Career Guidance in Schools from European and International Perspectives: Designing Transfer in Career Guidance Between Science and Practice
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Augmented Career Guidance and Counselling - Insights into a developmental project on the application and evaluation of an AI-System

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Abstract

Young people are finding it increasingly difficult to gain a sound overview of alternatives, when transitioning from school to vocational training, further education, or professional life. The article presents the ongoing development project "Integration of AI in career guidance and in the training of counsellors based on speech recognition", a team of AI (Artificial Intelligence) experts from the German Research Centre for Artificial Intelligence and the University of Trier, researchers from the University of Applied Labour Studies (HdBA) and counselling practitioners are trying to find out how artificial intelligence can support counsellors in their work with clients in their career orientation and decision-making. The approach is to develop and evaluate a prototype for an AI-system that can be utilized within career guidance and counselling by professionals. The article embeds the presented AI system in the AI-critical discussion and shows how the system should be evaluated. In the conclusions, we outline the testing and evaluation steps that will be taken in the further course of the project.

Keywords

career guidance, career counselling, artificial intelligence, augmentation, professionalisiation

1 Introduction

In the ongoing (2024-2025) development project "Integration of AI in career guidance and in the training of counsellors based on speech recognition ", a team of AI (Artificial Intelligence) experts from the German Research Centre for Artificial Intelligence and the University of Trier, researchers from the University of Applied Labour Studies (HdBA) and counselling practitioners are trying to find out how artificial intelligence can support counsellors in their work with clients in their career orientation and decision-making (Weber &

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Ertelt, 2025). The project aims to develop an innovative AI-based system that uses speech recognition technologies to help careers counsellors support clients in their career decision-making processes. The Federal Employment Agency's BERUFENET (with around 3,500 continuously updated descriptions of occupations this is the most comprehensive vocational encyclopaedia in Germany) serves as the vocational database. The project is thus part of the scientific and professional research and development efforts contributing to the digitisation of career counselling. (Kraatz, Rübner & Weber, 2021; Weber & Schulz, 2023).

The question of how much information the individual needs in order to make an appropriate decision is of central importance for information management in counselling. To understand these needs we use the three approaches from the perspective of information structural methodology (Ertelt, Schulz & Frey 2022): Phases in the decision-making process, type of information included and rational and heuristic behaviour.

Use of artificial intelligence (AI) for demand-oriented guidance based on heuristics: AI as support for the iterative reduction of the problem space in favour of the construction of a solution space as a tentative experience space.

We use speech recognition as the basis for the development of a pilot application:

1. it must be possible to translate the language of the counsellor into the terminology of the database (ontology) in such a way (question of fuzzy logic) that an adequate response (data output) is possible.
2. the type and scope of the data provided should be orientated to the course of the conversation, i.e. already filtered, so that to a certain extent it takes on the character of guiding information (no information overload).
3. the AI should be able to document the construction of solution spaces (consisting of constraints/criteria and alternatives) and thus make them transparent for the dialogue partners.

Limitations in the linking of algorithmically working AI systems and heuristic-oriented individual decision-making behaviour are also addressed (Gigerenzer, Reb, Luan 2022, pp. 191; Gigerenzer 2023, p. 841).

The AI-system (“AI-Demonstrator”) is in a first evaluation process since June 2025. The prototype is under test over the course of the year and trialled by professional practitioners and in counsellor training and further education as well as by experts and students. The current focus, which is on career orientation and decisions for career starters and study choices, could be extended to other areas of the career guidance counselling field.

