

Unleashing the Power of Artificial Intelligence in New Product Development: Building AI Into Your Stage-Gate[®] New-Product Process

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The Coming AI Wave

Artificial Intelligence (AI) stands poised as the harbinger of a profound revolution, reshaping every facet of the corporate arena. Early adopter firms deployed AI for many reasons: to enhance efficiency, bolster agility, and amplify productivity. But the number one benefit realized is *increased innovation*, as reported by 35% of these early adopters globally (Jyoti and Riley, 2022).

Pioneering companies, such as GE and Nestlé, have not only showcased the myriad applications of AI in new product development (NPD) but have also reaped substantial rewards. For instance, GE boasts a huge 50% reduction in development times, while Nestlé reports a dramatic 60% increase in the pace of innovation! As such, the fervor surrounding AI's integration into NPD begs crucial questions, particularly for business leaders:

- 1. What role should AI play in innovation within your business?** Industry giants like GE, Siemens, Pfizer, Unilever, and Nestlé are leading the charge in AI adoption for NPD, with AI applications spanning the gamut from idea generation to product design and testing, product creation, and even product launch. The pertinent question remains, however: Are more typical firms leveraging AI to revolutionize their NPD processes? Furthermore, which AI applications yield the best results and have the most significant impact on NPD performance – where should you focus? Note: this article is targeted principally at *physical goods producers*, not software or service providers.
- 2. What is the business case for AI within our organization, considering the early stage of AI applications in NPD and the uncertain returns on investment?** Traditional approaches to NPD have yielded lackluster success rates, hovering around 25–30% for decades. The advent of the AI revolution promises to change all this (Nieto-Rodriguez and Vargas, 2023). AI is revolutionizing how companies conceive, develop, and launch new products, and *early adopters are reporting dramatic performance improvements*. On the other hand, Lamarre et al. (2023) point out that despite the claims about the positive impact of AI on NPD performance, “hard evidence that directly ties digital and AI transformation to improvements in operational KPIs and financial performance is scant.” Addressing these concerns necessitates closely evaluating AI's potential against its perceived risks and costs.
- 3. How should your business navigate the adoption and deployment of AI in NPD?** Amidst divergent perspectives on the optimal approach, ranging from *widespread deployment across the entire organization* to a more risk-averse *incremental step-by-step approach*, one fact remains indisputable: You need a plan driven by the organization's leadership! AI projects frequently falter in practice: Indeed, a staggering 85% of AI machine learning (ML) endeavors fail to deliver, with only 53% transitioning from prototype to the implementation stage (Nunez, 2021). Key reasons for such failures include inadequate

change management, a lack of understanding of user needs, and a failure to foster organizational trust. Hence, a *carefully crafted adoption and rollout plan* or process is key to AI's effective integration into NPD.

This article draws on 5 recent articles by the author that have appeared in peer-reviewed journals in 2023-2024; links are in the "References" section at the end:

1. Cooper, Robert G. 2023a. "The Artificial Intelligence Revolution in New-Product Development," *IEEE Engineering Management Review*.
2. Cooper, Robert G. and McCausland, Tammy. 2024. "AI and New Product Development," *Research-Technology Management*: 70-75. Jan 16.
3. Cooper, Robert G. 2024a. "The Coming AI Wave: The Impact on Product Development in Engineering Management," *IEEE Engineering Management Review*.
4. Cooper, Robert G. 2024b. "The AI Transformation of Product Innovation," *Industrial Marketing Management*.
5. Cooper, Robert G. and Brem, Alexander M. 2024. "The Adoption of AI in New Product Development: Results of a Multi-Firm Study in the US and Europe," *Research-Technology Management*,

The purpose of this 2-part article series¹ is to address these three critical questions. As business leaders grapple with the imperatives of innovation, the strategic embrace of AI in NPD emerges not merely as an option but as an existential mandate. In navigating this transformative journey, informed decision-making, strategic foresight, and a steadfast commitment to organizational agility will delineate the path toward sustained success in the AI-driven landscape of tomorrow.

The AI Wave Is Coming Faster than We Expected

The rapid emergence of the Fourth Industrial Revolution heralds a new era driven by AI, biotechnology, and robotics (Suleyman, 2023). With parallels drawn to historical transformative periods like the First Industrial Revolution, the Electrification Era, and the Information Age, each revolutionizing business and society, the current wave promises even swifter change.

Projections indicate that the Fourth Industrial Revolution, propelled by AI, will unfold with unprecedented velocity in the coming years. Coincidentally, the much-awaited advent of AGI (Artificial General Intelligence), capable of performing cognitive tasks on par with humans, had been expected to occur around 2050; that date has recently been revised to 2028 (Losey, 2023; Jafari, 2022); Elon Musk in April 2024 predicts AGI will be here in two years... by 2026! (Norges Bank, 2024).

The "adoption window" for each successive revolution has shortened, intensifying the pace of transformation: Look how narrow and high each new wave has become, as shown in Figure 1. Tracking the various industrial revolutions in Figure 1 suggests a 13–15-year adoption window for AI in business, peaking around 2028–2029 (Cooper and McCausland, 2024). The inflection point – beginning the steeply rising part of the adoption curve in Figure 2 – is estimated to have occurred in early 2022 (Jafari, 2022). As the adoption window gets shorter with each new revolution, the *adoption rate* becomes more intense, also shown in Figure 1. Figure 1 thus forecasts an *intense period of change* over the next 5–6 years, impacting business and NPD profoundly.

¹ This article is Part 1 of a 2-part article series; Part 2 can be downloaded on www.stage-gate.com

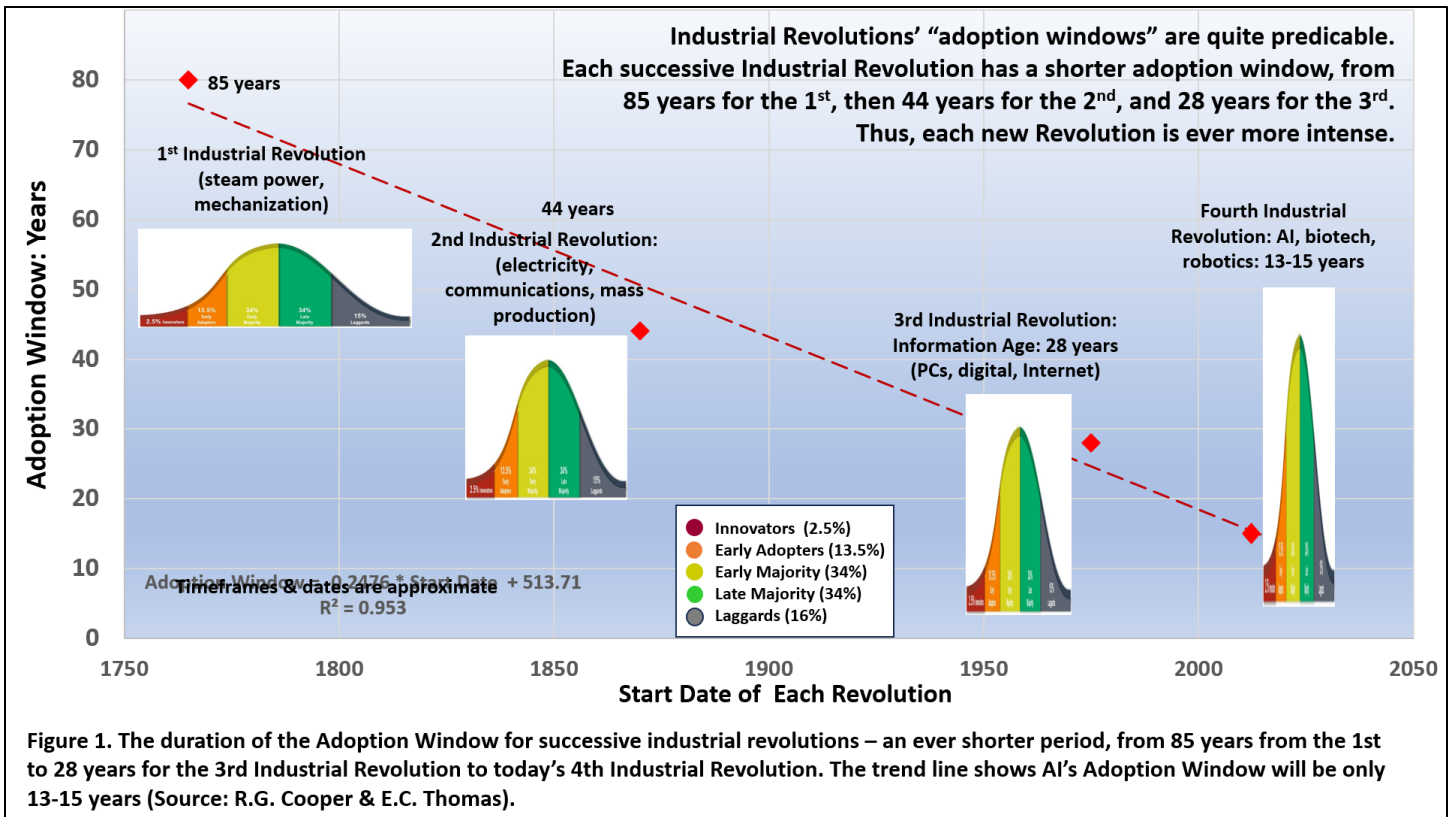


Figure 1. The duration of the Adoption Window for successive industrial revolutions – an ever shorter period, from 85 years from the 1st to 28 years for the 3rd Industrial Revolution to today’s 4th Industrial Revolution. The trend line shows AI’s Adoption Window will be only 13-15 years (Source: R.G. Cooper & E.C. Thomas).

