# Competence Development within Hybrid Value Creation

## Need-based Competence Development for the Successful Implementation of Hybrid, Data-Driven Business Models

Sascha Stowasser, Nicole Ottersböck

## 1.    Introduction

Digitalization offers a wide range of opportunities to develop companies, their services, and structures. The initial point is the handling of data and their possibility to generate information (Jeske/Ottersböck 2020). This information can be useful in very different ways for the further development of companies. Approaches to this are offered by a company's products and services, the processes required to produce or generate them, and the underlying business models (Berlage et al. 2018). A special form for digital business models is described by the term of hybrid value creation. This involves linking physical products with digital services, also known as smart services (Kempermann/Lichtblau 2012).

The hybridization of value creation and the sociotechnical work system design required for this are being explored in the research project "AnGeWaNt - Arbeit an geeichten Waagen für hybride Wiegeleistungen an Nutzfahrzeugen" (translated: Work on Calibrated Scales for Hybrid Weighing Services on Commercial Vehicles). The project is funded by the German Federal Ministry of Education and Research (BMBF) with resources from the European Social Fund (ESF) (www.angewant.de, funding code: 02L17B050). In the project, hybrid business models were developed since 2019 with a total of three pilot companies and these are now being implemented step by step. Furthermore, digital platforms for data exchange are being developed as the basis for these business models (Jeske/Ottersböck 2020).

The companies involved in the AnGeWaNt project are established in the market with their physical products. These are commercial vehicles, attachments for commercial vehicles and calibrated scales. Based on the current business models of the companies, hybrid, data-based services are being developed in the project. These can be customized by collecting product usage data. For this reason, products are equipped with sensor technology and networked with each other so that data can be collected and stored during product use and in some cases analyzed and used in real time. Based on a broad and comprehensive database, customers will be able,

for example, to calculate more precisely the expenses incurred for completed construction work in the future. The associated experience makes it possible to carry out more accurate quotation calculations. The resulting competitive and cost-covering offers lead to advantages on the market. In addition, product usage data can be taken, for example, to enable predictive maintenance and counteract machine failure, which can help to reduce costs. Benchmarking, i.e., the comparison of product usage data from several companies, makes it possible, for example, to check whether there are any correlations between product use and machine failure. Likewise, further potential for improvement can be derived. Figure 1 shows a simplified illustration of the development of hybrid, data-driven business models, also known as smart services.
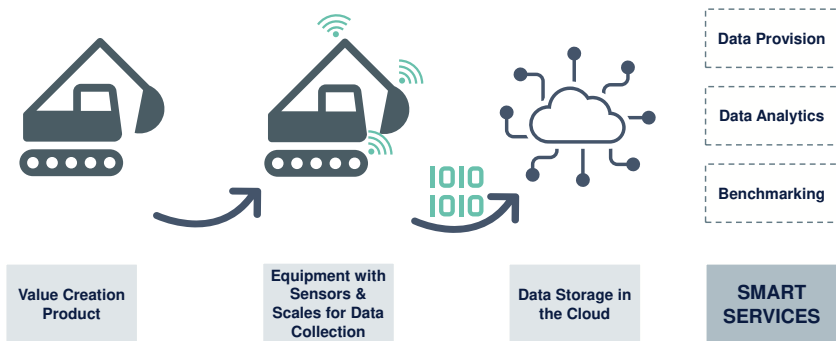


Figure 1: Exemplary, simplified presentation of the possibilities of smart services on the example of the product shovel excavator (Ottersböck et al. 2020 modified)

In addition, the concept of the project includes cross-company cooperation. The scales of one pilot company can be integrated into both the commercial vehicles and the attachments of the other companies and generate weighing data through their usage. In the future, these can provide information, for example, on which weight a wheel loader transported in which time and how much gasoline was consumed. In this way, potential for optimization in the handling of commercial vehicles can be derived and resources can be saved. In addition, improper handling of products (e.g. overloading) is counteracted and repair costs can be saved.

