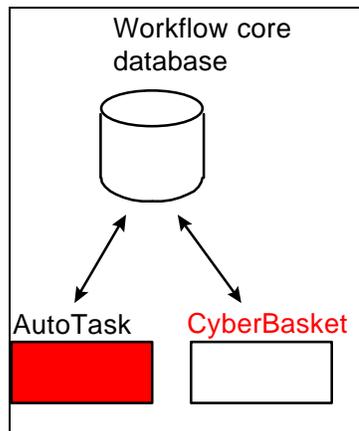


The workflow database is the heart of the workflow solution. It comprises information about the workflow procedures, which define the processing sequence, the involved people/teams based on role (skill set), category (workload) concepts, as well as applications and data, based on this information the workflow solution assigns workload to people/teams at the right time to complete a workflow case which is also stored in the database.

### **Terminate Case and Archive Database**

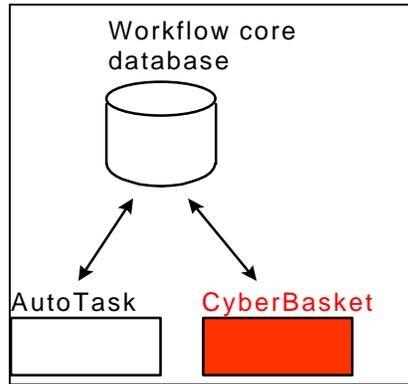
The Terminate Case Module closes all finished cases. A case is terminated when all its tasks are finished. Entries into the workflow database for the case are deleted in the workflow core database after the workflow metrics has been transferred into the Archive Database. Thus, it is kept for possible cancellation operations or statistical analysis (workflow metrics).

### **AutoTask**



The assigned workload is a task list, which can be automatically or interactively processed. In the workflow procedure is defined whether a task has to be executed automatically or interactively. A task which requires no further information (data or decisions) or operations is processed by the AutoTask.

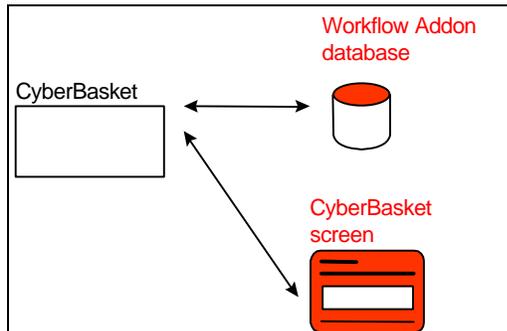
**CyberBasket**



If an activity must be processed by a User, the CyberBasket assists. All tasks requiring interaction can be seen on the CyberBasket tasklist. Each user can only see those tasks which he is allowed to process. This is based on a role (required skills for task executing) and categories (workload definition). There are a variety of functions available in the CyberBasket which allow the user to setup his personal workenvironment. Besides the starting of tasks, there are filtering and sorting functions available.

Tasks can be suspended and then be shown separately. A history function shows what happened so far with the workflow case up to the present moment. A task can have notices added to it at any time (Postit concept). With a smart and flexible escalation concept, problematic tasks can be passed on to superiors who can either process the escalated task themselves, send back a commentary or can pass it on for further completion to a person with the appropriate skill set.

**CyberBasket screen and workflow Addon database**

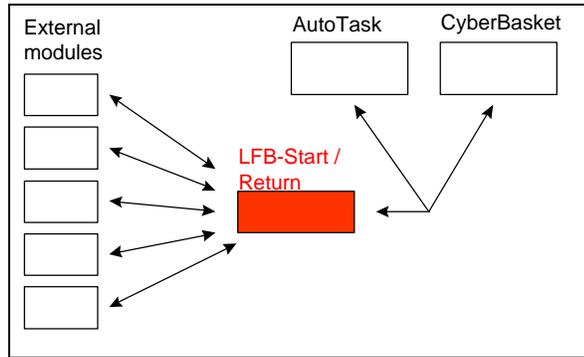


The CyberBasket Screen is used as Graphical User Interface (GUI) for the Desktop Integration of all in LFBneu required business functions.

The required data is processed and reported in various forms.

For special data such as notices, a additional database is used. This would then always be required when information on tasks or cases cannot be stored in the workflow database.

***LFBStart Module***



External programs can be called up by CyberBasket and the AutoTask. This takes place via the LFBStart/Return Interface Module. It recognizes all possible external applications which the workflow Engine could have called up. The applications are initialised and started with defined parameters. After completion of external work it reports back various Return Status.