Despite AI’s potential, its current adoption globally remains modest. As of early 2023, only 13% of firms reported integrating AI into their NPD efforts (McKinsey, 2023), a number that had risen to 24% by early 2024, almost double in one year (Cooper and Brem, 2024). This signals the onset of the “early majority phase” in Figure 2 as AI adoption gains momentum, with the wave cresting within the next 5-6 years. By then, an estimated half of your global competitors are expected to have embraced AI for NPD. What will be your status?

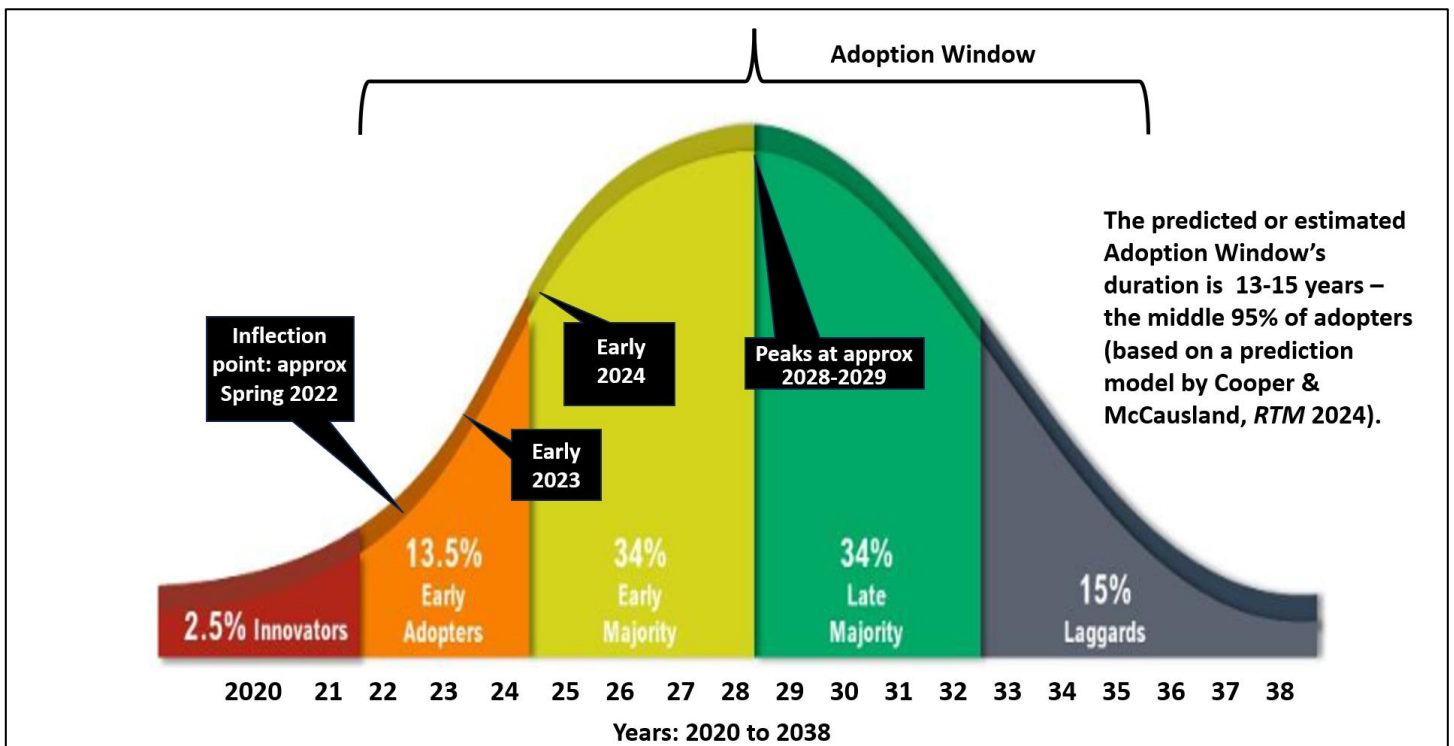


Figure 2: The estimated adoption curve for AI in business and NPD based on Rogers’ (1962) diffusion of innovation model (the Adoption Window’s duration is from Figure 1; dates are approximate).

The Potential to Drive the Stage-Gate New-Product Process

AI has been defined for business simply as a “prediction technology that reduces the cost of predictions” (Agrawal et al., 2018). Where we make predictions today, such as market forecasting, AI will make them faster, better, and much cheaper. And for problems that today do not involve prediction, AI will take the traditional problem – such as creating the drawings for a new concept car – and turn it into a prediction model: AI will predict how a creative artist would draw the car, given specific instructions.

Prediction is at the heart of making decisions under uncertainty, which is a major part of a new-product project, hence the *transformative role of AI in NPD*. An important concept in NPD is that product development is a process. And like any process, NPD can be managed to make it faster, more effective, and more productive. The NPD process is portrayed as a series of “stages”, each stage comprising a set of recommended tasks undertaken by the project team; before each stage is a decision point or “gate”, where management makes the go/no go decision – to kill a bad project or to continue to invest and move forward into the next stage. In this *incremental commitment model*, amounts at stake – the investments – are balanced against the uncertainties of the project, and thus *risk is managed*. This stage-and-gate format leads to the term “Stage-Gate® process”, which has now been adopted by about 54% of physical-product firms for their NPD globally, according to a recent PDMA study (Knudsen et al., 2023).²

A meaningful concept, especially in this age of AI, is to *view the entire NPD process* from idea to launch as *an information process*. The information that teams gather in each stage yields uncertainty reduction and validation of assumptions about key facets of the project, such as the product’s design and the project’s economics. If one views NPD as *an information process*, then *AI is ideally poised to power this process*: AI excels at information gathering, processing, and analyzing. For example, NPL can search and analyze unstructured text found online in user forums, and blogs, as well as customer feedback. AI also shines at handling and processing huge amounts of data quickly and making complex mathematical calculations for product design and engineering in record time. AI is a prediction machine, which is a major requirement in NPD – for example, AI can forecast the new product’s sales accurately before launch; or “predict the design” of the ideal product for the target customer. Because AI excels at information handling – gathering, analyzing, integrating, and predicting – AI is positioned to transform this NPD information process, and thus transform Stage-Gate®.

Five AI Target Areas in NPD

Many possible applications exist for AI in NPD, over 40 applications in a recent count (Cooper, 2023a), too many to outline in this article. But five key NP areas, where major deficiencies exist, and which are also vital to get right to achieve new product success, have been identified by research (PDMA, 2023; Cooper, 2023a). These areas are where there is a huge need for improvement, and coincidentally AI can also offer major benefits in all five of these target areas. They are:

1. Generating ideas and creating and testing product concepts.

² According to the Knudsen et al. (2023) PDMA (Product Development and Management Association) study of 651 global product developer companies, 54% of physical-product firms use Stage-Gate for NPD. The rest use either the Phase-Review process (which focuses only on technical activities) or no process at all. The Best Performing firms tended to use Stage-Gate even more so.

2. Doing the front-end homework, and building a robust business case, thus leading to better Go-to-Development investment decisions.
3. Accelerating product creation and physical development and testing.
4. Commercialization and launch of the new product, and also the immediate post launch period.
5. NPD tools and models used across the new product process, including portfolio management, project management, and Natural Language Processing (NLP).

