

Lisa Meyne

The Complexity of Vocational Education and Training Services: A Survey Instrument

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The Complexity of Vocational Education and Training Services: A Survey Instrument

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**Findings from the accompanying scientific research of the BMBF funding line
"Internationalization of Vocational Education and Training" (wb-ibb)**



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Zusammenfassung

Der vorliegende Beitrag befasst sich mit der Komplexität von Berufsbildungsdienstleistungen im internationalen Kontext, welche bislang in der internationalen Berufsbildungsforschung kaum thematisiert wurde. Um die Komplexität dieser Art von Dienstleistungen zu erfassen, wird ein geeignetes Erhebungsinstrument benötigt. Im Rahmen des vorliegenden Beitrags wird das Komplexitätsbewertungsmodell nach Blockus herangezogen, welches sich auf den Input, die Potenziale und den Output von Dienstleistungen konzentriert und bislang vor allem im Kontext der Wirtschaftswissenschaften Anwendung fand. Dieses Modell wird für den Rahmen internationaler Berufsbildungsdienstleistungen angepasst und um eine neue Komplexitätsdimension mit drei dazugehörigen Komplexitätsausprägungen erweitert. Das so entstandene Modell wird anhand von neun Projekten aus der Förderrichtlinie "Internationalisierung der Berufsbildung" (IBB) des Bundesministeriums für Bildung und Forschung (BMBF) validiert, welche sich u.a. mit der nachfrageorientierten Entwicklung und modellhafte Implementierung von Aus- und Weiterbildungsdienstleistungen für internationale Märkte befasst. Zur Validierung des Modells werden qualitative und quantitative Daten der neun ausgewählten Projekte der IBB-Förderrichtlinie in Form einer Sekundäranalyse herangezogen und anhand von Dokumentenanalysen und qualitativer Inhaltsanalysen ausgewertet. Zusammenfassend ist fest zu halten, dass das Komplexitätsbewertungsmodell, welches um die Dimension der Transferkomplexität ergänzt wurde, für die Bewertung und Erhebung der Komplexität im Kontext internationaler Berufsbildungsdienstleistungen geeignet ist, zusätzliche Validierungen und Anpassungen des Modells im Rahmen weiterführender Forschung jedoch erforderlich erscheinen.

Abstract

This paper focuses on the complexity of vocational education and training (VET) services in an international context, a novel concept up to the present. To capture the complexity of this kind of service, a survey instrument adequate for the purpose is needed. Therefore, the complexity assessment model based on Blockus is used, which focuses on the input, potentials, and output of services. This model was adapted for international VET services and supplemented with a new complexity dimension with three associated complexity forms. The resulting model was validated with reference to nine projects from the funding line "Internationalization of Vocational Education and Training" (IBB) of the German Federal Ministry of Education and Research (BMBF), which addresses, among other subjects, the demand-oriented development and model implementation of education and training services for international markets. In order to validate the complexity assessment model, qualitative and quantitative data regarding the nine selected projects of the IBB funding line will be used in the form of secondary analyses and analysed by using document analyses and qualitative content analyses. In summary, the complexity assessment model, which is supplemented by the dimension of transfer complexity, is suitable for assessing and surveying complexity in the context of international vocational training services, but requires additional validation and adaptation in the context of further research.

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1 Introduction

In the present study, the complexity of vocational education and training (VET) services is considered in the context of international projects. Following Hilbig (2019) VET services are understood according to the subsequent definition:

VET services are knowledge-intensive services in which a transfer of knowledge takes place from the VET provider to the respective participant. VET services have the essential characteristics of services (immaterial, intangible, integration of the external factor [...]) and follow the three phases of a service [potential orientation, process orientation and result orientation]. Furthermore, the teaching and learning process is at the core of the VET service and is crucial for the competitive advantage of the VET service provider. (p. 12f; translated by the author)

The typical features of services are thus also characteristic of VET services, with the teaching and learning process central (Hilbig, 2019). However, the complexity of services has thus far received more detailed attention in the context of economics. Thus, there are various empirical and theoretical–conceptual works that deal with the complexity of services (cf. Benkenstein & Güthoff, 1996; Blockus, 2010; Braun, 2016; Burianek et al., 2007). Numerous works exist, for example, in the area of complexity management and task complexity (e.g., Benedettini & Neely, 2012; Bosch-Rekveldt et al., 2011; Briscoe et al., 2012; Danaher & Mattson, 1998; Hobday et al., 2000; Liu & Li, 2012; Mikolon et al., 2015; Polese et al., 2014; Topi et al., 2005; Wood, 1986¹). In the context of international VET research, this topic represents a novel concept. Accordingly, the question remains which criteria can be used to determine the complexity of internationally transferred VET services. This question is relevant especially because it can be expected that complexity has an impact on the chances of success of such services. For example, the chances of success of VET services with a high degree of complexity, such as those that intend to have a broad impact with systemic changes through their transfer processes, are usually very low (Stockmann, 2019).

A wide variety of interdisciplinary research fields deal with the topic of complexity, which is why the concept of complexity in the context of economics is briefly described below. Blockus (2010) points out that a definition of the term poses difficulties, especially in the context of economics, since the previous attempts to define it are formulated too generally on the one hand, and on the other hand are too strongly focused on certain sections and thus do not take complexity sufficiently into account. In order to make an approach to the concept of complexity, Blockus (2010) refers to the four aspects: Constitutive characteristics, reference object, forms and effects of complexity. In the prevailing literature, the constitutive features (quantity, variety, variability, and interdependence² [cf. Blockus, 2010]; see Chapter 4) are seen as characteristic of services, as they make the distinction between material products and services particularly clear (Petz et al., 2016). A general definition of *complexity* is not immediately formulable in order to do full justice to the

¹ For a more detailed overview, see the literature review by Braun (2016).

² An evaluation of interdependencies as intersections between the elements for the consideration of complexity is not carried out in the context of the present contribution. It is rather a first approach to the topic in the field of international VET research. In the course of the discussion of the results (see Chapter 6), a first classification of possible interconnections between the forms of complexity is made. Further research gaps are then identified in chapter 7.

complexity of the topic itself. Nevertheless, in order to use a concise definition of the term in the course of this study, the following definition will be used:

The collectivity of all interdependent characteristics and elements that are part of a diverse but holistic set of relationships (system). Complexity is understood as the variety of behavioural possibilities of the elements and the variability of the courses of action. Complexity can be determined by the number and type of elements and their interrelationships. [...] Dealing with complex systems requires a high degree of knowledge about the causal relationships of the system elements (type of interconnect- edness) and the ability to reduce complexity to a few characteristics and patterns (com- plexity reduction). (Alisch et al., 2004, p. 1711; translated by the author)

In order to be able to actually assess complexity, a reference point must be specified whose complexity is to be captured. Complexity in itself therefore only exists in dependence on a system that it attempts to describe. As the system³ to be considered is elected, there is always a certain reduction so that the complexity can be captured (Dernbach et al., 2019). This circumstance is related to a varying degree of internal and external complexity of a system, since the complexity outside a system is significantly higher than in the system itself, which is necessary for a system to function at all (Luhmann, 2018). As this paper deals with the complexity of VET services, "complexity in service enterprises [...] (is) defined as an attribute of the system 'service provider', which is reflected in the quantity, variety, interde- pendence and dynamics of service potentials, processes and outcomes." (Blockus, 2010, p. 30; translated by the author).

In addition to defining the concept of complexity, it is necessary to consider the topic of transfer in the context of this contribution. The term *transfer* is used in various contexts in VET⁴, in this paper, vocational education and learning transfer is addressed. What is meant here is the international transfer of VET structures, processes, content, and practices from a context of origin to a target context (Frommberger & Baumann, 2019; Gessler, 2019). With regard to the assumption of the extent to which the transfer of the German dual training system is possible internationally in principle, different positions exist in the debate. While one side argues that a transfer of the dual system is not possible due to a multitude of preconditions (see, among others, Burgt et al., 2014; Greinert, 2013; Münk, 2017), the other side holds the view that a transfer can certainly succeed with appropriate adaptation of structures, processes, contents, and practices (see, among others, Bliem et al., 2014; Euler, 2013; Gessler, 2020; Pilz, 2016; Stockmann, 2013). Which aspects should and can be transferred to another country is intensively discussed in international VET research, as the transferred components of dual VET need to be adapted to the demands and needs of the target country (Euler, 2013).

Since this study considers the complexity of VET services in an international context, the transfer phenomenon must be taken into account, as it can be expected that certain factors of transfer influence service production and delivery. It can be expected that the transfer process of an initial VET service is significantly more extensive and thus more

³ In the context of this paper, international VET services are considered here as a system of selected funded programs of international VET cooperation.

⁴ Learning transfer occurs, for example, when what is learned by an individual is transferred by that person to a working area and applied there for a period of time (Baldwin & Ford, 1988; Gessler, 2012).

complex than that of a continuing⁵ VET service in general. The reason for this is, among other aspects, the longer duration of the educational service, as well as the accompanying necessary adjustments to the target context and the more extensive state regulations in VET. In the course of this, it can be expected that the complexity of the service has an impact on the transfer process. The complexity of the transfer process, along with the various factors that condition it (Toepper, 2021), may also have an influence on the complexity of the service⁶. The question thus arises as to how the complexity of vocational training services can be adequately captured. Wiemann et al. (2019, p. 16; translated by the author) mention the "complexity of vocational education or different training activities in the respective countries" and thus refer to "the specificity of vocational education as an object of study" (Wiemann et al., 2019, p. 16; translated by the author), which "is characterized by a high degree of complexity" (Chen et al., 2021, p. 16). The complexity issue is already present in VET research and can be considered in terms of different facets at the micro, meso, or macro level.

