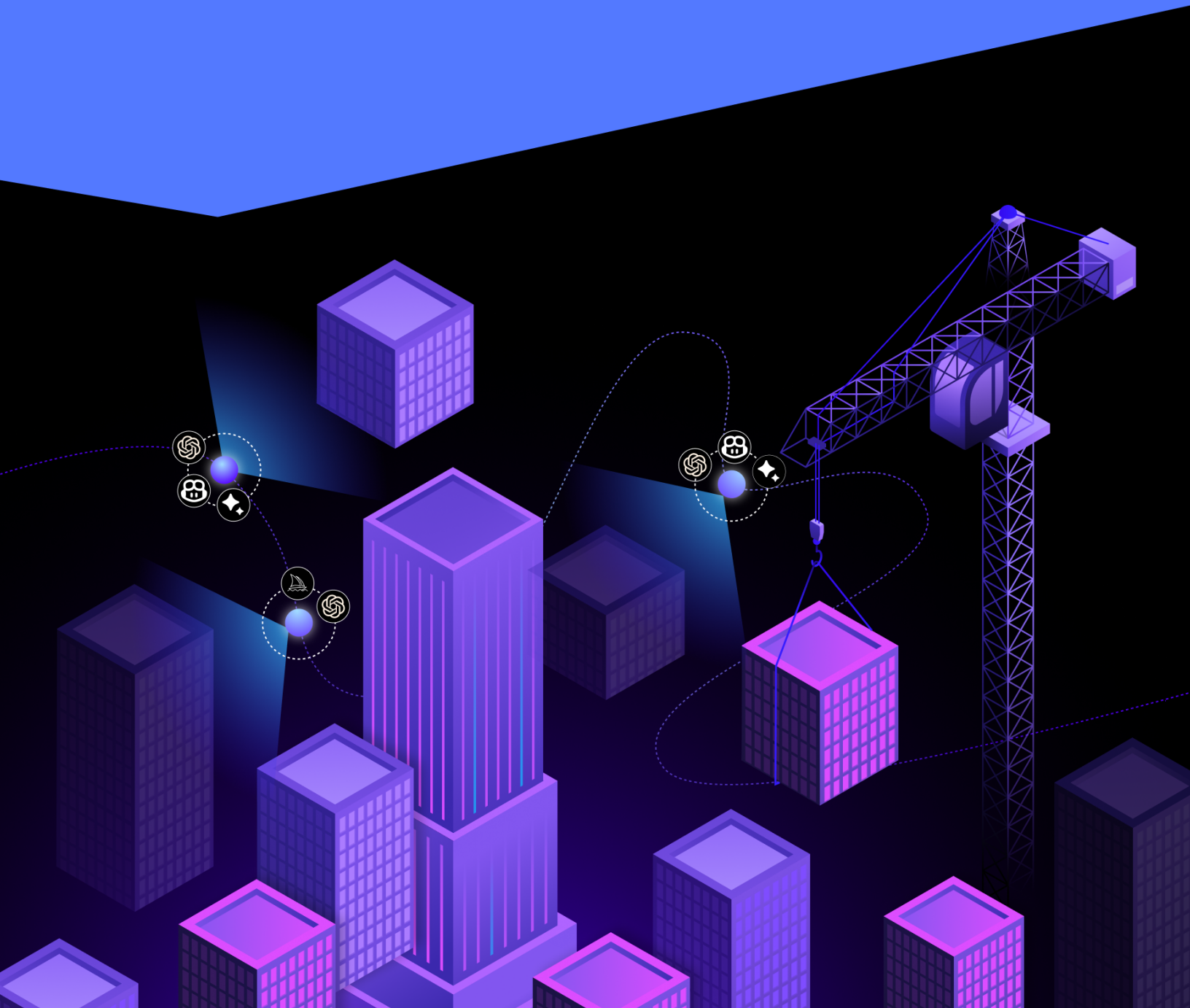softserve

GENERATIVE AI

REDEFINING THE ECONOMICS OF SOFTWARE DEVELOPMENT

THE DAWN OF GENERATIVE AI

In the world of artificial intelligence, it is easy to fall into the narrative of machines replacing humans. But AI, and specifically Generative AI — born of human ingenuity — is designed to enhance, not eliminate jobs.

