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PROSPEKTIVE GLOBALE WISSENSCHAFTLICHE TRENDS

IMPLEMENTIERUNG VON TECHNOLOGIEN DER KÜNSTLICHEN INTELLIGENZ ZUR PERSONALISIERUNG DES FREMDSPRACHENLERNENS FÜR ERWACHSENE IN DER LEBENSLANGEN BILDUNG

PROSPECTIVE GLOBAL SCIENTIFIC TRENDS

IMPLEMENTING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE PERSONALIZATION OF FOREIGN LANGUAGE LEARNING FOR ADULTS IN LIFELONG EDUCATION

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EINFÜHRUNG / *INTRODUCTION*

The contemporary world is currently at the height of a technological revolution that is fundamentally transforming all spheres of modern society, ranging from the economic and political to the social and spiritual. A key catalyst of these changes is artificial intelligence (AI) technologies, which are rapidly being integrated into everyday human activity.

The field of education is no exception, as the digital transformation of education is inextricably linked with the active implementation of AI. These technologies have already become an integral component of the digitalisation process; they are widely employed to enhance the quality of education, facilitate personalised learning, monitor the dynamics of learners' achievements and more. This creates extensive opportunities for the development of new strategies and the application of innovative approaches to organising the educational process, particularly within the context of lifelong learning.

The use of artificial intelligence tools, including generative models, adaptive educational platforms, and automated feedback systems, makes it possible to take into account individual educational needs, levels of language proficiency, professional interests, and learning strategies of adult learners. This contributes to the formation of an adaptive educational environment that ensures the effective development of foreign language communicative competence.

At the same time, the integration of AI technologies into the educational process requires thorough scientific substantiation, the systematisation of methodological approaches and the development of effective models for their implementation, taking into account the specific characteristics of adult learning. In this context, it is particularly important to understand both the prospects and the potential risks associated with the application of AI in education.

The relevance of this study is determined by the necessity for a comprehensive theoretical understanding and practical implementation of artificial intelligence technologies in the personalisation of foreign language learning for adults within the framework of lifelong education, with the aim of enhancing the effectiveness and adaptability of the educational process.

The aim of the study is to substantiate and develop methodological recommendations to implement the artificial intelligence technologies in the personalisation of foreign language learning for adults in lifelong education.

In order to achieve the aim, the following objectives have been formulated:

1. To analyse the theoretical foundations and determine the current state of the usage of artificial intelligence technologies in the personalisation of adult learning within lifelong education.

2. To identify the pedagogical conditions and substantiate the principles for integrating artificial intelligence technologies into the process of foreign language learning for adults.

3. To develop an organisational and pedagogical model for the personalisation of foreign language learning for adults through the use of artificial intelligence technologies.

4. To formulate methodological recommendations to implement the proposed model in educational practice, taking into account both the opportunities and the risks associated with the use of AI.

The object of the study is the process of personalisation of foreign language learning for adults within lifelong education.

The subject of the study comprises artificial intelligence technologies and the methodological foundations of their implementation in the process of personalising foreign language learning for adults in lifelong education.

The scientific novelty of the study lies in the following:

– an organisational and pedagogical model for the personalisation of foreign language learning for adults, integrating artificial intelligence technologies, has been developed and scientifically substantiated;

– methodological approaches to the use of AI technologies for monitoring the dynamics of learning achievements and for the formation of individual educational trajectories have been further refined.

The theoretical significance of the study consists in expanding scholarly understanding of the mechanisms through which artificial intelligence technologies

influence the processes of personalising adult learning, deepening the theoretical foundations of andragogy and foreign language teaching methodology within the context of the digital transformation of education, and establishing a conceptual basis for further research in the field of lifelong learning.

The practical significance of the obtained results lies in the development of methodological recommendations and instructional support materials for the organisation of personalised foreign language learning for adults through using AI technologies. The findings of the study may be implemented in higher and postgraduate education institutions, corporate training environments, and continuing professional development programmes.

KAPITEL 1 / *CHAPTER 1*
THEORETICAL FOUNDATIONS OF THE PERSONALIZATION OF FOREIGN LANGUAGE LEARNING FOR ADULT LEARNERS IN A DIGITAL EDUCATIONAL ENVIRONMENT

1.1 Methodological Framework for the Personalization of Adult Learning in Lifelong Education

One of the priority directions in the modernisation of contemporary education is the implementation of a personalized approach, oriented towards taking into account the individual characteristics, life and professional experience, educational needs, and goals of adult learners within the framework of lifelong learning.

Adult education constitutes the core of the lifelong learning concept, encompassing three complementary dimensions: *formal* education (the attainment of state-recognised levels of education and qualifications); *non-formal* education (learning through programmes that do not necessarily lead to officially recognised certification) and *informal* education (self-directed learning occurring in the course of everyday life activities). Contemporary andragogical theory focuses on addressing the problem of the "competence crisis of the individual" (as defined by M. Knowles) in a rapidly changing world, which is a decisive factor in ensuring social mobility and competitiveness [1].

At the same time, the dynamic development of intelligent systems necessitates a reconsideration of traditional didactic approaches, as artificial intelligence is becoming not merely a tool but a key driver of the transformation of educational interaction.

Accordingly, the study of the effectiveness of foreign language learning for adults through the use of AI technologies requires, first and foremost, a clarification of the content of key concepts and their theoretical interpretation within the context of the contemporary paradigm of lifelong education. To this end, it is essential to differentiate and establish the relationships between related categories, namely: "individualization", "differentiation" and "personalization" of learning.

An analysis of scholarly and methodological literature [2; 3; 4; 5] makes it

possible to identify the following specific characteristics of these concepts:

individualization is understood as a learning process that involves taking into account the characteristics of each adult learner (such as pace, learning style and level of knowledge) through the use of didactic materials adapted by the teacher. The key feature of this approach is its focus on the learner as an individual; however, full control over the organisation of the educational process and decision-making remains with the teacher;

differentiation consists in grouping learners according to specific criteria (such as language proficiency level, professional interests, or prior experience) and selecting appropriate tasks and teaching methods accordingly. While this approach optimises the learning process for groups with similar characteristics, it does not ensure complete individual adaptation;

personalization represents the most advanced and comprehensive level of organising the learning process. It is regarded as a pedagogical strategy grounded in subject–subject interaction and the active involvement of adult learners in designing their individual educational trajectories: "…only under conditions of personalized learning does the learner become an active participant in the educational process, jointly with the teacher defines learning goals, assumes responsibility for the organisation and modification of learning, and creates their own educational environment" [6]. In contrast to individualization, where the learning process is adapted by the teacher, personalization is inherently *learner-centered*. Within this context, AI technologies function as an instrumental framework that enables the technical realisation of learning flexibility and facilitates the construction of *a unique educational trajectory* [5; 7].

The effectiveness of personalized learning within the adult education system is determined by its specific characteristics, including the heterogeneity of learner groups in terms of knowledge and experience, a strong pragmatic orientation, the necessity for the immediate integration of acquired knowledge into professional practice and limited time frames for training.

Under such conditions, personalization emerges as an essential prerequisite for

achieving effective learning outcomes, while the implementation of AI technologies (including language models, adaptive platforms, and chatbots) significantly expands the possibilities for individualization. This enables the realisation of **dynamic personalization**, whereby the learning process is continuously transformed in accordance with the needs and actions of the learner. At the same time, the transition to a digital educational environment is accompanied by a range of ethical and practical risks that must be taken into account in the development of the proposed model (Table 1).

Table 1 – Risks and Prospects of Implementing Personalized Learning through AI Technologies

Category	RISKS (Limitations)	POTENTIAL (Opportunities)
Organisational and Ethical	Data privacy concerns and ethical issues related to the collection of learner information.	Automated real-time diagnostics of learners' knowledge and educational needs.
	The "digital divide" and unequal access to advanced technological solutions.	Prompt support and mentoring through chatbots and virtual assistants.
	The risk of dehumanisation of education due to excessive reliance on algorithms.	Support for learner autonomy and independence (a key principle of andragogy).
Content and Quality	AI "hallucinations" and factual inaccuracies in the generation of specialised content.	Generation of hyper-personalised content tailored to the learner's professional experience.
	The risk of non-transparent assessment (the "black box" problem), which contradicts the principle of autonomy.	Adaptive content and flexibility of learning materials that can be instantly modified.
Communicative Competence	Over-reliance on translation tools and automated correction systems.	Accurate phonetic diagnostics and accent correction through ASR (Automatic Speech Recognition) systems.
	The formation of "algorithmic" accent and intonation patterns.	Generation of intonation models based on professional examples (native speaker input), enabling more natural and expressive speech training.
	Inhibition of spontaneity and flexibility in speech production.	Development of "communicative improvisation" through unstructured dialogues with LLM that dynamically adjust context and topic.
	Limitations in the development of pragmatic and sociocultural competence.	Simulation of complex negotiation scenarios with embedded cultural codes to enhance pragmatic competence.

	Inability to adequately assess written competence at the stylistic level.	Stylistic analysis of professional texts providing differentiated feedback on the appropriateness of "Tone of Voice" (formal, technical) in accordance with professional standards.

The systematic consideration of the aforementioned risks, together with the maximisation of the potential of digital tools within the framework of dynamic personalization, necessitates the development of a coherent methodological foundation. In response to this need, a methodological platform for personalized learning (Figure 2) has been proposed, grounded in the synergy of five interrelated approaches (Figure 1), which enables the adaptation of the educational process to the specific characteristics of adult learning within the context of lifelong education.

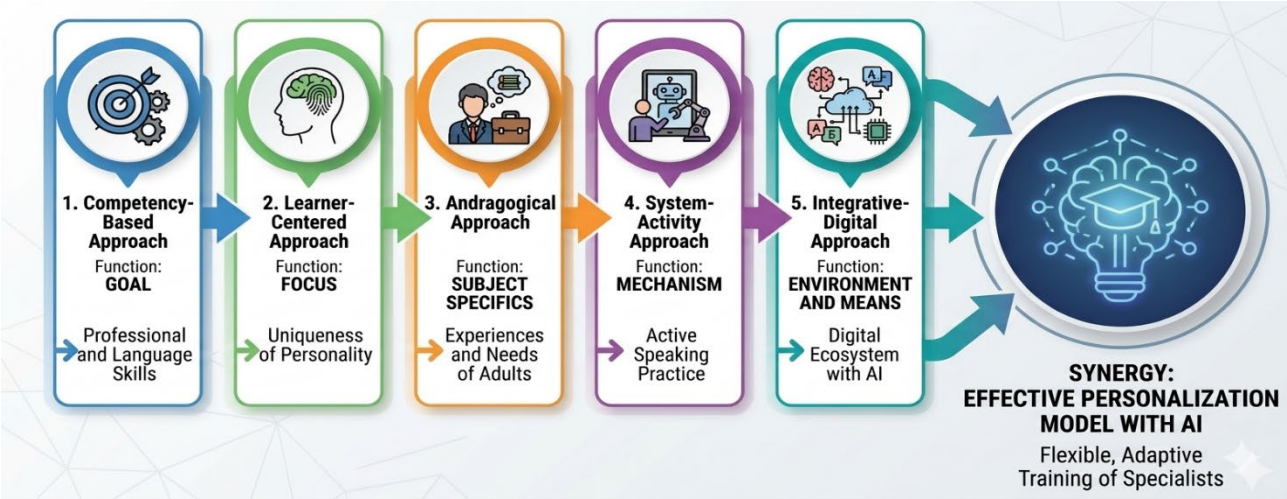

Figure 1 – Synergy of approaches

Source: generated by the author using the Gemini AI digital tool

Let us examine in detail the methodological approaches for implementing a strategy of personalized learning.

1. The competency-based approach in the context of foreign language training for adults is oriented towards the development of communicative competence aligned with the professional and personal needs of the learner. It requires a strong emphasis on professionally oriented language (English for Specific Purposes, ESP). Within the system of lifelong education, this approach is closely correlated with the requirements of professional standards and models of both Soft Skills and Hard Skills development.

2. The learner-centered approach focuses on the psychological uniqueness of each learner, including their learning styles, motivation and prior experience. Within the context of professional development, the key aspects include:

– ***autonomy:*** learners are responsible for their own educational trajectory, with AI serving as a supportive tool that enhances their independence;

– ***pragmatic goal orientation:*** aligning language learning with professional needs strengthens intrinsic motivation as the primary driving force of lifelong learning;

– ***digital learning safety:*** the creation of an environment in which errors are considered an integral part of the learning process, thereby supporting the preservation of the individual's self-esteem.

Given the specificity of the target audience, the psychological dimension of training should be further complemented by consideration of learners' socio-professional characteristics.

3. The andragogical approach constitutes the foundation of adult lifelong learning and is aimed at the implementation of ***the principle of conscious partnership***. In this context, the learning process is structured around the resolution of authentic professional tasks, where the learner acts as an active subject of educational activity. The implementation of this approach in the present study is based on the following principles:

– ***autonomy and self-direction:*** the learner is an active subject of the learning process who consciously defines educational goals and assumes responsibility for outcomes;

– ***primacy of experience:*** the use of professional and life experience as the main learning resource. In particular, foreign language acquisition is based on professional terminology and real communicative situations encountered in professional practice;

– ***pragmatism and contextualisation (motivation):*** knowledge is perceived not as abstract theory but as an applied tool for solving concrete professional tasks (for example, learning a foreign language for specific professional purposes such as negotiations, report writing, or analysis of technical documentation);

– ***immediacy of application:*** orientation towards the immediate implementation

of acquired skills into practice, thereby facilitating career advancement and enhancing an individual's social status.

Within the context of AI technologies, the andragogical approach enables the realisation of ***the principle of adaptability***. AI acts as a driver of personalization, adjusting the complexity, thematic focus and format of learning materials to the learner's existing experience, time constraints and current career needs. This corresponds to M. Knowles' theory (Malcolm Knowles, 1973; 1990), according to which the effectiveness of adult learning is directly dependent on the relevance of educational content to learners' current professional challenges [1].

4. The systems-activity approach is fundamental to foreign language training, as it conceptualises learning as an active form of speech activity. Within the framework of the present study, this approach is implemented through two interrelated dimensions:

the activity dimension assumes that foreign language acquisition occurs exclusively through the completion of communicative tasks. The use of AI technologies (such as language models and virtual interlocutors) creates conditions for continuous language practice, the simulation of professionally oriented dialogues, and the provision of immediate feedback, thereby intensifying the learning process;

the systemic dimension considers lifelong adult learning as an integrated system in which objectives, content, methods, and AI tools exist in a dialectical interrelation. This enables the organic integration of artificial intelligence tools into the structure of learning sessions, ensuring consistency and coherence in the educational process.

