GRIPS
Co-botting – Digitally Assisted Work

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Co-botting – Digitally Assisted Work

Work 4.0 is taking place in a working environment with intelligent information and services. These are introducing the possibility of digital work assistants and digital work accelerators that are calibrated to the specific capabilities of the worker they are helping. They combine the strengths of people *and* machines in order to successfully overcome future challenges posed by the world of work and demographic phenomena.

The future effects of Work 4.0 are the subject of highly controversial discussion – in particular questions over which jobs will decline or cease to exist as a result of automation, and in return, which new jobs will be introduced. Most experts agree that Artificial Intelligence (AI) and robots will replace people in many sectors. New jobs are expected to emerge, however, especially in the digital and creative sectors.

A further central idea surrounding Work 4.0 is that employees should be prepared as best as possible for the new digital job profiles. This means that further education and training will call for a great deal of creative potential – including for bot (AI program) programmers and "trainers" involved in machine learning. In addition, service jobs that are performed by people and involve social skills, emotional intelligence and interpersonal communication skills are expected to become more and more important.

Former professor of AI and robotics pioneer Rodney Brooks represents a slightly more level-headed approach. In his opinion, the dissemination of innovations in robotics and AI will take far longer than expected by most [1].

Rethinking the concept of "work"

It is interesting to note that there is another core question regarding digitization which has been addressed very little: How can people and machines mutually support one another using digital processes in such a way that creates a high-performance work cycle? This system may be known as "co-botting", but "digitally assisted working" is a more meaningful expression.

Abb. 1: In "co-botting", people and machines mutually support one another.

Viewed from this angle, work maintains its role as the director and catalyst for sustainable economic development; it does not degenerate to become a "gap-filler" for anything that a machine cannot (yet) do. This means that human jobs are the last and most important mile in digitization, and a decisive factor in the sustainable success of digitization projects. From this perspective, digitization, combined with demographic trends, presents an entirely new set of requirements; these shall be examined briefly below.

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“It's all about flexibility” – project not routine

One of the strengths of digital processes is their high level of flexibility and customization. This has a considerable influence on the nature of the work connected to these processes: The number of routine jobs is falling dramatically with Work 4.0. According to research conducted by McKinsey, two thirds of all highly digitized companies anticipate that the organization of workflows will become more project-based than function-oriented [2].

The risk of a job becoming automated, maintains The Economist, depends less on whether it is blue-collar or white-collar and is instead dictated by whether or not the job comprises routine work [3]. A recent study conducted by PricewaterhouseCoopers (PwC) comes to the same conclusion: To a large extent, jobs with a high risk of automation consist of physically demanding or routinely repetitive tasks, e.g. filling in forms or simple problem-solving. Careers that demand social skills or education will be less affected by automation [4].

Learning on the job – working as learning

Fewer routine tasks also means that employees must be continuously acquiring and learning new skills. Learning will play an ever more significant part in employability – an article by the BBC about the effects of automation comes to the following conclusion: Employees therefore will be in a constant state of requiring new expertise and will not be able to depend on one set of acquired skills that will rendered superfluous by automation at some point anyway [5].

Bhagwan Chowdhry, Professor at the University of California, is cited in the same article, stating that the differentiation between working and learning needs to become more amorphous. The reason for this, according to Chowdhry, is that there is still a division between learning and working processes: Those who are working are not learning – and those who are learning are not working. Chowdhry points out that a change is worth considering, by which people move away from the traditional five-day week and instead spend 60 percent of their time working and the remaining 40 percent learning. A report by the recruitment company Aerotek also comes to the conclusion that training and re-training are critical factors for companies and employees working in fields where people are increasingly being replaced by machines [6].

