Andreas Graesser

THE DATA WEAVER

How Chief Data Officers Win the Data Race Now

innovad

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Published by: innovad LLC, Wayne, PA, USA.

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Foreword

The Data Weaver exposes the significance of data within our digital world and its transformation into the most valuable asset in business. Data alone, however, isn't the future. It always requires somebody who knows, who guides, and who orchestrates.

Dr. Ing. Andrin Blauenstein, an entrepreneur and investor, says: „*More than 150 years after the emergence of the machine textile industry, the term 'weaver' takes on a whole new meaning. The data of the digitized world as the highest good require a **Data Weaver** of the modern age.*"

Are there still companies not entirely digitized or operating on data islands? While the answer is a loud 'yes,' these patchwork architectures cry for an immense urgency for data transformation. **Now** is the time to transform data and ensure visibility across all lines of business.

Without the Chief Data Officer (CDO) and Data Weaver, who guides and acts on the data, the dramatic proliferation of data silos accelerates – just consider how easily any application can run within the cloud and uses its own data foundation.

Companies must prepare their transformation journey to SAP S/4HANA by separating data from applications, making them clean and simple, and limiting the operational data footprint by historizing data.

While *Data Weavers* are still not common within the corporate world, their absence pinpoints a problem area that has been neglected for many years: The data universe inside corporations grew multifold over the past years – and not many businesses take full advantage of this Dataverse.

CDOs must evolve as "Masters of the Dataverse," able and willing to engage with today's state-of-the-art technologies such as Artificial Intelligence (AI), Machine Learning (ML), and Neural

Networks. S/he is the data executive enabling insight and empowering business leaders to use it across all business units. Therefore, the CDO is responsible for developing *and* deploying intelligent data solutions for all lines of business.

Aside from many technical explanations, some fictional stories about Tim, a senior data executive hired by a coffee chain, make the book entertaining. These episodes show Tim at the crossroads of 'data and technologies,' his pain points and struggles with the coffee chain's data situation, and his willingness to learn and innovate in new ways.

Back to the real world, Stefan Metzger, the CEO of Digital Switzerland, confirms: "*Referring to the Chief Data Officer as the **Data Weaver** underlines the importance of the role. It goes beyond all data layers and focuses on people and processes, and it is needed for all medium to large companies.*"

The bold emphasis on constant learning to stay on par with technological advancements spins through all the chapters. The daily news about Large Language Models (LLM) and big data applications that have filled our inboxes since the end of 2022 are indicators that expansions in technology and software applications come with accelerated speed. But don't forget: The foundation of these capabilities is data, which requires *somebody* to make sense of it.

Wayne, PA (USA), August 2023

Andreas Graesser

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Visions for a Digital World

Who drives the visions for a company? Of course, it's the CEO – and despite a range of different leadership styles, s/he develops and delivers the strategies top-down. The visions need to be communicated to and bought in by all teams. And here, leadership style matters. Every employee needs to understand the goals; therefore, the communication language needs to lean on business terms and simple words.

Data – the core of this book – already requires some abstract thinking to connect actual events with existing data points. Therefore, an excellent approach to sharing vision statements is to limit data points to the necessary.

During his first day on the job, Tim, the senior technology executive who had just joined a coffee chain company, saw his company's vision statement for the upcoming fiscal year:

"Provide superior customer experiences and attract new customers to increase same-store revenue by 16%."

Instantaneously, Tim knew that this statement was loaded! It was not so much to make customers return to the coffee shop; that was more the job of the capable and friendly baristas. It was the second half of the statement: "…attract new customers…". With his technology experiences, he immediately grasped the digital challenges weaved into his company's vision statement. Today's world is digital, and each potential customer spends countless hours on their devices. Indeed, these people left data traces all over the Internet; the only challenge was how to "find" them and lure them into the nearby coffee shop.

The coffee chain's vision statement consists of two parts. The first part covers the challenge of each barista and each supporting

function: Treat the customer so s/he comes back. And the second part targets the technical and data layer, something Tim got hired to help: Find and attract new customers.

Implicitly, the latter part of the coffee chain's vision statement assumes that the digital world surrounds us like the oxygen sphere on Earth needed to breathe and live. Calling this sphere *the Internet*, the younger generations certainly need it to live – and breathe. Technology is everywhere, and while there are still people who pay cash, a vast majority of customers[1] at coffee shops pay cashless – evidently powered by integrated apps and technologies.

Digital technology appears in our lives at the doctor's office, the university, or our daily job. It facilitates knowledge sharing and enables collaboration and innovation with digital platforms supporting the experiences. Any absence of these backend systems is unthinkable today and would catapult us back to the digital 'stone age.'

Digital technology is needed to spawn innovative services and experiences that improve the quality of life or simplify transportation.

Despite the data sphere surrounding us, companies still need to explain the *World of Data* to many employees. However, without an accurate understanding, 'data' is often negatively associated with *surveillance* and *control*.

Therefore, the companies' leadership must eliminate the fear factor from the equation. Data shouldn't be used for monitoring and scrutiny – instead, it should be used to empower individuals and teams to make informed decisions and drive value for all.

If the leadership could not understandably convey the intention of data gathering, it would result in distrust and resistance and never would lead to adopting technological processes.

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[1] Statista 2023: 30% of payments at coffee shops were cash.

Data is the invisible factor that creates trust or destroys it. Clear communications about the purpose of data collection, how it is used for analytics, and who has access to the findings are crucial.

Therefore, the company policies must demonstrate responsibility for any data usage, particularly privacy data. And it starts at any office building accessible with a badge: Should the company gather the time stamps for entering and leaving the building, or is *trusting the employees* a superior standard to maintain?

Fig. 1: Word cloud "Vision"

I remember my first implementation project in Beijing (China). The fingerprinting procedure to enter and leave the building concerned me. It was apparent that somebody was watching me.

