Integration of financial institutions supported with data asset development – Magyar Bankholding case study

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Abstract

Magyar Bankholding was created as a result of the integration of three large banks, where digitisation and data centricity, including also the creation of efficient data asset management, were emphasised from the very beginning. Our study investigates, as a case study, whether a survey and preparation work based on the maturity assessment method can shorten the implementation time of a data asset, estimated at 1 to 1.5 years, to 7 months in a complex bank integration process. The results were backtested one year after the work was completed, so all the effects could be evaluated. It can be concluded that the application of the methodology described in the study has had a positive impact not only on time requirements, but also on business, digitalisation and technological objectives.

KEYWORDS: Data asset management, data processing, data warehouse
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Description of the economic situation

The financial world is undergoing continuous and global changes, with significant market implications. The resulting direct effects also affect individual financial institutions. (Zéman – Kalmar – Lentner, 2018). As competition intensifies and broadens, financial institution market players are no longer only facing traditional banking competitors, but also various fintech companies, neo-banks and actors of the shadow banking system. (Kecskés – Zéman, 2018). In addition to the intensification of the competitive environment, the constant changes in the external regulatory environment also have a significant impact on the day-to-day activities of banks. On the one hand, stricter guidelines can have a positive impact on banks' operations and stability (Lentner et al., 2019) but, on the other hand, they can cause significant changes in business and IT processes. The current trend is that financial products are becoming more accessible across the whole society, but the level of financial literacy of the population is still below the expected level (Németh, 2019).

It was in this external environment that the most significant bank consolidation process in the Hungarian banking market of the past decade started on 15 May 2020. The newly created holding organisation is responsible for examining and preparing the framework for the creation of a new Hungarian-owned bank group, the synergies between the banks and the operational and cost optimisation potential of their cooperation. (MTB – MKB, 2020). The three bank groups to be integrated (MKB Bank, Budapest Bank, Takarék Bank) served almost 1.9 million customers nationwide when their cooperation began, operated almost half of the domestic branch network, more than 920 branches, and had a combined balance sheet total of nearly HUF 5,800 billion. With these aggregated indicators, the new Magyar Bankholding Zrt. (MBH) became the second largest bank group in the country (BB – MTB – MKB, 2020). The resulting cooperation has a number of extraordinary potentials, which have been published by the participants in several press releases and statements. The most significant of these are:

- The bank groups complement each other well, both in terms of customer and service portfolio.
- In terms of geography, the Takarék Group has a network of ATMs and branches covering the entire countryside, which can be complemented by the MKB and Budapest Bank branch and ATM network in Budapest and in the major cities.
- The merger will allow the exploitation of various cost and investment synergies, and rationalisation of duplications in operations and overlaps.
- There is also significant potential for rationalising IT operating costs, improvements and systems.

From a customer perspective, the new universal bank is only a well-capitalised and well-established player in the market, but is also able to offer the best of the three banks to its partners (MTB – MKB, 2020), (BB – MTB – MKB, 2020).

The merger of the operators was envisaged in two steps. In the first step, on 31 March 2022, the two member banks of Magyar Bankholding Zrt., Budapest Bank Zrt.

and MKB Bank Nyrt. merged. Then, it was planned that in a second step, the Takarék Group would join the newly created bank in the second quarter of 2023 (MBH, 2022).

The idea is to build a European-level institution that focuses on customer service, flexibility and speed. One of the foundations for that is digitalisation and continuous digital construction, whereby a retail IT infrastructure will be built around a single core system that can deliver something new in terms of both speed and customer experience (Károlyi, 2021). This means a focus on digitalisation, which will enable the bank group to compete with bigtech and fintech companies, as well as the increasingly popular neo-banks. "These companies are far from achieving the financial results of large, traditional universal financial institutions, yet they can react very quickly to changes in the market, they can launch new products in weeks and change platforms to meet customer needs in seconds. The bank group intends to incorporate this flexibility and capability into its emerging new digital system," Balázs Vinnai, strategic advisor of Magyan Bankholding, summarised the plans in an article of Forbes magazine (MBH, 2021).