As with every major technological advancement — from the industrial revolution to the digital age — jobs have changed, and new jobs have been invented. Remember, no one ever heard of a social media manager until the early 2000s. With the advent of Generative AI, the velocity of job transformation can accelerate even further, reshaping industries at an unprecedented rate.

When it comes to software development, SoftServe views Generative AI not merely as a time-saver, but as a means of fostering a new era of creativity and efficiency catalyzing higher team productivity and better project outputs.

SOFTWARE DEVELOPMENT ECONOMICS

Software development economics balances between resources invested and value delivered from software projects. Consider it as the financial blueprint for crafting software.

- Productivity measures how efficiently resources, like developer time, are used.

- Time-to-market gauges the speed of software product development and delivery to the market.

- Return of investment (ROI) assesses the financial returns from software relative to its development costs.

Together, these metrics offer a holistic view, helping businesses navigate the complexities of software development. For this research, we concentrated primarily on the first two metrics due to their heightened sensitivity to Generative AI.

Since each software development life cycle (SDLC) involves various roles and disciplines, contributing to the overall project effort and having varying degrees of sensitivity to Generative AI, it is crucial to begin with a project model that outlines the typical effort contributions from each discipline.
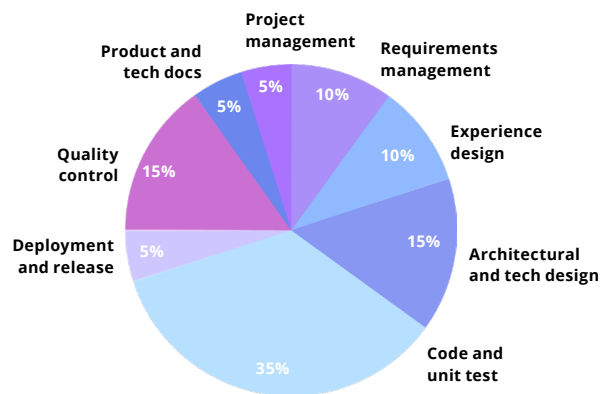

We believe that it is not only about how much time we can save with the help of Generative AI but also how much additional work we can accomplish. To test our hypothesis, we initiated research to see how integrating AI into SDLC can help accelerate work and deliver exceptional results. Does integrating Generative AI signify the next chapter in the evolution of software development teams as described in the picture below?
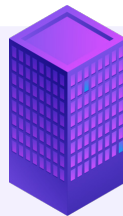

Individual contributors

Tasks are executed by standalone individuals who are responsible for designing, coding, and testing software components.
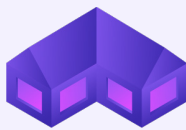
In-house teams

Teams include a mix of roles (designers, developers, testers) who work under one roof, enabling better coordination and communication.

Distributed teams

Teams work effectively across different locations and time zones, which brings the benefits of a wider talent pool and around-the-clock productivity.
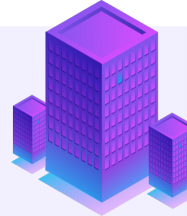
Virtual teams

Global teams with a diverse set of skills and perspectives who might never meet in person but can collaborate using digital tools.

AI-augmented teams

Teams that focus on complex, creative tasks requiring human intuition and empathy. AI helps with automating repetitive tasks and analyzing large data sets.

SOFTSERVE'S RESEARCH PROJECT

The goal of our research project was to benchmark how Generative AI can boost the productivity of software development teams — primarily people with different roles doing various tasks that result in a joint output. For this research, we involved 1000+ SoftServe associates — software professionals across seven countries, multiple disciplines, and different levels of maturity.

The implementation of a human-in-the-loop approach during the Generative AI decision-making process adds an extra layer of oversight and control, fostering trust in the AI's decisions. By combining human intelligence with AI capabilities, this approach proves valuable, especially in intricate or sensitive decision-making scenarios.

PEOPLE AND TASKS

A typical software development project involves a multifunctional team handling various tasks throughout each phase of the SDLC, which collectively determines the project's output. Their job responsibilities can partially be covered with the help of Generative AI. Since SDLC performance is a function of multiple factors and an interplay between them, we adopted a segmentation strategy. We took individuals from diverse directions and grouped them into different cohorts based on specializations, roles, technologies, and levels. For each cohort, we defined a set of the most common and repetitive project tasks. Participants were then asked to complete these tasks with Generative AI (**test group**) and without it (**control group**).