The aim of this paper is to consider the complexity of vocational training services by further developing a survey instrument for the special context of VET services, which are to be transferred into another target system. In the context of this, the meso level is thus addressed, as the research objects are projects that aim at the transfer of elements of the meso level. In the following, a generic model for capturing the complexity of VET services is developed, which does not refer to a specific target context and is therefore not limited to a particular country setting, resulting in a reduction of complexity as described above. The foundation of the considerations is the complexity assessment model according to Blockus (2010), which is used as a basis for the classification of complexity in the context of the present study. The model was developed according to the characteristics of services, in which Blockus (2010) includes three dimensions: *Potentials*, *processes*, and *outputs*. In the context of educational transfer, the input, processes, and output of the transfer phenomenon are also considered (Peters, 2019). The application of Blockus' (2010) model as a basis for the development of the survey instrument is therefore useful⁷, as the three dimensions show strong overlaps with the factors considered in the transfer discourse of international VET. In the context of this study, the following research question is addressed: *Which adaptations or extensions of Blockus' (2010) complexity assessment model are necessary to adequately capture the complexity of VET services in the context of international VET transfer?* Thus, in the course of the paper, a reduction in the complexity of the VET service system takes place via simplification by narrowing down the complexity phenomenon to fixed dimensions. To assess the complexity of VET services, possible influencing factors resulting from the transfer process are thus included, since it can be expected that these influence the complexity in

⁵ The term continuing VET also refers to the term of further VET in the following course of the article.

⁶ In addition to the complexity of the service to be transferred, the complexity of the context also plays a central role. Since the service is located in a specific educational system, the politics and culture of the system of origin as well as the target system influence the development and implementation of the service. The complexity of the context will not be discussed in the following.

⁷ A more detailed explanation of the selected model, including a comparison of other research, is provided in section 4.

the specific case of the educational service. The already existing model of complexity assessment, according to Blockus (2010), is extended in the context of the present contribution so that a fourth dimension—*transfer complexity*—will be added to the model.

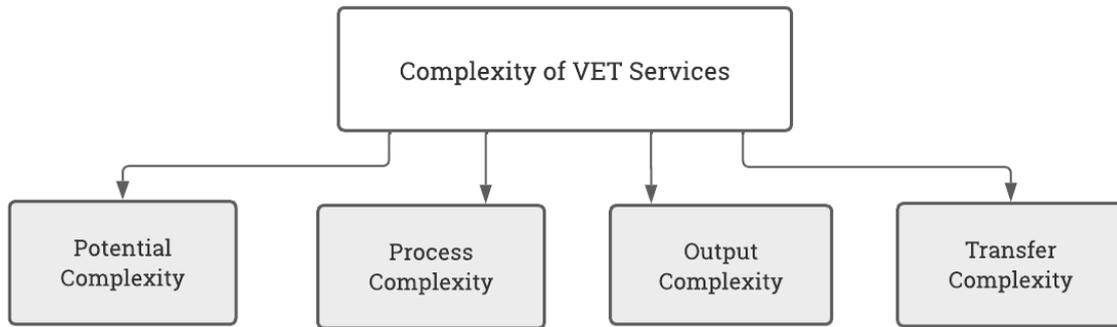


Figure 1: Dimensions of Complexity of VET Services (own compilation following Blockus, 2010)

The resulting model for assessing the complexity of VET services (see Figure 1) is then tested for applicability in the field using selected projects from the funding line of the German Federal Ministry of Education and Research (BMBF) regarding the internationalization of VET. Kühn (2021) further states, in reference to the BMBF funding line, that the included projects have reduced service complexity compared to previous projects of the same project actors due to market focus strategies. However, it remains to be evaluated how the complexity of such services can be captured.⁸

⁸ An investigation of the cost and benefit effects of service complexity, as conducted by Blockus (2010), was not carried out in this article due to its focus on transfer.

2 Previous Research on Transfer

The topic of VET transfer has been discussed for several years, both politically and academically, and the debate seems to be growing more intense. In the context of the internationalization of VET, the terms *export* and *transfer* can be distinguished in the discourse (Geiben, 2017). In part, the terms are used synonymously, but at their core, they have a different conception of how VET services can, or should, be transferred to another target context (Geiben, 2017). While the term *export* is often equated with a transfer of structures, processes, contents, and practices without any form of adaptation, the term *transfer* aims at the fact that a transfer cannot be successful without an adaptation to the target context. Despite existing scholarly efforts, a comprehensive definition of educational transfer in the VET context is challenging as the transfer phenomenon itself seems to be particularly complex. Following Perry and Tor (2009), Gessler (2019) points out that "VET transfer or 'educational transfer' can [...] be conceptualized as a transfer of VET ideas, structures, and practices from one place to another. The unit of study can be countries, regions, cities, or even institutions" (p. 232; translated by the author). As mentioned in the definition, different levels of transfer can be distinguished in the international context, so that transfer can be thought of as a "multidimensional process" (Tonhäuser & Bückner, 2016, p. 151). Thus, transfer can occur at the local, regional, and national levels. Here, the three levels are centrally connected to the contents, which are to be transferred on these. The transfer of system elements is particularly preferable on the national level, the transfer of special training offers on the local level, and the transfer of individual projects on the regional level, for example, due to the inclusion of regional networks. Transfer in the VET context can thus be distinguished in the micro, meso, and macro levels (Geiben, 2017). Li and Pilz (2021) emphasise the importance of the issue of transfers of vocational education and training systems in the current research debate on the macro-level of the transfer topic (Allais 2010; Davoine and Deitmer 2020; King 2014; Maurer and Gonon 2014; McGrath 2002; Valiente and Scandurra 2017) and also refer to a variety of definitions of the term itself. Furthermore, Pilz (2017) identifies that the macro level addresses the elements of stakeholders and funding, while the meso level⁹ considers aspects such as curriculum, institutions, certification and teaching staff. The micro level is meant to outline the concrete teaching and learning.

Even though, a comprehensive coverage of the term "transfer" in the context of VET is challenging as the phenomenon of transfer seems to be particularly complex. Nevertheless, a brief description of several central concepts of transfer in VET is given in the following. The term *policy transfer* is used at the national level, whereby the terms *policy borrowing* and *policy learning* can be distinguished. *Policy borrowing* increasingly refers to the transfer of best practice examples, while *policy learning* focuses on national adaptation (Geiben, 2017; Steiner-Khamsi, 2004). With regard to the issue of *policy borrowing*, it can be observed that research points in two directions: "One group of researchers actively advocates for policy borrowing and the other group is interested to understand when, why, and how policy borrowing occurs" (Steiner-Khamsi, 2014, p. 154). Addressing actors, processes and impacts of policy change continues to occur in the context of policy learning related to national

⁹ In the present paper the meso level is considered, as the research objects are projects aiming at the transfer of meso level elements.

macro-level adaptation (Geiben, 2017; Phillips & Ochs, 2003; Raffe, 2011; Steiner-Khamsi, 2010). The transfer of educational structures, curricula, and best practices, which can generally be summarized under the term *policy transfer*, has been taking place in an international context between a wide variety of countries for 40 years (Barabasch & Wolf, 2011). In the course of VET transfer research¹⁰, practice-based, theoretical and research-based studies can be found, whereby the scientific bandwidth is narrow, especially with regard to empirically validated results (Wiemann et al., 2019). While the focus of empirical work in transfer research can be located predominantly at the macro level (cf. e.g., Barabasch & Wolf, 2011; Bliem et al., 2014; Euler, 2013; Lewis, 2007; Stockmann, 2019; Wolf, 2020), theoretical and empirical studies can be found to a much lesser extent at the meso and micro levels (cf. e.g., Peters, 2019; Pilz & Li, 2014). For example, the question of what factors influence transfer is intensively discussed in the context of transfer in international VET research. Thus, the literature cites a variety of drivers and barriers that have significant impacts on the success of transfer (e.g., Bliem et al., 2014; Fraunhofer MOEZ¹¹, 2012; Gessler, 2019; Gessler et al., 2021; Posselt et al., 2019). In the meantime, studies on VET transfer regarding for example the type of VET-related services are also part of the debate (Hilbig, 2019; Kühn, 2021; Meyne & Peters, 2022). When criteria influencing the success of VET transfer are considered, the model of promoters (Gemünden & Walter, 1996; Hauschild & Chakrabarti, 1988; Witte, 1973), among others, becomes significant. The model was developed in the 1970s and provides a basis for explaining the success of educational transfer (Gessler, 2019). The promoters depicted in the model represent different roles that focus on the areas of expertise, power, process, and relationships that have emerged directly from empirical practice, each performing different tasks in the innovation process. In addition to the question of which factors influence the transfer and are thus decisive for the success of the transfer process, other questions include which different types of transfer processes can be found in the context of international vocational training services and how the adjustments made in the course of the transfer activities can be described. Gessler (2017) addresses this question in the context of a study on the transfer activities of a German car manufacturer in the USA and thus presents one of the first classifications of transfer types in the research field at the level of individual projects. In this respect, the question remains open which factors of transfer affect the complexity of VET services and which aspects of transfer have to be considered in order to adequately address and assess the complexity of VET services.

¹⁰ For an overview of the current state of the literature on the subject of international transfer in VET research, see Li and Pilz (2021) and Toepper et al. (2021).

