Data Migration Assessment

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1 Executive Summary

1.1 Scope of Work

The scope of this Data Migration Assessment was to review the process that was performed for the migration of claim and treatment data for the EFI Programme. It therefore includes assessing key tasks in the analysis, design and testing of the data migration. Accenture has reviewed the timeline, methodology and sequence of events from the start of the data migration effort in 2009 until the EFI+DMI System went into operation in September 2013.

This report is based on review of the documents listed in Appendix 6.1 from the data migration process for the EFI Programme. The purpose of the review has not been to consider who is responsible for the decisions taken during the project execution. The report does therefore not include a legal review of the contractual obligations in the EFI and DMI contracts and the report can thus not be used to conclude whether or to what extent any of the parties involved in the project execution can be held legally responsible for their involvement in the project.

The assessment is made based on our experience and on assumption that the conclusions in the assessment are representative also for the data migration documents that have not been reviewed.

1.2 Approach for Data Migration Assessment

The assessment has been conducted by examining key documents and conducting interviews with key people involved in the data migration for the EFI Programme. The documents reviewed and the interviews conducted are listed in Appendix 6.1.

The examination of documents started with the original requirements for data migration and ended with a report describing the deficiencies in data in the EFI+DMI System after go-live. Interviews were conducted in order to clarify facts in the documents reviewed.

Accenture's Delivery Methodology for Data Migration was used as a reference for generally accepted IT industry normal practices of data migration projects. For each stage of the methodology, we have assessed the facts as evidenced by the documents reviewed versus a normal practice approach.

Accenture did review the documents listed in Appendix 6.1, which cover:

- Original Requirements for data migration
- Strategy and planning documents
- Status reports
- Meeting notes
- E-mail correspondence, including attachments
- Results from our EFI Technical Analysis

Accenture did not review:

- Detailed design documentation, e.g. field mappings or program logic

- Test case documents

- Contract documents not specifically related to data migration

1.3 Key Findings

Accenture's assessment has identified the following:

Scope, Planning and Management of Data Migration

A comparison of the strategy and planning documents for data migration with the status reports from the migration trials revealed that:

- Not all the entry/exit criteria for the migration trials, as stated in the conversion plan, were adhered to during the execution of the data migration trials

- The end-to-end testing of EFI and DMI with the migrated data was not completed

Data Cleansing

Cleansing of source data with deficiencies prior to migration is a vital task according to the methodology. Although there was a clean-up list defined and the data cleansing activity was tracked, we found that:

- Status green had been reported although there were a number of unfinished activities listed

- The data cleansing still did not prevent data with e.g. incorrect amounts from being migrated

Data Migration Testing

Accenture's Methodology for Data Migration calls for repeated migration trials of all the relevant data until the migration trials are successful - before migrating data to production. Our analysis of the conversion plan, the summary status reports from the migration trials and post migration status reports found that:

- None of the data migration trials (PK1, PK2, PK3, PK4) were on a full scale (100% of source system data) – the most extensive migration trial, PK4, was limited to ~49% the amount of data in the production migration

- The summary status reports for each of the migration trials (PK1, PK3, PK4) reported that the trials were completed, although there were listed remaining defects that were still to be fixed

- As the EFI Modtag Fordring (MF) component, as well as EFI+DMI, were under development and testing during the migration trials, it is a fact that neither the application used for migration (MF) nor the target System (EFI+DMI) were tested in their final state with the migrated data. The testing was therefore inconclusive and

invalid, as it was done on earlier versions of MF, EFI and DMI than the versions used during the production conversion and production

- Only limited testing of the migrated data was performed in a test phase (pilot) between PK4 and go-live. The end-to-end testing of EFI with the migrated data that was described in the conversion plan was not performed

Deployment / Go-live

A review of the summary status report from the last migration trial PK4, revealed that:

- The scope of PK4 had been reduced and had not covered 100% of all data to be converted. Only ~49% of source data was attempted converted in PK4

- The exit criteria for PK4 had been reduced compared to those listed for PK2 in the conversion plan. PK4 would not have passed the exit criteria if they had been used as specified in the conversion plan

- The summary status report from PK4 still concluded with a recommendation that PK4 be approved and that the project could continue to the production migration, "with prioritized risk reduction actions and defect corrections"

