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How to Transform Your New-Product Development with AI: From Vision to Deployment

AI is already transforming the way firms conceive, develop, and launch new products. But where and how do you begin this journey? A proven AI adoption model is outlined to pave the way.

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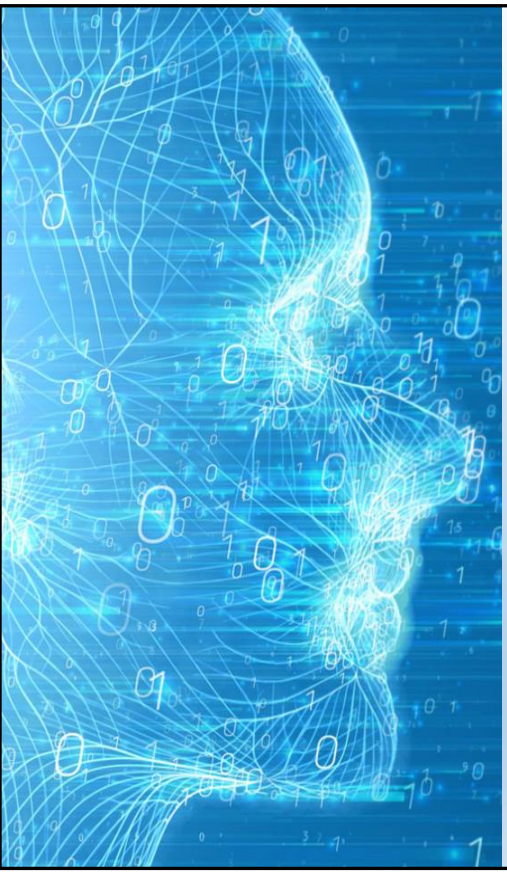