5. The integrative-digital approach serves as a bridging mechanism between traditional foreign language teaching methodologies and emerging technologies. In the context of digital transformation, it implies not merely the use of computers as auxiliary tools, but rather the deep integration of digital instruments into the structure and content of learning. This approach ensures the organic combination of professional knowledge, language training, and digital competences, where AI becomes an inherent component of the educational ecosystem, creating a "smart" learning environment.

The digital component of this approach is aimed at the development of digital competence within the system of lifelong adult education. By using AI for language

learning, adult learners simultaneously acquire skills in effective interaction with neural networks ***(prompt engineering)***, learn to critically evaluate AI-generated content, and use digital tools for self-directed learning. These competences are critically important for the contemporary professional.

The visual representation of the methodological platform for personalized adult learning in lifelong education is presented in Figure 2.

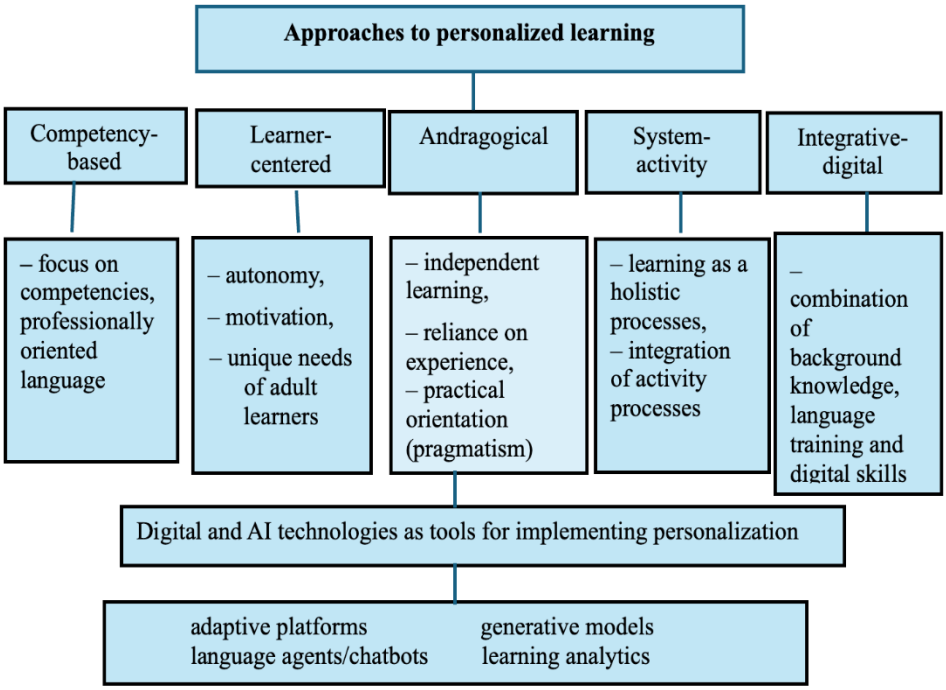

Figure 2 – The methodological platform

Author's development

The methodological platform (Figure 2) above represents a synergy of approaches that ensures the transition from a traditional model of teaching to a personalized learning system supported by artificial intelligence (AI). Such learning is "focused not only on the pedagogical mastery of the teacher, but also on the tools available in the learning process <…> In the era of digital technologies, a vast amount of knowledge has become accessible, which requires structural changes in the ways it is disseminated, as this is decisive for lifelong learning" [8]. This platform is therefore not merely a theoretical construct but a response to the challenges of "the digital age".

The technological and procedural implementation of the platform is ensured by *systemic-activity and integrative-digital approaches*. These enable AI to be viewed not

as an external add-on, but as an organic component of the learning process that intensifies language practice and fosters the digital competence of the contemporary professional. At the same time, *the andragogical approach* defines the ethical and value-based foundation of interaction, grounded in the principles of conscious partnership and reliance on the professional experience of adult learners. The integration of these approaches creates conditions for the implementation of flexible and adaptive adult learning within a dynamic digital environment.

Summarising the theoretical analysis, it can be stated that the introduction of AI into the system of foreign language training for adults leads to the transformation of traditional didactic models into a holistic platform for personalised learning. The key outcomes are as follows:

1) personalization is defined as the highest level of learning organisation, based on subject–subject interaction and the active design by adult learners of their own educational trajectories;

2) the role of AI is substantiated as a driver of adaptability and autonomy, functioning as a systemic component of the contemporary educational ecosystem;

3) a methodological platform has been developed which, through the synergy of five approaches, ensures the pragmatic orientation of learning, aligning digital tools with the professional needs of adult learners (ESP).

Thus, the personalization of foreign language learning for adults in lifelong education emerges as a complex, multidimensional process in which artificial intelligence technologies function as a system-forming factor.

1.2 Didactic Potential and Typology of AI Tools in the System of Foreign Language Training for Adult Learners

The substantiation of the didactic potential of artificial intelligence (AI) requires a clear definition of its essence within the educational context. In the scholarly literature, the category of **Artificial Intelligence in Education** (AIEd) is understood as a set of software systems and algorithms capable of performing cognitive and

creative functions traditionally regarded as the prerogative of humans, including speech recognition, text analysis, decision-making and content adaptation. This definition is grounded in the seminal report by R. Luckin and W. Holmes, "Intelligence Unleashed" (2016) [9], in which AI is conceptualised as a tool for unlocking the intellectual potential of participants in the educational process.

To ensure a human-centred approach, this study draws upon the definition proposed by UNESCO (2021), according to which AI systems are "information-processing technologies that integrate models and algorithms to develop the capacity for learning and performing complex tasks, resulting in predictions and decision-making in both real and virtual environments" [10].

Historically, the term "artificial intelligence" was introduced by Professor J. McCarthy in 1956 during the Dartmouth Conference, marking the emergence of a new scientific field aimed at creating "intelligent machines" [11, cited in Panukhnyk]. Despite the long evolution of this concept [12], the central idea remains the replication of human cognitive processes.

Within the framework of this study, the focus is placed on the **didactic potential of AI**, which is realised through the following key functions:

1) adaptive function – the capacity of AI systems (such as LMS platforms and adaptive algorithms) to continuously adjust the complexity and pace of content delivery in accordance with the learner's actions and needs, thereby ensuring "dynamic personalization";

2) diagnostic and analytical function – the provision of immediate feedback and error analysis in language practice, enabling adult learners to independently adjust and refine their educational trajectories;

3) communicative and simulation function – the use of language models and virtual interlocutors to create an authentic foreign language communication environment, which is critically important for modelling professional dialogues within the framework of English for Specific Purposes (ESP).

For the process of foreign language acquisition, two technological branches of AI are of particular significance, forming the foundation of this study:

1) *machine learning (ML)* – the ability of systems to learn from large datasets (for example, by analysing a learner's errors, the system begins to generate tasks specifically targeting areas of difficulty). This forms the basis of adaptive learning systems (ALS);

2) *natural language processing (NLP)* – a technology that enables computers to understand, interpret and generate human language. NLP serves as the "engine" underlying translation tools, chatbots, and speech recognition systems.

These technological branches (ML and NLP) in contemporary educational solutions rarely function in isolation; rather, they are typically integrated, forming complex intelligent systems. For the purposes of this study, the emphasis is placed not on the software architecture of these technologies but on their didactic capabilities.

From the perspective of linguodidactics, the "intelligence" of contemporary digital systems lies not so much in the complexity of their software architecture as in their capacity to model the activity of an experienced teacher. The process of adaptation in such systems is based on the interaction of three didactic components:

– ***linguistic content (WHAT is being learned?)*****:** a digitised corpus of language material, ranging from lexical units and grammatical structures to professional texts and communicative situations within the framework of English for Specific Purposes (ESP);

– ***learner profile (WHO is learning?)*****:** the system continuously analyses the learner's "digital footprint", capturing not only knowledge gaps but also individual characteristics, including learning pace, typical errors and even the level of motivation;

– ***learning strategy (HOW is learning organised?):*** a mechanism of pedagogical decision-making through which the system selects the most appropriate instructional intervention, whether to re-explain a rule, provide additional practice or shift to a topic more relevant to the learner's needs.

Such an evolution of technologies leads to a shift in the educational paradigm: from simple automation (the replacement of routine teaching tasks) to the concept of intelligence augmentation (IA), where **AI functions as a tool for enhancing the cognitive capacities of adult learners**. This ensures the implementation of dynamic

personalization, whereby learning continuously adapts to the needs and actions of the user.

Taking into account the aforementioned functions and technological branches, AI tools may be classified according to their functional purpose.

1. *Generative language models (Large Language Models, LLMs)* represent the most advanced class of systems based on transformer neural networks, including such models as *ChatGPT (OpenAI), Claude (Anthropic), Gemini (Google), Microsoft Copilot, Llama (Meta), Mistral (Mistral AI), Grok (xAI), and DeepSeek (DeepSeek-AI)*. Within the educational environment, these models perform the functions of an intelligent tutor or an adaptive conversational partner. Owing to their capacity to operate on vast corpora of linguistic data, they provide a high level of learning personalization; from the simulation of authentic foreign language dialogues and the explanation of complex grammatical structures to the creative generation of contextualised learning materials and project-based ideas for professional development.

A distinct group of tools demonstrating high effectiveness in the teaching of professionally oriented foreign language (ESP) is represented by ***intelligent research assistants*** based on Retrieval-Augmented Generation (RAG) technology, notably *NotebookLM*. Such systems enable creating the personalized "knowledge base", constraining AI-generated responses exclusively to user-uploaded professional materials.

Within the context of adult learning, NotebookLM facilitates the implementation of the following didactic scenarios:

– *contextualisation of learning*: the adult learner uploads their own professional texts (analytical reports, case studies, articles), on the basis of which the system automatically generates glossaries, contextual explanations and interactive exercises that fully correspond to highly specialised needs;

– *multimodal practice*: the Audio Overview function transforms complex written texts into structured discussions in English, creating unique conditions for the development of listening skills within a professional domain;

– *development of digital autonomy*: the use of such tools requires proficiency in *prompt engineering* and the critical evaluation of generated content, thereby directly supporting the integrative-digital approach to learning.

2. ***Adaptive learning platforms (Adaptive Learning Systems)*** are systems that automatically adjust the learning pathway to the individual user, such as *Duolingo, Knewton, Coursera* (with elements of AI coaching), *DreamBox Learning* and *Khanmigo* (Khan Academy). These platforms focus on the dynamic modelling of the individual educational process. They are capable of analysing learner performance in real time, identifying gaps in cognitive assimilation and automatically adjusting task complexity, thereby implementing the principle of personalization.

3. ***Translation and writing assistance tools (Translation & Writing Assistance)*** include systems that support text production and correction, such as *DeepL, Google Translate, Grammarly, and LanguageTool*. These tools not only correct errors but also analyse style (Tone of Voice), suggest synonyms, and improve sentence structure, which is critically important for professional communication.

4. ***Speech recognition and synthesis technologies (ASR & TTS)*** comprise systems for Speech-to-Text (voice recognition) and Text-to-Speech (speech generation), including tools such as *Otter.ai*, built-in assistants (e.g. *Siri, Google Assistant*) and specialised pronunciation trainers (e.g. *ELSA Speak, Poised*). Their educational function lies in enabling the development of listening and speaking skills without direct teacher involvement. Systems such as *ELSA Speak* or *Poised* are capable of analysing pronunciation at the phonemic level and providing detailed feedback on accent and intonation. For instance, in preparing an economist to deliver an annual report presentation, a virtual tutor may analyse not only grammatical accuracy but also the confidence of pronunciation of professional terminology (e.g. liquidity, volatility, diversification), providing visualised statistics of errors.

For the purpose of systematising these tools within the framework of the present study, Table 2 is proposed. It should be noted that the list of software tools is not exhaustive and is continuously evolving due to the rapid development of the Generative AI market.

Table 2 – Typology of AI Tools by Functional Purpose in the System of Foreign Language Training for Adult Learners

AI Category	Type of Interaction	Example of Use in Language Learning	Representative Tools
Intelligent Tutoring Systems (ITS)	Mentoring	Step-by-step explanation of grammar, responses to questions such as "Why is this incorrect?"	Duolingo Max, Khanmigo, Grammarly, Coursera (error explanation function).
Dialogue Simulators	Communication	Role-play scenarios (e.g. job interviews, negotiations) with a virtual agent.	Praktika.ai, TalkPal, ChatGPT (Voice Mode), Replica.
Content Generators	Resource creation	Generation of personalised professional texts.	ChatGPT, Claude, Gemini, Twee.
Analytical Systems	Diagnostics	Assessment of language proficiency (CEFR) and identification of knowledge gaps.	ELSA Speak (pronunciation analysis), EnglishScore, built-in analytics of LMS Moodle/Canvas.
Translation and Writing Assistance Tools	Assistance	Correction of professional writing style, evaluation of "Tone of Voice", contextual translation of terminology	DeepL, Google Translate, LanguageTool, Quillbot.

Thus, the didactic potential of AI in foreign language training for adults lies not only in the automation of routine tasks, but also in the creation of an intelligent digital environment. Such an environment facilitates the deep integration of digital tools into the structure of the learning process, contributes to the development of digital competence in the contemporary professional, and ensures continuity in lifelong learning.

The analysis of AI tools indicates that the current technological landscape offers a wide range of solutions suitable for educational purposes. A key feature of these technologies is the shift from **static content** to **dynamic interaction**, which enables the implementation of a genuinely personalised approach rather than a merely declarative one.

It has been established that the didactic value of these tools is grounded in their capacity to model the activity of a teacher through the interaction of three core components: linguistic content, the learner's digital profile, and an adaptive learning strategy. This confirms the transformation of the educational paradigm from

automation to intelligence augmentation, whereby technology enhances the cognitive capabilities of adult learners.

In the context of lifelong adult learning, the most promising approach is the integrated use of generative large language models (LLMs to practice communication and content explanation) in combination with specialised natural language processing (NLP) tools (to development pronunciation and writing skills). This integrated approach creates a coherent digital learning environment that aligns with the principles of andragogy and the systems-activity approach and provides a foundation to develop the instructional model presented in the subsequent chapter.

1.3 Theoretical Foundations for the Integration of AI into the Process of Forming Foreign Language Communicative Competence

The successful integration of AI technologies into the system of foreign language training for adults is determined by the effective alignment of the defined methodological platform (see section 1.1.) with the functional capabilities of AI (see section 1.2). At this stage, it is essential to determine how technological tools transform the process of developing the key learning outcome – foreign language communicative competence (FLCC).

Viewed through the lens of the proposed methodological framework, the polysemous nature of the concept of FLCC acquires renewed relevance, while an analysis of scholarly discourse demonstrates the transformation of classical interpretations under the influence of digitalisation.