- The steering committee of the EFI Programme made the go-live decision following the PK4 summary status report recommendation
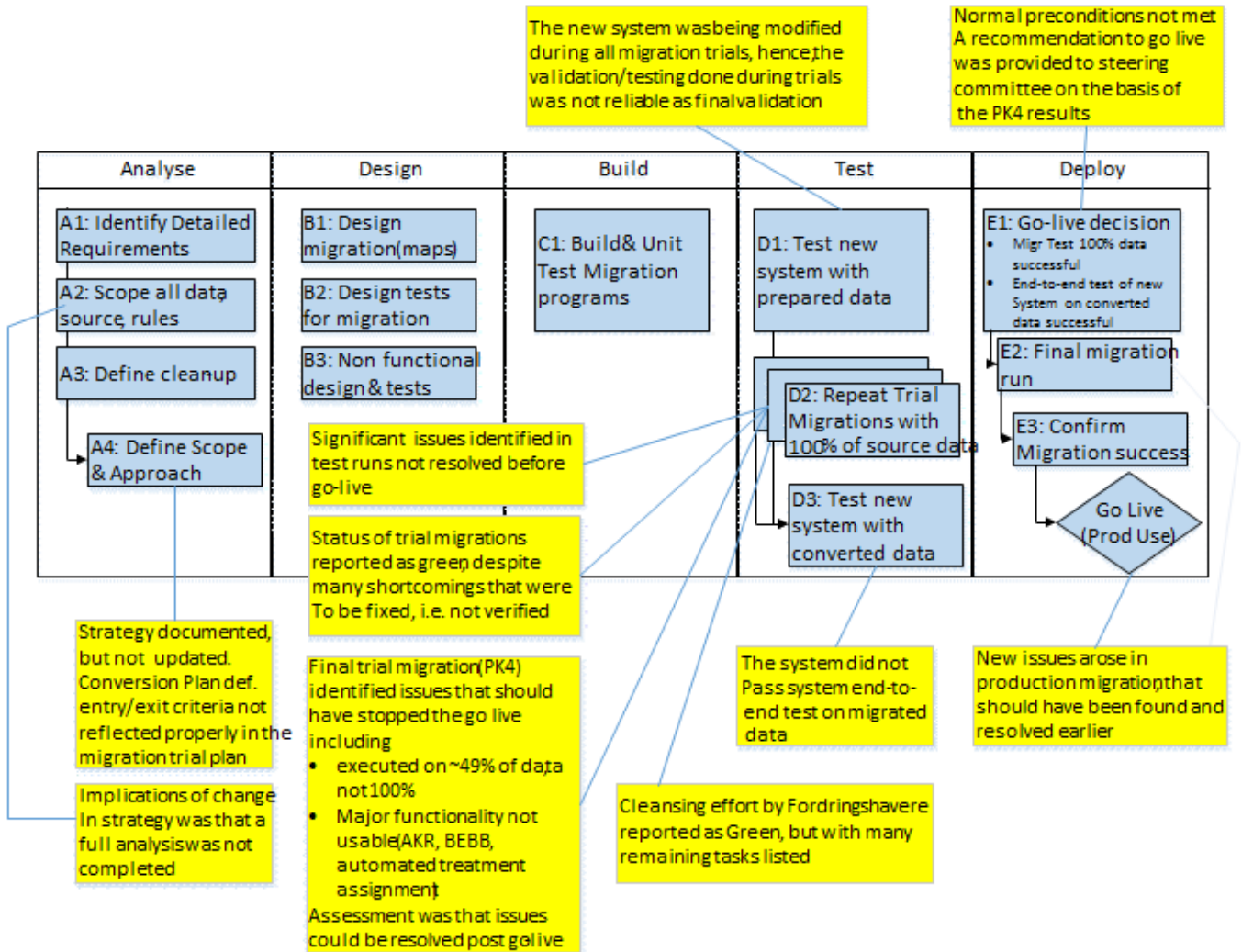
Figure 1 Accenture Data Migration Methodology and highlighted shortcomings in the EFI migration project.

In Summary

The diagram above illustrates the major tasks of data migration according to Accenture's Methodology for Data Migration. The callouts in yellow indicate where our findings from the data migration of EFI and DMI deviated from the methodology's approach.

The evidence is clear that

- Less than half of the combined body of data in all source systems were ever included in migration trials prior to the production conversion.

- The validation of incoming data was not sufficient to prevent incorrect claims being migrated

- The migrated data was not tested end-to-end with the EFI+DMI system before the production migration

These facts are the most important deficiencies of the data migration project and constituted a high level of risk that the data migration would not be successful.

1.4 Consequences

The consequences of the EFI data migration were:

- Data was migrated into the EFI+DMI System that could not be processed correctly by the system. As the EFI+DMI system had not been thoroughly tested with the migrated data it could not be expected that it would be able to process the migrated data correctly

- The EFI+DMI System was designed to handle data without deficiencies and Modtag Fordring did not include sufficient data validation to ensure that only correct and complete data was entered into EFI. For instance claims were placed on treatments where the claim type – treatment combination is not allowed

- As of 2 years post go-live it has not been possible to enable much of the disabled automated functionality originally intended in EFI, due to a variety of functionality and data related issues which are still not fixed, e.g. incorrect expiration dates on claims

1.5 Recommendations

In order to recover large portions of the affected data, with a view at one point to continue operation with new systems, a data cleansing exercise should be performed to detect and correct data issues introduced by the data migration or subsequent operation. The data cleansing should be aligned with other functional and technical changes being planned, and will require more focus on clear requirements and testing. The data cleansing will be complex and lengthy, and is likely to be able to resolve only a portion of the known data issues.

2 Scope of Work

The scope of this data migration assessment was to review the process that was performed for the migration of claims and treatments data for the EFI Programme. It therefore includes assessing key tasks in the analysis, design and testing of the data migration. Accenture has reviewed the timeline, methodology and sequence of events from the start of the data migration effort in 2009 until the EFI+DMI System went into operation in September 2013.