Know-how – AI is hardly a replacement for experience

Practical knowledge sharing and on-the-job training are not new ideas; they have always been lived out by experienced experts and shrewd apprentices. Over the next few years, however, these “old hands” will become less and less available as the baby boomer generation retire and leave the market. The fact that there is no-one to take their place will become a decisive factor when job vacancies cannot be filled with qualified workers. The Center for Automotive Research in Ann Arbor also identifies a clear lack of workers in the machine tool industry, which it explains as being largely the result of demographic development [7].

In light of this fact, we must ask whether these shortages can be partially compensated for by automation and digitization, a suggestion which is rejected by an article in Quartz: Even if productivity were to continue to rise by the same rate in future as it has in the past 50 years, this increase would not be enough to sustain the current gross domestic product [8]. Productivity must therefore increase at a greater rate than it has to date, according to the article. The article's author points to McKinsey's statement that the key to this could be automation technology, as it could increase productivity by 0.8 to 1.4 percent; however, as McKinsey emphasizes, this would only be effective if people were to continue to work. This will require teamwork between human and machine, as many jobs may not be automated to any extent, or to an insufficient extent in the foreseeable future.

Gig economy – workers “on demand”

There is another observation to be made in connection with the question of qualifications: According to Forbes, almost two thirds of small and medium-sized companies invested more time in training courses than they did the previous year because their workers did not have the skills and knowledge they required [9].

Another concept – which has become known as the “gig economy” – may be of help here. It involves

employing the remaining workers in a more productive manner, making use of their skills across the whole company: Companies also undergo a shift, obtaining services from independent service companies and freelance workers. This means that specialists are put to better use and are employed where they are most urgently needed. On this subject, Forbes cites a study by Deloitte which states that over half of global executives indicated that they intended to employ more flexible and independent workers over the next three to five years.

Automation can help to recruit workers according to demand by creating service portals which "advertise" service assignments in detail to qualified freelance specialists and track the assignment through to invoicing. In addition, automation can also help in instructing less qualified workers, using digital assistance functions to support them so that they can complete more complicated tasks safely and correctly. The following section looks at how this works.

Digital assistance – new concepts of work

If the content of work is undergoing constant change, if workers are continuously required to learn to do new jobs, specialist knowledge is growing scarce and experts are constantly switching between companies, Work 4.0 can only be successful with the help of highly efficient digital assistance. In other words, support and instruction that is effective and adapted to suit individual employees is not just possible with digitization – it is required as a matter of urgency.

Digital assistance is certain to raise productivity, increase employer satisfaction and reduce errors. For the product-based Work 4.0, this means that assistance is based on experience, is configured for each individual case, employs appropriate media, relieves employees of routine jobs and is based on the context in hand. Viewed individually, these attributes are defined as follows:

- *Experience-based*: Support must be adapted depending on the employee's experience.
- *Individually configured*: Instructions must take into account the unique configuration of the system or the individual product in question.
- *Media-appropriate*: Information must be offered in the medium that is best suited for the task in hand, e.g. 3D models for processes that are hard to visualize spatially; animations for complex work steps; voice assistance for jobs requiring both hands and constant visual attention; augmented reality for less experienced employees and virtual reality for training courses and work preparation.
- *Unburdening*: Assistance services must relieve employees of routine jobs, e.g. service planning, time and cost calculations, stock checks, diagnostics strategies and log keeping.
- *Context-specific*: Digital assistants must take into account the context, e.g. the work objective (Does the job involve service, maintenance or troubleshooting work?), the application profile of the product (How has the product been used? How will the product be used?), the current condition of the product as determined by condition monitoring, and the product history, taken from its service and maintenance history.

These requirements can only be met by means of a semantic information management concept [10]. Such a concept forms the basis upon which efficient assistance services can be made available within a realistic budget – these services are known as "smart content" services.

Smart content services – practical solutions

Smart content services is a new technological concept, developed to make Work 4.0 more productive by supporting it intelligently with digitization measures. This support is based on both content and data. At the heart of smart content services are semantic information models which present content (e.g. work descriptions, diagnostics networks, rules) such that it can not only be reworked into instructions for people but also interpreted by digital processes. This type of intelligent content is currently known as a knowledge graph or semantic graph by most high-tech companies [10]. Smart content services are developed for specific applications and made available for work assistance.

