Focus on the human being - Development of user-centered operating concepts for sustainable success in mechanical engineering

Human Ready.

WHITEPAPER

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The challenge of human-machine communication

In recent years, we are experiencing a skyrocketing level of digitization and automation. However, due to insufficient and poor operating concepts, the benefits of this automation can often only be used in parts. A fact that already leads to high frustration in the private environment, but can cost you money in the industrial context and can cause massive sources of danger for the operators. Normally, standardized solutions are used regardless of the necessary consideration for the different individuals interacting with the machine.

In addition, the ratio of operator to number of machines has shifted by the increasing degree of automation and fewer operators are responsible for more machines. This increases the complexity and potential danger of incorrect operation. Another factor that increases complexity is the difference in the level of training of the operators who work at different depths on the same machine. If systems and machines are used internationally, this also has to be taken into account during operation. For example, there is no question mark in Asian characters, which affects the user experience. In our white paper, we discuss a user-centric approach that must respond to the individual, the operator. The operator of a machine is as diverse as life, different origins, languages, cultures and educational level have a high impact on the communication between man and machine. We describe the problem of a non-user-centric operating solution, the effects and solutions.

We also highlight the importance of consistent operation, e.g. in a production line of machines from different manufacturers.

This white paper focuses on these questions:

What questions must be asked and answered before planning the operation of a machine, and what are the relevant influencing factors?

What is the ideal project team for planning and implementing an operating solution?

What is the ideal project team for planning and implementing an operating solution?

What is the future of machine operation?

Impact of inadequate operating concepts

The focus of this white paper is on the industrial use of human-machine communication, thus affecting all persons nationally and globally who work with machines. We put forward the thesis that the operation of machines of any kind is usually not optimal. The resulting direct or indirect effects can be:

High training costs

Der Nutzer sollte die Möglichkeit haben, seinem Können und Aufgabendefinition entsprechend, die Bedienung einer Maschine in einer vertretbaren Zeit zu Erlernen. Die Bedienung muss flexibel genug sein, um ein Lernen während der Bedienung zu ermöglichen, weiters sollte die Bedienung sich proaktiv an das Können der Operator anpassen.

Increased error rate, waste

Inadequate operation leads to confusion, too many „clicking attempts“ to frustration, erroneous inputs to time delays and production errors, overall the mental stress and direct (material and efficiency) and indirect (lost work) costs increase.

Untapped potential on the machine

Everyone knows a software, e.g. a word processor that, it is believed, offers a variety of functions. At the same time, one is aware that one uses only a fraction of it. If this happens with a production machine, then one either purchases a product that is too much, because one does not need the functions, or the production is not optimal and loses its efficiency due to unexploited potential.

Lack of flexibility for changes

New markets, new customer groups may require adjustments to an existing operation or operating concept. Only an open system can withstand these requirements. Examples of this flexibility are:

- Intelligent language management, e.g. Recognizing available space with different fonts (Asian fonts); On the fly editing of languages - directly on the running machine and much more.
- Open framework for implementation of new and custom functions.

Learnings and inputs are not or only partially recorded and utilized

Much experience is made directly on the machine. This is experience that is valuable for the further development of the operation. The dialogue between man and machine should be given, through active inputs and through the evaluation of behavior on the machine.

Disadvantages in the market communication / sales

- Salespeople like to show interested customers a visual and functional operating concept.
- A good service can be a unique selling point and a selling point in comparison to the competition.
- Appealing operating concept, e.g. on a multi-touch screen, the operation is often seen as the „face“ of a machine.

Demotivation of the machine operator

For the user / operator on the machine: Working on a machine usually carries a high level of responsibility due to the risk of waste, standstill and the output of inferior quality. This builds up a permanent stress.

What questions must be asked and answered before planning the operation of a machine and what are the relevant influencing factors?

Strategic questions

The operating concept of a machine or machine group primarily concerns the currently available technology and field of application. But what does the roadmap look like? How will this machine possibly change with new environmental factors? Which technologies will be relevant in the future? Influencing factors are:

Internationality

78%[1] of the machines produced in Germany were exported in 2018 - to countries with other languages but also other cultures. Where are the future markets for our company? What conditions and expectations do we find in the respective countries? A detailed consideration is worthwhile:

- What are no-gos?
- What helps in special markets?
- Are there local conditions one can or should consider?

Demography

Who operates a machine? This question is often much harder to answer today than it used to be. The typical male operator is between 18 and 40 years old, with technical training. Of course, these operators still exist, but he is no longer the only relevant persona. This is also due to the fact that automation has long since ceased to be limited to the industrial production environment and is now relevant to all areas, including medicine, care and cleaning. There are also different demands of different generations. For example, what do millennials expect from the operation of a machine, and how does operation affect motivation and, ultimately, efficiency?

Competition

How is the demarcation of the competition today? Where does the competition come from? How will the competitive situation change in the future, and what can we do to maintain a competitive advantage in the future?
In addition to the core functionality of a machine, the operating concept, in particular the UX design, increasingly represents a way to distinguish itself as a company. In addition to many factual advantages, the operation is an easily communicated difference.