2.1 Methodology for Data Migration Assessment

The assessment has been conducted by examining key documents and conducting interviews with key people involved in the data migration for the EFI Programme. The documents reviewed and the interviews conducted are listed in Appendix 6.1.

The examination of documents started with the original contracted requirements for data migration and ended with a report describing the deficiencies in data in EFI after go-live

The interviews were conducted in order to clarify facts in the documents reviewed. Accenture did review the documents listed in Appendix 6.1, which cover:

- Contract documents concerning the data migration
- Strategy and planning documents
- Status reports
- Meeting notes
- E-mail correspondence, including attachments
- Results from our EFI Technical Analysis Report and Technical Report

Accenture did not review:

- Detailed design documentation, e.g. field mappings or program logic
- Test case documents
- Contract documents not specifically related to data migration

Accenture's assessment of the data migration process documents:

- Started with the documents made available to us from the EFI Programme at the start of the assessment
- We have requested and obtained a number of additional documents based on document references found in the first documents we reviewed
- Our examination of documents has not been exhaustive, but focused on obtaining a logical sequence of documents describing the EFI data migration from start to end

The main focus of this data migration assessment were:

- To assess the production data migration that was done in Aug/Sep 2013 to migrate claims and treatments from the source systems into EFI and DMI before EFI and DMI were put into production in Sep 2013
- To examine the critical tasks that were performed in preparing for the data migration, including the validation of the data migration through testing

2.2 Limitations

The scope of this data migration assessment was to review the process that was performed for the migration of claims and treatments data for the EFI Programme. It therefore includes assessing key tasks in the analysis, design and testing of the data migration. Accenture has reviewed the timeline, methodology and sequence of events from the start of the data migration effort in 2009 until the EFI+DMI System went into operation in September 2013.

This report is based on review of the documents listed in Appendix 6.1 from the data migration process for the EFI Programme. The purpose of the review has not been to consider who is responsible for the decisions taken during the project execution. The report does therefore not include a legal review of the contractual obligations in the EFI and DMI contracts and the report can thus not be used to conclude whether or to what extent any of the parties involved in the project execution can be held legally responsible for their involvement in the project.

The report is made based on our experience and assumption that the conclusions in the report are representative also for the data migration documents that have not been reviewed.

3 Approach and Methodology

3.1 Approach

Accenture's approach for this assessment was:

- Review of the documentation as listed in the Appendix

- Accenture's Delivery Methodology for Data Migration was used as a baseline of the tasks that should be performed in a data migration process and for which we looked for documented evidence that had been done

- For each stage of the methodology we have assessed the facts as evidenced by the documents reviewed

- Develop a preliminary report with findings, including references to the documents reviewed

- Conduct interviews with key individuals who had been involved in the data migration process, as listed in the Appendix, to answer key questions and to ensure that essential relevant documentation had been located and reviewed

- Review all findings with stakeholders

3.2 Data Migration Fundamentals

This section briefly describes the fundamentals of data migration.

Data are the valuable business records, which are the reason for a business to exist. Data migration involves movement and transformation of data from a source system and format into a format that another system can process. Typically, the target system includes different functionality or changed processes that require changes to the data. Data from legacy source systems usually requires a clean-up effort (e.g. correcting addresses, de-duplicating), which usually is performed in the legacy source systems prior to migration.

The data to be migrated is then extracted from the source system and mapped and transformed, as needed, into the required format that can be loaded into the target system. With large amounts of data to be migrated, the extraction, transformation and loading requires use and configuration of ETL software or custom coded software to be built for the job. This migration software must be thoroughly tested prior to performing the data migration.

Because of the variations normally found in source data and the complexity of mapping and transformation, the migration effort usually requires a number of trial runs before everything works – for all the data, this is called migration trials.

The ultimate goal of data migration is to ensure that the target system will be able to process the migrated data correctly. This requires that:

- The target system must first have completed testing with prepared (controlled) test data, this is a prerequisite for the following step

- Then the target system must be tested with the migrated data to validate that it is in fact capable of processing the migrated data correctly

The testing described in the previous paragraph is normally a test of all relevant business scenarios from start to finish; normally referred to as "case based testing" or "end-to-end testing".

The term "data conversion" is often used instead of and interchangeably with "data migration".

3.3 Methodology

Accenture's Delivery Methodology (ADM) for Data Migration is used as a reference for generally accepted industry practices of data migration.

The methodology is organised into a five-step process with a standard set of tasks to be performed.

A: Data Migration Analysis
    A1: Identify and agree on data migration requirements, approach and responsibilities. Systematic breakdown of high-level requirements into detailed requirements that are traced back to the high-level requirements, in the form of a Requirements Traceability Matrix
    A2: Define the scope of data to be migrated, and migration rules. Data profiling of 100% of the data to be migrated, to assess data quality, volume and number of variants
    A3: Define and agree on any data clean-up to be performed, prior to migration
    A4: Define the total migration approach, which includes all relevant aspects of the data migration (all data sources, all variants). Decide on single migration (big bang), phased or incremental approach

B: Data Migration Design
    B1: Design how each item of data is to be mapped and migrated from source to target
    B2: Design how the migration will be validated through testing
    B3: Define non-functional aspects (i.e. performance / available time window for the full migration to be processed)

C: Data Migration Build
    C1: Build and test the migration programs
D: Data Migration Testing
    D1: Testing of the new system with prepared test data (precondition for the next steps)
    D2: Repeated trial migrations, until all data migration procedures and jobs are working as intended for all the data to be migrated
    D3: Testing of the new system processes (end-to-end) with the migrated data

E: Data Migration
    E1: Go-live decision
    E2: Final migration run
    E3: Production controls, to confirm that the migration has been successful in the production environment.