FLCC as a personal resource is defined as "a specific manifestation of a complex personal resource that ensures the possibility of optimal and effective interaction in the process of professional communication with foreign partners, and which facilitates self-education and personal development of future specialists" [13, p. 16]. Under conditions of AI integration, this competence is transformed into the adult learner's capacity for autonomous and personalised management of their own educational trajectory.

FLCC as an integral professional characteristic is understood as "a complex construct, an integral characteristic of professional and personal qualities, representing the ability to demonstrate highly effective communicative capacity in foreign language professional communication, to create and manage discourse, and manifested through the application of a system of knowledge, skills, and abilities …" [14, p. 17]. Under the influence of AI, FLCC evolves into the specialist's ability to communicate effectively within a "human – AI – human" interaction model.

FLCC as a set of knowledge, skills and abilities is defined as "the aggregate of knowledge, skills, abilities, and competences necessary for the performance of professional activities in a foreign language …" [15, p. 8]. Within the digital educational environment, this understanding is expanded by the inclusion of a fourth fundamental component – linguo-digital competence. This encompasses the ability to integrate algorithmic tools into professional activity, as well as skills in prompt engineering and the critical evaluation of the authenticity of generated content.

Synthesising these perspectives through the prism of the andragogical and integrative-digital approaches, within the context of this study, foreign language communicative competence of adult learners is defined as: **an integrative capacity of the individual to solve professional communicative tasks by means of a foreign language, utilising contemporary digital tools to establish effective interaction, independently seek information, and engage in continuous professional self-development.**

In our view, this definition emphasises a paradigmatic shift: in the era of artificial intelligence, a specialist is required not only to master the linguistic code, but also to be capable of interacting effectively with intelligent systems in order to achieve communicative objectives.

Drawing upon the model of the Common European Framework of Reference for Languages (CEFR) and taking into account the andragogical specificity of adult learning, it is appropriate to distinguish the following *components of foreign language communicative competence (FLCC)*, the development of which is significantly enhanced by the didactic potential of AI tools:

1) language (linguistic) competence – mastery of lexical, grammatical and phonetic material. AI tools (including adaptive vocabulary learning platforms, intelligent grammar correction systems, and pronunciation trainers based on automatic speech recognition (ASR) technologies) enable the effective automation of routine consolidation processes. This allows classroom time to be reallocated to more complex, interactive communicative tasks;

2) sociolinguistic and sociocultural competence – knowledge of cultural norms, politeness conventions and registers of communication (formal/informal). AI technologies based on large language models (LLMs) make it possible to simulate a wide range of social and cultural contexts through role-based interaction with predefined parameters. This enables learners to practise authentic behavioural patterns within a safe educational environment (for example, through the simulation of negotiations between a start-up founder and an investor);

3) pragmatic (discursive) competence – the ability to produce coherent utterances and construct logically structured texts and dialogues in accordance with communicative intent. In this process, AI functions not only as a communication partner (providing scaffolding), but also as an analytical tool for evaluating the logical structure of discourse. The use of specialised conversational agents and AI-based writing systems facilitates the effective structuring of professional texts;

4) professional competence (English for Specific Purposes, ESP) – mastery of specialised terminology and genres of professional communication. The didactic advantage of AI in this domain is particularly significant, as it enables the hyper-personalisation of content. Algorithms are capable of instantly generating tailored learning materials (such as case studies, professional articles, and glossaries) directly aligned with the learner's specific field of specialisation (e.g. economic, legal, or engineering English). Such a level of adaptability cannot be achieved within the framework of a traditional static textbook.

1.3.1 Mechanisms to Implement Methodological Approaches

The development of the above-mentioned components of foreign language

communicative competence (FLCC) does not occur in a random manner; rather, it is governed by a clearly defined methodological logic. Within a digital educational environment, each of the methodological approaches identified in section 1.1 acquires a specific technological embodiment.

The systematisation of mechanisms through which theoretical principles are transformed into concrete functional capabilities of AI enables a clear representation of the logic underlying the integration of AI into the learning process (Table 3).

Table 3 – Mechanisms to Implement Methodological Approaches through AI Technologies

Methodological Approach	Mechanism of Implementation through AI	AI Functionality
Andragogical	Autonomous learning management	Adaptive platforms that enable learners to select topics relevant to their current professional experience and individual schedules.
Competency-based	Targeted diagnostics	AI-driven analytical systems that identify specific gaps in language skills and automatically generate individualised exercises to fix them.
Systems-activity	Simulation of communicative activity	Generative language models (LLMs) that function as interactive interlocutors for practising professional dialogues (role-play scenarios).
Learner-centred	Content adaptation	AI systems that present learning materials in the most suitable format (text, audio, video) and style, in accordance with the learner's cognitive preferences.
Integrative-digital	Creation of a digital ecosystem	Integration of diverse tools (translation systems, grammar checkers, dialogue simulators, and content generators) into a unified, personalized learning environment.

A key advantage of AI lies in its capacity to deliver **scalable personalization**, which has traditionally been unattainable within conventional educational settings. This function is realised through three interrelated core processes:

1. Diagnostics and modelling of the learner profile. AI continuously collects data

on the rate of content assimilation, types of errors, time spent on tasks, and levels of motivation. On the basis of these data, a digital learner profile is automatically generated, enabling the precise identification of the learner's current level of foreign language communicative competence (FLCC).

2. Adaptive content delivery. In contrast to static textbooks, AI systems are capable of dynamically adjusting the complexity and thematic focus of tasks in real time. For example, if a learner demonstrates an interest in the field of finance or requires the development of competencies in this domain, algorithms automatically generate additional authentic content (texts, case studies, dialogues) incorporating relevant professional terminology. This fully corresponds to the principle of pragmatism within the andragogical approach.

3. Immediate and differentiated feedback. The system provides instant evaluation of the learner's communicative performance. This is critically important for the development of FLCC, as it reduces the time between action (utterance) and correction, thereby optimising the formation of language skills in accordance with the principles of the systems-activity approach, particularly through real-time skill adjustment.

1.3.2 Typology of Interaction Scenarios within the "Learner – AI System"

The effectiveness of AI in adult learning is determined not only by its technical functionality, but primarily by the selected interaction model, which must correspond to the learner's specific communicative needs. Within the framework of this study, three core models have been identified, ensuring the comprehensive development of foreign language communicative competence (FLCC).

1. The "AI Tutor" model (Drilling & Instruction) assumes a dominant role in managing the learning process. It is aimed at the intensive elimination of gaps in linguistic competence through the generation of individualised tests, the explanation of grammatical rules using examples from professional contexts, and the automated training of vocabulary.

2. The "AI Interlocutor" model (Simulation & Role play) is based on subject–

subject (peer-level) interaction, in which AI simulates authentic communicative situations. This scenario is indispensable for the development of sociocultural and pragmatic competences. A typical example is the simulation of negotiations with an international partner, where the AI strictly adheres to a specified linguistic style and cultural tone (e.g. British business etiquette versus American small talk conventions).

3. The "AI Copilot" model (Co-creation & Scaffolding) implements the concept of intelligence augmentation (IA), in which AI functions as an assistive tool for the execution of real professional tasks. This scenario is oriented towards the development of specialised professional competence (ESP). Its practical application is found in collaborative work on business correspondence, reports, or presentations, where AI suggests improvements in stylistic coherence and terminological accuracy.

The effective implementation of these scenarios highlights the necessity of developing a specific skill among adult learners – **prompt engineering.** Within the context of this study, this is conceptualised as a **linguo-digital meta-competence**, defined as the ability to formulate precise and purposeful prompts, manage contextual parameters and critically validate generated content.

For effective personalised lifelong learning, adult learners must be able to: *define the context* (clearly specifying the role of AI, its domain of expertise, and the intended objectives); *set parameters* (indicating the desired level of language proficiency, stylistic register, and response format); and *critically evaluate outputs* (verifying generated content for potential "hallucinations", as well as linguistic and domain-specific inaccuracies, thereby assuming responsibility for the final communicative product).

Thus, the integration of AI into the process of developing FLCC in adult learners is theoretically substantiated and demonstrates considerable didactic potential. AI should be regarded not merely as a technical tool, but as an intelligent tutor capable of managing the learning process on the basis of data, ensuring a level of personalisation aligned with professional objectives and the principles of andragogy.

1.4 Experience of Integrating AI into Foreign Language Learning

The analysis of empirical experience in implementing AI technologies within the educational process constitutes a fundamental stage in substantiating the scientific novelty of the present study. Such an analysis enables not only the systematisation of the most effective forms of AI application in the personalisation of foreign language learning, but also the identification of unresolved issues specific to adult education (the andragogical context).

Global AIEd practice demonstrates the predominance of Narrow AI tools, which are directly associated with the development of foreign language communicative competence (FLCC) [16; 17; 18].

The application of *adaptive learning systems* is widely evidenced. Commercial platforms (such as *Duolingo, Memrise and AI-enabled functionalities within Coursera or edX*) actively employ machine learning algorithms to personalise both the pace and content of instruction (thus implementing the competence-based approach). These systems continuously analyse user responses, diagnose areas of cognitive difficulty, and dynamically adjust task sequencing in order to maximise the effectiveness of repetition and consolidation.

The use of *intelligent tutoring systems and simulation tools* (ITS & LLM) is also increasingly prevalent. Generative language models (such as *ChatGPT, Gemini, Claude, and Perplexity AI*) are utilised to create highly interactive environments that simulate authentic communication. This directly supports the implementation of the systems-activity approach, as learners are afforded opportunities to practise professionally oriented dialogues without temporal constraints or psychological barriers.

The implementation of *speech recognition technologies* (ASR) is another significant trend. These systems are integrated into specialised pronunciation training tools (for example, ELSA Speak), providing immediate and precise feedback on phonetics and intonation. This enables the refinement of speaking skills at an individual level, aligning with the principles of the learner-centred approach.

Overall, international experience demonstrates the high effectiveness of AI in addressing specific components of FLCC (such as vocabulary, grammar and pronunciation). However, it often overlooks key andragogical principles, particularly learner autonomy and the integration of professional experience.

Domestic experience of AI integration, although characterised by a lower level of commercialisation compared to global leaders, demonstrates rapid and substantial development within the scientific and methodological domain. Contemporary Ukrainian researchers actively investigate processes of digitalisation and the application of AIEd, substantiating the necessity of transitioning towards an integrative-digital approach. A central issue in scholarly discourse concerns the level of readiness of academic and teaching staff for professional interaction with AI systems, as well as the development of digital meta-competence among all participants in the educational process [19; 20; 21].

Particular attention in contemporary research is devoted to the experimental application of AI technologies. In higher and postgraduate education institutions, there is evidence of targeted implementation of individual AI tools, particularly for the automation of assessment processes, the generation of educational content, and the use of large language models (LLMs) as assistants in the preparation of teaching and methodological materials [22; 23]. Issues of regulatory support have also come to the forefront. Strategic documents of the Ministry of Education and Science of Ukraine, together with broader digitalisation policies, are creating a favourable environment for further scientific and pedagogical experimentation in the field of AIEd [24; 25; 26].

These trends are likewise reflected in the activities of leading higher education institutions. In particular, the *Department of Foreign Languages and Cross-cultural Communication at Simon Kuznets Kharkiv National University of Economics*, on the basis of which the present study is conducted, has in recent years undertaken systematic scientific and methodological work on the digitalisation of foreign language education. Within this strategic direction, the department has developed a range of initiatives, including the design and development of interactive professionally oriented learning resources; methodological modelling of algorithms for the application of contemporary

educational platforms; and the investigation of the *linguodidactic potential* of generative artificial intelligence in the processes of developing foreign language communicative competence (FLCC).

For instance, during the period 2023 – 2026, the academic staff of the department have published a series of scholarly works and instructional materials that have undergone successful validation within real educational settings [27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40].

The analysis of existing practical experience has made it possible to identify key gaps that need to be addressed within the framework of this study, namely:

– *methodological fragmentation.* Contemporary digital platforms, although demonstrating high levels of effectiveness, generally fail to ensure the comprehensive implementation of the methodological approaches identified in this study (in particular, the andragogical and integrative-digital approaches). This limits the extent to which the specific characteristics and needs of adult learners are fully taken into account;

– *issues of data quality and security.* The functioning and training of adaptive systems require large volumes of data, which raises ethical concerns related to data privacy and the protection of personal information;

– *human resource capacity.* At the present stage, there exists a significant gap between the technological potential of AI tools and the actual level of proficiency in their use among teaching staff.

Addressing these gaps necessitates the development of a coherent and scientifically grounded model that systematically integrates the capabilities of AI for the personalisation of foreign language learning for adults within the framework of lifelong education.

Conclusions to Chapter 1

The conducted theoretical and methodological analysis has made it possible to formulate a number of key conclusions that constitute the scientific foundation for the further development of a model of personalized learning:

1. The essence of personalized learning as a leading pedagogical strategy in the digital era has been clarified. In contrast to traditional individualisation, personalization is learner-centred and based on subject–subject interaction, where the adult learner actively participates in designing their own educational trajectory, while AI technologies serve as a tool for its technical implementation.

2. The synergy of five methodological approaches determining the effectiveness of developing foreign language communicative competence (FLCC) in adult learners has been substantiated: *the competency-based approach* (orientation towards specific professional skills); *the learner-centred approach* (consideration of individuality and motivation); *the andragogical approach* (reliance on life experience and learner autonomy); *the systems-activity approach* (learning through active communicative practice); and *the integrative-digital approach* (the creation of a coherent digital learning system).

3. The didactic potential of AI technologies has been systematised through their adaptive, diagnostic-analytical and communicative-simulation functions. It has been demonstrated that the "driving force" of personalization is constituted by natural language processing (NLP) and machine learning (ML) systems, which are capable of modelling the activity of an experienced teacher through the interaction of linguistic content, learner profiles and learning strategies.

4. A typology of "learner–AI" interaction scenarios has been defined, where technology assumes the roles of "AI Tutor" (eliminating knowledge gaps), "AI Interlocutor" (simulating professional situations) and "AI Copilot" (co-creating content). This reflects a shift from the concept of simple automation to that of intelligence augmentation (IA), understood as the expansion of learners' cognitive capabilities.

5. Based on the analysis of international and domestic experience, critical gaps have been identified, including the methodological fragmentation of existing platforms and the disparity in levels of digital competence among teaching staff. This confirms the necessity of developing a coherent, scientifically grounded methodological system that integrates AI into the process of foreign language training for adults within lifelong

education.

Despite the existence of advanced international platforms and artificial intelligence tools, the problem of developing a systematic methodology tailored to a specific target group – namely, adult learners engaged in lifelong learning remains highly relevant.

