

News on New Work

Data consistency and digital whispering in the corridors

Here, we are publishing the manuscript of the keynote address given on the second day of this year's Cadison International Conference (CIC), which was conducted virtually on November 3 and 4 and reached more than 300 participants worldwide.

by BERNHARD D. VALNION



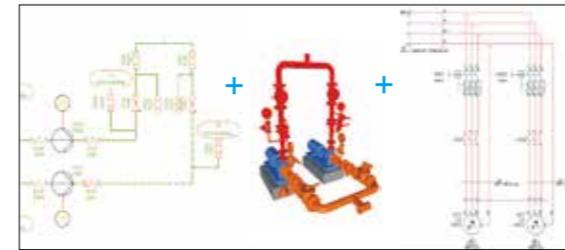
Picture: Pixabay / Free-Photos

Ladies and gentlemen, as a result of the pandemic, we have all become part of a worldwide testing laboratory. As part of the opening presentation for the second day of this year's Cadison International Conference, I want to talk about the current status of digitalization and the engineering workplace of the future, which is currently still at virtual prototype stage.

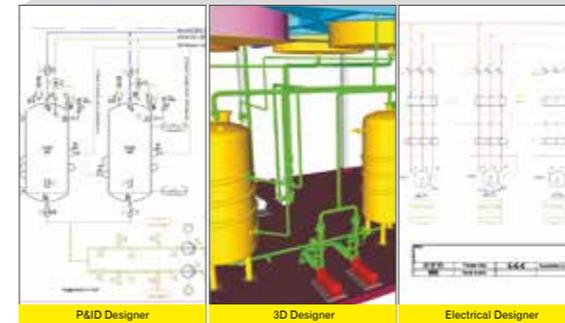
CADISON WORLD

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Each discipline uses the output from other team to create a multi-disciplinary Extensible Construction Set and reuse in current as well as new projects



Reuse Existing Design to Create New Designs

Data quality as the gateway to Industry 4.0

Data consistency means that the data format is correct or that the data is in correct relation to other data. This term is not often used in information security, but tends to be found in computer science in general. Data integrity refers to the fact that the retrieved data is correct.

Data integrity versus data quality versus data security – what are the differences?

These three aspects are related, but not the same. Data quality ensures that the data stored in a database meets the standards and requirements of an organization.

Data security concerns measures that are taken to protect corporate data from misuse. These include the application of methods and techniques that make data inaccessible to unwanted parties or make selected data available to desired parties. Especially in distributed work environments it is crucial to ensure data integrity, data quality and data security. This is often neglected in the discussion about home offices. If problems arise here, efficiency can be lost.

Flexible framework for efficient work split

Many organizations in the construction and plant engineering industries have recognized the need for a common data environment (CDE) to support collaboration between project participants. But what is a common data environment? There are many interpretations of what a CDE could be and guidance on this has been provided in the British industry standards BS EN ISO 19 650 and PAS 1192. In addition, there is the German DIN SPEC 91 391.

According to BS 19 and PAS 1192, a CDE is a collaborative work environment that everyone uses to coordinate information with supply chain members for a project. BS is a widely recognized international standard for organizing and digitalizing information about buildings and civil engineering works, including modeling them according to BIM approaches. In the UK, PAS defines BIM Level 2, which is a 3D BIM environment for project delivery.

DIN focuses on functional sets and open data exchange between platforms of different system providers. If CDEs from different vendors are used in a capital project, seamless data exchange must be guaranteed. The OpenCDE group in the BuildingSMART International foundation, for example, is working on this. An important open format is IFC, which allows object-oriented exchange of 3D data.

What working is all about – the digital twin

A digital twin can be defined as a virtual instance of a delivered physical asset that contains data and simulators for real-time forecasting, optimization, monitoring, control, and improved decision-. Recent advances in numerics and hardware performance bring this promise closer to reality. This requires know-how partnerships in the sense of eco-systems. The digital twin is a communication tool for internal, cross-disciplinary concerns and towards the client in the sense of data handover, for example when it comes to delivering cyber-physical systems.

Value of digital twins: digital twin allows remote monitoring and control in real time due to its holistic approach to data integrity. A comprehensive data fusion of planning and operating data ensures that errors in the system can be detected far in advance based on an intelligent analysis of sensor data and that appropriate measures can be taken on this basis to keep plant downtimes as short as possible. A digital twin enables the run-through of what-if analyses, which leads to better risk assessment. With greater autonomy and all information at their fingertips, teams can better use their time to establish agile collaboration, resulting in higher productivity. With the help of a digital twin, system-specific services can be tailored to create new business models. Central, individually asset-related access to information in conjunction with structured data storage leads to increased transparency in real time and automatically generated documentation.