4 Chronology of Events

Based on our review of all the documentation and interviews listed in the Appendix we have drawn the following high-level timeline for the data migration of the EFI Programme from start to finish.

ID	Task Name	2008	2009				2010				2011				2012				2013			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Migration Strategy (EFI)		▆																			
2	Migration Trial 1 (PK1)												▆									
3	Migration Strategy for EFI+DMI (no documented strategy found)														▆							
4	Migration Build															▆▆▆						
5	Migration baseline documentation															▆						
6	Migration Trial 2 (PK2)																	▆				
7	Migration Trial 3 (PK3)																	▆				
8	Migration Trial 4 (PK4)																		▆			
9	Production Migration																			▎		
10	Data Validation																			▎		
11	Go Live Decision																			▏		

Figure 2 EFI Data Migration Timeline

Based on Accenture experience with comparable projects, we have the following comments to the timeline:

The initial migration trial seems short, only ~ 2 months. With a data migration of this scale, approx. 6-12 months would have been expected for the initial task, as it should involve profiling of all the data to be migrated, definition of migration rules etc.

With a data migration of this scale, we would have expected ~10 data migration trials. Each of these would have the following characteristics:

- Would be full scale, including all the data to be migrated

- The final 2-4 data migration trials would be essentially identical to the production migration, in order to fine-tune the migration approach before the production migration

- According to Accenture's data migration methodology, the final task is "Confirm migrated data", as data validation is done as an integral part of the data migration trials, not as a separate activity afterwards

In a data migration project of this scale, according to Accenture's methodology and experience, the timeline and activities would have been more in line with what is indicated below.

ID	Task Name	2008 Q4	2009 Q1	Q2	Q3	Q4	2010 Q1	Q2	Q3	Q4	2011 Q1	Q2	Q3	Q4	2012 Q1	Q2	Q3	Q4	2013 Q1	Q2	Q3	Q4
1	Migration Strategy & Analysis		█																			
2	Migration Design				█	█																
3	Migration Build						█	█	█													
4	Migration Trial 1										█											
5	Migration Trial 2												█									
6	Migration Trial 3													█								
7	Migration Trial 4														█							
8	Migration Trial 5 (end to end w app)															█						
9	Migration Trial 6 (end to end w app)																█					
10	Migration Trial 7 (end to end w app)																	█				
11	Migration Trial 8 (identical to live)																		█			
12	Production Migration																			█		

Figure 3 Expected Data Migration Timeline

According to the Data Migration Methodology, the total data migration effort would run in parallel with systems development for most of the duration of the project.

However, we normally would have recommended a more concentrated project effort to reduce the timeline to e.g. 2 – 2½ years in order to reduce the risk of scope changes during the migration.

The remainder of the document deals with the assessment of the data migration work that was done, as evidenced by the documents reviewed and the interviews conducted. The report has been structured according to the phases of the Data Migration Methodology.

5 Findings and Consequences

5.1 Assessment of the EFI Data Migration Analysis Phase

This section describes Accenture's assessment of the analysis phase of the EFI data migration project. We identified the following documents as the most relevant for the assessment of the analysis phase:

Ref.#	Category (used for sorting)	Document title
2	Contract	L21 Underbilag - EFI Konvertering.doc
3	Strategy	Konvereteringsstrategi v1.2.pdf
4	Plan	Konverteringsplan EFI v09 CSC KONV
7	PK2	Opsamlingsskema for test PK2.docx
9	PK2	2013 02 01 Oprydningsliste til IU
10	PK3	05 b KFL_Prøvprøvekonvertering 3 afrapportering v0_2 [DOK32828717] (10064235_1).DOCX
17	PK4	16 Prøvekonvertering 4 afrapportering v0_3 [DOK31571202] (10064294_1).DOCX
34	Production conversion	Produktionskonvertering afrapportering v0_8 (00000002).docx
46	Production conversion	Bilag B - Tværgående konverteringsmangler (9573038_2) (2).docx

Table 1 Overview over Relevant Documents for Assessment of Analysis Phase

Information in the documents listed above was compared to what is to be expected in the analysis phase of a data migration project, based on ADM for data migration.

Our assessment focused on answering the following key questions:

- Were the requirements [1] sufficient to define the scope of work?

- Was there a documented data migration approach, and was this appropriate to manage the work?

- Was all the data and variants to be migrated identified and analysed during the analysis phase? And was the need for data cleansing appropriately addressed?

5.1.1 Key Findings

Data Migration Requirements
Based on our review of the original requirements for data migration the EFI Programme, as listed in [1], Section 1.2, it is our observation that these were few and high-level. According to interview 3, the only detailing of requirements that was made are in the form of mapping rules which are documented in Excel documents per treatment type and in the

Informatica portal, plus specified data formats that the source system owners were to deliver data in to the migration team.