KAPITEL 2 / *CHAPTER 2*
MODEL OF INTERGATING ARTIFICIAL INTELLIGENCE TECHNOLOGIES INTO PERSONALIZED FOREIGN LANGUAGE LEARNING FOR ADULT LEARNERS

2.1 Conceptual Foundations for Designing an AI Integration Model

The scientific substantiation of personalised foreign language learning for adult learners necessitates the application of the method of pedagogical modelling. This method enables the reconstruction of a complex educational process as an integral system, facilitates the examination of interrelations among its components and allows for the prediction of the effectiveness of implementing innovative technologies.

The design of a model for integrating artificial intelligence is driven by the need to resolve the contradiction between the increasing demands placed on adult learners' foreign language communicative competence (FLCC) and the insufficient flexibility of traditional forms of instruction. Prior to presenting the proposed model, it is essential to clarify the essence of this phenomenon. In scientific discourse, a model is defined as "a mental or material system that adequately reflects the object of study and is capable of substituting for it in such a way that the investigation of the model provides new information about the object" [41, p. 46].

Within the context of this study, particular relevance is attributed to the position of N. Sura, who emphasises that a pedagogical system constitutes a specific model of the educational process under investigation, the foundation of which is a set of interacting pedagogical elements. The researcher notes that "the model of the pedagogical process itself, that is, the pedagogical system proper, is not static; it may be modified and refined in the course of research, gradually approaching the version that most adequately reflects the educational process under study" [42, p. 221]. This characteristic of the model – **its dynamism and capacity for refinement** – is of critical importance in the context of artificial intelligence integration, as digital tools enable the system to adapt in real time to the evolving educational needs of the adult learner.

This approach makes it possible to resolve the contradiction between competency

requirements and traditional instructional methods. V. Klochko and M. Pradivliannyi emphasise that "a model of specialists in technical or economic fields with advanced proficiency in a professionally oriented foreign language can only be formed as a result of the establishment of the conditions for its emergence, as well as through the implementation of future professional activity" [43, p. 27].

Building upon these theses, the proposed model is conceptualised as a tool for creating precisely such "conditions for the emergence" of competence. Within a digital environment, these conditions are constituted by content adaptability, interactive engagement with AI, and the professional contextualisation of learning tasks.

The conceptual foundation of the model is based on the synergy of five methodological approaches (andragogical, competency-based, learner-centred, systems-activity and integrative-digital), which determine its multi-level structure. The design is grounded in the concept of intelligence augmentation (IA), whereby technology is viewed not as a substitute for the teacher but as an intelligent tool to expand the cognitive and communicative capacities of the adult learner.

Accordingly, the model is intended to ensure the implementation of three core didactic functions of AI (adaptive, diagnostic-analytical and communicative-simulation), as reflected in the proposed conceptual framework, which is based on the following key principles:

– *the principle of competence orientation*, which emphasises the development of foreign language communicative competence (FLCC) required for the performance of professional functions, thereby highlighting the alignment between objectives and outcomes;

– *the principle of andragogical autonomy*, whereby the learner acts as an active subject who, in collaboration with AI, designs their own educational trajectory, with AI serving as a support mechanism rather than a controlling agent;

– *the principle of dynamic adaptability (personalization)*, according to which both the content and procedural components of learning are modified in real time in response to the learner's progress and needs, implemented through an adaptive cycle;

– *the principle of integrativity*, according to which AI technologies function as a

system-forming factor across all components of the model, permeating every element and transforming the model into a high-tech personalised learning system.

A visual representation of the conceptual model and the interrelationships between its elements is presented in Figure 3. This visualisation structures the author's conceptual framework and reflects the operational architecture of the educational process.

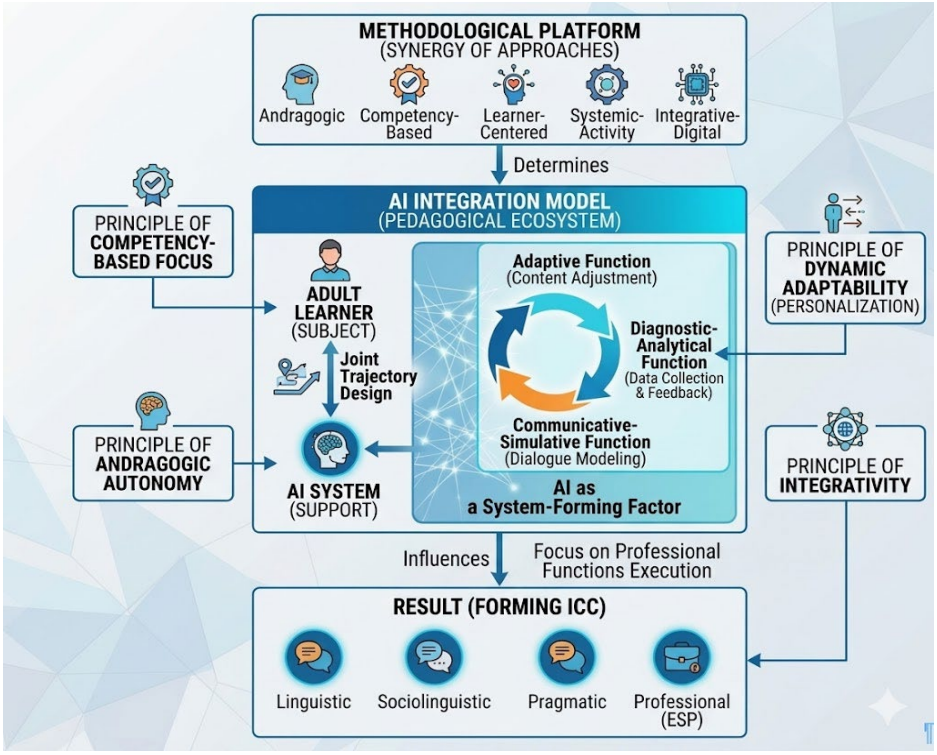

Figure 3 – Conceptual model of AI integration into personalized foreign language learning for adult learners

Source: generated by the author using the Gemini AI digital tool

The scheme illustrates a transition from linear learning to an adaptive educational environment, where the key components include:

methodological platform – the synergy of five approaches, ensuring the scientific coherence and robustness of the model;

subject–digital interaction – positioning the adult learner as an active agent who, in partnership with AI systems, designs their own educational trajectory. In this context, AI functions not as a replacement for the teacher, but as an intellectual support mechanism;

functional core – a closed-loop system of AI didactic functions (adaptive, diagnostic-analytical and communicative-simulation). This enables the learning environment to respond in real time to the learner's "digital footprint", adjusting content and task complexity dynamically, thereby ensuring genuine rather than merely declarative personalization;

competence-based outcome – a clear orientation of all model components towards the development of FLCC, with particular emphasis on its professionally oriented component (ESP).

Thus, the proposed model enables the overcoming of the static and fragmented nature of traditional instructional approaches, creating a coherent adaptive learning environment grounded in the principles of andragogical autonomy and intelligence augmentation. This approach ensures a high level of personalisation, whereby the pace, content, and trajectory of learning are dynamically adjusted to the individual needs and professional experience of the specialist, which is critical for effective foreign language training of adult learners within a lifelong learning framework.

2.2 Structural and Functional Characteristics of the AI Integration Model

To ensure the integrity of the adaptive educational environment, the proposed model of AI integration is designed as a set of five interrelated components. Each component performs a specific function and is transformed under the influence of generative technologies, forming a unified algorithm of personalization.

1. The target component *(strategic vector)* defines the overall aim of the learning process – namely, the development of foreign language communicative competence (FLCC) and the learner's linguo-digital metacompetence (prompt engineering). This component performs prognostic and motivational functions by specifying objectives in accordance with the individual professional needs of the learner.

The formulation of target orientations directly determines the content of the subsequent component.

2. The content component *(dynamic content)* delineates the substance of learning

(professional vocabulary, communication genres) and, due to generative AI, becomes flexible and hyper-personalised. Unlike static textbooks, content is generated dynamically in response to the learner's specific request (Generative Content), thereby enabling the implementation of the English for Specific Purposes (ESP) approach at a fundamentally new level.

The realisation of such flexible content is only possible through the deployment of an advanced technological toolkit.

3. The technological component *(instrumental core)* constitutes the central element of the model and comprises a set of AI tools, including adaptive platforms, LLM-based simulators, and analytical systems. Within this component, AI performs an instrumental function by automating routine processes and providing immediate feedback. It is precisely this component that ensures the functioning of the adaptability algorithm: the system analyses the learner's "digital footprint" (response time, types of errors, level of lexical complexity), identifies gaps, and automatically transforms the learning environment accordingly.

At the same time, such technological automation necessitates a reconfiguration of roles within the organisational component.

4. The organisational component *(procedural logic)* determines the forms and algorithms of interaction within the "learner – AI – teacher" system. It regulates the shift from direct instructional control to consultative support, whereby the teacher assumes the role of an architect of interaction scenarios (Tutor, Interlocutor, Copilot), while the learner retains andragogical autonomy.

The effectiveness of such interaction and the degree of achievement of the set goals are reflected in the performance block.

5. The resultative component *(diagnostic block)* provides for a comprehensive assessment not only of the level of FLCC development but also of the learner's readiness to autonomously utilise intelligent systems in professional activity. It represents the final, yet non-static, element of the model, as the data obtained serve as the basis for the subsequent learning cycle.

It should be noted that, within the dynamic functioning of the model, the

technological component acts as an integrative core ensuring the continuity of the process. The remaining components are transformed into four successive procedural blocks, forming an iterative (cyclical) feedback loop (Figure 4).

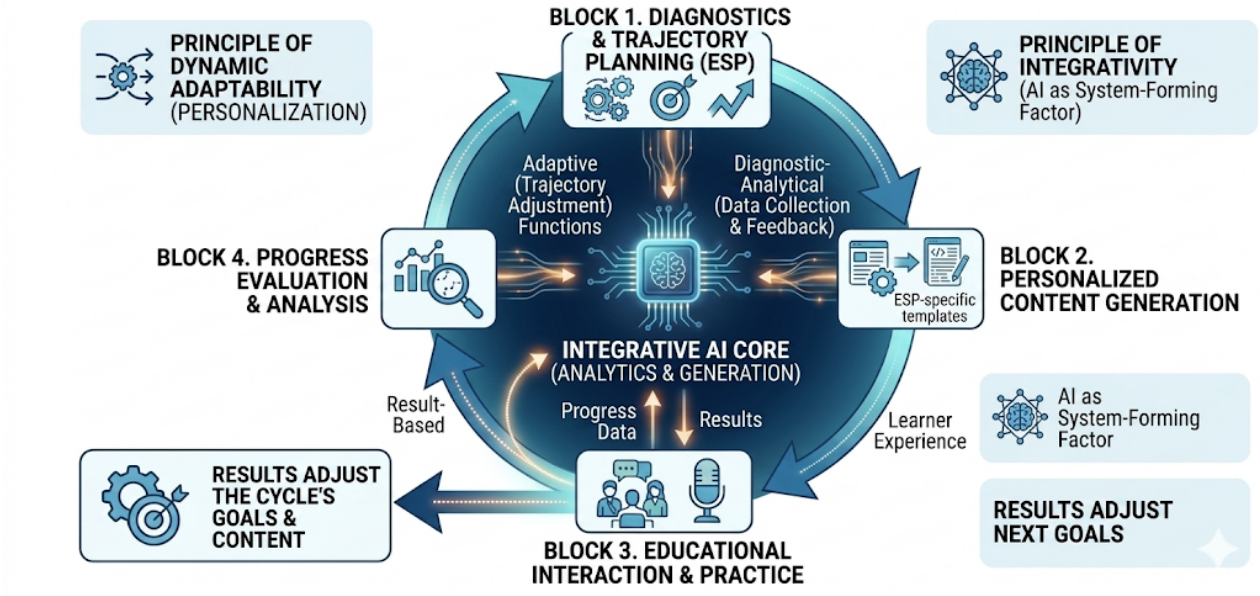

Figure 4 – Cyclical model of AI integration

Source: generated by the author using the Gemini AI digital tool

The presented scheme visualises a cyclical process in which learning outcomes directly inform subsequent objectives, thereby fully aligning with the principles of adaptive and personalized learning. In particular, data on learner progress obtained at the assessment stage are fed back into the integrative AI core, which automatically adjusts the diagnostic and planning trajectory for the next iteration. To ensure the precision of the scientific description, the interrelationship between the structural components and their roles within the procedural cycle is presented in Table 4.

The criteria for success within the proposed model extend beyond language proficiency to include the ability to effectively utilise AI as a tool for professional augmentation.

Thus, the proposed structural and functional framework demonstrates the transformation of the model into an active adaptive system. Owing to the technological component, which operates as an integrative core, the model ensures an iterative (cyclical) mode of functioning. This enables both the content and the organisation of

learning to be flexibly transformed in accordance with the evolving dynamics of the adult learner's competence development.

Table 4 – Structural Components and Their Roles in the Cyclical Framework

ROLE IN THE CYCLICAL FRAMEWORK	COMPONENT IN THE TEXT	FUNCTION
Central integrative AI core	Technological (3)	Serves as the "system-forming factor", ensuring automation and connectivity between all components.
Block 1: Diagnosis and goal-setting	Target (1)	Based on data analysis, AI determines the learning trajectory and strategic objective (ESP).
Block 2: Generation of personalised content	Content (2)	AI generates flexible, demand-driven content, thereby implementing the substantive dimension of the model.
Block 3: Learning interaction and practice	Organisational (4)	Defines the forms of interaction within the "learner – AI – teacher" triad.
Block 4: Assessment and analysis of the "digital footprint"	Resultative (5)	Diagnoses the level of FLCC, with results fed back into the central core to initiate a new cycle.

2.3 Operationalisation and Methodological Implementation of the Functional Blocks of the Model

In order to move from the theoretical structure to the practical implementation of the model, it is necessary to elaborate each of its components through the lens of dynamic interaction between the subjects of the educational process and intelligent systems.

1. The target component performs *prognostic and regulatory* functions. It constitutes the starting point of the entire model cycle, as it determines the content, the selection of technologies, organisational forms, and assessment criteria. Its key task is to formulate the desired learning outcomes.

The strategic objective of the model – **to form readiness to apply foreign language communicative competence (FLCC) in professional activity through AI tools –** is specified at two levels: **the professional level** (achievement of ESP standards) and **the digital level** (acquisition of prompt competence).

In contrast to static systems, the goals within the proposed approach embody the principle of dynamic individualization. They may be automatically refined on the basis of data collected by the technological component; for example, in cases of rapid acquisition of passive vocabulary, the focus iteratively shifts towards the active use of terminology in professional simulations.

Thus, the target component functions not merely as a declarative element, but as a prognostic instrument that initiates each new iteration of the learning cycle.

2. The content component (the personalized generation block) performs *informational and adaptive functions*, defining the set of knowledge, skills, and practical scenarios required to achieve the objectives specified in the target component.