1000+ PEOPLE

100+ USE CASES

300+ TASKS

7 Countries	**9** Disciplines	**10+** Directions
Ukraine	Software Engineering	Back-End
Poland	Business Analysis	Big Data
Mexico	Quality Management	Mobile
…	…	…

Use Case Sample

Implement a business logic that calls public API and collects data in JSON format using .NET technology. Store the response data and implement additional functionality for filtering, ordering, and limitation rules to allow users to consume specific data in specific amounts.

Tasks

☑ **Endpoint.** *Create an endpoint that accepts 3 optional parameters to process the data received from Countries Public API. Parameters can be provided to make the response more specific and ordered.*

☑ **Filtering.** *'country_name' - Type 'String'. A parameter that helps select only countries containing the provided string in a country name. Otherwise, it provides all records retrieved from Public API.*

☑ **Ordering.** *'order' - Type 'String'. A parameter that helps to order results by country name. Possible options — 'Descending' or 'Ascending'. Otherwise, records are provided in a random order.*

☑ **Limitation.** *'limit' - Type 'Integer'. A parameter that is used to specify a limit of records returned by the request. Returns first 'limit' number of records if the 'limit' parameter is provided.*

☑ **Unit test.** *Create unit tests for all functions created earlier.*

☑ **Document functionality.** *Update Readme.md with application description (2 paragraphs, 4-10 sentences), information on how to run the developed application locally, and at least 10 examples of how to use the developed endpoint.*

Focusing on separate tasks

Rather than focusing on large projects, we decided to concentrate on separate tasks making it easier to compare outputs and assess the impact of Generative AI.

Identifying the most common tasks

SoftServe's professional development platform, **People Excellence (PeEx)**, which assesses the performance and productivity of individuals across various domains, streamlined the process of identifying common tasks.

Defining task requirements

By setting precise, measurable requirements and detailed instructions for each task, we ensured a shared understanding and consistent outputs.

CHATGPT AS A PRIMARY GENERATIVE AI TOOL

Among a variety of commercial, open-source, and narrow-specialization Generative AI tools available on the market, we used the newest version of ChatGPT — GPT-4 as one of the most advanced LLMs available on the market that is easy to use, quick to learn, and applicable for many directions and roles in SDLC.

PROCESS OF EXPERIMENTS

As the test group was carrying out project tasks with Generative AI and the control group without, this allowed us to compare productivity levels between the two cohorts. Considering Generative AI systems can produce different outputs depending on the generated prompt, we educated participants on using prompts effectively to achieve the desired results.