It is our evaluation that the detailing of the original requirements [1] were lacking the hierarchical breakdown structure which is required for defining all the tests that are necessary in order to validate the full data migration effort.

Data Conversion Strategy and Planning

Based on our review of the data conversion strategy [3], data conversion plan [4] the production migration report [34], our observations are that:

- The initial conversion strategy only covered EFI

- Separate data conversion strategy documents for EFI and DMI had been developed prior to EFI and DMI being gathered into one organization [34], Section 1.1. (Our document review has not identified the data conversion strategy document for DMI)

- There was a change to the conversion strategy [34], Section 1.1 after PK1: "SKAT wanted to introduce the principle of taking the debts directly from the claimants" (our translation). The strategy document [3] was not updated with the modified strategy, but it was reflected in the conversion plan [4]

- The data conversion plan describes an overall time plan for data migration trials, organization of the data migration effort and entry and exit criteria for the data migration trials

- It is our evaluation that although the strategy document was not updated, the planning document [4] for the migration trials was updated and contained the basic high-level information required for managing the migration trials

Analysis of All Data and Variants to be Migrated

According to interview 3, data profiling had only been done on external data, not SKAT data.

It is our evaluation that:

- Not all data and variants that were to be migrated were identified in the migration trial PK1, before subsequent migration trials were executed. According to [30] PK1 was insufficient because the data in KMD-IND lacked the details that was wanted in EFI (split of claims in main claim and sub-claims (interest, fees)).

- None of the migration trials PK2, PK3, PK4 were on 100% of the data, as the number of source systems and the volume of the data that was included increased for every trial, but PK4 still didn't cover all the data to be migrated

Need for Data Cleansing of the Source Systems
A data clean-up list [9] was defined, but according to interview 3 this covered only SKAT internal data. Data clean-up status was tracked [9], but although a number of areas were marked as green there were still unfinished clean-up tasks listed.

It is our evaluation that data cleansing of the source systems was insufficient or not done, because e.g. fields with incorrect values were migrated to EFI+DMI, according to [46].

5.2 Assessment of the EFI Data Migration Design Phase

This section describes Accenture's assessment of the design phase of the EFI data migration project. We identified the following documents as the most relevant for the assessment of the design phase:

Ref.#	Category (used for sorting)	Document title
34	Production conversion	Produktionskonvertering afrapportering v0_8 (00000002).docx
46	Production conversion	Bilag B - Tværgående konverteringsmangler (9573038_2) (2).docx
57	Accenture deliverable	Technical Report.docx

Table 2 Most Relevant Documents for Assessment of Design Phase

Information in the documents listed above was compared to what is to be expected in the design phase of a data migration project, based on ADM for Data Migration.

Our assessment focused on answering the following key questions:

- Did the data migration design documents include the necessary controls to secure that only quality data was migrated – and all non-conforming data written to error logs?

- What data controls were designed into Modtag Fordring, the part of EFI through which the vast majority of claims were migrated? (Modtag Fordring is the interface through which claimants submit their claims to EFI+DMI)

5.2.1 Key Findings

Based on our examination of the documents it is observed that the design documentation has not been sufficient to prevent invalid data from being inserted into EFI because it was discovered, after the production migration that crucial details were missing such as decisions for salary deductions [46].

According to the final report [34], Section 1.1, claims were migrated using the Modtag Fordring application, where it was temporarily allowed to accept historic claims as part of the migration. Treatments (indsatser) were migrated using the ETL tool Informatica.

This is consistent with statements from interview 3, where the Konsortium stated that claims were migrated using the Modtag Fordring interface, where an exception flag had

been added to the Web service message to Modtag Fordring to also accept historic claims.

Validation in MF is based on a number of things [see Technical Report]:

- WSDL and/or XSD validation on the enterprise service bus (ESB)

- Matrix configurations, which are rules matrices for e.g. which claimants are allowed to submit which types of claims

- Administrator configuration, which is based on super user configuration of the system via the user interface. E.g. selecting which fields are on different types of claims, and whether they are mandatory

Accenture have shown in our Technical Report [57], that Modtag Fordring does not include validations to ensure that only valid claims can enter the system. E.g. when MF was used to load claims in the migration, claims were accepted and put on a treatment for which the claim type was not justified. There is no sanity checking on key fields, e.g. to ensuring that dates are in a proper time sequence for the claim to be in a valid state, and the amount of debt is not sanity checked [46].

5.3 Assessment of the EFI Data Migration Build

No specific comments.

5.4 Assessment of the EFI Data Migration Testing

This section describes Accenture's assessment of the testing of the EFI data migration project. We identified the following documents as the most relevant for the assessment of the testing that was done:

Ref.#	Category (used for sorting)	Document title
3	Strategy	Konvereteringsstrategi v1.2.pdf
4	Plan	Konverteringsplan EFI v09 CSC KONV
5	PK1	Prøvekonvertering 1 afrapportering 19012012
7	PK2	Opsamlingsskema for test PK2.docx
10	PK3	05 b KFL_Prøvprøvekonvertering 3 afrapportering v0_2 [DOK32828717] (10064235_1).DOCX
12	FKT	2013-04-13 FKT reduktion og færdiggørelse.docx
17	PK4	16 Prøvekonvertering 4 afrapportering v0_3 [DOK31571202] (10064294_1).DOCX
34	Production conversion	Produktionskonvertering afrapportering v0_8 (00000002).docx

| 46 | Production conversion | Bilag B - Tværgående konverteringsmangler (9573038_2) (2).docx |

Table 3 Relevant Documents for Assessment of Testing

Information in the documents listed above was compared to what is to be expected in the testing of a data migration project, based on ADM for Data Migration.