The further development of work design for the implementation of hybrid value creation is the central content of the above-mentioned AnGeWaNt project. To this purpose, information flows as well as work and organizational structures will first be examined and designed to suit hybrid business models. Subsequently, collaboration within companies and across their organizational boundaries as well as leadership issues will be analyzed and adapted to the needs for the successful implementation of hybrid value creation. Finally, changing competence requirements are identified and corresponding learning and teaching concepts will be developed.

These will be described below. This paper expands and deepens the presentation of the research project's methods and results from an overview paper published in 2020 (Ottersböck 2020).

## 2.     Competence Requirements for Digitalization and Hybridization

A key success factor for the establishment of new data-driven business models and a successful digital transformation are the appropriate skills among the workforce (Seifert et al. 2018; Altun et al. 2019). Often companies be constrained in their innovative strength by a lack of competencies and skilled workers (Anger et al. 2020). The introduction of new business models therefore requires the development of competencies in the workforce. Taking targeted measures to develop competencies requires a comprehensive analysis. It is important to find out which company departments are particularly relevant in connection with the hybrid business model and what changes and competence requirements will arise in these areas because of digitalization and hybridization. For example, the companies in AnGeWaNt already identified competence requirements during the period of business model development. The identified competencies need to be covered so that the new business models can be realized. In particular, the development and information technology (IT) departments need skills in data science (programming and data analysis) and in the development of expanded, networked IT infrastructures, as well as legal knowledge, e.g., regarding to data security and data protection (Ottersböck 2020).

To implement the hybrid business model, competence development is a key activity. A four-phase approach, according to Lange & Longmuß 2015, was developed in the project to provide systematic support for competence development and a successful change process in the companies (Figure 2):
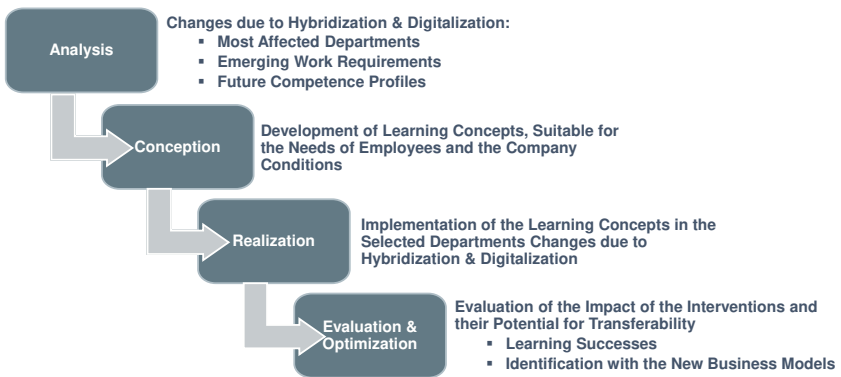


Figure 2: Four Phases of Competence Development for Hybrid Business Models in the AnGeWaNt Project (Ottersböck 2020 according to Lange & Longmuß 2015, modified)

1) Analysis phase: Identification of future competence needs that will arise as a result of the changes through hybridization.

2) Design phase: Development of learning concepts based on the results of the analysis phase.

3) Implementation phase: Application of designed learning formats in the selected pilot department.

4) Evaluation phase: Verification of the interventions and initiation of optimization as well as identification of their utility for other organizations.

Four sub steps, each building on the other, were carried out for the analysis phase:

1) Workshop, to identify changes resulting from the new business models (Chapter 2.1)

2) Cross-divisional competence check for successful digitalization and implementation of hybrid business models (Chapter 2.2)

3) Executive survey to identify changes and useful activities regarding the successful establishment of hybrid business models in the individual departments (Chapter 2.3)

4) Requirements survey to determine future competence needs and identify competence gaps in a selected department (Chapter 2.4)

The following parts describe in detail the analysis phase and exemplary results.