For each specific project task, we appointed an expert who possesses in-depth knowledge and extensive experience. The experts' responsibility was to ensure project tasks were executed using the same method and then assess the implementation of tasks and the quality of outputs performed by both groups with and without Generative AI. Following this approach, we achieved consistency across task execution and avoided influence of external factors since different people might approach identical tasks in various ways. If quality was not sufficient, such results were excluded from the calculation of final results.
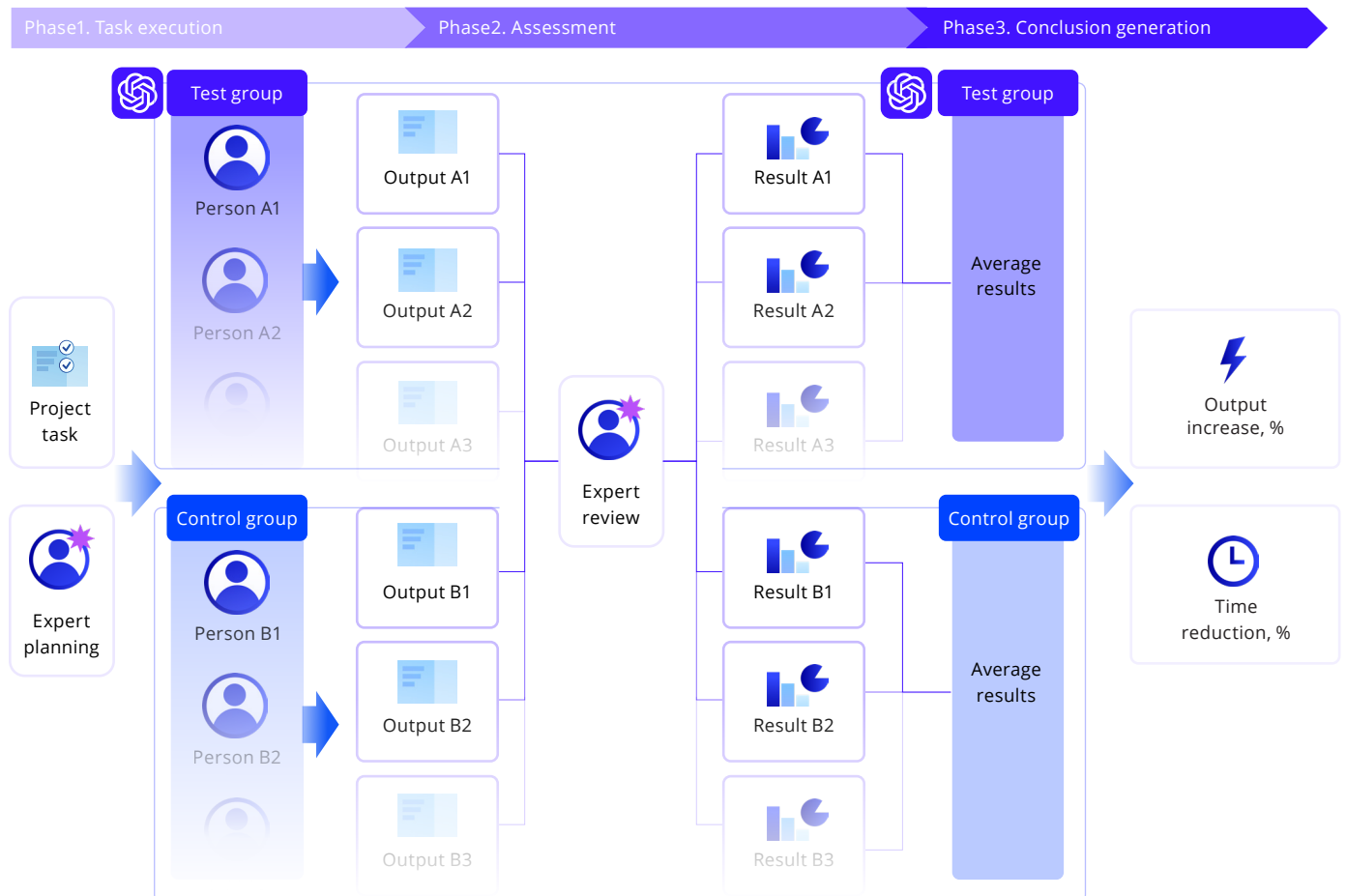
WE SUCCESSFULLY CONDUCTED
1500 EXPERIMENTS