2 Objective – Augmentation of career guidance and counselling

Why should counselling deal with AI? A first argument was stated by Engel and colleagues (2024, p. 501): “Otherwise others will do it” (translation by authors). Our goal is to develop a testable AI system ourselves in order to delve deeper into the topic and its opportunities, while also addressing obvious weaknesses and dangers associated with LLM (Engel u.a. 2024; Walpuski 2025) and better controlling them within a structured framework. With this in mind, a second argument for us is that we want to learn for ourselves what works and what doesn't when apply AI in the context of counselling. This includes not only technical issues, but also ethical issues, acceptance by those affected (guidance seekers, counsellors) and implementation in a specific ecosystem, e.g. an organisation that offers career services, schools, etc. as well as the reflection of not-intended side-effects. Secondly, we think it makes sense to also use AI in hybrid work in career guidance and counselling, i.e. to continue testing the hybridisation of digital and non-digital elements (Mocigemba & Unterreiner, 2024). It is a very interesting challenge to carry out the necessary interdisciplinary development work in collaboration with

AI experts and to learn from their perspective. We came across the concept of "augmentation" in connection with the use of AI. This is about using AI to expand the options that people, especially counsellors, have. Career Counselling should therefore not be replaced by technology but augmented (Walpuski, 2024; Weber & Ertelt, 2024; Seufert & Meier 2024; Kirste, 2019). The aim is to test how people can use technology to achieve better results where necessary. This has already been researched in other knowledge-intensive services. Maletzki, Rietzke and Bergmann (2024, p.167) formulate this as follows: "Since roles in knowledge-intensive services can have extensive requirements that a single actor may not be able to fulfil alone, several actors should be allowed to fill roles together. To this end, we expect that the shortcomings of one actor in their role can be compensated for by including complementary contributions from other actors in the process model". The idea of a counsellor acting as an actor with an AI actor is still unfamiliar at the moment. Advice will also certainly change to some extent if "hybrid intelligent support systems" (Maletzki et al. 2023, p.) play a role in counselling. The central questions of this project are what counselling could look like with the integration of AI, what role AI can play as an actor and support tool and what limits become apparent. Based on these considerations, the project formulates the following research question, which goes beyond the development of the AI model: ‘How can artificial intelligence (AI) support consultants in their work with clients and in their professional orientation and decision-making?’ In order to break down this question for the present development project, it is specified with the following objectives:

- The development of an AI prototype (‘demonstrator’)
- Evaluating the testing of the AI prototype in simulated counselling and in the training of counsellors
- Developing and critically reflecting on AI knowledge for counselling and the training and further education of counsellors in our working context.

The second and third objectives are particularly important, as we do not view the project as a technology project, but rather as a collaborative project between technology utilisation and its integration into social and communicative contexts. The justified criticism of AI developments in the counselling field (Walpuski, 2025; Kieslinger and Nierobisch, 2024) should be addressed in particular by openly discussing the technological foundations and the interaction of AI models. It is an explicit goal of the project to uncover possible unintended effects and biases through testing and to introduce the results into the discourse on AI in counselling. With reference to Davin (2023), we are interested in the question of what ‘other communication services’ arise when counsellors and models that use AI cooperate in their work with clients and thereby produce something new for counselling (‘AI novelties’) (Davin, 2023, p. 8).

3 State of Research

AI is now being examined from various perspectives in counselling research. A number of contributions focus directly on career counselling and AI models developed for career counselling. Other contributions take a more comprehensive perspective without referring to specific models. In summary, the current literature on AI in career counselling can be classified along two axes. On the one hand, there is professionalisation and, on the other, practical testing. While articles focused on professionalisation tend to be critical of AI and offer little insight into practical AI applications (Engel et al. 2024; Kieslinger & Nierobisch, 2024; Walpuski, 2024; Walpuski 2025), there are articles that test AI models in a rather euphoric or at least positive light, but apply few profession-specific criteria (see below). Combining the development of a

transparent AI model with its critical testing and evaluation represents an exciting opportunity to bring both perspectives together.