2.1.    Workshop to Identify Changes through Hybridization and Digitalization

In order to raise awareness and to identify the changes that could result from the implementation of the hybrid business models, a interactive workshop was conducted with the project teams of the three companies. The project teams were mainly made up of employees and managers from the development and sales departments as well as human resources. In this workshop, the project teams anticipated changes that could result from the hybrid business models and systematically recorded them on a flipchart in the following four categories (see Figure 3):

- Work tasks

- Work equipment

- Work environment

- Cooperation and teamwork

Once the hybrid business models are implemented, the companies will sell smart services with product usage data beside their products. In particularly, this will require new technological competencies, e.g., for the installation of sensors, smart networking systems and the development of information technology (IT) infrastructures, as well as data science (Figure 3). It is expected that smart devices such as mobile tablets and smart glasses will be used increasingly in the future, e.g., for remote services and for the sale of products. Corresponding technical competencies must also be built up to operate these devices. Increasingly in the future data distribution will be handled via online platforms and cloud services. The project teams of the companies therefore assume that their working environment will be much more virtual in the future. This will be accompanied by increased virtual cooperation and teamwork as well as distance leadership.[1] It was also discussed that technical development is now advancing very quickly and that companies will need technically equipped creative spaces for cross-disciplinary project work in the future to be able to develop innovative ideas quickly and flexibly and try them out directly (Figure 3).
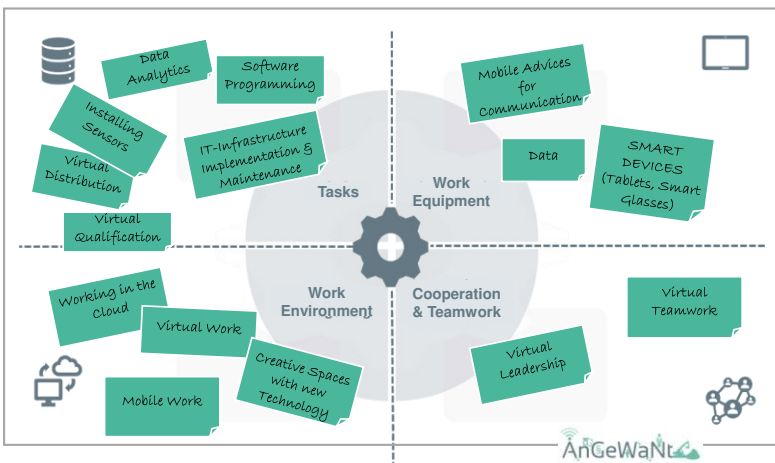


Figure 3: Examples of anticipated changes that may occur in the enterprises as a result of implementing hybrid business models (workshop part 1) (Ottersböck et al. 2020)

The quality of the results of such a kind of workshop depend significantly on how well the business models have been worked out. The more concretely the business models are, the more concretely future changes and competence requirements can

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[1] The workshop took place in 2019 before the Corona pandemic. The Corona pandemic and the need for virtual, mobile work have pushed the digitalization in the companies. The possible changes discussed in the workshop are therefore now already a reality.

be estimated by the workshop participants. This also applies to further activities in the analysis phase (Ottersböck 2020).

## 2.2.     Competence Check

Based on the results of the first workshop, the second part dealt explicitly with specific competence requirements that arise in companies because of digitalization and hybrid business models. On the basis of a literary compilation of various key competencies for the future labor market, the participants were presented essential competency requirements in three categories: technological competencies, core digital competencies and, in summary, social and personal competencies (according to Kirchherr et al. 2018). Following this thematic introduction, the company project teams filled out a competency check (known as a competency analysis portfolio in Ottersböck et al. 2020), which they used to evaluate the identified future essential core competencies.

