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For Eidgenössische Zollverwaltung EZV
September / October 2010

Optimizing EZV's Current and Future Customs Platform

A Technical Audit of the e-dec Application

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Executive Summary

The Eidgenössische Zollverwaltung (EZV) engaged Forrester Research in July 2010 to assess its two major applications – e-dec and NCTS – and recommend improvements in technology architecture, organization and management practices, and costs and benefits. EZV was motivated by doubts that e-dec in particular was a sound foundation for its core business processes (import, export, and transit) in the future due to unpredictable costs, high costs, and application instability.

After reviewing hundreds of pages of documentation and interviewing all of the major stakeholders in EZV and BIT (EZV's IT provider), found that:

- After 10 years of investment and effort, EZV has not yet been able to achieve its strategic IT goal of creating a single application for all of its import, export, and transit processing.
- The e-dec application generates significant costs, due to its distributed architecture and use of substantially more storage than NCTS, to which e-dec is often compared. E-dec's operating costs are much higher than NCTS' operating costs.
- No individual in either EZV or BIT is responsible for end-to-end performance, reliability, and cost control for e-dec. As a result, EZV has been unable to remedy various complaints about e-dec. Also, EZV has been unable to control the operating costs of e-dec.

Forrester recommends that EZV reform its application strategy as follows:

1. Adopt a strategy that assumes e-dec and NCTS will be employed for many years.
2. Drop the stated goal of replacing NCTS by 2013 and consolidating all import, export, and transit processing on e-dec.
3. Reorient all e-dec and NCTS investment to achieving two strategic goals:
    a. Continue to expand automation of customs processes to remain competitive and generate the significant revenue the Bund depends on from its customs administration.
    b. Reduce and control the operating costs of e-dec and NCTS to fit the Bund's budget constraints.
4. Seek to consolidate all export-declaration processing on a single application to save costs. Currently, both e-dec and NCTS process export declarations.
5. Work with BIT to solve e-dec's reliability issues once and for all, and only then determine the feasibility of e-dec as a single application for all customs processing.
6. Design an architecture to integrate e-dec and NCTS in pursuit of the new strategic goals.

Further, Forrester recommends that EZV reform its IT management organization to implement the new application strategy. EZV will need a business architect to take responsibility for its application portfolio, and to manage end-to-end financial and functional application performance against its strategic goals. Forrester recommends that EZV:

1. Implement the Bund's NOVE-IT Process P04 "Informatik führen." These recommendations concern:
    a. Centralization of top IT management activities and elevation to one-up "integration management" level
    b. Dedication of a minimum of 3,5 FTE to the new unit to cover EZV's overall IT strategic planning, budgeting and portfolio processes, according to the directions specified by die Strategische Informatikplanung (SIP).
2. Appoint one "full time equivalent" employee to cover each of the missing SIP roles; specifically;
    a. A business process owner for the core processes transit, export and import
    b. An enterprise business architect. Based on our experience, we believe that this business architect (BA) should be an internal executive at senior level with

demonstrated deep knowledge of the core processes transit, export and import and excellent relationships within EZV with the custom offices and also with EFD and BIT.

3. The new business architect should set up a task force consisting of EZV's IT finance / controlling, the application managers of e-dec and NCTS at EZV and BIT, and BIT's enterprise architect. Together they should refine the baseline created in this project and develop an improvement plan for e-dec.

Purpose and Methodology

Project Objectives

The Eidgenössische Zollverwaltung - EZV (the Swiss Customs Administration) engaged Forrester Research in July 2010 to:

- assess the e-dec/NCTS application environment supporting EZV's core business processes import, export, and transit; and
- provide strategic recommendations for the future state, including technology architecture, investment and benefit aspects, and management practices.

The objective was for Forrester to analyze the adequacy of e-dec and NCTS and answer several questions, which concern EZV's executive management, articulated as:

1. Why are the operating costs of e-dec 3 times higher than NCTS?
2. What are the advantages/disadvantages of e-dec as EZV's single strategic application for export, import, and transit processing? Will e-dec be able to support EZV's need for a high performance, mission critical, and secure import, export, and transit processing in the future?
3. Are the current and future plans to embrace a SOA/Java environment implemented correctly in e-dec? If not, how can the overall situation be corrected?
4. Can e-dec be expanded to perform all of EZV's import, export, and transit processing? What are the financial implications and consequences of an expansion of the current e-dec system? (e.g. Is it necessary that a new server must be added for each bundle of additional 10'000 incidents?)
5. Could all functionality of NCTS be integrated into e-dec? What would the cost be? (rough estimate) And could the critical security feature/functionality still be guaranteed in the transitioned end state?
6. How is the service delivery formalized and implemented? Is it supported through organizational processes such as governance, architecture, and service management? How do these processes flow? What is their impact on costs and service quality?

Project Methodology

In conducting this audit, Forrester carried out the following key tasks:

- Reviewed background documentation provided by EZV and BIT[1]
- Conducted stakeholder interviews with representatives from EZV and BIT[2]
- Processed the facts into findings and preliminary conclusions and reflected these back to representatives from EZV and BIT[3]
- Consolidated the findings, conclusions, feedback into this final report which provides also a set of recommendations concerning technology architecture, investment and benefit aspects, and management practices.
- Summarized the key elements of the final report into an executive presentation[4]

Purpose of this document

This document concludes the audit. The following sections will:

- Summarize the current situation making references to documentation provided by EZV and BIT
- Revisit the findings presented on August 20 to address the comments and additional clarifying discussions since then
- Provide a set of conclusions as basis for recommendations
- Make recommendations on how to improve the current situation

Current Situation

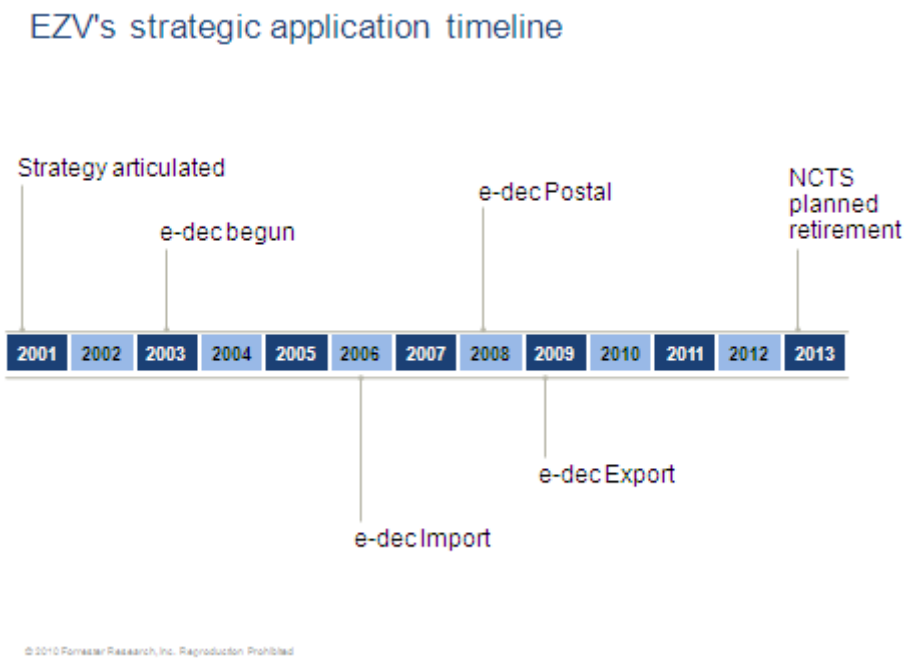
Overview

About 10 years ago EZV planned to have one technology platform for processing import, export, transit, and postal functions. At the time, EZV's import-declaration processing was done by an application called ZM90. A different application – NCTS – processed export-declarations and transit messages. ZM90 was obsolete and needed to be replaced.

The concept was to support all business service levels through a modular, flexible and more efficient SOA-based architecture and a single user interface for EZV's 4,000 officers as well as external organizations that interact with EZV's systems[5].

First the import application ZM90 was redesigned and put into operations in 2006[6]. The new application is known as e-dec. Next, the postal application ELPO was replaced by IPV[7] in e-dec. Finally, the project called IDEE implemented export processing functionality in e-dec. See Figure 1.

Figure 1



Source: EZV and BIT documents

In the second half of 2009 the new e-dec Export was launched and began to gradually take over the processing of export declarations from an old paper based solution. According to the "all e-dec" statement of work formalized in 2008, e-dec was expected to replace NCTS' entire functionality, i.e. export and transit, by the end of 2010[8]. A more recent roadmap diagram suggests the projected finalization of the redesigned NCTS and integration into e-dec as 2013[9].

In fact, EZV currently now employs two applications – NCTS and e-dec – to complete its import and export declaration processing, transit request processing, and postal functions. In Q1 2010 EZV used e-dec to process all import declarations, and about 46% of export declarations. EZV still employed NCTS for 33.3% of export declarations and all transit declarations[10].

Moreover, EZV's executive management has serious doubts that e-dec can ever become the single application for all import-export-transit-postal processing envisioned 10 years ago. Why? Inconsistent reliability and high costs.

NCTS and e-dec are enterprise applications that must meet strict availability, security, and change-management requirements. Table 1 summarizes these common requirements for both applications.

Table 1

Category	Requirement
Hours available	24 hours per day, 7 days per week.
Availability SLA	99.8% uptime
Planned service windows	Sunday von 0800 - 1200
Security	High
Releases per year	Target: 4 major releases per year

Source: Forrester Research from interviews and documentation

Table 2 summarizes the main differences between e-dec and NCTS[11].

Table 2

Feature	e-dec	NCTS
EZV business processes	1. Import declaration processing 2. Export declaration processing	1. Export declaration processing 2. Transit message processing
Business impact at EZV	Principal source of income of EZV, over 10 Bn CHF /annually	Administration of securities and bonds of ca. 100 Mio CHF.
Political and economic Impact	High domestic impact. In case of failure all involved parties will have to deal with delays in the clearance handling. The conditions of futures cannot be kept. Losses of up to one day can be compensated at great cost because of a back up process but longer failures have to be written off at great losses.	High impact domestically and internationally. In case of failure all involved parties will have to deal with delays in the clearance handling, emergency procedures are based on written paperwork. Failure mostly affects the export area. Emergency procedures need be handled manually and require the respective effort form all involved countries in Europe.
Service hours	7/24 h Operation (peak hours 4am – 6pm)	7 / 24 h Operation (peak hours 4am – 9pm)
Availability in 2010, (January-June)	99.8% requested 99.85 reported	99.8% requested 99.88 reported
Architecture	3-tier Java Web	2-tier database application (most logic in the database)
Workload(s)	Declaration processing: Either import or export declarations	• Declaration processing (Export only). • Transit message processing (120 different messages)
Annual service fees due to BIT in 2010 and 2011	2,181M CHF in 2010 2,904M.CHF in 2011	1,099M CHF in 2010 1,081M.CHF in 2011
Number of developers at BIT in 2009/2010	16 FTE (about 20 pers.) in 2009 12 FTE in 2010	5 (about 8 persons) in 2009 5 (about 8 persons) in 2010
Permanent project staff at EZV in 2010	5	3
KSC staff at EZV in 2010	1,5-2,5 FTE e-dec import and 2-4,5 FTE e-dec export	2-3,5 FTE NCTS

Source: Forrester Research from interviews and documentation

Before proceeding further with its original plan to expand e-dec to perform all export, and transit functions, EZV asked Forrester Research, Inc. to audit of e-dec and make recommendations for the next steps[12].

A Description of e-dec's Architecture

E-dec is an application for managing EZV's import, post, and some export business processes. The application automates processing of declarations associated with import and (some) export requests to the Swiss government. About 2,000 Customs Agents use the application, and many firms submit import and export declarations to be processed by e-dec. E-dec is EZV's system of record for Import-declaration processing.

E-dec's primary import function is to register import declarations, and automatically generate the required reference certificate, manifest, and fees. To carry out this import-management function, e-dec provides a tool for customs officers to review requests, input declaration information, and either approve or decline import registrations. E-dec also provides trade statistics and accounting information to two other Bund systems.

E-dec is one of two systems EZV employs to process export declarations. NCTS is the other, and NCTS is EZV's system of record for Export declarations. Both applications process export declarations and provide appropriate responses to the applicant. Although both e-dec and NCTS process export declarations, NCTS' database is the system of record for export-declaration processing. NCTS accepts declarations in the EDIFACT format, and e-dec accepts declarations in XML. Both systems accept declarations via email (SMTP); e-dec also can take declarations via a Web service interface.