The initial successes of the merger process have become tangible with the publication of the consolidated figures for the first two quarters of 2022 at holding level, which now include not only the three banks but also the retail and corporate portfolios of Sberbank, acquired in the meantime. The bank group thus achieved a profit after tax of HUF 50 billion in the two quarters (Kiss, 2022). This significant achievement is partly the result of the digitisation process that has already begun. Although digital transformation and the merger that took place at the same time meant significant cost increases on the one hand, it also brought immediate savings on the other. This was due to the expansion of digital services, the simplification and digitalisation of operational processes, and elimination of duplications in operation (Kiss, 2022).

As a result of digitalisation, the various data collection and processing systems have reached a level of sophistication that allows maximising the utility of data and information, so data and information have been included in the production resources in recent years in most of the literature (Lo Franco – Compagno, 2018). This can be managed through data management, data asset management, which is a data management function that ensures the quality, integrity, security and usability of the data collected by the organisation (Castanedo, 2017).

The above questions are key in a bank merger process. On the one hand, without good data management practices, it is difficult to achieve the objectives of digitisation, integration and synergies and, on the other hand, each of the three merging banks has some previous experience in this area.

Theoretical background, literature review

The aim of the literature review is to present the theoretical background and the main concepts of the research method used in the case study.

There are many versions of explaining the concepts of data governance, data management, and how to define them. The definitions and interpretations of the

different authors (DAMA-DMBOK Guide, 2017), (Benfeldt Nielsen, 2017), (Khatri – Brown, 2010) overlap to some extent, but none of them can be considered axiomatic, but rather reflect the approach of the organisation or researcher to the topic and what they consider to be the main focus of their study.

For the purposes of this survey, due to its specific nature and unique content, the scope of data management is defined as follows: data management is the process that takes place from the actual production or collection of data to the point at which the data are deleted or archived. Throughout the entire lifecycle of data, data management focuses on making data accessible and easy to access for all stakeholders (actual human users and IT solutions). (Vajda, 2022) The process should ensure that stakeholders have a high quality, integrated view of the data (Bajnai – Fenyves, 2021), including business and IT definitions of the data, as well as quality indicators for correctness, timeliness, consistency. (Vajda et al., 2021).

Digital, data-driven organisations that see data as an asset and strategic resource are significantly ahead of their peers in data management. This is reflected in data governance policies and IT solutions. Thus, a data-driven business culture is one that values and invests in organisations of and solutions relating to data management (Petrella, 2022).

Magyar Bankholding's member banks started on the digitalisation path even before the merger and achieved partial results in the area of data management. In our survey, it was key to determine the level of maturity of these organisations in data governance and data warehouse building. Therefore, some maturity models that are relevant for the study are presented.

Literature review of the maturity assessment of data governance solutions

There is a diversity in the field of data governance maturity models (DGMM), but their common underlying philosophy is to objectively measure the current performance of the organisation in a given area and compare it either to a desired level of performance of the organisation or to a benchmark. To do this, the model must take into account all the components of the data management ecosystem(Gupta – Cannon 2020). In the following, we describe and compare the most important features of three maturity models (DGMM) used in the field of data governance.

Capability Maturity Model (CMM)

The initial version of the model was published by Carnegie Mellon University's Software Engineering Institute (SEI) (Paulk et al., 1993). The CMM is not a full-scale DGMM, but due to its practical, process-oriented approach, it is widely used for the general assessment of data management processes, IT developments and for identifying and improving their maturity level. The methodology defines five distinct maturity levels, which are described according to Seiner's (2017) interpretation of data governance processes:

1. Initial: Processes at this level are ad-hoc and sometimes even chaotic.
2. Repeatable: Each process is defined, repeatable, schedulable and traceable.
3. Defined: At this level, processes are already documented according to consistent standards.
4. Managed: Process descriptions provide the opportunity to measure and control them.
5. Optimizing: At this level, organisations and processes focus on continuous improvement of performance.