The check provides an overview of the competencies required for digitalization and hybrid business models as well as their availability in the organization, and whether these can be built up from internal specialist resources, whether external workforces need to be recruited, or whether collaboration with external providers will become necessary. In addition, an assessment was made as to whether customers will also need the expertise in the future for gaining a benefit through the data collection and smart services. Ultimately, the workshop participants assessed the priority of the identified core competencies in connection with the new business models. The highest-priority technical core competencies (priority >5) identified in the workshop are presented below (Figure 4).

The results of a study by Kirchherr et al. (2018) show that so-called tech specialists in particular, i.e., those trained in data science, programming, or web development, are needed in all industries, but represent a scarce resource on the labor market. The competence check in AnGeWaNt confirms these results, as companies increasingly need this technical know-how to execute hybrid, data-driven business models. In addition, the ability to prepare and communicate technical content in a way that is appropriate for the target audience, known in the check as "tech translation" (according to Kirchherr et al. 2018), was given high priority in the competence check, as well as hardware development, design, and administration of networked IT-systems. The last-mentioned competence is available in the pilot company, while the other competences must be built up from internal resources or even require additional external specialists for the new tasks. The companies are therefore faced with the challenge of building up competencies in the technical area, without the business models cannot be implemented. The check determined that the customers of the company also need know-how about data analytics, tech-translation and the development of IT-infrastructures so that they can benefit from data and smart services. Figure 4 shows an excerpt and exemplary result of the competence check regarding the category of technical expertise:

| Competence | Available Inhouse | Can be Build Up | External Professionals/ Partners will be necessary | Competence the Customers will need | Priority 0 (low) bis 10 (high) |
|---|---|---|---|---|---|
| Data Analytics | | ✓ | ✓ | ✓ | 10 |
| Tech-Translation | | ✓ | ✓ | ✓ | 9 |
| Web Development | | | ✓ | | 8 |
| Smart Hardware-/Robotic-Development | | ✓ | | | 7 |
| Conception & Administration of Smart Network IT Systems | ✓ | | | ✓ | 6 |

Figure 4: Exemplary Result of the Competency Check with a Focus on Technical Professional Competencies (Workshop Part II), Competencies according to Kirchherr et al. 2018 (Ottersböck et al. 2020 modified)

In the competency check, the companies indicated that, in addition to the core competencies, they also increasingly need expertise in dealing with digital information (digital literacy) (based on the study results of Spires and Bartlett 2012 and Kirchherr et al. 2018) as well as data protection and data security. The check on social and personal competencies revealed that employees will need to be adaptable to changes in the future and should be willing to engage in lifelong learning, which also confirms the study results of Blacke and Schleiermacher 2018 and Eilers et al. 2017. They should also have a so-called "digital mindset," be curious about new things and have an affinity for technology (Ottersböck et al. 2020).

## 2.3.     Survey of Executives

The workshop for anticipating changes that may result from new business models showed that the new business models in the companies will have an impact on competence requirements and that new competences must be built up for realizing the business models. In the further stage of the analytical phase, the aim was now to determine the "status quo" and the impact of the business models and digitalization on the sociotechnical work system. The focus of the survey was also to determine in which specific company departments the most changes will occur and what competence requirements will arise there. A questionnaire as an analysis tool was developed in AnGeWaNt to get an deeper insight in the different company departments and their estimation of changes due to hybridization (Frost 2020, Frost/Helming 2020, Ottersböck 2020).