The e-dec application employs four layers to do its work, as depicted in Figure 2[13]. These layers perform the following functions:

- **Interaction tier manages key officer and customer interactions.** People and customers interact with e-dec in two ways: through a Web application and through electronic documents. The Web application displays declarations and provides various controls for Customs personnel to manage declarations. The "Flow" module of e-dec manages incoming electronic documents (in either email or EDI formats), as well as return messages.
- **Business processing tier processes declarations.** Import and export declarations are actually processed by the module called "e-dec Core". This is a custom application that employs a variety of *services* (written in Java) to validate, process, respond to, etc. declarations. E-dec Core selects and arranges the appropriate services for a given declaration based on the context for that declaration.
- **Data management tier manages transactions and content.** The e-dec system employs two databases. The Production Database stores the results of declaration processing. The Operational Data Store (ODS) is like an internal data warehouse. ODS provides snapshots of the Production Database to allow analysis and reporting on e-dec's data.
- **Auxiliary links integrate with external systems.** The e-dec system employs a variety of integration links to external systems – principally NCTS, Fire III, GSD, and Tabak/Bier. Most of these are links between databases, and do not employ the e-dec Interaction Layer. For example, e-dec loads the Customs product catalog data stored in the GSD database at the beginning of each day via a database link.

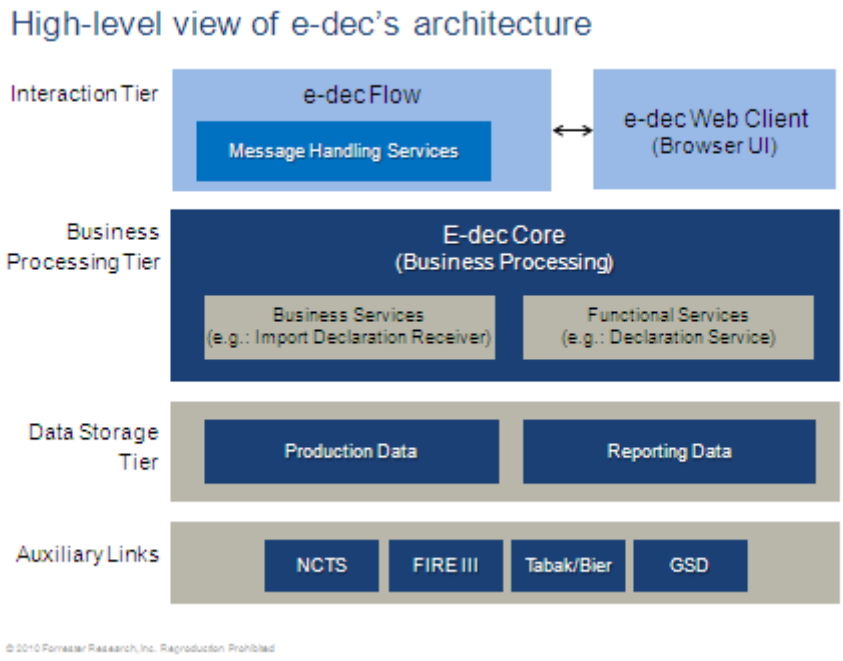
The interaction (e-dec Flow), business services, and data management tiers each run on separate servers. BIT can raise the capacity of each layer independently of the other. So, for example, as e-dec's export-declaration load expands, BIT can add servers to the interaction-processing tier to handle greater volumes of declarations coming in, as well as add servers to the business-processing tier to ensure steady throughput of declaration processing. BIT can also expand e-dec's data management tier, as per normal database-scaling practices.

BIT employs virtual servers (rather than physical servers) for e-dec. As of August 20, 2010, the ratio of interaction tier (e-dec Flow) servers to business services (e-dec Core) servers was 2 e-dec Flow virtual servers to 10 e-dec Core servers.[14]

E-dec processes incoming import declarations using the basic process depicted in Figure 3. Processing starts with the arrival of a declaration via either email or a Web service API. At that point:

- The declaration is converted into an internal format – a Java object – and forwarded by the message-handling services in e-dec Flow to the business processing services of e-dec Core. The message-handling layer of the architecture manages message security (digital signatures and encryption), as well as message-validation rules, and other functions relevant only to message processing.

Figure 2



Source: Forrester Research, Inc. from BIT documents

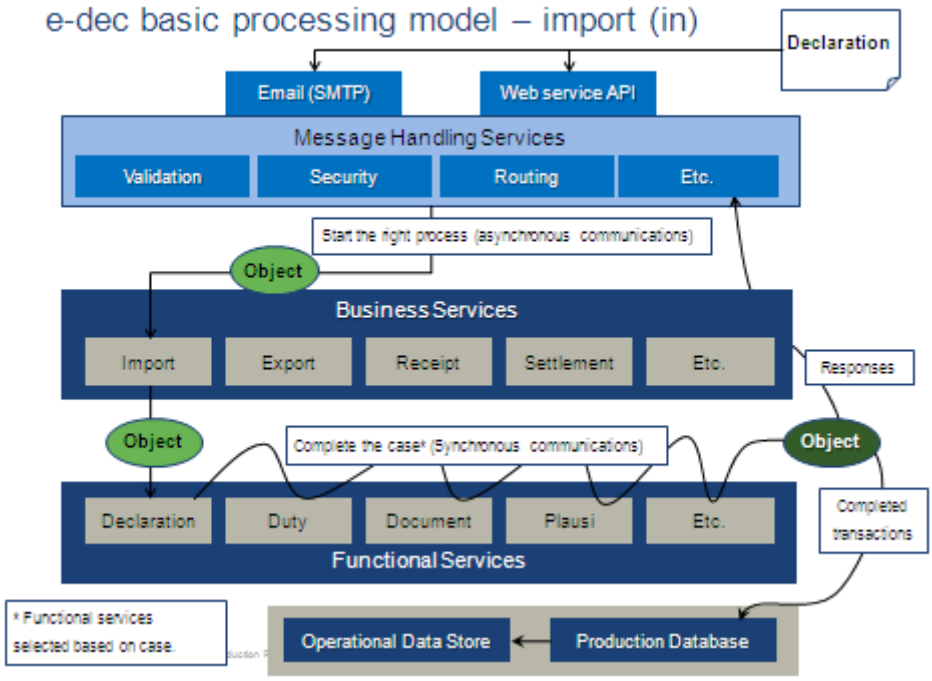
- By the time a message reaches the business processing services of e-dec it is validated and ready to be processed. Two essential activities ensue in the business-processing layer. First, the declaration, in its Java form, is sent to the right process within e-dec Core. Second, e-dec core assembles the right collection and sequence of what we call functional services to process the declaration. E-dec provides individual Java modules for each function required to process declarations, including declaration handling, duty calculation, "plausi" rules, documentation, and others[15].
- When an individual declaration is completely processed, the e-dec core updates the Production Database with the results of that case. This data update is performed using conventional database transactions and Java database interfaces.

Figure 3 highlights the two kinds of communications used in e-dec: asynchronous and synchronous. Asynchronous communications is a flexible model. It means, for example, that e-dec Flow and e-dec Core can "talk" about multiple declarations at the same time. Synchronous communications is less flexible, but faster. Each declaration processed in the e-dec Core is done so using synchronous communication between Java modules.

Figure 3 is a simple view of how e-dec processes Import declarations to provide an understanding of how the application works. Figure 3 and the accompanying discussion do not represent the full range of Import cases e-dec processes on any given day. Customs officers, for example, can intervene in a process flow to make decisions about an exceptional declaration.

Figure 3 also does not depict how e-dec processes Export declarations. This process is more complex than e-dec's Import processing, due to BIT's need to synchronize Export cases processed by e-dec with Export cases processed by NCTS. Forrester found the integration between these two systems to be very complex and therefore a risk to processing reliability.

Figure 3



Source: Forrester Research, Inc. from BIT documents

A Description of NCTS' Architecture

NCTS is an application for managing EZV's Transit and some export business processes.

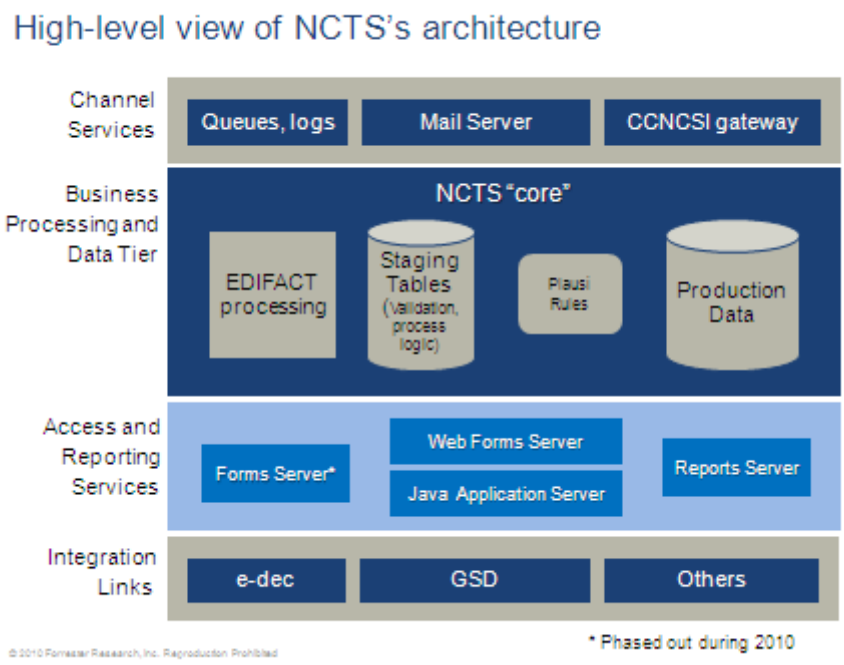
- In Transit, NCTS automates processing of some 120 message types imparting the disposition of cargos scheduled to pass through Switzerland. Ninety of these messages are defined by the European Union, and 30 are defined by the Bund. NCTS is EZV's system of record for these data.
- In Export, NCTS processes declarations associated with export requests from Switzerland to other countries. About 2,000 Customs agents use the application, and many firms submit Transit messages and export declarations directly to NCTS for processing. NCTS is the system of record for Export declarations data.

As mentioned earlier in this report, NCTS and e-dec both process export declarations and provide appropriate responses to the applicant. In processing export declarations, though, e-dec integrates with NCTS, using it as a system of record for export declarations.

NCTS application employs four layers to do its work, as depicted in Figure 4[16]. These layers perform the following functions:

- **The core of NCTS is a large relational database.** The majority of NCTS's processing takes place in tables within a large Oracle database. Message-processing rules are encoded in PL/SQL, Oracle's database programming language, within tables created for each message type NCTS handles. Message processing is completed in these "staging" tables and then moved into production tables as completed transactions. An EDIFACT translation gateway feeds these database processes, converting from the EDIFACT format to an internal format.
- **Access and reporting services recently transitioned to Web forms.** Customs officers access NCTS data using either online Web Forms or via reports. Both the Web Forms and reports employ data in the production tables. NCTS originally employed Oracle Forms, a client/server platform for Windows interfaces. BIT completed a transition to Web Forms in April 2010[17]. NCTS employs about 200 screens and about 200 reports.
- **Channel services receive and prepare messages.** NCTS receives messages via email (and returns messages via email as well). The mail server and collection of files and logs used to capture incoming messages, enrich them with data from the EC, and prepare them for conversion by the EDIFACT gateway constitute channel services for NCTS.
- **NCTS has integration links to several applications.** BIT maintains several integration links between the NCTS production database and external applications. External links allow the GSD catalog information to be loaded into NCTS daily. In other links, Tabak/Bier information is loaded from NCTS into Tabak Bier or in the statistic application called DDB . E-dec has a database link to NCTS for master data to be loaded daily into e-dec. E-dec also sends EDIFACT messages to NCTS when transit processing must follow export-declaration processing.