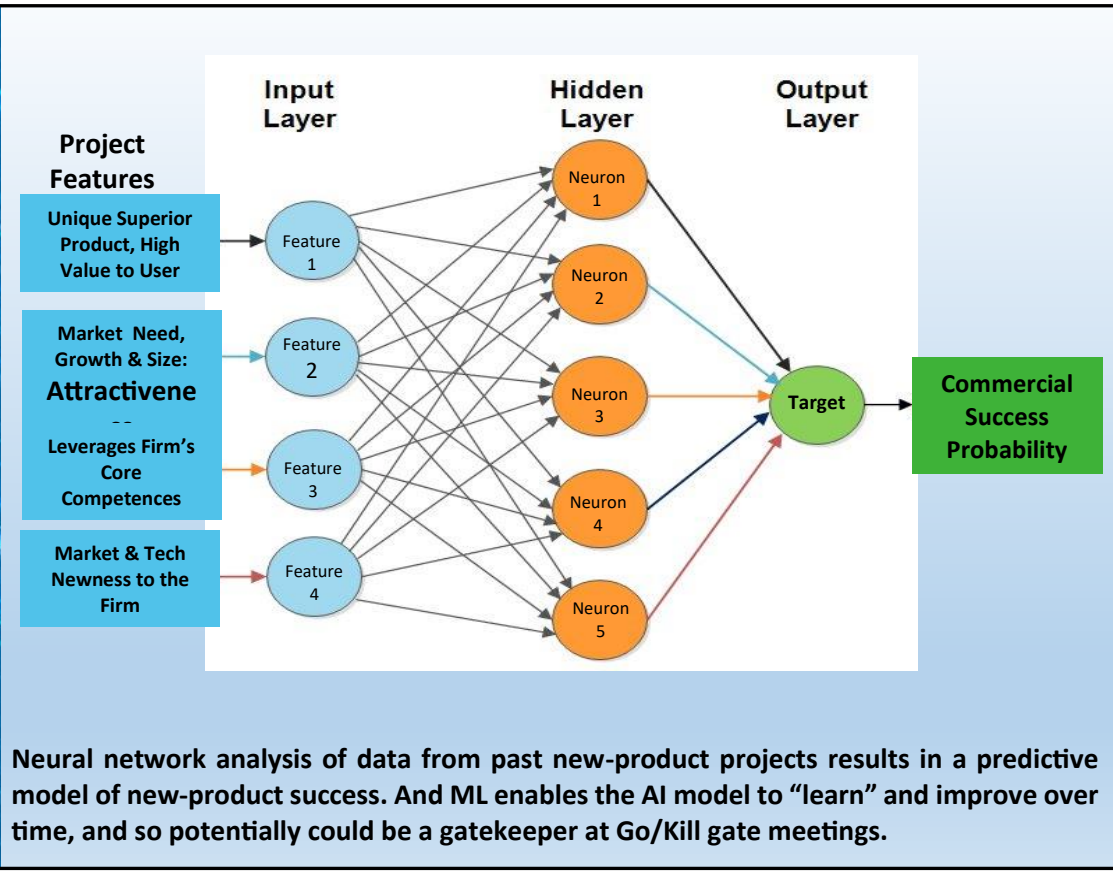

Neural network analysis of data from past new-product projects results in a predictive model of new-product success. And ML enables the AI model to "learn" and improve over time, and so potentially could be a gatekeeper at Go/Kill gate meetings.

The Future Is Here… Now!

Artificial Intelligence (AI) is poised to transform the way we conceive, develop and launch new products (NPs). Initial results from early adopting firms are dramatic: reductions in development times of 50% or more; better

optimization of product designs; breakthrough discoveries of new products; and better launch planning.[1,2] Early adopter firms have implemented AI for various reasons, but the *number one benefit* realized *is increased innovation*.[3] This AI revolution wave is coming fast, estimated to have a 13-year window of adoption, peaking before the end of this decade.[4]

Some of the examples of successful implementation of AI for NPD have been quite remarkable, almost like science fiction:

- Nestlé *has increased its pace of product innovation by 60%* using AI – the firm uses AI to mine past technical research reports, and also to generate market-derived new product ideas and concepts;[5] in a similar vein, Unilever generates new product concepts for skin care products, and also boasts a robot-staffed chemistry lab that can even create and test the new products.[6]

- GE has *cut design times in half* by using AI for rapid design-and-testing in turbine development. Traditionally, it might take 2 days for engineers to run a computational analysis of the fluid dynamics of a single design for a turbine blade. Now, Machine Learning (ML) trains a *surrogate model*, enabling a million design variations of the blade to be evaluated in just 15 minutes.[7]

- In a very different industry, biotech company Moderna uses AI to develop and test thousands of different mRNA-based medicines and vaccines.[8] Drug companies typically spend a billion dollars developing a drug in the hopes of making billions in return, but see a success rate of just 15%. AI *improves those chances to 50%* and reduces the time-to-market as well. AI algorithms help the molecular design decision-making by using data-driven predictions for the best code-sequences to use. "The AI bet paid off for Moderna, which was able to develop a leading COVID-19 vaccine in record time".[9,10]

- BASF "discovers" new emollient chemical compounds for use in the skincare industry with its *Emollient Maestro* software, based on IBM's Watson AI platform; [11] similarly, Pfizer and other drug companies use AI tools, like ATOMWISE, to *discover new drugs*; the AI tool screens thousands of compounds to identify and predict candidate compounds that likely will attack the target disease.[12]

- In the development of its automatic manual transmission, car-marker Renault was able to *accelerate by almost 50%* the iterative design-develop-and-test process;[13,14] also in the auto industry, GM is using an MIT-development AI-tool to design concept cars, then then to *predict consumer liking* for the design – far faster and less expensively than doing traditional consumer concept testing.[15]

- 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:[16] For example, 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.[17]

- After launch, an *AI digital twin* exists for each new Tesla vehicle on the road; the vehicle's embedded sensors diligently collect performance data and relay the data to its twin, providing invaluable feedback from the real-world operation of the vehicle.[18] Similarly, in the realm of aviation, GE has implemented digital twins for its GE90 engines on Boeing 777 aircraft that foresee engine degradation. And Siemens, a

pioneer in the domain of digital twins, has introduced ATOM, a virtual model to monitor its gas turbines and compressors once in operation.[19]

The Role of AI in NPD

Many complex definitions exist for AI. But the *simplest and most useful* for AI in NPD is by Agrawal, Gans and Goldfarb[20] in their bestselling book: AI is simply a "prediction technology that reduces the cost of predictions". 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, give the right prompting instructions.

Consider then where AI fits into NPD. NPD is a *process* that is characterized by *many tough decisions*, often *high risk*, and usually made under *conditions of great uncertainty*. Examples include: the decision to invest to develop a major new product, often at considerable cost; or to launch it when there are still unknowns. Product design and design optimization decisions, production decisions, and marketing decisions – pricing and marketing communications – are also challenging NP decisions.

