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Generative AI Playbook for R&D

Sagentia CTO Forum members

Amcor plc / Bayer Crop Science / Mars, Incorporated / PepsiCo Inc. / Stepan Company / The Procter & Gamble Company

Sagentia and the CTO Forum

Sagentia is a global science, technology and regulatory consultancy. We combine deep technical and scientific expertise with specialist industry knowledge to deliver best-in-class results against complex briefs.

We serve clients across a range of sectors including medical, defense, aviation, consumer goods, food and beverage, chemicals, energy and industrial.

Sagentia has established its CTO Forum to tackle issues of material interest to R&D leaders.

The Forum comprises an invited group of senior R&D executives. We combine their inputs with our own knowledge base and research – with the twin aims of sharing insights and developing actionable guidelines.

The focus of this year's Forum is the use of Generative AI in Research & Development.

Sagentia thanks the members of the CTO Forum:

- Jason Keiper – Vice President and Chief Technology and Sustainability Officer, Stepan Company
- Mike Graham – Research & Development Lead, Crop Science Division, Bayer
- Nici Bush – Chief Innovation, Science and Technology Officer for Mars, Incorporated
- René Lammers – Executive Vice President and Chief Science Officer, PepsiCo Inc.
- Victor Aguilar – Chief Research, Development and Innovation Officer, The Procter & Gamble Company
- William Jackson – Chief Technology Officer, Amcor plc

Sagentia is represented on the Forum by:

- Dan Edwards – Chief Executive Officer, Science Group plc
- Paul Wilkins – Managing Director, Sagentia Innovation and Sagentia Medical
- Patrick Hannon – Senior Vice President, Sagentia Innovation

We also offer thanks to the many individuals from various companies who contributed to the outputs of this Playbook including:

John Nettekoven (Amcor plc); Martin Mendez-Costabel and Phani Chavali (Bayer Crop Science); Jim Kennedy (Mars, Incorporated); Damian Browne and James Yuan (PepsiCo Inc.); Stew Taub (The Procter & Gamble Company); Melissa Helm, Emily Zarefsky, and Vanessa DeMarco (Stepan Company); and Jenni Hastings, Paul Williams, Justin Weeks and Michael Zeitlyn (Sagentia).

Using this Playbook

Many R&D leaders are asking how they should harness the power of Generative AI (GenAI) within their organization.

This Playbook aims to embrace that challenge – drawing on insights and experiences shared by members of our CTO Forum.

We begin with opening remarks which set the scene for insights that follow.

The Playbook then has three sections or 'Plays', each with an overarching message for R&D leaders.

Under each Play we present:

- Observations – reflections on the current situation
- Principles – key learnings and guidance

In addition, in Play 2 we include a set of use cases provided by Forum members.

We conclude with closing remarks, where we briefly review the current landscape for GenAI in R&D and outline potential topics for future discussion.

Play 1: **Fit with digital journey**
Relating GenAI to other digital tools and initiatives, with a focus on the major challenges associated with GenAI.

Play 2: **R&D problems to solve**
Providing guidance on when and how to use GenAI.

Play 3: **Successful implementation of GenAI**
Explaining what is different about GenAI's adoption and suggesting approaches to help deliver successful outcomes.

Definitions

- **Generative AI** creates new content ranging from text, images, and software code through to research hypotheses, experimental (synthetic) data, and new product concepts by 'learning' from existing data sets. Agentic AI (AI that can perform tasks autonomously) is treated as an implementation of GenAI
- **Analytic AI** can process, analyze and interpret structured, statistical data – using algorithmic approaches such as machine learning, natural language processing and data mining to identify patterns, generate insights, and make predictions

Opening remarks

GenAI heralds a new era for R&D and innovation – with an expectation of far-reaching change across R&D organizations.

Since OpenAI released ChatGPT in November 2022, blue chip companies have cautiously engaged the technology - seeking use cases which can deliver outcomes at scale. Such use cases have been identified in areas such as marketing and customer engagement, but less so in R&D (beyond personal productivity tools and novelty demonstrations). R&D leadership must learn (firsthand) what makes GenAI a distinct technology and then decide how best to harness its potential.

Today, company Boards are looking past the GenAI hype and demanding value creation. In R&D, stories abound of promising experiments and applications, but few players in traditional industries have created significant value. Right now, companies are seeking competitive advantage through experimentation. What must come next are positive impacts on innovation outcomes and the 'bottom line'.

> *"Right now, companies are seeking competitive advantage through experimentation. What must come next are positive impacts on innovation outcomes and the bottom line."*
>
> *Dan Edwards, CEO, Science Group plc*

Whether one is a GenAI convert or GenAI skeptic, all business leaders need to understand the technology and its potential impact on people and working practices. Whilst GenAI is part of a digital continuum, having much in common with earlier technologies, it is also materially different. Its disruptive potential is greater – changing not only the way we work, but also what it might mean to be an R&D professional in the years ahead.

Although it may be tempting to take a 'wait and see' approach, GenAI is likely to fast become table stakes in R&D; delay risks lost advantage. Many of us have started our journey along the GenAI maturity curve (a representation of which follows). However, without established roadmaps, most efforts rely on learning by doing.

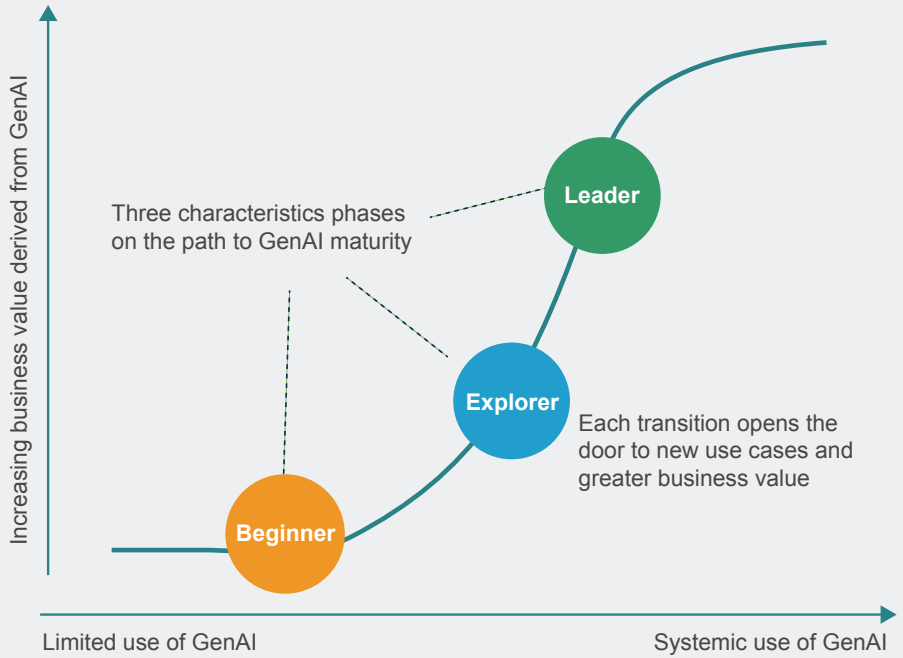
This Playbook aims to provide guidance for R&D leaders as they address the challenges and opportunities of GenAI. It shares the emerging insights and experience of companies in Sagentia's CTO Forum.