Leaders must emphasize at any opportunity that they respect privacy and individual data rights – for their employees, customers, partners, and even competitors. Applying ethics centered around data will go a long way in building a trustful working environment.

So many devices gather and collect data that we sometimes forget the threatening situations surrounding us.

- Home assistants – do people know if the technology is not listening for sure?
- Camera surveillance – does the backend technology uses facial recognition technology and make people trackable?
- Laptops – how do people know that there are no active key loggers?
- Mobile devices – how do people prevent location tracking using geospatial data?

Just one incident, event, or scandal can destroy months of trust-building activities and confidence in the leadership. No business leader wants to test how far s/he can go.

In a world where data is accessible and transparent, the data of employees and customers need to be protected – under all circumstances. Open-Source applications are a possible way to solve the dilemma of protecting privacy versus collecting and analyzing data. As a piece of mind, somebody concerned with data gathering can investigate the source code of an application – or ask somebody who can understand that source code.

Digital Spaces

Companies' vision statements are at a particular abstraction level and potentially seem to point to 'alternative worlds.' What if Tim, our protagonist, would read a different reality from the first half of his company's vision statement:

"Provide superior customer experiences and…."

Hypothetically, Tim could serve customers by providing them with a <u>digital</u> coffee shop experience. But a virtual coffee shop? What nonsense; this idea is really far-fetched.

But think about it: Interactive renderings of alternative worlds are possible with each modern digital device. And with wireless networks sporting superfast speed and data transmission (e.g., 5G and 6G), any virtual experience is thinkable.

So, what are these alternative realities, often called a Metaverse? Let's have a glance at Augmented Reality and Virtual Reality.

Augmented Reality (AR)

Augmented Reality provides an experience that <u>supplements</u> the view of a physical environment with digital objects in real-time.

AR uses the handheld's camera to enhance the experience of a physical world with a virtual object. This physical world could be a landscape, a living room, or a face captured as a selfie. A digital thing could be a product that somebody might want to buy. On the handheld device, AR now places the virtual product into the real world captured by a camera and presents the combined view.

Many online retailers already use AR to familiarize consumers with their products. Fig. 2, for example, depicts a chair, a virtual object from the retailers' catalog, within a physical environment such as a home office.

Another AR example scenario stems from the fashion industry. Nowadays, buying new glasses doesn't require visiting the shop anymore. Online shops use AR to provide the look and feel of sunglasses on the shopper's face[2].

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[2] www.glasses.com

Fig.2: Virtual chair in Graesser's physical home office[3]

AR can spur creativity by allowing users to create interactive and immersive experiences. AR brings 3D models to life, permitting users to manipulate them in real-time and produce unique visuals. AR technology is a creative tool for art projects, and it empowers users to create visuals and stories.

Using AR through apps makes it easy to interact with any digital object in a natural way. Typically, people can use these AR apps without any software coding experience to enable artistic results, create unique avatars, and place virtual objects within physical spaces.

An example of AR experiences is the *Reality Composer* for iPhone at the Apple Store. With just a few clicks, the user can create artwork that s/he can share with family and friends.

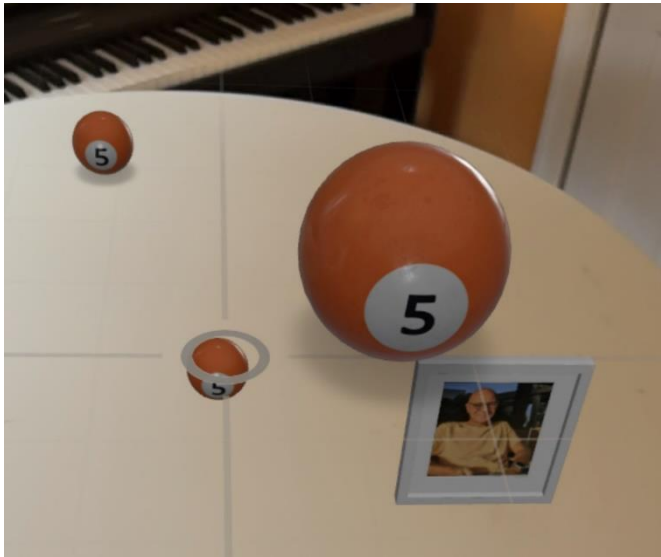
[3] See the AR app at www.target.com

Fig.3: Virtual objects on Graesser's home office table

Fig.3 shows three balls and a framed picture as virtual objects. This artwork can be sent as SMS, and the receiver can experience AR without needing a pre-installed program.

Virtual Reality (VR)

Virtual Reality delivers an experience that simulates an immersive physical presence in an imagined environment.

VR simulates an entire environment, much more than a single object or a thing; it can be the moon – or Nowhere-land. Within this simulation, VR creates a fully immersive experience for users, allowing them to interact with the environment and other users as if they were in the same physical space. The space is 100% digital – everything is imaginary, and nothing is real.

Nonetheless, such a digital experience was unthinkable a few years back. Does somebody want to visit the Louvre and not fly to Paris? Today, this scenario is possible from the convenience of a living room.

VR makes users collaborate on projects and activities in real time, allowing them to access the same space and resources, regardless of location. With VR, industrial product training and machinery

handling can be made easy and scalable. Now, flight simulators have existed for a long time[4]; but today, VR technology can provide these experiences for everybody, not just the pilots.

While any mobile phone with a camera powers AR, the VR experience requires more technology: Headsets including audio capabilities, powerful network connectivity, and other movement tracking devices, for example, for playing virtual tennis games. With these technologies, the users (i.e., the players) can completely escape their physical environments.

Villanova University offers in their VR lab, the Cave, an immersive experience of the Sistine Chapel in Vatican City. The Cave visitors can enjoy Michelangelo's Renaissance paintings from 1512 without the hassle of flying to Rome in Italy.

