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Initiatives: Artificial Intelligence

Vendor adoption of GenAI has advanced quickly and continues to challenge understanding of this new technology in the enterprise. Application leaders must understand what GenAI can do and how it can be safely enabled within an application portfolio to unlock productivity, efficiency and innovation.

## Overview

### Key Findings

- Enterprise applications comprise 13 markets across four categories: digital workplace, customer relationship management, enterprise resource planning and augmentation services.
- Large language models (LLMs) — a technology underpinning generative AI (GenAI) — remain a complex and confusing topic, with ample scope for misunderstanding.
- Broadly speaking, the adoption of GenAI has been greatest in the context of digital workplace markets, with limited adoption in ERP and CRM. For the most part, the inclusion of GenAI within enterprise applications is focused on user experience, primarily content creation.
- The technologies underpinning GenAI capabilities are common across enterprise applications (e.g., same models and usage patterns).

### Recommendations

Application leaders responsible for enterprise applications must:

- Get ahead of the confusion and hype of GenAI by focusing on the capabilities LLMs provide. Treat LLMs as “black boxes” that deliver outputs (responses) steered through a combination of model choice, model settings and engineered inputs (prompts).

- Explain to stakeholders how GenAI capabilities are changing the way applications augment and automate work by understanding the ways in which vendors are using the technology within their products. From this, work with stakeholders to control adoption and adapt to its impacts.
- Pursue opportunities for rationalization and consolidation by working with peers in data and analytics, enterprise architecture and software engineering to develop a strategic approach to model operations.

## Strategic Planning Assumption(s)

By 2026, more than 80% of independent software vendors will have embedded GenAI capabilities in their enterprise applications, up from less than 1% in 2023.

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*The following research is a work in progress that does not represent our final position. We invite you to provide constructive feedback to help shape this research as it evolves. All relevant updates and feedback will be incorporated into the final research.*

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### Enterprise Applications Markets

Enterprise applications comprise a range of markets under the categories of customer relationship management (CRM), digital workplace (DW) and enterprise resource planning (ERP). These markets are summarized in Table 1. In addition to these categories, adjacent markets provide augmentation services (AS) to the enterprise applications within these categories (e.g., digital adoption platforms), hence the fourth category.

**Table 1: Enterprise Application Markets and Categories**

(Enlarged table in Appendix)

| Category | Market |
|---|---|
| AS | Application Portfolio Management Tools |
| AS | Digital Adoption Platforms |
| CRM | Cloud Extended Planning and Analysis Solutions |
| CRM | Contact Center as a Service |
| CRM | Customer Communication Management |
| DW | Collaborative Work Management |
| DW | Content Services Platforms |
| DW | Innovation Management Tools |
| DW | Intranet Packaged Solutions |
| DW | Meeting Solutions |
| DW | Visual Collaboration Applications |
| ERP | Cloud ERP for Product-Centric Enterprises |
| ERP | Cloud ERP for Service-Centric Enterprises |
| Note: More markets will be added as this research matures. | |

Source: Gartner (January 2024)

Our monitoring seeks to identify what's available and what's forthcoming from vendors. It is derived from multiple sources, including vendor announcements and insights from the analysts covering each of these markets. Both the breadth and depth of this monitoring will expand as this research develops as part of Gartner's Beta Research program. Our initial scan is based on a sample of three vendors in each of the markets listed above, or a market overview provided by the lead analyst(s) covering these markets.

## Understanding LLMs in the Context of Enterprise Applications

When approaching LLMs in the context of enterprise applications, it is unhelpful to dive too deep into what is a nascent, complex and rapidly changing domain. Doing so is a distraction from what enterprise application leaders need to know. Instead, it is better to treat LLMs as "black boxes." While we may know the name and version of the model(s), the number of parameters and the vendor(s) responsible, the finer details of how actual inputs map to actual outputs are opaque — even to their creators. This will be the case for the foreseeable future due to the sheer complexity and scale of the underlying mathematical mechanisms within these models (see Note 1). However, the important points are:

1. Input and output are associated through training and implicitly encoded in the model.

2. Output is derived from what is inputted plus data that is implicitly encoded within the model.

3. The output can be shaped by controlling the input.

Each model is frozen for release and use, hence the version number. While models can be tuned with further training — that is, fine-tuning — they must again be frozen before they are used. Moreover, fine-tuning for enterprise application customers is atypical and more likely to be undertaken by those pursuing software development such as vendors and service providers. LLMs don’t learn “on the job”; they come and are used pretrained.