The content of the model **is grounded in the principles of professionally oriented learning (English for Specific Purposes, ESP) and ensures the comprehensive development of FLCC within a professional context.**

The structure of the content encompasses three levels:

– *lexical and grammatical* – professional terminology, standard collocations and grammatical structures required for effective communication within a specialised domain;

– *pragmatic and communicative* – modules based on authentic professional cases (e.g. delivering presentations, writing reports, participating in international meetings);

– *metacompetence* – instructional content aimed at developing prompt engineering skills and the critical evaluation of AI-generated outputs.

A key feature of the content component under conditions of AI integration is its dynamic and generative nature. AI transforms the process of knowledge acquisition, shifting from static textbook-based material to hyper-personalised micro-content along the following vectors:

– *adaptivity (Adaptive Generation)* – based on the learner's current level of proficiency and individual trajectory, the technological component (LLMs) generates unique texts, tasks, and role-play simulations (AI role-play simulations) incorporating domain-specific vocabulary;

– *contextualisation* – immediate alignment of learning materials with the learner's

professional profile. For instance, when studying conditionals, a learner with a background in economics will be presented with scenarios related to market strategies or financial forecasting;

– *modularity* – content is structured into small, self-contained units (microlearning), which correspond to the needs of busy adult learners.

Thus, the content component serves as an informational bridge linking strategic objectives (the Target component) with the means of their implementation (the Technological component), ensuring both the relevance and adaptability of the learning process.

3. The technological component (integrative AI core) performs *instrumental and implementation functions and constitutes the core element* of the proposed model. Its primary task is to ensure the mechanism of dynamic adaptation of both the content (content component) and the organisation of the learning process (organisational component) in accordance with the individual needs of the learner.

Unlike traditional auxiliary tools, AI technologies in this model permeate all components and function as a system-forming factor. The functional classification of AI tools integrated into the model is presented in Table 5.

Table 5 – Functional Classification of AI Tools within the Adaptive Model

Technology Category	Primary Purpose (Functionality)	Role in the Model (Didactic Function)
Large Language Models (LLMs)	Generation of authentic, professionally oriented content; creation of interactive communicative scenarios and simulations (AI role-play simulations) that replicate real-life situations.	Function as a virtual tutor and conversational partner, providing immediate feedback on grammar, vocabulary, and stylistic appropriateness.
Adaptive Learning Systems (ALS / ITS)	Diagnosis, progress monitoring, and management of the learner's individual learning trajectory.	Ensure continuous analysis of performance data, automatically selecting subsequent content blocks or adjusting task complexity in line with the learner's evolving needs.
Speech Processing Technologies (NLP/ASR)	Recognition and analysis of spoken language; assessment of pronunciation, intonation, and speech rate.	Provide detailed real-time feedback, facilitating the development of pragmatic and phonological competences within foreign language communication.

The systemic integration of the technologies outlined in Table 5 enables to transform the educational environment from a static system into a self-regulating one. The practical implementation of this mechanism is grounded in a continuous cycle of data collection on learning effectiveness and its real-time processing to modify the instructional process along the following vectors:

diagnosis → content adaptation

Assessment results obtained from the specialist (Operational Component) automatically inform the system which specific lexical or grammatical gaps require remediation.

generation → correction

Based on these data, Large Language Models (LLMs) generate new, unique tasks specifically targeted at the identified weaknesses, thereby ensuring maximum relevance of instruction.

monitoring → management

Adaptive Learning Systems (ALS) continuously track time-on-task and performance efficiency, enabling optimisation of the learning pace in accordance with andragogical principles.

The integrative function of the technological component lies in establishing **a closed-loop cycle of adaptive learning.** Artificial intelligence does not merely provide tools; it creates an intelligent environment in which every learner action is analysed to enable the immediate adjustment of subsequent educational tasks. This ensures the realisation of the principle of andragogical autonomy, whereby AI serves as a means of supporting the learner's independent educational activity.

4. The organisational component performs *managerial and procedural functions*, defining the architecture of interaction among the subjects (learner – AI – instructor) and regulating the use of tools (Technological Component). Its primary objective is to ensure the continuity of the learning cycle through the redistribution of functional responsibilities in line with the andragogical principles of autonomy and practical orientation.

Effective integration of AI requires a clear reallocation of roles and functions

among participants in the educational process, thereby operationalising *the principle of synergy* (human – machine collaboration). AI assumes routine instructional functions and ensures personalisation; the instructor/tutor – undertakes coordination, mentorship, monitoring of target competence levels (ICC), and evaluation of complex, creative tasks that cannot be fully algorithmised; the learner, in turn, focuses on the development of skills and the professional ethics of communication. A detailed specification of roles and their functional responsibilities is presented in Table 6.

Table 6 – Distribution of Functions and Interaction Models within the AI Integration Framework

Subject / Role	Functional Responsibilities	Didactic Value within the Model
Learner (Specialist)	Formulating prompts, critical analysis of AI-generated content, and self-correction based on AI feedback.	Acts as an active subject who independently manages their learning trajectory (in accordance with andragogical principles).
Artificial Intelligence (AI)	Content generation, adaptive diagnostics, and provision of immediate feedback (including automated assessment systems).	Performs the role of a "personal coach" and simulator of the professional environment.
Instructor (Mentor)	Design of the educational environment, monitoring of group dynamics, development of strategic learning scenarios, and facilitation of professional discussions.	Transforms from a "source of knowledge" into a coordinator and expert in the assessment of complex competences.

The aforementioned distribution of roles is operationalised within a blended learning framework, which functions as the organisational backbone of the model and enables an optimal integration of the technological efficiency of AI with the facilitative support of the instructor. The functioning of this structure is based on two complementary modes:

1. Autonomous work (self-directed learning). This mode prioritises individual interaction with the Technological Component, wherein the learner independently engages with adaptive tasks, develops prompt-engineering skills, and participates in LLM-based simulations. Such an approach ensures the full realisation of the andragogical principle of learner autonomy, providing a safe digital environment for

experimentation and for overcoming language barriers.

2. Collaborative work (session-based support). This mode is implemented through regular instructor-led sessions focused on solving complex communicative cases, delivering presentations, and engaging in professional discussions. At this stage, emphasis shifts to aspects requiring human empathy, sociocultural competence, and ethical judgement – dimensions that currently remain beyond the scope of AI algorithmisation.

Thus, the Organisational Component ensures the flexibility and adaptability of the system through the modular structuring of content. A clearly defined organisation of the educational process, supported by transparent assessment criteria, enables learners to monitor their progress in real time and to make informed decisions regarding necessary adjustments to their learning trajectory. In this way, the integration of technologies and content is transformed into a managed, iterative, and, fundamentally, *human-centred process* of professional development.

5. The Resultative Component (Assessment and Adjustment Block) performs *evaluative and corrective functions* and constitutes the final stage in the model's cyclical structure. Its purpose is to conduct a systematic analysis of achieved outcomes and to align them with the objectives defined at the initial stage of the cycle.

Within the proposed model, effectiveness is assessed across the following principal dimensions: *motivational–value dimension* – evaluation of the learner's needs and intrinsic motivation to employ foreign language communicative competence (FLCC) and AI; *cognitive–technological dimension* – assessment of knowledge of AI technologies and the development of prompt competence; *operational–communicative dimension* – evaluation of practical foreign language communication skills in a professional context.

The integration of AI transforms assessment from a static (summative testing) procedure into a continuous and analytical process:

1) automated diagnostics. The Technological Component (ALS) continuously collects data on task performance (speed, accuracy, number of attempts), ensuring objectivity of measurement;

2) assessment of spoken production. NLP/ASR tools enable automated evaluation of phonetic accuracy and speech rate within dialogue simulations (AI role-play simulations);

3) qualitative assessment. The instructor focuses on evaluating complex professional cases and creative tasks that require human interpretation and sociocultural validity;

4) andragogical self-reflection and self-regulation. Learners conduct subjective evaluations of their own progress, their level of satisfaction with AI interaction, and their readiness to apply acquired skills in real professional contexts.

To ensure that self-reflection functions as a genuine pedagogical tool rather than a formal procedure, it is implemented through the progressive development of an internal dialogue between the learner and the intelligent system. This process begins with reflective feedback mechanisms (Reflective Prompting). For instance, upon completing a complex module, the AI tutor provides not only a test but also a series of self-analytical prompts (e.g., *"Which aspects of communication were most challenging for you, and why?"*), encouraging learners to independently identify and interpret their difficulties.

Such analytical engagement forms the basis for a critical comparison between expectations and actual outcomes, whereby learners correlate their initially defined learning objectives with their current digital competence profile as generated by the system. The logical culmination of this cycle is the conscious adjustment of the learning strategy: based on both subjective perceptions of progress and system-generated data, the specialist may independently initiate changes in pace or focus, for example, by requesting an increased proportion of practical professional simulations in place of theoretical modules.

Thus, the Resultative Component constitutes an integrated system in which objective analysis (through automated assessment systems and AI metrics) is combined with the learner's subjective reflection. This not only closes the iterative loop of the model (see figure 4) but also transforms external control into an internalised drive for self-development. In this way, the model addresses the so-called "competence crisis"

(in the sense of M. Knowles), fostering the learner's capacity for continuous, conscious, and technologically mediated lifelong learning.

Consequently, the systemic interaction of all five components transforms the model into a dynamic mechanism in which learning outcomes (Resultative Block) directly inform the immediate revision of objectives (Target Block) and content (Content Block). Such an approach ensures the continuity of the educational cycle and maximises its responsiveness to the evolving needs of the contemporary adult learner.

Conclusions to Chapter 2

The results of the analysis and the development of the structural–functional model to integrate artificial intelligence technologies into personalized foreign language learning for adults in a lifelong learning context allow for the following general conclusions:

1. The proposed model constitutes a holistic, open, and dynamic pedagogical system comprising five interrelated components: target, content, technological, organisational, and resultative. Its design ensures the implementation of the system-activity, competence-based and integrative-digital approaches to foreign language instruction.

2. The model operates as a closed adaptive cycle in which the resultative component performs not only a summative but also a regulatory function, initiating the adjustment of objectives, content, and instructional strategies. This eliminates the linearity inherent in traditional educational processes and ensures dynamic personalisation of the adult learner's educational trajectory.

3. The effectiveness of the model is determined by the synergy between the pedagogical principles of andragogy and the functional capabilities of artificial intelligence technologies. The technological component, represented by Large Language Models (LLMs), Adaptive Learning Systems (ITS), and NLP/ASR tools, enables the generation of professionally oriented content, continuous progress monitoring and immediate feedback, thereby creating conditions for genuinely

personalized learning.

4. The organisational component of the model facilitates transforming roles among participants in the educational process: artificial intelligence performs the functions of a virtual tutor and communication partner, while the instructor focuses on mentoring, coordination and expert evaluation. Such a redistribution of functions enhances the autonomy of the adult learner, in alignment with key andragogical principles.

5. The model is grounded in a comprehensive set of methodological approaches (competence-based, activity-oriented, andragogical, systemic and integrative-digital), which confirms its scientific validity and conceptual coherence. The proposed approach ensures a transition from static instructional content to adaptive, context-sensitive interaction within an AIEd (Artificial Intelligence in Education) environment.

KAPITEL 3 / *CHAPTER 3*
TECHNOLOGY OF SIMULATIVE FOREIGN LANGUAGE LEARNING BASED ON GENERATIVE AI MODELS

The preceding chapter provided a theoretical substantiation of the model to integrate artificial intelligence into the system of personalized learning for adult learners and defined the functional roles of AI at each stage of foreign language communicative competence (FLCC) development. However, the full realisation of this model's potential requires the development of a clearly structured technological toolkit capable of transforming theoretical constructs into authentic learning experiences.

Chapter 3 is devoted to the methodological operationalization of the model through the design of simulative learning scenarios. This technology is grounded in an iterative approach, whereby each scenario functions as a safe digital environment for practising professional and cross-cultural cases. The key mechanism underpinning this process is scenario engineering – purposefully designed algorithms of interaction with artificial intelligence (prompt design), which facilitate the transition from passive reception of information to active subject–subject engagement.

3.1 Prompt Design Methodology as a Tool for Developing Professionally Oriented Educational Content

Within contemporary paradigms of higher education digitalisation, the effectiveness of simulative learning directly correlates with the quality of communicative interaction between the learning subject and generative models (LLMs). This aspect foregrounds the development of prompt competence as a strategic component of digital literacy, relevant not only for instructors but also for adult learners.

A key theoretical and methodological dimension of this study lies in conceptualising prompt engineering as *a linguo-digital metacompetence* of the learner. The ability to interact effectively with AI systems is increasingly becoming an essential skill for a wide range of professionals – from software developers to philologists.

Mastery in formulating precise and contextually appropriate prompts constitutes a critical competitive advantage in the context of global automation and the intellectualization of labour.

For a more comprehensive understanding of this concept, reference to lexicographical sources is instructive. The Cambridge Dictionary defines prompt engineering as the process of designing prompts in natural language that a human provides to artificial intelligence in order to obtain optimal responses [as cited in 44]. Expanding on this definition, O. Kanishcheva emphasises that prompt engineering extends beyond mere interaction with generative AI models; a prompt is not simply a query, but rather the construction of specific frameworks that enable the generation of maximally relevant and useful outputs [ibid. 44].

Within the scope of this research, this construct is interpreted as **an integrative ability of the learner to synthesise domain-specific linguistic knowledge with algorithmic thinking in order to manage the process of knowledge generation.** Unlike purely technical skills, this *metacompetence* enables the learner to assume the role of an "architect of the educational process", wherein language itself becomes a tool for programming an intelligent didactic environment.

In the context of digital transformation in education, prompt design is regarded as a critical factor in bridging the technological gap between the potential of generative models and the actual level of foreign language communicative competence (FLCC) development among learners. The use of a "framework-based" approach to prompt design enables the implementation of andragogical principles of learning, where each prompt represents a conscious step within an individualised educational trajectory.

The methodological foundation of this approach lies in the concept of controlled generation (prompt engineering). From a linguodidactic perspective, a prompt functions as a "semantic frame" that delineates the space of possible model responses, directing generation towards authentic professional discourse. The process of formulating prompts requires learners to engage in precise conceptualisation of professional situations, thereby constituting an exercise in the development of metacognitive skills. As H. Crompton & D. Burke (2024) aptly note, the effectiveness

of learning depends on the depth of intellectual partnership: "Prompt engineering in education is not merely a mechanism for obtaining answers; it is a complex process of knowledge articulation in which the learner is required to formulate communicative intentions with maximum precision, representing a higher form of cognitive reflection" [45]. This view is further supported by Mollick E., & Mollick L. (2023), who argue that prompt engineering represents a new form of academic writing, where the precision of conceptual formulation directly determines the quality of knowledge generated by the system [46].

Thus, the development of *linguo-digital metacompetence* in prompt engineering enables professionals in economics and related fields to transform AI from a mere tool into an intellectual partner, thereby ensuring high pragmatic relevance of learning scenarios.