Figure 4



Source: Forrester Research, Inc. from BIT documents

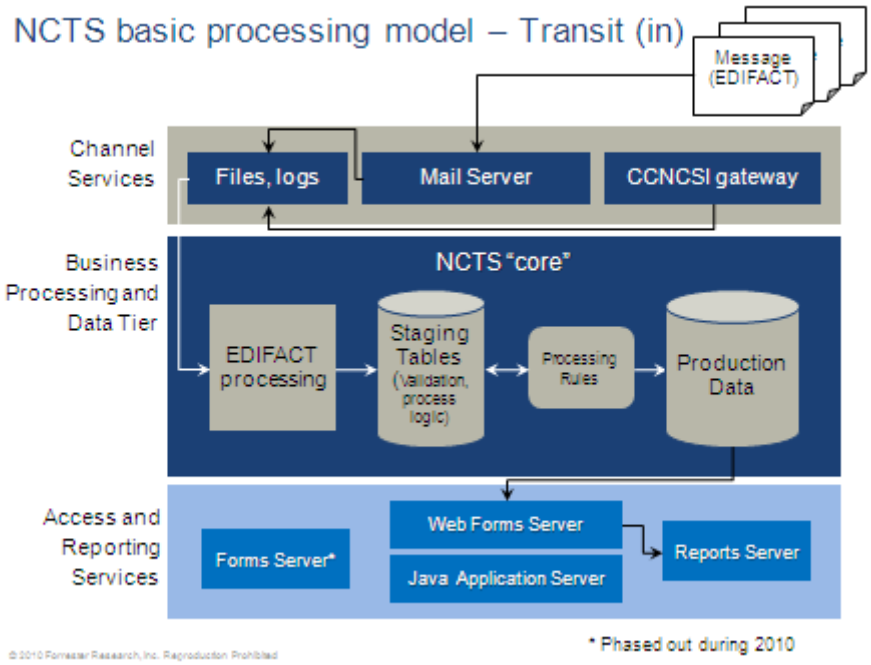
NCTS employs a modified two-tier database-application architecture (the channel services layer is the modification). Data management and business processing functions are carried out in a single database server. BIT adds new Transit message types and new Export functions to NCTS by defining schema to represent the new message, the database procedures required to validate and otherwise process the messages, and a new EDIFACT-to-relational map. BIT raises the capacity of NCTS primarily by adding capacity to its database server. NCTS' database has grown by a factor of 17 during the last six years[18]. NCTS's architecture does not afford opportunities to scale data services independently of business logic.

BIT runs NCTS's database on an HP-UX server cluster, and runs NCTS's channel services and EDIFACT gateway on a separate HP-UX cluster. BIT plans to replace these HP-UX clusters with zLinux virtual servers during Q4 2010. As of August 20, 2010, NCTS used 20 servers. NCTS' access and reporting tier runs on two application servers[19].

NCTS processes incoming Transit messages using the basic process depicted in Figure 5. Processing starts with the arrival of an EDIFACT message via email, and validation of its electronic signature. At that point:

- The channel services move the message to a file and log it. Further, channel services add information from CCNCSI to create a final message for the EDIFACT gateway to convert.
- The EDIFACT gateway converts the message to NCTS' internal data format so that it may be processed. The gateway forwards the message to the NCTS database for processing.
- NCTS staging tables store the message's data and run the required business logic to process them. Most of the logic is validation of the data contained in the original EDIFACT messages. When this initial phase of message processing is finished, the message transitions to the next step: Production.
- NCTS' production database contains the final disposition of Transit messages. The production data is used to create outgoing messages (responses), as well as reports and access via Web Forms.

Figure 5



Source: Forrester Research, Inc. from BIT documents

Figure 5 is a simple view of how NCTS processes Transit messages to provide an understanding of how the application works. Figure 5 and the accompanying discussion do not represent NCTS' Export declaration processing.

Costs and Benefits

EZV decided to proceed with the redesign and migration of its core systems (ZM90, ELPO, and NCTS) to the e-dec platform based on business and technology optimization arguments. These promised cost

savings have not materialized, and EZV sometimes questions whether or not the new software is complete and accurate.

For example, when EZV decided to replace the ELPO postal system with IPV in 2006, key arguments justifying the project were the need to accommodate newly introduced postal regulations and estimated staff and cost reductions of 40 FTE, worth 5,5M CHF yearly[20]. Since its completion, EZV has questioned the enhanced functionality of ELPO, in particular relative to the incurred extra costs[21].

In 2009 the development team for e-dec (export, import and add ons) consisted of 16 FTE (up to 20 persons), versus 5 FTE (up to 8 persons) for NCTS[22]. The cost of the yearly SLA for e-dec (including import, export and transit) due to BIT was 2,11M CHF in 2008 and 3,19M CHF in 2009 (Figure 6)[23].

Figure 6

e-dec and NCTS operating costs (2008-2011)

	2008		2009		2010		2011	
Cost category	e-dec	NCTS	e-dec	NCTS	e-dec	NCTS	e-dec	NCTS
Application operations	162,680	78,715	140,771	69,719	143,640	87,141	452,290	87,141
Database operations	91,770	216,475	49,445	191,735	68,634	191,735	80,166	191,735
Windows systems mgt	106,050	0	21,886	0	29,729	0	57,505	0
UNIX application server mgt	235,480	245,210	193,037	217,186	216,504	217,186	272,676	217,186
UNIX database server mgt	0	0	138,384	0	113,770	0	112,003	0
Storage	564,445	82,250	1,281,416	86,397	558,637	82,677	673,134	99,572
Backup/recovery	442,540	64,505	500,247	33,728	266,259	39,401	411,494	60,884
Data center infrastructure	78,260	78,610	70,215	69,626	61,163	69,626	0	0
Application-specific components	0	25,275	0	25,275	51,646	41,349	51,646	54,583
Application-specific personnel	0	0	0	0	12,772	0	12,772	0
Option DALA (archive)	0	0	16,740	16,740	16,740	16,740	0	16,740
Option Kalvor (disaster recovery)	336,245	117,285	479,074	103,681	291,741	103,681	430,869	103,681
Option application maintenance	96,000	450,000	300,000	180,000	350,000	250,000	350,000	250,000
Totals	2,113,470	1,358,325	3,191,215	994,287	2,181,635	1,099,736	2,904,555	1,081,722

Source: BIT documents

In addition to external expenses for development and IT operations due to BIT, the deployment of the new e-dec functionality has changed EZV's business support requirements: Since the launching of the e-dec initiative during the last five years, EZV dedicated in average 5 FTE for coordination and development work[24]. More recently the deployment of e-dec export has increased EZV's business support activity volume. KSC statistics show that the staff requirements for supporting e-dec export has grown practically from zero in May 2009 to 2,5-3,5 FTEs this year, while the support for NCTS oscillated between two and 4FTEs during the same period[25].

The migration to the e-dec platform was also justified with technology arguments, the strongest being compliance with the SIP recommendations concerning[26]:

- Development of a lean and effective IT portfolios

- Early identification of change requirements and planning using advanced technologies such as e-government and SOA
- Elimination of unnecessary applications and legacies

Management Practices

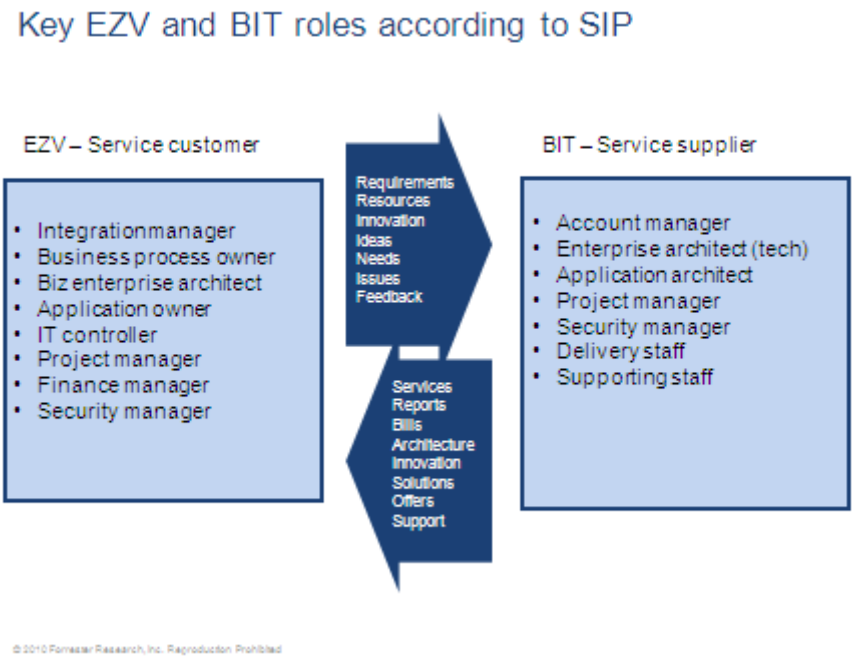
EZV and BIT use SIP (die Strategische Informatikplanung) as a broad technical architectural foundation for the development and management of the e-dec/NCTS platform[27]. SIP provides strategic, architectural and implementation directions to all public administration units under the Federal department of Finance[28]. SIP complements the holistic process model created by The Federal Strategy Unit for IT (FSUIT) during the project NOVE-IT for the management of technology. NOVE-IT recommends also the Neue Rechnungsmodell (NRM) for billing and chargeback[29]. SIP specifies the interaction model between service customers and providers, in particular BIT, in terms of governance, management processes, roles and accountabilities.

Of critical importance for EZV are the NOVE-IT processes: 1) "P04 - Informatik führen" (Manage IT); 2) "P05- Lösungen entwickeln" (Develop Solutions); and 3) "P07- Benutzer unterstützen" (Support users).

SIP promotes service orientation and formalizes the relationships, roles and responsibilities that should exist between customer organizations (Leistungsbezüger), like EZV, and service supply organizations (Leistungserbringer), like BIT. Figure 7 illustrates the key roles relevant to the management of core business applications according to SIP.

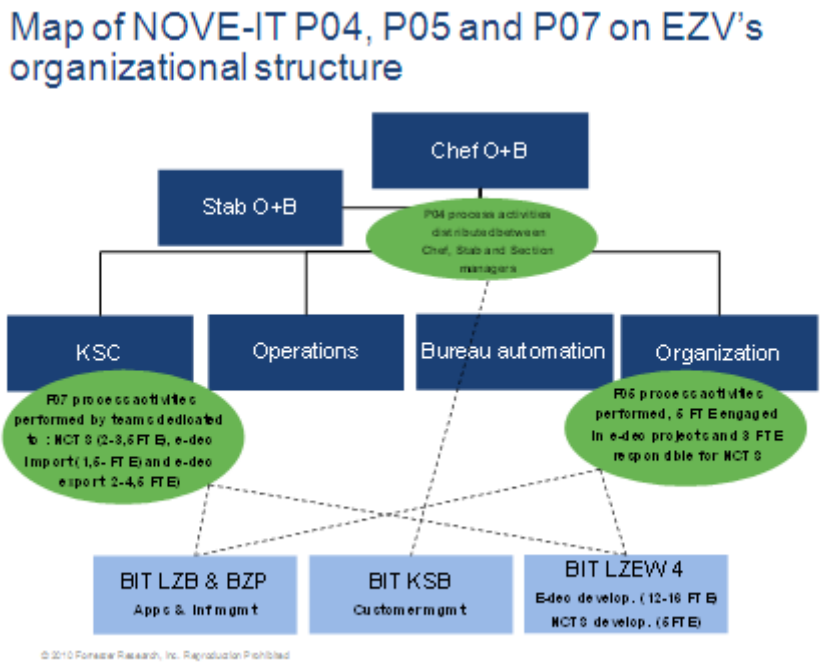
Figure 8 shows how the processes P04, P05 and P07 map on the current organizational units which operate e-dec and NCTS at EZV and BIT: While the activities of the process P04 are distributed across different functions (Abteilungschef, Stab O+B, Bureau Automation, KSC, Organization, Operations), P05 is performed from within Organization, and P07 from within KSC (Kunden Support Center).

Figure 7



Source: Forrester Research, Inc. from Bund documents

Figure 8



Source: Forrester Research, Inc.

Findings

Forrester performed an assessment covering e-dec's and NCTS' architectures and related management practices. The preliminary results were discussed with stakeholders from EZV and BIT on August 20, 2010[30]. In this Section we revisit the findings, insert comments made by stakeholders, and add more details. The assessment is based on four criteria, which we defined as:

- **Stability and robustness**. The automated environment meets SLA commitments agreed between EZV and BIT.
- **Business flexibility**. EZV staff can implement business process changes as needed.
- **Complexity**. The automated environment's structure enables straightforward and cost-efficient change.
- **Costs**. The lifecycle costs – development, updates, and operations – are understandable and controllable by EZV.

Perceptions

- Nobody perceives e-dec to be stable, as reported in statistics from help desk, BIT operations, and feedback from users.
- EZV perceptions of e-dec's flexibility vary. The EZV project managers are happy with e-dec's flexibility and the customs officers like e-dec's GUI and document features; however EZV and BIT management see e-dec as very difficult to manage.
- E-dec is perceived to be complex. As heard from the BIT enterprise architect, e-dec has many interfaces, and is complex as a result. E-dec also requires more people, more coordination, and overall support to manage the application; whereas NCTS requires a small team.
- Costs of e-dec perceived to be high and uncontrollable. The benefits of e-dec were poorly communicated and therefore difficult to measure. The business case for e-dec is not clear, as Forrester has not seen or heard a cogent statement confirming this case.