There are only a few comprehensive studies on the use of AI in career guidance. One study was commissioned and published by the ILO (International Labour Organisation) (ILO, 2021). This study shows that AI can be used to address career choice problems and support decision-making, and that it is already being used for this purpose. The link between individual selection criteria ('constraints') and 'solution spaces' and related well-founded alternatives (e.g. occupations) that we aim to establish in our project could be supported by AI in various ways. Nevertheless, the report also highlights open questions that we have taken into account in our research project. These relate to the necessary contextualisation of the instrument (e.g. in relation to occupational classification systems, scientifically based career choice criteria, the age and goals of the career counselling, the reliability of the database and the knowledge ontology, consideration of data protection, especially with regard to the personal data of those seeking advice, the avoidance of pattern recognition, which can lead to incorrect generalisations based on AI (e.g. in relation to gender or ethnicity), and the avoidance of purely rational decision-making approaches, as human decisions are not made solely on the basis of maximising benefits according to ideal criteria.

The study concludes that: „Current experiences indicate that AI supported tools are complementary to practitioner-based support, rather than its replacement and should be used on that basis" (ILO 2021, p. 13). The research and development project presented here takes up this conclusion and proposes the development of a system that supports counsellors but does not replace them. Rather, it can be used for training purposes and to support counsellors in their search for and communication of information.

The ODiCY platform compiled by the OECD (n.d.) provides an overview of existing ICT and AI-based guidance tools. Currently, ten systems or programs that use AI are listed there. The literature review by Osborne et al. (2024), which included more than 1,300 articles identified in central literature databases (ERIC, EBSCO) for the years 2009-2022 and classified as belonging to the most important journals in the field of career guidance and counselling, identified only 129 articles related to ICT. None of these focused on artificial intelligence in the narrow sense; the term is only used in the context of policy articles that aim to draw attention to the importance of the topic.

A large proportion of the contributions we have identified for AI in career counselling from 2022 onwards are devoted to testing and discussing general AI models or AI models from related fields of work, whereby these tests are more situational in nature and are not part of transparent development processes for AI models (including Engel et al. 2024; Kemptner & Mocigemba, 2024; Stanik, 2023; Mayer & Hübner, 2023; Lahoud et al., 2023; Kuhail et al. 2022) Rahman et al. (2023), who describe their own development based on ChatGPT, remain rather superficial and largely uncritical of the weaknesses of the AI technology used in the accompanying study. Fulmer (2019), who addresses the issue of AI use in counselling, takes a technology-optimistic perspective by assuming that AI models will have a high 'learning ability' in the future and emphasising the (future) potential benefits of AI for counselling and AI ‚as' a counsellor. It should be noted that the findings presented in these articles are mostly based on short trials. In our view, it would be necessary also in line with Engel et al. 2023 and their reference to the 'backstage' to systematically enable third-party testing when developing systems that use AI and to make the underlying AI models and prompts accessible.

Another perspective is the discussion of the effects of AI use on the professionalisation or deprofessionalisation and ethics of counselling (Buchanan, 2025; Kieslinger and Nierobisch, 2024; Walpuski, 2025). In addition, there are also contributions in which professional associations take a position on the ethical implications of AI use, some of which also critically examine non-use from an ethical perspective and argue for a balanced attitude towards AI and

participation in development and discussion processes (ACA, n.d.; NCDA, 2025; IAEVG, 2024; Larbalestier, M. 2025; Brinkmann et al. 2023; Weber, 2025).

Contributions on the intended or unintended effects and impacts of using AI in counselling provide important insights for our project and offer categories for the critical evaluation of AI projects in counselling. Walpuski (2024) highlights the following points of criticism based on a case study from the coaching context: Promise of ubiquitous availability when counselling or coaching services are digitized and automated, lack of transparency regarding the criteria used by AI models to identify characteristics, wishes or needs of clients, problems of 'automation bias's i.e. the attribution of supposed objectivity or optimal fit of the suggestions made by an AI model by the users, inherent evaluations by the programrs and the data used are not identified or disclosed and are not perceived by the users AI models are anthropomorphized by their manufacturers (e.g. through avatars) but also in their reception by users. At the same time, gender stereotypes are used and perpetuated through the representation of AI avatars as female, in the counselling or coaching context, the question arises as to whether the introduction of AI models will transfer the definition of process- or careergoals to AI, the use of data generated through the use of the AI application is not disclosed or prevented, the theoretical foundations of counselling used for AI modelling remain unclear. Although the assumptions on which it is based can be partially reconstructed in its use, they cannot be transparently traced: "(...) it becomes apparent that AIMY® (the AI bot tested, author's note) works on the basis of theoretical models and programming that are not recognisable to users" (Walpuski, 2024, p. 114, translation by the authors).