***Business functions and databases***

The business functions have been extensively and newly implemented. For their part, they use information from various SBC core databases that are directed over API's. These databases are in most cases the same as those already used before workflow integration. The work methods of the whole LFBneu system are outlined. Two important points of the application architecture that are not seen from this schematic sequence have yet to be indicated.

***Printoutput Management:***

The Securities Delivery business requires decentralized as much as centralized printout facilities. Centralized printing is mainly requested in mass business and in connection with automatic mail order routes. Adequate customer service requires that certain printouts be printed decentrally. For checking, principally every printout is written into a dossier database. At a later point in time, the dossier database is archived.

***Transactions security and error handling:***

Error handling and transaction security in the distributed system environment (Mainframe, workflow, four different databases, integration of many applications) is a great challenge. CICS transactions must be managed as well as workflow cases. Long life transactions consist of a lot CICS transactions which must be synchronized if a processing error occurs. To guarantee the controlled rollback of workflows, a transaction security integrity concept was implemented. Rollbacks caused by technical (e.g. lost connection to the mainframe environment while executing a workflow-enabled CICS transaction) or business errors (cancellation of settled business) can now be handled secure and controlled.

The standardisation of the error tracking process all over the newly developed modules required communication spanning departments with a large development team (approx. 22 persons). A central Errormessage Database with all errors automatically categorized fulfills the challenges of error handling. If an error refers to an individual case further processing is stopped. If an error refers to a general business function, the further processing will be blocked for all cases affected. In

the worst situation, a distributed system error occurs. Then the overall workflow system cannot be started for any task until the error is remedied.

## SYSTEM ARCHITECTURE

### **Workflow dual server**

The Eastman workflow engine runs on two Hewlett Packard Unix servers of type K210 with two Processors and 256MB memory per server. The implementation of a workflow- and backup server with disk mirroring is implemented to guarantee high production security.

### **Workflow metrics NT-server**

In order to be able to keep with data volume low, the data of completed cases is transferred onto a workflow metrics server daily and deleted from the production environment. A Compaq-Prolinea Pentium 200 server with 18GB harddisk using the Microsoft SQL-Server database. Through this transfer of data the metrics analyses and online information about cases. Current business are unleashed and the performance of the productive system is improved.

### **Common bridge dual NT-server**

These two NT servers are also Compaq Prolinea servers and are required for the SNA connection to the mainframe. To comply with the high accessibility requirements, a back-up machine for the communication server is also installed here.

### **Shared NT-fileserver**

This NT server is required for additional shared files, for software-updates on the clients and printing (described in section printers). It is installed as general fileserver for data that all clients must have access to.

### **Securities vault server**

This IBM RS6000 computer with the AIX operating system takes over the automatic handling of security transfers in the securities vault. The administration software therefore by the DIGITRON company is tied into workflow application.

### **AutoTask clients**

These Pentium NT-computers are dedicated to background processes. Models by Hewlett Packard as well as by Compaq are installed. These computers handle any automatable work which occurs. This includes:

#### **Create/Start Case:**

This process checks on a regular base if new orders are waiting on the mainframe order database. The workflow cases are generated and immediately started.

#### **EventHandler:**

This process checks on a regular base if new events have entered the mainframe event-database that can be assigned to an awaiting workflow case. The EventHandler reactivates the awaiting or suspended case.

#### **AutoTask:**

Tasks that can be handled without user interaction are processed by the AutoTask client (e.g. printing, booking or starting new subprocesses, etc.)

As these applications have high datathroughput and make no big demands for graphical userinterface, they are written in Microsoft Visual C++.

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### **CyberBasket clients**

The Backoffice is equipped with approximately 100 workflow workstations. Hewlett Packard and Compaq Pentium PCs with Microsoft Windows NT are installed. To satisfy client requests for a customized electronic Inbasket, a frontend application called CyberBasket was developed. It was built using Microsoft Visual Basic 4.0, Microsoft Windows API and Eastman Software API-Set OPEN/workflow 2.1. CyberBasket expands in many ways the functionality of the standard inbasket. It is the User's integrated desktop to the LFBneu system. All the Tasks which are ready for the user or his group can be viewed, forwarded, reassigned, escalated or processed in many ways from here. (See Appendix 2)

Additionally this is a new way of interactive helpsystem available for every user. It shows all the workflow procedures in graphical form with hyperlinks to sub flows and explains the process itself in the users 'language' as well as other business related topics. The whole system has been developed in HTML and is viewed in the Netscape Browser. (see Appendix 2).