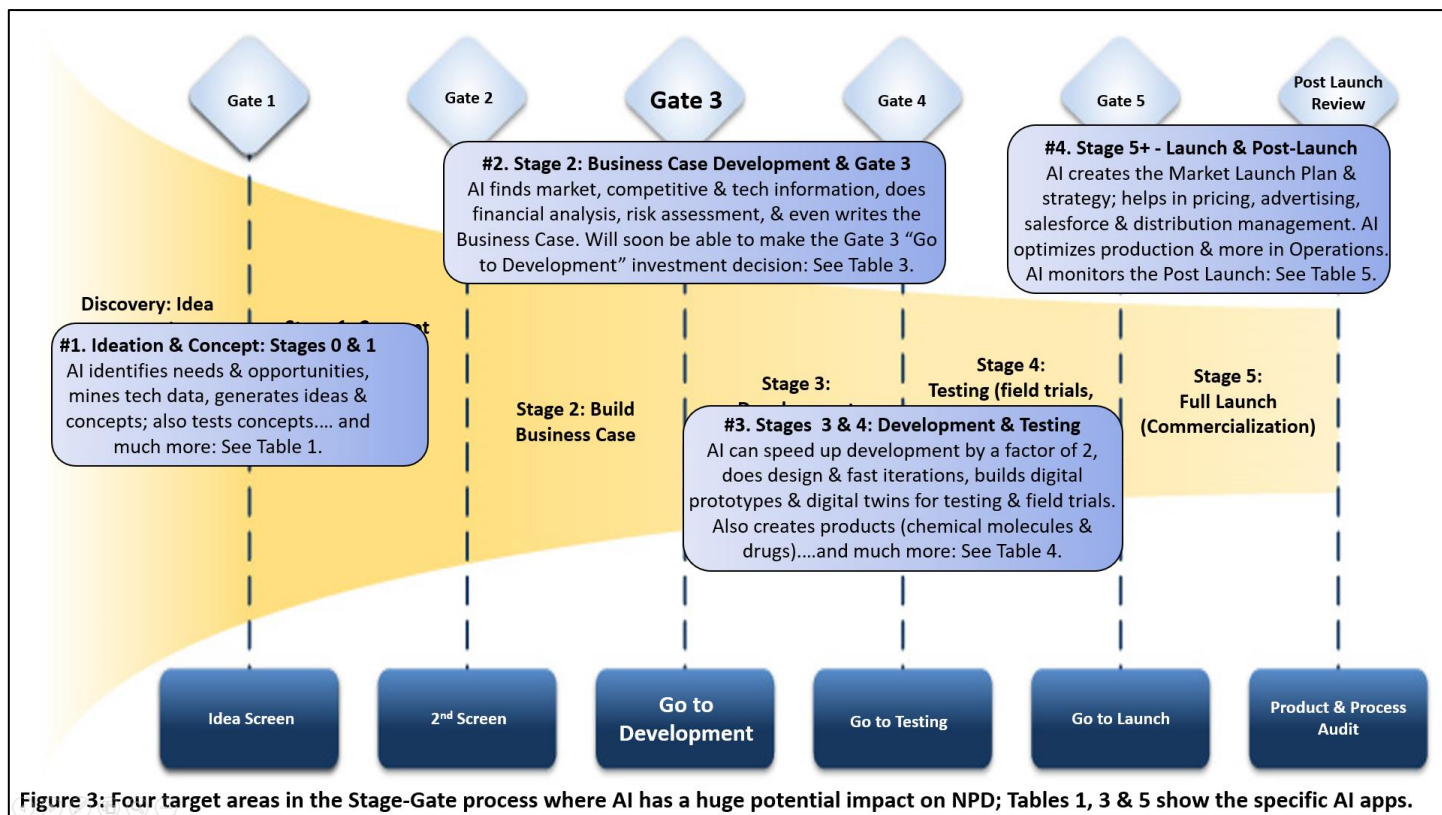


Figure 3: Four target areas in the Stage-Gate process where AI has a huge potential impact on NPD; Tables 1, 3 & 5 show the specific AI apps.

These five target areas are the focus of this article; their locations in the Stage-Gate® idea-to-launch process are shown in Figure 3, with more detail on each target's AI applications in Tables 1, 3 and 4.

AI for Generating Ideas and Concepts – See Table 1

Generative AI for ideation

A straightforward way to uncover novel new product ideas is *simply to ask generative AI*: With the *right prompts*, it can in a few seconds create a list of ten very clever new product ideas in almost any market sector. But words of warning: One should be a skilled "prompt engineer" to be effective at this; do not expect to log onto *ChatGPT* and start generating million-dollar ideas right away (Coursera, 2024).³

An example: The chocolate bar market is a crowded, competitive one, and the dramatically rising prices of cocoa, a raw material for chocolate, have increased manufacturing costs substantially. Given this squeeze, ChatGPT was asked (with the right prompts) to come up with ten good new product ideas for this category. The unedited result is in Table 2... you be the judge!

³ Numerous courses online and at colleges & universities are available in the field of "prompt engineering". See Coursera (2024).

Table 1: AI Drives Idea & Concept Generation and Testing – Stages 0 & 1 in Stage-Gate

AI Tools & Applications for Ideation & Concept Stages: AI can....	
1	Generate novel NP ideas with Generative AI (e.g., ChatGPT, with the right prompts)
2	Scan the Internet (assess unstructured text) to identify market gaps, customer needs, points of pain
3	Define the market opportunity by scanning blogs, forums, reports, online complaints & user comments
4	Analyze text responses from surveys & interviews
5	Generate a first draft of a customer interview guide
6	Generate NP concepts – transform the scanning insights into concept proposals
7	Evaluate product concepts
8	Mine internal technical data (R&D research reports) to find opportunities for exploitation of IP
9	Design & draw product concepts from verbal commands, predict customer reaction
10	Do iterations of concept drawings with estimates of their impacts (cost, weight, etc.)

The method does work! A recent ideation study using *ChatGPT* revealed surprisingly positive results: The impact of *ChatGPT* in generating innovative concepts was measured compared to the use of “classic” design methods (brainstorming, TRIZ, etc.). From a “novelty” perspective, *ChatGPT* performed quite well, contrary to expectations (since its knowledge base contains only information about things that have already happened; Filippi, 2023).

Table 2: Sample New Product Ideas for Chocolate Bar Company – Unedited Reply From ChatGPT

“Here are some ideas for new products that could complement your existing chocolate bars and help mitigate the impact of rising cocoa prices:

- 1. Nutty Bliss Bars:** Create bars that feature nuts as the primary ingredient, such as almonds, peanuts, or cashews, coated in a layer of chocolate. Nut-based bars can provide a satisfying crunch and a different flavor profile while still offering the indulgence of chocolate.
- 2. Fruit & Yogurt Bars:** Develop bars that combine dried fruits like cranberries, raisins, or apricots with creamy yogurt and a hint of chocolate drizzle. This option provides a balance of sweet and tangy flavors and appeals to consumers looking for a healthier treat option.
- 3. Oat & Honey Bars:** Offer bars made with rolled oats, honey, and a touch of chocolate for sweetness. These bars can cater to the growing demand for wholesome, natural snacks that provide sustained energy and satiety.
- 4. Seed & Spice Bars:** Experiment with bars incorporating seeds like pumpkin, sunflower, or chia seeds, along with spices such as cinnamon or ginger. These bars can offer a unique texture and flavor experience while providing a nutrient-rich snack option.
- 5. Protein-Packed Bars:** Develop bars enriched with protein sources like whey, pea protein, or soy, and enhance them with chocolate flavoring. These bars can appeal to health-conscious consumers seeking convenient, on-the-go protein snacks.
- 6. Coconut Delight Bars:** Create bars featuring coconut as the star ingredient, either shredded coconut mixed with chocolate or coconut-based bars with a chocolate coating. Coconut adds a tropical flair and a satisfying chewiness to the bars.
- 7. Whole Grain Bars:** Introduce bars made with whole grains like quinoa, barley, or amaranth, combined with chocolate chunks or cocoa powder. These bars can offer a hearty texture and a wholesome alternative to traditional chocolate bars.
- 8. Spiced Dark Chocolate Bars:** Explore the incorporation of exotic spices like chili, cardamom, or sea salt into dark chocolate bars. These bars can appeal to consumers seeking sophisticated flavor profiles and a touch of indulgence.
- 9. Free-From Bars:** Develop bars that cater to specific dietary preferences or restrictions, such as gluten-free, dairy-free, or vegan options. By offering inclusive choices, you can attract a wider customer base and differentiate your brand in the market.
- 10. Customizable Bars:** Allow customers to create their own personalized bars by choosing from a variety of ingredients like nuts, fruits, seeds, and spices, along with different types of chocolate coatings. This interactive approach can enhance customer engagement and loyalty.”

