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Implementation of Artificial Intelligence Tools in IT Companies: European Research 2023–2025

D.S. Pashchenko
Independent software researcher, Moscow, Russian Federation

ABSTRACT

The goal of the study is to assess the potential of AI tools in industrial software development. It is based on the analysis of the results of applied research of the main areas of AI application and the potential capabilities of AI in Europe in 2023-2025 were analyzed, and expert forecasts were compared with the actual state of affairs in the IT industry in mid-2025. **As a research hypothesis** the study suggests, that AI tools and their application techniques have reached the state of technological maturity to function as full-fledged tools for automating the work of virtually every member of a software development team. **The objective** includes determining the possibilities of practical application of AI tools in software development by mid-2025, taking into account a holistic analysis of the prospects of the industry's development. **Scientific novelty** of the research represents comparison of previous forecasts by industry experts with the current state of affairs in the European IT industry. Furthermore, the research provides specific recommendations for implementing AI tools in the process of software development.

Keywords: artificial intelligence; large language models; software engineering; digital transformation

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INTRODUCTION AND PROBLEM STATEMENT

The development of software by means of artificial intelligence tools has been a relevant scientific and practical objective for over the last 15 years. Numerous specialised and consulting entities tried to predict the future of software engineering with AI tools playing a key role [1, 2], and to present innovative production processes characterised by a high degree of automation and the application of "intelligent" technologies [3]. Nevertheless only by the fall of 2022, there occurred a significant shift in the organisational and production paradigms within the industry of software. This was facilitated by the evolution in the pertinent development of AI tools and their unparalleled access to millions of specialists worldwide.

Traditional software development centres pertinent in isolated offices are more commonly replaced by geographically remote teams [4, 5]. Within these new configurations, each key production function, like systems analysis, project management, design and development of software, is presided over by an expert efficient in automation tools that perform autonomously all routine tasks on their behalf. Notably, the transition from workplace-based work to hybrid and completely remote formats has also played a crucial role in this process: new models of organizational structures have significantly modified the fundamentals of team formation, recruitment strategies, and termination of employment in the IT industry [5].

Concurrently, the technologies based on the concept of using AI tools in software engineering (AI-augmented software engineering) are assuming growing importance [6]. The capacity of IT-companies to adapt effectively to such fast-changing consequences becomes vital for sustaining competitiveness [7]. Despite the industry's active ongoing changes, investments in its key areas require a well-balanced and prudent approach, which, in turn, determines the relevance of making corresponding research [8].

To accomplish the defined objective of evaluating the potential of AI tools in software development, the findings of the author's earlier scientific studies were analysed in the articles "Early Formalisation of the Use of Large Language Models in Software Development" [9] and "AI Tools in Software Production: Demand and Barriers" [10]. These researches involved over 60 teams from IT companies, system integrators, and banks with high-level in-depth proficiency in software development, throughout a wide territory: from Russia and Kazakhstan to the UK and Spain. Participants were among representatives of various segments of the industry, such as the following:

- Independent software vendors, who accomplished both in-house and product development (Miro, Google, Finastra, Finshape, Sber, VTB, Playrix, OZON, PSB, Deutsche Bank);
- Companies of tailor-made software development and outsourcing entities (Atos, SOFTEC, First Line Software, EPAM);
- System integrators (ThoughtWorks и Auxo);
- Other IT companies with intricate corporate structures (Capgemini Engineering, ARM, ZEISS Digital, Ericsson).

The author applied a two-round methodological approach:

- Structured Google Forms surveys and video interviews;
- Unification of results and their discussion with experts (including feedback on preliminary findings).

Such a broad composition of experts (35 developer teams involved the first study and 27 teams in the second one), as well as the broad geographical representation (*Table 1*), has provided a strong evidence-based background, allowing for the expectation of a thorough reflection of advanced European experience.

The author's works [9, 10] comprised three sections, the last of which contained forecasts related to medium-term and long-term trends in the development of AI tools and the transformation of the IT industry. This article presents an interim analysis of the findings regarding the market outlook of the industry as of mid-2025, and assessing the possibilities for accomplishment of some ideas in the near future.