In the sections that follow you will learn about the key stages of GenAI maturity observed by our Forum members.

Within the three 'Plays', we offer ten principles that can help cross the chasm from early to established and successful use of GenAI.

The adoption of GenAI will present many challenges for R&D leaders. We hope this Playbook helps you navigate the path successfully.

Maturity curve for GenAI adoption



Key attributes of the three stages of GenAI organizational maturity

	Beginner	Explorer	Leader
Governance	Policy devised and communicated	Principles and protocols in operation	Embedded in routine business practice (and regularly reviewed)
Type of projects	Bite-sized – focus on productivity	Meaty – address current significant problems to solve (faster/better)	Holy grail – address previously unsolvable problems
Scale of adoption	Small number of pathfinders tackling specific projects	Used by significant numbers across R&D organization	Established as mainstream tool/practice
Other characteristics	Small number of test cases	Adopted for an array of use cases (some at scale) Data strategy in place; with commitment to capture and curate quality datasets Proactive change management program to drive uptake Agentic AI starting to be used	Still experimenting but some use cases have been scaled Concrete examples that demonstrate ROI Projects underway that aim to push boundaries and drive transformative change (e.g. re-engineering workflows at scale, developing new capabilities)
Size of investment	$	$$$	$$$$$
Next steps	Demonstrate value with tried and tested examples Create/implement plan for laying the foundations (data, technology, people and governance) Promote (and scale) successful use cases	Focus on today's challenges Reinforce good practices Ensure foundations are in place	Identify transformative opportunities Develop hypotheses on how to address opportunities - and continue to experiment Update strategy and goals to reflect new-found capabilities of GenAI

Ten principles

Play 1: Fit with digital journey

1. **Embrace the leadership challenge** – consider GenAI as one element in your digital toolkit – one which places distinctive, new demands on R&D leadership
2. **Commit to data** – make smart data curation a central feature of your GenAI journey – leverage proprietary data to gain competitive advantage
3. **Recognize the people challenge** – expect people to move more slowly than the technology; understand the motivations and concerns of R&D professionals
4. **Focus on value; be ready to iterate** – prioritize value creation (rather than novelty) – be ready to reset expectations as your experience grows

Play 2: R&D Problems to solve

5. **Find best fit** – prioritize problems that are well suited to the idiosyncratic capabilities of GenAI and where resolution can deliver value, ideally for multiple team members
6. **Manage for maturity** – match your ambition to your organization's GenAI maturity – do not run before you can walk
7. **Distinguish between divergent and convergent tasks** – understand how GenAI addresses distinct types of tasks – for both, keep humans in the loop

Play 3: Successful implementation of GenAI

8. **Lead the change** – develop programs to provide your people with motivation and training; ensure tools are simple to use
9. **Activate specialist teams** – form teams to provide leadership, guardrails and IT infrastructure; encourage pathfinders to identify and address R&D 'problems to solve'
10. **Protect skills, challenge role boundaries and respect specialisms** – identify risks and opportunities linked to the introduction of GenAI; develop plans to manage them appropriately

Play 1
Fit with digital journey

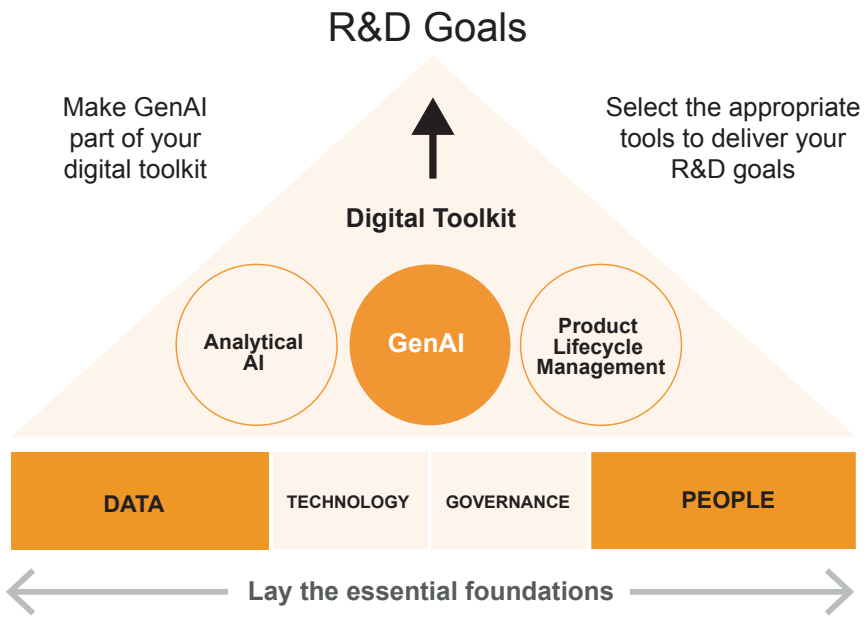
Play 1 discusses how GenAI relates to organizations' wider digital strategies. Whilst recognizing the similarities between GenAI and other digital tools, it calls out significant differences and factors that pose the greatest challenge for R&D leaders.

It counsels R&D leaders to step in to the challenge, whilst retaining a focus on delivering business value.

The overarching message from Play 1 is:

Strengthen foundations of data and people to drive value creation through GenAI.