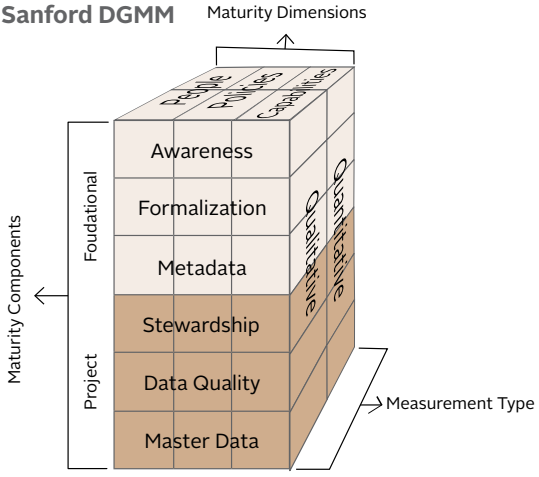
IBM Data Governance Maturity Model

The IBM model tests and evaluates a total of eleven criteria to classify organisations according to five defined maturity levels. These are: organisational structure and awareness, stewardship, policies and regulations, value creation, data risk management and compliance, information security & data protection, data architecture, data quality management, classification & metadata, information lifecycle management, audit information – log management & reporting. The great advantage of the method is that it is not only suitable for a complete analysis, but can also be performed independently for any of the eleven aspects mentioned above. The definition of the five assessment levels will then change according to the eleven criteria. (Al-Dossari – Sumaili, 2021), (IBM, 2007).

Stanford DGMM

This model was published by the Stanford University Data Governance Office, which builds on the results of previously proven models in the field (IBM, CMM) while retaining their five levels of maturity assessment, but following a completely new approach and criteria in the specific survey methodology. This is illustrated in Figure 1.

Figure 1: Structure of the Sanford DGMM



Source: Stanford (2013)

The Stanford DGMM divides the maturity assessment into two major components – the fundamental and the project components. Each of the two components contains a further three thematic subdivisions that define the content of the survey. Each content area is measured along three maturity dimensions, which define the specific aspects of the test. The types of measurement are essentially quantitative – using a 5-point scale – but there are also topics that are complemented by qualitative studies (Stanford, 2013).

The Stanford DGMM is not only a methodology, but also a concrete set of tools that can be used for a one-off review of an organisation, and can also be operated embedded in daily practice, helping to continuously measure and compare measurement results against plans.

In summary, in the time since the first DGMM was published, a number of new results and versions have emerged in this area, with varying degrees of depth. Therefore, it is of paramount importance to identify the areas and objectives of a study before starting it. It can then only be determined which model can be used in part or in whole to assess the particular problem.

Literature review of the maturity assessment of data warehouse systems

Our review at Bankholding had to cover not only the management of the data assets and their maturity, but also the state of the IT solutions that represent them – data warehouse and business intelligence systems. We have therefore included this topic in the literature review by presenting two models.

The model, published as the Data Warehouse Capability Maturity Model (DW-CMM), considers a total of six aspects in two broad groups and scores on a five-point scale (Spruit – Sacu, 2015):