¹¹ Since 2016 the Fraunhofer MOEZ is called the "Fraunhofer Center for International Management and Knowledge Economy (Fraunhofer IMW)".

3 Research Design and Methodical Approach

To capture and assess the complexity of VET services, a survey instrument tailored to this context is needed. Based on the centrally discussed literature, a theoretical model is drawn upon and adapted to the specific context of international VET transfer, and subsequently validated.

Lincoln and Guba (1985) contrast the notions of internal and external validity in the context of qualitative empirical social research with the terms *credibility* and *transferability* or *applicability*, thus arguing for alternative quality criteria (Kelle et al., 1993). In this regard, Kelle et al. (1993) explain, that in the debate about quality criteria in qualitative social research "strategies for validation and not quality criteria [are] discussed" (p. 19; translated by the author). Thus, Lamnek (2010, p. 144; translated by the author) also indicates that "validation is about trustworthiness, credibility, reliability, and confirmability". On the basis of this, reference is made to the cited notions of credibility and transferability, according to Lincoln and Guba (1985), who describe these as "naturalist's equivalents for the conventional terms" (p. 300), thus emphasizing that the *classical* quantitative quality criteria need alternatives in the qualitative research context. Lincoln and Guba (1985) suggest several strategies to ensure the credibility of qualitative data. According to the authors, one strategy for producing credible results is triangulation: "Triangulation involves taking different perspectives on an object under study" (Flick, 2008, p. 10; translated by the author). In the context of the present study, data and method triangulation as well as theory triangulation are applied, since the data used are from different surveys, which are "combined into one phenomenon" (Lamnek, 2010, p. 142; translated by the author) so that different methods and different theoretical approaches are brought together. To validate the results, Lincoln and Guba (1985) further cite the *applicability* or *transferability* of the findings, describing them as "empirical matter, depending on the degree of similarity between sending and receiving contexts" (p. 297). The methodological approach of the present study begins from this point and provides validation of the applicability of the previously developed model of complexity assessment for international VET services. The similarity of the contexts is given by the fact that for the emergence of the model and in the context of application, it is a matter of services as the object of interest, which show clear similarities in their structure. Methodologically, a two-step process can thus be observed: The further development of the model for international VET services, on the one hand, and the examination of the applicability of the model in the field on the basis of selected cases of the IBB funding line, on the other hand. As a data basis, data from the BMBF funding initiative IBB were examined in the form of a secondary analysis, which were collected as part of the accompanying scientific research¹² (BMBF, 2017). Nine projects of the focus c¹³ of the IBB funding line

¹² The accompanying scientific research project "wb-ibb" (Scientific Monitoring of the BMBF Funding Initiative "Internationalization of Vocational Education and Training") supported the implementation and strategic further development of the BMBF's funding activities for the internationalization of VET through evaluation, research and networking activities. The project was carried out from 2017 to 2020 by the Chair of Vocational and Business Education at the University of Osnabrück and the Institute of Technology and Education (ITB) at the University of Bremen in cooperation with the Institute for Innovation and Technology (iit) Berlin at VDI/VDE-IT GmbH.

¹³ Furthermore, the two other focus of the IBB funding line a) and b) can be mentioned, which refer to a) bilateral exploratory projects on the prerequisites and topics of vocational training cooperation and b) measures for the support and model implementation of bilateral vocational training cooperation.

were selected, which pursued the *demand-oriented development and model implementation of education and training services for international markets* (see Table 1).

Project	Type of VET Service	Sektor
I_1	Further VET (originally initial & further VET)	Logistics, mechatronics and sustainable energy supply
I_2	Further VET	Automotive sector
I_3	Initial and further VET	Environmental engineering
I_4	Initial VET	Automotive sector, metal and electrical engineering
I_5	Further VET	Automotive industry
I_6	Further VET	Education and training sector (intersectoral)
I_7	Initial VET	Port logistics and transport
I_8	Further VET (originally initial & further VET)	Agricultural sector
I_9	Further VET	Manufacturing sector (intersectoral)

Table 1: VET Services and Sectors of the analyzed IBB Projects

The case selection was made according to the most-different-system design, so that the selected cases differ significantly from each other, apart from the aspect already mentioned (Millis et al., 2010). The sample was thus compiled on the basis of a contrasting case selection so that the selected projects of the IBB funding line could be examined in the form of a case-comparative analysis with regard to commonalities and differences that arise. In this regard, Kelle and Kluge (1999, p. 9; translated by the author) write: "The comparison and contrasting of cases is a necessary prerequisite for arriving at a valid and methodologically controlled description and explanation of social structures". Schittenhelm (2009) further states:

When it comes to the transferability or even the claim to generalizability of qualitative research results, a sample does not simply gain in quality through the size of the number of cases. Rather, the decisive factor is which case comparisons and case contrasts are possible on the basis of a given sample. (p. 16; translated by the author)

On this basis, projects that could be distinguished from one another were selected based on certain contextual factors. Clear differences between the selected projects can be noted with regard to the cultural context and the dressed economic sectors in the target countries (see Table 1). All of the analysed projects offer VET services but aim to implement them in different target contexts and economic sectors. The following table shows the data base used, which was collected as part of the accompanying scientific research for the IBB funding line (see Table 2).

Sources	Data Base
Application Form	9
Expert Interviews	9
Business Modell Canvas	9
Online Surveys	2 Surveys

Table 2: Overview of the Analyzed Data Base (own compilation)

The data used comes from two online surveys¹⁴ with the project actors in which data on the funded projects were collected with regard to the implementing organizations, the personnel, the network structures, the kind of cooperation, and the form of foreign activities. These data are supplemented with the respective project descriptions of the nine projects and with results from qualitative, guideline-based expert interviews with collaborative projects, in which data were collected on the project goals, the service and business model development, the developments and needs in the target country, the key partners and activities, and the financing and internationalization strategies of the projects. In addition, the Business Model Canvas (BMC) of the project proposals was consulted, in which the business models are described by the projects on the basis of nine categories (Osterwalder & Pigneur, 2010; for a more detailed overview of the use of the BMC in the course of the IBB projects, see Gessler et al., 2019b). The data were analysed using document analysis and qualitative content analysis according to Mayring (2008, 2016). The expert interviews with the project actors were recorded and transcribed.

¹⁴ The online surveys as well as the qualitative expert interviews were conducted between 2019 and 2020.

4 Complexity Assessment of VET Services

Blockus (2010), and later Bruhn and Blockus (2011), have dealt extensively with the complexity of services. In this regard, Blockus (2010) distinguishes three forms of complexity that occur in the service provider's system. These forms of complexity constitute the *potential*, *process*, and *output dimensions*, which are narrowed down to certain complexity characteristics. The complexity characteristics of quantity, variety, variability, and interdependence were defined by Blockus (2010) for the three dimensions, as these significantly determine the forms of complexity. Since the three dimensions influence each other, they must be considered together to adequately capture the complexity of services. The prevailing interdependencies between the individual forms of complexity illustrate the interconnections among them (Blockus, 2010), which is why "a clear distinction of the three dimensions (is) not always possible" (Blockus, 2010, p. 81; translated by the author). In the following, Blockus' complexity assessment model is described in more detail. Then selected works from the field of complexity assessment are compared. Following on from the justified selection for the use of the model according to Blockus (2010), the extension of the complexity assessment model is discussed in the subsequent section.

4.1 The Complexity Assessment Model According to Blockus

The *potential complexity* forms the first dimension of the complexity assessment model according to Blockus (2010) and is aimed at the resources that a provider must have at its disposal to be able to offer a specific service in line with the existing demand on the market. In this respect, a distinction is made between the four complexity forms of *employee complexity*, *location/branch complexity*, *material complexity*, and *technological complexity* (Blockus, 2010). *Employee complexity* is primarily composed of the large number and diversity of employees involved in the creation of a service. *Location and branch complexity* are to be regarded as the second characteristic of the dimension of the *potential complexity*. Complexity is thus primarily related to the quantity and variety of locations and branches. *Material complexity* is the third form of the dimension that arises from the quantity and variety of services offered. In the context of material complexity, the materials used in the provision of a service are considered. In the case of services, however, the materials often play a supporting role in the provision of these; in contrast to material products, the focus here is usually on the input factor of the employees' work performance (Blockus, 2010). *Technological complexity* forms the fourth and final form of the dimension. According to Blockus (2010), this complexity form refers to the product itself, which is technological, to the complexity of the production systems and/or to the complexity of the supporting systems. Since services in particular exhibit a high degree of immateriality, technologies are increasingly used in the provision of the service and are thus less likely to be regarded as a material result. The complexity form also aims at the variety and multiplicity of the technologies. Blockus (2010) also distinguishes between the technologies used in terms of whether they are directly involved in the provision of the service or merely support it and thus make an indirect contribution to the provision of the service.

A service is created by combining a wide variety of activities and, thus, processes that are necessary to provide the service. *Process complexity* represents the second dimension of

the model. Thus, how the performance of these activities is accomplished so that a certain service results at the end is analysed. To assess the complexity of the processes, an analysis of the *performance, support, and customer processes*, as well as *task* and *external factor complexity*, are provided within the dimension (Blockus, 2010). The *performance, support, and customer processes* form the first complexity form of the process dimension. Service processes are defined as those processes that have a direct relationship to service provision. The support processes, on the other hand, have an indirect connection to the services provided as they only make a supporting contribution to the direct service processes. Blockus analyses the performance, support, and customer processes with regard to their quantity, variety, variability, and interdependencies. In addition to the quantity of such processes, heterogeneity is also important (Blockus, 2010). *Task complexity* then constitutes the second form of the dimension, which is intended to capture the complexity of individual activities that leads to the processes of the first form of complexity of this dimension. A distinction is made between the objective and subjective complexity of the tasks, since individual tasks depend to a large extent on how individual employees assess them (Blockus, 2010). In the context of the process complexity of services, Blockus refers to the complexity of external factors. The external factor describes the integration of the customer into the provider's processes for creating the service (Blockus, 2010).