For the practical implementation of this approach and to minimise the risks of model "hallucinations", we propose a four-component structure of professionally oriented prompts. Each component of this structure performs a specific linguodidactic function, collectively creating an effect of "deep immersion" in a professional communicative environment.

Within this framework, the prompt formula may be operationalised as a structured sequence: **role + context + task + format**.

1) Role Assignment (Role Prompting). This involves attributing to the AI system a specific professional identity (e.g. "investor", "critical partner", "linguistic editor"). Such specification activates the corresponding layer of specialised vocabulary and stylistic conventions within the model.

Didactic significance: Role definition compels the AI to employ domain-specific terminology and adhere to appropriate communicative etiquette.

Example: *"Act as an experienced financial analyst in an international company …".*

2) Context Parameterisation (Context Setting). This entails defining the parameters of the professional domain and communicative situation (e.g. type of company, contract value, time constraints, emotional tone). It creates an effect of "immersive simulation".

Didactic significance: Context ensures the pragmatic relevance of the task; without it, AI-generated responses tend to remain overly generalised.

Example: *"... during negotiations concerning a delay in equipment delivery under a €1 million contract. Your interlocutor is an aggrieved client demanding compensation for missed deadlines."*

3) Instructional Goal (Didactic Task Specification). This component involves the explicit formulation of the purpose of interaction, ranging from simulating communicative conflict to generating exercises based on learner errors.

Didactic significance: This is the core of the prompt, determining the type of learning activity (simulation, analysis, translation, correction).

Example: *"Provide an analysis in the form of a comparative table highlighting critical errors."*

Or:

"Conduct a role-play with me. You initiate the conversation. After each of my responses, do not merely continue the dialogue, but also provide a brief analysis of my grammatical errors in brackets and suggest a more polite alternative".

4) Output Constraints (Format Specification). This involves defining the technical parameters of the output: length, structure, discourse style and level of linguistic complexity.

Didactic significance: Ensures alignment between generated content and the learner's proficiency level (e.g. CEFR) as well as professional communication standards.

Example: *"Use C1-level Business English vocabulary and professional idiomatic expressions. Avoid complex metaphors; focus on domain-specific professional register".*

Such structured prompt design enables the learner to progressively acquire the *linguo-digital metacompetence*, transitioning from the use of predefined templates to the autonomous construction of complex educational frameworks.

At the same time, it should be emphasised that even a methodologically well-designed single prompt constitutes merely the initial point of interaction. The logical

extension of this methodology, within the framework of foreign language communicative competence (FLCC) development, is the transition from linear queries to an iterative dialogue strategy (prompt chaining). Within this paradigm, AI is transformed into a "Socratic interlocutor" who, through successive refinements, guides the learner towards independent resolution of complex professional tasks, providing targeted support precisely in those areas where difficulties arise" [47].

Learning thus evolves into a dynamic feedback loop: "generation – analytical reflection – adaptive correction". This enables the learner not merely to obtain an answer, but to engage in a reflective process concerning their own communicative performance.

An example of an iterative cycle within a learning scenario may be outlined as follows:

Initial prompt: generation of a baseline text or communicative situation.

Learner action: *the learner composes a business email in English.*

Clarifying prompt: request for analytical feedback and explanation of errors.

Prompt to AI: *"Analyse my email in terms of diplomatic tone and professional vocabulary. Identify elements that may be perceived as overly direct."*

Adaptive prompt: generation of micro-learning tasks based on identified gaps.

Prompt to AI: *"Based on my errors, create three micro-exercises to reinforce appropriate constructions that will help me politely decline a client's request."*

The pedagogical value of prompt chaining is corroborated by the research of E. Mollick (2024), who observes that "the greatest educational value of AI lies not in the initial generation, but in the process of revision and refinement. It is within iterative dialogue that deep acquisition of professional concepts and linguistic norms occurs" [Mollick, 2024].

Such cyclicity fully operationalises the andragogical principle of autonomy, whereby error is no longer perceived as an object of negative evaluation, but rather as a point of developmental growth. Within this process, AI functions as a dynamic partner, adapting to the learner's pace and needs, thereby ensuring continuous personalization of the educational trajectory.

Thus, prompt design should be understood not merely as a technical instrument, but as an intellectual filter that enables the realisation of andragogical autonomy and the alignment of generative AI capabilities with the highly specialised needs of professionals in the field of economics. Moreover, prompt design facilitates the implementation of the just-in-time learning principle, whereby the learner independently identifies their "zone of proximal development" by formulating targeted requests aimed at correcting specific errors arising within their professional practice.

3.2 Modelling Simulative Learning Scenarios for the Development of FLCC in a Digital Environment

The scenarios presented below elucidate the logic of the spiral development of competences in specialists of an economic profile, progressing from initial linguistic scaffolding to complex intercultural simulations and the public presentation of professional outcomes. Each stage is accompanied by methodological guidance on prompt formulation, enabling learners to implement the principle of autonomy and independently regulate their developmental trajectory within the framework of lifelong learning.

The scenarios are designed with the involvement of the Technological Component of the model (see sections 2.2 and 2.3), in particular through the use of large language models (LLMs), which automatically generate variants of professional dialogues, reports, presentations, technical documentation and role-play simulations. In this way, the principle of dynamic adaptability is operationalised: the content of each scenario (lexis, level of complexity, genre and communicative objective) is continuously adjusted to the learner's profile and individual needs.

The proposed scenarios are organised into blocks according to a progression from reproductive to productive forms of activity. They constitute a spiral system of learning actions: **imitation → problematisation → analysis → intercultural adaptation → public presentation**. This spiral structure ensures a gradual increase in cognitive load – from the reproduction of models to the construction of independent communicative

strategies in unpredictable contexts. The learner begins with safe imitation, proceeds through a stage of "crisis" (problematisation), acquires reflective experience (analysis), extends this experience to an international context (adaptation), and ultimately culminates in a fully realised professional performance (presentation).

The scenarios are described according to a unified algorithm reflecting the iterative nature of the model:

1) professional context: a description of the situation (e.g. negotiations with international partners);

2) didactic objective: specification of goals in accordance with the Target Component;

3) interaction with AI (prompt scenario): examples of prompts for generating content or role-play simulations;

4) expected outcome and reflection: methods of assessment and directions for further adjustment of the learning trajectory.

BLOCK 1. COGNITIVE–RECEPTIVE STAGE: LINGUISTIC SCAFFOLDING.

Objective: acquiescing professional standards and linguistic models.

Scenario 1.1. Hyper-personalization of professional content: adapting authentic materials (ESP Modelling).

AI generates idealised models of texts or dialogues based on authentic materials relevant to the specialist's field. The learner engages with these through substitution exercises and reflective repetition.

1. Professional context. The learner independently selects a relevant authentic material (e.g. a research article, technical manual, financial report or industry news item) required for the completion of real professional tasks. AI assumes the role of a developer of personalised instructional materials derived from this text.

2. Didactic objective.

Professional: developing lexical competence within a narrowly specialised domain (e.g. management, engineering, finance) through the transformation of passive input into active practice tasks.

Digital: acquiescing advanced prompt engineering skills for managing the generation of educational content.

3. Technological implementation (prompt design).

The learner assigns the AI the role of a linguodidactic expert: *"Act as an expert in teaching English for Specific Purposes (ESP). Analyse the following text (article attached). Identify ten key terms essential for a specialist in my field. Create three types of exercises for their acquisition: (1) explanation of meaning in English; (2) gap-filling tasks using newly generated sentences; (3) a situational task (case study) in which I must use these terms".*

4. Interaction process and dynamics (Content Component). The system instantly generates a unique learning module tailored to the complexity of the provided material. Interaction proceeds iteratively: the learner completes the exercises, while the AI conducts automated diagnostics, identifying lexical and grammatical gaps and providing corresponding feedback.

5. Outcome and self-reflection.

The outcome is the transformation of external professional information into the learner's internal linguistic resource. Within the process of self-reflection, the learner evaluates the degree of satisfaction with the personalisation of content and determines the need for further adjustment of the learning trajectory (e.g. requesting additional exercises on specific topics).

The implementation of this scenario ensures a direct alignment between learning and professional activity, that constitutes a fundamental principle of andragogy. Within this framework, the Technological Component functions as a systemic integrator, transforming the combination of technologies and content into a managed and human-centred process. This enables the specialist to avoid engagement with irrelevant material, focusing exclusively on those linguistic units that are essential for their professional mobility and competitiveness.

Scenario 1.2. Role-based modelling by example (Scaffolding-based Simulation).

This scenario implements a guided learning strategy in which AI functions not

merely as an interaction partner, but as a linguistic mentor providing the necessary cognitive and linguistic scaffolding at the stage of imitating professional activity.

1. Professional context.

The learner (a junior financial analyst or manager) is required to present key indicators of a quarterly report to a foreign supervisor. At this initial stage of learning, the principal challenge lies in the accurate selection of terminological constructions for describing trends (e.g. distinguishing between fluctuate, plummet, soar) and adherence to conventions of business etiquette.

2. Didactic objective.

Professional: acquiescing and activating specialised professional terminology within the context of financial reporting; developing basic dialogic skills based on modelled interaction.

Digital: developing skills in interacting with AI as a source of expert guidance; understanding the principles of step-by-step content generation.

3. Technological implementation (prompt design).

The learner employs a specialised prompt activating the "support mode": *"Act as my experienced mentor-colleague. We need to discuss financial indicators. Conduct a dialogue with me, but in each of your replies suggest 2–3 professional phrases or terms that I could use in my next response. If I misuse a term, correct me immediately in a polite manner".*

4. Interaction process and dynamics (Scaffolding).

The interaction is structured according to a "mentor – learner" model:

Initiation stage: AI poses a simple open-ended question regarding the report.

Support stage: each AI response includes a "Helpful Vocabulary" block offering linguistic options for expressing ideas.

Adaptation stage: depending on the learner's performance, AI gradually reduces the number of prompts, encouraging a transition from imitation to autonomous speech production.

5. Outcome of AI-mediated activity (Communicative Component).

Through scaffolding, the learner successfully completes the dialogue, employing

more complex linguistic structures than those initially available. AI provides a final analytical summary of the terminology used, confirming the appropriateness of specialised vocabulary and offering a model of an ideal final report based on the completed interaction.

The scenarios within Block 1 represent the reproductive stage in the development of FLCC, where the principal objective is to provide the learner with linguistic benchmarks and facilitate the acquisition of sociocultural communication patterns. At this stage, AI fulfils the function of cognitive scaffolding by offering ready-made linguistic models, formulaic expressions of communicative etiquette, and domain-specific terminology within personalised content. The high subjective relevance of the materials enhances the learner's psychological confidence, thereby establishing the necessary cognitive foundation for progression to more productive and destabilising stages of the educational spiral.

BLOCK 2. PRODUCTIVE–PRAGMATIC STAGE: PROBLEMATISATION.

Objective: applying knowledge in cognitively challenging situations.

Scenario 2.1. International business meeting: negotiating contract terms.

In this scenario, AI assumes the role of a "challenging" partner, deliberately introducing constraints (e.g. the need to revise pricing or deadlines), thereby compelling the specialist to move beyond pre-formulated templates. The scenario is designed to develop spontaneous professional speech and the use of diplomatic communicative strategies in English for Specific Purposes (ESP).

1. Professional and cross-cultural context. The learner (manager or financial analyst) participates in an online meeting with a representative of a culture characterised by specific business communication norms (e.g. a high-context Eastern culture or the direct communication style typical of Northern Europe). The principal challenge lies not only in articulating pricing strategies in English (ESP), but also in selecting an appropriate level of politeness and communicative distance.

2. Didactic objective.

Professional: mastering negotiation strategies (bargaining and negotiating) and

using specialised economic terminology in an international context.

Cross-cultural: developing ability to adapt communicative style to the cultural expectations of the interlocutor (e.g. avoiding direct refusal when interacting with representatives of Asian business cultures).

Digital: developing oral prompt engineering skills and effective interaction with voice-based AI interfaces (Voice-to-Voice AI), including configuring AI avatars to assume specific socio-cultural roles.

3. Technological implementation (extended prompt design).

The learner assigns a role model to the AI using a specialised prompt with embedded cultural parameters: *"Act as the head of a delegation from Japan. Your communication style is highly polite and indirect; you avoid conflict but firmly insist on a 10% discount. Pay attention to whether I use appropriate politeness strategies and whether my speech becomes excessively direct, which may be perceived as disrespectful".*

4. Interaction process and dynamics.

Context generation stage: AI initiates the meeting with culturally appropriate small talk. The learner must demonstrate awareness of etiquette before transitioning to the business discussion.

Active practice stage: AI employs culturally specific communicative signals (e.g. prolonged pauses or vague formulations). The learner must interpret these cues correctly and adjust their argumentation accordingly, using voice input and applying mitigating expressions (e.g. *"I understand your position, however ..."*) alongside professional reasoning.

Immediate correction stage: through automated assessment systems and NLP technologies, the system analyses not only grammatical accuracy but also speech rate and the appropriateness of terminology, providing feedback either during the interaction or immediately afterwards.

5. Outcome and self-reflection. Upon completion of the simulation, the learner receives a transcript of the interaction with highlighted areas for improvement. This forms the basis for reflective analysis: whether a compromise was achieved; the extent

to which the selected linguistic constructions (ESP) aligned with intercultural pragmatics; which communicative barriers emerged during spontaneous responses; and which lexical items should be incorporated into subsequent learning cycles. The learner also independently evaluates whether moments of intercultural misunderstanding were perceived during the session.

The methodological value of this scenario lies in the realisation of the principle of didactic synergy: during facilitated sessions, the teacher may engage the group in analysing the strategies employed in simulations, while AI provides extensive opportunities for individualised communicative practice that cannot be replicated within the constraints of traditional classroom time.

Scenario 2.2. Problem-Solving in Professional Contexts (Problem-Solving Scenarios).

This scenario focuses on managing force majeure situations (e.g. technical failures, client complaints), where language functions as an immediate tool for resolving professional challenges.

1. Professional context. The learner encounters a high-pressure situation, such as disruption of a logistics chain, identification of a critical error in a financial report prior to audit, or a conflict of interests between international partners. The AI simulates the behaviour of an aggrieved client or concerned supervisor, demanding an immediate and effective solution.

2. Didactic objective.

Professional: to develop crisis communication skills, the ability to conduct high-stakes negotiations, and to reach compromise solutions in English.

Digital: to utilise AI as a stress-training simulator capable of dynamically modifying task conditions in response to the learner's decisions.

3. Technological implementation (prompt design).

The learner formulates a "high-pressure prompt": *"Simulate the following situation: I am a project manager and our product release is delayed by one week. You are the client who has invested significant resources. Your tone is critical. I must propose a recovery plan that preserves the contract. Evaluate my ability to maintain*

professional ethics and persuasive argumentation".