AI to identity market needs

AI excels at gathering and analyzing online text from many sources, even text in an unstructured format, to spot market gaps, user problems, and complaints, and thus point to opportunities for new products. These sources include user forums, customer complaints, online reviews, and online blogs, magazines, or journals. These AI tools, using ML, reveal what customers like or dislike, and can identify customers' points-of-pain, needs, and wants. NLP is used to analyze open-ended text responses and extract insights and trends from unstructured text data, such as customer feedback, survey responses, product reviews, and social media comments. Here are two very different examples of AI used to generate new product ideas or concepts:

Heavy equipment: A major US manufacturer of commercial snowplows (mounted on the front of vehicles) sought ideas and concepts for a new product, a difficult challenge in a mature and competitive market. AMS's app used ML to mine data from websites (online forums and blogs) where snow equipment operators talk, and complain, about the products they use. The AI app *found 21,000 user comments* and complaints online from snowplow operators.... but in an *unstructured text format*. An analysis by the AI app then produced 1600 statements that the app had identified as providing "customer insights" into unmet needs and problems. *Visibility was a top issue:* The snowplow blocks the truck's headlights and driver's line of sight when making a sharp right-angle turn. A new snowplow was designed based on the AI research, filled the market void, and went on to become a commercial success

A new snack food: Pringles, a leading snack brand, recently introduced a unique flavor experience in South Korea, a country renowned for its diverse food culture. Using *Ai Palette*, the Pringles team analyzed flavor preferences, dining trends, and cultural nuances by assessing millions of data points online including native Korean inputs (Ai Palette, 2024; a commercially available AI service). The research led to a flavor that was both innovative and captivating. Further, the new and unique flavor wasn't just another product on shelves; it told a story rooted in extensive data on dining habits and current food trends, so consumers were drawn to the new product with the promise of a culinary adventure. The new Pringles product created "a limited-time experience that bolstered their brand's cultural relevance and market presence". This use case of the AI app demonstrates the potential of merging big data with culinary creativity – a winning formula for sustained success in the food and beverage industry.

AI and voice of customer

AI has immense potential for market-focused idea generation. A thorough understanding of customers' needs and wants, the competitive situation, and the nature of the market are essential components of new product success (PDMA, 2023). The best ideas come from market-focused idea-generation activities.

For idea and concept generation, many firms begin their front-end work by conducting qualitative interviews to uncover customers' needs (user problems to be solved), especially B2B. But these VoC (voice of customer) interviews are often difficult to schedule – customers are busy – and expensive to undertake, especially if done in person. And often, after the sixth interview or so, the same customer problems keep surfacing! (Adams, 2023). ChatGPT can explore the user perspective by simply asking the AI model to list key challenges or needs users face in specific contexts or while using a certain product (Bilgram and Laarmann, 2023):

AI for VoC: To accelerate VoC interviews, the *AIM Blueprinter* now can *identify the main user problems* in the target market *before the VoC interviews even start*, thus greatly reducing the number of interviews needed (Adams, 2023). This novel AI-based feature has been tested in multiple B2B markets, including biotech, EV

battery production, and high-pressure valves. In every case, project teams agreed that the customer problems identified by AI were very consistent with their human interviews. This AI feature promises to greatly reduce the number of human interviews needed, thus accelerating the VoC work in the project. Note that the human intervention is still done – there is human oversight and validation – but fewer interviews are needed to achieve the same result.

Technology-based ideas

Technology-driven ideas are often the source of groundbreaking product innovation. Many companies possess valuable technological insights derived from years of research and exploration. However, much of this information remains underutilized, stored in files or in researchers' notebooks. Nestlé, recognizing this potential, implemented a *technical data-mining approach* at its research facility in Lausanne, Switzerland. Using AI and NLP, the tool enables the discovery of new insights from past research studies (Palzer, 2022). This proactive data mining has proven successful, allowing Nestlé to extract far more value from its research and foster the creation of new inventions.

Environmental assessment

In addition to idea generation, in this early exploratory phase, project teams often seek a deeper understanding of users, technologies, and regulatory forces to identify opportunities and potential threats. General influencing factors in the environment can be gathered by asking ChatGPT to perform a PESTEL analysis (political, economic, social, technological, environmental, and legal). As the idea progresses and begins to take shape, building VoC into the concept design is also critical. AI algorithms analyze large amounts of data and generate insights to assist with product design decisions (Mailey, 2023). This leads to more tailored or personalized products that meet the unique needs of individual customers or segments.

Concept creation

Generative AI algorithms create realistic 3D renderings of new product concepts. AI algorithms also analyze the design data and, when prompted, show design modifications; this makes performing “what if” scenarios simpler – “make it stronger, make it smaller” – and enhances the process of comparing different product concepts, for example in terms of cost or weight. Visualizing the concept makes it easier for stakeholders to see what is required to build the product, and also can be used to seek customer reactions in a concept test. Digital prototypes can be designed easily by AI to enable acceptance testing and concept validation with users after generating initial ideas and concepts (Bilgram and Laarmann, 2023).

AI-driven concept-car designs: Carmakers can spend \$3 billion on a single car design. Machine learning models can now streamline the process (Eastwood, 2023). Traditionally, this design process has relied on “theme clinics” where carmakers bring hundreds of targeted consumers together to judge designs. Theme clinics can cost \$100,000 each, and carmakers hold hundreds each year to test concepts before full engineering design. Now, General Motors works with MIT to employ a generative AI model that creates fresh car designs based on prompts from designers regarding viewpoints, colors, body type, and image. The model generates designs that are aesthetically pleasing to consumers or aesthetically innovative. Additionally, an AI predictive model *forecasts consumer preferences* for the car design, effectively eliminating initial customer concept-testing, an expensive and time-consuming task within the automotive industry.

AI to Build a Robust Business Case – See Table 3

There are two ways to win at new products! One way is by *doing projects right*: Assemble a qualified, empowered cross-functional project team, do voice-of-customer research, get the homework done up-front, and many other “best practices” now acknowledged as key to NP success (PDMA, 2023). The second way to succeed is by *doing the right projects*. That is, make the right go/no go and project investment decisions at gates! Here, according to the most recent PDMA study, businesses have much room for improvement (Knudsen et al., 2023).

AI Tools & Applications for Building the Business Case & the Decision to Invest in Development. AI can....	
1	Seek & analyze online market data, provide market insights
2	Make predictions: market size, sales, pricing & costs
3	Seek & analyze online market information & data, provide market insights
4	Monitor competitors' activities: launches, pricing, etc.
5	Identify technology trends & technology disruptions
6	Provide the facts on a specific technical subject, answer technical questions (e.g., ChatGPT, Gemini)
7	Analyze financial data & make revenue & profit projections
8	Simulate different scenarios, gauge financial impact of factors, like price & competition, on profits
9	Predict how well a particular product will sell
10	Identify potential risks & propose mitigating actions
11	Write or prepare the Business Case
14	Predict new product success or failure before Development begins (using a neural network model and ML)
15	Make or recommend the Go/No Go decision
16	Prioritize & optimize the portfolio list of development projects (subject to constraints & objectives)

The “go-to development” decision is one of the most important resource commitment decisions in the NPD process. It’s also one of the most error-plagued decisions! An estimated 70% of projects that managers approve for development *never become commercial successes* – they either fail in the marketplace or are killed before launch, often after considerable financial investment. Tossing a coin would give better gate decisions! Good go/no go decisions depend on a robust business case. Given its power to scan multiple data sources, and gather and analyze data, including unstructured text data, AI becomes a great help in constructing a fact-based business case – see Table 3. Some vital applications include:

Market analysis

AI is instrumental in comprehending market dynamics, competition, and target customer segments. Utilizing AI tools, businesses can analyze market data from online reviews, user forums, online publications, magazines, and journals, much like for idea generation above, but this time to identify trends, market volume and growth, and sales potential (Columbus, 2020). Predictive analytics tools make forecasts of market trends, sales, pricing, and costs. ML, when applied to the right data, unveils patterns beyond human discernment. Notable software tools like *Monday, Funnel*, and *SAS Customer* facilitate efficient market data acquisition and analysis (Capterra, 2023).

Competitive analysis

Tools like *Crayon* employ AI-powered algorithms to monitor competitors' activities, including product launches, price changes, and marketing campaigns (Van Houtven, 2023). AI offers real-time insights into competitors' strategies, market positioning, and customer targeting, aiding project teams in informed decision-making on product differentiation and market opportunities.

Technology analysis

AI software provides real-time insights into technology trends, investment activities, and disruptions (e.g., *CB Insights*). Additionally, *ChatGPT* responds dynamically, assembling facts on specific technical subjects when prompted correctly.

Financial analysis

AI-powered tools analyze market, sales, and financial data, assisting project teams in building a robust business case. Analyzing historical data, AI predicts a product's sales performance and earnings (Helrish, 2022). AI facilitates financial data analysis and projections on potential revenue and profitability, including simulating different scenarios to predict the impact of factors like pricing and competition.

Risk assessment

AI's maturity in business is evident in risk assessment and management. Applications include using big data and ML to help project teams anticipate risks. These tools propose mitigating actions and are evolving towards automatic adjustments in project plans to avoid specific risks (Nieto-Rodriguez and Vargas, 2023).

Writing the business case

AI tools now exist that generate or write the entire business case, such as *Upmetrics*, *15MinutePlan*, and *My Business Case Hub*[®]. For example, *Upmetrics* has an AI-powered writing assistant that generates text, rewrites content, shortens or expands on it, and changes its tone (Upmetrics, 2023). *Upmetrics'* AI financial forecasting assistant makes accurate and realistic forecasting easier with revenue and expense stream suggestions. The *MBC* AI tool provides guides and a process to streamline the project team's workflow in creating their business case by asking prompting questions vital to the business case (MBC, My Business Case, 2023). With the answers the project team provides, the *MBC* tool then produces a comprehensive, well-structured business case in minutes. With the right prompts, *ChatGPT* can also write an effective business case (Minasyan, 2023).