Technology Development / Disruption

Which technologies will be relevant in the future for our machines and also for the operation of the machine? Where must we take actions today?

Business model

Changes in the market demand the adaptation or even the rethinking of business models. How do we sell our products in the future? New ways of financing through „Machine as a Service“ are changing the distribution, new services are expanding the range of services. The operating concept is an essential part of the business model. Are we ready for it?

Expectation of the operators

What do the future operators expect from good machine operation? To what extent can this expectation influence the purchasing decision on the one hand and motivation on the other?

[1] Source: ifo-Institut, Statistisches Bundesamt, Stifterverband der deutschen Wissenschaft, VDMA/ifo Institute, Federal Statistical Office, Stifterverband der deutschen Wissenschaft, VDMA

Tactical questions

Where are the pain points at our customers? Can we address these specifically with the operating concept? Can we fill an existing gap in the market? Can a new concept of operation include the introduction of new services, such as integrated remote support, support data analysis, or even accompany the introduction of a new product?

You know your customers and your competitors best; analyze the current situation in order to draw conclusions for the operating concept.

Practical questions

Resource availability is very relevant for the implementation and maintenance of an operating concept. Are the resources currently available internally and can these be set up as needed? What services can external service providers offer? If a specific knowledge is tied to a few people, the project often leaves the company with the employee.

A project of this kind requires resources from different areas and is sometimes very intensive and multifaceted. In order to avoid time delays, it is essential to involve all stakeholders from the beginning, otherwise you run the risk in the worst case of a full stop in the middle of the project, with the result „Back to the start."

When will the project „Machine Operation" be started?

Ideally, the operation is part of the product development already in the development stage, then machine functions and their operation can be coordinated with each other. The production process is checked for operability and logic at an early stage. By integrating users with different use cases, dummies functionality and their operation can be tested at an early stage.

A valuable moment for a new operating concept are product enhancements, upgrades, retrofits, etc. In addition to the value of optimized operating solutions, the value of the new product perceived by the customer also increases.

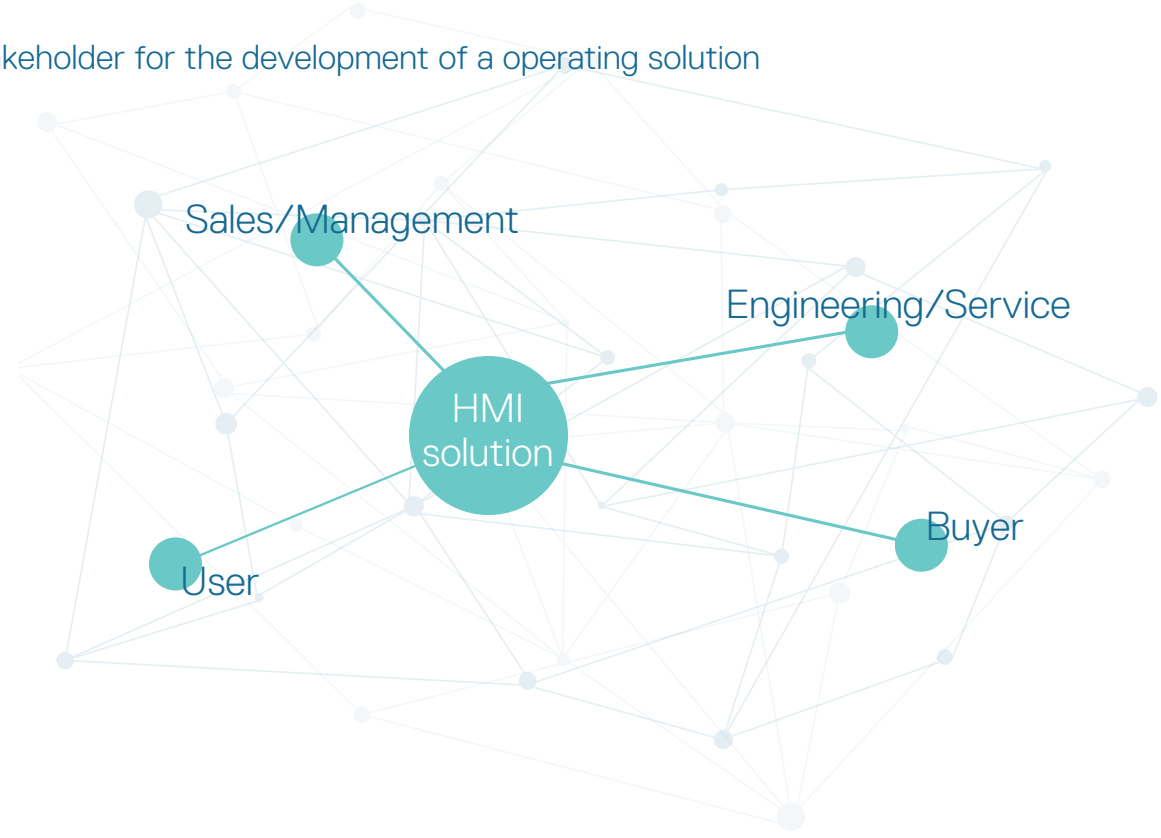
What is the ideal project team for planning and implementing a control solution?