The third dimension of the model is the *complexity of the outputs*, which consists of the *service program complexity*, the *service complexity*, and the *complexity of the customer structure* (Blockus, 2010). *Service program complexity* is produced by the number of different services offered by a provider. This is also classified according to the characteristics of quantity, variety, variability, and interdependence. The quantity of the service program is expressed by the number of different service categories offered, while the diversity results from the different variants of these categories. If an adjustment to the service program becomes necessary due to various causes, this is reflected in the variability of the complexity form. If certain service categories or variants are combined, interdependencies between them arise (Blockus, 2010). *Service complexity* refers to the concrete design of the service in the variant, as it is ultimately provided to the customer. Complexity is assessed based on the number and variety of individual sub-services. Depending on whether the service result has to be adapted according to customer requirements, the variability of the complexity form is mapped. Interdependencies arise when the various partial services overlap (Blockus, 2010). The third complexity form of output complexity is *customer structure complexity*, which aims at the set-up of the customer base. Suppliers have to decide how large their customer base should be, which means that the market itself and the respective market segments must be defined. If several customer groups are addressed at the same time, the complexity of the customer structure rises¹⁵.

4.2 Comparison of Selected Works on Complexity Assessment

In addition to Blockus' (2010) complexity assessment model, there are other economic models for classifying the complexity of overall service, so selected theoretical and empirical works are thus compared. In this respect, the theoretical work of Benkenstein and Güthoff

¹⁵ For an overview of the complexity dimensions, see section 4.3, figure 2.

(1996) "Typologization of Services" and, building on this, the "Typologization of Hybrid Products"¹⁶ by Burianek et al. (2007) are mentioned. The empirical work of Braun (2016), "Complexity of internal services"¹⁷ is, together with the work of Blockus (2010), one of the few empirical works in this field.

A comprehensive examination of service complexity that considers the effects of complexity is provided by Blockus (2010) and Braun (2016). Blockus (2010) empirically verifies selected sub-aspects of his complexity assessment model, while Braun conducts several empirical studies to validate her theoretical approach to measure the complexity of internal services. The resulting model of Braun (2016) are conceptually close to the existing literature in the research field and thus, in some aspects, resemble Blockus' (2010) assessment model. The work of Burianek et al. (2007) and Benkenstein and Güthoff (1996) does not include an operationalization of the complexity characteristics. The following table provides an overview of the four approaches to assessing complexity (see Table 3)

Authors & Year	Short Title & Approach	Complexity Dimensions & Forms	Constitutive Characteristics
Benkenstein & Güthoff (1996)	Typologization of Services, theoretical	2 dimensions: Performance characteristics of services, personality characteristics of the demander 7 forms of complexity: Number of partial services, multipersonality, heterogeneity of partial services, length of service provision, individuality of service, perceived risk, involvement	Quantity, variety and variability
Burianek et al. (2007)	Typologization of hybrid products, theoretical	No dimensions. 7 complexity characteristics: Type of customer benefit, scope of service offering, number/heterogeneity of sub-services, degree of technical integration, degree of integration into the customer's value domain, degree of customization, temporal dynamics/variability of service delivery	Quantity, variety, variability and dynamics

¹⁶ In this context, a hybrid product is understood to be the combination of goods and services to form a service package (Burianek et al., 2007).

¹⁷ The frame of reference here is "the perceived complexity of internal services by internal customers" (Braun, 2016, p. 37; translated by the author).

		3 dimensions: Potential complexity, process complexity, output complexity	
Blockus (2010)	Complexity of service compa- nies, empirical	10 complexity forms: Employee complexity, location/branch com- plexity, material complexity, Technological complexity, Service, support & customer pro- cess complexity, task complexity, complexity of the external factor, service program com- plexity, service complexity, complexity of the customer structure	Quantity, variety, variability and Interdependence
Braun (2016)	Complexity of internal services, empirical	4 dimensions: Variety, diversity, interdepend- ence, and dynamics (constitutive features are used as dimensions of complexity). No forms of complexity.	Quantity, variety, interdependence and dynamics

Table 3: Selected Scientific Papers on Complexity Assessment (own compilation)

In the centrally discussed literature in this field, quantity, variety, interdependence, and variability are noted as important characteristics of complexity (Benkenstein & Güthoff, 1996; Blockus, 2010; Braun, 2016; Burianek et al., 2007). However, if the characteristics are named differently, with minimal distinctions across the theoretical and empirical works, the categories for assessing complexity target the same aspects. The characteristics of quantity and variety are considered in all theories cited to classify the complexity of services. Contrary, the interdependencies between the elements considered in the system of the service are not explicitly examined. Benkenstein and Güthoff refer to the interdependencies between the established dimensions (Benkenstein & Güthoff, 1996), as do Blockus (2010) and Braun (2015). Burianek et al. (2007) mention that the overlaps between complexity dimensions are not considered in their model.

The theoretical work of Burianek et al. (2007) differs essentially from the work of Benkenstein and Güthoff (1996) in that they understand the dynamics or variability of service provision as a complexity feature in the typologization of hybrid products and thus introduce a temporal component into the model. The variability is also considered in the theoretical models of Blockus (2010) and Braun (2016), while this feature of complexity is not considered only in the theoretical model according to Benkenstein and Güthoff (1996). However, Benkenstein and Güthoff state that the complexity characteristics presented can be supplemented in the future with regard to further characteristics.

Scientific works that deal explicitly with the complexity of VET services were not found at the time of the investigation. In terms of assessing the complexity of VET services, no theoretical model has been designed specifically for this type of service. Therefore, there is little to no corresponding research in this area. Subsequently, Blockus' theoretical model provides a comprehensive view of service complexity as it maps the phenomenon of complexity in multiple ways by considering the three dimensions, 10 forms of complexity and constitutive characteristics (Blockus, 2010), so that this also appears to be suitable for the context of international VET services.

4.3 Further Development of the Complexity Assessment Model

To take the complexity of VET services into account, further aspects must be included in the complexity assessment model, which is why the model requires expansion. Thus, a new dimension is added to the model, which is referred to as *transfer complexity* in the following sections. This dimension aims to capture complexity in the particular case of VET services, thus including contextual factors of transfer in the model. The dimensions of potential, process, and output complexity already cited remain in their original form and continue to be considered according to the constitutive characteristics mentioned by Blockus (2010). As already noted in the section on *transfer*, the type of transfer and the various promoters play an important role in the transfer process. The set targets of the projects are also crucial, as they show, among other things, at which level the project is to be located with its implementation in the target country. Because of this, the complexity forms *target complexity*, *transfer-type complexity*, and *promoter complexity* are included in the model (see Figure 2). Moreover, the constitutive characteristics are considered as well in the new dimension of *transfer complexity*.

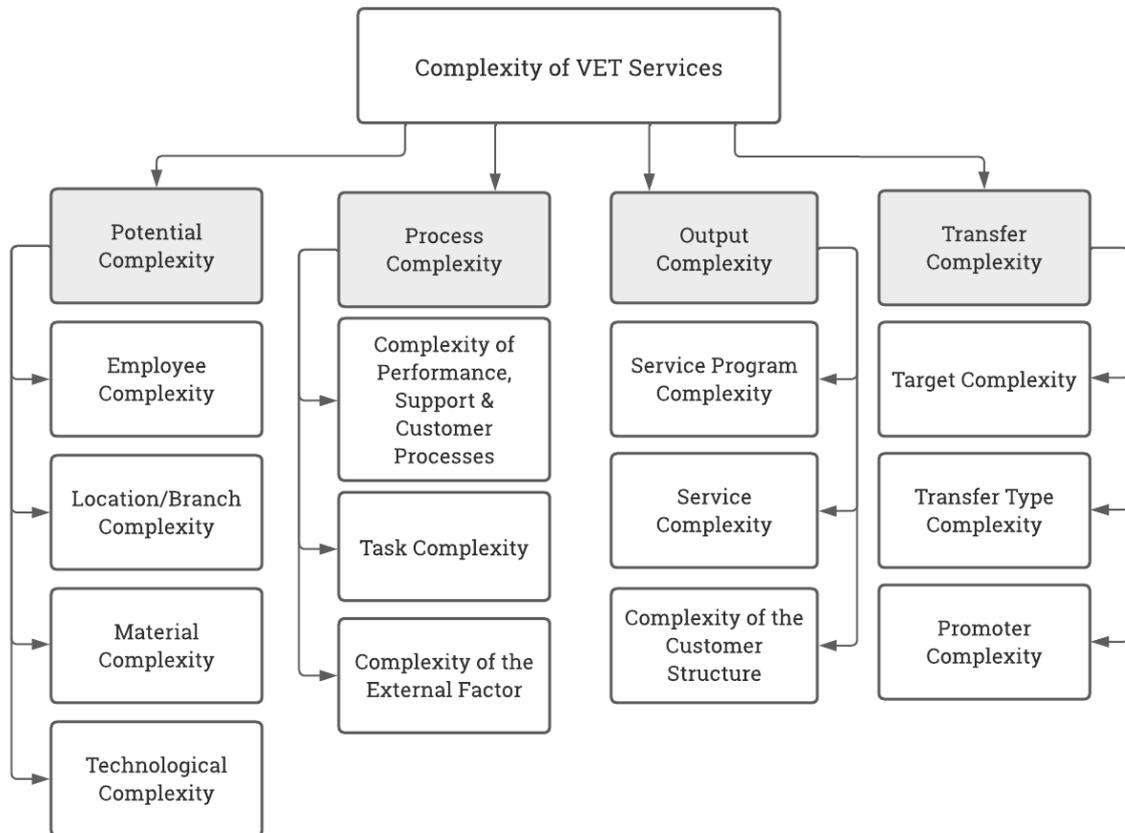


Figure 2: Dimensions and Forms of Complexity of VET Services (own compilation following Blockus, 2010)