In two of the companies, guideline-based interviews were conducted with 14 executives from different departments based on the questionnaire. The interviews covered the following topics in particular (Frost 2020, Frost/Helming 2020, Ottersböck 2020):

● Change Management

● Experiences about the Introduction of Technology and Digitalization

● Leadership

● Corporate Culture

● Knowledge and Competence Management

The following Figure 5 illustrates the issues in the topic of knowledge and competence management:
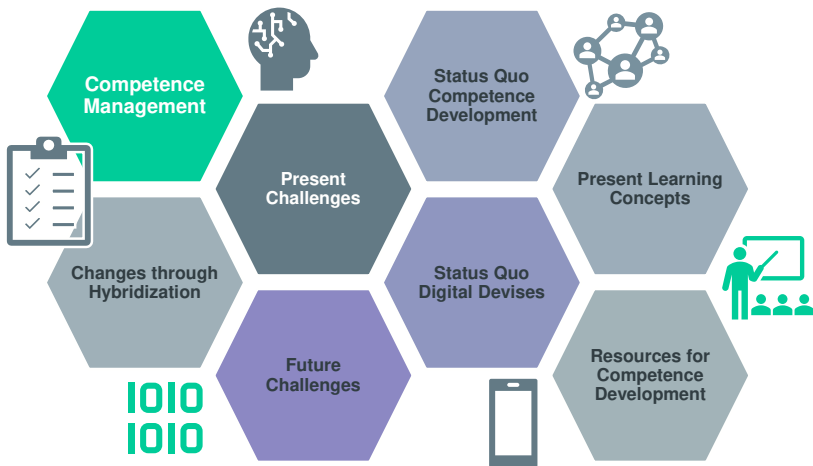


Figure 5: Range of topics in competence management in the interviews with executives (Ottersböck 2020, modified)

The interviews have shown that specially five departments in the companies will be affected by changes resulting from the implementing of the new business models. The development department is the main actor in this innovation process, as this department is responsible for and drives forward the development and implementation of the new business model. This involves a close collaboration with the IT-department, which is responsible for the IT-infrastructure and the development of the online platform which will be used to transfer the product usage data in the future. These two departments have the technical perspective in the project (see Figure 6 left side). The customer perspective is provided by the three departments application consulting, sales, and service (see Figure 6 right side). These are the areas where significant changes in the work system will result from the imple-

mentation of the new business model. The company's applications consulting division is responsible for planning and designing customers' digitalization projects. Employees in this department already have essential knowledge such as process analysis and the value of data for process optimization. The sales area (here in particular the sales customer service) has the most customer contact and will be contribute to sell the smart, data-based services in addition to the products to the customers (Ottersböck 2020).

There will also be numerous changes in the service department resulting through the implementation of the new business models. It can be assumed that the service will also have to answer questions about data provision and technical problems with the cloud and online platforms in the future. In addition, all three pilot companies are currently working on expanding their remote service and establishing digital tools for the service area.
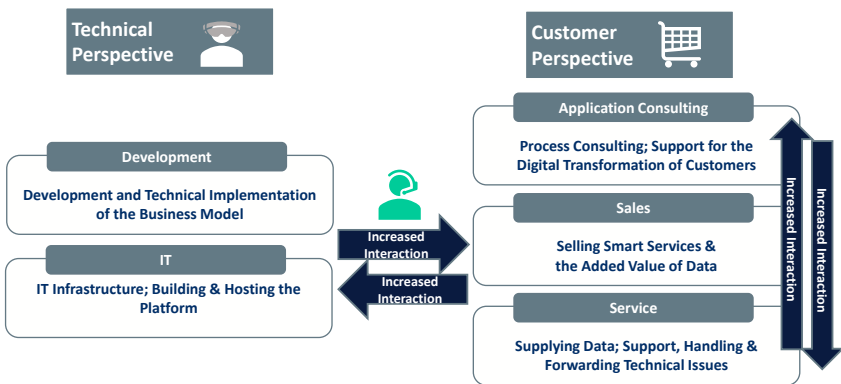


Figure 6: Identified business areas and possible changes through the implementation of hybrid business models (Ottersböck 2020)

In addition to the development- and IT-departments, the sales force in particular was identified as being important for promoting and establishing the new business models on the market. The strategy for building up competencies in the IT- and development-departments has already been defined by the company and initial measures have already been taken, such as training employees in programming or recruiting new employees or assignments of student research projects. For this reason, the sales department was selected as the model department for the more in-depth requirements analysis and competence profiling (Ottersböck 2020).