Often, the Metaverse and Virtual Reality are semantically linked. Like in VR, the Metaverse typically involves a shared, immersive, and interactive virtual environment where people can communicate, interact, create, and explore. Potential applications include virtual social networks, shopping malls, classrooms, gaming worlds, and simulations. The Metaverse is predicted to become an essential platform for digital businesses – similar to the Internet around 30 years ago. It's forecasted that the Metaverse provides secure and efficient ways for companies to conduct transactions and even manage their operations. But these predictions are not yet recognizable outside the gaming industry - the Metaverse is still in its early beginnings.

An example of an industrial Metaverse is the *Digital Twin*, a virtual realization of a physical object. Such a 'physical object' could be as complex as an entire production plant – or a new building such as a hospital. In the medical field, a digital twin becomes an increasingly important tool, allowing nurses and doctors to participate in digital simulations of a new hospital to be built. The Digital Twin serves as a reference of the physical spaces and systems while allowing the test of potential improvements.

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[4] The first flight simulator came to life in the 1930s.

Any new hospital construction is faced with a great deal of responsibility. An entire hospital's layout and design must be crafted to meet the needs of staff, patients, and building codes.

Inside the building, the space must be planned for triage, ICUs, recovery, outpatient clinics, operating rooms, and X-rays. Accessibility for emergency vehicles, visitors, and parking spaces must also be architected.

A Digital Twin provides nurses, doctors, and other personnel with a real-time digital model of the planned hospital. It allows them to explore and use its components and provide feedback for improvements and optimizations. As a VR tool, the Digital Twin holds the rulebook for facility standards and building codes that immediately check any architectural modification.

As such, a Digital Twin reduces the design costs and time to completion of buildings, allowing nurses and doctors to identify potential problems long before the physical construction begins. Architectural change requests are made via the software, not by tearing down physical walls. Medical personnel could check the hospital's efficacy of layout and its functionalities, and the wholly tested VR hospital nearly guarantees a perfect physical hospital as a result.

This Metaverse example of a Digital Twin can be applied to any large construction project, for example, manufacturing plants, refineries, or even smart cities.

And what happened when Tim thought about his idea of a *virtual coffee shop*, a kind of mini-Digital Twin?

Of course, Tim dismissed the idea of a virtual coffee shop. But since he knew from many satisfaction surveys, customers weren't super happy with the organization and processing inside the shops, and the long wait times to get their favorite coffee brew didn't make things easier.

Tim decided to explore the Digital Twin idea further since he could experiment with store layouts, seating areas, and store access –

including parking opportunities outside the store. It would be super-easy with a digital model to redesign floor plans, prototype service areas, and turn wait zones into experience spaces.

Indeed, he got increasingly excited the longer he thought about these out-of-the-box ideas. Suddenly, he recognized that he got a first glimpse of the Metaverse. VR at his fingertips – this Digital Twin idea could drive the physical transformation of the coffee shops to the next level. Indeed, this was serious business and not just playing games.

Highly motivated, he decided to get some advice from his IT department about setting up a Digital Twin. Maybe they knew a software vendor to start a VR collaboration.

Exploring Data

Data, the MVP of Business

Within large or small corporations, the fundamental questions center around data quality, reliability, accuracy, and ease of access. However, many business processes still work data manually. And while *manipulation* carries a negative aspect, any manual step in a business process is error-prone, interruptive, and might lead to unreliable results.

IT systems such as ERP or CRM applications produce massive transactional data constantly and often grow into the terabyte space and beyond. But to turn data into insight, each business leader needs access. As such, data is becoming any business unit's **M**ost **V**aluable **P**layer (MVP).

Data Warehouses and Data Lakes are the places where data is stored. But how is it used? Business leaders ask questions – and data will answer them. But hold on – the world isn't that easy. Let's have Tim a word.

After meeting with some tech nerds in the IT department, Tim didn't get a satisfying answer about his Digital Twin vision. But back in his office, he got a call from the coffee chain's purchasing lead.

"Tim, listen. I really need last year's consolidated purchasing numbers of all our coffee bean farmers. Where did we buy from, on which dates, and at what price points? Also, delivery accuracy and bean quality are of utmost importance. Can you help me?" Tim said, "No problem. You'll have the information asap."

It turns out it <u>was</u> a problem. While Tim thought in his SQL mind that a simple report would do the trick, this wasn't the case. The reason why the purchasing lead has called Tim: Somebody had

to pull the data together – manually! Each country had its own vendor application that produced data. And the different systems had different data definitions that had to be consolidated, typically on a spreadsheet level. This work was a far cry from a simple SQL query. In fact, the central database he wished for was non-existent.

Tim had no other option than to start digging for data. He pulled the data sources together, consolidated the data views, and created some meaningful reports. And he said to himself, "This time, I have to do the analysis manually – but next quarter, this data procedure will be automated, and purchasing can pull the reports themselves." He truly felt like a gold digger going West in the 19th century. "Are we living in a digital world, or what?"

Disparate data sources, no integration between satellite systems and the central ERP, manual data downloads and uploads, and many spreadsheets along the way: Are these symptoms of missing data entanglement only visible at a handful of companies? The answer is a clear "no." You can find missing integration and manual data operations in nearly every company. And many companies still rely entirely on spreadsheets[5] when it comes to business analytics. Is this dependency on spreadsheets a cause or an effect?

Cause and Effect

The <u>cause</u> is the reason something happened. Typically, these reasons answer the *Why*-question. Signal words like *because*, *unless*, and *since* identify the reasons.

The <u>effect</u> is the result of an action. Typically, it provides answers to questions like "*What* happened?" Signal words like *if*, *therefore*, and *consequently* mark the effects of actions.

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[5] Deloitte study 2019: 62% of companies rely completely on spreadsheets.

Applying the questioning technique to Tim's problem, he would ask first, "Why do they call me?" The straightforward answer: "Because the data layer isn't integrated into a single source of truth." But how should he integrate the data into its own layer? This sounded pretty abstract. Tim had to think about how to explain these abstract constraints to his businesspeople who were not so much 'inside the data topic.'

