MODERNSYSTEMS

CASE STUDY

WIN BOOK: NATURAL/ADABAS

PROJECT AND SOLUTION DETAIL FOR NATURAL/ADABAS MODERNIZATION, GLOBAL CUSTOMER SUCCESS STORIES

Introduction

Software AG, one of the remaining IBM mainframe independent software vendors (ISVs), has been selling the Natural/Adabas application platform for many decades on the IBM platform. While the Natural language has a COBOL-like syntax, it has its own proprietary runtime environment. Adabas, a high-performing, prerelational, inverted-list file structure often, but not always, accompanies many Natural-based mainframe applications. Despite running mission critical applications and transactions on this platform, specific factors are driving companies away from Natural/Adabas.

What You'll Gain From Reading This Document

This document incorporates industry analysis, direct customer feedback and 30 years of project experience to help you **validate our solution** as a best practice method for modernizing Software AG Natural/Adabas environments. The content within:

- **Summarizes the market trends** driving migration
- **Shares two detailed case studies** of Natural/Adabas modernization driven by stated market trends
- **Insight into Modern Systems' technology** used to modernize Natural/Adabas environments
- **Offers examples of other customer successes** worldwide using our solution

Relevant Environments, SAG Products

- z/OS, z/VSE, OpenVMS
- Natural: Report and structured mode, Construct-generated programs, Entire-X, Natural Process
- Adabas access from Cobol - ADAPREP, ADAPRI, ADASQL, direct calls

About Modern Systems

A global leader in modernization since 1983, we have:

- Been trusted by Walmart to modernize the world's biggest order processing system
- Completed several large scale, successful Natural/Adabas modernization projects worldwide
- Developed a solution that offers the most choice and least risk for modernizing legacy applications and databases

Why Modernize?

With business buyers and IT buyers both striving to extend the life of existing applications, yet still bring additional functionality and value to the business, modernization efforts for Natural/Adabas platforms being driven by specific business outcomes.

There has been an increasing focus on business operations, risk, and growth driving modernization rather than simply cost reduction. The focus on business outcomes enables IT and the business to focus investments where the business outcomes are richest and also prioritize initiatives from a portfolio strategy. The following are typical drivers used by business and IT managers to trigger Natural/Adabas modernization efforts.

Software AG's Shift In Strategy Driving Prohibitive Costs

In a press release Software AG wrote: "Software AG's strategy has been strongly focused on growth in the Business Process Excellence (BPE) business line since 2012. As a consequence, the company heavily invested in new products and the expansion of its sales teams."

This change in focus prompted Software AG to maximize the revenue coming in for Adabas while it still could. Most Adabas customers are large enterprises, so each customer could pay a lot more than a typical Open Systems customer. Prices for Adabas quickly jumped into the hundreds of thousands US dollars.

This short term revenue strategy has been effective. In January 2014, Software AG reported a record level of license sales in the final quarter, with Group license revenue climbing 22 percent. However, the number of Adabas installations has steadily declined, and revenue predictions for the same group in 2015 are 9 to 16% lower.

Resource Risk, Lack of Compatibility With Modern Business Needs

The Natural language and Adabas database have been classified as "legacy systems," so finding skilled resources in these areas is more difficult than ever. **Lines of business demand better reporting, integration with mobile, social, analytics and cloud platforms.** These requests expose the inefficiency of maintaining an Adabas platform, which can no longer compete with open systems in time to development, scalability and cost. The combination of these factors in addition to the prohibitive expense of Adabas platforms is driving change from the office of the CFO to the CIO.

Companies Are Fighting Back

Nissan has used Software AG's Adabas data management software and Natural programming environment to power its order-management system and other business tools since 1983. However, Nissan sued Software AG after the German software vendor tried to charge the Japanese automaker more than $3 million for the right to hand its applications over to an outsourcer. "Software AG recently has engaged in a widespread practice of auditing its licenses and demanding more fees from its licensees who are dependent on the Software AG software for their business operations," Nissan said in the court filing. Nissan in court papers filed called the move by Software AG a money grab from a vendor that "is not experiencing any significant growth from new products."