2.4.     Approach for Analyzing Competence Needs in the Sales Department

The task requirements analysis in AnGeWaNt is designed to identify which competencies the workforce will need in the future to be able to implement the hybrid

business models in a successful manner. For this purpose, it is necessary to anticipate future changes in their work system through the implementation of new business models. A key success criterion for a successful analysis is therefore that the employees have a comprehensive understanding of the new business model and be able to understand its value for the company and their customers. Various methods can be taken to reach employees from all departments in a way that is appropriate for the individual target group. For example, the companies in the project involved employees and executives from different departments in the development of the hybrid business models. Therefore, they organized workshops and cross-company events or asked for feedback about the results after each development step. In addition, team, and divisional meetings as well as regular contributions on the current development status in the company's own newsletter or by e-mail served to inform the workforce. To share information and for networking purposes, the company also organizes company event days where employees can inform themselves about the status of activities from other departments at theme tables. A company has developed a fictional success story or a so-called vision for publishing their hybrid business model, which is now used to inform employees from different work departments about the new, hybrid business model. This story and a published video interview with the companies' project manager about AnGeWaNt can also be used for marketing purposes once the hybrid business model is launched (Figure 7) (Ottersböck/Frost 2021):



Figure 7: Communication tools and methods used in the AnGeWaNt project to inform the workforce about the projected hybrid business models (Ottersböck/Frost 2021)

The task analysis tool TAToo from Koch & Westerhoff 2019 served as the basis for the requirements analysis in the sales department of the AnGeWaNt-companies'. The analysis manual described in TAToo was adapted and expanded to address the aspects of digitalization and hybridization in AnGeWaNt. TAToo offers guidelines for conducting requirements analyses in different ways, for example, as an interview, an observational interview during work, or in a workshop format with several participants. The choice of format depends on the operational framework conditions and the employees' daily work routine. Since the employees in the sales department work nationwide mobile and are rarely on site in the company, the analysis was realized by telephone interviews and a workshop in digital form.

In the first part of the interviews, the participants answered questions about their current tasks, activities during their workday and the needed competencies, therefore. In order to get an accurate picture of the current scope of tasks in sales, the participants were requested to describe challenging situations that they had successfully mastered in the past and which competencies they need to handle these challenges (based on Koch & Westerhoff 2019). In addition, interaction to other departments were analyzed.

In the second part of the interviews, the focus was on anticipated changes to the work in sales due to the future planned implementation of the hybrid business models. The following Figure 8 shows an example of the structure of the interviews for identifying competence requirements for successful hybridization:
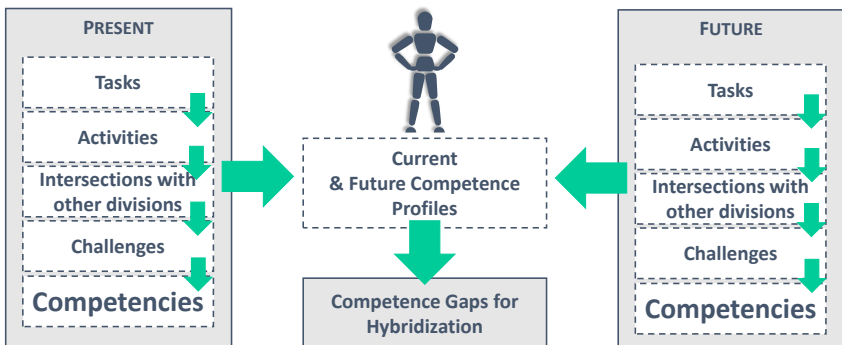


Figure 8: Exemplary representation showing the structure of the requirements analysis for the identification of competence gaps for hybridization (Ottersböck/Frost 2021 modified) (topics based on Koch & Westerhoff 2019)