Crucially, the material used for training may or may not be known — it varies by model and creator — even though this has a significant bearing on the output. Part of the challenge in deploying LLMs within the context of enterprise applications, and therefore enterprise operations, is that the material used for training models is typically sourced from the publicly available internet. Therefore, it is significantly different in both form and function from that used within enterprises. Sparse input shifts the output’s dependency onto the model, and therefore its training data. This increases the risks that output will be derived, ultimately, from training data, and moreover potentially “fanciful recall” of that training data depending on the temperature setting used. To ensure alignment with enterprise applications and operations, it is necessary to shift reliance from the model to its input. This requires that the input — or prompt — be engineered.

Prompt engineering structures the input to steer the model’s output, or response. Many methods exist, but to shift the balance from the model to the needs of its application, context can be added to “ground” the model’s response. A common method for doing this is retrieval augmented generation (RAG), which extracts relevant content from internal repositories and adds this to the prompt. The net effect is to shift the focus of the response from facts encoded in the model to facts presented in the prompt. Doing so grounds the response in the context of the enterprise application and its operations.

## Evaluating GenAI capabilities

We consider capabilities according to three phases of the product life cycle:

- **Generally available** — Products and features that are in use by customers

- **Preview —** Products and features released on a limited basis to a subset of customers
- **Roadmap —** Planned or in-progress development of products and their features

However, this first iteration of research only looks at the first two phases. In future versions, we intend to look into the roadmaps of sample vendors.

These phases of a product's life cycle are considered for representative vendors in each market. We consider capabilities across three broad categories of GenAI purpose, namely:

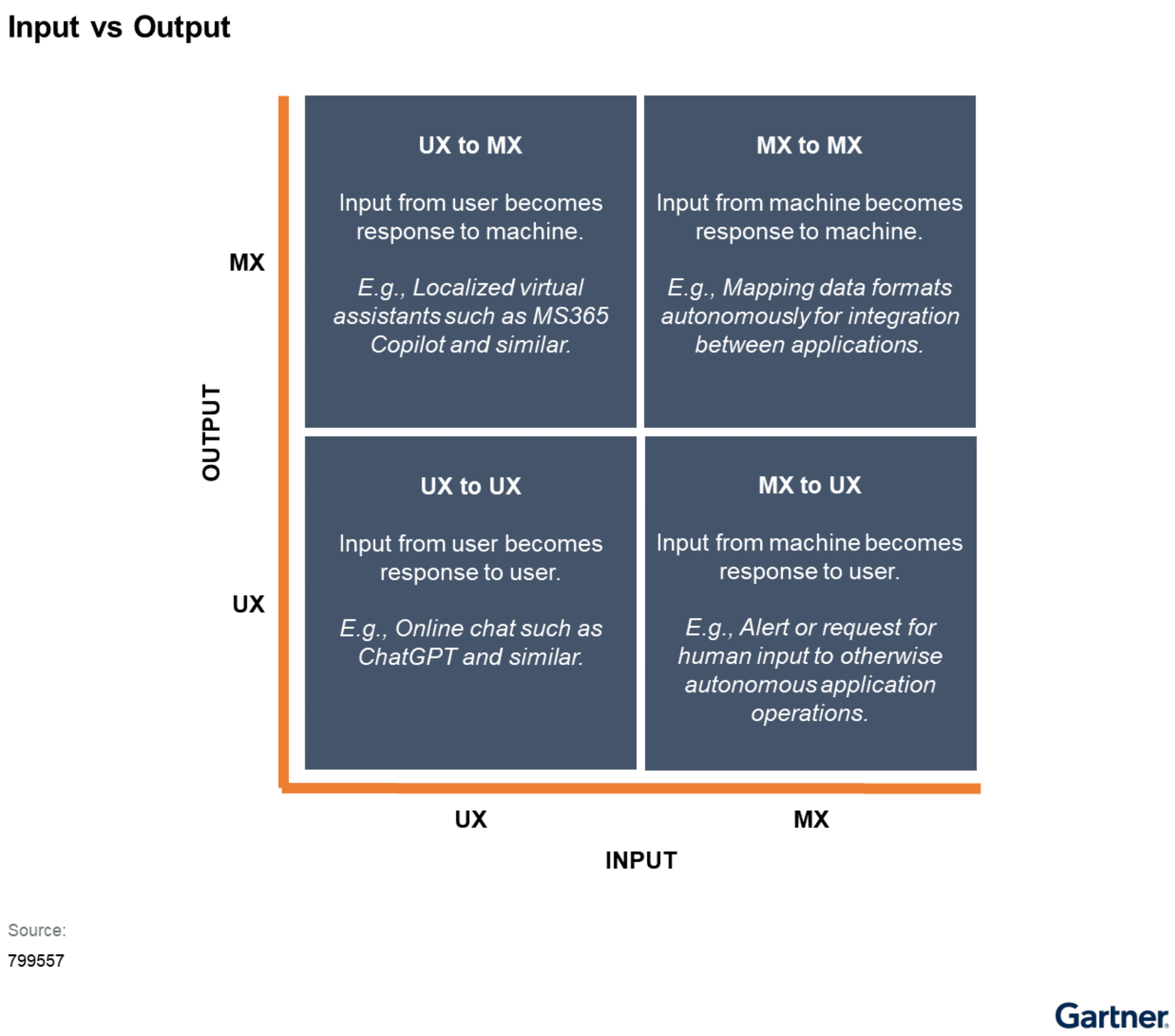
- **Content consumption —** How content is queried and conversed with, retrieved and synthesized in a consumable fashion
- **Content creation —** How content is produced for consumption in various forms, including text, image/video and audio
- **Technology creation —** A subset of content creation that deals with the generation of code, which may serve UI and processing, or data for processing