*The data education could happen during a data integration initiative. But still, what would be the value the purchasing teams would get from such a program? He instantly knew that he shouldn't focus only on the bean farmer situation. Many other business questions about same-store profitability, logistics, and customer satisfaction could be better answered with an Enterprise Datawarehouse. With the proper data foundation in place, Tim would be in a much better situation to explain **cause and effect** to his business folks and educate them on using reports and queries as a self-service.*

Another narrative that can explain *cause versus effect* from a different angle is the SVB storyline.

When the Silicon Valley Bank (SVB Bank) collapsed on March 10, 2023, it was the second-largest bank failure in US history. But what exactly caused this collapse?

Over a period of two years, SVB grew their deposits by 220% compared with the 26% growth of all other banks[6]. The bank invested its funds in long-term bonds when rates were near zero. But those long-term bond prices fell when interest rates rose, cratering their investments.

Two days before the collapse, SVB announced that it suffered a $1.8 billion after-tax loss and urgently needed to raise more capital to address depositor concerns. Their stock price tanked by 60% on March 9, 2023.

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[6] SVB filings and FDIC quarterly banking profiles.

Since everybody is practically digitally connected, this helped spread the information quickly on Twitter and WhatsApp, causing people to panic. Customers started withdrawing money in waves, and some analysts think the bank run was Twitter-fueled.

Since banks only carry a portion of money in cash, this bank run by depositors was devastating for SVB. They couldn't fulfill the withdrawal demands anymore.
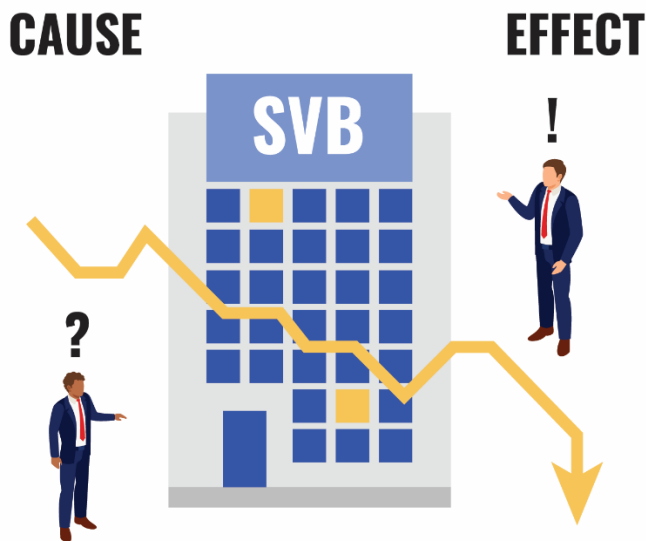

Fig.4: SVB – Cause and Effect

Merger and Acquisitions (M&A)

While distressed situations like the SVB case likely turn to acquisitions (which happened on March 27, 2023, when First Citizens Bank acquired SVB), integrating an acquired company always represents a challenge on all layers: Data, processes, and people. We can be sure First Citizens Bank wasn't ready for integration due to the dramatic speed and sequence of events. But in other situations, and despite long-running M&A efforts, integrating new business units has remained challenging for years. Cultural adaptations on the people layer certainly need time. But on

the data layer, IT leaders should be able to weave the new business units together in no time. Isn't the data integration just a technical exercise?

The demand for selling and buying companies is still unbroken - high levels of liquidity and the urge for continuous growth motivate buying activities. At the same time, corporations are ramping up their sales activities of business units to focus on the core and simplify operations.

Speed is crucial when it comes to the integration of an acquired company. While it is an essential success factor to align business processes and back-office operations as fast as possible across the enterprise, consolidating the data layer is of the utmost priority.

Typically, not all data from the acquired company is needed. But a solid data architecture must exist before the integration to decide which data is moved into the transactional databases and which old data sets are slated for historization. Data consolidation and reduction must go hand in hand during the merger process. *Data reduction* in this context doesn't mean *deletion* of data; it means data is being historized or archived considering the respective data retention periods for legal hold and tax situations while still accessible.

Data Transformation to a New Digital Core

Mergers and acquisitions are transformational moments that can define the future success of the New Digital Core. Obviously, all data must be analyzed and evaluated during the preparation stages. Which data portions have to move and which to stay? What about data quality? Are cleansing or data enhancements required to reach the data quality standards? Things can be done right – or wrong.

The old ERP systems typically amassed data over the last 10 or 20 years. No processes were in place to identify data records that were not needed anymore. Master data weren't changed because they were linked to old transactional data still residing in the system.

Why would somebody need old sales or purchase orders from that long ago?

If the data transformation to the New Digital Core would just start without analysis and data retention decisions, the migration would take all 100,000 records instead of the 5,000 relevant ones, and the duplicates and incomplete data records wouldn't be recognized. The business wouldn't get any value from such a data transformation.

Another scenario is deploying all old data across the New Digital Core and its satellite systems. While too much data migrates into the new environment, the former data dependencies will stay in the same complex way as before. Instead of *data simplification*, the data layer preserves its full complexity.

Therefore, any event or trigger to simplify the data sphere of a New Digital Core should be used to concentrate the data on its essentials. Producing a clean and harmonized data foundation will define the future for many years to come. And once the simplification process is triggered, it can stay on to keep the databases clean and harmonized for years to come.

The data platform that empowers these transformational data visions is JiVS IMP. But let's see first how JiVS came to life.

JiVS – the Success Story

The First Generation of JiVS started as a Data Historization Platform. The fundamental goals behind the *Intranet Viewing System (IVS)* back in the 1990s were securing old data and decommissioning the respective legacy environments. At the time, many organizations needed to migrate from mainframe systems to client-server architectures. Best-known examples include the transformation projects from SAP R/2 mainframe to SAP R/3 client-server systems. The IVS supported customers to transfer their legacy data cost-effective to a secure data store.