The go-to-Development decision

One might expect that the "go-to development" decision would be a prime candidate for AI as a decision-making tool (or in earlier times, an expert system or statistically-derived algorithm). Such models have existed: Some were developed privately by analyzing internally available data on past projects within the company. One early public model is *NewProd*, developed by analyzing data from a large sample of successful and failed new product projects (Cooper, 1985). *NewProd* achieved an impressive 84% accuracy in predicting success or failure pre-development, according to a Dutch study (Bronnenberg and van Engelen, 1988) – nearly *three times the performance of the average human manager*. Despite the potential of such models, their reception was lukewarm: Senior management was simply hesitant to turn NPD investment decision-making over to a model. The same is *not true in the world of finance*, however: "A Hong Kong venture capitalist fund credits a single member of its management team with pulling it back from the brink of bankruptcy. But the executive is not a seasoned investment professional, nor even a human being. It is an algorithm known as Vital" (Burrige, 2017).

Ultimately, management will have to accept the primacy of AI in these key go/no go decisions situations in NPD, simply because the amounts at stake are so large, the importance of making better NPD investment decisions is so high, and management’s current track record here is so poor. AI possesses great technical capabilities: Its capacity to analyze vast datasets, to recognize patterns more adeptly (for example, using neural networks), and also to learn from experience via ML (the venture capital robot learned and improved over time). An AI decision model also eliminates inherent human biases. Through neural network analysis, AI thus will emerge as a superior predictor of new product success or failure compared to human decision-makers (Nieto-Rodriguez and Vargas, 2023).

Accelerating Product Design, Development, and Testing – See Table 4.

The theory is clear: Faster to market means higher profits: Sales and profits are realized sooner, and money has a time value. Being in the market first results in higher market share, hence more sales and profits – “first mover advantage”; and being late to market means missing the window of opportunity, or incurring other penalties (for example, annoying valued customers who are dependent on the new product; Langerak, 2010). But the reality is much different: Less than half of new products are launched on schedule (Cooper, Desai, Green, and Kleinschmidt, 2024). Thus on-time performance and accelerated innovation remain a goal for product developers (Knudsen et al., 2023).

AI Tools & Applications for Development & Testing: AI can....	
1	Create 3D models & generate technical drawings
2	Create mockups, virtual prototypes, digital models
3	Design products with the right features & dimensions for the customer
4	Design products that are more user-friendly & aesthetically pleasing
5	Create or ‘discover’ products (chemicals, drugs), predict their efficacy
6	Use digital models, virtual prototypes, & digital twins for rapid & multiple iterative product design & testing
7	Undertake structural optimization – to reduce weight & cost
8	Optimize design with digital twins – mimic a product in the field, monitor it, & collect data on its operation
9	Use digital twins to facilitate user field trials (monitoring the product when in user testing)
10	Process & analyse feedback from users re. field trials (make sense of unstructured text using NLP)

AI models for iterative product design

AI and digital product design and validation yield remarkable reductions in development times. For example, simulation models, virtual prototypes, and Digital Twins are digital models of the product that mimic the product’s behavior in the real world, without incurring the cost of building a physical product prototype (see text box “Digital Twins”). The representation of the product in the digital realm enables design engineers to simulate various scenarios and understand product performance and allow for identification of design flaws and potential improvements. These models, simulations, or Digital Twins can also be used with AI algorithms to optimize designs, improve functionality, and enhance product performance *before any physical prototype is created*. Thus, the Digital Twin saves much time and reduces the number of iterations needed with physical prototypes. Later in the NP process, Digital Twins can provide real-time monitoring of the product in use to

enhance the data collection during user field trials and even after launch, allowing engineers to check on and optimize the product's performance.

Digital Twins – Different Types, Different Uses

A *Digital Twin* is a virtual representation or digital replica of a physical product, system, or service that looks, behaves, and functions identically to its real-world counterpart – only virtually (Grunitz, 2023). Powered by the Internet of Things (IoT), AI, and software analytics, the Digital Twin uses real-world data to generate simulations that predict the performance of a product or process. Digital Twins are used for many purposes in NPD, such as testing, simulation, integration, monitoring, and maintenance throughout a product's lifecycle – from conception to end-of-life and disposal.

Different types of Digital Twins exist depending of their purpose. One typology is Digital Twins for a component, versus a product, or for the entire use system. Another categorization that is very relevant to NPD is:

- *Simulation model Digital Twin*: a virtual representation or simulation of a physical object or system. Engineers or designers use it to simulate *how a product would behave in the "real world"* and under different conditions, allowing them to test various scenarios *without the need to build physical prototypes*. Digital Twins foster a lower-risk environment for product development, allowing a project team to experiment, iterate, and choose designs without the financial implications of crafting physical prototypes (Product School, 2023). The example below of a Digital Twin of an automobile transmission falls into this "simulation model" category. Note: *Digital Twins* and *simulation models* both use virtual model-based simulations, but they are *not quite the same*: Despite being used for product design applications, the simulation capabilities of traditional computer-aided design and engineering (CAD-CAE) can do much less than Digital Twins when used in design (more on this topic at TWI, 2024).
- *Operational Digital Twin*: a real-time digital replica of a physical object that is *already built and operational*. The twin, connected to its physical counterpart through *sensors and IoT*, continuously collects data about the product's performance, conditions, and usage. Tesla and Boeing use *operational Digital Twins* to monitor the performance of their products once in the field. These Digital Twins help in predictive maintenance, performance optimization, and troubleshooting; they can also be used to monitor user field trials of new-product prototypes.

While *simulation model Digital Twins* are more prevalent currently, *operational Digital Twins* are becoming increasingly important as more products, including consumer goods, become more complex and more connected through the Internet.

In mechanical design: Here are some use case examples of the use of *AI simulation model Digital Twins* for complex mechanical products:

Aircraft engine and airframe design: GE employed Digital Twins in the development and manufacturing of its LEAP aircraft engine (Leading Edge Aviation Propulsion), a high-bypass turbofan engine. Digital Twins streamlined the testing and optimization process, reducing the need for extensive physical product testing. This led to substantial cost savings in the development phase, making the LEAP engine more cost-effective and competitive in the market (Aerospace, 2023).

Automated Manual Transmission (AMT): To streamline its AMT development (a sportier alternative to the traditional automatic transmission), Renault employed AI simulation for modeling the new transmission (MIT,

2021). Utilizing Siemens' Simcenter Amesim, the simulation technology incorporates neural networks – AI learning systems inspired by the human brain (Siemens, 2023b). Renault design engineers thus were able to immediately predict the behavior and performance of the new transmission, permitting fast and early design refinements in the development process. This proactive approach mitigated late-stage problems and delays, thus cutting AMT's development time by nearly 50%.

EV aircraft design: Bye Aerospace's electrically-powered aircraft project utilizes Siemens AI design software for designing a composite lightweight airframe (Siemens, 2023a). The intricate engineering process necessitates numerous iterations to attain an *optimal balance between strength and weight*. The AI model facilitates a smooth transition from design to analysis, giving designers more time for iterative refinement. In contrast to a conventional aircraft design program that typically permits only 2-3 iterations, the AI tool enabled a weekly iteration cadence, resulting in far more iterations and refinements, and ultimately an almost "perfect design" that met 99-100% of requirements.

Optimizing product design: GE researchers, using ML, trained a surrogate model which then employed 100 computational models to determine the optimum shape for the crown of a piston in a diesel engine. This model or Digital Twin permitted many rapid iterations – design and test – which resulted in a near-optimal piston design that *delivered a 7% improvement in fuel efficiency with a reduction in soot emissions....* all in 15 minutes instead of the normal two days! Similarly, GE has cut design times in half by using AI for rapid design and testing in turbine development (Bogaisky, 2019). Traditionally, it took 2 days for engineers to run a computational analysis of the fluid dynamics of a single design for a turbine blade. Now, ML trains a surrogate model, enabling *a million design variations of the blade to be evaluated in just 15 minutes*.

AI for electronics and IC development

Mechanical design is not the only type of development that AI undertakes in record time. In the field of electronics, AI is transforming integrated circuit (IC) design by automating tasks and optimizing chip performance. Machine learning algorithms can analyze vast amounts of design data to find the ideal balance between power consumption, performance, and chip area. This lets engineers explore design options much faster than traditional methods.

An IC design example: Google Research employs *PRIME*, a deep learning approach, for chip layout design (Shenwai, 2022). *PRIME* leverages existing data to create chip designs that are both faster and smaller than those designed manually, and it significantly reduces design time while maintaining quality.

Deep learning works by using artificial *neural networks* to learn from data. Neural networks are made up of layers of interconnected nodes, and each node is responsible for learning a specific feature of the data (Patel, 2023). As the network learns, the weights on the connections between the nodes are adjusted so that the network can better classify the data. Over time, the network model is "trained" and thus performs better.