*Target complexity*¹⁸ is included in the model as a form of *transfer complexity*, since the service itself becomes more complex depending on whether the project target aims at the local,

¹⁸ Target complexity is also described in brief by Blockus (2010), which refers in his work to the consideration of multiple targets at the same time from a company-internal perspective. The complexity form is not included within the complexity assessment model of the author.

regional, or national level. For example, Stockmann (2019, p. 156; translated by the author) indicates "In this regard, projects and programs that sought fewer goals, relative to their goal profile, tended to be more successful than those with a large number of goals". The author thus targets whether the respective projects aim for broad impact and systemic change (Stockmann, 2019). In the context of *target complexity*, the goals to be pursued with the project plan, how diverse these are, and which changes and adjustments to the goals appear necessary over the duration of the project must be considered, for example, adjustments due to changes in the needs in the target country.

Three transfer types are mentioned by Gessler (2017). The author deals with this topic in the context of a study on the transfer activities of a German automotive manufacturer in the USA. In the context of the transfer types, it is considered how the transferred VET structures, processes, contents, and practices are to be classified in terms of whether an *imitation*, an *adaptation* or a *transformation* of the original model has been undertaken (Gessler, 2017). The transfer of identical structures, processes, content, and practices can be characterized as *imitation*, the transfer of similar aspects as *adaptation*, and the transfer of structures, processes, content, and practices that differ significantly from one another as *transformation* and thus innovation. The transfer types each illustrate a different degree of orientation to the target system (Gessler, 2017). Based on the transfer types, an understanding of transfer in terms of a continuum becomes clear, as proposed by Gessler and Kühn (2019). The transfer types are to be included in the theoretical model as a form of complexity, as it is anticipated in the context of the article that the complexity of VET services is influenced by the transfer type and the adaptations to the target context that this requires. It can be understood that *imitation* involves a lower level of complexity than *transformation*. *Adaptation* could possibly be located between the two types in terms of complexity. Thus, for *transfer type complexity*, the involved transfer type and the degree of adaptation associated with it in the course of the transfer activity are examined.

The third form of complexity listed in the model is the *promoter complexity*¹⁹. The promoter model can first be traced back to Witte (1973), who developed the original model with the two promoter roles of the *expert promoter* and the *power promoter*. Following this, Hauschild and Chakrabarti (1988) added the role of the *process promoter* based on a comparative study. The fourth role in the promoter model, the *relationship promoter*, was added by Gemünden and Walter, who confirmed it using two empirical studies related to cross-border business relationships (Hauschild & Gemünden, 1999). The basic idea of the promoter model represents the view that promoters, due to suitable resources, are able to overcome occurring barriers in the innovation process, which has a promising effect on implementation (Gessler, 2019). In this context, different promoter roles can be occupied by the same person under certain circumstances (Peters & Gessler, 2019). The *power promoter* is characterized by their hierarchical potential, which enables them to pronounce appropriate sanctions on opponents when necessary (Witte, 1999). The *expert promoter* brings in technical expertise, which means that they usually have no significant hierarchical power, but due to technical knowledge, they have strong argumentative power toward the opposing party

¹⁹ To classify the *promoter complexity*, the present analysis examined the project partners of the IBB project networks as promoters so that the promoter roles of the origin system (Germany) were considered.

(Witte, 1999). The *process promoter* combines the expert and power promoters and thus possesses communicative skills to, among other things, transform ideas into an action plan (Hauschild & Chakrabarti, 1999). The *relationship promoter* brings the involved interaction partners together and thus facilitates a dialogue between them (Gemünden & Walter, 1999). In the context of this study, promoter roles, among others, are used to assess the complexity of VET services. In the context of VET services, promoters in both the origin and target systems play a crucial role in whether transfer succeeds, is unnecessarily complicated, or even fails (cf. Gemünden & Walter, 1996; Gessler, 2019; Hauschild & Chakrabarti, 1988; Witte, 1973). Thus, to assess the complexity of VET services, existing promoters must be included. In the context of the complexity form, how many promoters are actively involved and which promoter roles are represented are addressed. Furthermore, it is relevant which changes and adjustments occur with regard to the roles, for example, due to the fluctuation of important persons. Overlaps between the promoter roles are also of interest, since, as has already been pointed out by Peters and Gessler (2019), different roles can also be performed by the same person. In conclusion, the resulting model for assessing complexity comprises four dimensions and 13 forms of complexity, based on Blockus (2010).

5 Validation of the Model in the Context of International VET Services

The theoretical model for complexity assessment according to Blockus (2010), including the new dimension of *transfer complexity*, is subsequently empirically validated with regard to its applicability for VET projects in an international context. Regarding this, factors of transfer that influence the complexity of the service are included. It can be expected that the complexity of the service itself affects how the transfer is subsequently carried out (see Kühn, 2021; Stockmann, 2019). In the following, nine projects of the IBB funding line are thus analysed with regard to the four described dimensions with their respective forms of complexity. In the course of the project analysis, it became clear that the majority of the analysed projects offered further VET services. Thus, four of the nine projects developed further VET services (I_2, I_5, I_6, I_9), two projects focused on initial VET services (I_4, I_7), and two projects pursued the goal of offering both at the beginning but switched to further VET services in the process (I_1, I_8). In contrast, project I_3 pursued initial and further VET over the entire project period (see Table 1).

5.1 Analysis of the Input Dimension

The first complexity dimension refers to the potential for service production (Blockus, 2010), to the input for the development of the VET service to be transferred. *Employee complexity* is the first form of complexity of the input dimension. It can be seen that the number of employees involved in the creation of the service varies greatly across the project networks. The lowest number of employees was found in a project network with five persons (I_7), while the highest number of employees in two projects were 19 (I_2, I_6). For the other project networks, the number of employees ranged between nine and 14 (I_1, I_3, I_4, I_8)²⁰. The number of new hires per project network also varied among the projects between one (I_3) and nine employees (I_2). Project staff members who spoke the language of both the origin and the target countries played central roles in the project. Changes and adaptations of staff occur, especially due to the fluctuation of employees. Major changes also occur when contact persons in the target country change (I_3), which is not uncommon, especially at the national level.

Location complexity forms the second complexity form of the dimension. It should be emphasized that this complexity form varied greatly regarding the activity of the IBB projects in the target countries. The term "*location*" must therefore be understood in a broader sense. Forms of presence in the target country are described as an office on site with employed staff (I_8, I_9), support by a partner institution on site (no own office; I_3, I_5, I_6), and already existing education and competence centres in the target country (I_1, I_4, I_7). One project can operate without an explicit office in the target country (I_2), as the relevant partners are all located in the same place so that a point of contact is to be established for support. Only three out of nine projects had no current or planned offices in the target country (I_3, I_5, I_6).

²⁰ For projects I_5 and I_9, no data is available for employee complexity due to missing information from the online surveys.

The *material complexity* of the dimension could not be classified in the project analysis due to the nature of the projects since a component of all projects of the focus c of the IBB funding line is the identification of suitable materials for the provision of the educational service. Consequently, the materials created for the projects analysed were not yet available in the final versions at the time of the study. Furthermore, access to the available materials for the IBB projects was not given, so an evaluation regarding their complexity was not possible. Since VET services of this kind are generally not yet fully available in the target markets, suitable teaching and learning materials must first be identified, which usually require intensive translation activities that increase the complexity of the creation of the materials. The increased use of learning platforms will require special revision and adaptation of the materials to the target context, which may be intensified under the prevailing conditions of the pandemic.

The *technological complexity* of the projects is particularly evident in the marketing of educational services, communication, and teaching. Technologies are increasingly used for communication between collaborative partners, as there is often a great distance to be bridged between them due to the international nature of the projects. Some projects have a much stronger technology relation than others, especially regarding the use of technology in teaching. Six of nine projects used technology in teaching, so e-learning was implemented in the form of a blended learning concept by combining online and presence teaching and learning (I_1, I_2, I_4, I_6, I_7, I_9). Virtual exchange platforms for communication and information exchange with project partners were also explicitly mentioned by six projects (I_1, I_3, I_4, I_7, I_8, I_9). Among other things, knowledge management was supported by forums, wikis, or blog contributions. For the analysed IBB projects, technologies were to be understood not only as a means of service provision, but also as a service output to be developed and marketed in the course of projects. Changes in the complexity dimension became visible when, for example, the use of certain platforms and software proved to be ineffective, so that it was necessary to switch to other technological options, or completely new technologies enabled new implementation options.