4. Interaction process and dynamics (strategic component).

The interaction follows a branching scenario model, where each response from the learner generates new reactions from the AI. The system evaluates not only grammatical accuracy but also the pragmatic effectiveness of proposed solutions – whether they de-escalate the situation and demonstrate sound economic reasoning.

5. Outcome and self-reflection.

The learner receives a comprehensive assessment of stress resilience and strategic flexibility within a foreign-language environment. Reflection at this stage is particularly deep: the learner analyses their ability to overcome language barriers under emotional pressure and identifies the linguistic strategies most effective in conflict de-escalation.

Scenarios within Block 2 represent the transition to productive application of linguistic patterns under conditions of cognitive conflict. In accordance with the principles of andragogy, adult learners are motivated when they perceive a direct link between learning and real-life problem-solving. Within the framework of situated learning, this stage transforms a foreign language from an object of study into an operational tool for professional functioning.

At this stage, the functional role of AI also undergoes a significant transformation: whereas in Block 1 it provided cognitive scaffolding, within the problematisation phase it assumes the role of a dynamic and demanding interlocutor. Such an approach enables the learner to move beyond artificially constructed learning environments and supports a genuinely human-centred model of preparation for unpredictable challenges in real-world cross-cultural communication.

BLOCK 3. EVALUATIVE AND CORRECTIVE STAGE: ANALYSIS AND REFLECTION.

Objective: critical appraisal of outcomes and remediation of deficiencies.

Scenario 3.1. Digital Business Correspondence: Preparing an Analytical Report for an Investor.

This scenario focuses on in-depth linguistic expertise applied to completed tasks,

with AI providing explanations for errors and offering stylistic alternatives.

1. Professional context. The learner is required to prepare an Executive Summary or a covering letter to accompany a financial report for an international investor. The principal task is to transform complex statistical data into clear, persuasive arguments in English, adhering to a formal business register.

2. Didactic objective.

Professional: to master the structure of business correspondence and reports, and to employ specialised lexical units for describing economic trends (e.g. *volatile market, upward trend, fiscal constraints*).

Digital: to develop skills of "co-authorship" with AI, including the ability to verify generated content for factual accuracy and refine stylistic nuances (Human-in-the-loop approach).

3. Technological implementation (prompt design).

The learner adopts an iterative approach to text development: *"Here are my draft notes for the quarterly report (text provided). Help me structure them into an Executive Summary for a British investor. Use a restrained, analytical tone. After producing the draft, explain your choice of terminology used to describe risks".*

4. Interaction process and dynamics.

Structuring stage: the AI proposes a coherent organisational framework (Overview → Key Findings → Risks → Recommendations).

Linguistic analysis stage: the system highlights overly "emotional" or "informal expressions" and suggests appropriate academic or professional equivalents.

Verification stage: the learner checks whether the AI has preserved the accuracy of numerical data during reformulation, thereby addressing potential "hallucinations".

5. Outcome and self-reflection.

The learner compares the initial draft with the final version produced in synergy with AI. During reflection, particular attention is given to newly acquired linguistic constructions and to how automated feedback mechanisms facilitated the identification of recurring grammatical errors.

Within this scenario, the communicative addressee may be varied. For instance,

correspondence addressed to an American partner may require a more direct communicative style, whereas communication with partners from the Middle East may necessitate a more elaborate introduction and an emphasis on long-term relationship-building.

Scenario 3.2. Remedial Learning Track: Addressing Recurrent Errors.

This scenario provides a practical realisation of the evaluative and corrective function of the model, focusing on the transition from automatic error correction to in-depth linguistic analysis of professional discourse.

1. Professional context.

The learner engages with AI not merely as a proofreading tool, but as an expert intellectual partner. The object of analysis comprises linguistic deviations identified during the completion of prior tasks (e.g. preparation of a report in Scenario 3.1).

2. Didactic objective.

Professional: to develop a nuanced understanding of grammatical subtleties and stylistic alternatives aligned with C1-level professional discourse.

Digital: to foster autonomous learning skills, whereby the learner independently identifies areas of weakness and initiates self-correction processes without continuous instructor mediation.

3. Technological implementation (prompt design).

The learner formulates a complex, multi-layered prompt aimed at eliciting expert-level feedback: *"Analyse my text from the perspective of a linguistic editor: (1) do not simply correct errors, but explain their causes; (2) suggest more formal and academically appropriate equivalents for the highlighted phrases; (3) assess the tone of the message on a scale from 1 to 10 in terms of its compliance with professional etiquette".*

Following the stage of linguistic analysis, the learner proceeds to request the generation of a personalised micro-learning module based on automated assessment data: *"The automated assessment system has identified that I frequently confuse the use of the Future Perfect and Future Continuous in reports on delivery timelines. Create a concise reference guide based on my errors and propose five contextualised*

exercises in which I must correct these structures within a logistics-related professional context".

4. Interaction process and dynamics (Correction Block).

Reflective analysis stage: the AI not only provides correct forms but explicates the underlying logic of the learner's errors, comparing them with professional standards.

Training stage: the system generates exercises progressing from simple to complex, requiring the learner to integrate corrected structures into new professional scenarios.

Verification stage: a follow-up micro-simulation confirms the consolidation of knowledge and closes the iterative learning loop.

5. Outcome and self-reflection.

The learner observes progress through updates to their digital competence profile. Within the reflective phase, the learner evaluates the extent to which automated feedback has facilitated an understanding of error patterns, thereby supporting the transition to conscious and controlled use of a foreign language in professional contexts.

Scenarios within Block 3 focus on the implementation of the evaluative and corrective function of professional training, effectively closing the iterative learning loop: action – analysis – correction – action. At this stage, the emphasis shifts from solving external communicative problems to engaging in internal analytical work aimed at improving the quality of one's own foreign-language output.

The functional role of AI undergoes further transformation: it operates as an instrument of deep linguistic expertise and as a personalised diagnostic system. The application of AI technologies for analysing business correspondence and automatically detecting errors enables professionals not only to obtain corrected versions of texts but also to understand the determinants of their own stylistic and grammatical inaccuracies.

Such an approach transforms the organisational component of the model into a genuinely human-centred process, wherein adaptive systems ensure transparency of

assessment criteria and flexibility of the remedial trajectory. This, in turn, fosters the development of professional autonomy, as the activation of self-correction mechanisms empowers the learner to refine foreign-language competence independently of direct instructor supervision, in alignment with the core principles of contemporary andragogy.

BLOCK 4. STAGE OF CROSS-CULTURAL ADAPTATION: SOCIO-PRAGMATIC MODELLING.

Objective: flexible adjustment of communication to the socio-cultural context.

Scenario 4.1. Cross-cultural Pragmatics Simulation.

This scenario is designed to develop strategies of politeness and communicative adaptability within the specific business discourse of different cultures.

1. Professional context.

The learner is placed in a professional interaction with a partner whose cultural background requires a particular communicative style (e.g. British, Japanese or German business discourse). The primary task is not only to convey meaning effectively, but also to select rhetorically appropriate forms in order to avoid intercultural misunderstandings.

2. Didactic objective.

Professional: to develop socio-cultural, pragmatic, and discourse competences through training in flexible communicative behaviour.

Digital: to utilise AI as a dynamic source of socio-cultural knowledge and as a tool for real-time analysis of communicative pragmatics.

3. Technological implementation (prompt design).

The learner initiates interaction by establishing a clear analytical framework and role model: *"Let us simulate a business communication with a Japanese partner. The objective is to discuss delivery terms. The tone should be polite and indirect. After every three turns, explain which cultural strategies I have adhered to or violated".*

4. Interaction process and dynamics (simulated fragment).

AI (Japan Business Style): "We appreciate your proposal and will carefully review the delivery schedule."

Learner: "Could you confirm the earliest possible shipment date?"

AI Feedback (pragmatic analysis): "Level of directness is high. Consider softening the request by using conditional forms".

5. Outcome and self-reflection.

Upon completion of the session, the learner receives a detailed analysis of communicative directness, the use of politeness strategies and personalised recommendations for enhancing cross-cultural adaptability. Based on this feedback, the learner critically evaluates their own communicative patterns and adjusts their individual style of international professional interaction.

This scenario exemplifies the functioning of the Resultative component through the mechanism of immediate correction: assessment data and AI-generated feedback automatically inform the system of existing pragmatic gaps. In response, large language models generate new, targeted tasks that focus specifically on "identified weaknesses", thereby ensuring maximum relevance of the learning process to the andragogical needs of the adult learner.

Scenario 4.2. Mediation of Cross-cultural Conflicts in a Professional Environment.

In this scenario, AI simulates a multi-party meeting in which the specialist must act as a mediator between representatives of different cultures, aligning their interests. The scenario is designed to develop the learner's ability to function as a neutral intermediary in complex communicative situations, where tension arises not only from economic factors but also from cultural differences.

1. Professional context.

The learner (an international project manager) initiates a three-party online meeting to resolve a conflict between a manufacturer from Germany and a distributor from the UAE. The subject of dispute concerns delays in delivery. The German party appeals to force majeure and strict contractual clauses, whereas the UAE partner interprets the situation as a lack of respect for personal business relationships and demands flexibility beyond contractual obligations.

2. Didactic objective.

Professional: to master mediation strategies and techniques for mitigating cultural tensions, as well as to develop the ability to select an appropriate linguistic register that preserves neutrality.

Digital: to enhance advanced prompt engineering skills for constructing multi-agent simulation scenarios.

3. Technological implementation (prompt design).

The learner formulates a prompt defining role parameters for the AI: *"Act as two participants in a conflict. The first is Hans (Germany): highly direct, rule-oriented, using a formal business style. The second is Marwan (UAE): relationship-oriented, employing indirect communication and reacting emotionally to Hans's formality. I am the mediator. Your task is to initiate a dispute about delayed delivery. After each of my responses, reply on behalf of both characters and, at the end, analyse whether I have maintained a balance between both cultural paradigms".*

4. Interaction process and dynamics.

Exposition stage: the AI generates an initial exchange in which Hans and Marwan articulate their grievances.

Intervention stage: the learner proposes a third, mediating solution, employing specific linguistic strategies (e.g. *conditional structures, diplomatic hedging*) to avoid offending either party.

Transformation stage: the AI adjusts the reactions of both characters depending on the pragmatic quality and neutrality of the mediator's responses.

5. Outcome and AI-generated analysis (cross-cultural component).

The learner receives a reflective report in which the AI evaluates the degree of neutrality maintained. It identifies whether the mediator implicitly aligned with one cultural perspective (e.g. excessive directness favouring Hans while alienating Marwan), and assesses the effectiveness of mediation, specifically, whether a mutually acceptable compromise was achieved that respects both contractual logic and relational expectations.

Scenarios within Block 4 represent a stage of synthesis and integration, where

professional foreign-language communicative competence is enriched by a profound socio-pragmatic dimension. In contrast to previous stages, ranging from linguistic scaffolding to analytical reflection, the stage of cross-cultural adaptation is oriented towards developing the learner's capacity to operate under conditions of high socio-cultural uncertainty.

At this level, the role of AI evolves into that of a multi-agent simulator capable of reproducing complex behavioural patterns characteristic of diverse cultural contexts. This enables the implementation of conflict mediation scenarios and cross-cultural pragmatic simulations, where communicative success depends not only on terminological accuracy but also on cross-cultural empathy and the flexible modulation of linguistic register.

The use of AI as an instrument of socio-pragmatic modelling ultimately reinforces the human-centred nature of the model, as learning extends beyond conventional language exercises and becomes an experiential engagement with complex professional realities. Thus, Block 4 facilitates the transition from individual analytical work (Block 3) to the full integration of the specialist into the global professional environment, which constitutes the ultimate objective of developing foreign-language communicative competence.

BLOCK 5. PUBLIC PRESENTATION STAGE.

Objective: synthesis of acquired competences within a final product.

Scenario 5.1. Interactive Professional Presentation (Pitch Simulation).

This scenario is designed to develop public speaking skills and the ability to engage in professional discussion under conditions of high cognitive load. AI technologies generate presentation content, propose structural frameworks, domain-specific terminology and anticipate potential audience questions. The learner practises oral presentation skills in English within a specialised professional context, while analytical systems (ASR/NLP) monitor phonetic accuracy, delivery pace and coherence of argumentation.

1. Professional context.

The learner delivers a start-up pitch or business project presentation to a

prospective international investor. The principal challenge lies not only in presenting the material coherently but also in responding promptly and effectively to critical questions and counterarguments in real time.

2. Didactic objective.

Professional: to develop presentation competence, logical structuring of discourse and skills in professional argumentation in English.

Digital: to utilise analytical systems (ASR/NLP) for monitoring phonetic accuracy, tempo and logical coherence, as well as to interact with AI as a dynamic audience.

3. Technological implementation (prompt design).

The learner initiates the simulation by assigning a complex role model to the AI: *"Simulate a start-up pitch presentation. You are an investor from the United States. Ask critical questions regarding market viability. After the presentation, evaluate the structure and persuasiveness of my performance".*

4. Interaction process and dynamics (evaluation–analytical component).

AI (Investor): "What makes your product competitive in saturated markets?"

Learner: "Our pricing strategy allows lower entry costs and faster scaling".

AI Feedback: "The argument is relevant but lacks metrics. Consider quantifying the benefits".

5. Outcome and self-reflection.

AI-mediated interaction facilitates the development of pragmatic, analytical, and strategic components of professional foreign language communicative competence. Upon completion, the learner analyses metrics related to speech rate and accuracy, enabling informed decisions regarding the need to refine their presentation strategy.

This scenario exemplifies the transition from linear knowledge transmission to active simulation-based interaction, wherein AI generates content, proposes structure and supplies domain-specific terminology. Such an approach operationalises the principle of human-centred learning, as the system dynamically adapts to the learner's level of argumentation, thereby fostering continuous professional development within a specialised communicative context.

Scenario 5.2. Question and Answer Session: Stress Testing and Argumentation (Interactive Defence & Argumentation).

This scenario operationalises the stage of maximum communicative intensity, in which AI assumes the role of an active audience, simulating a post-presentation question-and-answer session following the delivery of a professional project.

1. Professional context.

Following the presentation of a financial report or investment plan, the learner is required to respond to clarifying, critical or even provocative questions posed by an "expert panel". This demands not only mastery of domain-specific terminology but also the ability to react instantaneously, structure spontaneous responses and employ strategies of polite disagreement or clarification.

2. Didactic objective.

Professional: to develop skills in spontaneous professional speech; to refine strategies of argumentation and counter-argumentation under conditions of communicative stress.

Digital: to cultivate the ability to use AI as a simulator for "intellectual sparring" and to analyse both the emotional and logical dimensions of responses.