Our assessment focused on answering the following key questions:

- Was the pre-condition on a stable, tested EFI+DMI System met?
- Did the migration trials cover 100% of the data to be migrated, and did the trials continue until they were successful?
- Had the system passed end-to-end testing with the migrated data?

5.4.1 Key Findings

Testing with Prepared Test Data
It is our observation from the trial migration reports PK1, PK3 and PK4 that EFI+DMI and Modtag Fordring were not thoroughly tested and were not stable during the migration trials.

It is our evaluation that since the target system was not stable and tested during the migration trials, the validation of data migration that was performed during each of the trials were inconclusive in terms of what would work in the production system.

Migration Trials
None of the migration trials PK1, PK2 (we have not seen this report, however it is stated [10] that this was the case), PK3 and PK4 represented a complete data migration trial, hence, there was no full migration trial performed prior to the production data migration.

Mapping rules for treatments were adjusted after each migration trial, also after PK4 [3].

In the final migration trial - PK4, the following was the result as stated in [17]:

- ~9.3 million out of ~19.1 million claims attempted to be migrated (49% of total claims)
- EFI rejected a significant number of claims, for multiple reasons including a lack of AKR functionality (customers that could not be reconciled with CPR or CVR)
- The balances in EFI and DMI did not reconcile, post migration
- There was a high probability that EFI would automatically mail 600,000 debtors immediately
- Payment ability (BeBB) calculations were not usable
- Assignment of automatic treatments were not usable
    - As a direct result of this testing, most automated functionality was disabled before go-live (the "pilotspor" was used instead)
- A number of remaining defects were listed

The summary status reports for each of the migration trials (PK1, PK3, PK4) [5, 10, 17] reported that the trials were completed, although there were listed remaining defects that were still to be fixed. (The summary status report for PK2 has not been identified).

Testing with the Migrated Data

Based on our examination, testing on migrated data was written into the conversion strategy [3], Section 13.3.2, and [4], Section 4: "A regression test on migrated data, where selected test cases from test of functionality (FKT) is applied on migrated data, in order to validate that migrated data supports the EFI-functionality. The final regression test is to validate that migrated data will function in EFI-processes" (our translation).

End-to-end testing of EFI+DMI with migrated data had not been completed prior to go-live, hence it had not been proven that EFI+DMI were able to process the migrated data correctly from being received through Modtag Fordring and processed through all the variations of treatments and claimants.

According to interview 4, the migration team only checked that the migrated data had been imported correctly into EFI, by checking the fields using EFI screens. This is not according to the conversion strategy or the conversion plan, where it is stated that an end-to-end test with migrated data was to be performed.

According to [34], Section 1.3.1: "It was only in the pilot that it has been possible to do functional testing of migrated data. Functional testing was performed to a limited degree in the Pilot" (our translation). The pilot test was a test between PK4 and the go-live.

Based on a review of a letter [12], there was a decision by the EFI project manager to limit the amount of functional testing in order to meet the September 1st 2013 deadline for go-live. Although scope reduction is a common thing to do in order to meet a set go-live date, it is Accenture's evaluation that two very risky decisions were taken:

- Retesting of fixed defects were not to be done before go-live. This is extremely risky as the need to retest defect corrections is common practice in any testing effort (regression test).

- Reduction of the end-to-end testing was to be compensated by a pilot and "other relevant activities", but there is no description of what kind of activities that were intended to compensate for the lack of sufficient testing.

The evidence is clear on the fact that less than half of the combined body of data in all source systems were ever included in migration trials prior to the production migration.

That and the fact that the migrated data was not tested end-to-end in EFI+DMI are the single most important deficiencies of the data migration project.

There is no way to predict how data will behave in a system if it has not been tested sufficiently, i.e. through testing end-to-end business processes on an amount of data which represents all the data variants that will come from the source systems.

5.5 Assessment of the EFI Data Migration for Production

This section describes Accenture's assessment of the EFI production data migration. We identified the following documents as the most relevant for the assessment of the production migration:

Ref.#	Category (used for sorting)	Document title
4	Plan	Konverteringsplan EFI v09 CSC KONV
5	PK1	Prøvekonvertering 1 afrapportering 19012012
8	PK2	07 Konverteringsstyregruppe møde 20130301 opd [DOK31571146] (10064259_1).PPTX
10	PK3	05 b KFL_Prøvprøvekonvertering 3 afrapportering v0_2 [DOK32828717] (10064235_1).DOCX
17	PK4	16 Prøvekonvertering 4 afrapportering v0_3 [DOK31571202] (10064294_1).DOCX
18	PK4	31 Afrapportering PK4 [DOK31571099] (10064402_1).PPTX
24	PK4	09 Referat EFI_DMI konvertering 20130523 [DOK31571247] (10064262_1).DOCX
28	Production conversion	bilag 1 - mail fra SKAT af 12 09 2011
29	Production conversion	Bilag 2 - mail fra SKAT af 09 05 2012
34	Production conversion	Produktionskonvertering afrapportering v0_8 (00000002).docx
46	Production conversion	Bilag B - Tværgående konverteringsmangler (9573038_2) (2).docx

Table 4 Relevant Documents for Assessment of Production Migration

Information in the documents listed above was compared to what is to be expected in the production migration phase of a data migration project, based on ADM for Data migration.