A contextual frame for GenAI in R&D



Play 1 observations

A

Same but different: GenAI is a tool like any other (e.g. analytic AI) in R&D's digital armory. Used well, it can help organizations deliver business goals.

Success in GenAI requires familiar foundations – including data assets, technology, leadership, governance, and a workforce enabled and encouraged to use the technology.

But beyond these similarities lie material differences that demand more from R&D leaders:

- Highly idiosyncratic technology using probabilistic not deterministic models
- A vast range of new use cases
- Reliance on many more data sources (both external and internal)
- Deployment by users across the R&D organization
- Very rapid rate of change (challenging for organizations and individuals)
- Unpredictable implications for R&D workflows and individual roles

In short, GenAI is poised to drive radical change in R&D. The pace of developments and the impact on R&D individuals are likely to be significant sources of disruption.

B

GenAI - a superpower for R&D: GenAI can elevate the ability of R&D employees. It connects people with multiple sources of data (internal and external) to create new pathways towards R&D goals.

Through the power of Large Language Models, teams can access huge pools of proprietary data (which may have previously been untapped) to solve problems and create opportunities 'faster, better, and cheaper' than in the past. Proprietary data includes internal data and potentially data from customers, partners and suppliers.

C

Not there yet: Although GenAI promises much, use cases in R&D have generally delivered only incremental productivity benefits. Few are generating positive returns on investment; fewer still are delivering transformational change.

Nevertheless, expectations remain high that GenAI will become table stakes for R&D organizations, and to realize the opportunity effectively it is important to embrace rather than defer adoption.

> *"Through the power of Large Language Models, teams can access huge pools of proprietary data (which may have previously been untapped) to solve problems and create opportunities 'faster, better, and cheaper' than in the past."*

Play 1 principles

1 **Embrace the leadership challenge** – consider GenAI as one element in your digital toolkit – one which places distinctive, new demands on R&D leadership.

GenAI should, in the first instance, be seen as a new component within organizations' existing digital toolkits. In common with other tools, success in GenAI requires an integrated approach – incorporating infrastructure, technology platforms, data, governance, and people.

But GenAI will place new and unfamiliar demands on R&D leadership:

- **Agility:** the pace of development will likely defy normal planning cycles – agile and adaptable management are needed
- **Data:** success requires investment in the preparation of data – a task some organizations will find easier than others (depending on existing knowledge management practices)
- **People:** the human factor – people are both GenAI's biggest enabler and most significant challenge

2 **Commit to data** – make smart data curation a central feature of your GenAI journey – leverage proprietary data to gain competitive advantage.

Curate and invest in quality datasets that support current and future GenAI applications. Where possible, use proprietary data (internal and/or from partners) to pave the way for competitive advantage. The greatest opportunities may lie in utilization of datasets (structured or unstructured) that are unique to the organization. Having access to the results of earlier in-house experiments (conducted over years) could offer unexpected insights which help solve new or previously unresolved challenges.

As companies refine their agenda for GenAI tools, they should examine their data strategy to assess:

- Scope and volume of data needed (and available) – a balance must be struck between having too little data (define a minimum requirement) and waiting too long before launching a tool
- Format and reliability of data sources/metadata
- How datasets are/should be connected
- Whether the necessary systems, platforms, and working practices are in place to capture, organize and share knowledge effectively

3 **Recognize the people challenge** – expect people to move more slowly than the technology; understand the motivations and concerns of R&D professionals.

The potential gains from GenAI can only be realized through the involvement of people across (and beyond) the R&D function. Scaling the adoption of GenAI tools across a wide user base is one of the keys to success.

However, positive engagement of R&D teams cannot be taken for granted. Lack of familiarity with GenAI, uncertainty about intended benefits, and concerns about long term career prospects all have the potential to derail successful uptake.

To address these issues, R&D leaders should align organizational and individual goals (where feasible), engage in active dialogue with teams, and ensure that appropriate support is available to individuals.

4 **Focus on value; be ready to iterate** – prioritize value creation (rather than novelty) - be ready to reset expectations as your experience grows.

Value creation should be the focus of all GenAI applications – teams should avoid unconstrained experimentation decoupled from R&D goals. Early use cases should align with existing R&D value creation activities to allow meaningful evaluation and comparison. (If proving ROI is difficult at first, leaders should ensure that programs have other KPIs against which they can be assessed.) As teams using GenAI start to demonstrate its utility, leadership can reassess what is possible and valuable.

With growing GenAI maturity, expect to set more ambitious aspirations. As well as radically improving the productivity of familiar workflows, GenAI has the potential to unlock capabilities that can realize ambitious or coveted ('holy grail') objectives that were previously unattainable (for example, discovering a new drug or molecule, or developing scalable personalized solutions). To capitalize on its full potential, leaders must be ready to iterate strategy and refresh goals at a higher cadence than previously required.

Play 2
R&D problems to solve

Play 2 explores the types of problems for which R&D organizations should consider using GenAI. The goal is to deliver innovation which is 'faster, better, cheaper'.

The Play opens with five case studies from CTO Forum participants. It then discusses how different combinations of approaches to problem solving (involving GenAI, analytic AI, and people) might be most appropriate. It advises the alignment of ambitions with organizational maturity including data readiness, workflow documentation readiness, and people readiness.

The Play closes by discussing different types of problems (divergent and convergent) and emphasizing that GenAI and human capabilities should be treated as companion resources, not alternatives.

The overarching message from Play 2 is to:

Prioritize opportunities which can offer greatest value, leverage the strengths of GenAI, use proprietary data, and match your (emerging) organizational maturity.

Framework for assessing potential use cases

Screen each use case against 4 criteria and act accordingly

Use case	1 Delivers business value	2 Plays to GenAI's strengths	3 Leverages proprietary data	4 Consistent with organizational maturity	
A	✗	✓	✓	✓	**Reject**
B	✓	✗	✓	✓	**Switch** to another technology
C	✓	✓	✗	✓	**Reflect** on if/how advantage is won
D	✓	✓	✓	✗	**Defer** until the organisation is ready
E	✓	✓	✓	✓	**Implement now**

Example use cases

The following use cases have been provided by members of our CTO Forum. They illustrate some of the ways in which GenAI is already being used within R&D and show how, as companies ascend the GenAI maturity curve, use of the technology can become more ambitious.