### **Printers**

The decentral printing services is implemented using the electronic forms printing solution of JetForm. NT server-based system automates and integrates printing with the workflow system. The system is connected to dedicated workgroup-printers. The standard printer is a laserprinter by Lexmark or HP.

Output for mass printing is pushed to the mainframe and its existing central printing services for high volume printing.

### **IBM mainframe**

A mainframe system IBM-390/MVS Cobol is installed as application server for the generic business functions as well as for database server for delivery orders. DB2 is installed as database and CICS is applied as transaction monitor. This offers the advantage that SBC can fall back on their existing security features for maintaining all customer-sensitive data. The mainframe is interfaced from the workstation by procedures, which are built through the CASE tool COOL:Gen from Sterling Software. The client part of the procedures is generated in C and the output for the server is in Cobol.

### ***Customer Benefits: Increased Productivity through Cost & Time saving***

- The overall reorganization of the business area of settlement, custody and corporate actions results in cost savings on personnel of 30 million dollar.
- SBC's annual savings will be 3--5 Million-dollar using workflow technologies in the Securities Management area.
- SBC estimates a long-term cost saving of up to 30 percent in this business area.
- With the newly integrated workflow solution the same order volume can be processed with markedly less personnel. When the full functionality is plugged in, approximately 30 percent of personnel could be released for other tasks, despite a 50 percent increase in order volume.
- Through improved, workflow driven time tracking system and the shortening of throughput SBC have strongly reduced penalty interest payments for overdue settlement deadlines.

- The processing time for the delivery process reduced by approx. 30 percent. Customer advises can therefore be produced 1day earlier than before which contributes to greater customer satisfaction.
- The newly achieved transparency with regards to process costs and work load for participants in the processing operations serves as an outstanding planning tool for management. Daily and mid-term optimization of personnel is guaranteed. Unknown accumulation of work orders in some teams used to lead to delays in settlements that created high interest costs. Such shortcomings have been eliminated through the implementation of the workflow system and are now immediately made known, thus the Manager responsible now has the possibility to immediately assign an employee from general processing to dealing with few, though more important tasks.

### ***Increased Quality of Services***

- The sources of errors in the processing of orders have been greatly reduced. These saves not only time for internal or telephone inquiries and error correction but also increased customer satisfaction.
- Customer inquiries on any given order can be very quickly and precisely answered.
- The implementation of the workflow system has dramatically increased the capacity of the Securities Management.
- The fully electronic documentation of the business processes within the Securities Management and the worldwide concurrent access to it guaranties that the users processing the securities services are always assisted by the appropriate procedures rules and policies to correctly complete the tasks.

### ***New Market Opportunities for SBC***

- The introduction of the workflow driven processes allowed the Management of SBC to become more customers oriented; also from an organizational point of view.
- New, market influenced services in the custody business could be implemented more swiftly than before. The new workflow solution offers SBC the flexibility to be able to react quickly to new customer requirements.
- SBC is equipped for growing volumes of transactions with the new system and has good cards in hand for new opportunities of concentration processes in the global custody business. With the present application architecture SBC is able to react quickly to changing conditions in the market and thus keep one step ahead of the competition.

## BPR, WORKFLOW AND PROJECT APPROACH

### ***BPR versus Workflow Approach***

Decision-makers at Swiss Bank Corporation examined the themes 'Business Process Reengineering' and 'Workflow Management' extensively in 1993. The proposition of Hammer and Champy on the theme 'Business Process Reengineering' was found to be theoretic, long-term oriented and radical as opposed to Workflow Management, which offered a pragmatic, short-term, evolutionary solution. The decision-makers saw greater potential in Workflow Management for

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reaching the business area goals as set out in the business strategy. Above all, the decisive factor in starting a workflow project was its potential for considerable short-term improvement on the operative level. This starting point led to the project LFBneu, whereby it was clear that workflow technology and a ready to implement and evolutionary approach would be chosen. Rather than radical, new structuring of processes in the Securities Management area, a short to mid-term (less than three years) achievement of increased efficiency and quality in operative business was placed to the fore.

## PROJECT APPROACH

A critical success factor in the implementation of workflow-systems is the project-related methodology.

The early decision to use the CASE-tool COOL:Gen and method from Sterling Software for LFBneu led to considering the use of this method also for the implementation of the workflow solution of LFBneu. As COOL:Gen is a functional, data and phase-oriented method, it was shown that a process-oriented action would be insufficiently supported and thus not suited for the implementation of workflow solution.