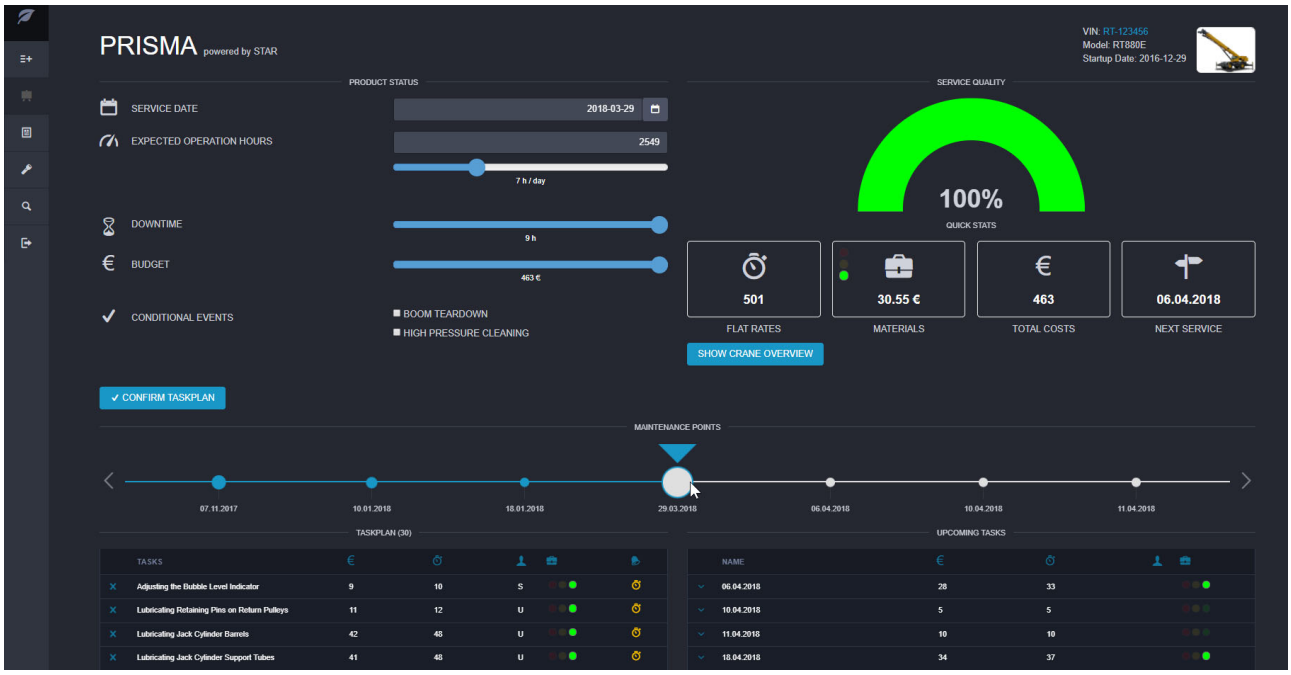

Abb. 2: Smart content services for intelligent service planning

A glimpse into service planning

The following application example demonstrates the concept of smart content services using an intelligent service planner for a crane that is based on the PRISMA solution from the STAR Group. This case involves various different smart content services:

- *Vehicle-specific data*: Information specific to the vehicle, such as the chassis number, model designation and date of commissioning are displayed. On the basis of this data, the data for the vehicle in question is called up in the background – this includes the service history and the vehicle configuration, which are required in order to provide the service information specific to the vehicle.
- *Product status*: Here the next service date is displayed along with the number of operating hours. The expected service life can be updated manually at any time and incidents from condition monitoring are listed as well.
- *Details of servicing*: Here details are given about how long the suggested service will take and how much it will cost (broken down into time and material costs). A suggested date for the following service is also displayed. These details of time and cost, as well as the time until the next service, are key variables for the customer when it comes to decision-making and optimization.
- *Service timeline*: The timeline displays past services and the date of the currently planned service, as well as other calculated intervals. The scope of the pending maintenance measures is also indicated.
- *Overview of service work and materials*: The user can also see which types of service work should be carried out – this includes their cost, the time required and any qualification they may need. In addition, a traffic light system indicates whether the required materials are available (green), can be delivered by the service date (amber) or still need to be ordered (red).
- *Overview of future servicing*: The dashboard displays further planned service dates that can be added manually to the current service date as applicable in order to outline maintenance works.

Relief from routine service work

By way of conclusion, it is clear that the smart content services of the PRISMA assistance system described here accelerate and simplify service planning, automatically providing service employees with individually configured service suggestions. Furthermore, the assistance system recalculates and optimizes the plan

after any changes and also checks the requirements for each service (materials and tools).

The service employee is relieved of these highly time-consuming routine jobs and is freed from sources of error (e.g. forgetting important service tasks) at the same time. This enables employees to better attend to the customer's wishes and align the service with their time and cost requirements.

Digital coaching – on-site instruction

Smart content services can not only facilitate planning but also assist technicians working in the field [10]. For example, digital assistance combined with augmented reality can help to rectify vehicle faults.

At the same time, augmented reality representations can help untrained personnel get to grips with unfamiliar products and learn on the job: By way of an example, they can help to pinpoint the position of an assembly or a part. Having the display on the object itself reduces error and speeds up work too. Overall, instruction on the object produces a steep learning curve.

Voice assistance – hands free for technicians

It is not always possible to read from or navigate a screen when working in the field. In such situations, support from a voice assistant provides the perfect solution.

The PRISMA assistance system, for example, offers the option to navigate by reading out the previous/next step. Furthermore, it uses highlighting in the image or 3D model to show the current position of a component and specifies which tools and materials are required. The user can read all technical data such as filling volumes, pressures, tightening torques and the time remaining, which helps to prevent exceeding the total time. The assistance system also keeps a log of all measured values and additional observations made during service work.

Situational information processing – attractive communication

Smart content services use animations, 3D representations, augmented/virtual reality (AR/VR) and voice assistants to enable an ease of instruction and degree of support that were previously unthinkable. Practical knowledge that was previously hidden away in impractical manuals and unattractive pictorial instructions can now be gained directly at the object in a situationally useful way. This means that even complex and new forms of work can be carried out safely and correctly. In addition, this type of knowledge communication makes learning much easier.

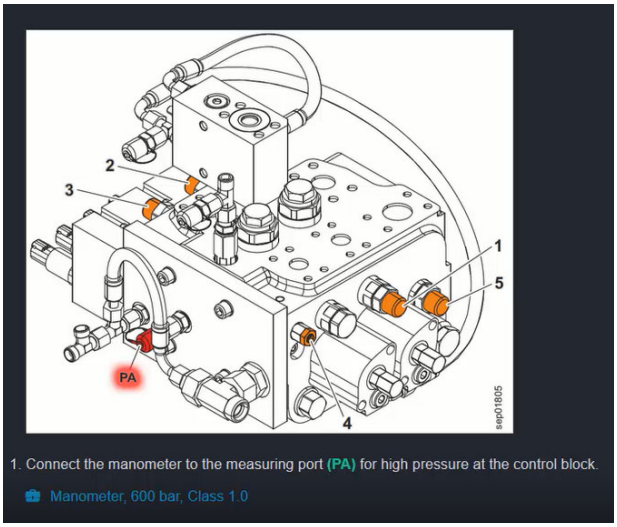

Abb. 3: The relevant component is marked in red.

Situational information processing also means that assistants can be switched off once employees have become so proficient at a job that they can carry out their tasks autonomously and confidently.