Customer Success: Singapore Land Authority

Business Requirements for Integration, Data Sharing, and Faster Service Spurs Transition

The Singapore Land Authority (SLA) handles the registration of property transactions, the issue of new title documents for all properties in Singapore. The Singpore Titles Automated Registry System (STARS) captures this information, applies current policy rules, and ensures accurate data for the Land Register, which is guaranteed by the government under the Land Titles Act. If this information is inaccurate, or if the updated policy information is not applied, the government is open to legal and financial liability.

Business Drivers for Project

The STARS system was built in 1995 on OpenVMS (DEC-Alpha), leveraging Natural/Adabas as the programming language and database. The objectives of the system were to:

- Automate several aspects of Title Registration for private properties and public housing to save time and reduce errors of manual entry
- Quickly and efficiently catalogue and report on title data

Maintaining the Speed of Business

However, as requirements evolved, the legacy systems were unable to efficiently support business needs.

Specifically, SLA needed increased system flexibility to:

- Respond to policy changes quickly and uniformly
- Allow new types of property transactions to be added to meet future business needs and data sharing requests across government agencies
- Extend capabilities of search and data filtering

The amount of time it would take to develop, then the cost to maintain these features in the legacy Adabas environment proved to be prohibitive for SLA.

Lastly, the STARS system had accumulated nearly 20 years of data and application customization. It was imperative to translate the appearance and functionality of the system in a manner that minimized user impact.

SLA: Project Delivery and Feedback

Critical Project Requirements

To ensure accuracy at all points, the SLA mandated:

- Measuring/optimizing data quality and planning data synchronization
- Mapping of existing data, tasks and functionality from current systems and database to target platform
- Ensuring accuracy of mapping and translation plan
- Plans for ensuring adherence to strict security policies during migration/conversion

System performance was a top priority as well. The new system had to perform as well or better than the legacy system. Therefore, the SLA requested comprehensive tests (unit, integration and system testing) conducted under the peak load specified within the application requirements.

Lastly, the code produced in the target state had to be of high quality to support STARS' integration requirements. The data from STARS is integrated into multiple form versions and over 100 external applications and databases.

In all, the following legacy workload was refactored to Java with Oracle Database:

- Over 1M lines of Natural code
- Over 150 DDMs representing more than 70 Adabas files
- 700 DCL programs

Performance

Performance benchmarks were set to ensure the refactored application met the needs of the business. Batch was tuned to execute within the batch window without impacting the operational Service Level Agreement. For Online, a 3-second response time was achieved for 90% of the cumulative transaction volume over SLA business hours (8:00am to 5:00pm); and no more than 5 seconds for 90% of the remaining 10% of transactions.

Custom UI Enhancement

All non-popup Natural maps were included in an HTML page that contained a Top Frame, Left Frame and Body Frame. The non-popup Natural map were included in the Body Frame of the web page. All searches and links were associated to the Top Frame and Left Frame and were coded to invoke a New Browser Window. Searches and links were removed from the Body Frame to ensure the 'conversational' integrity between the Web Browser client and the Web Application running on the Web Application server.

Knowledge Transfer

For optimal value upon delivery, Modern Systems provided Developer Training to the SLA team to ensure proper understanding and usage of the refactored code and supporting framework.

Customer Feedback

"We are pleased with the outcome of our engagement with Modern Systems," says Li Phing. "We were able to achieve our project goals within the timeline and budget specified at the outset of the project."

"Additionally, the refactored code and data tier acted as expected, enabling us to integrate with internal and external systems as needed, at the level of performance we required. The modernized STARS can now deliver data in ways that will provide new value to customers countrywide."

Customer Success: Police Mutual

Business Requirements for Integration, Speed to Service, and Microsoft stack drive transition

Police Mutual Assurance Society (PMAS), founded in 1922, offers financial advice and a range of products designed especially for the members of the UK Police services and their families. The ultimate goal of this modernization project was to help over 200,000 police officers receive savings, investments, and insurance services quicker.

Business Drivers for Project

PMAS was using a DEC-Alpha (Open VMS) environment to handle critical customer information and share data between different financial platforms. This environment and its surrounding systems became increasingly difficult to support and often lacked the ability to integrate modern systems used to gain insight from customer data.

Modern Systems' technology and services were used to modernize the legacy language and database from Natural/ Adabas to a new environment leveraging Microsoft SQL Server Enterprise, Windows Server, Visual Studio and Hyper-V.