A separate process-oriented, practical and evolutionary method called workflow Automation Method (WAM) was developed for approaching the workflow part of LFBneu. This method is a generic implementation approach. We were therefore left with the challenge of integrating this method into the project-specific context, meaning to combine WAM with the case tool COOL:Gen. The next section explains the generic method WAM, followed by a section showing how we have integrated this approach with the COOL:Gen method in the LFBneu project. Last but not least we will focus on Project Change-Management which is key for a successful project.

## WAM (WORKFLOW AUTOMATION METHOD)

The following will describe the different steps of the method.

### **Requirement Analysis**

In this first step, together with the customer, the targets and scope of the project were fixed. The targets were put into operation through the allocation of a measurement and setting priorities for each target. Thereby it was ensured that the formulated targets could be verified later using the completed workflow system.

With the identification of the mission critical applications, the roles, the core processes and the basic functions the functional scope of LFBneu was written down.

Key attributes of this step are as follows:

- Management oriented
- Customer centric
- Business focus

### **Process Analysis**

The core business processes, roles, applications and systems identified in the Requirement Analysis served as starting point for the Process Analysis. Based on

these results approximately 200 business processes, 150 business functions, 30 skill-/role-sets were identified and documented. The range of complexity is wide. A simple process is described by about four business functions, but to describe a complex process up to 100 different business activities can be invoked. The tool NetViz supported the analysis and documentation of the results, which we characterize as a low-end BPR-tool (see Appendix 1). The resulting graphics were then reused to create an electronic business documentation in HTML (see Appendix 4).

Within the framework of periodic workshops, the users and other specialists in the field critically checked the analysis results. Necessary corrections were carried out and the processes were adapted continually by the project team. The experiments concluded that the processes analyzed during the project development were continually changing so that a change management process was necessary in the project.

Key attributes of this step are as follows:

- Business focus
- Results described in the language of the customer
- High-grade user driven
- Pragmatic approach without 'BPR' overhead
- Evolutionary process analysis and improvement
- Change management for continuous process improvement

#### **Workflow Design**

The 200 business processes which were the result of the previous step were formally specified using the OPEN/workflow 2.1 graphical-oriented workflow procedure builder from Eastman Software. (see Appendix.3) Similar to the process analysis, the results were worked out in a user-driven and evolutionary manner. Still one main difference existed: the focus shift to the information technology side because this was the initial step for the implementation of the workflow system.

Key attributes of this step are as follows:

- • Workflow oriented
- • IT focus
- • Results described in the language of the customer
- • High-grade user driven
- • Pragmatic approach
- • Evolutionary workflow design and improvement
- • Change management for continuous process improvement

#### **Workflow Validation**

The workflow design was validated with the end users and securities management specialists. The goal of this step is to verify whether the workflow design correctly depicted the business processes. The separate tasks of a workflow were acted out in role-plays with the end-users so that the completeness and correctness of the business processes could be verified. A further effect of the role-playing was the illustration of the dynamics in the business processes. Through role playing this is experienced 'live'.

Key attributes of this step are as follows:

- Role oriented
- Process oriented
- User centric
- Business and IT integrated focus
- Results described in the language of the customer
- Live experience through the end user (role-playing)

**Workflow Integration**

The validated workflow was integrated into the existing and newly developed mission critical applications. The Rapid Application Development (RAD) using prototypes for the evolutionary integration of the existing and newly developed line-of-business applications was used in this step. Due to the RAD method the end-users were heavily involved in the review process of the integration modules (AutoTask, CyberBasket, LFBStart) so the benefits became clear to them and they were anxious to go live with the workflow system.

Key attributes of this step are as follows:

- Rapid Application Development
- Prototyping
- Component-based development
- End user involvement through review workshop

**Workflow Monitoring**

Over the time, the daily movement of workflow cases through the workflow system will deliver detailed metrics reports on how well the process is running. These reports can highlight problem areas such as bottlenecks or time over dues.

So far only one process was implemented as a prototype to gain experience in measure and monitor processes. (See Appendix 5)

**Process Optimization**

In the near future when all processes are implemented this step will be the base for optimizing the existing processes and so it is the starting point of continuous process improvement in the area of securities management.