- Amcor: Competitor intellectual property assessment
- Mars: AI research assistant for R&D associates
- PepsiCo: Ask experts for oil chemistry
- Stepan Company: Coding for non-experts – image analysis automation
- The Procter & Gamble Company: Collaborative ideation

USE CASE 1

Amcor: Competitor intellectual property assessment

Amcor is a global leader in packaging solutions for consumer and healthcare products. We are in the initial stages of adopting GenAI.

One of our first GenAI use cases is to assess the Intellectual Property (IP) landscape in our technical space – reviewing innovations from competitors, customers, vendors and others.

This process was previously performed entirely by humans (with online search tools). We are now using GenAI to perform specific tasks within the process – in particular, creating abstracts on patents filed which meet specific criteria.

The key inputs are data, technology and people.

- **Data:** access from IP databases (e.g. Google Patents and paid-for tools) – using search criteria for specific entities and topics
- **Technology:** public domain LLM tools
- **People:** in-house legal and IP teams

Employees run the initial query to collect the target data (inputting target topic/metadata, entities). GenAI then creates an abstract, which is edited and published by a human.

We then use GenAI to review these abstracts to identify competitive strategies. Again, our people validate, edit, and publish these findings.

Major benefits of this system are speed and vocabulary consistency. However, GenAI can struggle with technical language and interpretation – hence the importance of keeping the human in the loop.

The service is currently being trialed, so it is too early to quantify the value being created.

William Jackson, Chief Technology Officer, Amcor plc

USE CASE 2

Mars:
AI research assistant for R&D associates

Across our Petcare, Snacking and Food & Nutrition businesses our diverse and expanding portfolio delights millions of people and serves half of the world's pets.

Everything we do at Mars is deeply rooted in science. We identified an opportunity to develop a virtual assistant for Mars researchers, driven by a conversational AI interface and built on a platform integrating internal and external data from disparate sources. The goal was to improve productivity and innovation impact through two key pathways: automating routine yet critical tasks and fueling breakthrough discoveries by uncovering previously unseen connections.

Our AI-powered virtual research assistant features an intuitive user interface that combines analytical, predictive, and generative AI capabilities. The platform delivers in-depth information on a focused selection of topics, to give researchers findings and recommendations which they can test and validate in physical experiments.

The platform is powered by a database of over 30 million scientific articles, along with hundreds of scientific databases containing food, chemistry, and biological data. We've also integrated our own proprietary data and developed multiple ontologies to structure and connect the different data fields. All of this information is organized into a connected network - called a knowledge graph - which AI uses to find patterns and generate insights.

Key insights from the early introduction of the platform:

- **Relevance drives adoption:** Focus on delivering an intuitive user experience that Associates feel is directly relevant to their work. Capability can be improved with feedback - but without perceived relevance, adoption will be challenging
- **Data prioritization:** Planning for internal and external data integration from the start is essential. However, publicly available data is often better organized and peer-reviewed – start with this first while concerns with internal data such as IP are addressed
- **Scaling:** AI requires context and specificity to work well. Expanding the platform to new areas requires a strategic approach. The platform originally focused on human food and expanding to pet applications required new ontologies and methods that were not fully considered at the beginning of the work
- **Validation:** to ensure accuracy and trust, it is essential to validate AI predictions with a physical test. For example, validating novel ingredients predicted by AI is critical before incorporating into products

AI is reshaping every stage of R&D, yet its full impact is still to be realized. This is more than adopting new technology, it's reimagining how we discover, develop, and deliver innovation at scale.

Nici Bush, Chief Innovation, Science and Technology Officer for Mars, Incorporated

USE CASE 3

PepsiCo:
Ask experts for oil chemistry

PepsiCo, in common with other food and beverage companies, faces the challenge of accessing and retaining specialist knowledge which typically sits across fragmented information systems and in the heads of experts. This challenge is compounded if/when those experts leave the company.

To address this situation, we have developed a GenAI system, currently undergoing full trial, which allows R&D team members to ask questions of a virtual expert.

The system is built on three main components:

- **Data** (internal documents, with appropriate permissions and security policies)
- **Technology** (to understand user queries, retrieve relevant documents, generate contextualized, readable answers, and cite sources)
- **Human resource** (subject matter experts, IT and R&D users)

The system provides contextualized answers based on internal documents. Initial results have been promising across a range of use cases – with faster access to knowledge, transparent responses (with citations) and a built-in validation loop.

Success is dependent on high quality data (with early and continued involvement of subject matter experts an essential ingredient), intuitive user interfaces, and appropriate management of (user) expectations.

A key message for users is to view the tool as an assistant rather than the authority. GenAI does not yet replace true expertise.

René Lammers – Executive Vice President and Chief Science Officer, PepsiCo

USE CASE 4

Stepan Company:
Coding for non-experts – image analysis automation

Stepan is a North American chemicals company providing solutions for multiple consumer and industrial sectors. We are in the early stages of adopting GenAI – with a focus on accelerating specific steps in the innovation process.

The company identified automation of image analysis as an opportunity for improvement (manual analysis is time-consuming and prone to error). The challenge was to find people with the necessary coding expertise (and bandwidth) to build an automation program within an acceptable timeframe.

GenAI provided a solution where existing tools were insufficient. A research scientist (not a professional software engineer) was able to use GenAI to write a Python program to perform specific steps in the image analysis process – delivering significant time savings.

GenAI significantly reduced the number of working hours needed for a novice coder to achieve the results that could have taken many months. The technical work was in turn completed in about one-third of the time compared to customary testing and analysis.

Initial benefits have been impressive (at an individual level) - the next challenge is to see if these types of gains can be scaled across the company.

Jason Keiper – Vice President and Chief Technology and Sustainability Officer, Stepan Company

USE CASE 5

The Procter & Gamble Company: Collaborative ideation

A key focus of our R&D teams is ‘core innovation’ – innovation designed to refresh and update existing product ranges.

We believed GenAI could offer opportunities to enhance the performance of innovation teams and worked with Harvard Business School to test this hypothesis.