The Results

David Loughenbury, CIO of Police Mutual, acknowledged the business benefits of moving to the new platform. "The old platform required significant manual work to export data and had no rules or intelligence for automation. The new platform allows us to process and share data between business groups quicker with less risk. This project is the first phase of modernizing our overall infrastructure, reducing operating costs and adding integration with products like Microsoft Dynamics CRM. Now, our services and marketing teams can leverage data to do what we do best- know our customers and their needs."

The year-long project refactoring over 1 million lines of Natural and Adabas data was not without its challenges.

"The DEC-Alpha environment came with issues like file versioning and dynamically submitted Natural code for the DCL. Luckily, the source environment is ASCII like Windows so we were able to minimize codepage challenges", says John Regan, VP of Delivery at Modern Systems.

Adds Loughenbury, "We knew there would be some difficulty with the legacy environment, but we selected Modern Systems because of their significant experience, proven tools, and on-shore support. Modern Systems has worked closely and reliably with our teams from the inception of the project through the sizing and planning, right through to the delivery. The project has been completed within timescale and budget and this enables us to move onto the next stage of our IT strategy. The services provided by Modern Systems really accelerated the migration timeframe and de-risked delivery."

How It's Done: Modern Systems Solution Details

Our Refactoring solution delivers MORE than just a one-to-one conversion. Customers receive a fundamentally optimized application, infrastructure, and business function delivery vehicle. The following breaks down the technical details of our solution, followed by the applicable platforms for delivery.

Principal Solution Benefits

Modern Systems leverages automated data collection and code refactoring technology. Our solution guarantees a functional match to the source environment while generating fully maintainable Java or C# code. We refactor Adabas databases directly to DB2, Oracle or SQL Server. Specific benefits include:

- **Faster time to production** for modernized applications
- **Reduced cost and complexity** of modernization engagement
- **Minimized impact on users** and business units

The maturity of our solution enables us to deliver seamlessly though partners, who often use us to either complete or enable the scope of their core services.

Portfolio Analysis

It's necessary to have a complete, holistic analysis of the legacy system to ensure accurate results. Report output represents the legacy environment, covering technical inventory, business logic and project risk factors. This output can also reduce maintenance costs of the legacy environment by mapping out functional code and identifying "dead code". The output of this stage typically includes:

- Documentation of embedded languages, databases, 3rd party calls, etc
- Discovery of business rules, facilitation of business logic extraction
- Dead code identification and removal Excess and/or problematic inventory identification and removal
- Project Plan: timeline, duties, processes for error handling and change control

Target System Build, Data Modernization

Once inventory and legacy functionality is validated, the target environment is built and tested. Upon acceptance, Modern Systems began code refactoring and migration. The following process is automated and executed using Modern Systems' technology:

- Generate Natural unload programs to run against Adabas
- Resulting data is transferred to the target environment
- Generate programs to transform the data
- Generate loader utility, load the data to target
- Validate the data refactoring has been successful using check-sums and hash algorithms
- Full comparison of data from Adabas vs target
- Perform pre-delivery testing on every Adabas file that will be migrated at Go-live
- Add new tables and columns required as needed to target database
- Preserve archived data

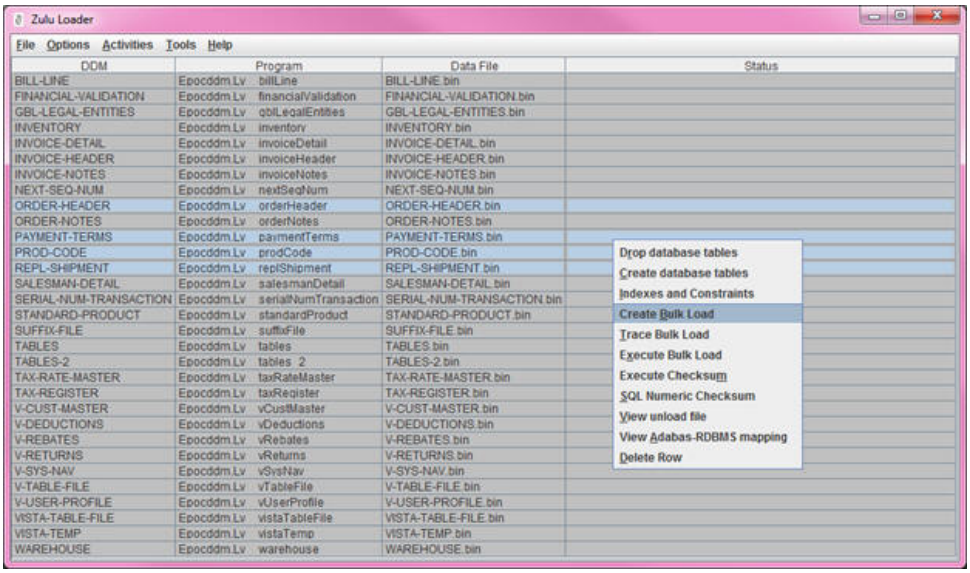
How It's Done: Solution Detail, Continued

