INTERRUPT
INSIDE

A technology magazine by Data Respons

Connecting the dots of industrial digitalization

About the ability to recognize similarities between industries

6 UX TRENDS YOU SHOULD KNOW ABOUT

What is going on, where are we heading?

Data Infrastructure for Automotive AI

It's no secret that software is "eating" the automotive industry.

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CLEAN <CODE>

Software development by and for people

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KENNETH RAGNVALDSEN

CEO DATA RESPONS

This edition of Interrupt Inside is the perfect representation on how technology and software is penetrating every industry, company, product, process, and business model.

ENABLING
DIGITAL ACCELERATION

A strategic perspective on how our skillsets and specialists are valuable across every industry comes from one of our managing directors in R&D Services in Norway, Ivar Melhuus Sehm. Ivar has worked in Data Respons since 1999, and he has experienced the massive transition from hardware to software, which has become the key characteristic for industrial digitalization.

Another testament on how software skills are applicable and valuable all-round comes from the newest Data Respons family member, Frobese. Even though Frobese is a company specialised within fintech their learnings and perspectives are universally usable. For example, DevOps is a word that's almost impossible to avoid in any company with a strong tech interest. And it's basically about how you maintain your operations while also developing your offerings and the user experience. Sounds easy, but for example for a bank its seldom good timing to shut down the online banking service to do any upgrades. Finding a process that allows for both development and operation is a sweet spot that any business wants to find. And needs to find.

Furthermore, Frobese has also contributed with an article on how to write clean code. Again, it might seem like a basic thing, but if you ask any developer how often they are bogged down with solving issues that stems from poor coding you would be surprised! Writing quality code is not easy. It requires a lot of experience and a curious mind in the developer that's writing the code. Writing code that solve the bigger problems and not just fixes a small bug is the difference between average and great developers. I like to believe that our specialists are usually great. When they are not fantastic.

Speaking about specialists, this edition of Interrupt Inside also holds two stories about cutting edge technology within the mobility sector. One story is about how our daughter company, inContext in Sweden, are using their expertise within electrical systems design to enable more sustainable transportation. By mounting a pantograph (a receiver for electricity, mostly used by trams) on top of trucks, InContexts' customer is making it possible for trucks to charge while they are driving, but also to run purely on electricity on specific stretches. It

surely is a complex electrical setup, but with the expertise from inContext it becomes much more doable. And maybe it's the shortest way forwards to transporting goods with zero emissions.

The other mobility story is just as fascinating. Our daughter company Epos CAT in Germany is currently working on a software stack that will function as a test bed for machine learning that will be used for autonomous driving. An enormous amount of data is needed for a machine to learn what it should do in a huge set of scenarios. And since having machine learning to drive on the actual street is not advisable, you need a digital replica of the world's traffic environment.
That's what Epos CAT is creating for a large automaker. It's really one of the first steps that any car company needs to go through before they can talk about having autonomous cars.

,, ... it might seem like a basic thing, but if you ask any developer how often they are bogged down with solving issues that stems from poor coding you would be surprised!

I promise you that after reading through this edition of Interrupt Inside you will sound like a digital expert at the next dinner party. If you can remember it all.

Enjoy,
Kenneth

ETRUCKS

THE FUTURE IS POWERED FROM ABOVE

BY: Arne Vollertsen for Data Respons

Say hello to the pantograph, the ancient device invented in the 1890s that's currently mounted on e-trucks on test tracks in Germany. Pantographs have been used on trains and trams to connect them to overhead wires, and it's a key component in the future of road freight. Cable harness experts from inContext are designing the e-trucks' wiring.

Road freight is increasing year by year with no signs of slowing down. This puts pressure on vehicle producers as well as legislators to coope- rate in developing sustainable solutions for road freight.

In 2016 Sweden opened the world's first stretch of eHighway for e-trucks, south of Gävle. Soon afterwards Germany launched an ambitious eHighway project, with Italy following suit, and UK planning a pilot project as well.

Most likely the green truck of the future will utilize a mix of technologies, including battery and hydrogen power, in combination with eHighways allowing the e-trucks to charge batteries while driving.

The e-truck friendly autobahn

5 km of overhead catenary lines are in operation on the A5 south of Frankfurt, one of the most heavily polluted roads in Germany. The catenary cables are supplying electricity to specially designed trucks with a pantograph mounted on top, connecting them to the wires. Additional sections of road are being te- sted near Lübeck and in 2021 the A5 will be supplied with another 7 km of catenary lines, together with another trial starting in Baden-Württemberg.

A large Scandinavian truck manufacturer has previo- usly provided the project with five hybrid trucks mo- dified with a pantograph. Now seven additional 2nd generation e-trucks are being developed. inContext is doing the tailor-made wiring on these improved vehicles working as a subcontractor.

Key component for e-trucks to succeed

eHighways will probably become the backbone for electrified freight transport by road, and we are really proud of being part of this effort to build a key component of the electrification soluti- on of the future, says inContext engineer Albert Mola.

We're especially thrilled by the fact that we're not only doing the design of the cable harness for the e-trucks, but also manufacturing and testing harness prototypes at inContext's own electrical

workshop. In this way we're taking the solution all the way from design to manufacture.

Two prototypes

According to Albert Mola, inContext is working on two different e-truck prototypes:

One is a fully battery powered truck

The other a hybrid truck with batteries as well as combustion engine.

Both have charging capabilities due to their roof-mounted pantograph and with their CCS charging port. This means the truck can charge its batteries while connected to the catenary cables. When leaving the eHighway it switches to batteries or combustion engine.

A tight fit

This is a completely new design compared to the first batch of trucks. They have extra batteries, and the hybrid version can carry a bigger load than its predecessor, Albert Mola explains.

He and his colleagues are facing numerous chal- lenges developing the new e-trucks, which are still in the prototype phase. For instance, integrating the pantograph, delivered by a large German manufacturer, into the existing electrical infra- structure of the vehicle. Also, they have to handle both the high voltage connections going from the pantograph to the batteries and drivetrain, and the conventional low voltage signals flowing through the vehicle, for e.g. CAN communication.

On top of that, we are working under some tight design constraints. For one thing, the modifications we are doing should be minimal- ly invasive, due to production cost. Also, the tower is crowded and contains a large number of components, so there's not much room for the wiring. Furthermore, the high voltage cables are very stiff with a bending radius that doesn't allow for much flexibility. So, there is a lot you have to take into account.

From design to workshop

Albert Mola is especially proud of the fact, that he and his colleagues are not only doing the schema- tics of the cable harnesses for the e-trucks. They are

also manufacturing actual physical prototypes at inContext's own cable harness workshop.

It has been really interesting to align our design group and our manufacturing team. For instance, we've created a form board, which is a 1:1 scale flattened representation of the cable harness for manufacturing. It contains all necessary informati- on to build up the cable harness such as length to branch points and all required components.

In this way we can take a new harness all the way from design to manufacture. The next step is to go to the truck manufacturer's assembly works- hop for prototypes to see if everything fits into the vehicle. All this will give us input for the se- cond iteration of the design.

Investing heavily in eHighways

The new prototype generation of pantograph-equip- ped e-trucks are expected to be released in Q1 2022.

When you look at the current eHighway projects in Germany, UK and other European countries, the demand for trucks with pantographs will be growing, says Albert Mola.