IEF/IEM INTEGRATED PROJECT APPROACH

**Chart 5: IEF/IEM Integrated project approach**

The integration of both methods are shown in the following table with regards to activities, tools installed, required roles and results:

| <b>Step</b> | <b>Activities / Tools Installed</b>  | <b>Required Roles</b>   | <b>Results</b>  |
|-------------|--|---|---|
|             | a) Requirement Analysis Workshop; no Tool support<br>b) Feasibility; no Tool support | <ul style="list-style-type: none"> <li>• Application Architect</li> <li>• Business Engineers</li> </ul> | <ul style="list-style-type: none"> <li>• Project Targets</li> <li>• Project Scope</li> <li>• Feasibility Study</li> </ul> |

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|  |  |  |  |
|--|--|--|--|
|  | <p>c) Application Architecture Definition; no Tool support<br/>Technology Architecture Definition; no Tool support<br/>d) Business Process Analysis; Tool: NetViz<br/>e) Business Function Analysis; Tool: COOL:Gen<br/>f) Tool Evaluation; no Tool support</p>      | <ul style="list-style-type: none"> <li>• Application Architect</li> <li>• System Architect</li> <li>• Organizational Engineer</li> <li>• Business Engineer</li> <li>• Workflow Engineer</li> </ul>   | <ul style="list-style-type: none"> <li>• Application Architecture</li> <li>• System Architecture</li> <li>• 200 Business Processes</li> <li>• 150 Business Functions</li> <li>• Evaluated Workflow Tool</li> </ul> |
|  | <p>g) Workflow Design; Tool: OPEN / workflow 2.1 procedure builder<br/>h) Specification of all business functions; Tool: COOL:Gen<br/>I) Development of an architecture prototype for system integration; Tool: COOL:Gen, Visual Basic 4.0, Visual C++ 2.0 / 4.2</p> | <ul style="list-style-type: none"> <li>• Organizational Engineer</li> <li>• Workflow Engineer</li> <li>• Business Engineer</li> <li>• Application Engineer</li> <li>• Application Architect</li> <li>• System Architect</li> <li>• Workflow Engineer</li> <li>• Application Engineer</li> </ul>  | <ul style="list-style-type: none"> <li>• 250 Workflow designed</li> <li>• 150 specified Business Functions</li> <li>• Architecture Prototype</li> </ul>  |
|  | <p>j) Validation and Acceptance of all workflow; Tool: OPEN / workflow 2.1, Visual Basic 4.0</p>   | <ul style="list-style-type: none"> <li>• End User</li> <li>• Organizational Engineer</li> <li>• Workflow Engineer</li> </ul>   | <ul style="list-style-type: none"> <li>• validated and user-accepted Workflow Procedures</li> </ul>  |
|  | <p>k) Workflow Integration; Tool: OPEN / workflow 2.1, Visual Basic 4.0, Visual C++ 2.0 / 4.2<br/>l) Business System Implementation; Tool: COOL:Gen<br/>m) Test; no tool support<br/>n) Migration; no tool support</p>   | <p>22 project team members in following roles:</p> <ul style="list-style-type: none"> <li>• Project Manager</li> <li>• Change Manager</li> <li>• Release Manager</li> <li>• Database Manager</li> <li>• Test Manager</li> <li>• Application Architect</li> <li>• System Architect</li> <li>• Workflow Engineer</li> <li>• Application Engineer</li> <li>• System Engineer</li> </ul> | <ul style="list-style-type: none"> <li>• Workflow and Securities Management System in Production Environment</li> </ul>  |
|  | <p>o) Workflow Monitoring*</p>   | <ul style="list-style-type: none"> <li>• Workflow System</li> <li>• Organizational Engineer</li> </ul>   | <ul style="list-style-type: none"> <li>• Workflow Metrics</li> </ul>   |
|  | <p>p) Workflow Optimization*</p>   | <ul style="list-style-type: none"> <li>• Organizational Engineer</li> <li>• Workflow Engineer</li> </ul>   | <ul style="list-style-type: none"> <li>• Optimized Processes, Workflow Procedure</li> </ul>  |

These steps are planned:

Beside the methods integration another great challenge of this project was to engage and coordinate specialists with various skills that could never have been found in individual persons. This was essential for enabling the design and development of the LFBneu solution.

First of all know-how about the business processes was needed to do the redesign of them. Skills of a workflow engineer were required to do the workflow design and implementation for the business processes. To bring the implemented workflow to life, system and application architects were in charge to integrate the different hardware, operating and application software into a complete workflow-driven system. Even among the application engineers, teams had to be formed comprising of mainframe programmers (Cobol), database specialists (DB/2), COOL:Gen engineers, interface programmers (Visual Basic; Visual C++).

PROJECT AND CHANGE MANAGEMENT

Securities delivery and safekeeping was operated with old core bank applications and must be gradually replaced with new workflow-driven software. Such a migration has a large risk portfolio that must be kept under control with a migration concept.