Table 1

Categories of Experts

Indicator	Characteristics of Experts		
Experience in software development	Less than 10 years	10–15 years	Over 15 years
Study 2024	22%	19%	59%
Study 2023	11%	22%	67%
Regions which have represented its experience in the study	Northern and Western Europe (Spain, Sweden, France, Germany, Switzerland, UK, etc.)	Central and Southern Europe (Poland, Czech Republic, Hungary, Serbia, Bulgaria, Cyprus, etc.)	Eastern Europe and CIS (Ukraine, Russia, Armenia, Turkey, Kazakhstan, Georgia, etc.)
Study 2024	11%	33%	56%
Study 2023	29%	20%	51%
Type of Business in the IT Industry	Software vendors, including in-house and product development	Software development services on order and outsourcing	Other type of IT business
Study 2024	56%	33%	11%
Study 2023	46%	29%	25%

Source: compiled by the author.

MAIN RESULTS OF APPLIED RESEARCH: 2023–2024

Both pan-European studies [9, 10] confirmed a sustained tendency of surging demand for software development with application of AI technologies, which fully corresponds with the theory of E. Rogers [13]:

- There exist groups of "innovators" and "early adopters" with project teams accomplishing corporate plans to integrate AI into software development processes, also applying integrated centralised policies and/or regulations.
- A category of "early majority" emerged by the late 2024, its participants have studied AI tools by means of pilot projects, individual and team experiments and have moved to their implementation in production processes, meanwhile the "late majority" and "laggards" groups are still emerging.

Besides, in accordance with the obtained findings, in mid-2023 nearly 20 per cent of teams and entities used AI tools in software development, and 43 per cent planned to do so in the near future [9], meanwhile by the end of 2024 these figures were 35 per cent and 48 per cent, correspondingly. The same applies to experts: in mid-2023, about 23 per cent of them used these tools in their professional operations on a regular basis and by late-2024, their number reached over 37 per cent. The experts found the impact of such technologies on the solution of daily tasks efficiently as significant, although 30 per cent of respondents still consider its significance as moderate but useful for performing specific tasks [10].

Both studies similarly identified the key advantages of using large language models (LLMs) in software development processes:

- Automation of routine operations and time saving;
- Intensifying the processes at the team and organisational level;
- Qualitative improvement of software product, including better user experience and documentation.

Besides, notably, although AI tools are not of high demand in business and systems analysis tasks, but they are assiduously applied in the following spheres:

- Encoding (including unit tests, stored procedures, etc.);
- For code reviewing (including its optimisation and refactoring);
- For accelerated prototyping of software solutions.

Approximately 63 per cent of experts applied them in code development and they were fully pleased with the results obtained [10].

The most common types of assignments with these technologies are the following:

- Writing automated tests;
- Fault management and reporting analysis;
- Identifying errors and vulnerabilities in code.

Still, approximately half of the teams have not used these advantages. Besides, experts pointed out the following:

- The influence of LLMs on the professional training of engineers is significant (41 per cent);
- LLMs are simply another useful tool (44 per cent).

Undoubtedly, the process of AI implication encounters the following snags:

- A high level of various risks — legal, ethical, etc. (44 per cent);
- Shortage of financial, time-based and human resources (30 per cent);
- Organisational resistance to innovations from engineers and managers (18 per cent).

Anyway, despite all of the above, the share of IT companies that basically apply these technologies with an official corporate policy for their use is 26 per cent, while only 30 per cent currently resort to it on a test-regime basis [10].

Thus, both studies come at the following results:

1. In Europe, there already exist "innovators" (pioneers), "early adopters", and the "early majority" groups.
2. The current use of AI tools is focused on working with program code, providing with software quality and automating documentation.
3. The need of IT companies is obvious for developing new skills for staff-AI dialogue: the earlier they start training, the more efficient will be the deployment of new systems.