At this point, the teamwork between human and machine comes into play once again, in that it is not only people who can learn from machines, but also the other way round: If a technician knows of a better, more elegant solution than the assistant, they can record their improved variant as voice feedback or film it using a tablet or smart glasses.

This feedback is a valuable form of input for the development team, helping them to constantly grow and improve assistance with practical knowledge. Consequently, smart content services in the form of digital assistance offer a new and comprehensive concept for the final furlong of digitization.

Conclusion

Digitally assisted working – or co-botting – is a people-friendly, innovative and realistic alternative to pessimistic assessments of digitization as a "job killer" and to the belief, driven by a bias towards technology, that many new jobs in digitization will emerge.

Digital assistance supports people without overstraining them or replacing them with premature automation alternatives. In co-botting, the strengths of human *and* machine are creatively combined. This smart combination will help in successfully overcoming future challenges posed by the complex digital world of work and demographic development.

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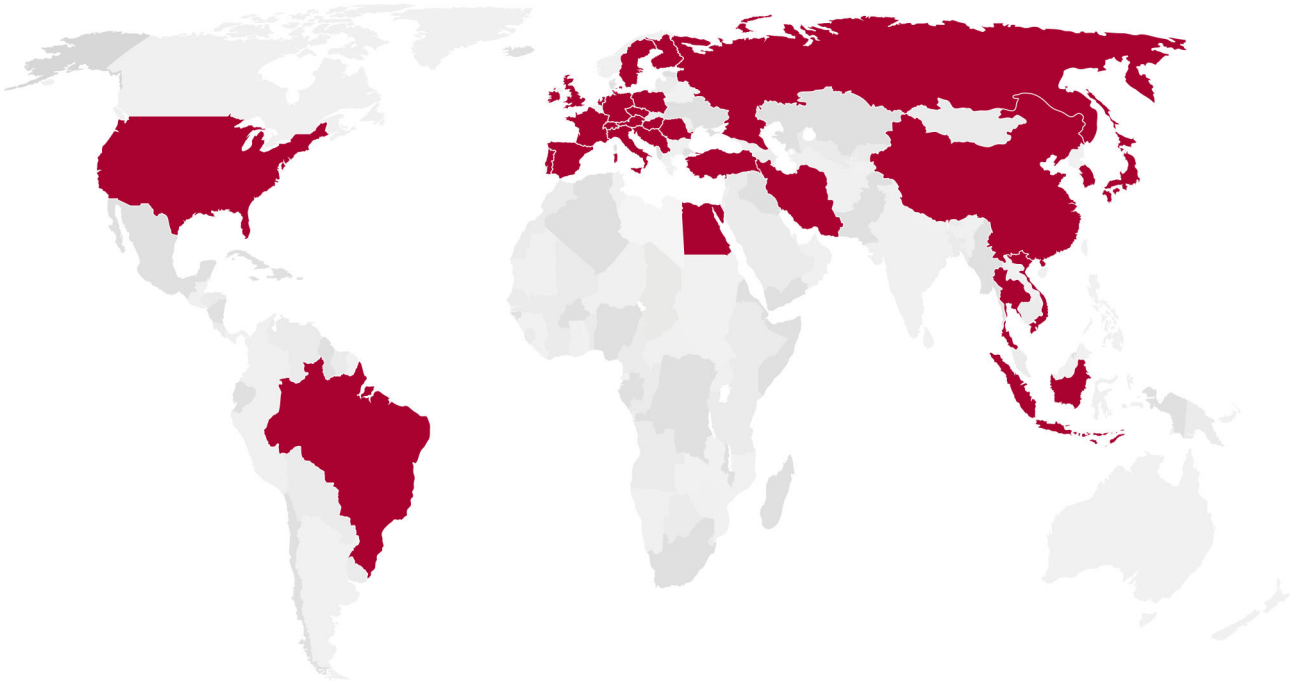

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