Code Refactoring

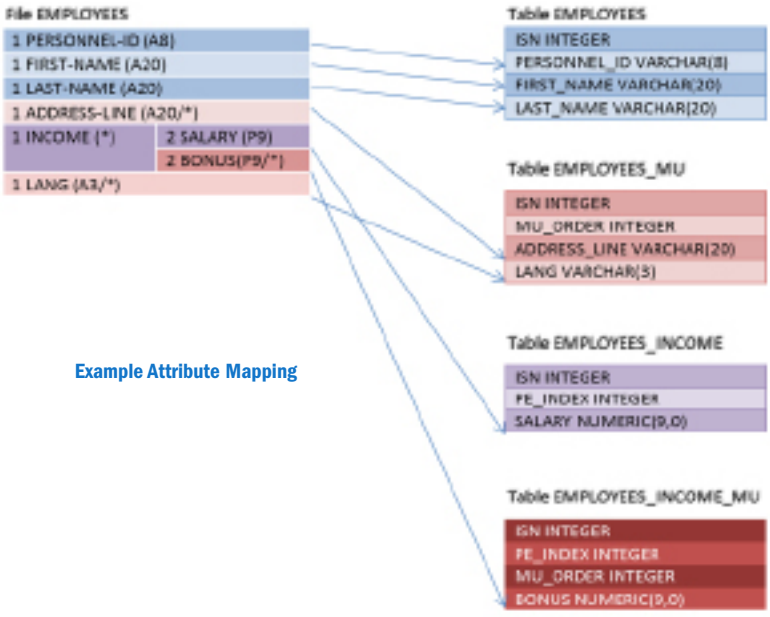
Natural code is refactored to Java or C# using our automated solution. Refactored programs can use a mix of Adabas and relational data facilitating gradual transition. Adabas-relational database synchronization reads Adabas PLOG and updates the refactored database, to facilitate parallel execution during transitioning. The logic of the application and presentation layer are refactored directly, then refined to meet requirements articulated specifically for the target state.

Testing and Delivery

A mutually acceptable Severity Index and Response matrix is created to classify and address bugs found in testing. Modern Systems works together with customers to validate unit tests and functionality of all refactored code.



Example Screen for Migrator



Example Attribute Mapping

How It's Done: Solution Detail, Continued

Target Environment Services

Ultimately, your modernization project depends on how it works in production. However, few companies have resources with equal understanding of Natural/Adabas and target states like Java, C#, SQL Server, DB2 or Oracle.

Modern Systems works as a connector between application and infrastructure teams, interpreting the conversion data to help meet requirements for target system performance. Our expertise on both sides of the project can help ensure ongoing success. Our post-production services include:

- Target Environment Architecture
- Target Environment Deployment
- Ongoing Application Maintenance

Target Environment Architecture and Deployment

Natural/Adabas requirements for performance don't always translate directly to modern infrastructure. We can ensure your design has the proper sizing and resources necessary for success in production. We work with several enterprise infrastructure providers, leveraging best practices and resources. Our supported infrastructure platforms include:

- HP
- IBM Z-Series, SoftLayer
- OpenStack
- EMC
- Amazon Web Services
- Microsoft Azure

Ongoing Application Maintenance and Management

Once the refactored application goes into production, many companies prefer to focus their best technical resources on augmenting the converted application, increasing its value to the business. Given our understanding of the application's requirements and usage patterns, companies often hire Modern Systems for application maintenance and management, enabling their IT teams to tackle tasks that add more value to the business quicker.