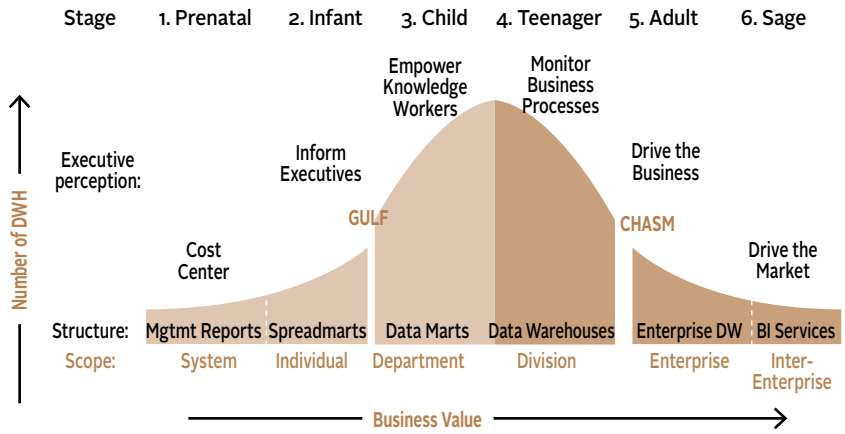
- DWH technical solutions:
  1. General architecture and infrastructure
  2. Data modelling
  3. ETL solutions
  4. BI applications
- DWH organisations and processes:
  1. Development processes
  2. Service processes

The benefits of examining these aspects are significant, as underlying technology and process deficiencies can be at the root of many business and user-side problems. For this reason, we have included some of the above aspects in our analysis.

An important common feature of data warehouse systems is their ability to positively impact business performance and value creation. The maturity levels of the model used by Wayne Eckerson, head of The Data Warehouse Institute (TDWI), represent the most important phases in human life from infancy to wisdom reflecting old age, drawing an analogy between the knowledge acquired and applied early in a person's life and the maturity levels of data warehouses and their ability to create value, see Figure 2. The Y-axis of the figure shows the number of data warehouse

implementations and is representative of the fact that a significant number of operational data warehouses are at the third and fourth maturity levels (Eckerson, 2004).

Figure 2: Eckerson – TDWI maturity model



Source: own editing based on Eckerson (2004)

Eckerson – TDWI maturity:

- Prenatal (before birth): Phase before the start of construction of the data warehouse. Here, accessing information is a considerable manual task.
- Infant (infant age): Data are collected in completely independent desktop databases and spreadsheets.
- Child (childhood): The era of data marts. At this stage, individual data markets are still living side by side in a non-integrated way.
- Teenager (teenage age): Central data warehouse solutions are created to serve each data mart in a uniform way.
- Adult (adult age): At this stage, organisations already consider data and information as an asset in the same way as any other productive asset. Therefore an company-wide Enterprise Data Warehouse (EDWH) is set up.
- Sage (age of wisdom): Data warehouse solutions can go beyond the boundaries of a given organisation. The data warehouse becomes a "service provider", able to provide data and full analytics to its external and internal partners, and enable the deployment of automated decision engines. (Eckerson, 2004).

The analytical and methodological approach we have adopted relies on several elements of the above model.

Case study – Holding level data asset development

This case study presents the initial steps of the implementation of data management and data asset management practices at Magyar Bankholding. During the integration process, the theoretical foundations of data asset management were laid. Building on that, the Central Data Warehouse (KDWH) solution has been designed with the following objectives:

1. The creation of common concepts along which the data assets of the two and later the three banks can be integrated at the conceptual level.
2. Implementation of a new IT solution, which will be operational from day one of the joint banking operation on the basis of the established conceptual basis.
3. Establishment of the necessary policy environment and metadata management foundations for the operation of data asset systems.

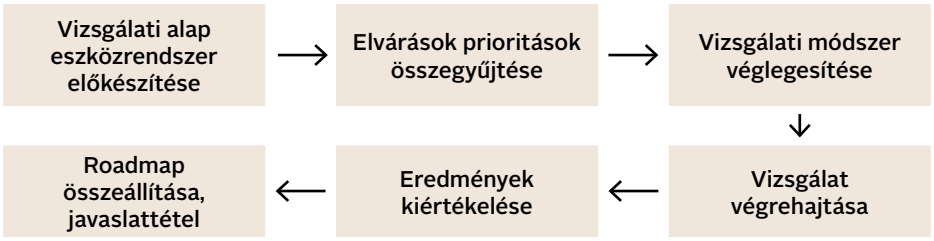
Phase 1 of similar solutions previously implemented at the three member banks took between 1 and 1.5 years. This timeframe can be considered as a general market benchmark for this type of task. The research process described in our case study was launched with the aim of using a maturity-based analysis method to investigate whether the implementation time could be reduced to 7 months while achieving the defined objectives.