5.2 Analysis of the Process Dimension

The first complexity form of the process dimension includes *performance, support, and customer process complexity*. Service processes are those demanded by the customer (Blockus, 2010). Relating to the nine analysed projects, the developed VET services represent the demanded service processes. The projects of the focus c of the IBB funding line tie in with this point, as they deal with the demand-oriented development and implementation of VET services, thus establishing a direct link to the demand in the target country. In the context of the *complexity of customer processes*, the communication between customers and providers is discussed in more detail. Regular meetings with all stakeholders so that partner companies in the target country were also actively involved in the projects were seen by seven of the nine projects as a central aspect of communication with customers. Above all, communication with potential customers occurred via websites but also partly via social networks, so that active work with the press and stakeholders was considered important by the projects. Communication with the respective customers normally took place via visits to the target country. The pandemic has led to severe restrictions in this regard. The complexity of support

processes is aimed at processes that support the creation of a service (Blockus, 2010). In the context of the nine IBB projects analysed, particular reference is made here to political and economic support in the origin and target systems, since this is of great importance for the project process. Partner companies and educational institutions in the origin and target countries also provided support. Depending on the expertise of the collaborative partners, IT support for the development of blended learning concepts is increasingly in demand. The financial support provided by BMBF funding is seen as a central support process for service creation in all nine projects (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9). In the context of *task complexity*, the subjectively perceived complexity of tasks on the part of project employees must be recorded (Blockus, 2010). Due to the limitations of the data, a survey of the complexity form was not possible. Furthermore, it should be noted that a survey of the subjectively perceived complexity of workers might encounter obstacles of social desirability.

The complexity of the *external factor* refers to the customers who are to be integrated into the service-creation processes (Blockus, 2010). Thus, different customer groups must be considered depending on the orientation of the project. For the analysed projects (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9), colleges or universities, schools, associations, employees, teachers, students, trainees, experts/specialists, companies, educational institutions, relevant networks in the origin and target country, governments, and chambers of commerce are to be included as external factors. Thus, the complexity of the external factor is partly congruent with the customer structure complexity of the projects. In contrast to the latter, a significantly larger number of possible external factors must be integrated into the creation of services. Challenges arise, for example, in part in the acquisition of participants in VET services and in the search for suitable contacts with companies so that the form of complexity can vary throughout the process.

5.3 Analysis of the Output Dimension

The analysed projects of the IBB funding line show significant differences in terms of their service program, which depends on the type of VET service. The projects that focus on the development of a specific VET service are characterized by low *service program complexity*. Accordingly, four projects (I_5, I_6, I_8, I_9) were classified as having low service program complexity. A medium program complexity was found in two projects (I_2, I_4). In addition to the conception of continuing vocational training, one project pursued the establishment of an education and networking centre in the target country (I_4), while another project envisaged the development of a comprehensive planning tool (I_2). In both projects, the service program thus went beyond the offer of a single continuing VET service, which justified the medium complexity of the project plans in this respect. In three projects (I_1, I_3, I_7), on the other hand, there was a high degree of complexity in the service program. Training and competence centres were to be established in two projects (I_1, I_7). The third analysed project (I_3), on the other hand, explicitly focused on improving the VET system in the target country so that an advisory service and a campaign tool for vocational guidance are also to be developed. Adjustments to the service program were not yet predictable at the time of the study due to the pandemic. However, it is foreseeable that the project schedule will change so that certain work packages will have to be postponed, such

as project visits to the target country to identify the needs of the target group or to meet partners. In turn, other work packages are brought forward where possible. In the long term, the pandemic could result in certain adjustments to the deliverable programs in the project, depending on how long the projects need to defer to certain work packages. Deferral is not feasible indefinitely due to project duration limitations, so future adjustments to the service program may need to be made.

Service complexity forms the second complexity form of the output dimension. The sub-services were identified based on the core work packages of the projects, which could be derived from the descriptions of the projects. Here, the work packages for project organization and management were disregarded since these were necessary in all projects but are not to be understood as partial services of the educational service. It can be seen that the nine project proposals all have between eight and 10 core work packages and are similar in structure in this respect (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9). Moreover, it should be noted that the formulated work packages of the projects differ significantly in terms of content, depending on the design of the service program. Adaptation of the VET service usually takes place according to the needs of the various target groups, with cultural sensitivity being crucial. The individual work packages overlap in terms of content and time for all nine projects (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9).

With regard to the complexity of the customer structure, the analysed projects have a similar composition. Six projects focus on the continuing VET of specialists who have already completed initial VET and thus have a certain level of prior knowledge (I_1, I_2, I_5, I_6, I_8, I_9). Further training of executives and specialists from middle management was also planned by two projects (I_2, I_8). The further education of trainers within the framework of a train-the-trainer concept was described by four projects (I_1, I_3, I_5, I_7) as an additional target group. All projects had companies as a direct or indirect target group (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9).

5.4 Analysis of the Transfer Dimension

Target complexity constitutes the first form of *transfer complexity*, which has been added as a new dimension to the theoretical model of Blockus (2010). In the context of this form of complexity, the goals of the projects are to be considered to determine whether the projects are geared toward institutional support or a broad impact in the VET system (Stockmann, 2019). As already indicated, most of the analysed projects (six out of nine; I_1, I_2, I_5, I_6, I_8, I_9), aimed to transfer continuing VET²¹. In the context of service program complexity, it was emphasized that some projects offer more comprehensive services than others, for example, when the target is to develop and establish a single continuing education program or to build a training centre. The analysis of the projects revealed that they all

²¹ The focus on continuing VET can be observed in the framework of the funded projects of the IBB funding line in general. For example, Kühn (2020, p. 9; translated by the author) states in the context of an online-based survey of the IBB projects: "The results of the survey show that the majority of German vocational training providers address employed persons both in Germany and in the project country and develop offerings for continuing vocational training (65%) in the projects or combine initial and continuing VET (43.2%). Dual initial training makes up by far the smallest target area (8.1%) of the projects".

at least focus on institutional support. System change and broad impact cannot be sought through individual projects in the target countries; these can only provide an impulse for change in the VET system. In general, however, there is a certain tendency toward a change of the respective education system through the analysed projects, since the projects fundamentally aim to create a better reputation for VET in the target countries or at least to provide an impetus in this direction. Although the projects are fundamentally focused on institutional support and less on broad impact, there are nevertheless certain gradations between the orientation of the goals of the respective projects, which are described in more detail in the clustering of the projects. Thus, it can be seen that three of nine projects (I_5, I_6, I_9) aim to develop and implement a specific VET service in the target country. Five out of nine projects (I_1, I_2, I_4, I_7, I_8) pursue further goals in addition to the development and implementation of specific VET services, such as the establishment of a training centre in the target country or the development of technologies as a service output. One project (I_3) explicitly describes the initiation of changes in the VET system in the target country.

During the course of *transfer-type complexity*, the transfer type represented by the analysed projects was ascertained, as well as the adaptations associated with it. First, it should be noted that further analyses of projects that deal more deeply with the services to be transferred to a new target context are necessary to determine the respective transfer types clearly. Since a classification of the transfer types is nevertheless central to the analysis of the present contribution and the extension of the theoretical model, a first classification of the projects was made, which needs further validation in the future. It turns out that the transfer type of *imitation* is not applied among the projects considered, since the services of the projects are all to be adapted in some way to the target context so that a transfer of the same structures, contents, processes, and practices is not undertaken. As the funding line for the internationalization of VET is the successor to the funding line *Vocational Training Export* (BEX)²², this aspect is not surprising, as it has already been worked out in terms of drivers and barriers that an adaptation of the structures, processes, contents, and practices to be transferred to the target system is crucial for the success of the projects (Fraunhofer MOEZ, 2012). An *adaptation* is expected to be carried out in four out of nine projects (I_1, I_2, I_6, I_8), as cultural and further adaptation are not a central aspect of the projects, which is why it can be concluded that the transfer of similar VET services is undertaken (Gessler, 2017). A *transformation* can be seen based on the analysis of the data in five of nine projects (I_3, I_4, I_5, I_7, I_9), as different aspects according to the original model are to be transferred, which is pointed out due to an explicit focus on, for example, cultural sensitivity and further adjustments to the target context. At this point, a classification of the transfer types was made with reservations, as the analysis of the projects revealed that further research on the transfer types was necessary to classify them explicitly. Likewise, a close examination of the projects over their entire duration, including the actual design of the transferred VET service at the end, is required.

In the context of *promoter complexity*, the project partners were addressed as promoters, since they were significantly involved in service creation. Based on the data, it was clear that

²² The BEX funding line was implemented from 2009 to 2017 and forms the predecessor funding line of the IBB funding line of the BMBF.

the roles of the power promoter, process promoter, expert promoter, and relationship promoter were present in all nine projects (I_1, I_2, I_3, I_4, I_5, I_6, I_7, I_8, I_9). In all projects studied, there was an overlap between the promoter roles, resulting in most project partners filling multiple roles simultaneously. For example, while in one project (I_6) the role of the power promoter is filled equally by two project partners, the role of the expert promoter is shared in variation by all four partners of the project. The strong variation in the performance of the promoter roles is particularly evident in project I_8, in which nearly all of the promoter roles (in varying degrees) are performed jointly by the five project partners, the representation of roles is also similar in project I_2. In project I_7, for example, the role of the process promoter is occupied by only one project partner, whereas in project I_3 this role is taken on by all project partners involved. Accordingly, the data illustrate that it is rather rare for a promoter role to be performed by only one actor. Thus, it can be seen that different actors usually fill the roles together, as highlighted by Peters and Gessler (2019). Based on the results, it can be seen that different actors contribute their experiences, knowledge, and contacts to the analysed projects to varying degrees so that the expertise of the respective partners can be used in a target-oriented manner for the project plans. Therefore, an exclusive responsibility for a project partner (e.g., for the role of the relationship promoter) would generally be highly impractical, as this partner would need to have a particularly high level of expertise and personal contacts in the origin and target countries. It is more promising to combine the contacts and networks of different project actors in terms of project progress.