In 2023, researchers studied the advantages of using the LLM Llama 2 and the tasks the model is most relevant. It turned out, that by the middle of the year it had already coped with the implementation of numerous tasks: from the common generation of required texts and program codes to the integration of solutions based on it into existing software products [11]. Thus, within a few weeks, European and the US developers generated dozens of free-for-all working projects, which exceeded most of their expectations, although this required knowledge and specific AI tools skills, as well as an advanced engineering culture in software development.

Regarding the level of demand in 2023–2024, for AI tools creating new IT products in Central Europe and the USA, it is worth noting that the abovementioned project was accomplished by the teams working in large corporations (General Electric, Nestle, Pfizer, Siemens), which are not software IT companies [12]. This is why, they lag behind in development of innovations rather than the enterprises mentioned earlier [10, 11]. However, the authors of the aforementioned researches have come to the common conclusions, namely:

- The demand for AI in software engineering is fast-growing for each year of observation;
- AI-powered tools reduce time-to-market manufacturing process of new products;
- Notable impediments to introducing AI systems in software development can be eliminated by involving top management in centralised innovation management, additional funding, and early training of employees.

Thus, describing new AI technologies, all specialists emphasise the timeliness of this trend for the IT industry, particularly for software development. The companies avoiding them risk losing ground to competitors and their market positions. However, notably, AI tools will not replace IT engineers not now or later, but serve only to automate routine tasks.

Table 2

Research Objectives (by mid-2025)

Research questions	Comments
Current role of AI tools in a team of engineers developing software.	Potential options of solution: auxiliary or primary tool for the engineer, coordinator of team efforts, prospective replacement for a person, etc
Current impact of AI tools on the transformation of necessary engineer skills.	It is necessary to identify, which individual and team skills are required for the optimal use of AI tools, how they develop over time
Aggregated development of AI tools which meets the expectations of engineers.	Rapid progress of AI tools for software development continues in 2022–2025. We must understand, which vectors of this development have been already accomplished
Rapid regulation of AI tools and their application methods in Europe.	Ethics, intellectual property, and information security are only a few of the aspects, which predict rapid regulation of the AI sphere in Europe and the USA
Most significant and noticeable elements of the current IT industry transformation related to AI.	The IT industry is actively transforming, the development of AI has a quite definite impact on this process alongside other trends: general digitalisation of the industry, virtualisation of production processes, and fully remote work of employees

Source: compiled by the author.

In the light of the findings of the applied research, the following aspects should be pointed out:

1. It is worth starting the implementation of AI tools with the most suitable areas of engineering activity, namely, with the tasks related to writing program code and creating product documentation.

2. It is necessary to formalise and document the process of AI implementation, and secure official support from the company's top management.

3. Special attention to AI from regulators requires all-round risk management in the implementation of internal projects for its introduction.

The findings of the research described in the section allowed for creation of a few practical research questions (*Table 2*), which will help solving the posed scientific problem and test the proposed hypothesis.

REFLECTION OF EARLY EXPERT FORECASTS IN THE REAL PRACTICE OF THE IT INDUSTRY

Currently, regarding the development of AI tools and their implementation in the IT industry, we can distinguish the following time horizons:

- Short-term perspective: **3–7 years**;
- Medium-term perspective: **up to 10 years**.

This section presents a set of forecasts for both terms including analyses of the industry's highlights already achieved by mid-2025.

The experts among participants of the above-mentioned surveys [9, 10] assessed the promising directions for introduction of AI (including large language models) into the production processes of software development in the medium term.

1. AI will be used as an ordinary tool for software engineers in the work associated with software design and code creation, namely, as an assistant for a large number of tasks and in the rest as a consultant or mentor.

2. For software quality management, AI will become an ordinary tool for experts in charge of accepting and validating new releases.

Respondents decline the idea of complete replacement of people with AI tools in all areas of software engineering in any timeframe [9, 10, 12]. However, 21 per cent of them believe that in the future, widespread AI involvement will trigger grave professional risks for certain categories of IT specialists [10].

The required routine skills of developers will change, since software development transform

its production paradigms in the medium term. Thus, 46 per cent of experts expect high demand for special knowledge related to interaction with and management of AI. Still, 31 per cent of software engineers express their confidence in a further change in the very essence of their profession within the framework of projects [9]. In reference to several case studies, it becomes clear how fast developers are mastering new technologies and apply them in their own solutions [11]. This not only illustrates a rapid reaction of engineering communities to accessible innovations but also their high dynamics in all processes: from studying tools to their commercial use.