BIT (e-dec development, LZEW4) provided following comment on the number of 322 incidents reported by BIT[31] (BZB Infrastructure operations), mentioned in the Forrester presentation:

- *Where does the Change Number come from? The deployment Plan with all the changes of e-dec shows completely different numbers. 322 is a completely inexplicable number.*

Application strategy

Forrester found the current application strategy to be limiting. The strategy is designed to produce projects, not to maintain and improve existing applications. Controlled by BIT, the application strategy limits business flexibility, which is required by EZV. Furthermore e-dec needs a modern environment, which is not presented in the current strategy. Additional findings on the limiting application strategy include:

- Reliability issues that prevent e-dec use for transit workloads.
- Lack of business flexibility, required by EZV.
- Stability issues with e-dec prevent it from being the only application for import, export, transport; NCTS remains critical to the business and it continues to evolve
- Future strategy has not been evaluated; it is not definitive what the future of NCTS and e-dec is.
- Supporting two core applications promotes higher costs, with e-dec's costs rising, seemingly out of EZV's control.

BIT provided following comments:

- *"We can imagine, that some people at EZV feel like that. On the other side, in most cases the project adds new functionality to the application, we have to add additional infrastructure and then the OpEx go up. But the decision to add additional infrastructure is taken in the project and EZV people are also part of the project team"*
- *"In 2010, the stability of the application was very good. We had two complete breakdowns of the data center this year, which also killed e-dec, but this was not a problem of e-dec."*
- *"As far as we know there were never plans to migrate transit workloads to e-dec before 2011"*
- *"According to SLA Measures e-dec is more or less at the same stability level"*
- *"This was a deliberate decision of the Projektausschuss (steering committee) the August 21st 2006 (see extract of proceedings below) to build the new export processes on the e-dec platform while keeping the existing reduced export processes on NCTS to protect the investment of existing EZV customers. The new e-dec export processes are targeted at a broader range of customs clients that were not using NCTS. It is expected that existing NCST export companies are moving to e-dec export because of the advantages they have there (e.g. electronic receipt eVV, faster response times with web service channel etc.). Up to now the EZV did not put any pressure on the clients to move away from NCTS to e-dec.„Extract form the proceedings:„a) Die Lösung IDEE wird mittelfristig die Lösung NCTS-Ausfuhrdeklaration ablösen; aus diesem Grund muss sie von Anfang an alle Ausfuhrprozesse enthalten (ergibt in der Zukunft weniger Changes für die Zollbeteiligten). B) Während einer gewissen Uebergangszeit werden die beiden Lösungen parallel angeboten (Investitionsschutz). Aus Sicht der Zollamtsvertreter sollte diese Parallelbehandlung betrieblich möglich sein."*
- *"We do not understand this statement -The strategy has not created modern environment sought in e-dec"*
- *"We do not understand this statement - e-dec is not yet a SOA strategy; it is a Java app built with SOA design principles"*
- *We cannot agree to this statement. - Each e-dec release requires deployment of 10 different packages. - It is not necessary to deploy all packages/deployment units for an e-dec release. E-dec is built in a very modular way. The modules/sub-systems are packaged into an individual deployment unit (in general an EAR File). This makes it possible to deploy changes to one module without affecting other modules. The Deployment can even be done without affecting the running system functionality of other modules.e.g. e-dec Document GUI is packaged to a deployment unit. It is possible to do a deployment of the document GUI without an interruption of the e-dec roundtrip (Import or Export). Like this we could do a separate document GUI release in spring that did not affect the rest of e-dec. Since certain modules change more frequently than other or are still under development in a running project, it is very useful to have this deployment flexibility.*

Current e-dec architecture

Based on our interview discussions we found the e-dec development teams to be more focused on SOA than fulfilling EZV's full requirements.

- Reliability still appears to be an issue for BIT. In 2009, BIT set up a task force to fix ongoing reliability issues. In 2010, e-dec had good reliability, until recently.
- E-dec, designed to be a flexible applications, but EZV still perceives limitations with it. The challenge appears to be that e-dec's design makes assumptions about how the processes work; when these assumptions are challenged by new process, e-dec is not as flexible.
- E-dec is constantly changing. According to BIT, e-dec was among the most-changed application in 2009. These changes occur in both the application code and in the infrastructure.
- E-dec's architecture generates larger than expected costs. The operating costs for e-dec are two to three times higher than the bill for NCTS.

BIT provided following comments:

- *"As you see in the details of our pricing models that we gave you in our interview, e-dec has much more infrastructure (storage, appl server, etc) than NCTS, not only because is's SOA, also because the transaction volume is higher in e-dec"*
- *"The development Team is not making assumtions about the processes. The processes are defined by customs and we help to document them. Up to now, customs did not require the flexibility to modify process structures or event implement new processes in the system themselves. The flexibility of the system is inside the process steps (activities/services) and not at the process level"*
- *"As stated in the mail of Stefan Hüsemann (23.8.2010) we are very much focused on the requirements of EZV.For the requirements engineering we put a lot of effort into understanding and documenting the business requirements of the customs: Example: we did a Business Model for e-dec Export based on the concepts of the customs. We model the business processes together with the client. We Identify business services that have a meaning to the customs officers. Customs and BIT LZ are very much focused on business requirements in their interaction. SOA was not the primary focus We explain our client what we build and how it works so he knows what he gets for his money and in this context we of course talk about SOA.So we conclude that the statement "To e-dec team, SOA matters more than fulfilling EZV's full requirements" is not correct"*

Middleware

Forrester found that E-dec has reliability issues, despite its use of strong middleware (Oracle database, Oracle WebLogic Server, Sonic MQ/ESB). The whole must be greater than the sum of parts to create reliable distributed systems.

- E-dec's middleware has a high dependency on highly skilled IT pros. Any changes, with one exception, need to be made by skilled IT pros. To provide business flexibility, e-dec will require additional business-user tools.
- E-dec's architecture is more complex than NCTS's architecture.
- Each realize of e-dec requires deployment of 10 different packages.
- E-dec is a Java application built with SOA design principles. It's not yet, a complete SOA strategy.
- E-dec runs on the most expensive middleware on the market.

Infrastructure

Forrester found that BIT's infrastructure evolution is not well-aligned with EZV's application strategy.

- BIT has caused reliability issues with its infrastructure changes, such as: introduction of SUSE Linux Enterprise Server (SLES), virtualized servers via VMware. zLinux looms as a new database platform that BIT doesn't have experience with.
- BIT will not provide business flexibility; it is assumed this is EZV's responsibility. BIT runs the system; EZV must ensure the right application and tools are provided.
- BIT's highly virtualized infrastructure, which is difficult to manage, adds complexity to e-dec. NCTS is a simpler environment.
- BIT's moves to cut its own costs sometimes raise EZV costs/risks. At least 25% more storage will be required for the zLinux, as it does not support compression.

BIT provided following comments:

- *"Our experience is, that the management of a virtualized environment is easier and less complex. The number of servers per sysadmin has grown in our data center is about 1.5 : 1 compared to a pure physical environment. The complexity of e-dec is not determined by the number of servers or by the infrastructure but rather by the number of interfaces of the application modules"*

- *"This statement - At least 25% more storage will be required the zLinux, as it doesn't support compression - is wrong. It is not a problem of the platform (zLinux), it's an Oracle bug with V10.2.0.4. Whenever you migrate this database release there can be problems with compressed tables (on every platform). We also had to decompress tables in other applications."*

Cost

BIT's bills to EZV show that the operating costs of NCTS are predictable32. EZV has a clear understanding of the costs associated with operating and maintaining NCTS. The costs to support e-dec are unclear and not transparent to EZV management. As explained in section Project Objectives, this was one of the main reasons for this audit. Forrester found that e-dec [33]:

- There is no consistency with e-dec's operating costs and the costs appear to be erratically different. Over the last four years, costs have varied approximately 30% from year to year. There have been increases in operating costs, such as storage that took EZV by surprise.
- EZV has no control of the operating costs. EVZ does manage project costs; however it lacks a function to influence operating costs. The operating costs are not factored into the e-dec development team's activities.
- The application strategy, mandated by EZV, drives higher operating costs. Some of this is because e-dec's architecture will naturally drive higher costs, but also the duplicate environments needed for export increase costs.
- Operating costs are under review as many groups are facing budget cuts in this economic climate.

BIT provided following comments:

- *Let's have a look to the storage example you mention. In December 2008, EZV had too much money by the end of the year and asked us to buy some terra of storage for future requirements of e-dec. Of course we did it and added the storage to the application (where it was empty) and to the SLA of e-dec (as we had OpEx as soon as we invested). For 2011 it's a big number of additional application servers that makes the SLA price go up. As soon as the infrastructure of e-dec will be stable, the price of the SLA will also stabilize.*
- *Whenever the project decides to change the application/infrastructure we can recalculate the new layout and say what the difference of the SLA cost will be. Our pricing model is very flexible and all we need to know is how the application changes. So I think that there is a good possibility to estimate future SLA costs very early in a project.*
- *We think that our Partners (Sektion Organitation, Organization, Kunden Service Center) know the business value of e-dec very well. The customs builds a business case for new process or functionality that should be implemented. Business Value and costs are part of the concept done by customs. The "Projektausschuss" then gives its OK for the project. From this we conclude that customs knows the business value quite well….The business value of e-dec is related to the functionality provided by these modules. The modules reuse parts of previously built sub-systems and increase the business value for customs and their clients.*

Organization

The challenges EZV is feeling with NCTS and e-dec are a result of no one owning the end-to-end responsibility for business processes that are supported by the two applications. The other organization challenges that EZV is facing include:

- The EZV leaders support the NOVE-IT and SIP recommendations for delivery IT; however some of the NOVE-IT processes and roles have not yet been implemented within the organization. Most critical among them are the process P04 and the roles business process owner and enterprise architect.
- There is a mix of roles and responsibilities between EZV and BIT, especially around enterprise architecture functions. In particular, BIT's EA function needs EZV solution architecture and

expects EZV to delivery this. It is also apparent that there is no business architecture team to coordinate business process optimization within BIT.

- EZV and BIT act as siloed organizations. Even further silos exist within BIT. Forrester could not find a single person with responsibility of e-dec and NCTS from development to operations. The lack of ownership creates risks, as that coordination of activities and across silos is crucial to the success of e-dec.
- There is a lack of control of costs, end-to-end, with no one overseeing this or owning responsibility for operating costs. The silos create sub-optimized costs, and BIT's operating strategy will drive costs

BIT provided following comments:

- *We do not understand this statement.Please clarify your view of "sustainable environment"?*
- *We think you should define clearly what you mean by business flexibility in general and what flexibility the customs is missing in e-dec.The following facts show that e-dec is fulfilling the flexibility requirements of customs (as far as they communicated them to us): a) New laws that change the rules governing customs processes can be implemented in e-dec in many cases just by modifying business rules. The software does not need to be changed (e.g. Plausi Service); b) Several other Services provide flexibility to the customs officers and the KSC (e.g. Selection Service and definition of selection rules, tracking of messages exchanges with companies, configuration of master data (products, customers, error messages etc.) in e-dec by KSC, …; c) New complex processes can be integrated into e-dec in a very reasonable time: example: EZA Kleinsendungen (special treatment for small declarations – also called e-dec easy) – the project was implemented below budget, faster than expected by customs and to full satisfaction of customs. (Can be supported by project assessment documents and mails of customs); d) E-dec provides several communication channels to the clients. Every service (EdecService, EdecReceiptService, EdecBordereauService, EdecSelectionAndTransitService) can be used through Mail-Channel or Web Service channel. This gives flexibility on the side of the companies using e-dec services. Another channel that has been opened by e-dec to the customs clients are web-applications that can be used by small companies without own customs system. These web-applications build themselves on the e-dec services (composite application). Other customs systems do not offer this flexibility and before e-dec the only exchange with clients was the exchange of customs just declarations only via mail.*

Forrester Detailed Assessment

e-dec's Architecture

Forrester's assesses the advantages and disadvantages of e-dec's architecture as follows. Figure 9 contains a summary. The advantages of e-dec's architecture are:

- **E-dec's architecture employs modern technology.** How and why EZV and BIT decided to build e-dec using a Java distributed architecture is the subject of some debate. But the decision was at least in part motivated by a desire for a single, *modern* application for Customs' primary business. At the time, NCTS and Model 90 were viewed as old and unsuitable for EZV's future needs. E-dec in fact provides a modern technology base for EZV's systems – a foundation well-suited to applications in the Internet era. The Java language and enterprise framework, Internet support, and modular, layered architectures are state of the art for most large organizations. Forrester's annual platform surveys have consistently shown that Java is widely used.
- **E-dec's architecture gives BIT flexibility to scale the application.** The e-dec architecture places major functions – message processing, business processes, and transaction processing – into separate tiers; BIT can raise the capacity of each of the tiers independently of the other. BIT could choose, for example, to deploy each tier on a different type of hardware to gain optimal cost-performance.