The advantages of integrated planning

This is anything but trivial, but all the more important: For example, to generate a P&ID from a PFD – ideally just with one mouse click, without having to touch the data again after import. This requires powerful connectors, which can be a technical problem.

This can only be done with the necessary ease if the CAx applications to be integrated have databases, ideally the same database for all disciplines. The objects and their metadata can thus be stored once centrally.

If this is guaranteed, the extraction of the final documentation is also no problem for the user. And to be honest, data integrity can only be achieved with one unified system architecture.

New Work means: homogeneous data structure and homogeneous working environment. In order to have a single toolset of truth!

Also, the next step towards VR/AR can only be taken on a common data basis. Otherwise, it will involve very high costs. Clearly, the management must know what is already possible with a manageable investment.

Market trends and investment behavior

In the following we will deal with the following questions:

- How relevant are the communicated topics related to digitalization? Or are they just pipe dreams of the vendor community?

- What impact do data-driven initiatives have on the labor market? On the structure of organizations?
- Are there concrete lighthouse projects in the process industry and other leading sectors from which we can learn?

Don't miss the train!

The train is already rolling. The relevance of digitalization is expressed simply by the fact that there are more and more chief digital officers around. And the list of studies on the subject is very long. According to German Statista association, based on estimates from 2019, there is talk of 2 300 billion US dollars in investments by 2023. However, caution is also called for because many vendors have simply stuck a different label on their existing portfolio and are now selling it as an 'Industry 4.0 enabler'.

In the spirit of New Work, it is important to note that, especially with the ground being gained in machine learning, the requirement profiles in the area of job advertisements are about to change. Increasing pressure will be exerted on job profiles that are still considered well paid today.



Lighthouse projects I: Evonik's metamorphosis to a software vendor

The specialty chemicals group Evonik (Essen, Germany) relies on ThingWorx from PTC for fast, efficient development of IoT solutions. Those so-called apps are to be developed in-house. This way, facilities and employees at more than 100 Evonik sites worldwide will benefit from the same apps, which can be quickly adapted to their respective needs ... thus making the transition to low-code development.

Evonik's process-experienced development teams connect different systems in the areas of information

technology (IT) and operational technology (OT). The data structure is based on the standard architecture of NAMUR and the international standard data model DEXPI. This will flatten the classic automation pyramid. The first apps have already been implemented: For example, an app combining a digital checklist tool for plant inspection tours with the DCS.

Lighthouse projects II: PDM 2020

The major project 'Product Data Management 2020' at Daimler (Stuttgart, Germany), which was designed to run for a total of five years, consisted of a total of eight subprojects and was completed nine months earlier than planned. One of the subprojects is called 'Data', which provides access to the individual, isolated backbone systems (data silos) to the ground. The knowledge graph technology of Conweaver is used here, which integrates a large number of backend systems across the entire value chain. An important target component was the intra-digital twin as a common communication vehicle.

Project management quote: "We have found that when we establish a strongly networked end-to-end process, it has a major impact on organizational structures."

Note: Organizational change does not happen as quickly as the technical implementation of a new process. After all, some processes are 100 years old: From the client to the dealer to the production to the factory, in case of warranty issues. One conclusion from the project is: "The new cross-process approach has led to a COO organization that redefines the responsibilities in the board departments in an end-to-end manner" – or to speak: data-driven processes take the lead. More details on PDM 2020 in this issue of d1g1tal AGENDA in the 'MOBILITÄTSINDUSTRIE' section.

Lighthouse projects III: Storming the Bastille

In capital projects processing, various tool chains are still in use – different tools from different vendors are used for different process steps in engineering. A lot of manual work is involved in



passing on data to the next process step. This method of working may still be justifiable in a conventional waterfall approach, but it becomes unacceptable in simultaneous engineering approaches to accelerate project execution because no consistent database can be achieved in project execution.

Quote from the management of a leading vendor: "We have been noticing for some time that the digital twin is perceived as added value by our clients. They are really pushing us to build the digital twin together with them. They are even willing to spend money on it."

What is really changing is the attitude towards the so-called principalities within companies. Management is much less willing to accept them today. With the generational change, castle walls are now being torn down. In the past, it was common for companies that served different markets to use different tool sets for this purpose. Similar to the wave of standardization that came with SAP, there is now a harmonization in engineering in the individual business areas, for example, based on Cadison.

Our picture left below shows Clemens August of Bavaria (1700 to 1761) with all the frills of his spiritual and secular reign: The electoral cloak and hat stand for the Electorate of Cologne, the episcopal pectoral cross hanging on his chest, the collar of priestly regalia.

Cut! Change of perspective to the employee's view

'New Work' refers to the changes in the work & life (im?)balance as a result of globalization and digitalization. There is a move away from the traditional wage worker who carries out his or her work according to strict specifications, towards alternative and flexible approaches that give them more freedom in the performance of their tasks and personal development opportunities. Keywords in connection with New Work are agile teams, co-working, online meetings and a culture of trust. The pandemic is acting as a turbo here.