The IVS was not limited to only SAP environments. All business applications such as JD Edwards, Baan, Peoplesoft, and Oracle's

ERP could be migrated and managed, independent of software release levels.

With JAVA, the data platform obtained more technical capabilities. Therefore, the name change to JiVS was a logical evolvement into the second product Generation. Predominantly, the primary usage scenario enabled the decommissioning of (old) legacy systems.

With the onset of the 2000s, many customers had complex IT landscapes and had to manage large numbers of old systems running on different software releases and hardware from various manufacturers. These situations revealed the power of JiVS. It did not conduct classical archiving; for tax auditors, there was no need to maintain the databases' field descriptions and table names. But JiVS identified and kept the semantics of all transactions and stored evidence of invoices, payslips, and receipts. JiVS could quickly fulfill any audit requests from the authorities, offering easy-to-use data access to the historized data. And so, the JiVS Historization received certification from several institutes of auditors and tax offices as they attested to the correctness of JiVS.

Fast-forward to today, JiVS evolved into a full-fledged Information Management Platform. The introduction of SAP's HANA applications, such as SAP S/4HANA or BW/4HANA, drove the need for data migrations from SAP ERP or any other ERP application to these real-time applications.

JiVS and SAP are integrated: All historized data can be accessed from the S/4HANA system directly and securely displays, for example, historized sales orders. The JiVS platform provides thousands of data adapters, not only for SAP.

The need for JiVS is significant. Within the next ten years, more than 25,000 existing SAP ERP customers must migrate to new target systems, often to SAP S/4HANA.

JiVS – *The* Information Management Platform

The JiVS platform consists of three architectural building blocks: Data Transfer, Staging Area, and Data Store.

The Data Transfer represents the data migration engine for transporting data from source systems to the JiVS Data Staging. Therein sits a so-called Object Content Repository, the platform's center of intelligence. It provides all the data object definitions to load the data from any source system and preserves its semantical context at the same time. These predefined data objects contain all the metadata belonging to a data entity.

For example, the personnel number is a unique identifier within an SAP system and is used across more than 1,000 database tables. The JiVS data object *PersNo* possesses all table and field definitions to identify and store the whole meaning of the entity 'employee' across the entire database.
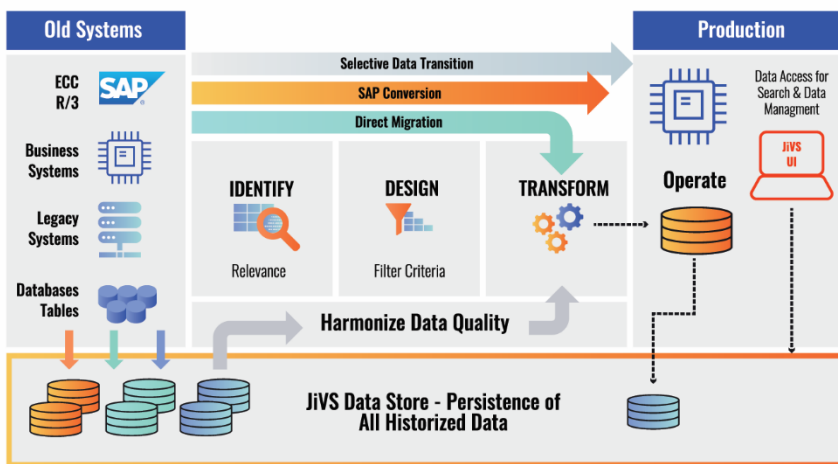

Fig. 5: Architecture of the JiVS Data Platform

During this process, the business transformation team doesn't have to deal with any configuration for standard business software, magnifying the power of the Object Content Repository and the data adapters coming with the platform. Of course, homegrown legacy applications require specific configurations to create and handle new data objects.

During the Identify phase, data is staged and extracted from all linked source systems by preserving their business context information. The platform analyzes the incoming data and evaluates its relevance.

The Design phase is the stage for data simulations. Which data is still active, and which portions can be historized? A rich set of data-filtering mechanisms allows tests to split the data into "active" and "historical."

The conclusion of the Design phase starts the final Transform segment and physically migrates the data sets into the target systems.

JiVS One Click Cockpit (OCC)

The JiVS OCC provides a control tower to manage the entire data journey. It visualizes the results of all data analysis stages and provides insight into the data situations (see Fig. 6).
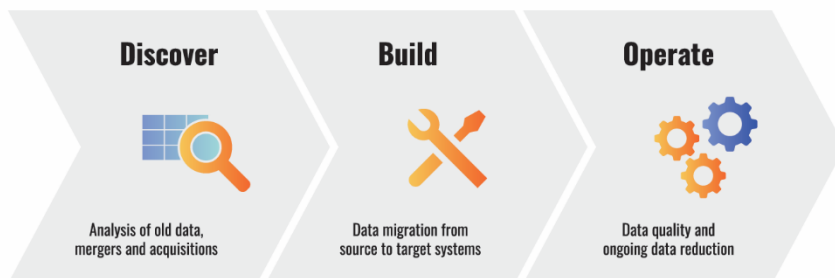

Discover	Build	Operate
Analysis of old data, mergers and acquisitions	Data migration from source to target systems	Data quality and ongoing data reduction

Fig. 6: OCC, the Next Level of Data Automation

Discover

The Discover stage involves all analytical data use cases, including data historization and reduction potential analysis. The value of the Discover phase comes into full play when mergers and acquisitions and carve-out scenarios are to be conducted. It reveals which data must be moved from a source to a target system to fulfill the business demand. The analytical data capabilities include end-to-end performance and speed analysis.

At the end of the Discover stage, the entire data situation is transparent, and business leaders can make their decisions based on facts, not guesses.