The following risk categories are to be considered:

| <b>Project characteristic</b>   | <b>Risk</b>   |
|---|---|
| Introduction of new technologies and a new highly integrated application architecture. Very strong inter-linking with existing bank applications and partner systems. | Feasibility risk  |
| New procedures for bank personnel. Coexistence of old and new procedures and old and new organizational structures during migration time.                             | Operation risk  |
| Mass data business  | Feasibility risk as regards coping with volume and operation risk in error situations |
| Application is placed in direct contact with customer   | Operation risk, Reputation risk   |

The introduction scenario chosen is laid out so that only one risk dimension must be managed per introduction phase. The migration concept includes a continual parallel operation of the old solution. Each introduction stage shifts more of the business volume from the old onto the new solution.

**Implementation Phase 0**

The feasibility risks were eliminated in an Implementation Phase 0. The complete application architecture and system integration was set into place and was verified using two chosen business processes with the required 11 business functions verified. The installation mechanisms and the synchronization of the mainframe installation and the installation of decentralized system components were also tested with this 'prototype'.

### **Implementation Phase 1**

This phase of the project focused on the new operational procedures that were transferred and trained into meaningful related groups. The mass business in this phase was avoided so that the user could concentrate on learning, practicing and verifying the new processes. In this phase, the 200 business cases with the required 150 business functions are transferred into operationally meaningful groups on verified application architecture. The mass business from the trading applications batch still ran through the old application so that the phase would not be overburdened by the mass business.

### **Implementation Phase 2**

The mass volume will be transferred over from the securities trading applications in Implementation Phase 2. The verified processes and the well-practiced user could now cope with this mass volume of business cases.

## INNOVATIONS

### ***Business***

#### **Automatic orders entry**

The application architecture allows a straight through order processing because the order entry and processing in the workflow solution is fully automated. This is a relevant factor for the 3000 employees in over 200 sites of SBC in whole Switzerland. Institutional SBC customers can issue orders through SWIFT message-based applications, so the workflow-enabled processing starts on the fingertips of the customer.

Using the Internet for this purpose is just planned for now. Internet security has to evolve quite a bit before some real life solutions will be realized. Nothing in this direction has been implemented yet, but we are constantly observing the evolutions and trends in Internet technologies and banking needs. The architecture is open enough to integrate further delivery systems in the future and Internet could well be one of them.

#### **Process Integration**

The processes of SBC customers and business partner like clearing houses or share registers are in the securities delivery processes integrated by using workflow technology. The automation of the process interaction with customer's partners led to dramatically time and cost savings.

#### **Encapsulation**

By the principle of encapsulating data as well as code at the correct place it is possible to re-use individual modules in further projects. Such component-based architecture is a prerequisite for SBC in order that business changes or newly promoted services can be quickly set into action. That is how important market segments can be won over from the competition.

#### **System-wide transaction security**

Transactions of current mainframe applications must be extensively connected to the workflow processing for maintaining security. This fact dictates a further innovation—transaction security over distributed systems. As many as 6 different systems could be involved in one process (workflow-engine, interactive client process, communications server, CICS DB/2 server process, IMS process, computer controlled securities vault). As no tools exist yet that can handle this

overall transaction security in a heterogeneous environment, it had to be built explicitly into the architecture and concept which also fulfills the high banking securities requirements. This is a common pitfall of workflow solutions in high security environments like banks or insurance companies.

### **Cancellation concept**

Perhaps the biggest innovation in this highly complex environment is the cancellation concept.

The cancellation in LFBneu aims to undo the work step processes that were carried out. When the working of a given process takes place as a transaction, the LFBneu cancellation concept effects a transaction concept for the workflow system. At the end of a transaction either all work processes have been correctly carried out or all work processes already carried out can be undone.

The requirements of the LFBneu cancellation concept are highly ambitious. It should be possible to cancel already completed as well as current business. The cancellation of business on the part of the customer should be enacted as quickly as possible (that includes bookings in the customer deposit, customer account, customer statements etc). Cancellations should be able to be performed to the greatest extent fully automatically and without user interaction. Finally, the data of the original business should not be altered by the cancellation for reasons of comprehension and security. In addition to the two most important cancellation procedures (cancellation of settled business and cancellation of current business), the LFBneu cancellation concept offers many other cancellation possibilities. Examples are “cancellation by compensation”, the “rectification” type of cancellation and the “reawaking” of suspended tasks through the cancellation.

### ***System***

#### **Controlled Exception Handling**

Controlled Exception Handling in all its different variants allows an enormous increase in service quality through time saving and error reduction. Very large risks lie in the possible errors of securities delivery that can be reduced to a minimum through controlled exception handling.