New Work requires flat hierarchies. Managers should act as coaches, inspire and motivate. A rethink is needed among managers, which of course is very demanding for many baby boomers.

In line with their management style, companies should ideally also switch to an agile way of working. This means that responsibility is scattered, away from management to work teams. In this way, project teams take responsibility for their own actions while management is on hand to advise – so much for the theory.

Since written communication clearly outweighs personal words in the digital working world, it is all the more important to express oneself unambiguously. Because sometimes an intention or an emotion is misinterpreted or negatively interpreted by the recipient via written channels.

The 'free-rider problem' often occurs in virtual teams. According to the motto: Nobody feels addressed, the colleague already cares. Messages must therefore always be written with a clear objective and the addressees must be addressed directly – of course without misinterpreting the tone.

And what conclusion can be drawn from the prototypical time of departure under the impression of Covid-19? It worked surprisingly well, but there was also stress. Besides: The engineers had worked more than ever before.

Digital natives and digital immigrants

Whenever there is talk of introducing a company-wide IT solution, the term 'change management' is quickly on the table to turn those affected into participants. But where do our sensitivities to new IT and business processes actually come from?

Our work culture is characterized by four conspicuous features, in particular expertise; bureaucracy; strict hierarchies, perfectionism.

The German educational system is trimmed for specialization and perfectionism. This special educational focus is a logical consequence of the traditions of the German guilds and master craftsmen – and a supporting pillar of the economic success of German machinery and plant engineering! In agile work environments like software development with its scrum teams, however, specialists feel uncomfortable. There are no clearly assigned roles, but ideally all team members should be able to work on the various tasks, across the different functions.

In German industry there is usually still a clear relationship between employee and boss regarding who is in command and who executes the orders. Only when problems arise do the responsibilities become blurred.

The baby boomers (also known as 'Best Agers' or 'Generation Silver') are predominantly specialists and thus digital immigrants (IT niggers, head monopolists) and digital natives – mostly just 20+ years of age – are more of the generalist type. Both have their advantages and weaknesses.

Both terms, digital natives and digital immigrants, were coined by US e-learning guru Marc Prensky, who introduced this classification in 2001. Mr Prensky describes digital natives as being those people who were born into the digital world with their constant need to communicate via smartphones, Facebook, Instagram & Co. and who take dealing with it for granted. Digital natives first try to solve a task with digital technologies, are multi-tasking specialists and avoid personal conversations with colleagues or superiors. Digital immigrants, on the other hand, were not confronted with digitalization until they reached adulthood and understand digitalization to mean mainly Google searches, online booking and recently even – thanks to the Corona crisis – video chatting. So how does an immigrant become a native, or rather a specialist become a digital native?



Silicon Valley: Cradle of the digital natives

Silicon Valley stands for consistent interdisciplinarity: Every subject studied at Berkeley or Stanford comes piggyback with computer science. As part of innovation tours, German CEOs and CDOs are happy to draw inspiration from start-ups on the US west coast.

Until the mid-20th century, the Santa Clara Valley in Northern California was semi-desert farmland. In San Jose, canned fruit was preserved on an industrial scale. Stanford (halfway from San Francisco to San Jose) was a small private university for not very talented kids from rich parents.

Stanford's rise to the intellectual center of the United States began due to lack of money, when the Dean of the Faculty of Electrical Engineering, Fred Terman, leased parts of the campus to small businesses. Today we speak of 'high-tech start-ups', referring to that time of laboratory equipment manufacturers and physical apparatus engineering.

I would like to recall: Two of Mr Terman's students, Bill Hewlett and Dave Packard, started making oscillators in a garage in Palo Alto in 1937. And we all know the rest of the story.

Mr Terman is often referred to as the 'godfather' of Silicon Valley and Dave Packard's parents' garage is part of the founding myth. But the man who set the decisive course was Bill Shockley, Nobel Prize winner and inventor of the transistor with Walter Brattain and John Bardeen. Mr Shockley had recognized that silicon was the better semiconductor material compared with germanium. It is always the apparently unimportant things that later write world history. Because Mr Shockley's mother was ill at the time, he decided to move near her and found Shockley Labs in Mountain View (today's headquarters of Google LLC).