Given management's track record in NPD – an estimated 70% of new-product development projects fail* – humans are not so good at making these decisions.[21,22] But if AI can help *make better decisions*, the expectation is that the *many NPD decisions based on AI predictions will improve*, and hence success rates will rise. One key to finding the place to begin in NPD is to *identify critical but challenging or problematic decisions* where the *amounts at stake are high* – high risk, with economic consequences – and probe further to see if AI could play a role.

A complex landscape:

AI has huge potential to improve NPD decisions. But the "AI-in-NPD" landscape is also a complex one with over 40 different applications of AI in NPD. In order to address the question of where to start, we've created a positioning map showing most of these 40 applications in Figure 1.[23] This map's north-south dimension (vertical axis) captures the role of AI in NPD, namely AI as an "originator" or AI as a "facilitator", from a model by Alex Brem et al:[24]

- The *Originator role* of AI is the *creative side* of product development – leveraging AI as creative model and method of inventing. "This function combines AI's generative and creative potential, based on advances in machine learning and deep learning."
- By contrast, the *Facilitator role* is more about *improving existing processes* and methods, making them more efficient and effective. It capitalizes on AI's ability to integrate and manipulate data in innovative ways.

The east-west dimension (horizontal axis) denotes the location in the NP process, from idea to launch, from the "front end" to the "back end"… shown as a typical new product process across the top of Figure 1.

*A 60% success rate is the most frequently reported success rate by the PDMA (Product Development and Management Association) studies over the years. But this 60% is the success rate for new products *at launch* – i.e., 60% of launched products succeed. However, if one looks at the attrition curve from idea to launch, the earlier one goes on the attrition curve, the lower the success rate. For example, only 14% of new product ideas become commercial successes. The 30% reported is measured from the point of "business case approval", which is the heavy commitment "Go to Development" decision point in the NP process.