It would make good sense to put them into serial production, and that's something we would be very happy to see, since we're part of the prototype con- cept. Moreover, I believe that overhead catenary lines probably will become an important component of the electrical long-haul infrastructure of the future.
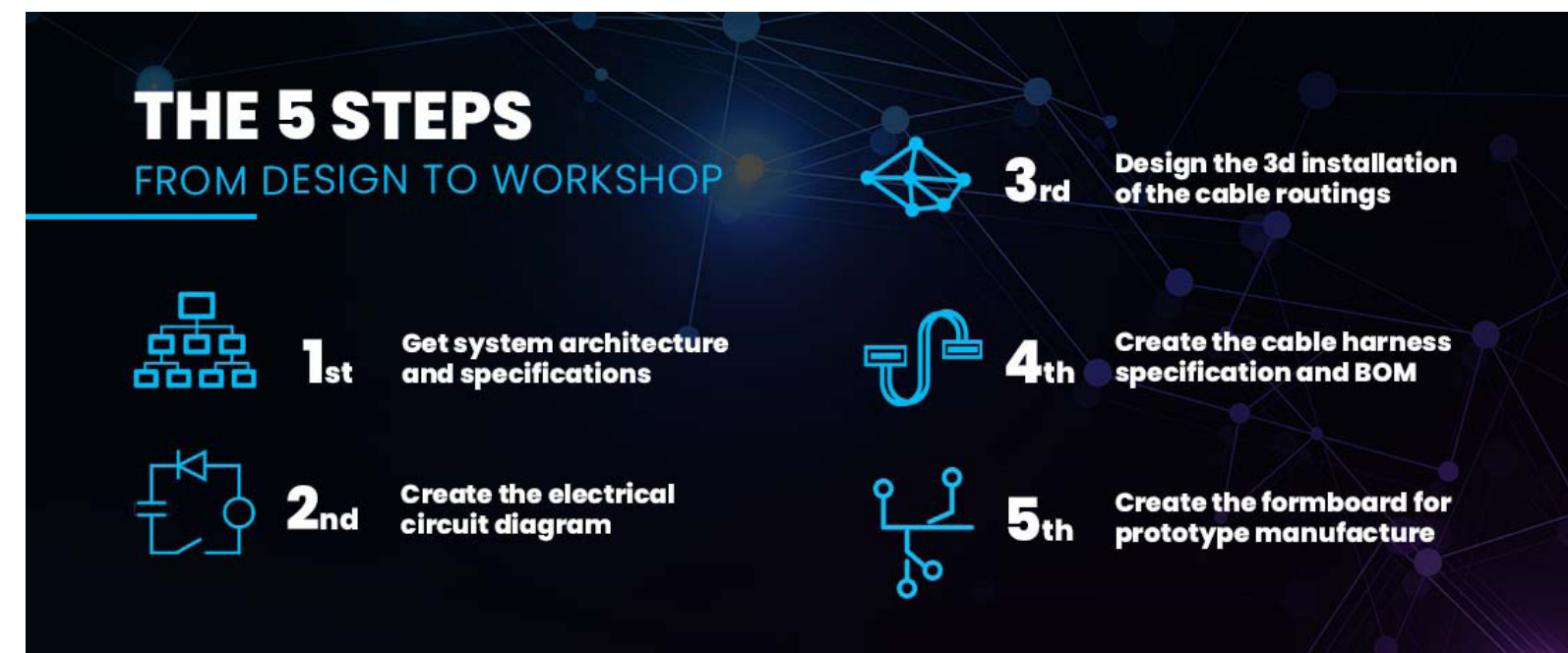
In any case, Germany is investing heavily in eHighways, planning on having between 100 and 300 km operational by 2024, increasing to 4000 km by 2030.

THE 5 STEPS
FROM DESIGN TO WORKSHOP

1st Get system architecture and specifications

2nd Create the electrical circuit diagram

3rd Design the 3d installation of the cable routings

4th Create the cable harness specification and BOM

5th Create the formboard for prototype manufacture

THIS IS **INCONTEXT**

inContext have since the start 2006 focused on building long term relations with our clients within the complete electrical systems, electrical equipment, mechatronic design and project management. We provide consultancy services of experienced and dedicated consultants who support our clients in future defining projects. We also offer prototype production of cable harness and complex as- semblies.

Dev Ops

## WHAT DOES IT REALLY MEAN? AND WHEN ARE YOU "DEVOPS READY?"

DevOps is a buzzword that seems to be on everyone's lips in the IT sector. Nowadays, it's not "system administrators" who are in demand but "DevOps engineers". Developers are increasingly using the buzzword "DevOps" when discussing the skills they need. Testers are supposed to "do DevOps". And more and more companies are declaring that they themselves and their products are "DevOps ready".

BY: Stefan Rose, Senior IT Consultant at frobese GmbH

You soon get the impression that DevOps is the big thing in the modern IT world. That it is a "must have" in order to be successful. That there is a concrete way to "do" DevOps. But once you dig deeper, the definitions of what DevOps actually is and how it is adopted are usually rather vague.

In order to understand why, first you have to realise that DevOps is not a procedure with fixed instructions, norms or plans. DevOps is a culture or a collection of best practices. So you can't just "do" DevOps.
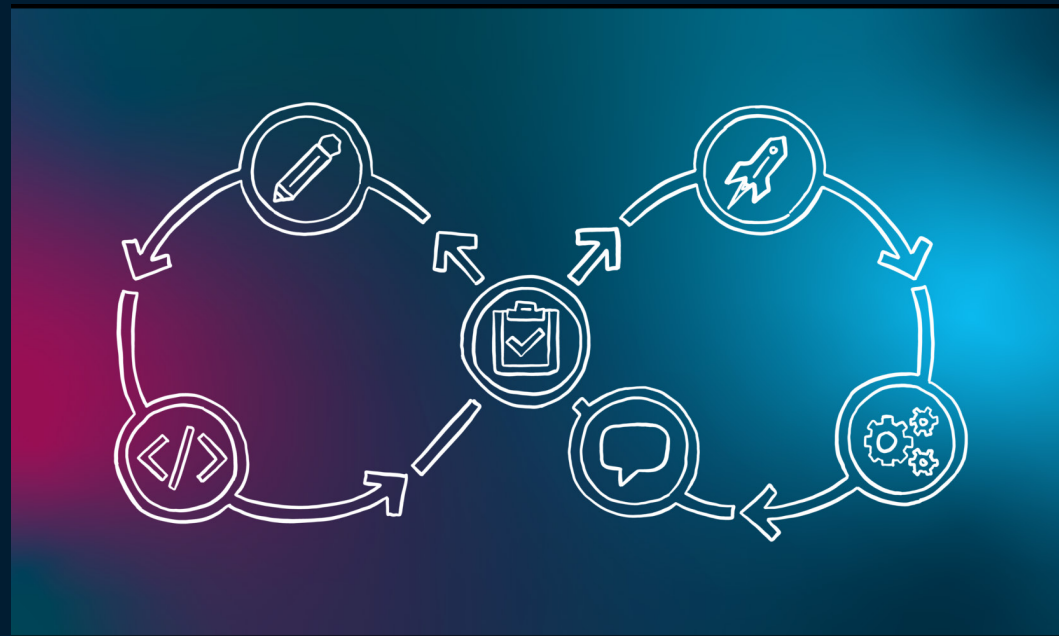
It is a corporate culture that builds on many already known and sometimes familiar components, uniting them to improve the efficiency of the software development process and the entire company. As a result, it is not enough merely to introduce new tools, fill individual positions in the company with "DevOps people" or for managers to declare that their team is "ready for DevOps". Rather, the introduction of DevOps is an ongoing process that questions the previously lived culture of a company or department and tries to break up and optimise existing processes. Thus, DevOps is a process improvement approach!

So why "DevOps"?

Changes in corporate cultures are actually always met with resistance. "Things have always been like this and have worked fine so far. Why change them now? And anyway, we are already agile."

This or something like it could be the initial response if you want to start introducing DevOps in your own company or at the customer's. Most of us no doubt learned during our training that IT consists of three specialist disciplines (silos): software development, testing and operation. And that each of these areas plays its own role and pursues its own goals:

Software development takes care of the implementation of or changes to software requested or ordered by the customer.

Quality assurance is caught in the middle, as this job depends on the results from software development and on the test systems provided by the company.

The company rolls out the software and takes care of stability and continuity. It knows the systems on which the software is supposed to run and/or builds them.

Even if each individual department does a good job, the result is often ultimately suboptimal. The reasons for this can often be traced back to a lack of communication between the individual specialist departments. To make matters worse, the fourth area, management, often only communicates directly with one of the three IT areas.

Poor communication inevitably creates the frictions that are inherent in most software projects. The main goal of DevOps is therefore to reduce this friction. In the language of DevOps, to remove the "wall of confusion".