Finally, Walpuski (2024) critically discusses AI-based career counselling (or coaching) applications against the backdrop of scalability in the context of the platform economy and the business model behind such a system.

In their article, Kieslinger & Nierobisch (2024) develop ethical considerations on several levels (Schiersmann et al. 2017). The use of technology, and AI in particular, and its effects must be reflected upon at these levels and with normative references. The following aspects are particularly relevant here: With regard to the understanding of career counselling, they highlight the importance of a reflexive approach and identify the implications, possibilities and limitations of technology use. The authors highlight ethical issues and insist that the digitisation of career counselling does not render questions of value superfluous, but that the central actors to whom ethical considerations can be attributed (the counsellors) may no longer be part of the counselling process or their role may be weakened. The limits of what artificial intelligence can be responsible for, must be scrutinised. The authors refer Here to the German Ethics Council (Deutscher Ethikrat, 2023). The final decision („Die Letztentscheidung ") must remain with the people (Kieslinger & Nierobisch, 2024, p. 110). The concept of intelligence is classified insofar as its transfer to technology involves a reduction of central aspects of human intelligence. In this sense, the stochastically generated stimulation of reflection, for example through a question, cannot be equated with reflective practice in career counselling. Due to the lack of consciousness and the absence of embodied understanding of an AI application, empathy and appreciation are simulated at best. However, such simulation cannot be the basis for a sustainable relationship and the trust that career counselling requires. "The value of career counselling for a conscious and well-founded decision is often precisely the "confrontational non-affirmation of the person seeking advice" (Nierobisch 2023, p. 5, quoted from Kieslinger & Nieorbisch, 2024, p. 109, translation by the authors). The risk is that those seeking advice remain in their "echo chambers". AI lacks the opportunity to question its bias and its own positionality. However, this is precisely what is necessary in relation to social inequalities, exclusion and inequality between people in social contexts, for example, and is provided by counsellors. The authors argue that the question of the importance of career counselling as a

professional and human task and its substitution by digitalisation should be critically examined. „Transferring human activities to machines means defining the human element in a new and deeper way and, in this context, repeatedly asking what is specific to good counselling“ (Kieslinger & Nierobisch, 2024, p. 111, translation by the authors).

The professional ethical considerations discussed here are very important. Key aspects were taken into account in the development of the system, while others should form the basis for critical self-examination by researchers and for further testing and dialogue with practitioners.

4 The System developed

4.1 Concepts that form the basis for the AI system

The first conceptual basis for the AI-System we are working on are theories of career decision-making. We are interested in classical career choice theories as well as decision theories, in particular non-rational decision theories, which assume that people make decisions on the basis of incomplete information and thus on the basis of incomplete solution spaces. Specifically, we draw on Gigerenzer and the decision heuristics he formulated (Gigerenzer and Gaismaier 2011; Ertelt et al., 2022; Weber 2021). With regard to AI, it is crucial here that AI does not function on the basis of unknown algorithms in the sense of a black box AI - as is known to be the case with large language models - but that the decision-making processes that take place in counselling are recorded on the basis of theory and mapped in the system. The system is designed so that the client's statements are placed in relation to a career theory-based sound ontology and all AI activities are based on this ontology. The current structure of the ontology can be disclosed and expanded in further project steps.