Our assessment focused on answering the following key questions:

- On what basis was the go-live decision made?
- Was the final data migration run successful?

5.5.1 Key Findings

Go-live Decision
The conversion plan [4] Section 5, 6 and 7 defined exit criteria for migration trials. The commonly accepted and sole purpose of defining exit criteria is that unless these criteria are met, the activity is not to be regarded as completed. Based on our examination of the

PK4 summary status report [17] it is observed that a complete migration trial of data from all sources was not completed, because Udbetaling Danmark (UDK) was not participating.

Based on our examination of the trial migration reports from PK1, PK3 and PK4 [5, 10, 17] and the summary status report from the production conversion [34] it is our observation that:

None of the 4 migration trials tested a full load of data from all sources

The exceptions (data migration defects) listed in PK3 and PK4 were not managed to a conclusion before moving on to the next trial migration. Overall status green was set for each of the migration trials despite the fact that there were remaining deficiencies and when the identified exceptions had been assigned to be fixed, without waiting till after the exceptions had been fixed and retested.

Despite the above shortcomings, the status report from PK4 [17], Section 7.1.1.2: concluded with: "It is recommended to finalize and approve migration trial 4 and it is recommended that the production migration can be performed on the current basis plus risk evaluated and prioritized defect corrections and changes" (our translation).

It is our evaluation that the conversion team should <u>not</u> have recommended to the steering group of the EFI Programme that the data migration could proceed to the production migration. Each of the deficiencies listed above should have mandated a clear no-go decision, according to Accenture's Data Migration Methodology.

<u>Final Migration Run</u>
The status report from the production migration [34] lists a substantial number of defects that were detected during go-live:

- Claims from DMO with incorrect liability

- Transports with incorrect payment period

- Missing expiration dates from DMO

- Errors in calculation of payment ability

- Expiration dates for RIS claims erroneous due to PEF rules in DMI

Accenture has done profiling of the migrated data in EFI and DMI which shows that the length of time since a payment was last received on migrated claims is so long that in our opinion they are effectively not being collected.

It was the decision of the project's steering group [28, 29] to move claims into EFI where it was known that subsequent manual tasks were necessary in order to process the claims correctly.

6 Appendix

6.1 Documents Examined

The following table lists the documentation examined for the data migration assessment. All documents in the list have been examined and where it is especially relevant to explicitly reference a document, and sections of a document, this has been done in the text of the report.

Ref. #	Category (used for sorting)	Document title
1	Original requirements	1. EFI 02 Leverandørens kravopfyldelse S v1_00
2	Contract	L21 Underbilag - EFI Konvertering.doc
3	Strategy	Konvereteringsstrategi v1.2.pdf
4	Plan	Konverteringsplan EFI v09 CSC KONV
5	PK1	Prøvekonvertering 1 afrapportering 19012012
6	PK2	33 Imødegåelse af trusler mod EFI go-live i maj 2013 klh [DOK31571118] (10064405_1).PPTX
7	PK2	Opsamlingsskema for test PK2.docx
8	PK2	07 Konverteringsstyregruppe møde 20130301 opd [DOK31571146] (10064259_1).PPTX
9	PK2	2013 02 01 Oprydningsliste til IU
10	PK3	05 b KFL_Prøvprøvekonvertering 3 afrapportering v0_2 [DOK32828717] (10064235_1).DOCX
11	PK3	01 EFI stg 010313 ekstra PK oplæg v2 [DOK31571111] (10064047_1).PPTX
12	FKT	2013-04-13 FKT reduktion og færdiggørelse.docx
13	FKT	Kopi af ANH FKT oplæg uge 16og17 v3.xlsx
14	FKT	130411 ANH FKT oplæg uge 16og17.xlsx
15	FKT	130627 Stormøde-2013-06-26.docx
16	PK4	11 Konverteringsstyregruppe møde 20130606 [DOK31571161] (10064265_1).PPTX
17	PK4	16 Prøvekonvertering 4 afrapportering v0_3 [DOK31571202] (10064294_1).DOCX
18	PK4	31 Afrapportering PK4 [DOK31571099] (10064402_1).PPTX
19	PK4	32 Drejebog PK4 gennemløb_0_4 (DOK31571107) (10064404_1).XLSX