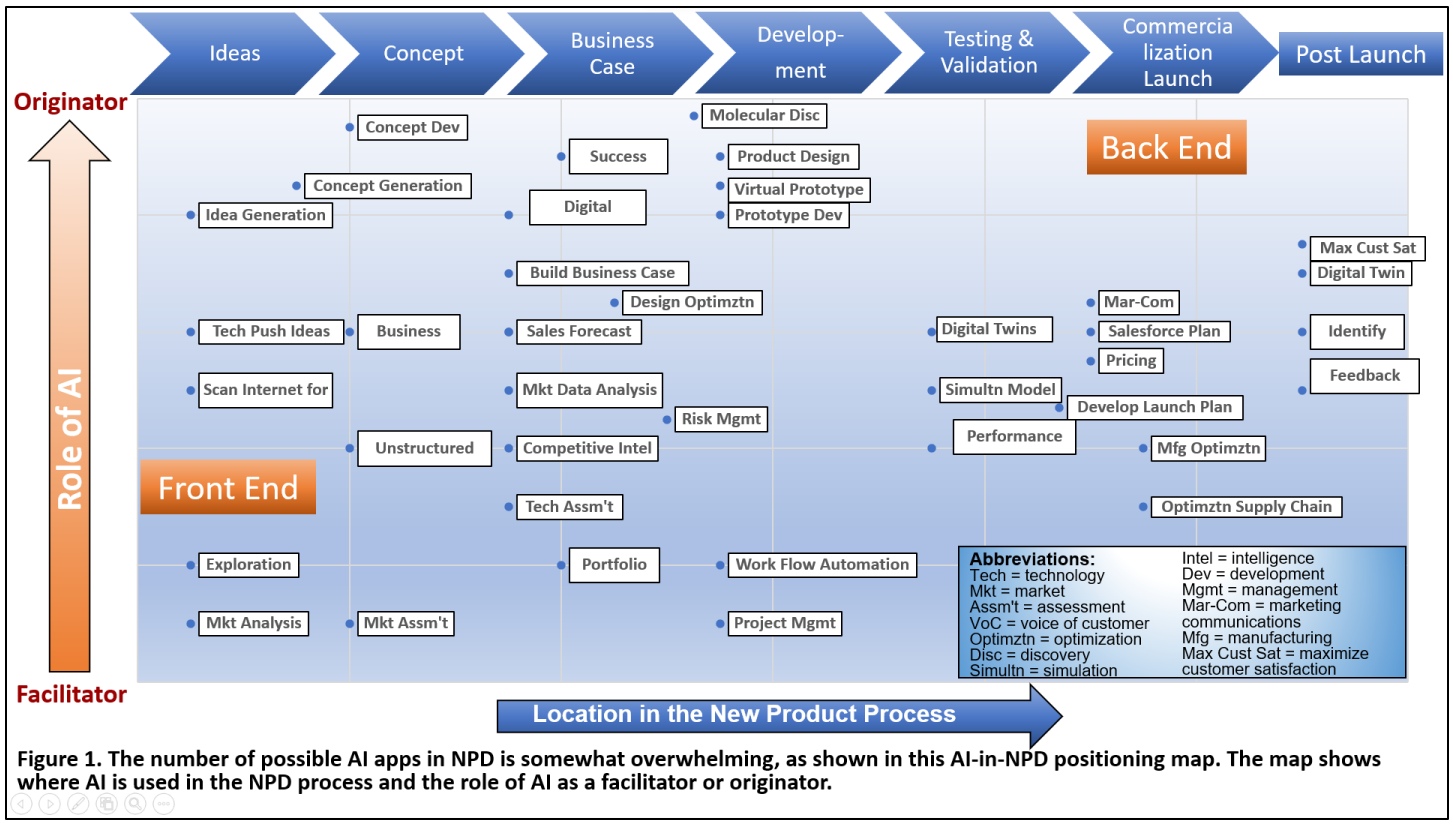

Figure 1. The number of possible AI apps in NPD is somewhat overwhelming, as shown in this AI-in-NPD positioning map. The map shows where AI is used in the NPD process and the role of AI as a facilitator or originator.

Specific details and example of each of these applications in Figure 1 are provided in another article (now available as a preprint from *IEEE Engineering Management Review*).[25]

Adoption of AI for NPD

While industry giants like GE, Siemens, GM, Unilever, and Nestle, armed with significant resources, spearhead the early adoption of this transformative technology, the question arises: What about the more typical firm? Is AI similarly revolutionizing their NPD systems? Despite the promise that AI offers, *only 13% of all firms globally* report using AI in their NPD effort.[26] An adoption rate of only 13% means that AI is still in the "early adopter" phase of the adoption curve for NPD – see Figure 2.[†]

Why are some firms hesitant to adopt AI? A number of studies have identified the reasons; these roots of reluctance are potential barriers that must be surmounted in one's journey to deploy AI in NPD:

1. ***Lack of a convincing Business Case***

One reason that has been identified in research is the lack of a robust Business Case. As one article on the topic noted: "Show me the money", a quote from the movie *Jerry McGuire*.[27] And while 89% of large companies globally have a digital and AI transformation underway, they have "only captured 31% of the expected revenue lift and 25% of expected cost savings from the effort".[28]

[†] "Innovators" and "early adopters" represent 2.5% and 13.5% respectively of adopters of a new technology using the Rogers diffusion of innovation adoption curve (Figure 2). These percentages total 16%. At the current 13% adoption rate of AI for NPD, AI is still in the "early adopters" phase.