AI for development in chemistry and biology

The pharmaceutical industry faces mounting pressures to discover and develop new drugs faster and at lower cost (Buntz, 2023). Drug companies typically spend a billion dollars developing a drug, but see a success rate of just 15%. AI improves those chances to 50% and also reduces the time-to-market (Overby, 2023). After training on huge amounts of data, AI tools can recognize the building blocks of organic chemistry; further, they can

accurately *predict the outcomes of real-world chemistry experiments*. Thus, AI tools yield substantial improvements in the productivity of drug discovery and screening:

Pfizer's drug discovery: Pharmaceutical giant Pfizer uses artificial intelligence to accelerate drug discovery (BuzzyBrains, 2023). The company has partnered with the AI firm Atomwise, whose platform uses deep learning to analyze millions of potential drug compounds and identify promising candidates for further testing. This has helped Pfizer to develop new drugs faster and at a lower cost (Atomwise, 2022).

Popular among big pharma firms for some years, similar AI tools are now being deployed for the discovery of *more traditional chemicals*. For example, AI is being used to find sustainable alternatives to traditional pesticides used by farmers to address environmental and health concerns (Earth.Org, 2021). Switzerland's Syngenta AG has partnered with Insilico Medicine to use its deep-learning AI tools to produce sustainable weedkillers. BASF's Emollient Maestro creates new emollients with better properties than traditional ones for the skincare industry (Irving, 2022). Here is another AI-discovery example:

New chemical discovery: Unilever, in collaboration with Arzea, utilized *Intelligent Protein Design Technology*, an AI tool that combines physics-based design and artificial intelligence to develop innovative stain-fighting enzymes for cleaning and laundry products (Unilever, 2023). This breakthrough resulted in a formulation with 50% fewer ingredients while achieving enhanced stability, performance, and sustainability. The rapid development, completed in just 18 months, was *five times faster* than conventional methods. More recently, researchers at the University of California, San Francisco, have employed AI to generate artificial enzymes from scratch, demonstrating the technology's ability to grasp fundamental biological principles in laboratory tests (Kurtzman, 2023).

AI for food development

In the food and beverage industry, AI is having a huge impact. Recipe creation has always been an art; now generative AI adds a scientific touch, unlocking many unique possibilities. An example is IBM's *Chef Watson*, which creates unique recipes by analyzing the chemical components of food, and combining ingredients that share similar properties; it has already created over 100-thousand unique recipes (Attri, 2024). Further, chemical and drug products are not the only molecular discoveries that AI is capable of; in food ingredients, AI is creating revolutionary discoveries, leading to the launch of many new food products. For example:

New food ingredient discovery: Tilray Brands' subsidiary, Manitoba Harvest (MH), a producer of healthy hemp-based foods, has launched a breakthrough product *Bioactive Fiber*, "discovered" with AI. MH partnered with Brightseed, a bioactives company Brightseed's AI platform, *Forager*, identifies naturally occurring molecules in plants and microbes (bioactives) and links them to specific human health benefits, thereby accelerating food discovery and validation and cutting the development time from years to months. The AI platform has identified 40 times more bioactive plant compounds than what had previously been documented. As the CEO of MH says: "Bioactives are gaining huge strides in nutrition science but are largely undiscovered and remain underutilized in health foods" (Global Newswire, 2024). AI is helping speed up the process!

Product testing with users using AI

Prototype tests of new products with users or *field trials* of products can take much time and be costly. Moreover, the user trial results are often unclear: Data collection from trial customers is spotty, consisting of

unstructured text from customer interviews and user comments; and incomplete data about product performance in use. Digital Twins and NLP both accelerate or improve this user trial phase of a NP project:

GE's and Siemens' Digital Twins: One of the primary strategies employed by GE to enhance product design optimization is the utilization of Digital Twins (GE, 2023). Digital Twins can be used during product design, field trials or actual product usage, facilitating the collection, analysis, and utilization of data for product optimization. Industry leaders, such as GE and Siemens, have fully embraced Digital Twins, employing them as digital models to act as a twin to a physical product or a component. During user tests or field trials, the performance of physical products can be closely monitored by its twin back in the engineering department.

Self-driving car development: Self-driving cars contain numerous sensors that collect data regarding the vehicle itself and the environment of the car (Dilmegani, 2024). By creating a Digital Twin of the test vehicle and measuring aspects of the vehicle's performance, developers work to minimize unexpected damage and injuries. Applications of Digital Twins in the automotive industry include road testing and vehicle maintenance.

When field testing products with customers, project teams typically rely on interviews and customer interactions to gather feedback. However, a significant portion of data from these interactions *remains uncaptured* due to its unstructured nature (handwritten or typed notes and recorded conversations). Consequently, project teams may overlook valuable insights into product performance and acceptability (Forsey, 2023). Mishra notes that “generative AI can effectively transform customer feedback into actionable data for your business” (Forsey, 2023). NLP takes unstructured data, such as recorded conversations and product usage comments, and converts them into structured text and even visually comprehensible charts and trend lines. This enables teams to analyze unstructured data like it is structured data, facilitating the evaluation of product acceptability and the understanding of customer preferences and dislikes regarding specific product features.

AI for Commercialization and Launch – See Table 5

Numerous applications exist for AI in the market launch and production start-up for the new product (Table 5):

Market Launch

AI helps companies market their new products more effectively (Figure 3). AI guides the project team in crafting *the marketing launch plan* for the new product: the strategies and tactics to reach the target market effectively. Project teams can now generate highly effective marketing plans with ease by employing AI-driven marketing plan generators, such as *Taskaid*, to streamline the planning process.

AI also assists with the execution of some of the elements of the marketing mix: Numerous AI tools are available to create, plan, aid decisions, and execute; some examples include (Goyal, 2023):

Marketing communications: A significant 78% of B2B and 65% of B2C firms now use generative AI, such as *ChatGPT*, to create advertising text, images, videos or other content (Deeb, 2023). For example, Google uses AI to target its ads to people who are likely to be interested in its products. One of Amazon's most effective sales strategies is using AI-powered product recommendations to engage customers and increase revenue (Cohen,

2020). Offers like “recommended for you,” or “frequently bought together” are instances of this highly effective selling strategy using AI.

AI Tools & Applications for Stage 5: Launch	
1	Crafts the Market Launch Plan & marketing strategy
2	Helps optimize pricing stagey; dynamic pricing
3	Writes the advertising copy (ads, brochures, social media marketing, online blogs & news releases, websites)
4	Helps target the marketing communications to the right customers
5	Optimizes distribution (can also help in shipping & delivery)
6	Many apps for Manufacturing & Operations – beyond scope of this article: production optimization, manufacturing simulation, training, quality control, source of supply management, shipping & delivery – see Marr (2023)
7	Use digital twins to monitor products in operation (after sale; monitoring the product once in use re. maintenance, new relaxes & fixes needed
8	Process & analyse feedback from users once in use; analyze unstructured text using NLP; ensuring customer satisfaction

Salesforce and distribution: AI automates lead scoring and salesforce routing, predicts customer behavior and preferences, and suggests the next best actions for the sales team (Dataconomy, 2023). For example, the AI model *Salesforce Einstein* analyzes customer data and past interactions to identify high-potential leads and suggest tailored sales approaches. Procter & Gamble uses ML algorithms to define the right product assortment for physical and virtual stores, and to analyze in-store information on product availability (P&G, 2022).

Pricing: AI helps companies set the right price for their products: For example, Uber optimizes its pricing strategy through dynamic pricing. Dynamic pricing employs ML algorithms and Predictive Analytics to analyze customer demand and adjust its pricing dynamically based on real-time demand (Obviously.AI, 2023).

AI for Manufacturing

The limitless applications and inroads that AI has made into manufacturing, shipping, and supply-chain management go far beyond NPD and are outside the scope of this article (a Forbes article by Marr [2023] provides a good summary).

AI for the Post-launch period

After the launch, AI continues to play a pivotal role in the success of the NP. Digital Twins monitor the product’s performance once in use, while AI and NLP algorithms, similar to those previously highlighted, analyze customer feedback and market data to discern use patterns, comments, and complaints. AI thus serves as a vital tool for companies to pinpoint potential issues or areas warranting improvement in the just-launched product, thereby facilitating design refinements aimed at total customer satisfaction. These analytical insights also prove invaluable to developers for charting the course of future product development endeavors.

Examples: A Digital Twin exists for each new Tesla vehicle on the road; its embedded sensors collect performance data and relay the data to its twin. Invaluable feedback is derived from the real-world operation of the vehicle (Preface, 2023). Similarly, in the realm of aviation, GE has implemented Digital Twins for its GE90 engines on Boeing 777 aircraft that foresee engine degradation. Siemens, a pioneer in the domain of

Digital Twins, has introduced ATOM, a virtual model for its gas turbines and compressors. Blockchain technology is anticipated to serve as a robust repository for vast volumes of digital twin data.