accumulating a substantial volume of reliable data to draw our conclusions.
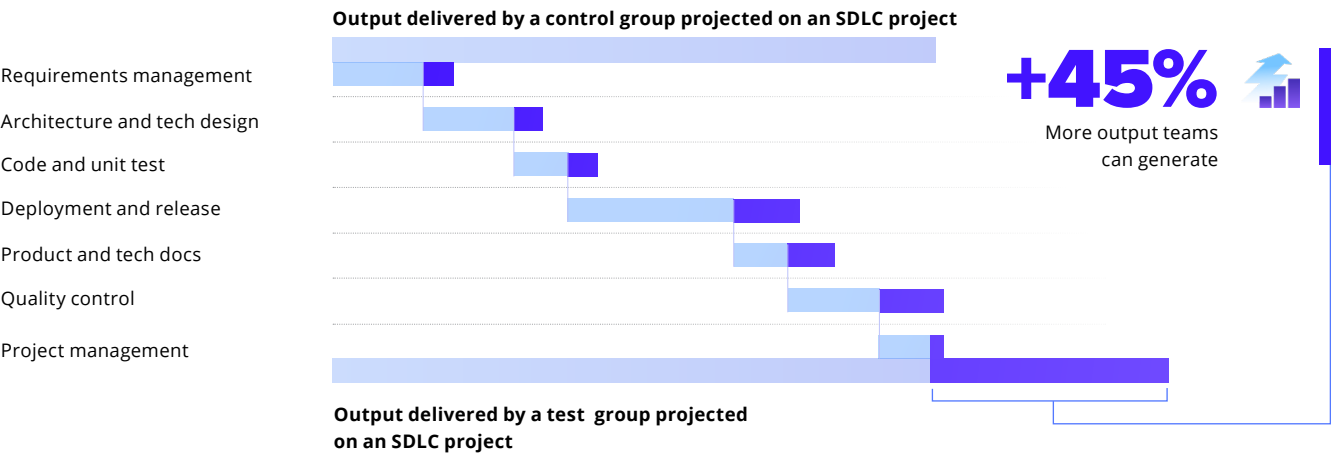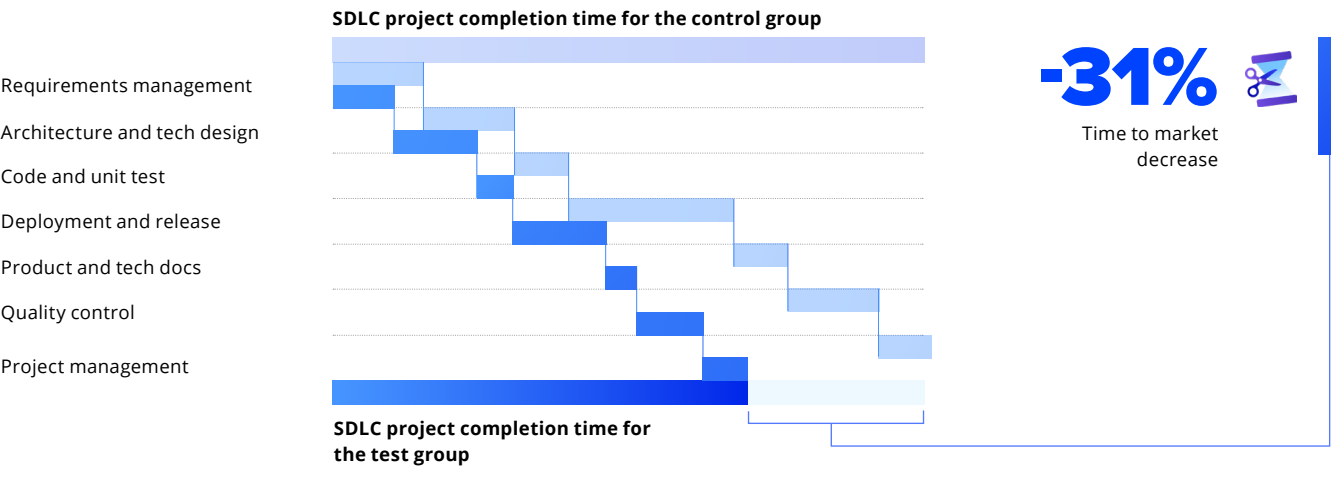
RESULTS

Based on our findings, we observed that integrating Generative AI across all SDLC team members yielded material gain in value. The extent of this value varies, with some domains experiencing significant benefits while others - more modest ones. Nevertheless, a positive impact is noticed across the board, indicating a consistent increase in productivity. Thus, we are inclined to believe that these results might generalize well and become applicable to most software development projects.

Requirements management	**+44%**
Architectural and tech design	**+39%**
Code and unit test	**+42%**
Deployment and release	**+48%**

Quality control	**+62%**
Product and tech docs	**+28%**
Project management	**+79%**

The most significant distinctions are observed in time reduction and output increase. These metrics have been reassessed considering an average weight of the project tasks in a typical SDLC project model, leading to the following insights.

With AI technologies at play, a significant reduction in the time required for task completion has been achieved.

SDLC project completion time for the control group

Requirements management
Architecture and tech design
Code and unit test
Deployment and release
Product and tech docs
Quality control
Project management

-31%
Time to market decrease

SDLC project completion time for the test group

Output delivered by a control group projected on an SDLC project

Requirements management
Architecture and tech design
Code and unit test
Deployment and release
Product and tech docs
Quality control
Project management

+45%
More output teams can generate

Output delivered by a test group projected on an SDLC project

While we are thrilled about the positive results of this research project, it's crucial to maintain a realistic perspective when applying these findings to real-world projects. Why? Because Generative AI, being incredibly promising, can't handle all aspects of project work. People spend time on communication, code reviews, refactoring, etc., and these activities were out of the scope of our research. Anyway, we firmly believe that any SDLC project will benefit from Generative AI, even if not as much as +45%, the productivity increase will be significant.

