

TECHNOLOGY ADOPTION

When Generative AI Meets Product Development

From ideation to user testing, large language models are allowing companies to explore more ideas and iterate faster.

By Tucker J. Marion, Mahdi Srour, and Frank Piller

As enterprises experiment with generative AI use cases, one promising area is emerging: incorporating image- and text-generation tools in the product development process. Generative AI is being used to enhance ideation and creativity, gain market and customer insights, and add user-friendly interfaces to sophisticated tools.

In our field research and interviews with managers, we have seen how GenAI can transform traditional innovation workflows. The three use cases described below show how these technologies can increase the productivity of innovation teams.

Use Case 1: Enhancing Creativity and Design Workflows

For a project last year, Boston design agency Loft used GPT-4 to suggest new product features by prompting it with known customer preferences. It then identified and refined the most promising ideas via additional prompts. Meanwhile, the designers began sketching product concepts and then uploaded the sketches into image generator Midjourney, where they could refine the visual designs with prompts in addition to reworking them on paper. In these creative stages of the innovation process, generative AI's tendency to produce hallucinations — text or images that defy facts or logic — were of no concern as the team was just looking for ideas.



When the development process moves into design and engineering, tools must be trusted to produce reliable outputs. Publicly available generative AI platforms could have helped the Loft team conceptualize ideas and sketch early prototypes, but the company paused its use of generative AI tools at this stage while its engineers built prototypes based on the selected concepts.

The Loft team gathered consumer feedback on the prototypes through video focus groups and surveys. GenAI was used to generate transcripts of consumer interactions with prototypes and then analyze them, a task at which large language models (LLMs) like ChatGPT excel. The LLM summarized and organized the data, recommended areas for improvement, and identified features that consumers liked as input for product launch marketing. The design team then integrated the findings into the initial design concepts.

Since that initial project, augmenting product development with generative AI has led to significant improvements in Loft's design process. For example, Loft's designers used the technology to quickly generate 50 different concepts for a guitar toy. Without generative AI, they would have spent many hours reading testers' feedback and sketching new concepts. Generative AI has not only helped them to work faster

but also to more effectively envision the product changes that will best address specific consumer needs. The company estimates that using generative AI has cut its product development time in half.

Use Case 2: GenAI for Customer Insights and Concept Validation

Designers at Creative Dock, a Czech company that helps clients create new business units, products, and services, incorporate

numerous rounds of market feedback into multiple iterations of its business model concepts before launch. Using existing large-scale market research data about customer needs in a specific sector, the company programmed an AI agent to generate simulations, such as a qualitative interview with potential customers — each representing a specific persona — about their demands and preferences or to get feedback on alternative value propositions for a new offering. This proprietary data was then used to finetune a general-purpose LLM so it could address specific market questions in each segment.

Martin Pejša, Creative Dock's founder, reported a 30% increase in technical development efficiency, a 40% efficiency gain in graphic design, and a tripling of content creation speed. AI is also used to review all new business models. As a result, the firm has achieved 50% year-over-year growth without adding full-time employees.

FlecheTech is also using generative AI to gather customer requirements, but in a very different way. The Swiss startup has built an expert application for designing and rapidly prototyping printed circuit boards (PCBs). Its target users are hobbyists, entrepreneurs, and anyone who needs a custom PCB for a hardware prototype or small-series production but may not have a

deep understanding of electrical engineering and PCB design. FlecheTech has fine-tuned a pretrained LLM using a database of many PCB designs and their descriptions to create an interface that users can interact with in plain language — such as “I need to measure this physical value,” “make X rotate at Y speed,” or “communicate with this protocol” — to design a circuit.

More complex PCB design queries are broken down into simpler subtasks as the LLM automatically identifies them. In addition, customers with complex designs can have the FlecheTech team review their GenAI-assisted PCB design before proceeding to prototyping. The company says this has reduced the six to eight weeks it typically takes a human designer to create a working board design by an average of more than 80%, with much greater productivity gains for novice users (and thus a much larger market for the company’s product). Compared with its competition, FlecheTech also has a considerable cost advantage because its staff does not necessarily have to interact with individual customers to understand their specific demands for a custom PCB; it has mostly outsourced this process to its GenAI-based chatbot.

Use Case 3: LLMs as Natural Language Interfaces to Complex Design Tools

LLMs’ linguistic fluency and ease of use makes them useful front-end interfaces to advanced simulation and engineering systems. Siemens’s industry division has recently added generative AI capabilities to its highly sophisticated engineering and design software, enabling a much wider range of users to interact with these systems. One of its tools, Simcenter, is an established simulation package that allows engineers to model the exact physical behavior of products or processes, replacing physical prototypes and test beds with digital ones.

While powerful, Simcenter typically requires long ramp-up times and extensive

user training, and interpreting its results requires specialized expertise. Siemens combined the tool with a GenAI-based user interface to create HiSimcenter. HiSimcenter can handle a range of tasks, such as answering simple queries about selecting the best computer-aided engineering tool for a given task or executing a fully automated generative design capability that inputs product requirements and directly generates a compliant design. The ChatGPT-based application has helped engineers set up and run complex simulation models, resulting in a more than 50% increase in modeling efficiency.

The Siemens engineers who developed HiSimcenter realized that having a reliable ground truth is the critical challenge in building a hybrid expert system. Because they expect training data to become critical to developing additional expert applications using generative AI, they teach selected employees across all major engineering tasks to assess the quality of data associated with specific tasks before it’s used to train the LLM model.

Siemens took a centralized approach to development of the tool in order to maintain quality control over the GenAI output and ensure its compliance with the firm’s policies and engineering standards.

Finding a Strategic Fit

Generative AI can bring tangible benefits to companies’ innovation and development processes. Managers considering how to use it will need a clear understanding of realistic expectations and desired outcomes and an appreciation that different innovation tasks require different approaches.

Publicly available generative AI tools like ChatGPT or Midjourney are well suited for creativity and ideation, as experienced by the design firms we studied. For more focused applications, like validating a concept with synthetic personas, a pretrained model must be enhanced with training data on the particular context. The amount, diversity, and quality of training data defines trust and significantly impacts

GenAI output quality in terms of addressing a specific context or market segment.

When very high precision and confidence in the results are essential, conventional simulation platforms and expert systems are required. As Siemens and FlecheTech have demonstrated, LLMs can serve as efficient user interfaces to these systems, allowing them to be used for complex engineering or scientific research tasks by a much larger base of users, such as those who have domain expertise but are unfamiliar with simulation systems. We expect that when users don’t need to have simulation experts manage the expert systems for them, they will run many more simulations — using such tools for discovery and not just for validation.

Last, given the speed with which these technologies are evolving, the question of integration within the organization becomes more critical. As Siemens demonstrates, a top-down approach of strategically investing in internal development and strategic partnerships is one approach to integration. However, these initiatives take time, and the latency of implementation may result in a technology deployment that is already dated by the time it’s available. Hence, we also recommend a bottom-up, democratized approach where teams and individuals select, use, and build tools as they see fit. Our research suggests that a mix of both approaches allows organizations to strategically build better data and trustworthy solutions while allowing for dynamic experimentation. ■

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