Figure 9

Advantages/disadvantages of e-dec's architecture

Advantages	Disadvantages
Well-suited to Internet era	Introduces unfamiliar complexity to EZV and BIT
Employs modern technology	Internal dependencies inhibit rapid change and development
Layers can be scaled independently	Only developers can change processes, add new features
High technical visibility for problem solving, design of new features	Requires a relatively high number of servers
Modern browser user experience	Reliance on auxiliary integration links raises complexity
High potential for service reuse to speed projects save costs	Has not met cost, functionality, and reliability expectations
	Tech team not at steady state

Source: Forrester Research, Inc.

- **E-dec's architecture has high potential for service reuse.** EZV's original goal for the e-dec project was to create a single system for all of its declaration processing. On August 20, 2010, e-dec was processing both Import and Export declarations, proving that BIT can provide a single Customs application that supports multiple business processes. Moreover, the e-dec development team accomplished this goal by modified and extending the original services in e-dec (both Flow and Core) to accommodate Export declarations[34].
- **E-dec provides technical visibility into declaration processing.** One of the e-dec development team's original goals for its project was to improve visibility into how the application is working. That is, rather than having to sort through transactions and database procedures to

determine the path of an individual declaration, personnel would be able to see services representing business processes and declaration-processing functions. It is not clear that EZV valued this goal, but the e-dec team did achieve it.

- **E-dec's architecture supports a productive browser-based user interface.** Many times during our interviews in Bern, EZV and BIT staff told Forrester that e-dec's primary business advantage was its productive user interface. The user interface has the look and feel of a modern Internet application, including the ability to view a declaration in its finished form (as a paper document). It is easier to train Customs officers to use e-dec than it is for NCTS[35]. The e-dec's architecture also is built to provide Web interfaces to any browser, which makes it open to use by EZV staff and partners, according to EZV's needs. It is not clear that EZV management values this benefit of e-dec, but it is a benefit nonetheless.

The disadvantages of e-dec's architecture are as follows.

- **E-dec's architecture introduces unfamiliar complexity.** All applications are complex in some way, and e-dec is no exception. E-dec's complexity is found in the coordination that must take place between its several layers and in its deployment architecture. These complexities are problematic because they are new and unfamiliar to the BIT[36]. BIT's technical staff has not yet mastered e-dec's complexity, One of the issues is BIT's policy of using virtual servers to run e-dec magnify the architecture's complexities, as it can make discovery of compromised components difficult[37]. As a point of comparison, NCTS' complexity (its many database stored procedures) is familiar to the development team and BIT operations staff, and so easier to control.
- **E-dec architecture's dependencies reduce flexibility, raise risk to availability.** E-dec has dependencies between its various components, as well as tight object dependencies between services in e-dec Core. Dependencies make change difficult, by magnifying the potential impact of any given change on the overall system. Dependencies also challenge reliable operations by raising the number of potential component failures that can cause either slow performance or an outage.
- **E-dec's architecture dictates that only developers can change processes.** One of the original goals of the e-dec project was to reduce EZV's dependency on IT people to change its Import declaration processing system (and ultimately Export and Transit as well)[38]. E-dec does not achieve this goal. The addition of new processes and data fields and the modification of existing processes, data fields, and user interface must be accomplished by the e-dec development team. Most substantial changes require senior developers. E-dec does offer points of flexibility for Customs staff, but these are limited to user interface personalization and setting declaration search parameters.
- **E-dec's architecture requires a high number of servers.** E-dec's server counts are high relative to NCTS, EZV's other big core system. E-dec's server counts are likely always to be higher than database applications like NCTS. As of August 20, 2010, the core message processing and business service components of e-dec ran on 12 server instances. And the ratio of messaging-handling servers to business-processing servers is 1:5, meaning that increases in message loads have potential to quickly drive up core processing server counts.
- **E-dec's architecture's high number of auxiliary links raise its complexity.** What Forrester calls "auxiliary links" are a collection of interfaces between e-dec and external systems. Not all integration links are managed via the e-dec Flow module. The architecture would be simpler if all integration links were centralized.
- **E-dec's architecture has not met reliability, cost, or functionality expectations.** EZV's management has not been satisfied with e-dec. We've previously noted e-dec's continuing reliability issues. E-dec's operating costs are also a concern. Features like e-dec's browser interface that shows finished import and export declarations as finished documents (in PDF format) resulted in a very large rise in storage costs. Lastly, EZV managers have variously questioned whether or not e-dec correctly implements declaration processing. Forrester was unable to completely document whether this is so, but the point bears investigation.[39]
- **The e-dec team at BIT hasn't reached "steady state" with the app.** "Steady state" means a technical team can maintain and operate an application reliably and predictably. The technical team responsible for e-dec at BIT has not yet reached steady state, as indicated by the

application's continuing reliability issues and unpredictable costs. Why? Again, e-dec employs new technology and a new design that the development and operations team apparently haven't yet mastered. BIT regularly changes its production environments to find cost efficiencies, and these changes introduce new factors to be mastered. The two most recent changes affecting e-dec are introduction of VMware ESX and Oracle (database) on zLinux. As a point of comparison, NCTS is at "steady state."

Service-Oriented Architecture and e-dec

People who work on e-dec say the application's service-oriented design is a strength. However, others in both EZV and BIT are either skeptical or confused about what SOA is and why it was useful in building e-dec. The following discussion seeks to clarify the role of SOA in e-dec.

The term *SOA* means many things. In Forrester's experience, people associate *SOA* with general benefits like "more flexible" and "more open" and with technical characteristics including asynchronous processing and use of Web services protocols and interfaces. Writings about e-dec have tended to associate the application with the general goodness of SOA[40].

Forrester would not use the term "SOA application" to describe e-dec. Rather, Forrester believes it is most accurate to describe e-dec as *a Java application that employs SOA design principles*. The facts about e-dec and SOA:

- The e-dec Core employs Enterprise Java Beans to provide functions required for message processing and declaration processing. The e-dec Core module calls these functional services in the patterns needed to satisfy any given case. The path a declaration follows through the e-dec Core varies depending on the type of interaction (import, export) and the calculations it requires.
- In e-dec Core, the EJBs that do the work of message processing are represented to the outside world (using Message-Driven Beans) as asynchronous services through a series of Java facades. The primary purpose of the facades is to connect the e-dec core services to the e-dec Flow layer of the architecture and to translate fundamental Java services into higher-level business functions.
- E-dec Flow is an asynchronous messaging environment (e-dec core's services are primarily synchronous). Asynchronous is an inherently flexible model for interactions between services. E-dec Flow mediates between incoming electronic documents and the e-dec core.
- E-dec provides one Web service – an interface that allows external organizations to submit import and export declarations. But e-dec does not employ Web services in its internal architecture, and does not employ Web services for integration with other EZV applications.

EZV and BIT must agree on the benefits and costs of e-dec's use of SOA principles. The e-dec application's architecture's use of service-oriented design provides some but not all of the benefits associated with SOA, and exhibits some but not all of the technical characteristics associated with SOA. Specifically:

- **E-dec employs SOA design principles to implement specific business processes.** E-dec has an architecture for choreographing Java components to create the right process for Import and Export declaration processing. To many in the industry, *SOA* describes integration architectures that provide data and/or business processes from major applications. E-dec is not designed along these lines. The e-dec Flow layer is not designed as a general service bus to integrate many services, but rather to service the interaction needs of e-dec. Adding new services to e-dec requires implementation of Java EJBs required in implementing those functions.
- **E-dec was built using a service-oriented design for Java.** Many associate the term *SOA* with the use of Web services standards to represent independent applications. The major Web services standards are SOAP, WSDL, and UDDI[41]. These Web services can serve as integration points for other applications to either get data from those applications or submit work to them. E-dec exposes a Web service for automatic submission of declarations for processing, but does not use Web services internally.

Costs and Benefits of e-dec

The analysis of BIT's itemized annual bill to EZV for e-dec and NCTS reveals six categories in which e-dec's operating costs exceed those of NCTS for the year 2011. NCTS' costs exceeded e-dec's costs in three BIT operating cost categories for the year 2011.Moreover, e-dec registered costs in four more BIT categories than NCTS. See Table 3.

Table 3

Cost category	2010		*Difference*	2011		*Difference*
	e-dec	NCTS		e-dec	NCTS	
Application operations	143,840	87,141	65.1%	452,290	87,141	419.0%
Database operations	68,634	191,735	-64.2%	80,166	191,735	-58.2%
UNIX application server mgt	216,504	217,186	-0.3%	272,676	217,186	25.5%
Storage	558,837	82,677	575.9%	673,134	99,572	576.0%
Backup/recovery	266,259	39,401	575.8%	411,494	60,884	575.9%
Application-specific components	51,646	41,349	24.9%	51,646	54,583	-5.4%
Option DALA (archive)	16,740	16,740	0.0%	0	16,740	-100.0%
Option KaVor (disaster recovery)	291,741	103,881	180.8%	430,869	103,881	314.8%
Option application maintenance	350,000	250,000	40.0%	350,000	250,000	40.0%
Totals	1,964,201	1,030,110	90.7%	2,722,275	1,081,722	151.7%

Exclusive costs

	2010		2011	
	e-dec	NCTS	e-dec	NCTS
Windows systems mgt	29,729	0	57,505	0
UNIX database server mgt	113,770	0	112,003	0
Application-specific personnel	12,772	0	12,772	0
Option DALA (archive)	16,740	16,740	0	16,740

Source: Forrester Research, Inc. from BIT documents

Additionally to the larger bills to BIT for service, EZV must currently allocate for e-dec operations (KSC) between 3.5 and 7 FTE and for NCTS operations between 2,5 and 4 FTE. The numbers for development and application management are for e-dec EZV 5 FTE and for NCTS 1FTE.

Apart from the cost aspects the benefits of e-dec versus NCTS are continuous matter of discussion between EZV and BIT. According to a recent EZV note[42]:

- *The SWOT-analysis (of e-dec export) was wrong. The new functionality for e-dec export could have been developed in NCTS export with estimated cost of 50'000.- sFr. (2 month). The cost for the project Idee where about 2'900'000.- sFr. With additional cost about 300'000.- to implement missing features. Still with this features e-dec export can't handle tobacco-products, simplified procedure for tax-free-shops, 2 step procedure for authorised consignors.*

Management Practices

As already mentioned in section Current Situation, the practices EZV and BIT should apply to the management of e-dec and NCTS are rooted in SIP's recommendations and NOVE-IT process model. Of critical importance are the processes

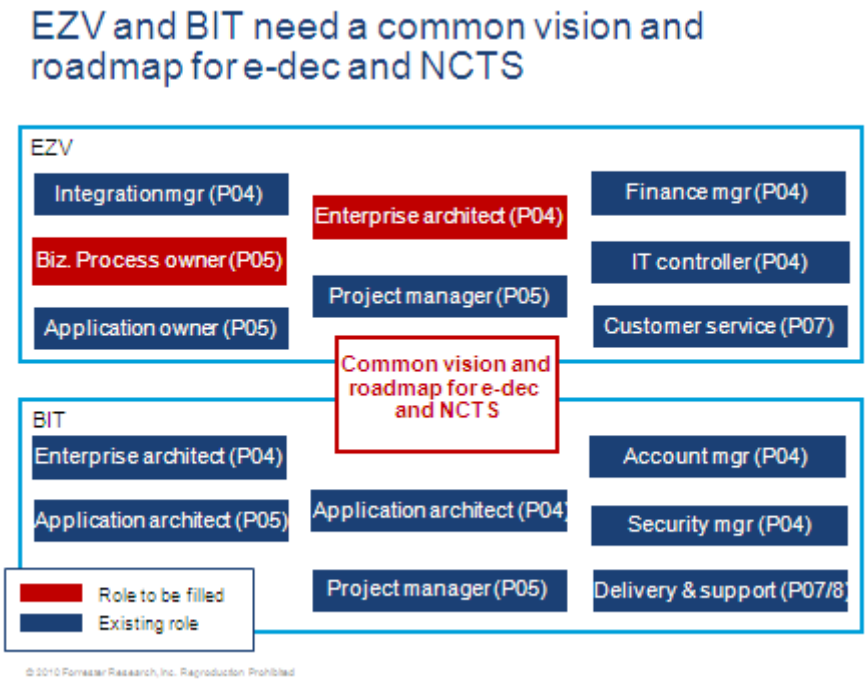
- **P04 "Informatik führen"**. EZV has recently performed an internal assessment which analyzed the IT management process and recommended improvements[43]. EZV has already improved the first version of its IT portfolio which contains a holistic view of all IT related projects, feasibility studies and running applications. But the assessment shows that EZV needs to add dedicated resources to cover the workload associated with the roles integration manager (100%), finance manager (100%) and security manager (50%), which today are carried by several executives across the organization. Moreover, EZV needs to implement a sustainable portfolio and controlling process to increase the maturity of its technology strategy and roadmaps.