"Devs are from Venus, Ops are from Mars.(1) ... Testers are probably from one of the moons of Jupiter and management is something else entirely."
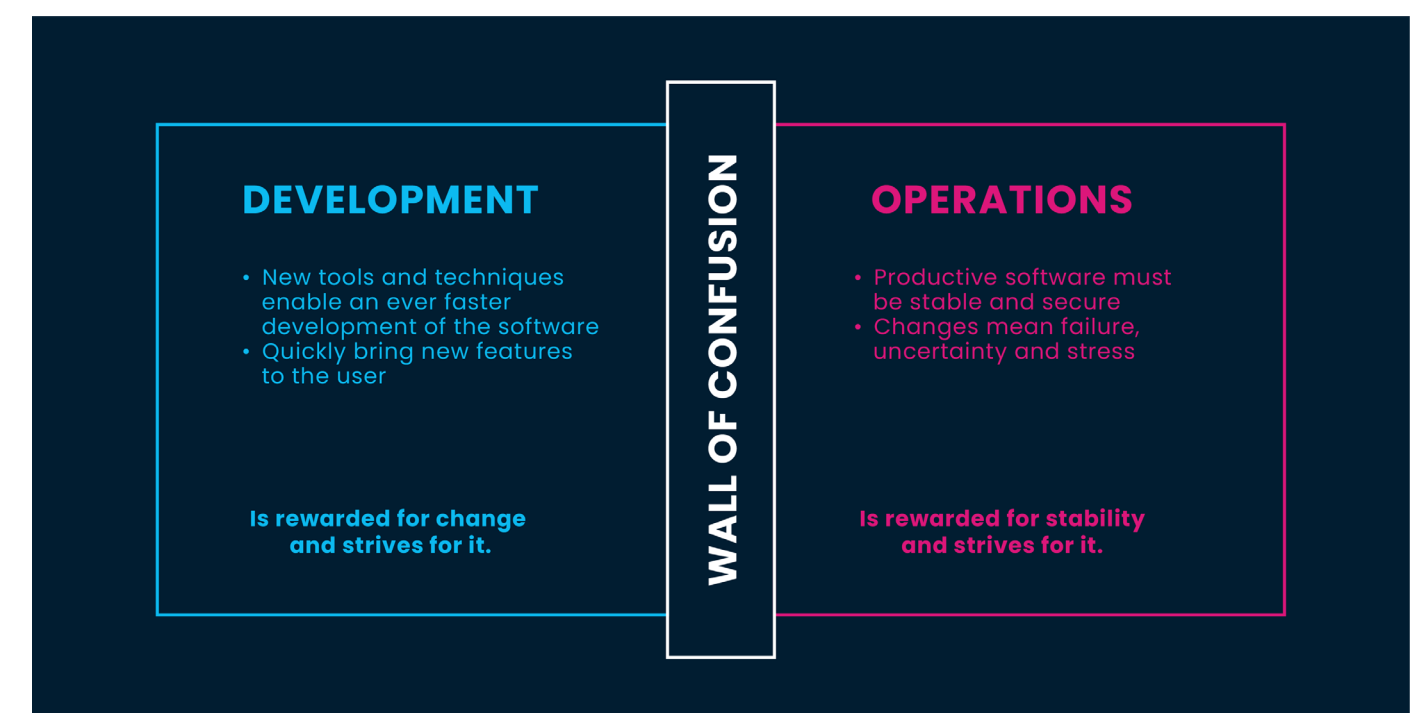

Figure 1: Wall of confusion between Dev and Ops

Let's leave out testing and management for the moment and first consider the "wall of confusion" between the departments from which the name DevOps is derived: software development (Dev) and operations (Ops).

As long as each group works in its own silo and only has its own goals in mind, friction is inevitable. The company's employees are unhappy because software may have to be introduced that requires changes to the existing systems and, in the worst case, results in downtimes due to incompatibilities and queries. Those in software development are unhappy because the new features that have been developed cannot be rolled out in a timely manner, or it only becomes clear that the operating infrastructure is not compatible with the new developments during the rollout. Incompatible frameworks, tools and procedures play their part, too. Communication does not usually take place directly, but via tickets, e-mails or third parties, which increases the effort and stress. Both sides perceive the "other's" actions as a threat to achieving the goals by which management measures them. Bugs that occur are played back and forth like ping-pong between dev, ops and the customer, everyone insisting on having done "their" job and looking to blame the others.

However, the solution could be "relatively" simple: improved communication with each other and coordination and standardisation of the processes and tools used across the entire process chain. DevOps should help to improve communication and above all to promote understanding between the parties involved. Unfortunately, changing a communication culture is one of the more difficult challenges when introducing a new corporate culture.

Even if management and test silos do not feature in the name "DevOps". Of course, the same goes for them. Everyone wants to do "their" job without feeling that they are being restricted by the other parties.

"Lack of trust in an organisation is really expensive. You can't villianise others if you know their kids." (2)

This is where one of the basic ideas behind DevOps comes into play. Improved communication between the silos increases the understanding of the needs of the other areas, and conflicts are minimised or can be recognised and avoided at an early stage. Instead of passing the software project "child"on from one "parent" to the other, joint custody is exercised from development through testing to deployment and operation.

This also creates new challenges for those involved. Instead of working in your own silo with your own specialist knowledge, a further understanding of the processes, procedures and tools used in the other silos is now needed in order to be able to work together effectively. Rather than just plumbing one topic in depth as a specialist (I-shaped specialist), people who have a wide range of knowledge of the entire IT process on top of their specialist knowledge are now increasingly in demand. These T-shaped professionals are experts in their field. However, thanks to their wide-ranging knowledge, they can communicate more easily with others or, if necessary, take on other tasks.(3)
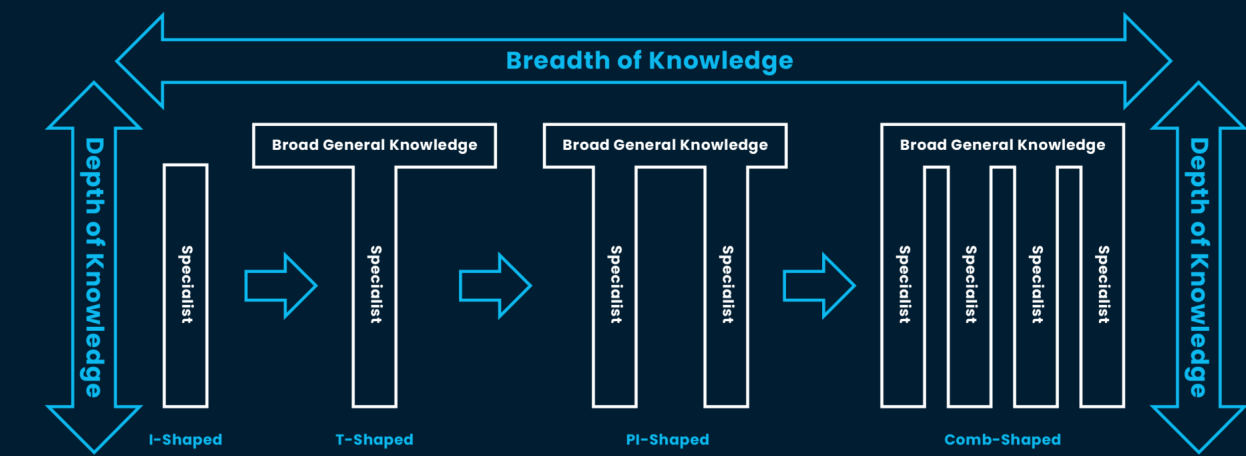

Figure 2: I-Shaped to Comb-Shaped Professionals (4)

If you now bring several such people together, you can interact better with each other on the basis of your overlapping areas of knowledge. This results in"DevOps people", whose knowledge is no longer separated in silos but rather is arranged in a comb shape.

The nice thing about it? Knowledge rubs off. A company doesn't have to hire new employees or explicitly train them (although this certainly helps). By breaking up the silo structure of the individual teams and "mixing" the specialists in appropriate teams, knowledge is almost inevitably gained, as long as the prerequisites for open and direct communication are in place.