Three Additional Valuable AI-Based Tools

Three useful tools in NPD cut across the entire NP process, and where AI plays a role, are highlighted below:

AI for Project Management

AI enhances project management and planning in a wide variety of ways, according to the Project Management Institute (PMI), automating time-consuming project management tasks (Reddi, 2023). AI tools facilitate scheduling processes and draft detailed plans and resource demands. Automated reporting is not only produced with less labor but can replace today's reports, which are often weeks old, with real-time data. These tools also drill deeper than is currently possible, displaying project status, benefits achieved, potential slippage, and team sentiment in a clear, objective way. Nieto-Rodriguez and Vargas (2023), citing research by Gartner, declare that by 2030, "80% of project management tasks will be run by AI-powered by big data, ML, and natural language processing." AI-based project and information management tools like *Albert Invent*, *Project Insight*, *Asana*, *Monday*, and *Trello*, help with efficient data management, project scheduling, and resource allocation.

AI for Portfolio Management

Portfolio management is about monitoring the portfolio of development projects, but most importantly, like a stock market portfolio, about making *the right decisions on which projects to invest in*. AI currently enhances portfolio management in NPD, particularly in the evaluation and prioritization of multiple projects. This involves creating an optimum portfolio of projects that maximizes its expected commercial value, yet is also appropriately balanced in terms of project types.

An example: Sopheon's *Accolade* employs AI to optimize a firm's development portfolio (Rutten, 2023). *Accolade* builds in a powerful algorithm or AI model called *Optimizer* (from Kalypso, used in stock market portfolio management): It determines the optimal prioritized list of development projects, given certain targets and specific constraints, such as resources and skills. The model can also create different portfolio scenarios answering "what if" questions, and shows the impacts of alternate portfolio choices in terms of strategic alignment, profitability, and resource requirements.

Natural Language Processing

NLP is a branch of AI that enables machines to understand, interpret, and generate human language, facilitating a wide range of applications in NPD. NLP can extract structured information from unstructured text, which can be used for information retrieval, knowledge graph construction, or entity linking; it can extract specific pieces of information from text; and it can identify underlying themes or trends in large volumes of text.

One area where NLP is transforming NPD is in *market research and customer feedback analysis*. By analyzing large volumes of customer reviews, social media conversations, and other textual data, companies can gain valuable insights into customer preferences, pain points, and emerging trends. This information can then be used to identify opportunities for new product development or to improve existing products. NLP can also analyze transcriptions of oral comments or written comments by customers – for example, comments from users taking part in product field trials.

NLP can also be used to automate various aspects of the NPD process. For example, NLP algorithms can analyze *technical documentation, research papers*, and other textual sources to identify relevant information and insights that can inform the design and development of new products. This can help companies reduce time-to-market and ensure that their products are based on the latest research and best practices.

The Business Case For AI in NPD

The lack of a strong and “provable” business case has been cited by some firms as the reason they are hesitant to move ahead with AI in NPD (McKinsey, 2022; Cooper, 2024b). While leading firms have showcased their successes with AI in NPD, building a strong, viable, and fact-based business case for implementing AI in NPD in your business remains a challenge.

AI’s Payoffs in NPD

AI permeates various facets of the conception, development, and launch of new products. Leveraging AI for product innovation yields manifold benefits, including enhancing *Design Thinking* (Garbuio and Lin, 2021), augmenting the effectiveness of *Open Innovation* (Ferràs et al., 2023), fostering the generation of better and novel product ideas (Bouschery, 2023), expediting physical development and testing (Nieto-Rodriguez and Vargas, 2023), optimizing development teams (Bouschery, 2023), and refining *go/no-go* decision-making processes (Cooper, 2023b). Importantly, AI’s integration tends to *augment employee efforts rather than replace employees*, minimizing concerns about job displacement in RD&E (Johnson et al., 2022; McKinsey, 2023).

What recent research tells us

The evidence just cited above is encouraging, but what about the impact of AI on traditional NPD performance metrics like the NPVI⁴, time-to-market, or NP success rates? Much of the evidence stems from single case examples, many cited in the examples above. While single case examples showcase the potential of AI in NPD, robust larger sample studies also substantiate its efficacy.

One major economic analysis across a large sample of firms in many industries reveals “increased growth for AI-investing firms, along with increased product innovation, but no evidence (yet) of higher firm-level productivity” (Babina et al., 2024). AI adoption was higher and the gains were larger from AI investments for larger firms. The study concludes that “AI facilitates product innovation and creates new business opportunities by enabling firms to learn better and faster from big data.”

Another large study – 558 new product cases, half successes and half failures – revealed significantly higher success rates for projects where AI was used. The improvement depended on which stage of the project AI had been used in (Zhang et al., 2021). For example, projects where AI was used for ideation and also for design and development had three times the success rates⁵ of projects where AI was not used; and projects where the business case was developed using AI had about 2.4 times the success rate. (Note: In this study, AI was *too broadly defined* to include apps such as smart personal assistants, language translators, chatbots, robots, and IoT).

⁴ NPVI = NP vitality index: annual sales from new products launched in the last 3 (or 5) years as a percentage of the business’s annual sales revenue.

⁵ Based on data from the Zhang, Zhang, and Song study (2021). Data from their Figures 1 and 2 were reworked to adjust for several factors, including the 50% success rate in the study (the result of the sample selection) versus the usually-reported 60% success rate.

An extensive analysis of almost *one thousand news articles* revealed that AI-augmented innovation yields “significantly lowered search costs and increased speed in R&D processes” (Johnson et al., 2022). For example, “AI processes vast amounts of information in the search for improved product formulae or product/process performance,” thereby cutting both costs and time. Most AI applications in R&D tend to *augment human work* – humans working with AI, enabling the human to do more, *rather than replacing humans*. The study concludes that “fears concerning humans being displaced have so far seemed somewhat exaggerated, at least in the case of R&D work” (Johnson et al., 2022).

A recent research investigation shows that a firm’s AI capabilities have a favorable effect on open innovation practices, which in turn leads to an improvement in business performance (Sahoo et al., 2024). Another study finds that AI has a strong positive impact on the discovery and development stages but not so much on the commercialization stage (Durmusoglu et al., 2021)

Finally, our study of US and German firms revealed alarmingly limited AI usage: Only 24% of businesses *had adopted even one AI application for NPD* (Cooper and Brem, 2024), with German firms ahead of US firms. Of special note: Employing AI for certain applications showed *very high correlations – that is, strong positive impacts – with some NPD performance metrics!* AI impacts most strongly on one performance metric, *accelerated development*; AI also impacts improved decision-making and making fewer errors, but has little effect on productivity in NPD, and none on improved agility. The most significant AI applications in terms of impact are (in descending order of impact; see Table 6 for impact magnitudes):

Table 6: Summary of Impacts of AI Applications on NPD Results

Correlations of Use of Applications with Performance Metrics				
AI Application	Accelerated Development	Improved Decision-Making	Fewer Errors	Improved Productivity
Product testing & validation	0.61	0.39	0.41	
Product design	0.36	0.42	0.35	0.34
Prototyping	0.43			
Simulation Models	0.32			
Competitive analysis	0.28			
Natural Language Processing			0.33	
Extensive Use of AI in NPD	0.48			

All correlations significant at the 0.01 level, two tail t-test. Pearson product-moment correlations (source and more detail in: Cooper and Brem, 2024).

1. *AI for Product Testing and Validation:* AI for automated product testing, virtual market testing, and in-use testing shows strong positive effects on both speed and improved decision-making, also fewer errors.
2. *AI for Product Design:* Leveraging AI with CAD to design and optimize products yields positive impacts across multiple metrics, notably speed and decision-making, as well as fewer errors and improved productivity.
3. *AI for Prototyping:* Rapid prototyping and automatic translation of drawings into prototypes significantly and strongly impact speed.
4. *AI for Simulation AI Models:* To simulate the behavior of a project, system or process; virtual prototypes or Digital Twins accelerate development.

5. *AI for Competitive Analysis*: To scan online for data on competitors, performance, products, and pricing; to monitor competitors' activities accelerates the NP process.
6. *Extensive overall AI usage in NPD*: High-AI-user businesses achieve shorter times to market, a strong impact!

Of these five high-impact applications, *four are located in the middle stages of the Stage-Gate process, namely Development and Testing*, the applications listed in Figure 3. Those applications – product design, development, testing, and user trials – are a key place to investigate first for possible AI deployment!

The Journey Forward

Trying to install AI in NPD without a system in place is like putting a dozen players on a football field with no playbook and no preplanned plays, and then expecting them to score! It works once in a while, but over the long run, the better-disciplined competitor will win. This is why experts and experienced firms recommend a *systematic process or “gameplan” for implementing major new technologies*.