Second, the use of a transparent, up-to-date, and known database is also of great importance from an advisory perspective. Unlike the LLM, the AI model is designed in such a way that it utilises well-known databases such as ‘Berufe.net’ (Bundesagentur für Arbeit, n.d.) or ESCO (n.d.). These databases not only provide information about occupations, but also characterise them using many criteria, such as activities, skills, interdisciplinary competencies and similar. The AI model can potentially access the databases directly based on the criteria of those seeking advice and filter suitable career suggestions, but the counsellor remains responsible for appropriateness of the vocational information.

Third, the approach to AI models pursued here is about the defined interaction between human experts (in this case counsellors) and artificial intelligence in various roles (Maletzki, Rietzke and Bergmann, 2024). There are also various requirements and technologies that interact within the AI model. A central element in this AI model is an "Ontology- and Data-Driven Expert System" (Maletzki et al. 2023, p.2). In the “so-called” ontology, this system maps the professional criteria as they are adopted from occupational and career theories, for example, or as they are available in the databases mentioned above. On this basis, the system imitates the cognitive processes that model a "solution space" (Ertelt et al., 2022; Weber 2021) for a career choice. This modelling is in turn the basis for the process-oriented integration of AI and human intelligence in the guidance process (Maletzki et al. 2023, p. 2). In addition, AI is used for speech recognition (large language models, LLM) in order to link the expert system with the content of the counselling interview. The criteria mentioned in the counselling interview for choosing an occupation or subject are recorded via the LLM and mapped in the expert system. The more criteria for the inclusion and exclusion of an option are mentioned, the more detailed the mapping of the solution space in the system becomes.

4.2 Description of the AI System and functionalities

This interaction between counsellor - client and various AI components results in three AI functions for counselling, which can be used optionally (see Figure 1): Recording criteria and mapping the solution space from the perspective of the person seeking advice. In the background, this model forms the basis for research in career and study databases, but the visualised model can also be called up and discussed during the counselling session. An output for the counsellor is also conceivable as an option (see Figure 2). The AI model records the structure of the conversation and can - if desired - make suggestions for deepening the conversation in the form of topics or specific questions. This function could be particularly interesting for the training and further education of counsellors. The AI model offers a filter algorithm that identifies career or study options that match the solution space. Suggestions or suitable career-related information can be displayed at any point in the conversation if required. By refining the search criteria and thus narrowing down the solution space, options can be reduced.

All functions can become relevant at different points in the interview. Whether and how they are used by the counsellor is up to him or her. We are thus implementing a model described by Maletzki et al. (2024), which sees the counsellor and the person seeking advice in the role of the decisive actor: "The team design pattern 'AI counsellor and human actor' enables an AI actor to provide decision options to a human actor. Conversely, it enables a human to make decisions on this basis and provide feedback on the quality of the options" (Maletzki et al. 2024, p. 171).