Our core aims were to:

- **Accelerate time to market** (and reduce costs) – by generating high-quality ideas/eliminating ‘bad ideas’ more quickly
- **Reduce reliance** on multi-person cross-functional teams

Several hundred staff across our R&D and marketing functions were involved in the test, split into one- and two-person teams. Teams were further divided into those with or without access to GenAI.

All teams were able to retrieve documents already available within the company. Teams with access to GenAI were given training on high quality prompting tailored to the challenge.

Headline results from the study were as follows:

Performance

- GenAI-augmented teams produced the best solutions (as assessed by in-house and external experts) and did so faster
- Individuals using GenAI performed on a par with two-person teams without GenAI
- Whilst the quality of ideas from teams using GenAI was good, there was limited evidence that GenAI could help provide breakthrough ideas to long-standing innovation challenges

Expertise

- GenAI helped individuals compensate for lack of expertise in areas outside their core roles (R&D or commercial)

Human sociality

- GenAI positively impacted employee experience, eliciting more favorable emotional responses from participants, contributing to enhanced morale

In summary, the study showed that GenAI can offer significant value as a ‘cybernetic teammate’.

Looking forward, there may be opportunities to redesign the make-up of cross-functional teams – further studies will be needed to explore this issue.

Victor Aguilar – Chief Research, Development and Innovation Officer, The Procter and Gamble Company

Play 2 observations

D

GenAI is not a panacea, but its capabilities are constantly evolving. GenAI is well suited to many tasks which can enhance individual or team performance in areas such as productivity, creativity and decision-making.

However, when identifying GenAI strengths, it is important to recognize that the technology is good at synthesizing multiple inputs in a probabilistic fashion. As such, it can be an effective tool for decision support. In contrast, GenAI is less well suited to decision automation, as it is not a deterministic model - i.e., it is not designed always to find the 'single right answer'. This latter point can be of particular relevance in R&D.

Accordingly, certain tasks are better suited to other tools such as analytic AI. With its ability to sift through large statistical datasets, analytic AI can identify potential solutions, predict their efficacy, or make decisions in areas such as predictive maintenance or quality control (e.g. assessing food safety and quality). That said, GenAI may still have a role to play, for example, integrating it with existing analytic AI tools can improve user interfaces or reconfigure data to provide rapid, high-level insights.

Similarly, there are some areas of decision making where it is generally felt that humans should retain primary responsibility. These include issues related to organizations' purpose and values. GenAI can certainly be used to inform decisions, but the ownership of these decisions should be the explicit domain of humans.

One potentially contentious area is people-related decisions (e.g. recruitment, promotions). There is an emerging debate over the extent to which these should be devolved to or augmented by GenAI.

In any case, as GenAI capabilities advance, the dynamic between human and GenAI roles and responsibilities will evolve, requiring humans to adapt and redefine how they work with the technology.

E

Maturity informs ambition: We have observed three levels of organizations' GenAI maturity (although a single organization may operate at various levels across divisions/functions):

- **Beginners** – Starting their GenAI journey; they may have extensive experience in analytic AI or machine learning, but experience of GenAI is limited to simple use cases focused on productivity gains
- **Explorers** – Have established GenAI processes and activities, and have laid initial foundations (technology, data, people, governance) to address identified problems. They have instigated change management initiatives, are making GenAI tools accessible across the organization, providing training and sharing successful use cases
- **Leaders** – Whilst still exploring, they are also looking to push boundaries and drive transformative change. They have well established foundations and a track record of successful use cases operating at scale (as well as less successful initiatives from which they have learnt)

The stage of GenAI maturity is a key determinant of how and where different types of challenge will be tackled. Factors in determining organizational maturity include assessment of data readiness, workflow documentation readiness, and people readiness. Some challenges should be deferred until the right foundations and experience are in place.

F **Transformation – organizational maturity required:** To date, GenAI applications have delivered incremental benefits to R&D workflows, for example, through faster innovation or superior product launch success rates.

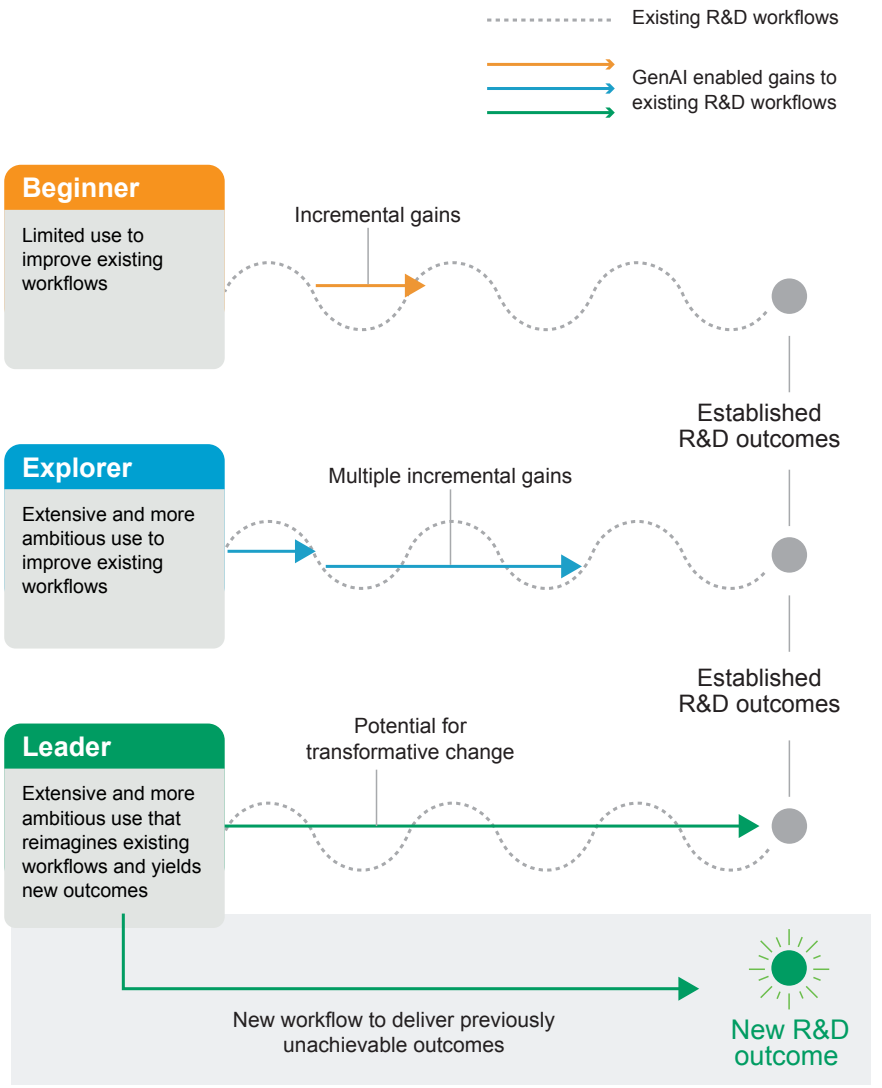
As companies' use of GenAI matures, achieving transformational change becomes a more realistic ambition. This may take the form of significant re-engineering or entirely reimagined workflows, and/or considering how to address previously unsolvable problems. Most organizations have yet to see transformational change.