  P05 „Lösungen entwickeln". According to P05 the critical roles in the application development process are played by the role business process owner and enterprise architect on the customer side. ISB states ***"Diese zwei Rollen müssen in jedem Entwicklungsprojekt explizit zugeteilt werden"***[44] . SIP elaborates also on the risk resulting from situations when architects are external to the customer organization and have limited understanding of its business systems and processes. It recommends the formation of an architecture board to validate the system design and reject it, when the proposed solution doesn't make business sense.

- **P07 "Benutzer unterstützen**". SIP does not provide details on this process. But the information and documentation made available by EZV's KSC (Kunden Service Center) suggests that this process is mature and run by dedicated teams to e-dec, NCTS and other applications using best-practices according to ITIL/ISO 20000 recommendations[45].

Figure 10 illustrates as-is and to-be organizational roles supporting the NOVE-IT processes P04, P05 and P07 for e-dec/NCTS platform at EZV and BIT. As-is roles are marked in blue and represent formal established roles, as we could identify them during interviews and the research of documentation. To-be roles, marked in red, are roles recommended by SIP, which have not been implemented yet. Today EZV and BIT do not have a common vision and roadmap for the development of e-dec and NCTS, as they don't have a function responsible for articulating the common vision and roadmap.

Figure 10



Source: Forrester Research, Inc.

BIT has created an enterprise architecture board and function, but this function is relatively new, has a very broad charter and scope, specific priorities and limited resources. Consequently, today's BIT's enterprise architect does not engage actively in decisions specific to e-dec and NCTS[46]. At EZV the roles business process owner and enterprise architect are not implemented. The immediate consequences are that:

- **The E-dec/NCTS strategy is driven from inside e-dec development projects**. In the absence of the business process and architecture competencies, strategic road-mapping decisions concerning e-dec and NCTS are driven from inside the e-dec development projects by BIT's technical architects. They collaborate in good faith with the EZV staff allocated to individual projects, but as acknowledged at EZV the end-to-end responsibility for the life-cycle of e-dec and NCTS – from feasibility to sun-setting, for e-dec and NCTS, individually and as a whole- is missing[47]. As a consequence, it appears that the Informatikkommission, which governs among others the road-mapping of e-dec and NCTS, takes decisions regarding the automation and optimization of EZV's core export, import and transit processes, and the mitigation of risks, largely based on know-how and insights residing with the e-dec technical architects from BIT.
- **E-dec's and NCTS delivery teams operate without coordination**. During the interviews at BIT we observed that the development teams for e-dec and NCTS, and the infrastructure supporting teams, e.g. for servers and databases tend to operate in silos. The application management function for e-dec focuses on development activities with low visibility life-cycle management and limited insights into technology operations[48]. The NCTS applications team is stronger involved in operations, due to the higher maturity of the application and compact structure of the team[49]. But the two teams do not appear to communicate regularly and synchronize their tasks, for example, to developing a common e-dec/NCTS vision and roadmap[50].
- **Task forces need to be formed to solve issues**. E-dec has not been consistently available to Customs officers and importers. For example, E-dec's reliability was so inconsistent during 2008 and 2009 that BIT had to set up a special task force to connect its different teams and address the problems during 2009. The temporary assignment yielded good results: e-dec's reliability rose during late 2009 and the first half of 2010, but during July 2010 again became inconsistent.
- **The business case for e-dec is a continuous matter of debate**. In the absence of an assigned end-to-end responsibility for e-dec and NCTS, the pros and cons of e-dec versus NCTS have been a continuous matter of debate between the proponents of both platforms.

Conclusions

This Section summarizes the assessment by answering the six questions EZV posted to Forrester in this project.

Question	What are the advantages/disadvantages of e-dec as EZV's single strategic application for export, import, and transit processing? Will e-dec be able to support EZV's need for a high performance, mission critical, and secure import, export, and transit processing in the future?
Answer	Forrester's states its opinion of e-dec's advantages and disadvantages above (near Figure 9). E-dec's chief advantage: It employs a modern architecture designed to accommodate many business functions, and has the potential for fast solution delivery. E-dec's chief disadvantages: It has not consistently met its SLA and it has been more expensive than expected to develop and operate. Furthermore, in Forrester's opinion, e-dec will be able to support EZV's need for a high-performance, mission-critical, and secure application for import, export, and transit processing *only if BIT revises its current development, deployment, and management processes.* Without much closer cooperation between the e-dec development team and the BIT deployment and operations team, Forrester has little reason to believe e-dec will become a consistently reliable application.

Question	Are the current and future plans to embrace a SOA/Java environment implemented correctly in e-dec? If not, how can the overall situation be corrected?
Answer	This is a difficult question to answer because no clear definition of "correct" implementation of SOA/Java exists. In Forrester's opinion, e-dec implements SOA principles in a Java architecture because: • e-dec Core relies on services for business processing. • e-dec's initial services have been refined as new workloads have been added. • e-dec's services are documented. • e-dec provides a Web service interface for submission of export declarations. But is this implementation *correct?* Forrester believes this is the wrong question. The right question should be: Does e-dec's SOA architecture meet EZV's needs? The answer to that question is: Sometimes, but not always. EZV and BIT must address e-dec's shortcomings with closer cooperation and focus on meeting EZV's requirements – both functional and nonfunctional requirements
Question	Can e-dec be expanded to perform all of EZV's import, export, and transit processing? What are the financial implications and consequences of an expansion of the current e-dec system? (e.g. Is it necessary that a new server must be added for each bundle of additional 10'000 incidents?)
Answer	Yes, of course, e-dec can be expanded to perform all of EZV's import, export, and transit processing. The e-dec development team is working toward this goal. How? • New modules can be added to e-dec. e-dec is designed to accommodate new processes and new services. • e-dec has sophisticated message-handling features that can be applied to all of EZV's declaration- and message-processing procedures. • e-dec could incorporate an EDIFACT-conversion service to support transit-message processing. However, Forrester believes the cost of consolidating all of EZV's import, export, and transit processing in e-dec would be great – probably too great to be practical under the Bund's shrinking budgets. Forrester reached this conclusion for three reasons: First, import- and export declaration processing follow similar workflow models, but transit processing follows a different model. Transit processing is less a workflow than a series of validations. Also, incoming transit messages often generate multiple outgoing messages, which is a different model from import and export. Given this fundamental difference, EZV and BIT should assume: • that e-dec's existing Java services will be of limited use in creating a new transit-message processing module. Thus, the new transit module will require much new code. • Addition of the new module will require a substantial expansion of e-dec's user experience, which will also require a relatively large investment. Second, judging by NCTS' daily workload of messages, BIT would have to more than double e-dec's capacity to accommodate all transit-message processing. As we've seen, expansion of e-dec's capacity drives up operating expenses at a high rate relative to NCTS. Third, e-dec's history of development costs suggests any major expansion of its function will require a large investment.
Question	Could all functionality of NCTS be integrated into e-dec? What would the cost be? And could the critical security feature/functionality still be guaranteed in the transitioned end state?
Answer	We interpret the question to mean: "Could BIT reimplement NCTS' functionality as e-dec modules and processes?" The answer, of course, is Yes. • E-dec's architecture is designed to accommodate many processes. NCTS' export-declaration and transit request processing could be added to e-dec. • E-dec's architecture includes a robust message-handling layer that could be extended to handle the many different Transit messages it doesn't handle today.

- BIT could add an EDIFACT-conversion service to e-dec.

But the cost of reimplementing NCTS as an e-dec module and/or set of services would be great. Forrester believes the cost of such a project would be between the initial e-dec cost and the cost of the export-declaration processes. Why?

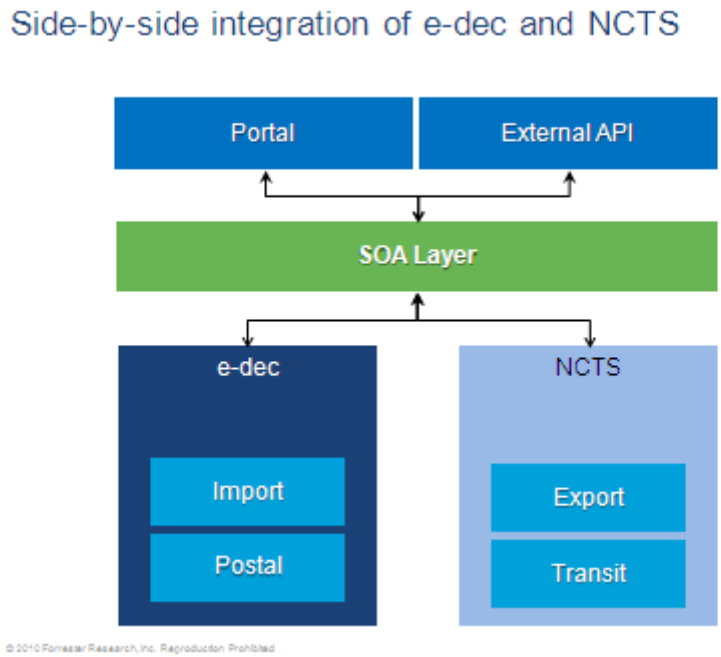
- Import- and export declaration processing follow similar workflow models. Transit processing does not follow these same workflow models.
- Assume that e-dec's existing services will be of limited use in creating the new transit module and/or processes. BIT will have to develop new services.
- Assume dramatic expansion of e-dec's capacity both to "field" and to process messages due to NCTS' large volumes. NCTS processes about 225,000 messages per day, which when added to e-dec would represent a tripling of e-dec's average daily workload today.
- Assume a more complex user experience would have to be built. Today, e-dec's user experience addresses only import and export declarations; Transit would have to be added.

Further, BIT would have to invest an undetermined amount to make e-dec predictably reliable. NCTS is a "customer-facing" application that Swiss trading partners depend on for their business operations. It must have high availability.

Question	Why are the operating costs of e-dec 3 times higher than NCTS?
Answer	Forrester's analysis identifies the following factors that drive e-dec's operating costs much higher than those of NCTS: • Much higher storage costs, primarily due to PDF storage • Much higher application operations costs • Much higher backup/recovery costs • Much higher disaster recovery costs • Much higher costs for server management • Higher process operations costs Currently e-dec consumes more than three times more resources (staff and assets) than NCTS, due to the higher complexity for BIT of its architecture, and the fact that evolution of the application is ongoing.

Question	Could all functionality of NCTS be integrated into e-dec? What would the cost be? (rough estimate) And could the critical security feature/functionality still be guaranteed in the transitioned end state?
Answer	As discussed in the answer to the prior question, the answer is: Yes, but it would be too expensive to do so. EZV and BIT have another option for the future, however: Integrate NCTS and e-dec as services. In this approach, EZV and BIT would avoid the reimplementation of NCTS. Rather, BIT would leave NCTS in place, and equip the application with new, modern interfaces for: • Programmatic submission of export declarations and transit messages. • A modern browser-based interface for EZV's customs agents and external parties. Further, BIT would create an integration architecture for e-dec and NCTS to replace the current integration points between the applications. The result will be a reliable interaction between the two applications as *business services.* BIT would achieve this integration of e-dec and NCTS using a service-oriented architecture that provides e-dec and NCTS with Web services interfaces mediated by an integration layer. See Figure 11. Forrester believes the cost of this approach to integrating the function of e-dec and NCTS would cost less than reimplementing NCTS as an e-dec module. Why? Because EZV and BIT would not have to incur the costs of reimplementing NCTS. Forrester believes the cost of developing SOA interfaces for e-dec and NCTS will be lower than reimplementing NCTS. This opinion is based on Forrester's general experience with such SOA projects; not on detailed study of the likely costs.

Figure 11



Source: Forrester Research, Inc.

Question	How is the service delivery formalized and implemented? Is it supported through organizational processes such as governance, architecture, and service management? How do these processes flow? What is their impact on costs and service quality?
Answer	Forrester's assessment shows that the processes P05 and customer support P07 for service delivery are formally implemented and supported through standard service SLAs and project methodology and documentation. But EZV has not formalized the process P04 – IT management yet. And it has not implemented the central role and function of a business process architect for e-dec and NCTS. As a result key attributes as functionality, flexibility robustness and business value find different interpretations. There can be no strategy for implementing these attributes without agreement on what they mean and why they matter. Moreover, without taking the lead in the benefits/cost discussion, EZV cannot hope to get a better control of the expected quality and costs.

Recommendations

EZV's Application Strategy

Forrester recommends that EZV reform its application strategy. The new strategy will assume that EZV will employ e-dec and NCTS for many years to come. EZV's strategy for these two applications must achieve two high-level goals:

1. Continue to expand automation of customs processes to remain competitive and generate the significant revenue the Bund depends on from its customs authority.
2. Reduce and control the operating costs of e-dec and NCTS to fit the Bund's budget constraints.