Although it is obvious that the drivers of global changes in the IT industry become the most innovative IT companies, however, sometimes, leading corporations from various sectors actively and in a coordinated way implement new technologies [12]. In the author's opinion and according to E. Rogers' classification, in 2025, this ongoing process represents the formation of the "late majority". Moreover, AI tools quickly turn into standard internal solutions for some leading corporations (from Russia's Sber to the US Amazon), which are not specialised in creating industrial software. This indicates a high demand for AI tools and rising competition.

Forecasts regarding a comprehensive AI tools development in the medium term are interrelated with solving typical tasks in software development, as well as the integration of AI into the most modern environments (code editors, build tools, documentation tools, etc.) and its implementation in project management systems (Trello, MS Project, Jira, etc.).

The directions most anticipated by development engineers by mid-2025 have been accomplished or ongoing in the final stages of implementation:

- Cursor AI (a contextual programming assistant) was integrated into the major part of standard software development environments and it fully supports high-level programming languages, so that, by mid-2025, more than half of the global corporations ranking in the Fortune top 1000 list use it on a regular basis[1];
- Full-fledged AI agents have already been implemented in all popular project management systems (Jira, Trello, etc.).

One more research question from *Table 2* is related to a rapid regulation of AI in Europe. Experts identified the following key problems in this domain [9, 10]:

- Information security: rapid development of AI implementation clearly may damage a comprehensive security management, both at the corporate and state levels.
- Implementation of AI tools for complex projects, a laborious high-risk process: data sources turn out to be increasingly specialised depending on the project type and the AI tool applied.
- Ethical aspects. The open data sources used for training global language models cannot be indefinitely available in public domain. Copyright and patent norms violation, as well as leakage of corporate secrets become severe problems in view of increasing demand for new technologies worldwide.

By mid-2025, a package of laws and acts regarding AI regulation were adopted:

- Since February 2, 2025, the AI Act[2] has been put in force in the European Union, which rather strictly regulates a large number of risks associated with the use of AI, including it in the IT domain.
- The Russian Federation legitimised a whole variety of by-laws and presidential directives in this area, which contain elements of sectoral regulation in view of the potential use of AI in the economy.[3]

In 2025, Kazakhstan, Turkey, Ukraine, the UK and some other countries adopted specialised laws regulating the use of AI in various sectors of the economy.

Finally, let us make an expert viewpoint analysis how the AI implementation in software engi-

[1] URL: https://www.cursor.com/enterprise
[2] URL: https://artificialintelligenceact.eu/
[3] URL: https://ai.gov.ru/ai/regulatory

Table 3

Solutions of Scientific Research

Research Question	Summarised Answer (by mid-2025)
Current role of AI tools in a team of software engineers	Engineer's primary tool. In the future, all areas of activity will be automated by a set of AI tools integrated with each other. Replacing human interaction with AI is not regarded, but the role for each position of team members (e.g., developer, tester, etc.) is changing significantly
Current impact of AI tools on the change of required engineer skills	The transformation of personal skills has already begun. The efficiency of a software engineer's and manager's working with AI tools is their personal competitive advantage in the labour market. The changing role of human aspect in the project at the next stage of automation also substantially impacts the need of acquiring new skills
Comprehensive development of AI tools is meeting engineer expectations	AI tools rapidly expands for software development. Practically all production tools in the industry (from development or testing environments to product and project management) are either integrated with external AI agents or have acquired new functional capabilities similar to the operation of such agents
Rapid regulation of AI tools and methods of their application in Europe	The issues of ethics, intellectual property, and information security is still a hot discussion topic about AI. However, both Europe and Russia (unlike China and the USA) are striving for rapid and rather strict regulation of AI in the form of laws and by-laws
The most notable and noticeable elements of the ongoing IT industry transformation related to AI	Since 2019, the transformation of the IT industry has been actively proceeding. The impact of AI on simple production and management processes is most noticeable, namely, in automation and also reduction of the probability of human errors. However, inadequate tools and insufficient investment do not yet allow for a transition to the target scenario: create a comprehensive automated software development process with minimal need for human participation