G **No binary divide:** Though it is tempting to categorize tasks, as a fit (or not) for GenAI according to their nature (convergent/ divergent), this can be difficult in practice.

At first sight, GenAI appears well suited to undertaking divergent tasks, where its 'creativity' should be a strength. In contrast, convergent tasks (selecting 'the right' answer) might be expected to present a greater challenge. However, in both cases, the role of the user is critical.

- **For divergent tasks,** GenAI can assimilate data from multiple sources to generate outputs. However, the track record of GenAI in ideation suggests it may perform better in delivering quantity rather than quality (novelty) of ideas. The latter is an area where skilled humans must guard against outputs which regress to a common/average answer
- **For convergent tasks,** GenAI is generally good at synthesizing data (e.g. summarizing research), but when a single 'right answer' is required, GenAI may be less reliable. It may struggle to find the right answer or, on occasion, hallucinate outputs. Human confirmation of results is essential

Aligning GenAI ambition with GenAI maturity



Play 2 principles

5

Find best fit – prioritize problems that are well suited to the idiosyncratic capabilities of GenAI and where resolution can deliver value, ideally for multiple team members.

The first step is to prioritize 'problems to solve' with the overarching goal of improving innovation performance – ideally at scale. Users should then identify which, if any, digital tools are likely to be best suited to addressing these challenges.

To recognize where GenAI provides 'best fit', users should consider how the technology works. Stripped bare, it is a next-word prediction engine; meaning it builds sentences in real time based on probabilistic weightings derived from training data.

That training imparts two capabilities:

- The first is an impressive manipulation of language, allowing GenAI to create coherent text or other content
- The second, less consistent capability is one of producing content - for example, a response to a query

It is in this second area that GenAI is susceptible to failure, particularly if the data being leveraged is of low quality or not particularly relevant to the query.

In R&D this quality/relevance problem can be acute. For example, in addressing a physics challenge the tool needs to discriminate its source content – peer-reviewed academic sources are likely to be preferable to posts on social media. Discrimination between sources can be achieved but is likely to require oversight from individuals with the necessary skills and experience.

Users who understand that GenAI lacks an inherent sense of meaning and does not apply common reasoning tests (e.g. distinguishing between causality and correlation), will be better able to craft tasks that 'fit' with the technology's capabilities and data sources.

A further factor in ensuring success is to deconstruct problems into component tasks so that users can evaluate the 'fit' of GenAI versus other digital tools or human expertise. This granular approach can help identify where a combination of tools may be most effective. For example, GenAI could improve the effectiveness of analytic AI tools through the creation of synthetic data, providing more user-friendly interfaces, or summarizing outputs of analytic AI tools.

6

Manage for maturity – match your ambition to your GenAI maturity – do not run before you can walk.

Organizations should assess their level of GenAI maturity and set out goals and programs that are appropriate to that level. Expect to start with the mass adoption of incremental applications before moving to transformative change.

- Beginners should explore tried and tested use cases (leveraging experience of others); develop a plan to establish GenAI foundations (data, technology, people); and seek to scale successful incremental use cases
- Explorers should identify significant problems for which GenAI is likely to be well-suited; ensure the necessary foundations are in place; and reinforce good practices already established
- Leaders should identify potential areas for transformative improvement, develop hypotheses for how these might be addressed (e.g. with agents/multi-agents) and experiment

With growing maturity, expect increased scrutiny of investment decisions; be prepared to demonstrate positive returns.

7

Distinguish between divergent and convergent tasks – understand how GenAI approaches distinct types of tasks – for both, keep humans in the loop.

Consider the strengths and weaknesses of GenAI when it is presented with divergent and convergent tasks. The limitations (or failings) of GenAI for both sets of challenges demonstrate the importance of retaining human oversight and engagement.

Whilst it is generally prudent to follow the advice of Ethan Mollick (a professor at the Wharton School of the University of Pennsylvania) – to treat GenAI as an "eager-to-please intern who sometimes lies to you"[1], the precise role of the human in the loop will vary depending on the use case.

For example, with more creative (divergent) tasks, human input may be needed to drive innovative thinking. In contrast, for convergent tasks (finding a right answer), a key role of the human is to check the veracity of responses proposed by GenAI tools.

In both cases, the human must proactively apply critical thinking - evaluating and redirecting the AI.

[1] https://tech.yahoo.com/ai/articles/wharton-professor-says-ai-intern-093700229.html

Play 3
Successful implementation of GenAI

Play 3 looks at the practicalities of implementation. It outlines the need for a change management program, which addresses the perceived threats of the technology, encourages the sharing of positive outcomes, and allows people to see how their peers are benefiting from GenAI at a personal level.

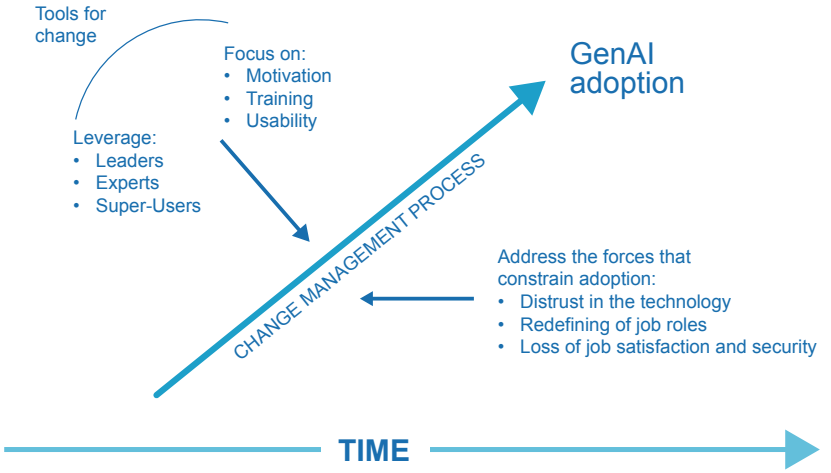
This Play advocates the use of cross-functional teams to support adoption.