Thus, EZV should retire its current application strategy as it applies to e-dec and NCTS. EZV's goal of replacing both ZM90 and NCTS with a single application (e-dec) by 2013 is unlikely to succeed for three reasons:

- Until e-dec's reliability is assured, it cannot take on EZV's mission critical workloads. E-dec's reliability continues to be a challenge.
- As discussed above, reimplementing NCTS' functions as one or more e-dec modules is likely to be prohibitively expensive in the Bund's tight fiscal climate of the next several years.
- EZV and BIT have no plan that Forrester can find to replace NCTS with e-dec, and it is already late 2010. Even if budget were available for such a large project like replacement of NCTS, BIT's past project performance makes Forrester doubt two years is enough time.

Forrester recommends that EZV take four specific actions in concert with BIT to reform its application strategy.

1. **Complete a feasibility study to retire NCTS from export processing within 12 months.** EZV currently has redundant applications for export-declaration processing. Consolidation of export-processing is likely to save costs. This feasibility study will determine whether EZV can reduce its costs by consolidating its export-declaration processing onto e-dec – or not. If EZV and BIT determine that e-dec cannot perform as EZV's only export processing application, then NCTS will return to this role.
2. **Align with new BIT shared services (e.g. security).** BIT has undertaken development of a security service for external partners, for example, that EZV will be able to use instead of creating and maintaining its own PKI modules for NCTS and e-dec. Ultimately, BIT's shared services should simplify EZV's applications -- and reduce costs.
3. **Design a SOA to integrate e-dec and NCTS**. Assuming that e-dec and NCTS coexist for many years to come, EZV should invest in a strategic integration architecture for the two applications. This new integration architecture should embrace SOA design principles, replace the tactical integration links used to integrate the two applications, and provide an improved application experience for customs officers, EZV staff, and external parties.
4. **Do a feasibility study on addition of Transit processing to e-dec.** As discussed in the Conclusions section, Forrester believes it unlikely that NCTS' transit-message processing features can be added to e-dec for reasons of cost. EZV should conduct its own detailed technical and financial study with BIT and reach its own conclusions on this question.

EZV's Commitment to e-dec

EZV's reformed application strategy recognizes the commitment to e-dec as its strategic import- and export-declaration application and platform. This commitment will be very difficult to reverse for three reasons:

1. EZV has spent millions of CHF and expended about 8 years of effort on e-dec (as of mid-September 2010). Given that e-dec is working, EZV and BIT cannot reasonably walk away from this investment.

2. E-dec is processing all of EZV's import declarations and half of its export declarations. The application works and is maturing – despite doubts within EZV about its costs and reliability.
3. EZV has no contingency strategy should it declare e-dec a failure. EZV can't go back to ZM90, and NCTS is not a good platform for a new application handling import-declaration processing.

Given this commitment to e-dec, the real question for EZV is under which conditions the e-dec application can and should be expanded. EZV should halt e-dec's gradual assumption of all import, export, and transit processes until it is satisfied BIT can meet four new conditions:

- **Predictable reliability.** BIT must solve the reliability issues that have occasionally afflicted e-dec. Forrester believes that BIT's experience during 2009 with the e-dec task force demonstrates that the application's reliability issues are caused by gaps in understanding between the development and the deployment and operations teams and *can be solved.* BIT also must raise its expertise in distributed data applications like e-dec and maintain.
- **Predictable operating costs.** EZV (with the rest of the Bund) faces shrinking budgets, and that fact makes e-dec's unpredictable operating costs unacceptable. EZV itself must organize to solve this issue. First, e-dec projects can no longer be considered in isolation of one another and justified solely based on their project-completion costs and benefits. EZV must factor likely operating cost rises in its management of e-dec projects. This means the e-dec project management staff must become expert at the intricacies of BIT's fees and rates, so they may optimize all projects to avoid the current unexpected rises in operating costs.
- **Faster solution delivery.** Among EZV management's top priorities for its entire application portfolio is faster development of new functions.[51]. According to the e-dec project team at BIT, this requirement was unknown to the team. The e-dec development team must reevaluate its development approach to find ways to deliver projects faster than they do now. EZV management must make clear its delivery expectations to guide the BIT development team.
- **Falling "unit costs.**" Forrester believes that behind EZV management's concern about e-dec's operating costs is a worry that operating costs will rise out of control as declaration and message volumes rise in the future. EZV management believes that international trade trends during the next five years will result in a dramatic expansion of the traffic flowing though its systems, and wants to be ready for such developments. In essence, EZV management wants the cost of processing each declaration and message to fall as the volumes passing through e-dec and NCTS rise. EZV management has little confidence such a trend is possible under BIT's current business practices.

Organizational Prerequisites

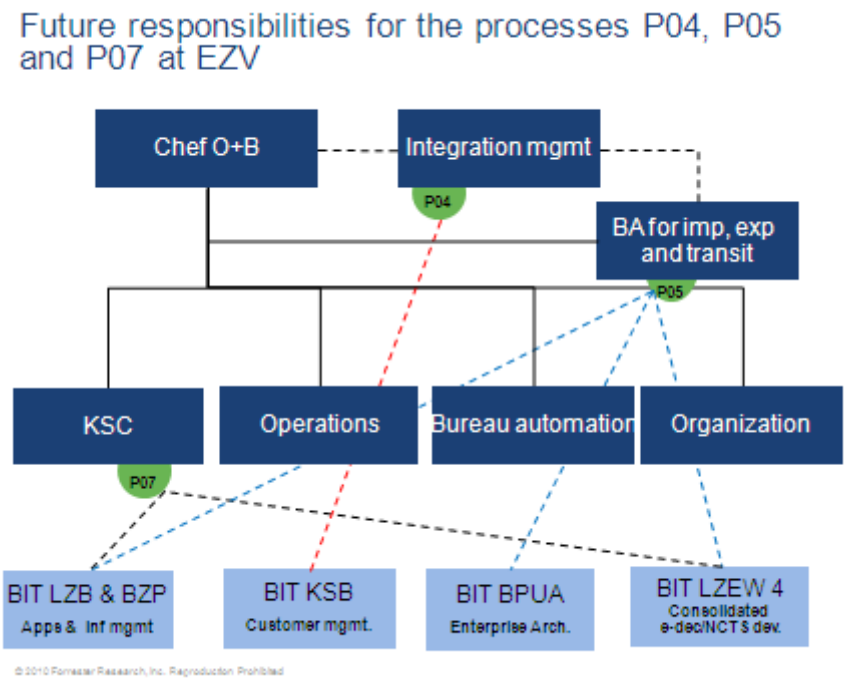
EZV will not be able to implement the technical recommendations of the previous Section without a few organizational prerequisites:

- **Implement NOVE-IT's Process P04 "Informatik führen"at EZV**. These recommendations concern 1) centralization of top IT management activities and elevation to one-up "integration management" level; 2) dedication of a minimum of 3,5 FTE to the new unit to cover EZV's overall IT strategic planning, budgeting and portfolio processes, according to the directions specified by SIP. The development of the process P04 at EZV has been already worked out in detail in a separate report, which recommendations are broadly accepted at EZV.[52] Figure 12 illustrates the recommendation. The responsibility for the Process P04 at EZV, the equivalent of a EZV CIO function should go to a dedicated integration a management function reporting directly Hauptabteilung Betrieb, while the responsibility for the development and operations of the processes export, import and transit should stay inside O+B.
- **Create the missing SIP business architecture (BA) roles at EZV**. In addition the already planned enhancements to PO4, EZV needs to appoint one FTE to cover the missing roles a) business process owner for the core processes transit, export and import; and b) enterprise architect. Based on our experience, we believe that this business architect (BA) should be an internal executive at senior level with demonstrated deep knowledge of the core processes transit, export and import and excellent relationships within EZV with the custom offices and also with EFD and BIT. Moreover the BA will need to bring a strong background in technology management, ideally with e-dec and NCTS and have/add strong knowledge of enterprise

architecture methodologies such as TOGAF. Appendix A provides a description of the BA's profile and key activities with respect to the NCTS/e-dec process platform.

- **Jump-start a task force to address e-dec and NCTS outstanding issues**. EZV should delegate to the BA the responsibility for implementing the technical recommendations from the previous Section, including a) the improvement of the current conditions; and b) planning and deploying the actions for a more efficient and productive future. The BA will need to set up a task force consisting of EZV's IT finance / controlling, the application managers of e-dec and NCTS at EZV and BIT and BIT's enterprise architect. Together they will need to refine the baseline created in this project and develop an improvement plan. The most outstanding task of the plan is the development of a common e-dec/NCTS roadmap and business case addressing benefits costs and risks from a unified perspective, which can be then monitored and tracked through the new created integration management and process P04.
- **Integrate BA in EZV's line organization to enhance the EZV-BIT process**. The BA task force will need to be integrated as a line unit inside EZV's operations organization to ensure the sustainability of the implemented action. Figure 12 shows how this new created function could be integrated in EZV's future structure and linked to the key stakeholders at BIT.

Figure 12



Source: Forrester Research, Inc.

Appendix A: Overview of the Business Architect profile and main activities

Focus, Positioning and Basic Skills

The business architect (BA) for the core processes (export, import and transit) is an internal executive at senior level with demonstrated deep knowledge of the core processes – export, import and transit. The role reports to Leiter Organisation und Betrieb (LOB). The business architect's roles and responsibilities are:

- "Co-own" the core processes, together with LOB
- Share the accountability[1] with the LOB and is responsible for end-to-end process management[2]
- Develop excellent relationships with 1) the custom offices; 2) the EZV key stakeholders (e-dec and NCTS project teams, controlling and operations (KSC), and also with 3) EFD and of 4) BIT - in particular with the enterprise architecture function, and the development teams e-dec and NCTS and the service management and operation teams.
- Develop strong skills in the areas of process modeling, process optimization, and business architecture.
- Bring strong background in technology management, ideally with e-dec and NCTS and
- Adds strong knowledge of enterprise architecture methodologies such as TOGAF.

Key Activities: Governance and Portfolio Management

The BA provides the liaison between EZV's business strategy (including EZV's technology strategy) and the operational units (EZV's development and operations and suppliers like BIT) responsible for implementing the strategy. Strategic activities/tasks at the top level include:

- Developing a governance framework for decision making regarding the core processes
- Liaise with the integration manager (P04) & LOB for directions and compliance regarding EZV's overall technology strategy
- Establish the chains of responsibility, authority and communications for the core processes end-to-end
- Establish measurement, policies, standards and control mechanisms to enable process stakeholders (projects, operations, suppliers) to carry out the work
- Develop a portfolio of services supporting the core processes
- Identify and maintain the overall business process architecture, including resources profiles and structure.
- Define the process and service related standards
- Liaise with the integration manager (P04) & COO for directions regarding funding and financial controls
- Define investment thresholds for processes and related services
- Evaluate, prioritize, and recommend the selection/rejection of tech investments
- Manage investments through full life cycle, including operations to disposal
- Manage the overall portfolio
- Monitor and report portfolio performance

[1] Shared accountability means that the COO and BA are ultimately accountable for decisions related to the core processes.

[2] Being responsible means that the BA manages the work to achieve the decided tasks."End-to-end" means: 1) business and technology; 2) from end-user to back-office; and3) during the entire life-cycle of the process, i.e. from requirements analysis, to process innovation, change and operations, and to disposal of components.

Key Activities: Investment Management

The BA oversees the tech investment mgmt process for the core processes, and liaise for execution with the project managers, and technical people such as account/relationship managers, business process architects, application managers, solution architects, who perform process specific activities including:

- Identify business requirements
- Analyze feasibility and alternatives
- Develop business cases
- Liaise with financial controls for directions and validation of business cases
- Take responsibility for implementation
- Manage investments through full life cycle, including operations to disposal
- Manage and report investment performance

Key Activities: Quality Assurance

BA is responsible for the development of an integrated quality assurance framework to provide a sustainable link between EZV and suppliers. The quality framework covers the following areas:

- Quality management for process integration and consistency. BA must verify that the core processes work with technical correctness across all interfaces, and changes are planned, tested and introduced into the production environment with minimal disruptions and maximal efficiency.
- Quality management for protection of investment. BA ensures that EZV and BIT perform regular service updates, including the underlying technology stack and application components.
- Quality management for business process improvement. BA map top issues, requirements, and challenges to the core process functionality, triggers audits and develop and track improvement actions.
- Quality management for business process operations. BA works closely with KSC and BIT to draw up and establish end-to-end operational procedures and standards for incident, problem, change, business process integration, automation and daily administrative tasks.