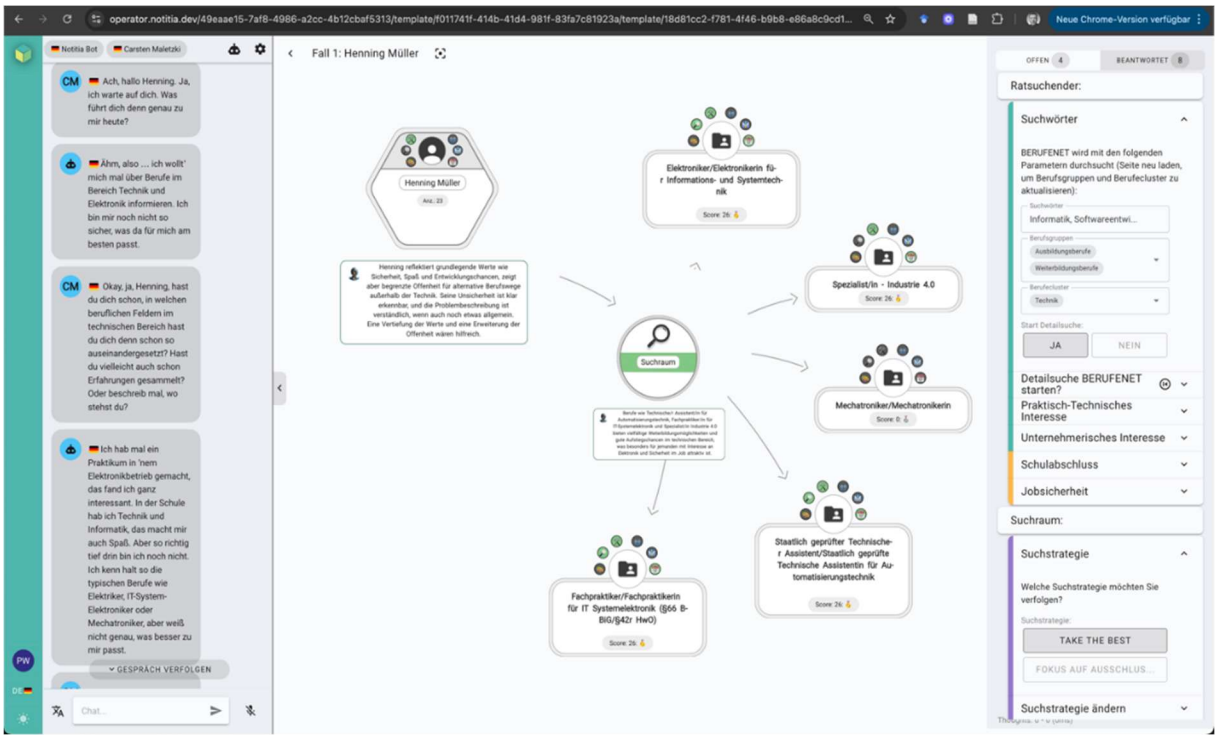

Figure 1 The AI system with recording of the conversation, mapping of the client's criteria and suggestions for further career counselling