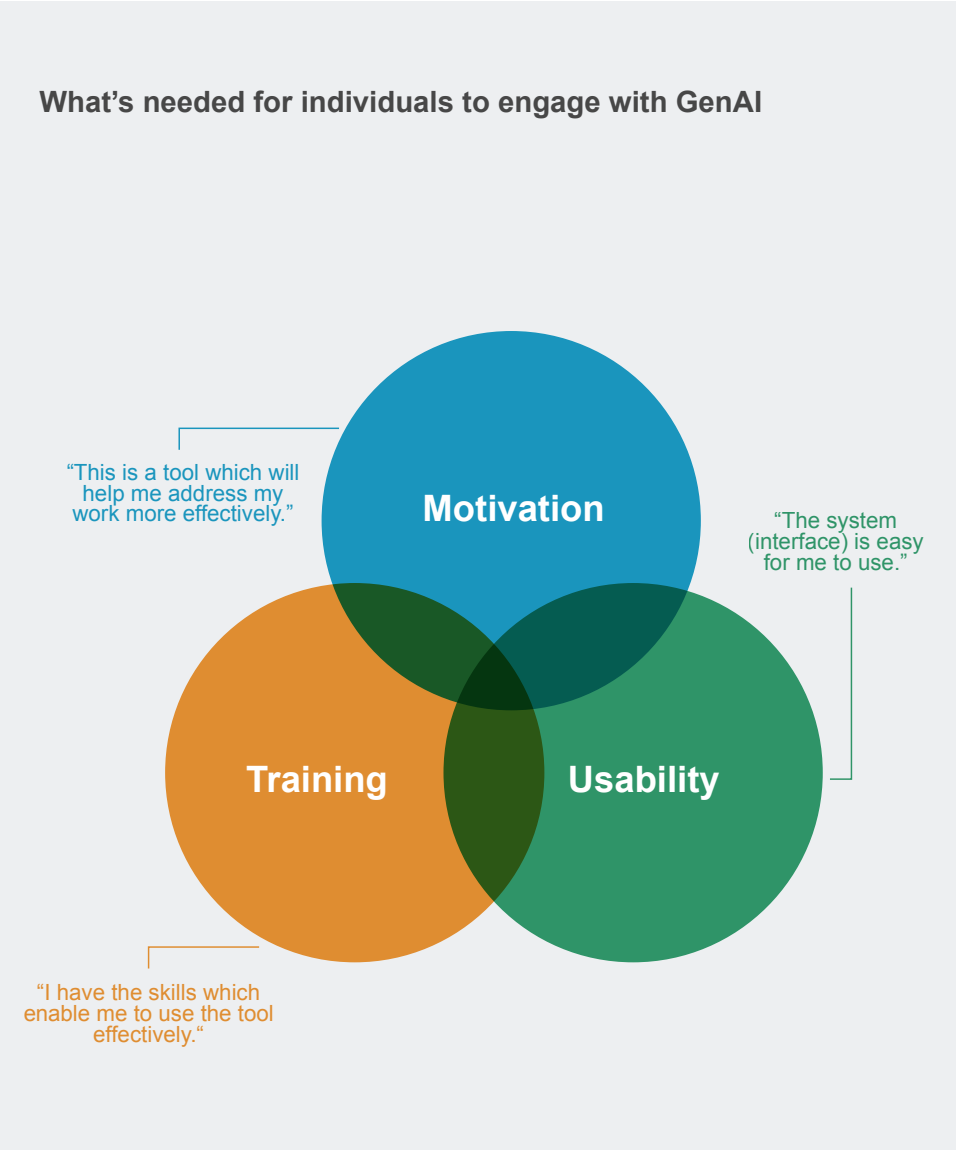
Whilst recommending specific actions to facilitate uptake, it advises that leaders also pre-empt foreseeable risks – addressing these at the outset to reduce resistance to this new technology.

The overarching message from Play 3 is to:

Mobilize stakeholders across your R&D team - provide the vision, training and tools which allow them to succeed – watch out for what is left unsaid.

Driving GenAI adoption within the R&D organisation





Play 3 observations

Managing change: A major potential benefit of GenAI is its ability to improve the performance of people across the R&D organization. But this can only be achieved if they have the necessary:

- **Motivation** "This is a tool which will help me address my work more effectively – it's relevant and it's a tool I can trust"
- **Training** "I have the skills which enable me to use the tool effectively – I know how to prompt, and I can deal with issues such as hallucinations, bias and IP infringement"
- **Usability** "The system (interface) is easy for me to use – it delivers good quality insights that I can find intuitively – I have adequate support if I need it"

Companies can rightly differentiate between tools for mass adoption and those designed for more specialist uses. For the former, usability needs to be a high priority; this may be a lower requirement for more specialist cases, where users may be more self-sufficient.

Whilst change management initiatives form part of introducing any new disruptive technology, the bar is higher for GenAI. Organizations which do not address these three issues may fail to drive successful adoption.

Soft issues such as motivation are amongst the most challenging and are often neither well acknowledged nor addressed. GenAI has the potential to disrupt the processes on which past success has been founded which can unsettle seasoned R&D teams. More significantly it has the potential to redefine the role and identity of R&D professionals, reframing the metrics that define how individuals add value, and even threaten to eliminate roles once thought essential.

Leaders should seek to understand the perspectives of staff across the organization – and recognize that team members may be reluctant to share their true feelings. Engagement is likely to require both empathy and time.

I

Ensuring good behaviors travel: Value creation will often depend on the scaling of demonstrably successful use cases. This requires active support and buy-in from multiple stakeholders – from leaders, role models and GenAI experts through to (potential) users with varying degrees of expertise and enthusiasm. This is likely to require a cohesive approach involving people across (and beyond) R&D.