Build

The physical data migration happens during the Build stage. Whatever the needed data scenario is, OCC supports it.

- Data Historization is integrated with SAP S/4HANA and provides direct data access from production systems to historized data.
- Data Migration transports data as assigned through the simulations from source to target systems and supports carve-outs and consolidations.
- OCC also improves Data Quality with data cleansing and enrichment during the migration.

OCC tracks all data activities and results in log files that allow powerful reports and visualizations on several levels.

Operate

Because the data journey never stops, OCC manages productive systems to stay lean and clean. Ongoing data retention management and automatic data historization ensure that valuable – and expensive – main memory isn't filled with unnecessary data.

Operational vs. historical data

The JiVS Visualization Cockpit identifies the entire scope of data and reveals it as *operational* and *historical* data portions. It identifies the company's data complexity, for example, by showing the number of organizational units. The blue-colored data portion in Fig. 7 is the footprint of the operational data set, while the red-colored size shows 'old data' and, as such, represents the potential for data reduction.

Data Simulations and Filter Criteria

Powerful data simulations allow the analysis of the data situation in-depth. The visualization dashboard explains the operational data size down to the table level, and data owners can quickly identify a data reduction scenario in terms of data size and amount.

Like any data platform that provides data governance and controls, so does the JiVS platform, which empowers a high-data-quality environment. Instead of artificially generating or manually creating test data, the platform can deploy actual data across all data entities. Such data generation capabilities result in the highest test data quality and ensure reliability in pre-production.
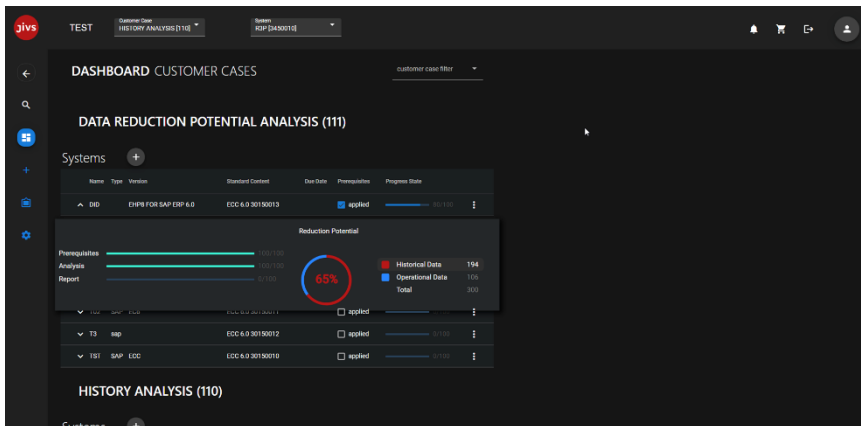

Fig.7: Data Reduction Potential Analysis

The JiVS OCC keeps high data quality standards during the preparation stages and the entire system operation. The ongoing enforcement of high data quality guarantees smooth business operations. *Data defects*, usually a significant concern during software implementations, are practically non-existent. And *if* there is a deviation from the standard, the workflow processes of the data governance ensure it's being corrected and managed.

Data Reduction Potential Analysis (DRPA)

The DRPA sets the stage for knowing the sizes of tables and databases, and it will provide profound insight into the upcoming data migration and the potential for data historization.

The method of data consolidation depends on the IT system strategy and includes the following scenarios: Complete system migration, step-by-step migration, or a side-by-side design. Whichever the data transformation scenario is, the data must be analyzed. The evaluation includes all data from the respective systems, and it classifies the data in old data and infrequently accessed data.

The deliverables of DRPA are fact-based on the existing amount of actual data. It conveys the potential for reducing operational data by considering all the parameters, including organizational units and document types.

Any data migration toward an SAP S/4HANA shows a significant value by a substantial data reduction. Considering the goal to minimize the target database size as much as possible, transferring *all* data to the new in-memory database could be very costly. Existing SAP ERP systems are, on average, 20 years old, and their databases are filled with up to 90% of historical data. In those situations, applying data reduction <u>before</u> the transformation would result in a 50% shorter migration time and an overall TCO savings of 80%[7].

JiVS Dashboards

Powerful dashboards such as the JiVS One Click Dashboard visualize the databases in size and complexity, for example, the number of organizational units. The data quality improves during the transformation process, quasi as a side effect of the business transformation (see Fig. 8).

The JiVS data analytics offers comprehensive slicing and dicing capabilities. It provides significant value when business leaders

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[7] Thomas Failer (2023)

want to understand better what happened with vendors and products over the past years. Data traces are identifiable by organizational units on the sales side as well as on the purchasing side. Even unused organizational units can be displayed for any given time frame.

The JiVS dashboards assist decision-making on any organizational layer to investigate potential divestiture, check product costing and logistics, or prepare a business case for a digital transformation, such as SAP. The data platform is a valuable application to control the data core and keep it as simple and clean as possible.
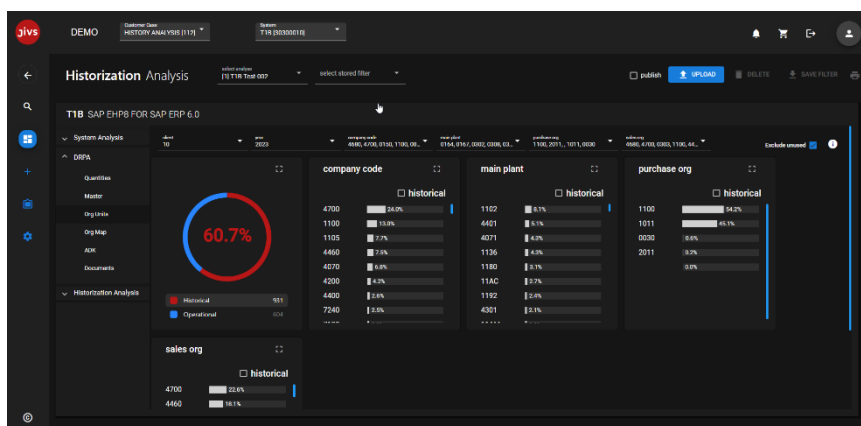

Fig.8: Historization Analysis

Migrate and Operate

Indeed, the data migration step is the most critical step of the entire procedure. Therefore, the responsible data leader must control the metrics tied to data transformation and constantly poll its progress for transparency.