20	PK4	08 Konverteringsstyregruppe møde 20130523 [DOK31571158] (10064261_1).PPTX
21	PK4	Konverteringsstyregruppe møde 20130523.pptx
22	PK4	12 Referat EFI_DMI konvertering 20130606 [DOK31571250] (10064267_1).DOCX
23	PK4	04 Referat EFI_DMI konvertering 20130508 [DOK31571245] (10064063_1).DOCX
24	PK4	09 Referat EFI_DMI konvertering 20130523 [DOK31571247] (10064262_1).DOCX
25	PK4	10 Konverteringsstyregruppe møde 20130530 [DOK31571160] (10064263_1).PPTX
26	Production conversion	Trusler mod opstart og ibrugtagning af EFI - oktober 2013 til udlevering
27	Production conversion	Imødegåelse af trusler mod EFI go-live i september 2013 030513
28	Production conversion	bilag 1 - mail fra SKAT af 12 09 2011
29	Production conversion	Bilag 2 - mail fra SKAT af 09 05 2012
30	Production conversion	Bilag 3 - MF_TEST_resultat_12 12 2011
31	Production conversion	Brev til SKAT 13 03 2015 - Konvertering
32	Production conversion	Afstemningsrapport EFI produktionskonverterig Notat.docx
33	Production conversion	Produktionskonvertering afrapportering v0_3x.docx
34	Production conversion	Produktionskonvertering afrapportering v0_8 (00000002).docx
35	Production conversion	VS Idriftsættelse - forberedelse af konvertering mm.msg
36	Production conversion	02 BEO_KonverteringsPostscripts [DOK33148644] (10064052_1).DOCX
37	Production conversion	03 Konvertering Post-Skript BOB V. 1.1 170912 [DOK33148599] (10064057_1).DOCX
38	Production conversion	15 Idriftsættelsesstg 04072013 defect status slides [DOK31572104] (10064288_1).PPTX
39	Production conversion	17 Referat EFI_DMI idriftsættelse 20130704 [DOK31572096] (10064325_1).DOCX
40	Production conversion	28 EFI DMI - Hovedtidsplan opstart - 131119 v3 [DOK29323931] (10064396_1).PPTX
41	Production conversion	34 Idriftsættelsesstyregruppe etablering v02 juli 2013 [DOK31572115] (10064408_1).PPTX

42	Production conversion	20121106 Verdensbillede.pptx
43	Production conversion	14 b 2012 01 19 Teknisk konvertering referat eftermiddag [DOK32937719] (10064278_1).DOCX
44	Production conversion	14 b Teknisk konverteringsproces rev maj12 [DOK32937725] (10064283_1).DOCX
45	Production conversion	EFI DMI prodkonvertering afrapportering v01.pptx
46	Production conversion	Bilag B - Tværgående konverteringsmangler (9573038_2) (2).docx
47	Production conversion	Dag til dag Cutover plan - EFI 10 06 13.xlsx
48	Production conversion	Processer i lukkeperioden EFI (3).docx
49	Production conversion	Kopi af ANH FKT oplæg uge 16og17 v3
50	Production conversion	2013-04-13 FKT reduktion og færdiggørelse
51	Production conversion	130926 SKMI0168S PA EFI-statusrapportering - SKAT systemmodernisering fase 2 v3 2
52	Production conversion	130730 31juli_UdfordringerttilLøsningnu_ved samletchefgruppe_forretning_teknik_projekt-pb.xlsx
53	Production conversion	130612 EFI Review - Mgmt præsentation - v1 0 - 130607
54	Production conversion	121126 Imødegåelse af trusler mod EFI go-live i maj 2013pptx
55	Production conversion	130503 Imødegåelse af trusler mod EFI go-live i september 2013 030513
56	Production conversion	Bilag_2_EFI leverancer
57	Accenture deliverable	Technical Report.docx
58	Other	BEBB Kunde.docx
59	Other	REV Diverse planer for EFI.msg
60	Other	06 b Fordringer_analyse_konklusion_v1_41_kommenteret[1] [DOK33853557] (10064248_1).DOCX
61	Other	27 b liste_man_tina (DOK31482432) (10064392_1).XLSX
62	Other	27 b mapningstabel_henlaeggelser_v08_2013_06_21_efter_prod_kon v (DOK31482431) (10064395_1).XLSX
63	Other	130610 Oplæg til workshop 110412 V4.pptx
64	Other	131001 Copy of 130926 SKMI0168S PA EFI-statusrapportering - SKAT systemmodernisering fase 2 v3 2.xls
65	Ministry of Finance	Bilag_2_EFI leverancer (00000002).pdf

Table 5 Documents Examined

6.2 List of Meetings

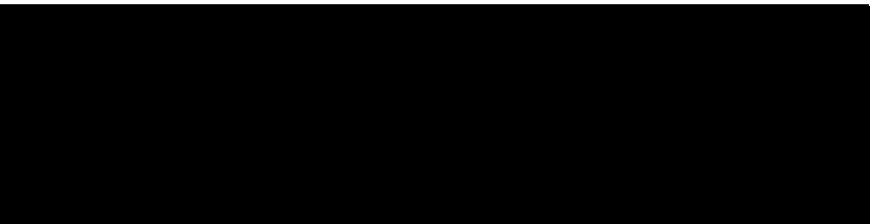The following interviews were conducted with stakeholders in the EFI data migration project:

Interview 1	
Interview 2	
Interview 3	
Interview 4	

Table 6 List of Meetings