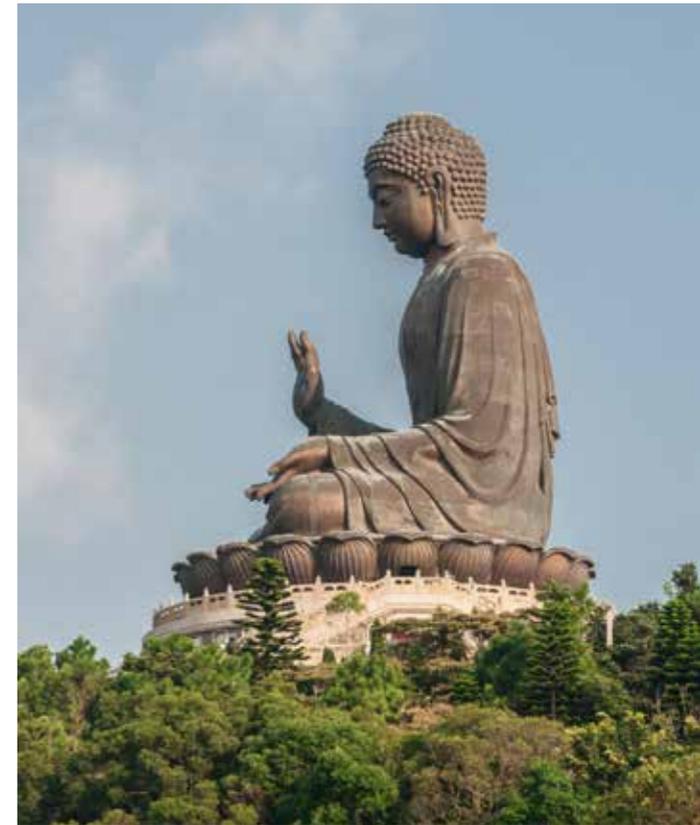
One feels obliged towards other knowledge carriers ('peer loyalty'). And this is exactly what Silicon Valley is all about (the name 'Silicon Valley' was first coined in the early 1970s and became popular ten years later): The mix of highly qualified employees and mutual help, so that some things simply happen much faster.

In addition: There is a lively exchange of employees between the companies. Because there are so-called at-will contracts. This willful employment relationship is a term anchored in US labor law for contractual relationships in which an employee can be terminated by an employer without good reason and without warning, as long as the reason is not illegal. In addition, every labor court declares non-compete clauses to be invalid – all this would be unthinkable in Germany!

Coffee machine and digital Chinese whispering

At the coffee machine in the office or in the corridor, informal background discussions can be held after spontaneous meetings. Resistance can be identified and overcome in the run-up to a meeting. This is not possible in the home office. Especially in online meetings with several people, no one wants to be exposed when conflicts arise. Rather everything is nodded off. There is also the danger that nerds will become even more orphaned because they are no longer socially integrated into the company.

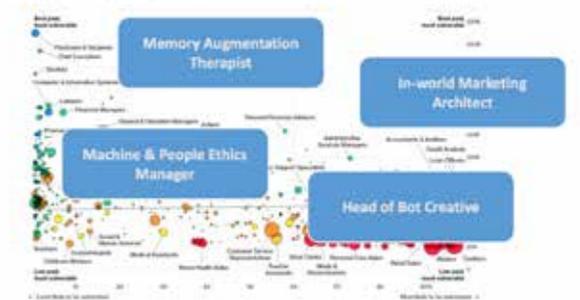
It is necessary to develop mechanisms so that the employees are also reached emotionally in the home office. Here is the remarkable example of the 'Yotribe' app: Users can video chat with each other in 2D. As a circle with an avatar, they move around freely in virtual



Keep calm even in times of New Work. Buddha making the gesture of appeasing fear

Picture: Wikimedia

New Jobs on the horizon ...



Machine learning and AI will exert increasing pressure on job profiles that are still considered well paid today

Source: LDD 2019



space. If two or more circles are close enough together, a connection is automatically created. The camera starts up and the conversation can begin. Thus, several bubbles are formed within the room, in which users interact.

Leadership and living in the new brave world of digitalization

According to the German BMAS, around 20.8 million people with a political or social migration background were living in Germany in 2018. This corresponds to a quarter of the total population. The cohort of baby boomers in Germany (baby boomers were born between 1955 and 1969) – digitalists with a migration background, if you will – comprises at least 50 percent of the total population of currently 83 million. That is a huge number of immigrants! Both, companies and employees are obliged to move:

Companies: They must continue to develop in the direction of an 'intelligent enterprise'. An end-to-end IT infrastructure without media disruptions must be established. For example, start GoTo or Microsoft Team meetings directly from the PLM system or the plant planning application such as Cadison, in order to present the context of the task without any doubt. And to deal with AR/VR applications.

In addition, the communication strategy to the employees, but also towards the customer, should be refined, for example, using storytelling techniques.

Employees: Communicating in a much more targeted way than before is mandatory. For example, for clarity about which work packages need to be processed by what time and whether this can actually be achieved. Self-organization is important in terms of clear rules for work and life (family). Flexibility and humor is also recommended, otherwise the fun gets lost.

Immigration into the virtual space means becoming at home there!

There is no alternative to digitalization, as our chancellor Dr Angela Merkel would say.

Thank you for your attention!