DEEP DIVE: AI & SOFTWARE ENGINEERING

Ready to see AI's power in action? Here's an example of how much better things can be when companies bring AI into software development workflows. Specifically, note the productivity increase of C#/.NET Back-End engineers.

Requirements management	+44%	Databases	Java Back-End
Architectural and tech design	+39%	Front-End	Node JS Back-End
Code and unit test	**+42%**	Mobile	Python Back-End
Deployment and release	+48%	**Back-End**	**C#/.Net Back-End**
Quality control	+62%	Big Data	Go Back-End
Product and tech docs	+28%	DW and BI	Scala Back-End
Project management	+79%	API Integration	Ruby Back-End
		Platforms	

24 Executed tasks

180 Accomplished experiments

116 Associates

30 Juniors   56 Middles   30 Seniors

+49% Average output increase
16-122% (min-max range)

-33% Average time decrease
14-71% (min-max range)

POINTS FOR CONSIDERATION

It is easy to get caught up in the excitement surrounding Generative AI, but it is crucial to thoughtfully approach its integration into your organization's SDLC and consider specific factors relative to your organization.

To ensure a smooth integration, collaborate with legal professionals on IP-related risks, conduct regular security assessments, and adhere to best practices in software development and infrastructure management. Stay informed about relevant laws and regulations. A proactive and thorough approach will safeguard your progress and success in the Generative AI-powered landscape.

SECURITY

To ensure responsible use of Generative AI tools within your organization, work on a comprehensive approach to address all security limitations by combining technical measures, adhering to policies and procedures, ongoing monitoring, and performing continuous improvement.

LEGAL

Generative AI tools need to adhere to specific compliance requirements, such as copyright laws, intellectual property rights, data protection regulations, or any other industry-specific standards. It is crucial to comply with applicable laws and regulations to avoid legal liabilities and maintain client trust.

TOOLS

Keep a close eye on the evolving landscape of AI tools, especially with so many emerging offerings, and try them in your own setting to pinpoint which best cater to your needs. Consider exploring tools such as GitHub Copilot, Amazon CodeWhisperer, and the Code Llama by Meta.
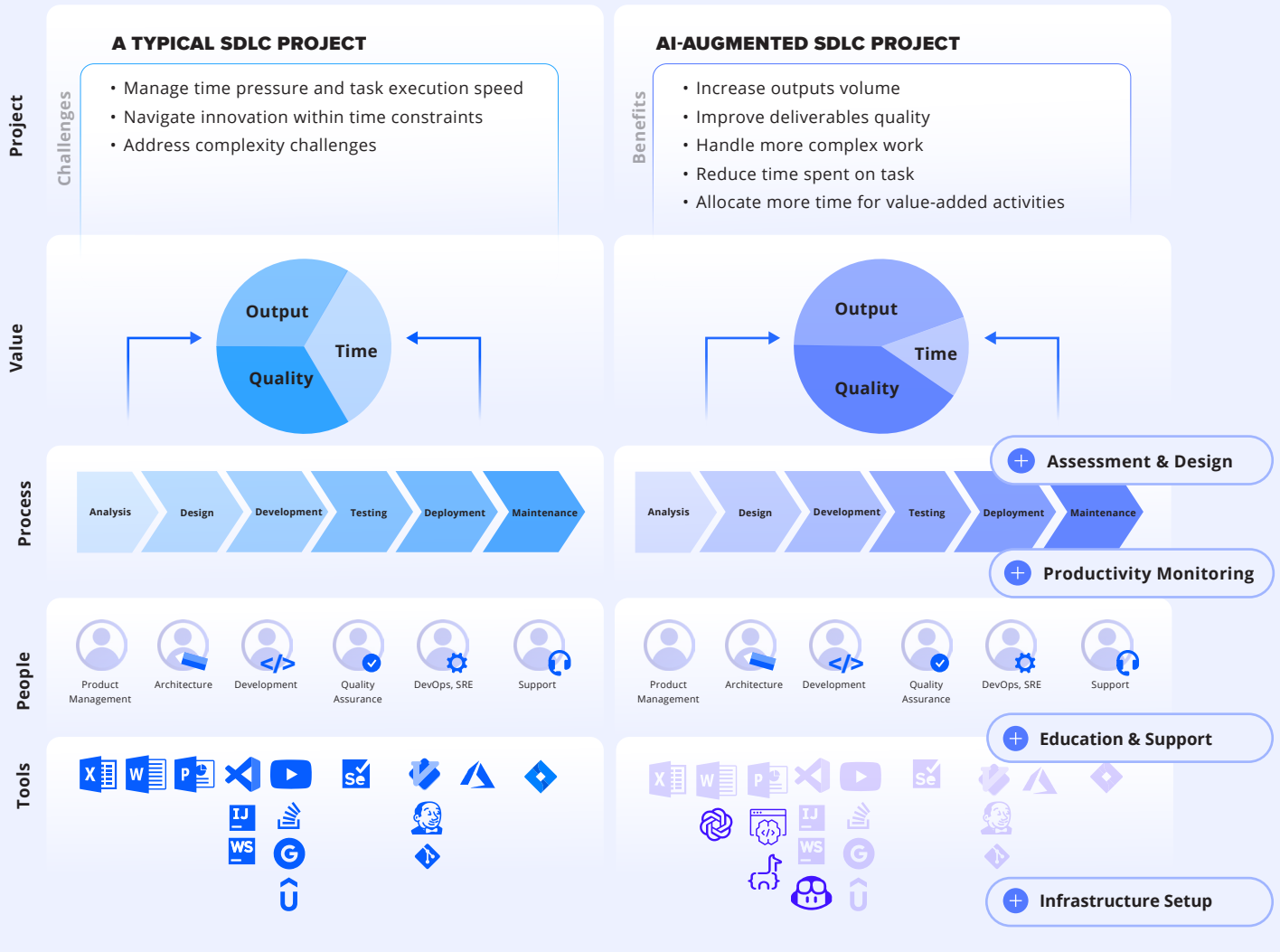
INFRASTRUCTURE