#### **Automatic Warning**

The permanent supervision of results from the business environment (customer, share register, sub-custodian etc.) with the suspend/event mechanism automatically sets off a warning. A fully automatic warning will be given by the system for non-punctual entry of instructions. This is a further feature that saves manpower and time.

#### **Metrics Evaluation**

Metrics evaluation offers great advantages to the system. Besides the time and cost reductions mentioned earlier, the new system brings with it considerably more transparency in the process costs. It gives rise to a concrete basis for deciding the pricing of services in custody business. (See Appendix 5)

#### **Process Orientation**

The intense concentration on particular internal bank processes during the analysis phase at SBC strengthened the process-oriented way of thinking. Then, possibilities for rationalization resulted and will result in the future. The process models worked out could serve as basis for new definitions in the future and reveal potential areas for improvement.

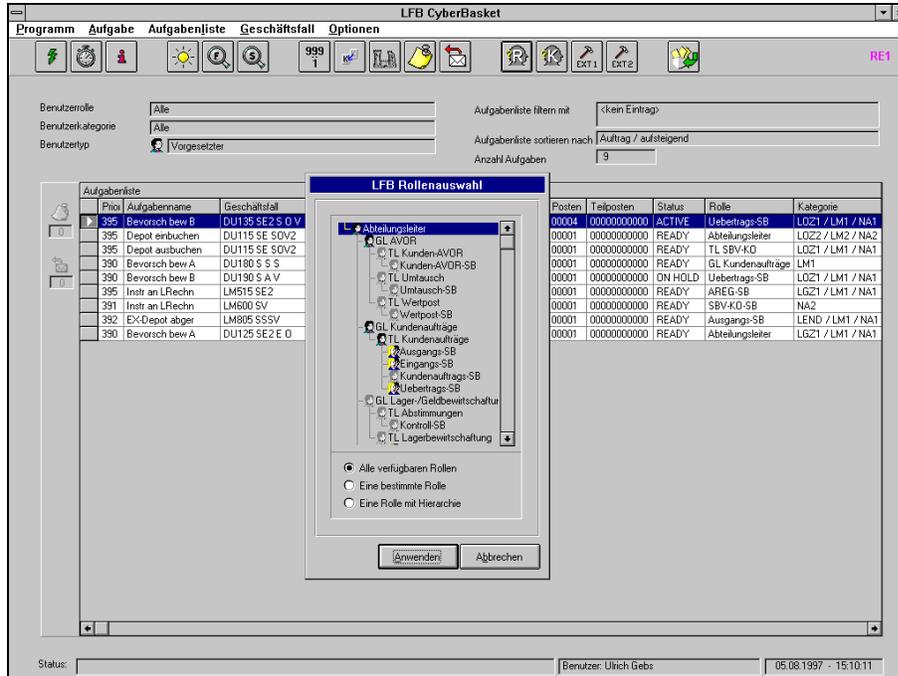
**Electronic Business Procedure Manual**

The Securities Management business is process oriented documented and based on Internet technology world-wide available for each SBC employee using the SBC standard infrastructure Internet-Browser Netscape. (See Appendix 4)