3. Technological implementation (prompt design).

The learner activates the "aggressive listener" or "sceptical investor" mode: *"I have just completed the presentation of my project [title]. You are now a group of sceptical investors. Ask me five challenging questions in turn regarding my strategy, budget, and risks. After each of my responses, do not simply proceed to the next question; evaluate how persuasive my argumentation was and whether I adhered to professional etiquette".*

4. Interaction process and dynamics (real-time defence).

Challenge stage: the AI generates questions targeting the weaker aspects of the previously presented content.

Response stage: the learner formulates answers, striving to maintain professional confidence and linguistic accuracy.

Evaluation stage (AI feedback loop): the AI analyses each response according

to parameters such as logical coherence, persuasiveness, use of specialised vocabulary and strategic appropriateness.

5. Outcome and transition to autonomy.

The learner receives a comprehensive assessment of their communicative resilience. This scenario concludes the training cycle, as it most closely approximates real professional conditions, where the success of a presentation often depends on the final discussion rather than the presentation itself.

The scenarios in Block 5 constitute the final stage of the iterative cycle of developing professional foreign language communicative competence, wherein the learner's individual achievements are transformed into a public communicative product. At this stage, the full integration of linguistic, analytical, and sociopragmatic skills, developed across previous blocks, is realised.

The functional role of AI at this stage is defined as that of a "digital tutor-expert" and an "audience generator". It enables not only the simulation of public speaking conditions before diverse target groups (investors, academic communities, or clients) but also provides a multifactorial analysis of the learner's performance, ranging from the persuasiveness of argumentation to adherence to genre-specific conventions of business presentation.

The methodological value of Block 5 lies in facilitating the transition to full professional autonomy, wherein the specialist employs AI for the final refinement of competences prior to entering the real business environment. Thus, the proposed spiral model, progressing through stages of imitation, problematisation, analysis, and adaptation, culminates in public representation, ultimately determining the learner's readiness for effective cross-cultural interaction within the global economic landscape.

Based on the modelling of simulative scenarios for the development of foreign language communicative competence, the following theoretical and methodological conclusions may be drawn:

1. The developed scenarios clearly demonstrate a transition from passive knowledge reproduction to a dynamic ecosystem of practice-oriented training. The use of generative models (LLMs) enables a shift from a subject–object paradigm to a

subject–subject interaction, in which the learner becomes an active agent directing their own educational trajectory.

2. The architecture of the scenarios is grounded in a logical progression from the reproductive level to productive synthesis.

Block 1 establishes the cognitive foundation through the provision of linguistic benchmarks and scaffolding.

Blocks 2 and 3 implement the stages of problematisation and analysis, wherein language is transformed from an object of study into an instrument of professional "survival" under conditions of cognitive conflict.

Blocks 4 and 5 facilitate progression to the level of intercultural adaptation and public representation of outcomes.

3. Within the proposed model, the functional role of AI is not static. The system undergoes an evolutionary trajectory – from a tool of cognitive support (scaffolding) at the initial stages, to a dynamic opponent in problem-based situations, and ultimately to an intelligent partner-diagnostician during the stage of error analysis. This enables the modelling of the unpredictability inherent in real professional contexts within a safe digital environment.

4. The scenarios fully align with the principles of andragogy as articulated by M. Knowles, insofar as adult learner motivation is sustained through the direct applicability of learning to real professional tasks and through engagement with individual, rather than generalised, errors. Learning is thus transformed into a continuous iterative cycle: "action – analysis – correction – action".

5. A key determinant of the effectiveness of the proposed model is the level of proficiency in interacting with AI systems. The precision prompt forming directly correlates with the relevance of learning outcomes, thereby substantiating the need for specialised training of professionals in the economic domain in methods of professional prompt engineering.

Thus, the proposed system of simulative scenarios embodies the philosophy of lifelong learning, as it not only addresses the "competence crisis" through the continuous updating of applied skills but also ensures learner autonomy in regulating

both the pace and trajectory of their professional development.

3.3 Implementation Algorithm and Methodological Guidelines for Model Integration into the Educational Process

The proposed guidelines are aimed at the systematic integration of artificial intelligence technologies into personalized foreign language learning for adult learners, ensuring alignment between educational objectives, professional needs and the affordances of digital technologies. Their implementation contributes to enhancing the effectiveness of foreign language training, fostering learner autonomy, and developing sustainable motivation for continuous professional self-improvement within the framework of *lifelong learning*.

To ensure the integrity of this process and effective coordination among all participants in the learning environment, a comprehensive implementation framework of the structural-functional model has been developed. This framework specifies the objectives, types of learning activities and the required technological toolkit at each stage (Table 7).

The staged implementation framework demonstrates the practical feasibility of the proposed model and its adaptability to lifelong learning contexts. The clear delineation of stages, responsible stakeholders and digital tools ensures effective governance of the educational process and creates conditions for its scalability within corporate and postgraduate educational environments. The integration of AI technologies at each stage facilitates the consistent development of professionally oriented foreign language communicative competence in accordance with the individual educational needs of adult learners.

The presented algorithm necessitates a reconsideration of traditional approaches to the organisation of instruction, thereby underscoring the need to formulate differentiated methodological recommendations for the key stakeholders within the educational process.

Table 7 – Framework to Implement the Structural-Functional Model of AI Integration into Personalized Foreign Language Learning for Adults in Lifelong Learning Contexts

Implementation Stage	Objective of the Stage	Core Activities	Responsible Stakeholders	AI Tools and Digital Technologies
1. Analytical–Diagnostic	To identify the level of foreign language communicative competence (FLCC) as well as learners' professional and educational needs.	Diagnosing foreign language proficiency; analysing professional communicative situations; assessing digital readiness.	Foreign language instructors; methodologists; HR specialists.	Online testing tools; ASR for speech analysis; AI-driven analytical modules; LLMs for initial evaluation of written texts.
2. Design–Modelling	To construct personalized learning trajectories and instructional scenarios.	Forming individual learning objectives; selecting professional scenarios; designing learning modules.	Instructors; tutors; digital course developers.	LLMs to generate scenarios and exercises; adaptive learning platforms; prompt engineering tools.
3. Activity–Implementation	To activate communicative performance and practical application of language skills.	Role-play simulations; problem-solving tasks; producing professional written texts.	Learners; instructors; tutors.	Generative language models; ASR/NLP systems; speech simulation tools; digital interaction platforms.
4. Evaluation–Correction	To analyse the learning outcomes and adjust individual learning trajectories.	Outputting learner's linguistic analysis; providing personalized feedback; adapting content and task complexity.	Instructors; AI-based analytical systems; learners.	Error analysis tools; stylistic analysers; AI coaching systems; progress analytics dashboards.
5. Reflective–Integrative	To consolidate results and develop learner autonomy.	Self-assessing achievements; reflecting on learning experience; planning further development	Learners; instructors; HR-departments.	Digital portfolios; reflective questionnaires; AI assistants for educational planning.

Source: generated by the author using the ChatGPT

Recommendations for Instructors and Tutors

1. Reconsider the role of the instructor from that of a content transmitter to that of a facilitator and tutor who supports individual learning trajectories and assists

learners in developing linguo-digital metacompetence.

2. Integrate AI into the educational process as a didactic tool, employing it to automate routine tasks (e.g., generation of adaptive assignments, preliminary text analysis) and to model professional communicative situations in real time.

3. Design learning tasks based on authentic professional scenarios, including dialogues, audio-based cases, business correspondence, reports, and briefs, thereby enhancing the pragmatic value of instruction.

4. Ensure the inclusion of a reflective component in learning by engaging learners in the analysis of their own linguistic errors, communicative strategies and the outcomes of AI-assisted interaction.

5. Foster digital and linguistic literacy by training learners to critically evaluate AI-generated outputs, edit generated content and use AI as a support tool rather than a substitute for communicative activity.

Recommendations for Digital Course Developers

1. Design courses according to modular and adaptive principles, enabling the individualisation of content, pace and level of complexity in accordance with the needs of adult learners.

2. Integrate AI functionalities directly into the course architecture, including curated prompt libraries, automated feedback systems, speech simulation tools, speech analysis technologies (ASR) and intelligent assistants for written communication.

3. Ensure interdisciplinary integration by combining language training with domain-specific content, the development of soft skills and digital competences.

4. Provide opportunities for learners to construct their own learning pathways by offering choices in tasks, genres, and communication formats.

5. Implement multi-level assessment of foreign language communicative competence, combining AI-driven automated evaluation with expert feedback from instructors.

6. Adhere to the principles of ethical and secure AI use, particularly with regard to data protection, algorithmic transparency and the avoidance of excessive automation within the educational process.

Recommendations for HR Departments and Corporate Training Centres

1. Integrate foreign language training into the broader system of professional staff development. Facilitate the adoption of AI tools as instruments of continuous "learning in the workplace", whereby linguistic support is available to specialists at the point of need when addressing professional tasks.

2. Utilise the analytical capabilities of AI to monitor the dynamics of employees' foreign language skill development and to adjust corporate training plans accordingly.

3. Promote the development of a culture of learner autonomy by encouraging the use of AI as a personal language assistant for self-directed learning, preparation for professional communicative situations, and reflective evaluation of outcomes.

4. Evaluate training effectiveness not solely on the basis of linguistic indicators, but also in terms of professional performance outcomes, including improvements in communication quality, task completion speed and levels of confidence in international contexts.

5. Ensure the ethical and secure use of generative AI within the organisation, particularly by safeguarding confidential data during the execution of learning tasks.

Conclusions to Chapter 3

Chapter 3 has operationalised the proposed model at the methodological level and presented an integrated technology for the development of foreign-language communicative competence (FLCC) among adult learners within a digital environment. The findings of the study allow the following conclusions to be drawn:

1. The effectiveness of simulation-based learning is determined directly by the quality of communication within the "human – AI" system. Prompt design is substantiated not merely as a technical instrument but as a linguo-digital metacompetence of the specialist – an integrative capacity to synthesise domain-specific knowledge with algorithmic thinking. This enables the learner to act as an active agent in the educational process, independently configuring the parameters of

the learning environment.

2. An architecture of the professionally oriented prompt has been developed, incorporating role descriptors, contextual parameters, didactic settings and format constraints. It has been demonstrated that the use of iterative prompt chains (Prompt Chaining) transforms interaction with AI into a dynamic feedback loop – "generation – analytical reflection – adaptive refinement" – thereby ensuring the deep acquisition of professional discourse.

3. The learning scenarios proposed in this chapter illustrate a practical mechanism to implement the model and confirm the didactic potential of generative technologies. They demonstrate the capacity of large language models (LLMs) to function as an effective tool for developing professionally oriented FLCC, ensuring personalisation of learning, fostering learner autonomy and integrating language training with authentic professional tasks relevant to adult learners.

4. The modelling of simulation-based scenarios across five functional blocks enables the implementation of the principles of contextual learning and non-linearity. Within these scenarios, AI evolves from a tool of cognitive support (scaffolding) into a "Socratic interlocutor", allowing learners to practise complex intercultural and professional cases within a safe environment, where error is reframed not as an object of evaluation but as a point of growth.

5. The developed comprehensive implementation algorithm, structured across analytical-diagnostic, design-modelling and operational-activity stages, ensures coordination among instructors, course developers, and HR units. This creates a coherent lifelong learning ecosystem in which foreign-language training is continuously adapted to the dynamic demands of the global labour market.

SCHLUSSFOLGERUNGEN / *CONCLUSIONS*

The present study has addressed a relevant scientific problem concerning the theoretical substantiation and practical model implementation to integrate artificial intelligence into a system of personalized foreign-language learning for adult learners. The findings enable to formulate the following conclusions:

1. The essence of personalised learning has been substantiated as a leading linguo-didactic strategy within the context of the digital transformation of education. It has been established that personalization is grounded in subject–subject interaction and the active adult learner's participation in shaping an individual educational trajectory. A clear distinction has been articulated between personalization (as a learner-centred approach that accounts for individual needs and intrinsic motivation) and individualization (as the adjustment of learning pace under instructor guidance). Five methodological approaches – competence-based, learner-centred, andragogical, activity-based, and integrative-digital – have been synthesised, the synergy of which determines the effectiveness of foreign-language training for adult learners.

2. A systematic analysis and classification of artificial intelligence technologies suitable for educational use have been conducted. The functional capabilities of adaptive learning systems, generative language models (LLMs) and natural language processing tools (NLP/ASR) have been identified. It has been demonstrated that the integration of NLP/ASR technologies is critical for the development of foreign-language communicative competence, as they enable the simulation of authentic communicative activity and provide immediate personalised feedback based on error analysis and learner progress.

3. A conceptual and methodological gap in existing digital language-learning solutions has been identified. It has been found that most current online platforms are oriented towards linear training of isolated skills and fail to realise the full potential of the identified methodological approaches. Such solutions frequently overlook the specific andragogical needs of adult learners – namely, the demand for autonomy, pragmatic relevance of content and alignment with professional experience – thus

necessitating the development of an original integrative model.

4. A structural–functional model for AI integration has been developed. A five-component organisational and pedagogical model of personalized foreign-language learning through artificial intelligence has been designed. The model represents a holistic, open and dynamic system comprising target, content, technological, organisational and resultative components. Within the technological component, the capabilities of large language models (LLMs), intelligent tutoring systems (ITS) and NLP/ASR tools are implemented, ensuring adaptive generation of professionally oriented content, continuous monitoring of learner progress and timely feedback.

5. The roles of the subjects within the educational process have been transformed. It has been determined that, within the context of AI integration, the instructor assumes a mentoring and expert-coordinating role (facilitation), while AI performs the functions of a virtual tutor. This redistribution of roles eliminates the linearity of the course and contributes to the development of learner autonomy.

6. Prompt design has been substantiated as a key technology for the development of linguo-digital metacompetence. It has been demonstrated that the use of iterative scenarios and the algorithmization of prompts enable learners to independently design learning content, adapting the generative capabilities of AI to the real tasks of professional activity.

7. Practical recommendations for implementing the model have been developed and tested. An implementation algorithm has been designed, encompassing analytical-diagnostic, design and operational stages. The obtained results may be utilised by educational centres and HR departments for the development of professional training programmes based on individual learning trajectories.

8. Scientific novelty and research prospects. The scientific novelty of the study lies in the development of a comprehensive organisational and pedagogical model that, for the first time, integrally combines AI technologies with methodological approaches to personalization in adult foreign-language learning. The proposed approaches extend the theoretical foundations of andragogy and language teaching methodology within a

digital environment, establishing a conceptual framework for further research in the field of artificial intelligence in education. The promising areas for further scientific research include expanding system functionality (additional language modules, assessment and analytics tools), enhancing instructors' qualifications in the use of AI, and addressing ethical and organisational aspects of the educational environment.

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