Returning to the analogy of a black box, LLMs perform three types of processing of input to output: reduction, transformation and expansion — or the combination of transformation with either reduction or expansion (but not both together). Let's consider some examples:

- **Reduction —** Summarizing an article reduces it.
- **Transformation —** Changing the tone of voice of an article transforms it.
- **Expansion —** Writing a draft from an initial paragraph expands it.
- **Reduction and transformation —** Selecting keywords from a fixed vocabulary to set the metadata for an article is both reduction and transformation.
- **Expansion and transformation —** Writing Python code from a brief written in pseudo code is expansion and transformation.

With respect to LLMs in the context of enterprise applications, both input and output can be sourced from and delivered to either users or machines (or applications) — that is, user experience (UX) or machine experience (MX). The combination of these two, although a simple 2x2 matrix, reveals a lot about the adoption and use of LLMs (see Figure 1). Many practitioners' first encounter with GenAI was ChatGPT (i.e., chat, or UX to UX). A natural progression is for machines to carry out tasks (i.e., UX to MX). Later, machines will need to engage with users when their input is required (i.e., MX to UX). Finally, machines will interact within and between each other (i.e., MX to MX). This journey, from UX to UX through to MX to MX, represents an increasingly mature adoption of LLMs.

### Figure 1: Input vs. Output




Source: Gartner

We also consider which services are being used to enable GenAI capabilities and how these are being integrated into applications. The capability for intelligence provided by GenAI comes via various services that can be leveraged in four ways:

- **Integral —** Inclusion in an application at the source (i.e., an integral part of an application, such as offering summarization as a feature of a word processor)
- **Peripheral —** Optionally augments an application (i.e., a peripheral part of an application, such as an optional vendor-supplied module)
- **Proxy —** Provided by another application with which data is shared (i.e., a separate, complementary application, such as a localized virtual assistant)
- **Custom —** Built to requirements (i.e., custom development, such as an in-house extension to enable the integration of third-party data sources)

## What's in General Availability or Preview?

From our initial review, there are insufficient examples of GenAI capabilities in products subject to preview. The number of such products, relative to the sample size, is too small to warrant a separate section, so we have combined preview and general availability here for this iteration of this ongoing research. Given this, our findings are summarized in Table 2.

For each market, we use low, medium and high to represent the number of discrete capabilities enabled by GenAI with the products of sampled vendors, rather than a count of vendors and/or products. This provides a more complete and representative indicator of generative adoption at the market level, given the need for vendors to match and differentiate on capabilities.

### Table 2: Adoption of GenAI Across Enterprise Application Markets

(Enlarged table in Appendix)

| Category | Market | General Availability/Preview |
|---|---|---|
| AS | Application Portfolio Management Tools | Low |
| AS | Digital Adoption Platforms | High |
| CRM | Cloud Extended Planning and Analysis Solutions | Low |
| CRM | Contact Center as a Service | Medium |
| CRM | Customer Communication Management | Low |
| DW | Collaborative Work Management | High |
| DW | Content Services Platforms | Low |
| DW | Innovation Management Tools | Medium |
| DW | Intranet Packaged Solutions | High |
| DW | Meeting Solutions | High |
| DW | Visual Collaboration Applications | High |
| ERP | Cloud ERP for Product-Centric Enterprises | Low |
| ERP | Cloud ERP for Service-Centric Enterprises | Low |
| Low: No, one or two instances; Medium: A few instances; High: Many instances | | |

Source: Gartner (January 2024)

The principal focus of vendors across the markets sampled is on GenAI capabilities that support content creation. There is also evidence of capabilities that support content consumption and, to a very limited extent, technology creation.