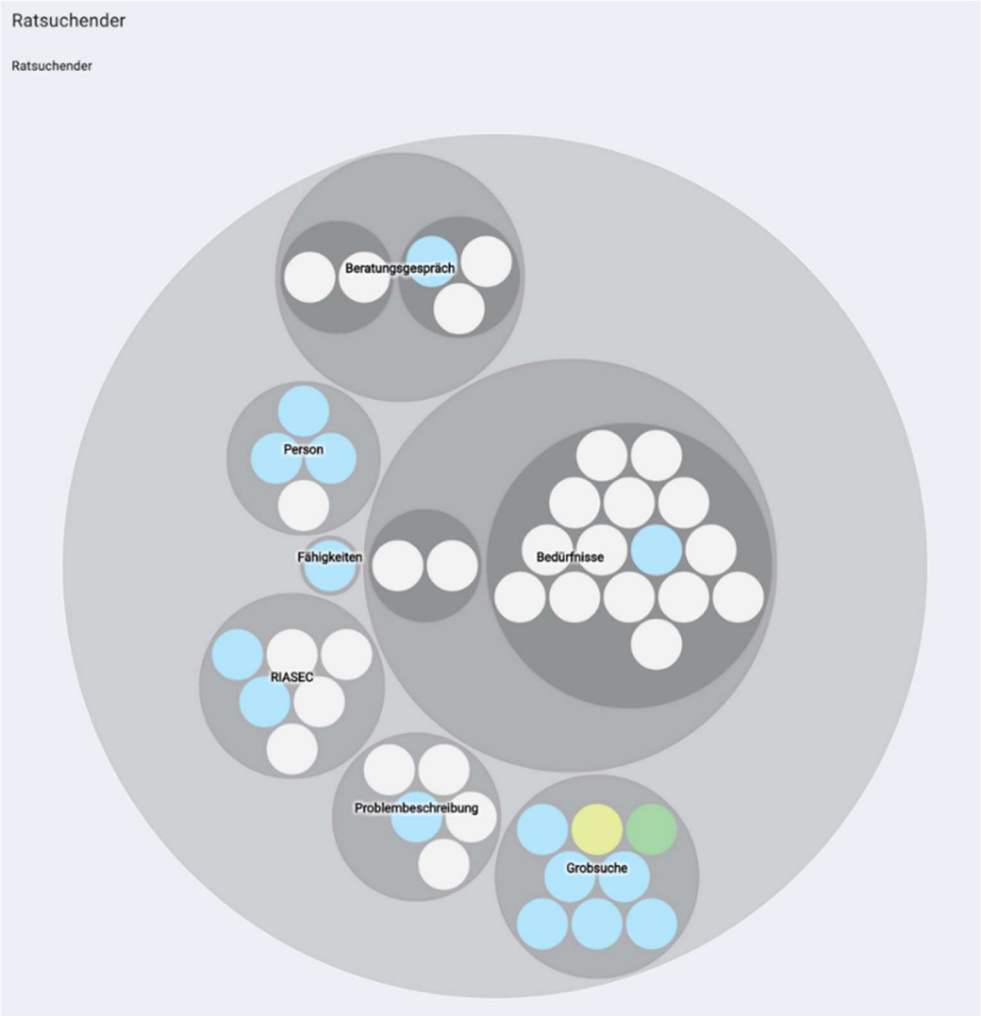

Figure 2 Semantic analyses created by AI with reference to the ontology of the system serve as a basis for proposed solutions or can be reflected upon and explored in greater depth during conversations

4.3 Exemplary case study and heuristic AI-support

Gati, Levin & Landman-Tal (2020, p. 137) have previously emphasised that most computer-assisted career guidance systems (CACGs) are by no means intended to replace professional career counsellors. This is because it has been shown that these systems are only most effective when used by a counsellor.

In our view, this emphasises the role of the counsellor as an expert in information management and decision support and opens up perspectives for the further development of these career counselling services through AI. Consideration of the client's individual heuristics and awareness of one's own heuristics as a counsellor in the construction of consistent solution spaces on the basis of valuative premises (criteria) are of central importance (Ertelt et al., 2022). However, in individual cases this requires the counsellor to have detailed occupational expertise in various occupational fields, training paths and conditions on the training and labour market.

Here we see the professional counsellor faced with the challenge of not uncritically applying algorithmically structured information systems via AI to decisions under uncertainty as is usually the case with clients. This is because many AI-based systems are not transparent

in their design principles and can therefore hardly be linked to the cognitive structures of individual heuristic decisions in a counselling context (Gigerenzer, Reb & Luan 2022; Gigerenzer, 2024).

This problem also requires the counsellor to be highly competent in assessing and reflecting the environmental conditions to which the client is exposed when making decisions and implementing them ("ecological rationality" sensu Gigerenzer). Therefore, in our project, AI-supported information management is made transparent for the client and counsellor in order to ensure the process-accompanying self-reflection of the individual heuristics applied. This includes the reflection of the and the interaction of the heuristics of counsellors and clients.

Our project is therefore also concerned with researching two heuristic approaches to career decision-making (counsellor and client), their linkage and the resulting information requirements in the course of the interview, which are met in a dialogue-oriented manner using an AI-supported filter system from the BA database BERUFENET. The information requirements should be orientated situationally to the client's respective solution space constructions and not to prescriptive or rational decision models.

The following example is intended to illustrate this. It is based on the transcription of a (real) career counselling interview, which was content-analytically evaluated according to three main categories: (1) Fact-related information or premises: Alternatives and their preliminary stages, e.g. job titles, information on the client's "ecological rationality"; (2) Valuative information or premises: Criteria, justifications; (3) subjective prescriptive information or premises: Process knowledge, heuristics, status in the decision-making process; emotions accompanying the decision, e.g. reactance, cognitive dissonance, problem pressure, involvement, uncertainty) of the information structural methodology (ISM) (Ertelt et al., 2022, p. 182 ff.).