In the presentation of the case study, where the findings and conclusions for each member bank are presented, we will use the designation "Bank A", "Bank B", "Bank C" instead of the specific member banks, preserving anonymity.

Description of the study process and methodology

The creation of holding level data assets started with a thorough groundwork to assess the data management and data warehouse solutions of each member bank. To ensure success, the East Capital Consulting Group with its scientific background and Oracle Hungary Consulting with its outstanding practical and methodological experience in data management solutions and data warehouse architecture in the banking sector were invited to participate in this work. The team has been complemented by experts from the data warehouses of the three member banks. Figure 3 shows the workflow used.

Figure 3: Applied workflow



Source: Own editing

Preparation of the basic test tools

The study also had to assess the three member banks' data asset management and related governance solutions, as well as the data warehouses that implement them. Therefore, the tools chosen have been designed accordingly. The usual methods of interviewing and document review had to be extended to include the possibility of reviewing physical database structures, data loading programs and exploitation program codes.

It was important to make one set of three different practices and tools comparable and assessable on the basis of the evaluation criteria. To do that, we initially planned to base the survey on the Stanford Data Governance Maturity Method in the area of governance, and the Eckerson approach to data warehouse maturity.

Gathering expectations, priorities

It is important to note that the aim of the study is not theoretical, but to establish a data asset management procedure and data warehouse system that can produce results in a short time. Therefore, in order to develop the right concept, it was necessary to be clear, before the study was launched, about the specific objectives and their characteristics. In this phase, we mainly reviewed strategic documents and conducted interviews at senior and professional management level. This resulted in a summary of objectives:

1. Creating common concepts.
2. Creating a new central data warehouse solution (KDWH).
3. Developing the foundations for a regulatory environment and metadata management.
4. An IT solution to support centralised policy and metadata management has to be established and made an enterprise-wide practice.
5. A data asset solution must be created that can track and support the process of merging the three banks, including changes to the associated IT systems, their integration and the migration of individual data sets at operational level.
6. The business functionality of KDWH should be developed along the lines of the agreed holding-level business strategy in order to achieve it.
7. The KDWH should fit in with the adopted holding-level IT strategy.
8. The IT solution of the KDWH should be flexible, easy to modify, evolve and cost-effective.
9. The timeframe for laying the foundations, setting the date for the integration of Budapest Bank and MKB Bank (LD1), and getting the business functionality up and running was 7 months from the start of the project.

Finalisation of the test method

Once the business priorities had been identified, it was clear that the analysis methodology used would be a priority. Due to the uniqueness and specificity of the con-

ditions identified, the full maturity testing methods selected during the preparation of the basic test toolkit could only be partially applied. The reason for this is that the comparison of the individual data asset solutions to be examined did not have to be based solely on a general set of criteria, but rather on a set of criteria that would help to determine which of the individual member bank solutions could contribute to the realisation of the identified business objectives and to what extent. In other words, the maturity of the individual member bank solutions had to be examined purely in this light. To achieve that, the previously planned methodology had to be changed and the maturity testing criteria and measurement method had to be created that was appropriate for the specific task. This will be explained later.

Implementation of the review

First, we reviewed the available documents per member bank. Existing policies and job descriptions were examined from a data governance perspective. From a data warehouse perspective, system designs, document-based data models and data architecture solutions, operational policies, operational error reports and user comments were examined. The information gathered provided a good basis for the preparation and implementation of the semi-structured interviews. At this stage, we typically interviewed Data Warehouse – BI and individual business area managers, as well as IT middle managers and experts.

The documentary and interview-based information gathering allowed to identify the technical and IT solutions used in each data warehouse that needed further targeted investigation. In this case, the identified program codes, ETL processes, database structures, log files, additional utilities and architectural solutions were subject to detailed technical analysis.