The way there is thus via an intermediate step: The "DevOps teams", in which colleagues are grouped together for a project on an interdisciplinary basis, and
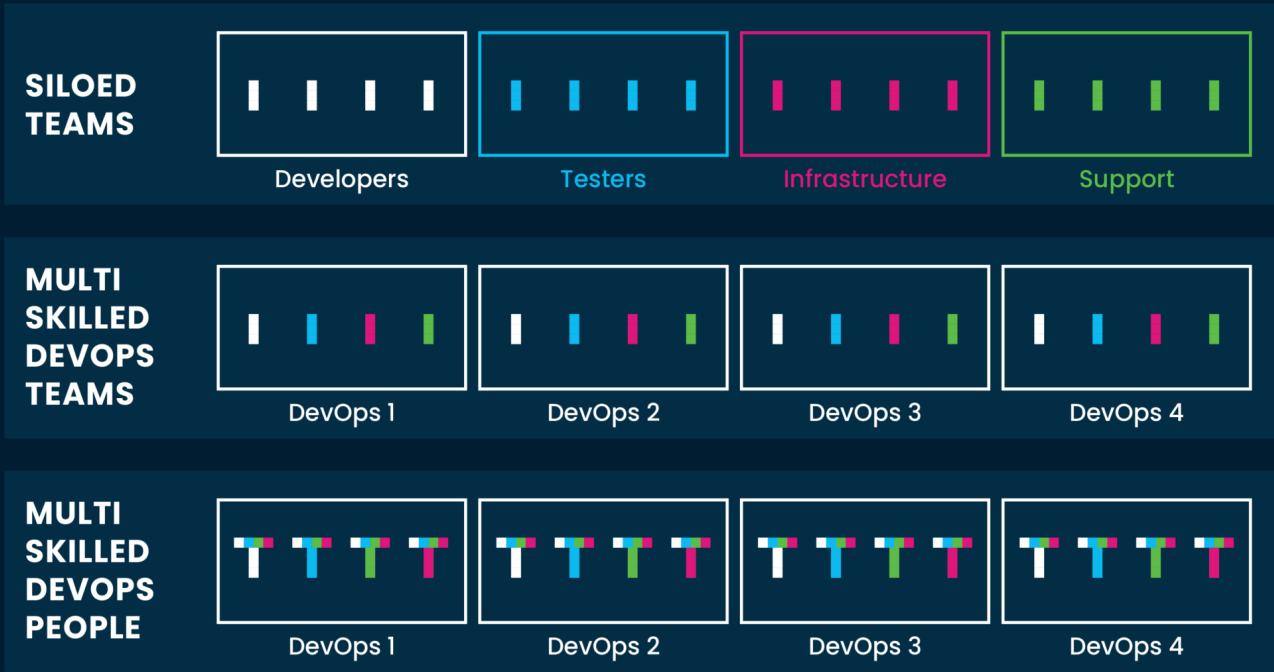

Figure 3: From Siloed Teams to "DevOps People"

communication can take place simply and directly. Possible barriers to communication that have nothing to do with knowledge should be eliminated from the start. Among these are spatial separation, different superiors or established communication channels via people outside the team. It's a good idea to physically group these teams as closely together as possible and to let them work in a self-organised manner.

Communication between the teams should also be facilitated so that emerging new processes, tools, procedures and findings can be coordinated with one another. This coordination allows a DevOps approach to gradually be developed which is specially tailored to the respective company.

The basic goal of the software development process is to develop an "us against the competition", in other words a "we're in this together" feeling. To maintain levels of staff satisfaction, it is also important not communicate DevOps as an order from above but as an opportunity to change and improve the existing processes.

"If you automate a mess, you get an automated mess." (5)

But hold on a minute, DevOps is all about tools and automation and CI/CD and defined processes, and so on.

This is one of the misconceptions about the subject. A company cannot be geared towards DevOps just by "prescribing" the "best" tools and processes from above. Such an approach will inevitably lead to resistance from employees. On the one hand, it destroys the "we feeling" and DevOps is no longer perceived as an opportunity but as an obligation; on the other hand, these instructions may sidestep the needs of the project or the employees.

The best tools and automations do not lead to good results if the underlying processes are not designed to support them. However, if the employees develop the necessary processes together and in coordination with one another, they can then jointly decide on the tools they need or want to use in order to achieve their goal and derive the appropriate automation steps for this. The

tools that team A uses to achieve success in their project are not necessarily the same tools that will lead team B to success.

Nevertheless, higher-level communication is also required in order to achieve company-wide coordination. Are there any tool sets and procedures that other teams have successfully used? Or are there specifications regarding acquisition and costs? Does it make sense to buy, implement and operate a new solution, including the necessary know-how development? Or is there an existing solution with the same functionalities?

These are questions that should be clarified comprehensively in the event of doubt. Over time, and due to the fact that the teams can be reconvened time and again for individual projects, a company-specific set of tools is developed. However, this should always be open to discussions or improvements.

The same goes for processes that are being developed. These should also be used across the board as far as possible. The corresponding automations can then be derived and implemented from such cleanly modulated processes.

Automation and tools mean that valuable time is freed up for the employees in the teams, which they can then use to share knowledge and achieve their project goals. It is therefore also in the interest of the teams to share knowledge and to find a basis for achieving the common goal.

Without successful communication, any tool or approach to automation is worthless!

The added value of DevOps

But how do the organisation, management and employees benefit when DevOps is introduced? After all, the basic idea of DevOps breaks with many long-established traditions in companies. The separation between the IT departments is largely eliminated, teams are responsible for their product and largely organise themselves and employees are expected to share their knowledge and thus their exclusivity. So why not leave things as they are and play it safe?

The answer is: Innovation and satisfaction!

For the customer

Due to the improved communication and the resulting better internal processes, DevOps leads to faster releases of the required functionalities, with higher quality software, since many sources of bugs can be eliminated in advance. Closer integration of the testers into the software development process and direct feedback to the entire team mean that debugging can take place faster. The release cycles are shortened and the customer sees results faster. This is reflected in higher customer satisfaction.

For the employee

DevOps supports innovation and new ideas, as well as knowledge generation among employees. In addition, the employees in the teams act independently and see the result of their work directly with the customer. Automation and tools eliminate as far as possible time-consuming activities that are perceived to be unnecessary and creates more time for ideas to be adopted. The horizontal part of the T-shape makes technical communication between colleagues easier and, in the event of doubt, more resources are available to help out individual colleagues. The sense of being solely responsible for a project cedes to a sense of togetherness. Ultimately, this also contributes to an increase in employee satisfaction.

For management

Instead of being the mediator between the silos when problems arise and having to direct communications, management can concentrate on a higher-level perspective. Since the teams largely organise themselves to implement projects, management has more space to act as an innovator for changes and to prepare the next projects. Due to increasing automation and the use of appropriate tools, the number of available key figures for reporting and the measurability of efficiency increases.

For the company

Due to the improved responsiveness, as well as the automation available and the more flexible teams, new product ideas can be tried out faster and their marketability validated. Rapid implemen-

tation of ideas and delivery of prototypes creates a clear competitive advantage. The productivity of the company increases due to employee motivation and the elimination of unnecessary process delays. A higher level of customer satisfaction improves the company's reputation. The KPIs obtained from the tools and automations can be used to further optimise and streamline the existing processes, which further intensifies the effect. (6)
Conclusion

DevOps is definitely more than just a buzzword. However, neither is it a panacea that superiors can prescribe to win an "agile" sticker. "We are now agile and we are now doing DevOps!" (7) does not work if the employees are not involved.

If you want to take advantage of DevOps, first of all you have to be aware that DevOps is an idea and not a dogma. You cannot expect a 1:1 solution that is perfectly tailored to your own organisation. Rather, you have to work this out individually, with the collaboration of all stakeholders. So DevOps is more of a guideline for best practices.

Even if setting up DevOps in an organisation requires open communication, a certain willingness to take risks and to learn from failures, the advantages demonstrated in those businesses which have successfully done so cannot be dismissed out of hand. Companies such as Amazon, Netflix and NASA have already successfully completed the transformation.

DevOps is therefore an opportunity to position yourself prominently in the market and to be one step ahead of your competitors through greater innovation, improved customer loyalty and higher employee satisfaction.

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frobese is a cooperative and successful team of experts specialized in consulting for banks and insurance companies. We focus on business expertise, project management, meeting quality standards and software development.

CLEAN <CODE>

SOFTWARE DEVELOPMENT
BY AND FOR PEOPLE

At the beginning of a software project, it is about choosing a tech stack, the core set of those technologies that will be used to solve the problem at hand. At the same time, a software architecture must be chosen to determine and ensure the basic organisation, components, relationships with each other and with the environment, and evolution of the intended software solution. Continuous Integration and Delivery must then be configured. And then the real work begins, the programming.

BY: Julia Kordick, Senior Software Engineer at frobese GmbH

Software development is a broad field

A rough distinction is made between software development on a „small scale" and "large scale". In training or (self-) study, one works with software development on a „small scale". On your own, you write short code fragments to learn core competencies such as the use of loops and conditions. As soon as you start working on your first practical projects or in your job, you are confronted with software development on a „large scale". You write more complex code with several people and are embarrassed to have to extend or change your own code as well as code written by other people at a later stage.