**Figures**

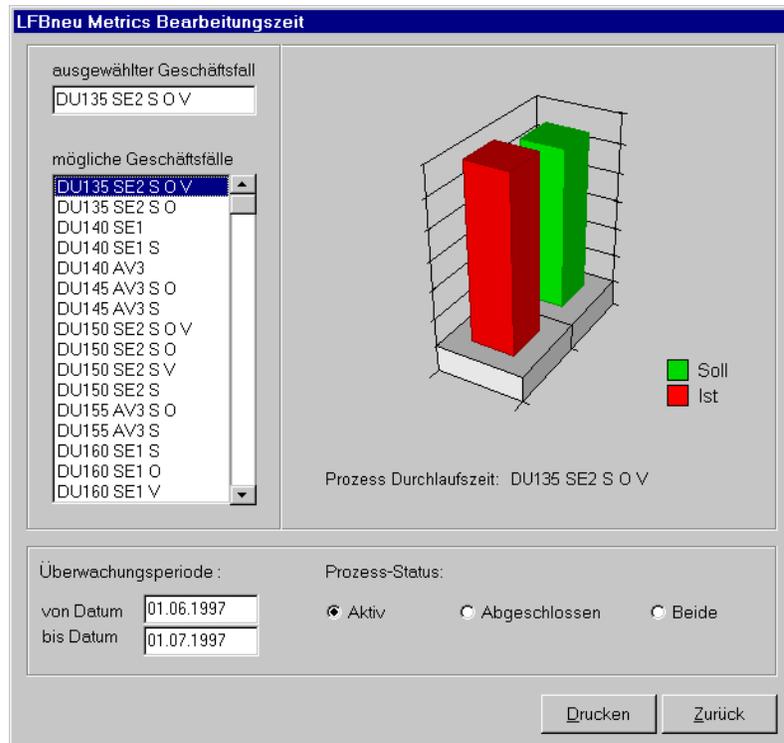
|                           |   |
|---------------------------|---|
| <b>Corporate overview</b> | <b>Swiss Bank Corporation SBC</b>                                   |
|                           | Founded 1872  |
|                           | One of the top three in Switzerland                                 |
|                           | 27,500 employees worldwide  |
|                           | Revenue of \$200+ billion per annum                                 |
| Project-team              | SYSTOR Competence Center Workflow / Case; Switzerland               |
|                           | SBC Custody team members; Switzerland                               |
|                           | Reunion Ltd; UK (workflow Consultancy)                              |
| Partners                  | Eastman Software, Switzerland                                       |
|                           | Sterling Software, Switzerland                                      |
|                           | JetForm; Germany  |
| System                    | IBM-390 MVS mainframe   |
|                           | HP K210 dual workflow servers                                       |
|                           | Compaq WinNT dual servers for communication                         |
|                           | Compaq WinNT server for Metrics                                     |
|                           | Compaq WinNT server for shared add-ons (i.e. printing)              |
|                           | IBM RS6000 AIX server for Securities Save system                    |
|                           | Compaq WinNT clients automatic processing                           |
|                           | Compaq WinNT clients for users                                      |
| Project Benefits          | 30 million in savings on personal costs based on the reorganization |
|                           | 3--5 million in annual cost savings in the Securities Management    |
|                           | 30 percent overall reduction in process cycle times                 |
| Project data              | Started in 4.Q./1994  |
|                           | Phase 0 in production 4.Q./1996                                     |
|                           | Phase 1 in production 1997  |
|                           | Phase 2 in production 1998  |
|                           | \$15 million project  |
|                           | Business value of some billion dollars                              |
|                           | System for 100 end users  |
|                           | 200 business processes in the Securities Management area            |
|                           | 250 workflow procedures   |
|                           | 50'000 orders per day   |
|                           | 20'000 workflow cases per day                                       |
|                           | Evolutionary user-driven process-centric project approach           |
|                           | Total people involved in 1994: 6 SYSTOR / 2 SBC                     |



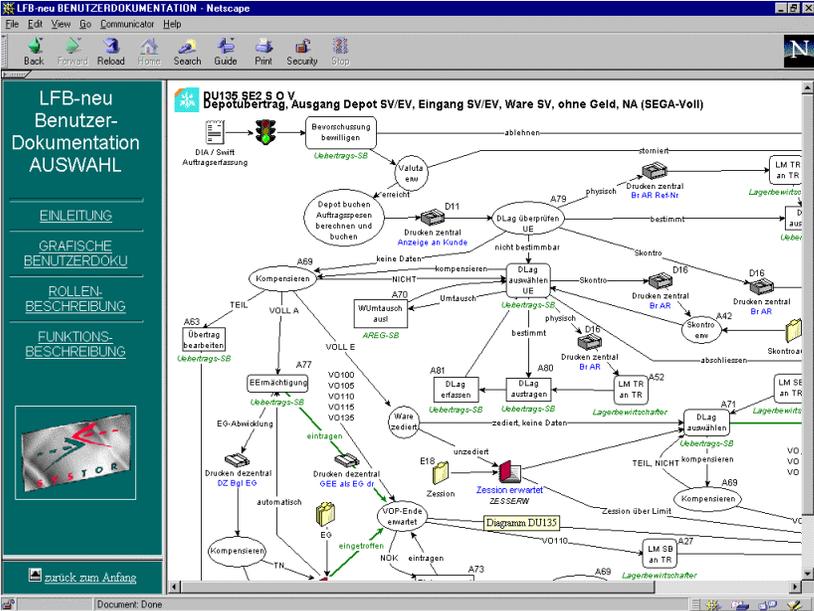


Appendix 2: ScreenShot CyberBasket; Visual Basic

Appendix 3: workflow; OPEN/workflow Procedure Builder



Appendix 4: ScreenShot Business Procedure Manual; HTML



Appendix 5: ScreenShot workflow Metrics; Visual Basic