Today‘s environment in mechanical engineering requires a holistic approach to develop sustainable solutions.

The operation of a machine has long been more than just the way you more or less simply bring a machine to work. It is increasingly becoming the face of the machine, communicating quality, function and performance. A machine is also measured by how appealing, logical and simply how sympathetic the operation is. The individual expectation is, i.a. due to smartphones etc., already high.

In addition to influencing factors, stakeholders should be identified and their expectations considered. Introducing a control solution for a machine is an intense project, and can only succeed if all stakeholders are onboard.

Stakeholder for the development of a operating solution



Expectations oft the Stakeholder

Operator

- Reduced representation of complex processes
- Logical prompting
- Clear UX design
- General symbol and color concept
- Stress-reduced operating environment
- Culturally and linguistically optimal adaptation

Management/Sales

- Clearly communicable and presentable product advantages
- Basis for sustainable after sales
- Tools for customer loyalty
- Long-term customer relationship

Technology/Service MB

- Presentation of all required functionalities
- Good connection to the interfaces of the machine
- Open and flexible system for ongoing adjustments
- Competent contact persons
- Professional service concept

Byer / Operator of the machine

- Customer expects state of the art in all areas
- Flexibility and sustainable service
- Operation of the machine without high training costs possible
- Good after sales and service

In the project team for an operating concept ideally people from all areas should be present, and actively contribute. We recommend having enough time and energy in this starting phase. Valuable inputs, concerns, recommendations and wishes can be discussed in a big round.

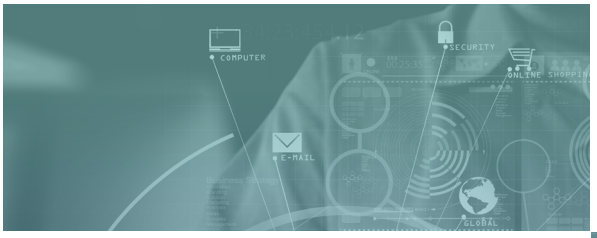
The creation of personas and use cases are crutial for the concept phase. Thus, the needs can be optimally queried and defined.

How can one establish a dialogue between man and machine?

Only in dialogue can new things arise, one-si-ded communication, specifications do not work in human / human communication, so why should they do it in human / machine communication?

In the dialogue questions can be asked and answered, feedbacks and suggestions can be made and tips given early on. Factors for a successful communication are:

- One speaks the same language
- Motivating, positive and constructive communication
- Familiar and well known, e.g. well-known colors and shapes from nature
- Focus on the essentials: Good conversations live from focus



Examples of implementation in machine operation

- Predictive Information: The machine is aware of the current process, which can provide the operator with relevant information and tips in advance.
- Gamification: Playful elements have long been used in many operations. A healthy competition, with yourself or others supports the workflow.
- Biophilia: In architecture known for some time, elements from nature are processed to give people a familiar feeling. In the development of machine controls this approach is still new.

Regardless of the type of user, ie. Operator for daily production, senior person in production planning, management or technical support. The user-centered approach with the reduction to the essentials „what does this person really need at the moment“ and the focus on humans opens up the possibilities for good operating solutions with a future.

What ist the future of operating a machine?

The technological possibilities are there. Already today machines can be controlled with Augmented Reality, Hearables, Wearables, Eye-Control and so on. The technology will continue to evolve, presenting more robust solutions and new approaches.

The solution, however, is not technology. The decision to use the technology only comes in the course of the project. At the beginning there are the questions in this white paper and the extensive elaboration of personas and use cases with the involvement of existing and future processes. The use of the technology will be tailored to the purpose and ability to be involved in the process, ie. the flow of data is made by technology, e.g. a virtual glasses, interrupted or extended?

Currently, a touch panel is the center of operation on machines. The future will look differently. Focusing on people, machines will be operationg in places and at times that are right for the user. With increasing degree of automation, the human being increasingly has a planning and a conductor-like task, can deal with the experience from the process and bring it back into the process with added value.

Conclusion

The operating concept is more than ever an integral part of a machine. Operating is more than just starting a production process. With the degree of automation, the possible and expected flexibility of a machine increases, the operation is an important medium to quickly capture and implement valuable information and experiences. The operating concept should also document, train, motivate and provide daily assistance. Important in the development of a control solution is the expansion of the field under consideration, in the inclusion of all relevant processes and the relevant stakeholders, a control solution can be created, which brings sustainable joy for all parties.

ALPHAGATE

Company profile Alphagate

With 20 years of experience, Alphagate Automatisierungstechnik develops the optimal operating solution for your machine. The UX design is tuned to the current process to ensure short training times and high efficiency. According to the latest findings of usability appealing, modern interfaces are designed. The implementation is implemented with the own visualization software „A-Vis“.

The core competence of Alphagate is the development of the interface, so that one can optimally fulfill the customer requirements. All common systems (PLC etc.) are addressed. Alphagate enjoys working with machine builders and engineering firms to work out the optimal solution together.

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