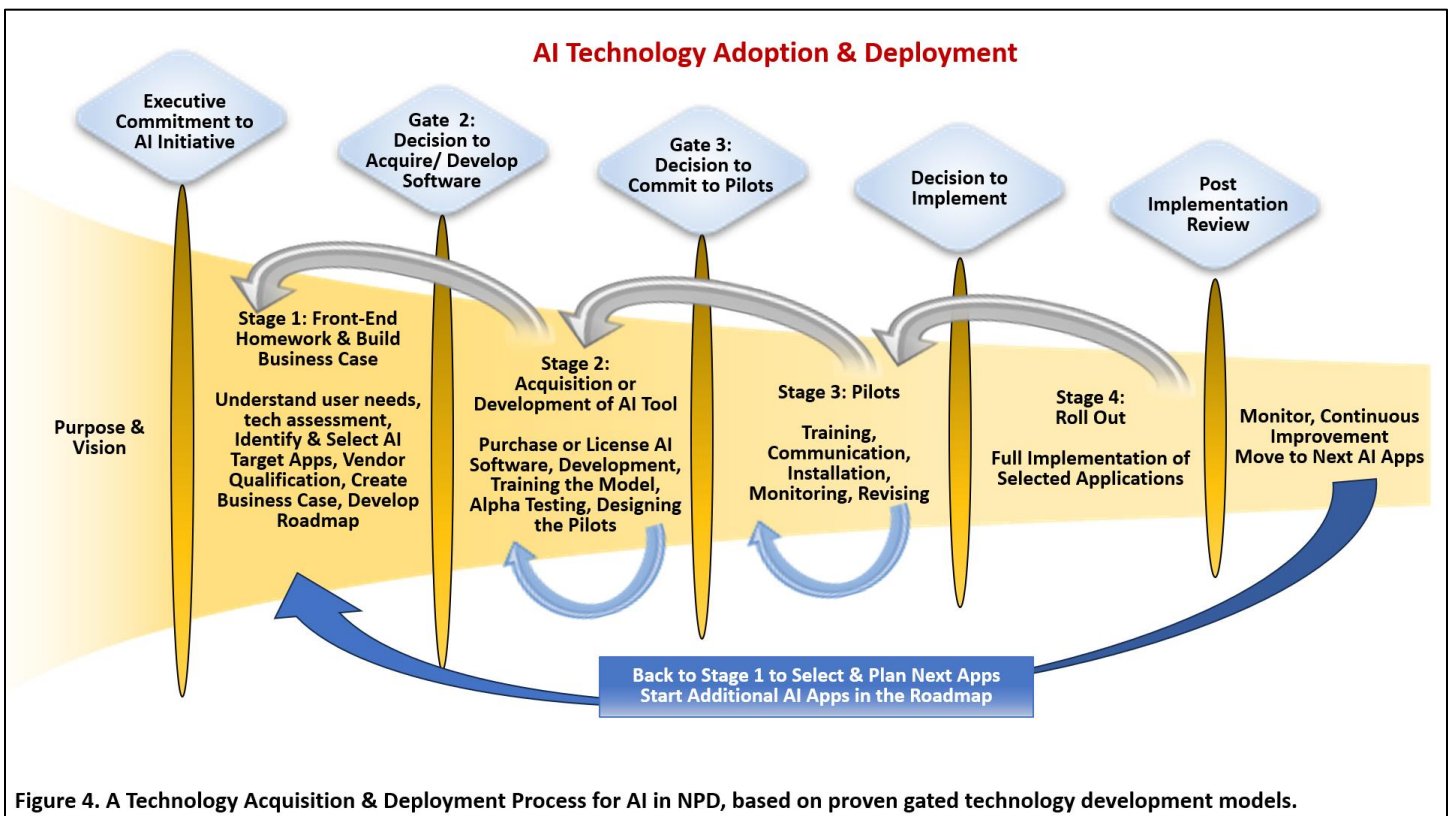


Figure 4. A Technology Acquisition & Deployment Process for AI in NPD, based on proven gated technology development models.

The deployment of new technologies and new ways of working is not new to NPD people. Numerous models or frameworks for technology development (TD) or technology acquisition and implementation have been successfully used for almost three decades. The recommended *gameplan or process for AI acquisition and deployment is shown in Figure 4*. The details of this process model, along with screening scorecard criteria for selecting the best AI NPD applications and evaluating their business cases, are provided in a “Part 2” article – see Cooper (2023b): “Transform Your New-Product Development With AI: A Framework for Acquiring & Deploying AI” (available in Article #7 at: [Robert G. Cooper - Artificial Intelligence in NPD \(bobcooper.ca\)](https://www.bobcooper.ca))

The Time to Act is Now!

The *nine most significant milestones in NPD management* were showcased at the recent PDMA Global Annual Conference in Sept 2023 – see Figure 5. They span almost 70 years – years that sped by in a flash! The author’s Stage-Gate® process is shown as *Milestone #5*, right after Porter’s Five Force model. AI will be the 10th milestone, and will likely have *more impact on NPD than the combined effect of the other nine*. Are you ready?



Figure 5. The nine milestones of new product development as displayed at the PDMA Annual Conference, New Orleans, September 2023. The 10th milestone, inserted by the author, is the AI Revolution in NPD, and must be built into Stage-Gate, which is #5 above. (Photo courtesy of Dr. Charlie Nobel, editor, JPIM).

The window will be short! The peak of the AI adoption curve for business (and NPD) will likely arrive in about 5 years. And the much-awaited AGI (Artificial General Intelligence), capable of performing cognitive tasks on par with humans, is expected by about 2028 (Losey, 2023; Jafari, 2022).

For business managers, it’s time to get on board: Get up to speed on AI in NPD, assess your needs, get some outside help, put a plan in place, and get into undertaking some pilots (see guide in Cooper, 2024b). The timid will fear moving forward. But the only way to avoid obsolescence is to embrace innovation. And AI is the most significant innovation of our time!

* * *

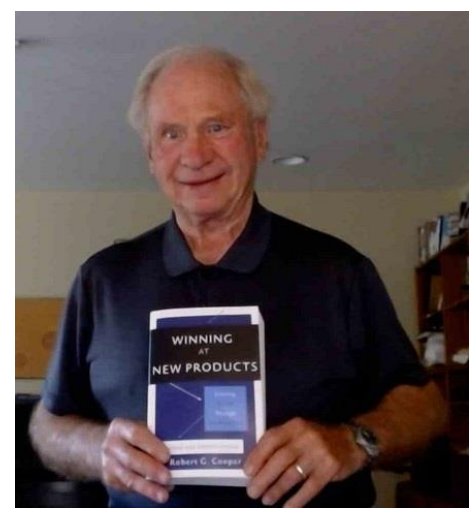
The author:

Since the article is about AI, we asked ChatGPT about the author: “who is the godfather of new product development in the USA?”

Here’s the answer:

ChatGPT

The title of "godfather of new product development" in the USA is often attributed to Robert G. Cooper. He is renowned for his extensive work in the field of innovation management and new product development. Cooper developed the Stage-Gate process, a widely used framework for managing new product development projects. His research and writings have had a significant impact on how companies approach innovation and bring new products to market.



And some info not from ChatGPT: Dr. Robert G. Cooper is ISBM Distinguished Research Fellow at Pennsylvania State University’s Smeal College of Business Administration, Professor Emeritus at McMaster University’s

DeGroot School of Business (Canada), and a Crawford Fellow of the Product Development and Management Association (PDMA). He is also co-founder of Stage-Gate International.

Bob has been a thought-leader and scholar in the field of NPD for decades, being the creator of the popular Stage-Gate® process now used by thousands of firms globally to drive new products to market; and also, the NewProd model for predicting NP success and failure, a precursor to AI models. Cooper has published 11 books – including the “bible” for NPD, “Winning at New Products”, now in its 5th edition, and more than 150 articles on the management of new products. Bob has helped hundreds of firms over the years implement best practices in product innovation, including companies such as 3M, DuPont, Bosch, Danfoss, LEGO, HP, ExxonMobil, Guinness, and P&G.

Bob is currently heavily researching “AI for NPD”, having undertaken the first-ever survey study on AI’s usage in NPD and its impact on performance results (2024), and has key articles recently published in top journals on the topic of “AI for NPD”(2023-24).

Cooper holds Bachelor’s and Master’s degrees in chemical engineering from McGill University in Canada; and a PhD in Business and an MBA from Western University, Canada. Website: www.bobcooper.ca Contact: robertcooper@cogeco.ca

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Are you ready to explore and learn more about Artificial Intelligence and its many applications in NPD? Wherever you are on your journey, we enable clarity and action.

Just Getting Started? Inform and motivate your team(s) with our popular, interactive 90-minute webinar, led by our Innovation Management guru and Top AI Researcher, Dr. Robert Cooper.

Ready to Plan? Roll up your sleeves and develop your AI Roadmap by bringing this 1-day team collaboration workshop to your business. Led by one of our experienced partners.

Ready to Innovate? Expertly tailor your innovation process to derisk early-stage exploration of AI technologies for new products. Additionally, equip your process with AI-enabled time savers.

Visit us at www.stage-gate.com for more information, products, solutions and contact information.

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