Source: compiled by the author.

neering will progress in the long term (until 2030), including the following stages:

1. Integration of AI tools into all areas of software development processes.

2. Complete integration of all AI tools jointly and with other production means in IT.

3. Formation of a comprehensive automated software development process with minimal need for human interaction.

Although respondents decline any possibility of a complete replacement of human participation by AI tools, some of such predictions have already came true by mid-2025:

- standardised and simple operations (such as web development) require AI tools rather than junior specialists, which occurs more easily and quickly than in complex and specialised projects;
- AI is transforming traditional roles: software developers move from programming to coordinating AI tools, which increases productivity but requires new skills and non-stop professional self-development;
- brands of software developer are transformed into centres, which provide consulting services and comprehensive integrations of information systems.

Thus, the research hypothesis is true: there is a growing demand for AI tools, the dynamics of transformations in the IT industry remain extremely powerful, and expert predictions for the medium term have already come true. Solutions to the research questions provided in *Table 3* will demonstrate that AI tools have reached industrial maturity: they are intensively used in software cre-

ation processes and represent an obvious competitive advantage, both nowadays and in the future.

CONCLUSIONS

The conducted analysis allows for determining with a high degree of confidence about a stable trend towards the widespread implementation of artificial intelligence, particularly large language models, in the processes of industrial software development. The integration of research results proves that AI tools make a strong impact on the technological transformation of the IT industry, which is ongoing actively.

New technologies are extensively introduced in the key engineering processes of European IT companies. They are efficiently used in creating product documents and program code, and in quality management of software. AI tools have a strong impact on the process of professional training, providing a more personalised and contextually relevant approach to develop engineering competencies. Concurrently, the following basic obstacles persist: shortage of financial resources, legal and ethical risks, inertia resistance of team members. Most of such deficiencies are easy to surmount by means of centralised support for changes from the company's top management and the application of a consistent strategy of implementation. Let us emphasise it: AI does not displace human factor from the IT industry, but merely automates standard and routine tasks. However, in the long term, we expect transition to new software development paradigms with AI tools closely integrated with each other and with other IT systems to minimise human participation in all routine processes.

By mid-2025, regulatory acts governing the risks related to the use of AI in the spheres of information security, ethics, and intellectual property have been adopted in the EU and some other countries. For Russia, the issue of information security is of particular importance in the light of developing national IT industry and building digital economy. Obviously, this aspect will be regulated in the near future.

The introduction of AI tools in software development processes has become an important and stable trend, which received institutional consolidation in leading corporations. It rapidly modifies the IT industry and accelerates the overall dynamics of its transformation.

Effective application of AI requires a centralised approach supported by the autonomy of developers and the transformation of organisational structures. Otherwise, enterprises may lose their competitive position. It is advisable for Russian IT companies to start promptly the use of such tools at the corporate level with formalised support of top management. In the short term, it is also advisable to commence with production processes related to code and documentation creation, gradually applying AI throughout all production areas, from project and product management to operations related to quality control and user support.

AI tools are not a replacement for people, but a means of enhancing their productivity, quality, and speed of implementation of software solutions. The introduction of AI tools is combined with a revision of staff training models and the development of new engineering competencies.

It is recommended to make investments not only in the purchase of new AI technologies (basically, by recurring payments per workstation), but first of all, in training for engineers, by means of providing new opportunities for them to use AI effectively in their activity.

Thus, the given research proves that the potential of AI tools is sufficient for the comprehensive automation of every process in software development. Moreover, it is already apparent, that these technologies become an integral part of modern engineering practice, defining a new vector for the development of the IT industry within the framework of its transformation, which began at the end of the last decade.

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ABOUT THE AUTHOR

Denis S. Pashchenko — Cand. Sci. (Tech.), independent software researcher, Moscow, Russian Federation
http://orcid.org/0000-0001-9089-8173
denpas@rambler.ru

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