The data migration process needs collaboration across the aisle. Business and IT leaders must collaborate closely to identify and solve data issues, mismatches, and any question that arises. Neither IT nor business can solely address concerns about data quality, cleansing, and governance. They must work together.

When Tim, our senior technology executive, investigated the existing system architecture, he found different business units used various cloud applications. And to make things worse, the applications were hosted by different cloud providers and operated within their data centers.

How should he be able to provide consolidated and reliable data to the business leaders? Wasn't there any governance in place before he arrived? Could the respective business units just do what they wanted? Obviously, he understood better and better why he got hired.

Based on his experiences from previous companies he worked for, Tim guessed that he needed to develop a concept such as a common data layer. Or should he even think of a central system, a single source of truth, such as an Enterprise Datawarehouse? At least he could consolidate <u>data</u> and <u>processes</u> into one reliable view. But certainly, the <u>people</u>, i.e., the business teams, wouldn't be happy with this centralized approach. They would fear losing too much power and control. Tim recognized the concerns and had to put more thought into the data strategy.

Regardless, he knew one thing: He had to act <u>now</u> – waiting wasn't an option. The urgency was palpable: Missing data integration across all the business units couldn't provide the analytics and visibility the coffee chain needed.

The Data Journey Never Ends

The data journey doesn't end with the migration. In fact, the data migration just marks the beginning of a long road ahead. Data must be managed, and it must be orchestrated for business analytics.

Data Orchestration automates data management, moving it from multiple sources to typically one central destination. It is the prerequisite for any data analytics to provide actionable insight.

When looking at a customer running a multi-cloud scenario, the different cloud providers operate multiple data centers, and their data security concepts make it not easy for the IT teams. However, business leaders don't see the technical layers, and they shouldn't worry about it. They always want a consolidated view of their results and situations, preferably in real-time.

Data Orchestration is a data lifecycle process that automates data loads as much as possible. While *Data Collect* and *Data Transform* in Fig.9 clearly point to the data staging capabilities, *Data Controls* must be in place as a data governance measure to check data quality and consistency at the moment of entrance.

The entire business community that *Uses* the data sets must provide feedback on the data, its relevance, and its value for decision-making. Based on that response, data controls must be adapted, or a new data stream must be implemented. As such, the data architecture is iteratively checked between data providers and consumers, resulting in a reliable *Data Model* for the enterprise and all its business functions.
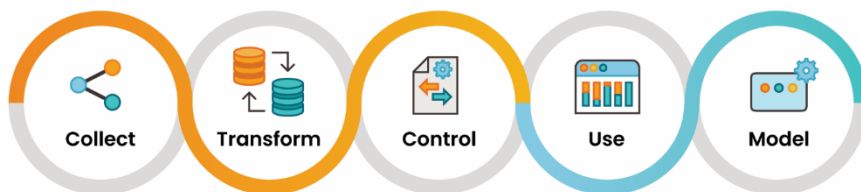

Fig.9: Data Orchestration

To some people, the term *Data Orchestration* sounds cool – but the actual meaning is still blurry for them. A better descriptor of the situation is *data integration*. While a governance model helps to keep data context and flow clean, the challenge lies in coordination. Many different data sources, data islands, and data lakes must be integrated into a data architecture that provides value to any corporate leadership level. Somebody must understand the disparate elements of a Dataverse and weave them together for data insight and business value.

The role of the *Data Weaver* is born, a telling title for the Chief Data Officer.

ERP and SAP

Within an enterprise, data is everywhere, and it's needed to manage and control all major business processes. With more data visibility, business leaders make better decisions. An Enterprise Resource Planning (ERP) platform represents a data model at its core. Sometimes named a *single source of truth*, an ERP is an information system that captures all transactional information[8] and enables managing all resources and activities within the entire enterprise.

Fig.10: ERP, the Single Source of Truth

In today's cloud world, however, master data might be managed within ERP satellite systems. Fig. 10 shows a reference architecture where applications like CRM, vendor management, manufacturing, and HR surround the ERP core.

Some master data are managed within the respective satellite systems. And these satellite applications can cover all functional business areas, including inventory management, manufacturing, supplier relationship management, and all customer-facing interactions.

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[8] Examples of transactional data are sales and production orders, deliveries, receipts, etc.

Nevertheless, the ERP's database consolidates all transactional data and provides a central repository for measuring, controlling, and governing all business units and processes.

Processes and data layers are the foundation for any transformation and the future scale of operations. Relying on an ERP, the business leaders know what's working well and what's not. Planning and forecasting the next period are reliable and accessible without manual data interventions.

IT leaders face budget cuts across the board and are under pressure to deliver new capabilities with less money. A software subscription model offers them a pathway to success. They can shift IT expenses from capex (capital expenses) to opex (operational expenses). Instead of *buying* hardware and *licensing* software, they subscribe to all-inclusive subscription models. Instead of heavy hardware investments, they pay a predictable monthly subscription fee. Depending upon the service level, this fee includes the entire technology and software stack, all managed by the cloud provider. By embracing the cloud model, IT leaders get the state-of-the-art digital capabilities they need to support all lines of business.

Cloud providers guarantee via service level agreements (SLA) system availability, performance, and operation. They also make the respective IT environment scale, which can, hypothetically, grow unlimited. Nevertheless, companies only pay for what they use in terms of resources.