The results gained from the interviews were used to identify the main working activities in the sales departments of the companies. For each work activity, the information from the interviews outlined activities, interfaces, challenges, and the necessary competencies in the present and in the future. The comparison made it possible to identify competence gaps and thereby also necessary future work skills. These results were illustrated in form of presentation slides for a following virtual

half-day consolidation workshop, which took place with all employees from the sales department. This workshop was intended to complete and concretize the results and ultimately to confirm them. The consolidation workshop is only necessary if the previous analysis was conducted with interviews. The interviews can also be replaced by a one-day workshop with all employees. In this case, the consolidation workshop is not required. Both approaches were piloted in the project. The benefit of the interview variant is that all the employees' perspectives are considered, and a more detailed analysis is provided. The disadvantage is that this method is much more time-consuming, and it must be followed by a workshop to validate the results with all employees in the department. The workshop alternative, on the other hand, is not as time-consuming, but it is also not as detailed, and it is possible that not all perspectives of the employees are covered.

## 2.5.    Exemplary Competence Requirements for Successful Hybridization in the Sales Department

The current sales of products require a comprehensive understanding of the products, technical know-how and specific electrical engineering knowledge from the employees in the sales department. In the future, employees in sales will also be required to sell smart services such as product usage data as well as process data. This requires new competencies such as the ability to analyze complex production processes for diverse customers in order to identify which data is available in the process and can provide customers with information for process optimization (Ottersböck 2020). Furthermore, it is expected that data affinity and a certain level of competencies for data analysis will be required in sales departments in the future. Hybrid smart services can only be offered if customers agree with the collection of production and product usage data. This most likely raises questions about data security precautions in the sales dialogue. Overall, it is to be expected that more technical know-how will be required in the future, for example to explain the installation and functioning of sensor technology, networking systems or cloud services (Ottersböck 2020). The following Figure 9 shows an exemplary, current and at the same time future competence profile regarding professional competencies in the sales department of one pilot company:
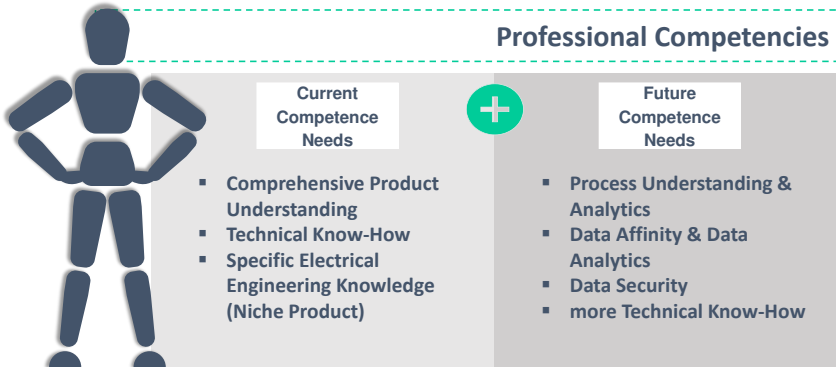
Figure 9: Exemplary, future competence profile for professional competencies in the field sales force of a pilot company (Ottersböck 2020 modified)

## 3.    Approach for Change Management and Competence Building through Hybridization

Digitalization and hybridization are resulting numerous changes in companies. In the project, various activities, as described before, were initiated to shape the changes socio-technically in such a way that they encounter a high level of acceptance among the workforces. This also includes ensuring the development of competencies for the successful implementation of hybridization. Therefore, the employees in the sales department were involved in the development of the business models in a participatory manner. Additionally, they were asked which learning tools they would prefer to develop the identified future work skills. It has become apparent that for the employees from sales especially in the company with a more complex hybrid business model (networked data collection of products beside their original product and smart services), the value of smart services for customers did not yet seem concrete. One reason for that is that at the time of the survey, the business models were still being developed and could not yet be tested and experienced in practice. Employees therefore expressed the need to "experience" the hybrid business model and its value for customers. In addition to increased cross-divisional interaction between the technical and customer-facing divisions, "learning-by-doing", for example in combination with assistance in the form of mentoring and coaching by the application consulting and development departments, has been considered as the preferred methods for building up competence. This is in the case when there will be the requirement to analyzing customers' processes and considering their options for data-based optimization. In addition, a business simulation game is currently being developed that aims to make it possible for employees to "experience" the value of data for customer process optimization. In several rounds of the game, participants will experience