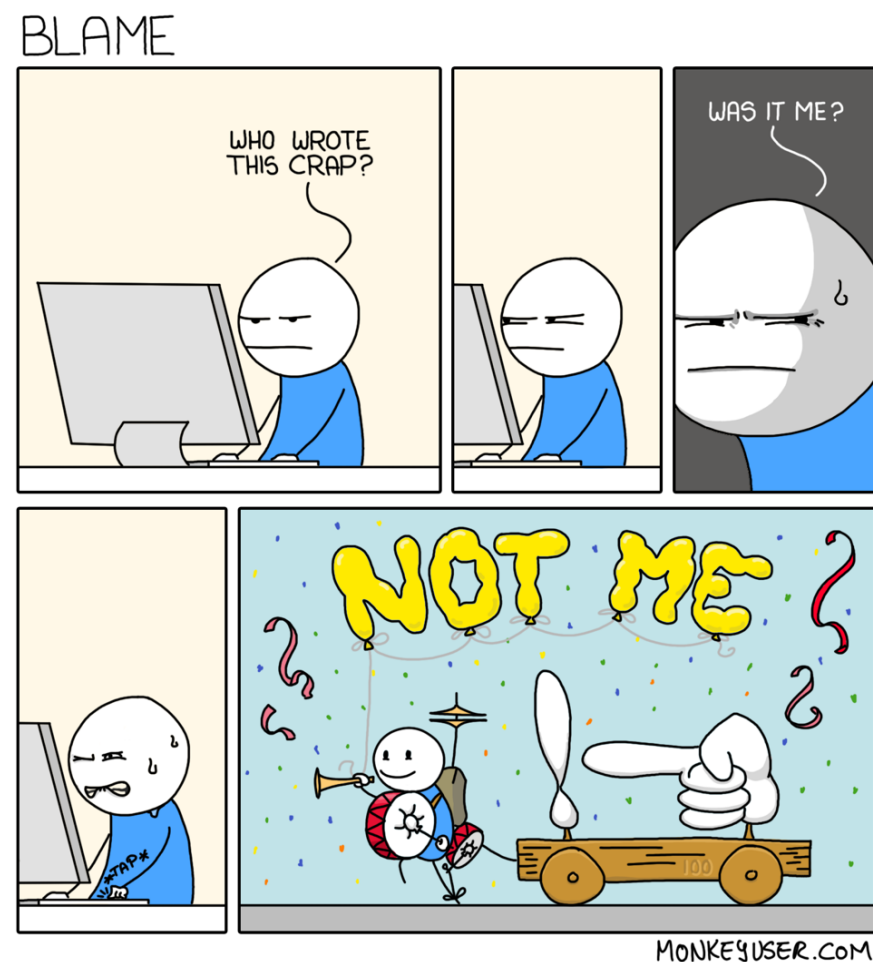A crucial factor is the readability of the code at hand. It is not only a key factor

Figure 1: git blame

for success and costs, but also for the work of the developers. They should be able to put all their energy into their work instead of being confronted with frustration, fear of `git blame` and the fixing of inconsistencies. And this is where Clean Code comes into play.

Software development for humans

Programming code is primarily written for machines. Machines are generally much more frugal than humans and are satisfied with semantic correctness. From the

machine's point of view, compiling code, i.e. code that can be interpreted by it, is finished and completely sufficient. Humans, however, are far less frugal. In addition to correct semantics, they also need logical structures and eloquent formulations so that they can process the code coherently.

If programme code is difficult to understand and read, human productivity is lost in the long run. Changes take more time and become more risky because they are only partially comprehensible.

As the project progresses, the creation of new code moves into the background and the modification of existing code becomes the norm. If software developers now read more code than they write, the costs explode in relation to the time spent.

Clean Code helps to resolve this pain point in that:

Human productivity is permanently main tained through easy-to-read code.
Costs for changes remain manageable.
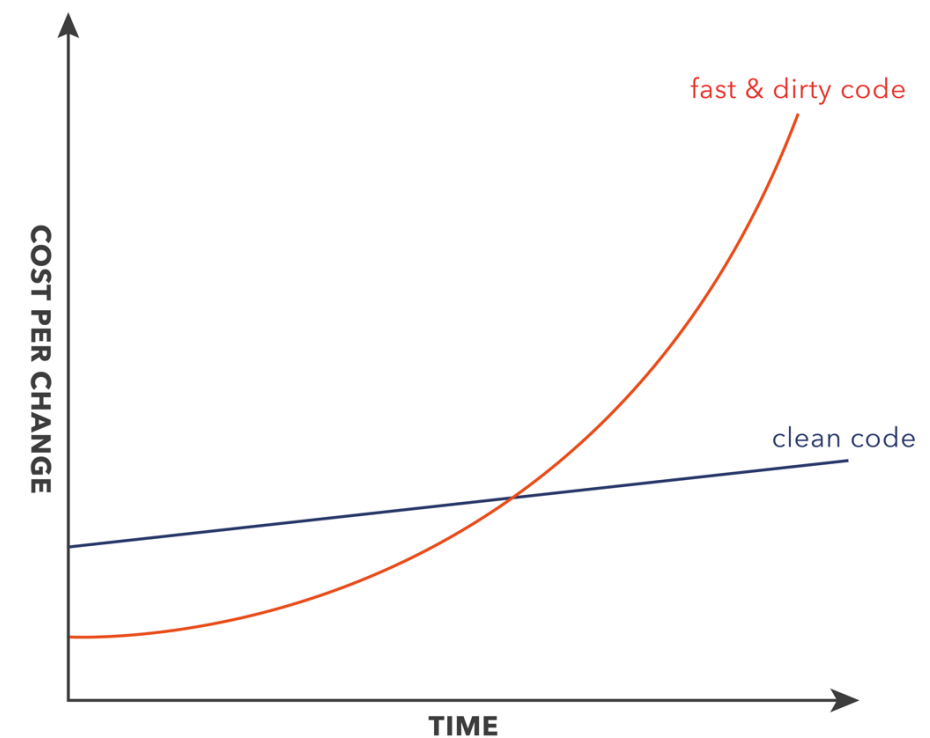More time is gained to create value.

Figure 2: Fast & Dirty vs. Clean Code

With small steps to success

Completely independent of the programming language used, there are many small, actually trivial measures that immediately contribute to a better readability of code. Three of these measures are explained below.

Choosing clear names is one of the oldest and most essential problems in

computer science. Choosing meaningful names for variables, functions, classes and packages takes more time, but saves it in the end.

Names should be unequivocally and describe the content: The path of least ambiguity is the right one. What is written on it should also be in it. In addition, context is substantially to creating comprehensibility: well-named variables in clearly named functions in eloquently named classes.

Here's a real-world example from React that was criticised in the code review:

const [currentSelection, setCurrentSelection] = useState(")

From the context of the class it could be deduced that it probably had to be about the selection of users who should get access to the element. The quick and easy improvement of readability could be achieved as follows:

const [currentUserSelection, setCurrentUserSelection] = useState(")

Comments

Robert "Uncle Bob" Martin, co-developer of the Agile Manifesto and grandmaster of the Clean Code philosophy, sees the use of appropriate comments as an attempt by developers to compensate for their own inability to express themselves clearly in code. He believes that before writing a comment, time and energy should be invested in revising the code for unambiguousness. He also argues that comments are often not maintained and thus there is a risk that a comment not only does not help to understand the code, but can even spread misinformation.

Nevertheless, he also lists good types of comments, such as ,to dos' or even public documentation in APIs.

My personal experience shows that the truth, as so often, lies in the golden mean. Especially when you are in the realm of legacy maintenance, clarifying comments are vital and even if the knowledge levels of technological specifics are (still) present in the team, they can be appropriate.

Here is a (particularly) bad example:

// the day of the month
number dayOfTheMonth

The naming of the variable is already sufficiently meaningful. The single superfluous comment is in principle irreleveant. However, if we view it in the context of a large business object, such as personal data management, the code can quickly become twice as long and thus confusing without gaining in meaningfulness through the comments.

Here is a positiv

/ TODO becomes obsolete with the completion of ticket xy and can then be removed */*

Formatting

The main task of professional software developers is communication and formatting, i.e. the presentation and structuring of code in files, is an essential form of communication that allows conclusions to be drawn about the general care and attention to detail throughout the project.

Every modern integrated development environment (IDE) provides automated code formatting tools that should be used consistently by the team.

Here is a poor and confusing example of a while loop:

while (i<10) {text+="The number is "+i; i++;}

With clean formatting, the loop becomes readable:

while (i < 10) {
text += "The number is " + i;
i++;
}

Wrap-Up

Software development is not only 0 and 1, it is risky, takes time and money. One of the many means of controlling risk and thus costs in software projects is Clean Code. Even with simple measures, success can be achieved in new and further development through readable code.

The measures listed here are only the tip of the iceberg. To become a Clean Coder according to Uncle Bob's ideas and to come back to code written in the past with less frustration, his books are a perfect start.