Evaluation of results

During the presentation and evaluation of the first round of test results, a lot of feedback and additional information was collected, which was used to compile the final evaluation scoreboards and graphs. These results will be presented in the following parts of the study.

Compiling a roadmap, making proposals

After the evaluation process was completed, a proposal for the functionality and technical content of the KDWH and the corresponding roadmap were drawn up. The resulting document was used as a KDWH development strategy.

Presentation of the maturity testing method used

Our specific methodology at MBH used specific elements instead of general assessment criteria at several points. This has ensured that the data asset management

practices and data warehouse solutions of each member bank are comparable along defined specific objectives. Accordingly, three dimensions of analysis and their sub-dimensions have been defined, for a total of six aspects, as follows:

1. Regulatory environment
   1.1. Formalisation and awareness
   1.2. Metadata management
2. Data warehouse solution
   2.1. Architecture / multi-entity operation
   2.2. Flexibility / reusability
3. Data content
   3.1. Master data – customer base
   3.2. Existence of necessary data points

Below the dimensional evaluation criteria of the evaluation system developed and their definitions are described.

Regulatory environment

In the light of the KDWH solution to be set up, this dimensional assessment will determine which member banks have real practical capabilities in this area and which of these policies can be applied in whole or in part to a KDWH solution.

Table 1: Regulatory environment dimension

	Regulatory environment	
	Formalisation and awareness	**Metadata management**
1	The organisation does not use regulatory methods, it performs the necessary tasks on an ad-hoc basis.	The organisation only deals with technical metadata during the development phase.
2	Data governance and data warehouse development processes, methods and policies already exist, but they are not yet applied by the organisation in all projects and not in all daily processes.	The organisation already collects and manages business metadata along the applications of each topic, but there can be multiple interpretations of a concept, with no consolidation or correlation between them.
3	The processes, methods and policies developed are binding and applied in all projects and day-to-day operations of the organisation.	A centralised metadata management for both business and technical metadata is in place, with each concept consolidated and hierarchised. These concepts are already used in some business applications and data are exploited along these lines.

	Regulatory environment	
	Formalisation and awareness	Metadata management
4	Data governance and IT development processes are integrated. The organisation is aware of their correlations. Projects and day-to-day operations are planned deliberately and accordingly, with their use. At this level, there is partial automation and IT support.	Metadata management is linked to development and data exploitation processes, but their integration is partial, not covering all data and processes. Users and IT staff understand and consciously use the tools.
5	Integrated data governance and IT development methods, policies and processes are created and administered in a common IT solution. This solution is based on development automations, generators, which the organisation applies on a mandatory basis.	Metadata management guides the entire data warehouse development and data governance process from the moment the need arises to the deployment of each solution. Data governance, development standards and metadata management are an integrated unit in both methods and tools.

Source: Own editing

Data warehouse solution

The data warehouse dimension is used to assess the extent to which the data warehouse solutions of each member bank can form the basis of the KDWH architecture.

Table 2: Data warehouse solution dimension

	Data warehouse solution	
	Architecture / multi-entity operation	Flexibility / reusability
1	The data warehouse is one big database, it is not yet internally layered, there are no uniform enterprise-wide dimensions. The data consistency of the overlaying applications is not resolved.	A robust solution that is non-modular, with the boundaries of each data group merging at the data model level. System designs and development documentation do not exist or are not up to date.
2	Appropriately layered architecture, robust data model, wide data mart layer, mainly fixed reports and pre-built applications.	Both at the level of documentation and at the level of the implemented data tables, well-defined units appear. ETL processes can be broken down into modules that are responsible for a specific set of data.
3	In addition to the previous ones, the architecture includes sandboxes for data mining and ODS solutions for fast data access.	A broad, large-scale business data mart and data exploitation layer that operates on a daily basis. The database and loading processes for each business exploitation can be identified and separated as necessary.