5.5 Final Complexity Assessment and Clustering

The nine projects of the IBB funding line were analysed for the respective complexity forms of the four dimensions so that an assessment of the complexity could be made with regard to the gradation of *low*, *medium*, or *high*. To assign the IBB projects to a complexity gradation (high, medium, or low) with regard to the different complexity forms, criteria for the classification of the projects were defined based on the data used, since complexity can only be assessed in relation to a system under consideration (Dernbach et al., 2019). Thus, a general application of these defined criteria to classify the complexity of VET services is not possible, which is why the criteria seem to be suitable only in the context of the present study. The significance of a high, medium, or low classification of the complexity of the projects thus arises in dependence on the other projects that have been analysed in the context of this study. The following is an example of the criteria analysed for assessing complexity. For each of the four dimensions, a complexity form is indicated as example with regard to the complexity characteristics using low, medium, and high (see Table 4).

1 Dimension – Location/branch complexity

Low	No office in the target country
Medium	Project partners have an explicit office in the target country
High	Own office or training centre available in the target country

2 Dimension – Complexity of the external factor

Low	No explicit reference to actors to be integrated
Medium	Explicit reference to a small number of actors to be integrated
High	Explicit reference to a large number of actors to be integrated

3 Dimension – Service program complexity

Low	Development of a special professional training
Medium	Development of a special professional training and another core aspect
High	Construction of an education centre or development of a more comprehensive service program, which goes beyond the aspect of middle complexity

4 Dimension – Promoter complexity

Low	Not all 4 promoter roles are represented
Medium	All 4 promoter roles are represented
High	All 4 promoter roles are represented and filled by different actors simultaneously

Table 4: Assessment Criteria of Selected Forms of Complexity (own compilation)

In general, it can be stated that the number of customers to be integrated for service provision can be classified as high in all projects, which is due to the internationalization of the project itself. When transferring dual VET services, not only the framework conditions of the education systems but also those of politics and the economy must be considered, which increases the complexity of the external factor. The complexity of the promoters can also be classified as high across all analyzed projects, since the data show a differentiated distribution of the project partners across the various promoter roles. In conclusion, the analysis of the IBB projects showed that the complexity of the overall service depended significantly on the complexity of the service program and, in the specific case of VET services, on the targets and transfer types. However, it should be noted that a more in-depth analysis is necessary to determine the transfer types in more detail. Considering all the complexity types of the four dimensions, three projects were classified as high complexity (I_3, I_4, I_7). Three projects (I_1, I_2, I_8) were in the medium range in terms of project complexity, and three projects were classified as low (I_5, I_6, I_9).²³ The underlying thesis of the study—that the complexity of VET services in an international context can be assessed by

²³ For each of the complexity forms, a classification of the form was made with regard to the expression low, medium high (see Table 4). Since three forms of complexity (material complexity; complexity of service, support and customer processes; task complexity) could not be surveyed on the basis of the data, the remaining 10 forms were classified according to their degree of complexity for each project. The assignment of the overall complexity of a project was then carried out as an aggregate of the surveyed forms of complexity of the four dimensions, so that, for example, project I_7 was able to register a high level of complexity with regard to six forms and thus also has a high level of complexity of the entire VET service.

extending the complexity assessment model according to Blockus (2010) to include transfer aspects—can be thus confirmed. It was shown that the complexity of VET services could be captured by Blockus' (2010) complexity assessment model, so that the dimension of *transfer complexity* represents a meaningful extension of the model in the context of international VET services.

It was not possible to explicitly record the *material complexity* (potential dimension), task complexity (process dimension), and the *service, support, and customer process complexity* (process dimension) within the scope of the present study to classify the degree of complexity of these forms for the respective IBB projects. Nevertheless, no adjustment of the model is necessary with regard to these characteristics. However, the recording of the service, support, and customer processes is so complex that a division of the complexity form would appear to be reasonable. To prevent the model itself from becoming too extensive, the complexity form according to Blockus (2010) is retained in its form. Thus, explicit changes to the developed model are not necessary following the analysis of the IBB projects.

The results of the analysis of the IBB projects demonstrated that the initial clustering of the projects is possible on the basis of the *target complexity*. The target complexity is closely related to the *service program complexity*, because the realization of a high target complexity is not achievable with a low complexity of the service program. Thus, a single VET service capable of aiming for system change and broad impact within a country's VET system, as certain facets of VET can be 'successfully' (Geiben, 2017, p. 24) transferred at the regional, local, or national level. Based on the analyzed data, it becomes evident that the targets of the projects can be clearly distinguished from each other in terms of their complexity. In the present study, it was possible to classify the projects on the basis of three specifications of the identified targets, which are defined as (1) *support of VET programs*, (2) *institutional support*, and (3) *institutional support with the initiation of systemic change*²⁴. The three specifications build on each other in terms of their complexity, as illustrated by the diagram in Figure 3. The first form is thus categorized as the *lowest*, the second as the *medium*, and the third as the *highest* form of the target complexity.

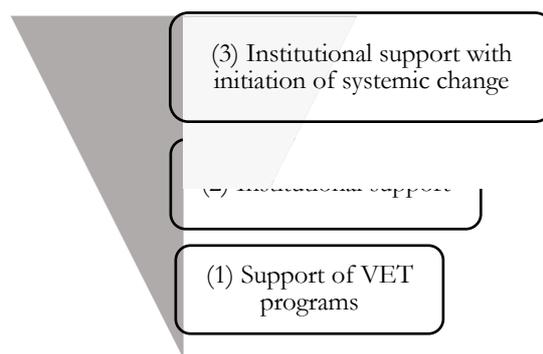


Figure 3: Specification of the Target Complexity (own compilation)

²⁴ The term *institutional support* as orientation of the goals of such VET projects are used in accordance with Stockmann (2019). The three specifications of target complexity were furthermore inductively generated on the basis of the data material.

The first specification of the target complexity is the *support of VET programs* in the respective target country so that individual VET services are implemented by the projects. The second specification is *institutional support*, which refers to the project setups, for example, VET centers or schools in the selected target countries, which make the project much more complex than those that support individual VET programs. The third specification of the target complexity is referred to as *institutional support with systemic change* because, in addition to the *institutional support*, the broad impact and possible resulting changes in the VET system are a central aspect of the project goals. The distinction between micro, meso, and macro levels and the transferred services of dual VET thus becomes clear on the basis of the differentiated characteristics of the complexity of the goals (see Geiben, 2017).

Thus, it can be seen that the first specification, support of VET programs, is found in three of nine projects (I_5, I_6, I_9), as they aim to develop and implement a specific VET service in the target country. Five out of nine projects (I_1, I_2, I_4, I_7, I_8), on the other hand, can be classified as institutional support as the second specification of target complexity, since they pursue further goals in addition to the development and implementation of specific VET services, such as the establishment of a training center in the target country or the development of technologies as a service output, so that the service program goes beyond the support of a single VET program. One project (I_3) can be classified with regard to the third type of target complexity, since the project explicitly describes the initiation of changes in the VET system in the target country, which indicates that the project is intended to initiate system changes.

Thus, it can be stated that there is a connection between the overall complexity of the service and the complexity of the goals to be achieved in the target country through the transfer of VET structures, processes, contents, and practices. The considered projects of the IBB funding line, which show an overall high complexity of the vocational training service, are to be located at least on the second specification of the target complexity. The projects with a medium complexity of the overall VET service are to be located with regard to their targets in the first and second specifications; the third specification does not occur in the considered projects with low and medium complexity. The support of VET programs as the first specification of target complexity is thus found more frequently in projects with low complexity in terms of overall VET service, which includes three of the nine projects. According to the results, *institutional support with the initiation of system changes* occurs only in projects with an overall high complexity in terms of VET service, although it remains debatable to what extent these goals can actually be pursued in practice. The occurrences between the overall complexity of the service and that of the three specifications of the *target complexity* are shown in Table 5.

Low Complexity	→	(1) Support of VET programs
Medium Complexity	→	(2) Institutional support
High Complexity	→	(3) Institutional support with initiation of systemic change

Table 5: Occurrences of the Specifications of the Target Complexity (own compilation)

In conclusion, it can be expected that the complexity of the targets has a direct influence on the complexity of the whole VET service, since the service program and the targets are mutually dependent, so that different levels of targets result from the respective design of

the service program and vice versa. It should also be noted that the three specifications of the *target complexity* could be distinguished in terms of a more precise differentiation of complexity within the specification itself. In this regard, further research would have to consider, for example, how much the complexity varies within the target specification of *institutional support*, so that institutions that are completely new to a target country would have to exhibit a higher level of complexity than institutions that already exist and have been further developed. The same applies to the first specification of the target complexity: *Support for VET programs*. Individual programs could be differentiated in terms of their target complexity according to whether existing programs were linked with practical elements or whether training and continuing education programs were developed and implemented from the ground up. The last type of target complexity, *institutional support with the initiation of systemic change*, is aimed at the system level, so that the complexity within the type could also be considered in a more differentiated manner. For example, a distinction could be made as to whether individual elements of the VET systems were adapted to the target context or whether the relationship between several elements of the dual system (i.e., the effects of the elements on each other) was also considered in a more profound way to aim for a higher degree of system change.