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CONNECTING THE DOTS OF INDUSTRIAL DIGITALIZATION

AN INTERVIEW WITH IVAR MELHUUS SEHM, THE CEO OF DATA RESPONS R&D SERVICES

Telecom, shipping, healthcare, agriculture, automotive – what do these profoundly different industries have in common? Well, ask the 130 developers at Data Respons R&D Services. In fact, their secret of success is their ability to see similarities between domains that may at first glance seem incompatible -an ability that is crucial to industrial digitalization.
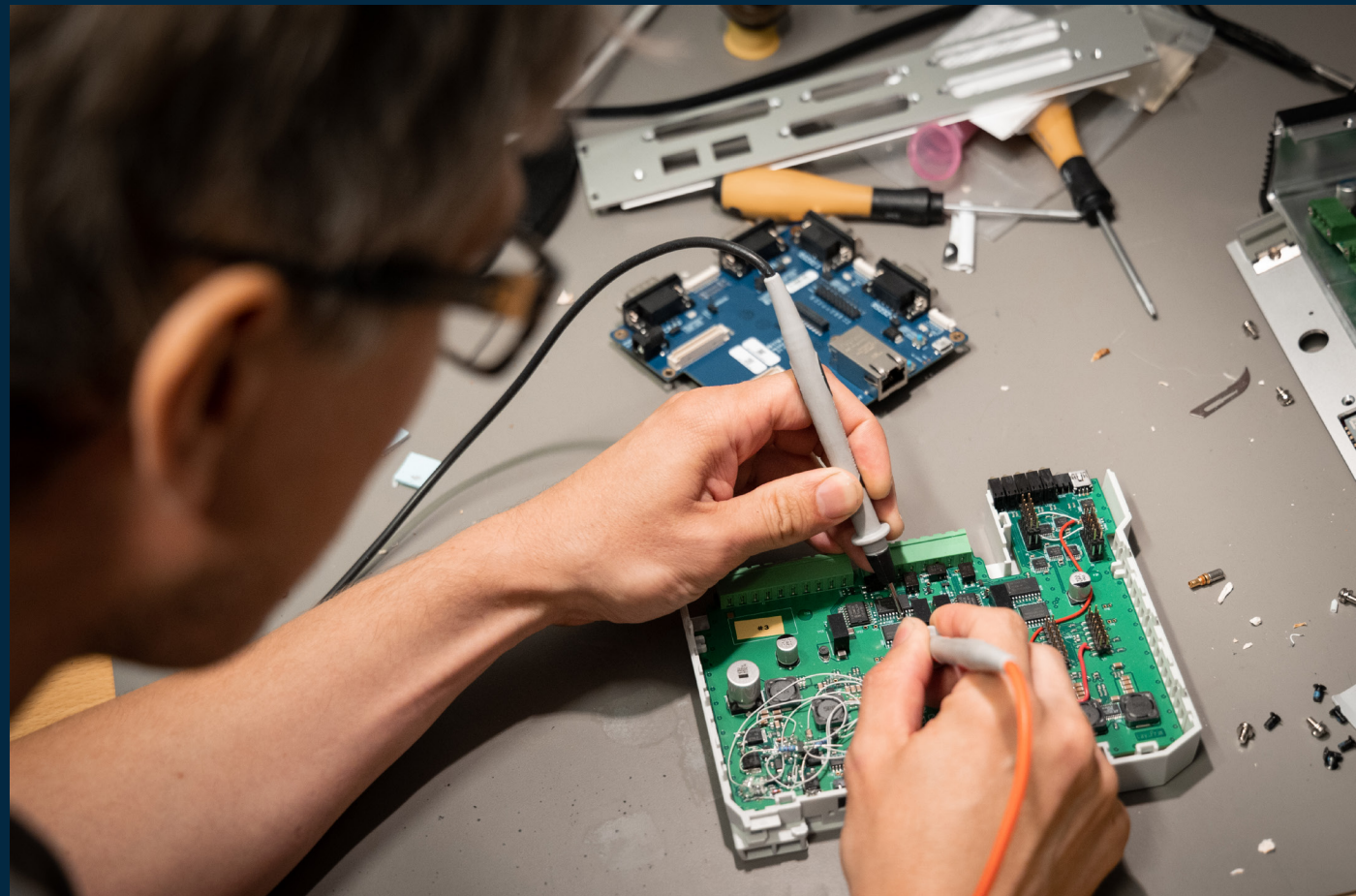
BY: Arne Vollertsen for Data Respons

Same, but different – different, but the same.

That could very well be the shortest possible explanation for why Data Respons R&D Services is having such success in developing innovative technology and industrial digitalization. "The same" referring to cross-domain technology knowledge in data communication, autonomy, monitoring and sensing, wireless, machine learning etc. – "Different" referring to in-depth and domain-specific knowledge within a range of industries, like oil & gas, space, defense, and shipping.

At Data Respons R&D Services they are experts in connecting the dots of industrial digitalization. According to CEO Ivar A. Melhuus Sehm this unique combo of technology and domain skills – or in his words "horizontal" and "vertical" knowledge – is the secret behind the company's ability to attract customers as well as gifted engineers.

Like building blocks

Photo of Ivar A. Melhuus Sehm.
Managing Director of Data Respons R&D Services, Ivar A. Melhuus Sehm.
You need to know the basic components of every digital solution. These building blocks are more or less the same, regardless of industry and application. However, it's equally important to be aware of all the things that are different. Every industry has its own logic, and its own requirements, for instance space is different from sub-sea. And if you want to develop solutions for customers in these fields, you need to know the ground rules and requirements of these specific domains, just as intimately as your customers.

Ivar A. Melhuus Sehm is a 20-year veteran of Data Respons R&D Services, and thus an expert in combining horizontal and vertical skills for industrial digitalization.

So, why not ask him what industries and domains are next in line in the current and seemingly unstoppable digitalization of everything. And while we're at it, we would also like to hear which new technologies are on the verge of a breakthrough.

The beginnings: telecom

But first things first, according to Sehm:

To set the scene, we need to go back to the start of digitalization in the telecom industry. Here in Norway, we had several telcos but very little standardization. Slowly during the 90's the process of standardization began, and now telecom is a highly automated and standardized industry with high predictability for both customers, service providers and suppliers.

Other industries looked to telecom for inspiration. For instance, the Norwegian oil & gas industry needed to rationalize its operations. Suppliers were asked to standardize their offerings to enable remote control and monitoring systems, and similar tools for increasing efficiency and bringing down cost. The oil & gas sector adapted telecom technology and applied it in their own setting. As an example, they took a well-known piece of telecom equipment – the fibre switch – and robustified it to operate under the harsh conditions of the oil & gas industry.

Says Sehm:

Now we're at a point, where there's a 10-strong team sitting in an office building in Oslo controlling oil and gas production in the North Sea. In the past you needed to have 150 people on an oil rig. Now you have an automated and centralized infrastructure managed at one hub, from where you can access drilling systems, actuators, salt-water injections – you name it. All this is standard telecom technology, robustified and adapted to the requirements of this industry.

For 20 years Data Respons R&D Services has been at the forefront of this process of industrial digitalization. We have succeeded, because we have deep vertical knowledge. We understand the physical domain, whether it's oil & gas, space or the maritime industry. We know how to ruggedize and robustify technology to work under these conditions, and we know the standards that regulate hardware and software in these domains.

Digitalized defense

According to Ivar Sehm, that same process of digitalization can be seen in many other industries and domains. The basic building blocks of industrial digitalization are adapted and adjusted to fit specific

by a massive portfolio of decision support systems requirements.

For instance, defense: 15 years ago, it would have been unthinkable for armed forces to put sensitive data on external servers. Now, the digital infrastructure of defense requires cloud-based services, real-time information, and the crunching of huge amounts of data. In today's command control infrastructure, an infantry soldier becomes a sensor in a network of information. On all levels, from 3-star general to common soldier, at sea, in the air and on land, you rely heavily on technology originally developed for telecom, now adapted and robustified for defense purposes.

Decision support at sea

It's the same, but different, in the maritime sector, a domain in which Data Respons R&D Services has contributed to a large number of digitalization projects over the years.

Says Ivar Sehm:

Just look at how the bridge of a ship has changed. You used to have 6 or 7 people up there looking at screens and checking stuff. Now you have maybe 2 operators guided, connected to satellites, to port systems and so on. And looking into the near future, we're heading towards autonomous, unmanned vessels remote-controlled via land-based virtual bridges. You might think of the maritime sector as a slow-moving, foot-dragging industry. And maybe it is, compared to a startup. But it has resources and willingness to invest heavily, and we've worked in that sector for years.

The potential of smart farming

While Data Respons R&D Services is constantly increasing its knowledge in well-established domains like maritime, defense, and oil & gas, new domains are starting to embrace the trend also.