	Data warehouse solution	
	Architecture / multi-entity operation	Flexibility / reusability
4	The data warehouse is capable of multi-entity operation.	There are specific technology solutions, applications, data model parts that can be extracted as a unit and built into another solution. Their reusability requires minimal conversion.
5	Architectural solutions for real-time decision-making, such as speed-layer, are emerging.	Service-oriented operation appears, publishing not only data but also business functions. It may be connected to the outside world and to the repository in a service-oriented way.

Source: Own editing

Data content

The purpose of the data content assessment is to determine whether the data content required for the KDWH at the time of LD1 can be made available in part or in full by each member bank's data warehouse.

Table 3: Data content dimension

	Data content	
	Master data - customer base	Existence of necessary data points
1	There is no centralised master data management within the data warehouse architecture.	The necessary data points are present to a small extent and their existence requires significant improvement.
2	Central integrated master data management appears	The necessary data points are available, but significant improvements are needed to provide them.
3	Centralised integrated master data management will be used for value-added data warehouse functions such as customer consolidation, master-customer training, etc.	The necessary data points are available, but require a medium level of development to provide them.
4	Customer master and or other master data management within the data warehouse architecture can also appear as standalone applications in the enterprise system architecture.	The necessary data points are available, but a small upgrade is needed to provide them.
5	Customer master and company master data solutions are also suitable for real-time operational level service.	The necessary data points are available and no development is needed to provide them.

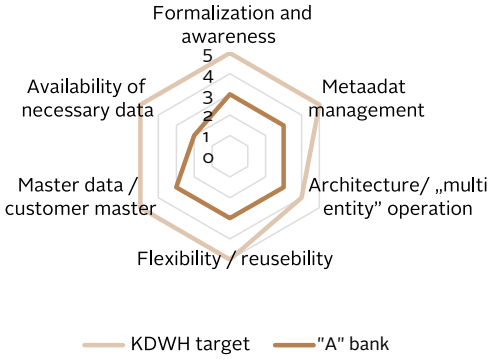
Source: Own editing

In addition to comparing each member bank's solution, it was important to make a comparison to the target KDWH status to be achieved. To this end, and based on the requirements collected, the key features of the future KDWH solution have been compiled along each dimension.

Description of test results

The results of the analysis carried out and a comparison of the target state by member bank are shown in Figures 4, 5 and 6. It is clear from the figures that, based on the criteria set up, there is no striking difference between the solution of Bank A and Bank B, but that the solution of Bank C is significantly more perspective for establishing the KDWH. It is expected that the results would have been significantly different if we had opted for one of the standard test methods without customisation. Therefore, the results presented here cannot be interpreted as the result of a full maturity study. The possible shortcomings and problems identified do not detract from the merits of the individual solutions and their applicability in the member banks, since they have been the basis of business service for many years, but from the point of view of the KDWH they are of little or no use to the individual organisations.

Figure 4: Comparison of Bank A to the target state of the KDWH

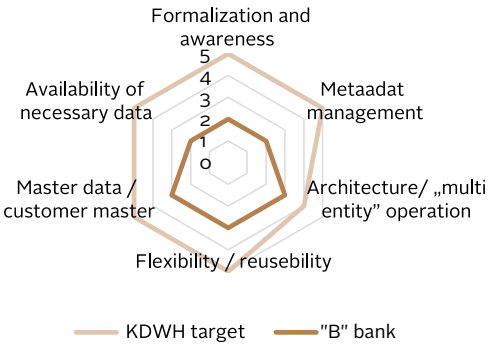


Source: Own editing

While it provides a good basis for local service, the robust architecture and data model of Bank A, is difficult to reuse and is not suitable for multi-entity operations. The metadata management used was not up to the task of being the basis for a new implementation, neither in its scope nor in its technical implementation. In terms of compliance, knowledge is provided by staff working in the data warehouse area and by non-document-based or electronic systems. As accessing individual data points is complicated, providing the necessary data content requires significant IT development. Master data management and within that the customer master is perfect for

serving the functions within the solution, but it cannot be understood or moved as a standalone solution.