In summary, five episodes can be identified to illustrate this, which are briefly characterised below, indicating the respective requirements for the vocational information system. The critical path here is the AI-supported filter system, which selectively adapts to the respective course of the conversation and is not orientated towards rational decision-making models (with potential "information overload") through the back door, so to speak.

In episode 1, the *Client (C)* can give a rough indication of the electronics and technology solution area and is aware that he still needs information for consideration. He has also already started an application portfolio, but still needs help here too. *Practitioner (P)* had to recognise that *C* is towards the end of the preliminary decision and already has a high level of involvement. It is clear that electronics is *C's* preferred occupational field. In addition, *C* addresses the bicycle sector (mechatronics technician) on the basis of tentative criteria. *The AI-system* need for information: Rough structure of the electronics sector and the bicycle mechatronics technician in the context of occupations with intermediate school leaving certificate.

In *episode 2, P* offers a consultancy contract that promises the transition from the preliminary decision phase to the commitment phase. The *AI-system* must demonstrate the minimum conditions for the two solution spaces based on criteria and procedures for realisation.

Episode 3 is about narrowing down the occupational field of electronics technician more precisely. Here, *P* demonstrates the need for qualified information, both with regard to the precise definition of specialisation and job content as well as training. The *AI-system* must primarily provide exemplary information via the filter function.

In *episode 4, P* attempts to specialise the electronics professions in the direction of devices and systems (because *C* had already tentatively thought in this direction beforehand). *C* is clearly out of his depth here, even though A uses a scale to measure the strength of preference. *P* must know that without more precise knowledge of the profession, such a measurement makes little sense for *C*. Here, the *AI-system* could provide more differentiated information in

advance, which *P* can pass on to *C* in prepared form or which *P* can show and discuss with *C* in the situation.

In *episode 5*, the field of bicycle mechatronics is also brought up. *P's* inclusion of the tentative criteria mentioned by *C* is not well based and partly judgemental. The *AI-system* could provide significant clarification here in order to adequately outline the solution space.

Based on different case constellations, the AI system presented here is designed to provide such support services in counselling sessions and to research how augmented counselling can look like in the future. How this actually takes place in simulated or real counselling sessions, whether this is successful and to what extent the use of the AI system represents added value and is acceptable from the perspective of counsellors and clients will be investigated and evaluated in further trials and a systematic evaluation.

5 Outlook – First insights, further testing and evaluation

The development and testing of the AI-System described is complex and can only succeed because the research partners on the AI side have done relevant preliminary work in related fields of work (Maletzki et al. 2023). Nevertheless, a variety of questions arise for the testing of the pilot application. Firstly, from a research perspective, the functionality of the AI model in the collaboration between the counsellor, the person seeking advice and the AI is of interest, e.g. in relation to which of the functions are used, where there is a need for improvement in usability and how further developments of the system are made possible on the basis of the test data.

From the described perspective of heuristic decision support with AI, further questions arise regarding the added value of the AI system and the possibility of supporting non-rational decision-making and individual heuristics.

From the counsellors' perspective, the practicability of the system is also of interest. How can the AI model (with a tablet or screen) be integrated into counselling work, what are the benefits and what barriers to use are perceived? What other use cases could be interesting? This is not least related to acceptance from practitioners and clients. For both those seeking advice and counsellors, "teamwork" with an AI is initially new and unfamiliar. What conditions need to be in place for acceptance of working with AI to develop, what aspects need to be clarified in advance (e.g. the issue of data protection plays a relevant role, but attitudes towards technology also need to be taken into account. From a professional perspective (Chapter 3), we should discuss and evaluate the extent to which the developed system addresses the problems and ethical concerns discussed or can address them in the future.

These questions will initially be investigated in simulations and in practice interviews with counsellors and students. The practical view of the research and development project is of great importance here. Further research questions will arise from the trial, which will be pursued in a continuation of the project.

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