Action to encourage GenAI adoption generally puts emphasis on positive human engagement, ensuring that individuals are motivated to invest time and energy in a task. This personal commitment is essential as the person best placed to determine how GenAI can help them do their job more effectively is often the individual user.

To encourage uptake, leaders should emphasize the importance of good news stories which convey positive outcomes, personal success, and recognition.

Whilst positive motivation is generally the preferred option, sometimes leaders need to be more prescriptive – for example, with knowledge management. In the absence of adequate data, GenAI adoption is likely to falter. In organizations where data capture and knowledge management are not well established, a more prescriptive 'stick' approach may be needed – the change in practice being a benefit to the organization more than the individual user.

J

Designing effective tools: The design and build of effective GenAI solutions requires active involvement of cross-functional teams. This process should combine the skills of R&D workflow specialists (to identify and break down problems to solve), GenAI experts (to shape the solutions) and data scientists (to understand where and how the necessary data will be accessed). GenAI tools need to be easy and intuitive to use – especially if the aim is to drive usage across the organization.

K

Developing and protecting skills: The introduction of GenAI brings risks to the development of necessary skills within R&D.

- First, GenAI is potentially well-placed to take on lower value tasks - traditionally a learning ground for junior staff. Without careful management, this learning path could disappear
- Second, if users become over-reliant on GenAI, they risk losing critical thinking skills (not only about the outputs from GenAI, but also more broadly in their day-to-day work)

Failure to address these risks exposes the R&D function to long-term harm and may create additional resistance to adoption.

L

Providing knowledge from multiple domains: A strength of GenAI is its potential to provide insights from alternative domains to augment a user's own specialist knowledge. For example, it can enable an R&D specialist to access insight from the perspective of other business functions, such as Marketing or Supply Chain, without having to engage directly with those individuals (which can be time-consuming and logistically challenging). With appropriate oversight, there may be opportunities to reduce team sizes – cutting costs and accelerating time to market. Poorly governed, it could lead to compromised outcomes.

Play 3 principles

8 **Lead the change** – develop programs to provide your people with motivation and training; ensure tools are simple to use.

First, ensure people are motivated and trust GenAI to help them do their jobs better. This process can be significantly enhanced if leaders are able to align business and personal goals.

The sharing of relevant, successful use cases is a key factor in achieving this. Recognize that users have various levels of expertise and enthusiasm – make sure messaging is framed appropriately. Design systems which are easy for people to use and help them produce superior results. This is key to enabling mass adoption. Develop training (and train the trainers) so good behaviors travel across the organization.

Do not assume people will articulate the extent of their concerns. Whilst they may be confident in expressing functional and logical arguments, they may be less willing to articulate concerns that relate to their personal identity or purpose. In presenting new use cases, leaders should anticipate potential human impacts and incorporate strategies that address these concerns into change management plans.

9 **Activate specialist teams** – form teams to provide leadership, guardrails and IT infrastructure; encourage pathfinders to identify and address R&D problems to solve.

Mandate enablement teams with leaders to inspire adoption, experts to facilitate tool use, and IT leadership to build infrastructure. Consider 'modelers' or users of analytic AI as they are often well-positioned to become super-users due to their grounding in the possibilities offered by AI.

Encourage pathfinder teams, combining workflow experts (engaged, experienced R&D senior team members who know how the workflow operates), data scientists, and GenAI super-users to develop prioritized applications. Whilst every R&D team has its unique problems, many problems are likely to share characteristics which a relatively small number of platforms can serve. To find effective solutions in the most efficient way, leverage the knowledge and understanding of these three distinct expert groups to define the problem, and identify technology and data solutions. Leaders must ensure that the right problems are prioritized and that Pathfinder teams are well-supported.

While the role of individual leaders and experts should be self-evident, the roles of other players should also be recognized. In particular, role models (likely to be senior staff) and 'fast followers' (people quick to adopt a tool, first used by 'pioneers') can have a significant impact on others. Mobilizing these distinct stakeholder groups through an integrated and cohesive plan is one of the keys to success.

10 **Protect skills, challenge role boundaries, and respect specialisms** – identify risks and opportunities linked to the introduction of GenAI; develop plans to manage them appropriately.

Skills

Future proof the R&D organization by protecting and developing critical-thinking skills, and ensuring juniors have new apprenticeship pathways. Ensure systems are designed in a way which encourages users to employ critical thinking skills – promote a culture which emphasizes the importance of users owning the results of their GenAI-augmented work.

For junior staff, develop training programs which prepare them for the emerging world of GenAI-enabled R&D, whilst still giving them a grounding in basic R&D skills. For mid-career staff consider development programs that allow them to retain and leverage their expertise and experience.

Role boundaries and specialisms

Assess opportunities to reduce the size of multi-functional groups and expand the scope of R&D responsibilities. Recognize that the introduction of GenAI may create a blurring of lines between traditional functions, for example it may reduce R&D specialists' reliance on other experts (e.g. in marketing or supply chain) for commercial information or perspectives. The converse may also be true, with marketing specialists having reduced reliance on R&D colleagues. Establish governance practices to protect against complacency and blind spots. Ensure that human expertise/specialisms are still respected at the appropriate time.

Closing remarks

All R&D organizations are on a learning curve related to GenAI. Some are more advanced than others, but for everyone these are early days.

Most organizations are taking their first steps - exploring how GenAI can help improve productivity by accelerating R&D processes and reducing costs. More adventurous organizations are also experimenting with tools to enhance creativity and edging towards including GenAI functionality in their products and services.

But few are yet demonstrating positive ROI – and, to date, perceived benefits are generally incremental rather than transformational.

Nevertheless, the promise of GenAI remains significant. As the technology evolves and organizations build their experience, the impact is likely to grow, providing R&D teams leverage the key foundations of data and people and retain a focus on value creation.

Looking ahead, R&D leaders and teams will need to address an expanding range of challenges:

- What new skills and talents will be required?
- How will organizational structures and systems need to change?
- What will be the long-term sources of sustainable competitive advantage?

The challenges will be great, but for leaders and teams that seize the opportunities, rewards should be immense.

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R&D's Generative AI Playbook©

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