For instance, farming has huge potential. The pressure to innovate is on, because we need to

increase efficiency to feed a growing population, while at the same time decreasing the environmental footprint of farming. The answer to that is autonomous tractors and smart feeding systems. Field sensors will be monitoring the soil for precision fertilizing, and mobile camera systems and robots are trained to remove weeds. The farmer of the future will be connected 24/7 to sensors, cameras, robots and decision support systems.

Smart homes and healthcare

While farming will be one area of digital innovation, smart homes will be another.

Although Ivar Sehm admits that we have talked about smart homes for decades without being able to agree on a common technology platform, we're seeing more and more companies working on connecting various smart devices and services, from solar panels on the roof to lighting and heating, security and much more.

Healthcare is another area, and it's closely tied to the smart home concept. Digitalization is not only affecting hospitals. In the future we'll have a growing population of elderly people and thus an increasing proportion of people with chronical diseases. At the same time, they want to spend their old age in their familiar surroundings of their own home. This will lead to a rising demand for sensor solutions monitoring the well-being of citizens, connecting them not only to doctors and nurses, but also to their loved ones, and thus creating a network of care to secure maximum quality of life and independence for as long as possible. Technology is evolving
While digitalization is affecting almost all aspects of modern life, the building blocks of technology are evolving as well. Just as the advent of 4G has been a prerequisite for the rise of the Internet of Things, new and emerging technologies will drive development even further.

Hardware is still playing an important role, but software is king, says Ivar Sehm.
Software has become the crucial element everywhere. Just look at the automotive industry. In the past it was all about steel and mechanics, now code is the main expense factor. It's the same in our own business. In Data Respons R&D Services we have 80 per cent software developers at all levels.
According to Sehm, the ability to create value out of data is taking center stage right now. It's all about data science and deep learning.

You can buy standard modules that are self-learning and able to understand the way they're being used and able to optimize their performance in that specific application or system they're part of. Developments like these open possibilities for creating for instance monitoring and maintenance systems, that can predict failures before they occur.

Robotics

The advancements in autonomy, computer vision, sensor systems, machine learning and wireless communication are converging into one thing: Robotics. Ivar Sehm even predicts that we're approaching a breakthrough, giving machines the ability to behave like humans.

You need powerful processors, deep learning, computer vision, combined with gripping functions and mobility. To put together all these components and to create something that adds value to our lives, that's the challenge. I have to admit, I'm impressed by the robots created by Boston Dynamics, not only the mechanics but also their ability to rationalize and to work together. Autonomous and collaborative robots like these will be a part of our everyday life eventually, and they will improve the quality of our lives, no doubt.

Horizontal and vertical

Industrial digitalization is the key to better productivity and sustainability, and both dimensions is needed in every industry. Data Respons R&D Services will continue to contribute to the application of new technology in different industrial

sectors by mixing horizontal and vertical skills and knowledge.

The basic knowledge regarding sensor technology, autonomy, data communication, wireless etc., applicable across different domains, will go hand in hand with in-depth knowledge of the unique requirements and conditions in specific industries. And the main offering will continue to be comprehensive development projects going all the way from idea to finished product.

Doing projects for our customers, that's where we're making the most significant difference. In-house we have lab facilities, test chambers, prototype workshops, and everything else needed for doing projects from start to finish. When we prepare a project for a client, we usually start with a feasibility study to determine to best technology choices. We perform an analysis of the risk involved in choosing different technologies, together with a cost analysis as well. Also, we can define high-level system requirements and do a rough estimate of the time needed to execute the project. We prefer to take responsibility for the whole development project. In fact, that's our main area of expertise. I like to think of it as Product Development As A Service. Taking care of the whole value chain, including mechanics, print board layout, software, and integration, that's when we really add value to our customer's business.

THIS IS **DATA RESPONS R&D SERVICES**

Data Respons R&D Services is an independent company in the Data Respons Group. For almost 40 years, we have worked with great success to meet our customers' expectations. We have delivered new and innovative technology that is critical to our customers' business, regardless of whether they are some of the world's leading technology companies, or ambitious start-ups.

We provide our customers with very high value creation through vertical expertise in most markets. This means that we can offer a complete value chain for product development, including lifetime support.

It's no secret that software is "eating" the automotive industry. According to some estimates, as much as 90 per cent of automotive innovation comes from software. Stefan Jahncke is one of the experts building the computing infrastructure needed to develop new AI-based solutions for the automotive sector.

BUILDING
A DATA INFRASTRUCTURE
FOR AUTOMOTIVE AI

BY: Arne Vollertsen for Data Respons

Think of the modern, software-defined car as a smartphone on wheels. Just like the smartphone is still a phone, a car will still be moving people around. But just like the smartphone, it will offer much more than its original, basic functionality – and this is where the data infrastructure for automotive AI comes to play.

Cars will reach new levels of sophistication regarding infotainment and interactivity. They will integrate seamlessly with the digital life of their users and offer just as many features and possibilities for personalization than a state-of-the-art smartphone.

And what is more, they will perform advanced analytics for autonomous driving and active safety. Automotive AI will integrate data from their surroundings, from other vehicles, from traffic monitoring systems, from GPS-services and much more.

Massive amounts of data

To develop the software-defined dream car of the future you need Artificial Intelligence, and you need data. A lot of data. No, in fact it's not enough to have a lot of data. You need massive amounts of data.

Machine Learning algorithms need to be trained on data, the more the better, to achieve higher precision and refinement in developing for instance driver assist technologies. To do their job, automotive software developers need a pool of car data from on-board sensors and cameras, and other information relevant for designing new

services.

Heart and brain

For a large company in the German automotive industry, Stefan Jahncke from EPOS CAT GmbH is designing the heart and brain of such a computer infrastructure containing massive automotive data.

However, while it's no secret that software is eating the automotive industry, there are a lot of secrets surrounding the work he's doing. Exactly what data the system will be storing, and what the engineers will be doing with it, that's a business secret. To newcomers these work conditions might seem difficult, but they're actually rather normal to the EPOS infrastructure team.

They have installed similar data infrastructures before, and customers often have strict secrecy rules. And basically, according to Stefan, the exact nature of the data isn't that important.

The customer has asked us to do a proof-of-concept of an infrastructure to be used by approximately 100 developers for designing and training machine learning solutions for automotive applications, Stefan explains.

The infrastructure will contain mostly sensor and video data, together with other data sources needed to increase the "intelligence" of the vehicle. To put this into context, you could compare a car to a human being. When you're driving and you see a red

light, you'll react right away and stop the car. But the on-board camera of a car only registers a red light. It doesn't know what to do with that information. You must build a system that translates the red light into computer language and makes the car react correctly to that input.

To develop autonomous or semi-autonomous vehicles we need to teach the car what to do in various situations. For that you need massive amounts of data. But there's much more to it than just processing data. In fact, data is only used to form a kind of pattern or frame. To get the car to put the data into context, to really "understand" it, you need neural networking and a lot of processing time. The infrastructure we're building is a tool for developers designing software to make vehicles react as correctly as possible, and to make them as autonomous as possible. Hardware and software

Stefan looking into hardware as well as software, with Graphics Processing Units from Nvidia forming the core of the infrastructure. Initially, GPUs were developed for the gaming industry, and have spread from there to other areas requiring ultra-fast image processing. Nvidia is widely used in the automotive industry.

Regarding software we're currently looking into what software to choose. We'll be running the Kubernetes cluster management software, but apart from that we haven't decided yet. For our proof-of-concept we've chosen the VMware Tanzu vSphere virtualization software to manage and optimize our Kubernetes cluster. Hopefully, in a few weeks we'll have the proof of concept ready for the customer to test.

20 to 30 terabyte per day

Provided that the customer approves the design, Stefan and his team will start building the actual infrastructure, gradually adding more components and equipment depending on the customer's requirements.

The new infrastructure will incorporate data from an existing data center containing several petabytes of data, primarily produced by onboard cameras and sensors of the cars connected to it.

And more data will be coming in. Stefan estimates that between 20 and 30 terabytes will be added per day.

He predicts that once the new infrastructure has been tested and approved by the customer, more developers will start using the system.

When fully operational, probably up to 300 software developers will be working on it. To accommodate them, and to secure enough storage space for the ever-increasing amount of data, a team of EPOS specialists will be permanently assigned to maintain the infrastructure, including managing updates, working with security, and all the other nitty-gritty of running an infrastructure of massive automotive data – growing every day.