Customer Success Index

Modern Systems has been the global leader in transitioning customers away from NATURAL/ADABAS platforms for over a decade. The following offers further insight to our history of success.

South Carolina Department of Employment and Workforce

Business Environment
The South Carolina Department of Employment and Workforce (SCDEW) oversees the registration and collection of the Unemployment Insurance Tax for South Carolina.

Business Need
SCDEW is an IBM mainframe installation. Over time, they migrated many of their Adabas and NATURAL applications to alternative platforms/packages. The remaining applications did not warrant the Software AG licensing fees. SCDEW selected the C#.net platforms as their preferred future platform.

Source and Target Environments
IBM z/OS with:
- 96 ADABAS / Vsam views
- 304K Lines of NATURAL and NATURAL VSAM Code
- 65 JCL members, 72 procedure members

Target System: Windows
- SQL Server database
- Application migrated to C#.NET
- JCL migrated to Windows scripts

Timelines
Delivery of modernized solution: 5 months
Total time through production implementation: 18 months
The refactored application went live in July 2011.

Export-Import Bank of the United States

Business Environment
The Export-Import Bank of the United States (Ex-Im Bank) is an independent U.S. Government agency that helps finance the overseas sales of U.S. goods and services. The Bank provides loans, loan guarantees, and insurance products.

Business Need
Export-Import Bank key business objectives are to improve the quality of service provided, manage the insurance and guarantee portfolio more effectively, and achieve flexibility to adapt more quickly to the industry and customer demands. A modernization to a new and open environment would allow the bank to achieve those business objectives.

Source and Target Environments
Mainframe/VSE with:
- 700 ADABAS/NATURAL programs
- 100 ADABAS tables
- 200 NATURAL maps
- 600,000 lines of code

Target System Windows
- Tomcat application server supporting J2EE
- Application migrated to Java/J2EE/JSP
- Oracle database

Timelines
- Modern Systems delivery of modernized solution: 8 months
- Total time through production: 36 months

Current Status
Applications were successfully refactored and tested, currently in production.
Modern Systems received 3 more applications for additional refactoring.

Customer Success Index, continued

United States Dept of Energy

Business Environment
The Energy Information Administration (EIA) is the section of the US Department of Energy providing statistics, data, and analysis of resources, supply, production, and consumption for all energy sources. The source applictions are used to collect and process data related to oil and gas resources.

Business Need
EIA has maintained three major oil and gas applications for over 20 years. The applications comprise a number of differing and, in several instances, proprietary technologies, principally Software AG's ADABAS and NATURAL. In recent years, EIA has found it difficult to maintain these legacy applications due to a scarcity of programming resources, and the increased costs associated with the aging technology. However, the business rules at the core of the technology provide effective support to the organization. EIA determined that it would be cost effective to engage Modern Systems to refactor the legacy code and data to the more modern Java and Oracle technologies. Their desire was to position the applications for future growth and to leverage current and emerging technologies.

Source and Target Environments
IBM OS/390 with:
- ADABAS and VSAM databases
- 1M LOC NATURAL/COBOL
- Written in Assembler, COBOL, Easytrieve, FORTRAN, JCL, NATURAL, and PL/I

Target System: Linux
- Oracle database
- Written in Java
- JCL migrated to KShell

Timelines
Delivery of modernized solution 12 months, total time through production implementation 24 months. Customer is in production with a successful modernization, and is very happy with their return on investment.

Armed Forces Services Corporation - USA

Business Environment
Armed Forces Services Corporation (AFSC) has a 130-year legacy of service, providing high quality, selfless people to help federal government improve the lives of active Military personnel, Veterans and their Families.

Business Need
AFSC was using a set of applications developed in NATURAL to provide military health and human capital services to the federal government and military personnel on deployments worldwide. Rising costs and technology advances prompted AFSC to initiate a modernization project that allowed them to transform their NATURAL based applications into c#.NET based applications, thus helping them significantly reduce software costs and enabling new technology options.