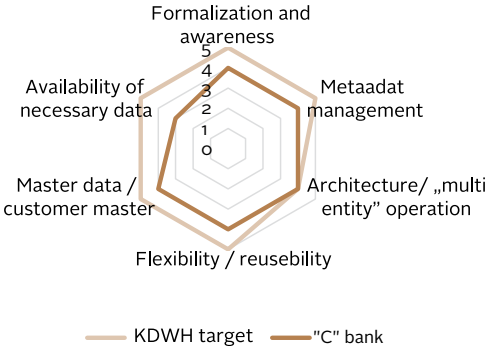
Figure 5.: Comparison of Bank B to the target state of the KDWH



Source: Own editing

Bank B's centric approach to business service did not focus on operational models, but on processes and techniques, thus the importance of consistency between services was overshadowed. Consequently, the custom-developed and evolutionary data model and architecture used cannot contain elements that are properly documented and reusable in the KDWH. This can be observed in the areas of metadata management, awareness and regulation. Just as in the case of Bank A, the provision and availability of the necessary data points requires major development.

Figure 6.: Comparison of Bank C to the target state of the KDWH



Source: Own editing

Based on our investigation, the design of the "C" bank solution was such that it could provide the most assistance in the construction of the KDWH. This is partly based

on the modular layered architecture and partly on the applications built around it. With development over a predictable and foreseeable time horizon, the master management solution used there, including the central customer master solution, can be adopted. There have been significant results in the field of metadata management. Due to the functional role of the system in cooperative integration, the "multi-entity" operation is fully solved. The solution documents, manages and applies technical and business metadata. Data governance based on these foundations cannot be said to be fully deployed or supported, but existing foundations can be reused. The data modelling and interface techniques used are adequate to be partially exploitable in KDWH development, although they require significant adaptation. The necessary data points are available and can be extracted with a moderate development effort due to the benefits provided by metadata management.

In summary, the solution with the smallest data warehouse development track record can provide the best foundation and reusable elements for the KDWH development. This can be partly explained by the fact that the theoretical and technological background was much more advanced when Bank C developed its integrated data warehouse solution than when Bank B and Bank C started their development. On the other hand, the multicorporate "multi-entity" operation has had significantly more advantages in terms of architecture, data structures and applications than previously thought.

The analysis clearly shows that, although several elements of the Bank C's solution can be transferred to the KDWH solution, their deployment and functionality are not sufficient to meet the expected target state. This means that significant adaptations and improvements are needed when they are applied. However, by using these reusable elements, the development timeframe is significantly shortened compared to a greenfield investment.

Conclusion

The present study was prepared one year after the completion of the concrete reviews and analyses. The reason for this is that the authors of the study all agree that the results of this kind of work can only be backtested in terms of their impact if they can be evaluated in conjunction with the results of the projects that have been set up as a result of the analyses performed. That is, the conclusions drawn and the summary of results are based not only on theoretical work but also on practical implementation.

As a first conclusion, the business, IT solution and project approach developed as a result of the study and included in the proposal have been successfully tested. As a result, the first phase of the KDWH construction was successfully completed within the 7-month timeframe, in line with the original objectives. It can be said that the foundations for the data asset governance and data management of the three merging banks have been laid.

Secondly it should be emphasized that the success of the KDWH can be clearly attributed to the results of the analysis presented in this study and the fact that the

business and IT design of the project to be implemented, as well as the definition of the project's operating principles and implementation method, were based solely on the results of the analysis.

In general, data warehouse and data governance maturity assessments can be incorporated into the preparation and solution design of specific projects. This approach goes far beyond the general market perception that these models and the results of the studies based on them are more suitable for strategic or tactical planning than for the preparation of a specific project. The practical applicability of these maturity models is significantly influenced by their adaptation to a specific task, the development of an appropriate measurement and evaluation framework and their consistent application throughout the process. ■

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