Appendix B: List of Reviewed Documentation

Forrester was provided and reviewed various background documents to help provide an understanding of the current situation and prepare for the stakeholder interviews. The documents Forrester reviewed included:

- EZV System Component Diagrams
- E-Dec Systemübersicht Import and Export
- E-Dec Systemuebersicht
- Guidance for Development of BT Service Catalogs
- ISDS_le_e_EDEC2.10
- OHB_EZV_E-dec_v1.4: Organisationshandbuch E-DEC/EZV
- EZV Organization Chart
- Ziele_NRM_d: Ziele Neues Rechnungsmodell Bund – NRM
- EZV Facts and figures_en
- 2010-07-07 Vision Statement
- SIP EFD Band B Langfassung V 1 5
- 01 Analysis of Situation E-DEC extension
- 02 Workflow_Messages
- 03 Basisdokument für Audit e-dec Engl 20100713 V1
- 04 Oracle on zLinux eng 20100713 V1
- Auswertung Aufwand im Vergleich zur Schätzung – IDEE LC2.xls
- Bispiel Change Plan e-dec BIT.doc
- Deployment Plan.xls
- E-deck 2010 Iterationsplan Mai.doc
- E-dec Flow Security Architektur und Design.doc
- e-dec Service Übersicht und Roadmap.doc
- Edec_Core_Deployment.doc
- Isds_le_e_EDEC2.09.xls
- PhasePlan e-dec 2010.doc
- Plausibilisierung RuleMapping.xls
- Programming Guidelines.doc
- Risk List e-dec.xlsm
- Rule Development Plausibilisierung.doc
- Schätzung UCs IDEE.xls
- Service Contract EdecService.doc
- Software_Development_Plan_LC3.doc
- SupplementarySpecification.doc
- UC001_WarenimportElektronischAnmelden.doc
- User Dokumentation Plausi-Regeln.doc
- Vision e-dec import.doc

- Web Service Design in e-dec.doc
- e-dec Architektur_Konformitaet.xls
- Edec_Flow_Deployment.doc
- Software Design Document.doc
- Software Requirements Specification.doc
- SoftwareArchitectureDocument.doc
- Evaluation_e-dec_IDEE_LC3.doc
- Iteration Assessment_LC2010 April.pptx
- Business Model.doc
- Detailplanung und Controlling e-dec.xls
- Schnittstellenbeschreibung e-dec Zollanmeldung.doc
- Software Architecture Document e-dec Flow.doc
- 2ftss-4-0-e-FTSS CORR 2009-SECTION II-Business Process Threads for Core Business.docm
- 3ftss-4-0-e-FTSS CORR 2009-SECTION III- Business Process Threads for Guarantee Management.docm
- 4ftss-4.0-e-2008-SECTION IV – Business Process Threads for Central Services.doc
- A3_0ftss-4.0-FTSS CORR 2009 – Appendix A3 – Procedural Codes & Structure of Reference Numbers.docm
- Btfss-4 0 –e-FTSS CORR 2009 – IE messages.doc

Appendix C: List of interviewees

Forrester conducted interviews with EZV and BIT stakeholders during the week of August 16, 2010. Interview participants included:

- Corrado Campigotto, System Engineer
- Fabien Cerf, Architect
- Yavuz Eskici, Amtric NTCS, Anwendungsentwickler
- Benno Fluri, Abteilungsleitung Bereistellung
- Jürg Hafner, Bereichsleiter
- Urs Holzer
- Stefan Huesemann, Systemarchitekt
- Daniel Joray, System Specialist
- Peter Kalkbrenner, NTCS, Entwicklungsverantwortlicher
- Sascha Körner, Teamleiter, System Engineer
- Turabi Köse, Programmleiter
- Christoph Luginbühl, Datenbankadministrator
- Thomas Moser, Produktverantwortlicher Betrieb Anwendung
- Matthias Müller, Datenachitekt Datenbaken
- Thierry Perroud, IT Unternehmes, Architect
- Matthias Rüfenacht, Informationssystem, Architect
- Rolf Spieler, Business Process Engineer
- Bruno Willener, System Engineer

Appendix D: Forrester Presentations

EZV Preliminary Findings Presentation

Presented on August 20, 2010

EZV Preliminary Findings 20 Aug FINA

EZV Recommendations and Findings Presentation

Presented on September 27, 2010

EZV Recommendations an

EZV Report Diagrams

100918 EZV report diagrams (2).pptx

Appendix E: About the Analysts

Alex Peters Ph.D.

Principal Analyst

Alex serves Business Process & Applications professionals. His coverage includes Lean strategies, sustainability, and ERP governance and organization. He is also a leading expert on best practices for making business technology organizations more effective and business-relevant through the implementation of business technology strategies, business-driven IT governance, service-oriented structures, and process frameworks.

Prior to taking on this role, Alex's research focused on CIOs' challenges, such as the development of IT strategies, enterprise architectures, the consolidation and streamlining of IT, sourcing strategies, change management, and communications strategies. Before joining Forrester in 2005, Alex developed the IT consolidation program and managed the data center of a large European automotive company. Previously, he spent 10 years at IBM and EDS as an executive senior consultant and led several international customer projects in areas such as mergers and acquisitions, IT shared services, sourcing, organizational change, process, and technology management. Alex also worked five years as a research scientist in the area of high-performance computing at the IBM Scientific Center Heidelberg, publishing in refereed journals and co-editing three proceeding books.

Alex received a master's degree in engineering from the Civil Engineering Institute in Bucharest, Romania and a Ph.D. in engineering from the Technical University Aachen, Germany. He received a postdoctoral fellowship from Princeton University.

John R. Rymer

Vice President & Principal Analyst

John serves Application Development & Delivery professionals. He is a leading expert on middleware for the enterprise. Included in his coverage are the Java/J2EE application servers from IBM, JBoss, Oracle, and SAP, as well as Microsoft's .NET platform. John is an expert on the enterprise strategies of IBM, Microsoft, Oracle, and SAP. John also contributes to Forrester's coverage of business rules platforms, Microsoft SharePoint, and complex event processing.

John came to Forrester through its acquisition of Giga Information Group and has a combined total of six years with the company. He has worked as an industry analyst for more than 15 years, starting in 1989. John's industry experience includes a stint as vice president of product marketing for IONA Technologies, where he gained first-hand experience in creating and executing market strategies.

Before joining IONA, John was principal consultant and founder of Upstream Consulting, a vendor strategy consulting group within Fleishman-Hillard International Communications.

John is a frequent speaker at Forrester conferences for IT professionals.

John graduated from Ohio University with a B.S. in journalism.

Endnotes

[1] For a list of the received and reviewed documentation see Appendix A

[2] For a list of the interviews performed between July 21 and September x, see Appendix B

[3] See Appendix D *Forrester's preliminary findings presentation of August 20, 2010*

[4] See Appendix E *Forrester's final presentation of September 27, 2010*

[5] Different newspaper articles e.g. *Ein neues Paradigma, www.computerworld.ch of June 17, 2005* or *Electronic Declaration als Business-to-Government-Lösung", e-Gov Präsenz, January 2009*

[6] According to *Projekt Redesign M90 Schlussbericht Phase Konzept of June 2002* the cost estimate for the development of e-dec import was 3,618M CHF. By the end of 2006 the reported investment was 11.036M CHF (9,6M CHF external services) – see *e-dec Redesign Modell90 Projektabschlussbericht, March 2007*.

[7] See *Projektauftrag IPV of 28.03.2007*

[8] According to the proposal *Gesamtprojektantrag/-auftrag all e-dec Version 3.0 of 27.03.2008* the realization of one integrated platform for import, export and transit is due I December 2010.

[9] See *05 NCTS-EDEC.ppt, 2010*

[10] According to *KSC statistics in 1.H 2010* the value of export transactions was 132 Bn CHF (7,5M records) of which: 60.6Bn CHF (4,1M records, 45,7%) were processed through e-dec export; and 44,2Bn CHF (1,6M records, 33,3%) were processed through NCTS. The remaining 21% were processed through other channels: Zentral 11,6%; VAR 9%; 0,4% Tobacco and Post. The value of import transactions was 124,6Bn CHF (12M records), 11,5BN of which (94% and 11,5M records) were processed through e-dec import.

[11] Summary based on information collected during interviews and by screening the documentation made available to Forrester.

[12] See Appendix C *Forrester's project kickoff presentation of July 21, 2010*

[13] This description of e-dec is Forrester's, not BIT's. Forrester based its description of e-dec on BIT documentation and interviews with Stefan Hüseman, systemarchitekt and leader of the e-dec development team.

[14] Source: Interview with Sascha Körner, teamleiter, system engineer, August 16, 2010. Interview with Bruno Willener, system engineer, August 16, 2010. BIT employs VMWare ESX 3.5 to virtualize SUSE Linux servers.

[15] Source: *Software Architecture Document* and Software *Contract e-dec Service* documentation from the e-dec development team.

[16] This description of NCTS is Forrester's, not BIT's. Forrester based its description of NCTS on BIT documentation and an interview with Peter Kalkbrenner and leader of the NCTS development team.

[17] Source: Interview with Michael Flückiger, Systemspezialist, August 18, 2010.

[18] Source: Interview with Bruno Willener, system engineer, August 18, 2010.

[19] Source for all facts about NCTS's deployment environment in this paragraph: Interview with Bruno Willener, system engineer, August 18, 2010.

[20] Source: *Konzept Integration Postverkehr in e-dec Import of 16.02.2007* .

[21] Source: *Entwicklungsvergleich ELPO / IPV of 4.08.2010*

[22] See *Evaluation e-dec IDEE LC3, BIT 15.02.2009* and *NCTS: Projekts-und Applikationseckdaten*, *BIT 12.08. 2010*

[23] Source: *Kostenentwicklung e-dec and NCTS, Berechnungsblätter BIT and Preismodell Betrieb Anwendung BIT*

[24] Estimates provided by R. Opplinger.

[25] Source: *KSC Tätigkeitsberichte und Statistiken, 2009-2010*

[26] Source: *Vision Statement zur Strategischen Informatikplanung of July 10, 2010*

[27] On July 7, 2010 The General Secretary of EFD provided a Vision Statement which reinforces SIP's directions

[28] *SIP Planung der EFD Band B Strategie – Architektur – Umsetzungsplanung of 20.11.2003*

[29] On July 7, 2010 The General Secretary of EFD provided a Vision Statement which reinforces SIP's directions.

[30] See Appendix D *Forrester's preliminary findings presentation of August 20, 2010*

[31] Source: Statistics provided by Benno Fluri

[32] Source: *Berechnungsblätter Betrieb Anwendung NCTS* and *Preismodell Betrieb Anwendung BIT*

[33] Source: *Berechnungsblätter Betrieb Anwendung e-dec* and *Preismodell Betrieb Anwendung BIT*

[34] Source: Stefan Hüseman conversation on Aug. 18 and phone follow up.

[35] Interview with Ludovic Chesaux, EZV NCTS project manager and former e-dec project manager, August 18, 2010.

[36] EZV has no other application that uses an architecture like e-dec's. EZV's other major application, NCTS, employs a well-understood central database architecture.

[37] For example, in 2009, one of the physical servers running e-dec lost a network connection, which shut down e-dec's GUI. VMWare ESX responded by moving the e-dec component to a different virtual server making the problem harder to find and fix. Interview with Stefan Hüseman, systemarchitekt, August 18, 2010,

[38] Interview with Turabi Köse, programmleiter, and Stefan Hüseman, systemarchitekt, August 18, 2010.

[39] For example, in the August 18, 2010 interview with Stefan Hüseman and Peter Kalkbrenner, Stefan stated that e-dec's process for export processing was different from NCTS' process. Urs Holzer indicated if this were true, then e-dec is likely incorrectly implementing the export-declaration process.

[40] Different newspaper articles e.g. *Ein neues Paradigma, www.computerworld.ch of June 17, 2005* or *Electronic Declaration als Business-to-Government-Lösung", e-Gov Präsenz, January 2009*

[41] SOAP is an XML standard for defining data payloads, which is combined with transport protocols like HTTP and HTTPS. WSDL is an XML standard for defining service interfaces. UDDI is an XML standard for registering and looking up WSDL services.

[42] Source Urs Holzer: Comparison of functionality NCTS versus e-dec export, e-mail to BIT, September 2010

[43] Source: Überprüfung des Prozesses Informatik führen in der Zollverwaltung, January 15 2010

[44] Source: *SIP Planung der EFD Band B Strategie – Architektur – Umsetzungsplanung of 20.11.2003, pp.32*

[45] Source, Interview with Marcel Frei and *KSC Tätigkeitsberichte und Statistiken, 2009-2010*

[46] Source: interview with Thierry Perroud

[47] Source: Interviews with Roger Opplinger, Gabriella Derungs, Ludovic Chesaux and Urs Holzer

[48] Source: Interview with Turabi Köse

[49] Source: Interview with Peter Kalkbrenner

[50] Judgment based on interviews with Peter Kalkbrenner, leader of the NCTS team, and Stefan Hüseman, leader of the e-dec development team.

[51] See Urs Holzer memo called "Flexibility of an IT-System in meaning of the business", September 8, 2010.

[52] See Überprüfung des Prozesses Informatik führen in der Zollverwaltung, January 2010.