the challenges in working processes and optimization potential offered by real-time data using the simulation of a gravel plant process as an example.

Business simulation games or so-called game-based learning offer a variety of essential education content for a working environment in an interactive and creative way, so that participants can derive significant benefit for their daily work tasks. The AnGeWaNt simulation is designed to help participants experience complex issues such as the optimization of a production process using data, i.e. information in real time, in an interactive setting. This learning concept has a high potential to trigger creative thought processes. The participants actively influence the course of the game with their ideas for improving the process in the respective reflection sessions. This ensures a sustainable internalization of the learning content and the possibility of transferring it to real company processes. Game based learning enhances the participants' awareness of the process as a whole and promotes the "ability to think in contexts" (Franken et al. 2019), which is identified in the study by Franken et al. (2019) as one of the essential competencies in the next five years (Conrad et al. 2021).

The following activities for supporting a successful change process and the development of competencies are considered to be effective in the project (Ottersböck/Frost 2021):

● Informing employees about the project and the progress of the development (information and awareness workshop)

● Involvement and participation of employees in the development and design of the business model

● Strengthening the interaction between the technical work departments (especially IT and development) and the customer-related areas (especially sales, service, and application consulting)

● Mentoring, cross-departmental teamwork, coaching by the application consulting and development departments

Specific learning tools are for example:

● Optimization by means of product usage and process data in real time using a simulation game respectively game based learning

● Classroom or online training on data security and data protection

## 4.    Conclusion and Outlook

The work environment is characterized by digital technologies and rapid change. This confronts companies and their employees with numerous of challenges. To constantly adapt to new circumstances requires a high degree of flexibility, learning ability, creativity, curiosity, and willingness to change, as recent studies on competence requirements show (Kirchherr et al. 2018; Blacke and Schleiermacher 2018; Eilers et al. 2017). Digitalization and the establishment of hybrid, data-driven business models are causing changes in tasks, work equipment, the work environment, as well as collaboration and teamwork (Ottersböck et al. 2020). This requires new and modified competencies in companies. Continuous development of skills was already seen as necessary by around 78% of the 7,109 employees questioned in the "Linked Personnel Panel", a survey of companies and their employees, in 2015 (Bundesministerium für Arbeit und Soziales 2016).

The results of the requirements analysis in the sales area in AnGeWaNt have shown that hybridization is accompanied by new demands for employees. Requirements analyses for planned hybridization projects presuppose that the hybrid business idea is at a mature, concrete stage and that implementation has been planned in detail. The basis for this is also comprehensive information of the workforce about the planed hybrid business models. This is important to enable employees to imagine future work scenarios that will be associated with hybridization and the resulting changes in their work fields. A fictitious success story or vision of the execution of the hybrid business model can be support this process and also contributes to the concretization of the business idea during the elaboration. The business simulation game, which is currently being developed, is intended to make a significant contribution to ensuring that employees in sales and other departments experience the value of networked data collection for process optimization. It is assumed that this understanding can contribute significantly to a successful sale of smart services.

In addition to the analysis and measures in the sales departments, the potential of cross-company cooperation to handle digitalization and competence development in the service departments of the companies is currently being examined. In the future, there will also be an increased demand for new competencies in the service areas. An example are new remote services and the support which customers need to deal with the data platforms.

# Acknowledgments

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