Source and Target Environments
IBM z/OS with:
- ADABAS database
- 300K Lines of NATURAL

Target System Windows with:
- Application migrated to C#.NET with SQL Server database
- CL migrated to Windows scripts

Timelines
- Delivery of modernized solution 4 months
- Total time through production implementation 6 months

The project was completed and went live within six months. Additional enhancements have been completed for the client and everyone involved with the project is very happy with the outcome. All objectives have been achieved within the planned timeframe and budget.

Customer Success Index, continued

Universal Music Group

Business Environment
Universal Music Group is one of the largest distributers of music in the world. They own many of the most famous record labels, including Interscope, Island Def Jam, Capitol Music Group and Blue Note.

Business Need
UMG's Order Processing and Dispatch application was the last application left on their IBM mainframe in the UK. Modernizing it to another platform meant the mainframe could be closed down allowing UMG to achieve significant cost reductions. UMG went through a lengthy decision making procedure to evaluate all the options available to them and finally decided to refactor the application to a C#./NET - a platform they already had in place for other applications.

Source and Target Environments
IBM z/OS with:
- ADABAS database with 180 million data records
- 360K Lines of NATURAL Code
- 17k lines of JCL

Target System Windows:
- SQL Server database
- Application migrated to C#.NET
- JCL migrated to Windows scripts

Timelines
- Modern Systems delivery of modernized solution: 6 months
- Total time through production: 13 months

Current Status
The refactored application went live in 2012. The overall project was delivered in time and within budget.

Leumi Bank

Business Environment
Leumi bank is the second largest bank in Israel. The bank is using ADABAS/NATURAL for their main banking applications and all the online activities between the bank and its branches are performed by NATURAL applications.

Business Need
The bank wanted to modernize its ADABAS/NATURAL applications to DB2/Java in order to reduce costs of maintaining ADABAS/NATURAL software. The cost reduction would result from saving the maintenance cost to Software AG, and by using the IBM zAAP processor that runs Java loads and reduces the number of MIPS. Also the bank wanted to improve service to customers, and moving to a modern environment and relational database would enable that.

Source and Target Environments
Mainframe/MVS with:
- 60 ADABAS/NATURAL applications
- 7,000,000 lines of code

Target System Mainframe z/OS with:
- WebSphere application server supporting J2EE
- Application migrated to Java/J2EE/JSP with DB2 database
- IBM zAAP processors

Timelines
Total time through production implementation of pilot 7 months. Staged modernization demonstrated coexistence capabilities in which some of the ADABAS tables were refactored to DB2 and some remained in ADABAS. The refactored Java application is working with both DB2 and ADABAS. The refactored Java application is interfacing with other non-migrated NATURAL applications. Modern Systems is currently delivering ongoing application services to Leumi Bank.

Customer Success Index, continued

Automation - Israel

Business Environment
Automation is a company that provides IT services to about 250 municipalities in Israel. Automation provides three types of IT services:

- *HR and Salary System*: Provides HR and salary services to municipalities' employees. This system runs on 3 mainframe systems using ADABAS/NATURAL and ADABAS/COBOL.
- *Finance System*: Provides financial services to the municipalities. This system runs on a mainframe system and also on Solaris, using ADABAS/NATURAL.
- *Billing System*: Provides billing services to the municipalities. This system runs on mainframe and Solaris systems, using ADABAS/NATURAL.

Business Need
Automation wanted to save costs and close its three mainframes within two years. They also wanted to save costs by eliminating the ADABAS/NATURAL maintenance expenses. They wanted to move all three applications to work on Unix and Windows systems, using either Oracle or SQL Server databases. They also wanted to improve the services they provide to their clients, in order to keep them with Automation and avoid competition. Moving to Java on an open system would allow them to add much more sophisticated services.

Source and Target Environments
Mainframe/VSE with:
- 22,000 ADABAS/NATURAL programs
- 2,000 ADABAS/COBOL programs
- 700 ADABAS views
- 14,000 NATURAL maps
- 9,000,000 lines of code

Target System Unix/AIX with:
- Tomcat application server supporting J2EE
- WebLogic application server supporting J2EE
- Application migrated to Java/J2EE/JSP
- Oracle database

Current Status
All applications have been successfully in production since 2009. There were 3 separate applications so delivery was staggered.

- Modern Systems delivery of modernized solution timeline: 12 months
- Total time through production implementation 38 months