The SLA often includes automatic upgrades – without impacting the business operation. As such, a cloud ERP guarantees business continuity, growth, and effective use of capital.

SAP S/4HANA

Some customers perceive SAP as too expensive and too complex. Combined with a significant shortage of SAP skills within the job market, they think SAP is costly. But with the advent of the cloud, business conditions have changed. "SAP as a Service" is *the* pathway to go. SAP's flagship application S/4HANA provides all

necessary business operation capabilities. Also, SAP has been known for over 50 years – a unique opportunity for enterprises to take advantage of their ERP experiences.

Many long-term customers changed ABAP code within their ERP systems to implement unique and non-standard business requirements. But we know from experience that customers' capabilities to adapt ERP systems according to their needs are a blessing and a curse at the same time. Modifying the core systems' ABAP code to fulfill specific business requirements is easy – however, the code's maintenance over the years becomes expensive; upgrades and even simple business process changes cause headaches – and always cost time and money.

Clean SAP S/4HANA Core

The ideal situation is to keep the core of SAP S/4HANA clean and practically untouched. Restricting software modifications entirely to the core system seems to be a bitter pill to swallow for long-term SAP users. But the wins the company gains are two-fold:

- The SAP S/4HANA Core can be updated as often as needed – usually twice a year in a public cloud scenario.
- Customers can adapt their business processes outside the core by utilizing SAP's Business Technology Platform (BTP) as the "business companion of SAP S/4HANA."

The SAP S/4HANA core stays simple and clean, while SAP BTP manages industry-specific capabilities and can fulfill company-specific business requirements. This 'separation of duties' allows business managers to think about customer needs first – in a seemingly world with no technological limits. Any innovation from this "Customer First" approach can be realized with the SAP BTP as the implementation platform.

SAP Business Technology Platform (BTP)

SAP's business integration platform BTP operates side-by-side with SAP S/4HANA. With BTP, customers can stay flexible and utilize all advantages of SAP's ERP as *the* technologically robust

and clean foundation. The BTP orchestration layer ensures business integration across all functional areas and organizations.

Fig. 11 shows the technical layers of the combined S/4HANA and BTP architecture. While SAP S/4HANA is the foundation for the application stack and the Single Source of Truth for all data, BTP enables specific functionalities for unique business scenarios. Five building blocks of orchestration services come integrated with SAP BTP, allowing technical integration of SAP and non-SAP applications.

1. *Application Development – No-Code Development*

Application Development (App Dev) enables the next generation of software development called *No-Code Development*. Modern software development platforms use intelligent capabilities to create software code based on input from business leaders. The paradigm '*Businesspeople know best!*' shifts responsibilities from software engineers to business analysts.

Analysts can architect business flows with no-code development tools step-by-step, and the no-code platform generates executable software. The software can be tested immediately for functionalities and ease of use. As a result, user-centric apps with role-specific functionalities make it easy to access the core of SAP S/4HANA.
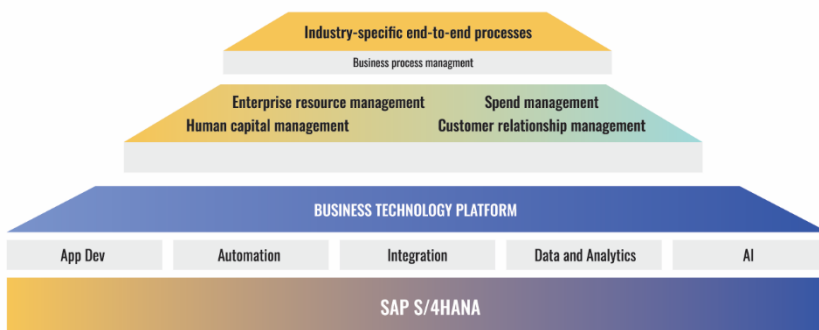

Fig.11: SAP S/4HANA and BTP

AppGyver is SAP's no-code platform and comes embedded with SAP BTP. Particularly on the data layer, it offers complete integration of any business flows and allows the incorporation of devices, sensors, and appliances. AppGyver's revolutionizing capabilities will tackle the skill shortage problem and put more power into the hands of the business.

2. Business Process Automation

A digital enterprise ensures data visibility and transparency across all business units; therefore, all business processes must be fully automated. And SAP BTP allows analyzing business processes for improvement and identifying those with the most impact on the business.

Business process automation empowers the streamlining and optimization of workflows across the enterprise. The embedded business process monitoring reduces human error, prevents system hiccups, and optimizes resource allocation across the enterprise.

Complete automation within enterprises is a gigantic step toward the digital vision with all business processes under control.

3. Integration of Business Applications

Using standardized microservices via existing interfaces (APIs), BTP is the integration hub for many best-of-breed applications. For example, the process integration of a HubSpot CRM application into the company's business process landscape can be done in minutes. After mapping the fields in Open Connectors, a BTP core component that provides prebuilt connectors for simple connectivity, the HubSpot instance can be managed and can exchange data.

Many other standard integration capabilities come out of the box, particularly for products of the SAP family, such as SAP SuccessFactors, SAP Concur, SAP Ariba, and many more.

4. Data and Analytics

SAP BTP enables **SAP Analytics** with real-time analytics on its HANA database. When utilizing HANA, enterprises experience

complete visibility regarding data insight and decision-making. SAP Analytics diagnoses business situations and can quickly address any business question. Its predictive analytical capabilities allow the business to forecast future business outcomes.

5. *Artificial Intelligence*

The CEOs' visions must include AI and ML as digital core competencies. Both help to engage better with customers and partners. BTP offers embedded AI and ML capabilities and side-by-side scenarios for large-scoped projects.

BTP empowers conversational AI for intelligent chatbots and Natural Language Processing. The platform weaves the business data of the HANA database with external streaming data to better understand, for example, the customer target groups and their buying behaviors. BTP offers these behavioral insights for finance, manufacturing, procurement, and many other business units.