Use existing neural networks or develop a proprietary large language model (LLM). Developing and integrating a custom LLM is significant both in terms of financial investment and required expertise.

INCORPORATING GENERATIVE AI INTO SDLC FOR CUSTOM SOFTWARE DEVELOPMENT WORKFLOWS

A TYPICAL SDLC PROJECT

Project / Challenges
- Manage time pressure and task execution speed
- Navigate innovation within time constraints
- Address complexity challenges

AI-AUGMENTED SDLC PROJECT

Project / Benefits
- Increase outputs volume
- Improve deliverables quality
- Handle more complex work
- Reduce time spent on task
- Allocate more time for value-added activities

Value

Output / Time / Quality

Output / Time / Quality

Process

Analysis → Design → Development → Testing → Deployment → Maintenance

Analysis → Design → Development → Testing → Deployment → Maintenance

⊕ Assessment & Design

⊕ Productivity Monitoring

People

Product Management | Architecture | Development | Quality Assurance | DevOps, SRE | Support

Product Management | Architecture | Development | Quality Assurance | DevOps, SRE | Support

⊕ Education & Support

Tools

⊕ Infrastructure Setup

⊕ Assessment & Design

- Review current SDLC model & deliverables
- Analyze team composition and roles
- Review development infrastructure
- Analyze legal aspects and update agreements
- Check adherence to information security protocols
- Formulate a Generative AI integration strategy

⊕ Productivity Monitoring

- Define the productivity measurement approach
- Analyze productivity metrics on the project
- Configure or refine productivity measurements based on the defined approach
- Define the baseline productivity level prior to Generative AI integration to assess subsequent gains

⊕ Infrastructure Setup

- Set up and configure infrastructure for coding
- Set up and configure infrastructure for content creation
- Set up and configure information security and license management

⊕ Education & Support

- Incorporate standard prompting practices
- Master the integrated prompting practices
- Configure the Generative AI toolset and use it safely according to information security standards
- Expand the use of Generative AI usage practices and support ongoing adoption

About SoftServe

SoftServe is a premier IT consulting and digital services provider. We expand the horizon of new technologies to solve today's complex business challenges and achieve meaningful business outcomes for our clients.

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