The effects on the part of the transfer types and the promoters on the overall complexity of the service should be considered for further research in this area. This would require a precise assignment of transfer types based on comprehensive analyses of the projects over their entire durations. An explicit assignment of the transfer types to the respective projects would only have to be made at the end of the projects since the data for this would then be completely available. To assess the impact of the promoter roles on the complexity of the overall service, a comparison of different projects would be necessary, whereby the presence and absence of the promoter roles would have to be examined with regard to their impact on the complexity of the educational service. In this regard, it would be necessary to ascertain, among other things, the extent to which the absence of certain promoters has a negative effect on service production and thus increases the complexity of the processes.

6 Discussion

The theoretical model, including the extension, was tested in terms of its applicability to the field of international VET as part of the present study, which allowed the model to be embedded empirically. The relevance of the article results from the previously missing consideration of the topic in this field of international VET research and the future possibilities arising from the application of the model. A grouping of the IBB projects was possible on the basis of the developed model, including an assignment of the characteristics of the *target complexity*, which allowed a first clustering of the IBB projects.

Blockus himself validated his model with regard to three forms of complexity so that one form of complexity of each of the three dimensions was empirically surveyed (Blockus, 2010). Blockus' results demonstrated that service complexity was largely dependent on the interdependencies between the various sub-services. Service complexity is also determined by the extent of service individualization and by the heterogeneity of partial services. The least influence on the complexity of this form has the number of partial services (Blockus, 2010). *Service complexity* could only be empirically surveyed and analysed to a limited extent in this study. As Blockus indicates, clear interdependencies of the partial services of the respective VET services can also be seen in the context of the present work. The considered work packages of the services show explicit overlaps in terms of time and content. Moreover, it becomes clear that consideration of the work packages of the projects does not provide sufficient information about the actual complexity of the service. The projects all have between eight and 10 core work packages, excluding project management. In connection with the overall complexity of educational services, however, strong differences can be found. In relation to the employee complexity of the service, the variability has the greatest influence on the complexity form, according to Blockus (2010). Compared to this characteristic, the multiplicity and diversity of the employees have a lower significance for the complexity form (Blockus, 2010). Thus, in the context of the analysis of IBB projects, it should be emphasized that the variability of the employee base due to fluctuation plays a decisive role, since project employees are difficult to replace due to their high level of expertise. In addition, it is clear that the number of employees is not directly related to the overall complexity of the service. For example, the project with the highest number of employees has only a low complexity of the whole VET service. Blockus emphasizes that capturing the performance, support, and customer processes in the context of his study "gives a less clear picture" (Blockus, 2010, p. 210; translated by the author), but the number and heterogeneity of the processes seems to be less relevant to the level of the complexity form than the overlaps between them and the deviations of the processes (Blockus, 2010). Further analysis is needed to classify the complexity form clearly. Blockus concludes that interdependence and variability as constitutive features have a greater influence on the level of complexity of the forms considered than their number and variety (Blockus, 2010). Blockus also refers to the relationships between the complexity forms, which he did not empirically surveyed. Thus, it can be strongly inferred that all of the complexity forms influence each other. However, it is hardly possible to include all the connections between the complexity

forms, so that only a selection of the overlaps between the forms can be considered based on Blockus (2010).

Clear overlaps between the various dimensions and forms of complexity also became apparent in the course of analysing the data from the IBB projects. For example, the complexity of the support processes is strongly influenced by location complexity, which is in line with Blockus' (2010) explanations. Thus, having an office in the target country of the project significantly enhances the process of service creation and delivery. There are clear overlaps between service program complexity and target complexity, as the service program may be more or less complex depending on the design of the targets. Therefore, the service program also has a direct influence on the perceived task complexity of the employees, even if this could not be surveyed in the context of the present work. Therefore, task complexity also has an influence on employee complexity (Blockus, 2010). In the case of high service program complexity, the employees perceive the tasks as more or less complex depending on the number of tasks. Accordingly, high service program complexity would have a negative effect on task complexity if employee complexity were low, so that employees would perceive them as particularly complex, which is consistent with Blockus' assumption that all forms of complexity have certain effects on each other (Blockus, 2010). Overlaps also occur between customer structure complexity and external factor complexity (Blockus, 2010) since the persons to be integrated to produce services could also be found among the customer segments targeted by the project plans. Blockus' (2010) reference that the dimensions, with their forms of complexity, cannot be considered separately from one another due to the prevailing interdependencies between them can also be confirmed in the present study.

As already mentioned, a connection between the complexity of the targets and the overall complexity of the VET service could be identified, whereby the complexity of the service program is also of decisive importance. Thus, the targets and the service program are mutually dependent, as corresponding objectives can be pursued depending on the definition of the service program, which is in line with Geiben's (2017) expressions regarding the projects to be transferred at different levels. Target complexity was added as a complexity form of the transfer dimension following Stockmann (2019) and Stockmann and Silvestrini (2013), as it can be strongly expected that the design of the goals, depending on whether they are focused on institutional support or broad impact in the VET system, has an influence on the complexity of the VET service. Stockmann (2019) concludes that VET projects with a lower aspirational profile, in terms of project objectives, are generally successful. The analysis of the projects shows that the targets can be classified as high in only one project, so that one project aimed to initiate system changes in addition to institutional support. Five projects had a medium complexity of targets, and three projects had low complexity. The extent to which projects with medium or low target complexity are, in general, more successful in establishing VET services in the target country in the long term must be investigated in further studies. Within the framework of the present study, an initial classification of the transfer types of the projects under consideration was made, whereby the respective adaptation of the vocational training measures with regard to the context of the target country was taken into closer consideration. Thus, it became clear that some projects planned a stronger inclusion of the contextual characteristics of the target countries

in the production of the service than others, from which a higher degree of cultural sensitivity can be concluded. A direct connection between the transfer-type complexity and the target complexity of the transfer dimension could not be established in the analysis of the IBB projects. Projects that have a high target complexity can also have a high transfer-type complexity if a corresponding adaptation of the service is to be made. Additionally, projects that have a low target complexity may also have a high transfer complexity if a high level of customization is already required to implement a development service. To classify promoter complexity, the present analysis examined the project partners of the IBB projects as promoters so that the promoter roles of the initial system were considered. The results show that the four promoter roles are represented in all nine projects, with the different roles usually performed by several actors simultaneously so that a high level of promoter complexity is found in all projects. A classification of promoters in the origin and target systems would be useful for further research on assessing the complexity of VET services, as it is possible that their lack would promote the complexity of the service by adding effort to the creation process. Thus, it can be anticipated that a higher complexity in the VET service occurs if relationships and processes are not supported by certain promoters. In addition to considering whether the individual roles are present in the origin and target systems, the connections among the roles are also informative (Peters & Gessler, 2019). To classify promoter complexity, this aspect would be particularly insightful, as the interdependencies between the roles in the origin and target systems would allow for a differentiated view of this complexity form.

7 Conclusion and Outlook

The model developed is based on Blockus' (2010) complexity assessment model, which has been extended to include the dimension of transfer complexity to address the particulars of international VET services. *Transfer complexity* is divided into three complexity forms—*target complexity*, *transfer-type complexity*, and *promoter complexity*. The focus here is not on capturing the complexity of VET service transfer in general. However, in the context of VET service complexity, it is necessary to consider certain factors of transfer that make the service more complex in its design. Thus, the individual criteria do not provide a sufficient indication of the complexity of the service. This becomes possible only by combining them so that a more nuanced picture of the expression of complexity with respect to different components of the service emerges. In conclusion, of the nine projects analysed, there were three projects with high complexity, three projects with medium complexity, and three with low complexity. A qualitative classification of the complexity of VET services and thus the determination of a high, medium, or low level of complexity of the entire project can only be attempted in the context of the present study, since the classification was made in relation to the other considered VET services. Concluding, the analysis of the IBB projects has shown that the complexity of the overall service depends mainly on the complexity of the service program and, in the specific case of VET services, on the targets and transfer types. Furthermore, it has to be considered that a higher complexity of the VET service might arise if the relationships and processes are not covered by specific promoters.

In the course of the paper, thus a generic model was developed to capture the complexity of VET services that does not refer to a specific target context and is therefore not limited to a specific country setting, leading to a reduction in the complexity of international VET services as a system of selected funded programs of international VET cooperation. Another limitation is the impact of complexity, which is not addressed in this paper, as it is a first approach to the issue in the context of international VET services, thus a clear gap in research arises. Because this topic has hardly been considered in VET research so far, there are numerous starting points for future research projects. Based on the developed model, a typologization of vocational training services would be conceivable in the context of further research. A consideration of the complexity of VET transfer itself could also be undertaken in the focus of further research. However, an examination of the topic seems to be particularly extensive, as the exact elements to be considered in the context of VET transfer at all levels have been difficult to grasp thus far. In the context of further research, it would also be interesting to examine the extent to which the complexity of international VET services facilitates or complicates the transfer process. Furthermore, it would be worthwhile to explore what factors influence the complexity of VET services in addition to the facets listed in this study so that the model might need to be supplemented with other forms of complexity. Moreover, the extent to which there is a relationship between service complexity and service quality would be an interesting area of research. Further empirical studies in the area of transfer types would be desirable to be able to include them more soundly in the context of the complexity of VET services. At this point, it would be central to investigate the extent to which the different transfer types are generally accompanied by a higher or lower degree of service complexity to be transferred and whether this increases

across the different transfer types. An explicit research gap arises from other possible transfer types and the underlying understanding of transfer (Gessler et al., 2019a). Concluding, it is worth emphasising that the capture of complexity in the course of the transfer phenomenon in VET can also be conceptualised as a continuum in line with the suggestion of Gessler and Kühn (2019).

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