In terms of **content creation**, the principal use case is augmented writing in the context of employee experience — that is, facilitating employees to write more effectively. Here, we see a broader range of capabilities, which are typically offered either as tools within toolbars or cursor tips. They include:

- Drafting, in whole or part, from a variety of starting points (e.g., blank page, response to message, next section or paragraph)
- Completion of a word, phrase or sentence
- Correction of spelling or grammar
- Changing tone and/or voice

In terms of **content consumption**, the principal use case is augmented reading in the context of employee experience — that is, facilitating employees to read more effectively. Here, we see a narrower range of capabilities, albeit across a variety of application touchpoints and user scenarios (e.g., providing summaries of meetings within meeting solutions). They include:

- Summarization (e.g., reducing one or multiple transcripts into a single summary)
- Question answering

In terms of **technology creation**, the principal use case is metadata attribution in the context of machine experience — that is, facilitating applications to process content as data. Similarly to content consumption, there is a narrower range of capabilities:

- Categorization, whereby labels are attributed to content with respect to a variety of dimensions (e.g., sentiment, topic, grouping)

## Next Steps

Vendors' inclusion of GenAI within enterprise applications is pervasive across markets but varies in the breadth and depth of the capabilities supported. Consequently, the impact on business activities supported by enterprise applications is multifaceted and complex, making it challenging to understand as well as communicate the implications of GenAI.

Following this research as it develops will enable enterprise application leaders to maintain an overview for their portfolio at a market level. They should use this as a framework through which to look at their own application portfolio, with reference to their applications in each market, to better understand the capabilities arising. From this, communicate with stakeholders and decide on the appropriate course of action as it relates to each application, as well as the broader portfolio of applications.

In summary, the decisions boil down to five principal choices with respect to the introduction of GenAI capabilities (see Table 3).

### Table 3: Application Choices for the Introduction of GenAI

| Recompose | Reject | Do nothing | Accept | Customize |
| --- | --- | --- | --- | --- |
| Change the composition of your application portfolio. Commission or decommission applications based on the presence or absence of GenAI capabilities. | Reject capabilities by rejecting or delaying application upgrades, where possible. This results in missed opportunities as well as risks inherent in staying with older versions of software. | Being unaware of the changes and not taking an active role in the decision to accept or reject updates to applications, customize applications or change the composition of your application portfolio. Doing nothing will expose you to vendors steering the application portfolio, and consequently, your organization. | Accept capabilities by accepting application upgrades, where possible. A conscious decision to selectively permit change requires the change and its implications to be understood. This will entail changes to the way applications are governed and managed (including risk), the ways of working they support and how adoption is facilitated. | Customize applications to add or tailor capabilities. This shifts the burden to the enterprise application leader and their teams, both direct and indirect. |

Source: Gartner (January 2024)

Given a portfolio of applications, a blend of choices will apply. Moreover, GenAI leads to common LLMs that are either shared or duplicated across the portfolio, introducing opportunities for rationalizing and consolidating applications. Furthermore, it heralds the need for enterprise application leaders to take a strategic approach to the use of models (i.e., ModelOps) — but not to take this on their shoulders. Rather, this is the responsibility of other IT leaders, such as those leading data and analytics, specifically data management. Enterprise application leaders should therefore work closely with their colleagues in pursuit of a strategic approach to the governance and management of the models underpinning GenAI capabilities.

## Acronym Key and Glossary Terms

| | |
|---|---|
| AS | Augmentation services |
| CRM | Customer relationship management |
| DW | Digital workplace |
| ERP | Enterprise resource planning |
| GenAI | Generative AI |
| LLM | Large language model |
| MX | Machine experience |
| UX | User experience |

## Evidence

Enterprise Application Markets: We are conducting a scan of 13 enterprise applications markets using a sample of vendors. Our initial scan is based on either a sample of three vendors in each of the markets listed above or a summary overview provided by the lead analyst(s) covering these markets.

## Note 1: How LLMs Work

Rather than operating on characters or words, LLMs work with tokens. Tokens are recurring sequences of one or more characters (e.g., a, sc, one, with, cr, eam, and, jam), determined by the frequency of occurrence in text, that can be used to deconstruct, process and construct text in a way that is impartial to the text's language and that language's rules. The number of tokens an LLM can accept as input and output is constrained. For example, PaLM is limited to 8k and 1k, respectively. Output is also further constrained by setting the so-called "temperature," which changes the likelihood of the next token being determined by probability (0) versus chance (1). Low scores tend to stick to the sequence of tokens that have been learned and therefore result in rote output; high scores deviate from this, resulting in more creative output.

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