THIS IS **EPOS CAT**

EPOS CAT GmbH is one of the leading consulting and service companies for automotive IT and CAT based in Ingolstadt and Neckarsulm. CAT is the abbreviation for Computer Aided Testing and stands for the support of measuring and testing facilities in automotive research and development.

What is going on, where are we heading?

6 UX design trends you should know about

BY: Arne Vollertsen for Data Respons

Illustrations by: Tina Marschner, IT Sonix.

Much is happening in the world of User Experience. We've asked two UX experts from IT Sonix about what to look out for – these are their six top picks.

Working closely together – both with customers and colleagues. That is the main priority for user interface and user experience designers Franziska Beer and Constanze Knospe. At IT Sonix they are part of agile teams involving software developers, project managers, product owners and data scientists serving clients mainly from the transportation & automotive, renewable energy, medicine, finance and construction segment.

In each assignment they work closely with customers to understand their requirements and the exact nature of the workflow the requested solution is going to support. They work in short, iterative cycles, with continuous customer feedback to ensure they're going in the right direction.

Beer and Knospe are experts in their field, and they are closely following the newest trends emerging in the UX world. We've asked them to select the most promising and interesting current trends. Their choice is not only focusing on the newest in tech. Sustainability and ethics are high on the agenda as well:

1. Increasing sigificance of Minimum Viable Products

3. Creating smart digital assistents

1. The MVP mindset

As mentioned, the IT Sonix development teams work in short, iterative circles, continuously integrating user and customer feedback. The Minimum Viable Product concept is a key part of this approach, and it has become increasingly popular in product development in recent years.

- **The MVP is a version of a product with just enough basic features to allow the customer to use it, Constanze Knospe explains.**
- **To design it, we collect information about the most important parts of the workflow, including roles, tasks and use cases.**

Based on that information we build the first version of the product. When we've launched the MVP, we start collecting user feedback to develop it further. We constantly integrate user feedback into the product. In our world, a product is never really finished. It's always in development. That way of thinking allows us to adjust it along the way, for instance if the customer wants to add features that are not included in the initial requirements.

As an example, IT Sonix recently assisted a large logistics service provider in redesigning its resource planning processes. The new system environment

was to ensure an increased efficiency and user experience. To reach that goal, the IT Sonix UX team gathered user requirements, defined use cases and user roles together with the customer. Based on this research the team was able to create a common understanding of a useful scope of the application and specified system requirements in detail by writing and prioritising user stories.
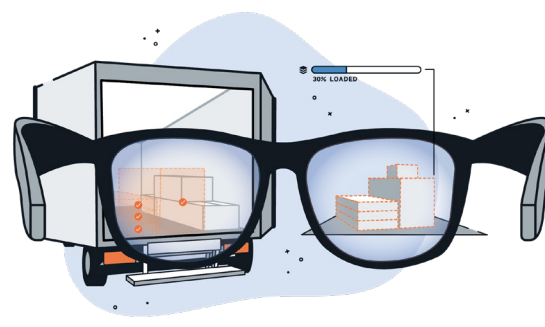
2. Augmented Reality expanding to B2B purposes

2. Augmented Reality expanding to B2B purposes

Another new trend that Franziska Beer and Constanze Knospe believe will gain traction is Augmented Reality and its adaption to the B2B world. Already widely used in entertainment and gaming, AR will be integrated in for instance production and servicing processes, and IT Sonix is receiving many customer requests pointing in that direction. For instance, AR can be used in manufacturing for quality control. A quality inspector can examine an item, and instead of filling out a paper form, he can attach the relevant digital documentation of its quality to the physical item.

- **It can be relevant for instance in the transport and logistics industry, where we have several customers, says Franziska Beer.**
- **We have developed a fleet management system, which helps truck drivers in their daily work. It's already available as a mobile phone app and on a special handheld device inside the vehicle. It assists drivers in several ways, with navigation, vehicle information, driving and rest times etc.**
- **If we were to integrate Augmented Reality into this product, we could imagine the worker wearing an AR headset in the warehouse where**

he's collecting his cargo.

The headset allows him to see the actual surroundings, but enriched with data, and pointing him to cargo that fits into his truck. The system could give him suggestions on how to best load his truck, so that it fits the order in which he'll be delivering the cargo to recipients along his route. It could even integrate the current rules and regulations for securing the load and alert the driver if something is not compliant. It could even block the truck from starting if there is anything wrong.

3. Creating smart digital assistants

Chatbots are an established tool for interaction between companies and their customers. They are used in customer support and in many other places. UX designers find new challenges in making them smarter and more efficient.

At IT Sonix, UX designers work closely together with data scientists to create chatbots, and they've gathered a lot of experience in voice recognition and voice navigation, among other things from developing digital assistants for call centres.

Key to developing smart digital assistants is doing

4. Minimizing complexity via UID simplicity

extensive user research. As an example, you must analyse the language habits of the users to determine, whether the questions the digital assistant is asking should contain specialist terms or more straightforward language. And you must determine the most frequent use cases and the most relevant questions in each specific context. This enables the UX designers to give their digital assistant a personality that fits its purpose. UX designers are working closely together with data scientists to train the algorithms behind these digital assistants, and according to Franziska Beer and Constanze Knospe this collaborative effort will become even more frequent in the future, as the number of digital assistants and their complexity increases.

4. Minimizing complexity via UID simplicity

Current user interface design must cope with two trends pulling in opposite directions. On one hand, striving for minimalism in design is still the way to go. On the other hand, interfaces must handle an increase in complexity, because they integrate more and more data sources and must visualize them in an intuitive and easily understandable way.

- *Most of the time we work with very complex requirements, Franziska Beer explains.*
- *Vehicle logistics is an example of such a complex use case. When a delivery vehicle breaks down, both the driver and back-office personnel must act quickly. They must arrange for further transportation of the goods it carries, and the damaged vehicle must go to the nearest repair shop to get fixed.*

All this involves additional drivers and trucks, towing services, and several other parties. They need quick, correct and clearly visualized information about the location of the truck, about the

continuation of the delivery etc., designed to fit their specific role in that process. For this task management solution, we've developed several design modules that can be integrated in for instance a dashboard, visualizing complex information to the user. Initially, it contains only basic and minimalistic functionalities. But the more you interact with it, the more your requirements increase, and you want to add more functionality to the basic version you started out with. For this you can find extensions inside the product, and you can activate them via in-app purchase.

5. Branded Interaction Design

As the number of digital products and services increases, brands must ensure that the customer experience they're offering is consistent, uniform and identifiable. Brands are alive, so to speak. Whether it's a car manufacturer, a fashion label, or a bank, a brand is the sum of all the touchpoints between brand and customer. And as the bandwidth of brand specific design increases, e.g., in emerging virtual environments like Facebooks new Metaverse, there is an increasing need for consistency across all products and services.

According to Franziska Beer and Constanze Knospe this means you must focus on what is referred to as brand tonality and brand picture. This is where Design Systems come into play. Design Systems are collections of reusable building blocks, that ensure consistency and reduce complexity in the design and development process, e.g. charts, tables, forms. Design Systems have been around for a while, but their importance is growing.

The need for consistency does not only imply the visual part of a brand. Language is just as important. You must ensure a consistent tone-of-voice, covering even the smallest parts, for instance the words you put on buttons in an application. For this the discipline of UX Writing offers a systematic approach, with guidelines like corporate language sheets securing brand tonality across different applications.

5. Branded Interaction Design

6. Ethical awareness and sustainability

To the User Experience community in general, ethical awareness and sustainable aspects in Digital Product Design are issues of increasing importance. Not least at IT Sonix.

- We believe we have a responsibility to find sustainable solutions to the societal challenges we're facing, says Constanze Knospe.

- *And we have an ambition that our projects and initiatives should contribute to the UN sustainability goals. This includes a focus on inclusive design and gender equality. As employers we make sure that we're not involved in projects that are questionable from an ethical standpoint.*

However, as Franziska Beer explains, she and

her colleagues from time to time find themselves caught in dilemmas. For instance, data analysis may suggest carsharing providers to avoid parking their vehicles in certain areas due to higher vandalism and crime rates. Consequently, people living in that area won´t benefit the same way from the carsharing offering.

This example leads to ethical considerations: So, instead of spreading share economy for efficiency and sustainability reasons to everyone, we somehow strengthen prejudices and isolation regarding social hotspots.

To tackle issues like these, a number of IT Sonix employees have established a sustainability guild, to promote sustainability awareness and to take practical steps to reach sustainability and climate goals. Also, the company has appointed two sustainability managers to lead the company's efforts in this field.

6. Ethical awareness and sustainability

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