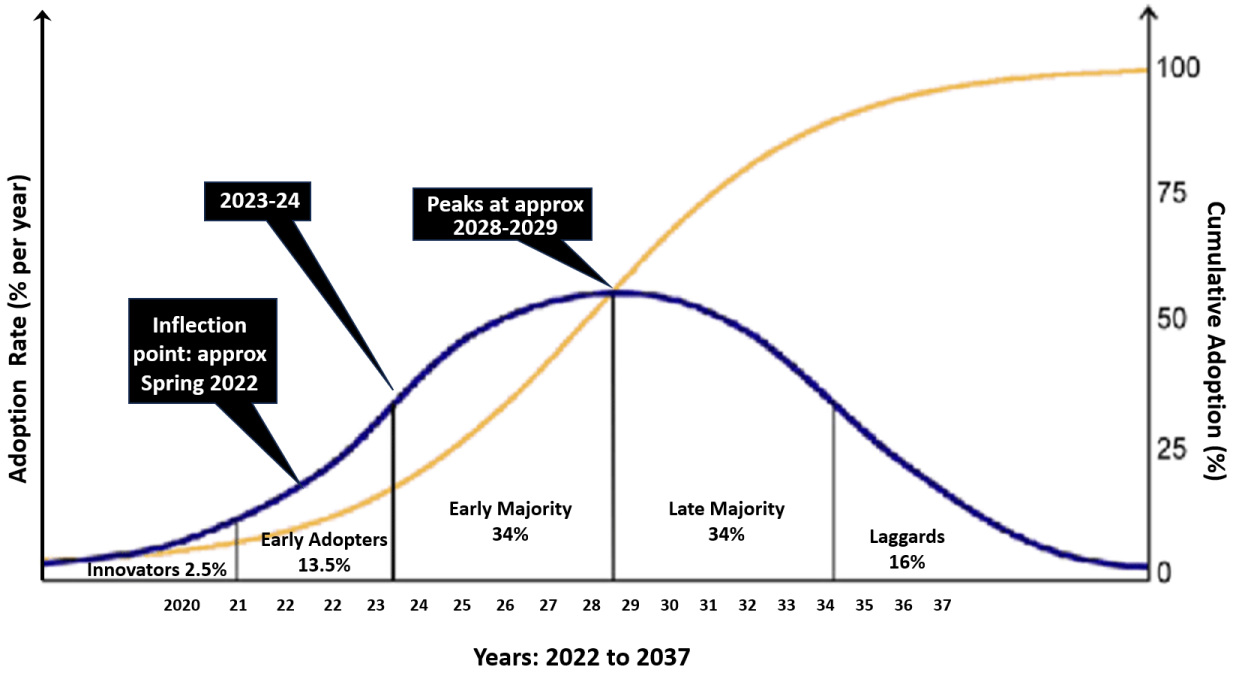

Figure 2: The estimated adoption curve for AI in business and NPD (dates are approximate; the estimate of the Adoption Window's duration of 13 years [±2 std. deviations] is from 2021 to 2037; data are from Figure 7).

The benefits of any new technology are difficult to predict, but numerous drivers to motivate firms to adopt exist AI for NPD. Five commonly mentioned benefits include:[29]

1. Fostering innovation: AI-driven insights from market trends, customer feedback, and data analysis identify market gaps, sparking new and innovative product ideas.
2. Meeting customers' needs: AI analyzes customer data to discern behavior and preferences, providing insights for product design decisions.
3. Accelerated time-to-market: AI expedites product development by swiftly analyzing vast datasets, facilitating rapid prototyping and design decisions.
4. Cost savings: AI streamlines product development by automating tasks like data analysis and testing, minimizing the need for extensive human resources..
5. Improved product quality: AI leverages customer feedback and usage data post-launch to identify and address issues in use, thereby providing an enhanced customer experience.

One problem is that these *commonly cited benefits* are largely based on expert opinion, on single case anecdotes, or on broad surveys, rather than on rigorous research studies of a large sample of AI-user firms. Indeed, "hard evidence that directly ties digital and AI transformation to improvements in operational KPIs and financial performance is scant".[30]

A few robust studies do exist, however: For example, an extensive analysis of almost one thousand news articles revealed that AI used in product innovation yields "significantly lowered search costs and increased speed in R&D processes".[31] In another study of 558 new product projects, those projects where AI was used for *ideation* and also for *product design and development* had *three times the success rates 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 (AI

[‡] Based on data from the Zhang, Zhang, and Song study (2021), using their Figures 1 and 2; their data was reworked to adjust for several factors, including the way the data are reported, and the 50% success rate in the study (the result of their deliberate 50:50 success/failure

was very broadly defined to include apps such as smart personal assistants, language translators, chatbots, robots, and IoT).[32]

2. Readiness to adopt AI

A firm's readiness to adopt AI can be judged by its "dynamic capacity" (DNC) – its ability to "sense, seize, and transform' – where a firm "unlearns the old", and then engages in exploratory new learning.[33]. A major UK study reveals that the *mindset of management* determines the readiness to adopt new management practices.[34] The dilemma with AI is that the great majority of CEOs are ready to adopt AI: 74% are "extremely optimistic about their organizations readiness for generative AI"; *but only 29% of other members of the C-suite* agree, a serious inconsistency.[35]

3. Adoption costs

Firms must play careful attention to the AI procurement process, and assess whether AI technology offers the anticipated cost savings. "While AI may enable some savings via automation of certain tasks, there are many additional costs that need to be considered when investing in this technology, including equipment, processing power and new skills [and people] needed".[36] Most user firms tend to partner with a focused AI vendor, much like most of the major drug companies have done. The AI sector is a complex environment, consisting of users, specialized AI suppliers, and tech giant companies (like IBM and Microsoft, whose platforms the specialized AI suppliers often use, such as IBM's Watson, Microsoft-Open AI's ChatGPT, and Google's Bard). The metaphor of a *bustling tango dancefloor* is cleverly used to represent the power exchanges between user firms and different types of suppliers – there are lots of potential tango dance partners, each with their own steps and routines![37]

4. Risks

Adopting any new technology involves risks. The top four perceived risks in adopting AI are:

- inaccuracy of results,
- cybersecurity,
- intellectual property protection, and
- regulatory compliance,

with about half of firms citing each of these four risks.[38] The same study reveals that most firms are addressing these risks. For example, cybersecurity and protection of IP are real issues, but working with a reputable AI vendor (whose software relies on secure platform from tech-giants, such as IBM's Watson, Amazon, Google, or Microsoft) mitigates these security risks. Regarding data accuracy, generative AI does on occasionally produce outputs that are either factually incorrect or unrelated to the given context. But with proper training on how to use prompts – the role of the "prompt engineer" – these "hallucination situations" can be avoided. The regulatory compliance risk can usually be handled with the help of legal and AI advice from outside experts.

5. Ethical considerations

One of the main ethical concerns is the well-being of one's own employees, namely the *potential for job loss due to AI*. However, the major study of news articles cited above reveals that most AI applications or "use cases" in R&D tend to *augment human* work – humans working with AI, enabling the human to do more – with minimal impact on job losses occurring in R&D.[§] "Fears concerning humans being displaced have so far

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sample selection) versus the usually reported 60% success rate (60% of new products launched succeed, a consistent result found for 2 decades by PDMA studies; Knudson et al, 2023).

[§] The term "AI use case" refers to a specific situation in which AI is used to solve a particular problem or address a specific need; we use the term "application" or "app" for short to mean much the same thing.

seemed somewhat exaggerated, at least in the case of R&D work".[39] For example, Mattel Hot Wheels car designers, using Open-AI's DALLE, become *better designers*, able to look at more options and can be more creative; there was *no reduction in the number of designers*![40] Additionally, McKinsey's global study reveals that AI is expected to have the *least impact on jobs in R&D* of any function, just about neutral.[41]. Above all, communication with employees – often, clearly, and honestly – about the role of AI in their departments and on impact on their jobs is essential.

A second ethical issue in using AI for marketing of the new product, including issues such as customer data protection, use and privacy; avoiding reinforcing prejudice and bias; and the concern that AI could create false content on its own, thereby spreading false information. Another marketing ethical issue is the potential for manipulation and deception of customers and users.[42] For example, AI-powered personalization of marketing communications may *cross the line* into manipulation, pushing customers to make decisions they wouldn't otherwise make. A related issue is that, by creating deepfakes, AI could be used to *create deceptive marketing materials* that mislead customers. Guiding principles for using AI for marketing the new product are:

- transparency and accountability: being clear about how AI is used and taking responsibility for its outcomes;
- fairness and non-discrimination: ensuring that AI is used in a way that is fair and inclusive for all customers; and
- human oversight and control: maintaining human control over AI systems and preventing their misuse.

6. Failure to deliver

"I'm seeing digital everywhere in my company except the bottom line." It's not unusual to hear a version of that grouse in many C-suites, and the data bears it out, reports a *Harvard Business Review* article.[43] AI often fails in practice: 85% of AI machine learning projects fail to deliver, and only 53% of AI projects make it from the prototyping test stage into final implementation.[44]

A deficiency commonly cited is the *failure to understand the user's needs in the company*. Using generative AI seems like a magical experience, which causes one to imagine where else this technology could be used…[45] that is, a *technology in search of a problem*. Wrong! Start with the problem: Understanding the users' needs and identifying the major *points of pain* is essential before seeking an AI solution. To most product developers, this is a well-known success factor; but it may not be as well understood by those in the AI technical community or in other parts of the business.

7. Poor implementation

A weak change-management program is a major reason why AI initiatives disappoint. Common implementation fail-points for AI in business include: a failure to communicate with employees; a lack of the needed employee skill set and insufficient training; the wrong or no performance metrics; setting unrealistic expectations at the outset; and the need for a *major change in mindset* of all those involved.

Unique to AI is the need *to build trust*, especially in line-managers and executives, that *data-driven decisions are better than gut feel, intuition, or traditional methods*.[46] Relying on intuition is effective if the decision-maker has developed their intuition through confronting many examples of the same problem, as is the case for professionals like doctors.[47] Nobel Prize-winner Daniel Kahneman has shown that "in unfamiliar circumstances, as is the case with many innovation projects, a decision-maker's intuition can be misled surprisingly easily. . . . Intuition must be supplemented with as much of a logical structure as possible."[48] Thus line-managers and

executives *must understand what AI is and how it works*, and *learn to trust in the AI-produced data* and also to "yield decision-making authority to an analytical process".[49]

A "Technology Acquisition and Deployment" Model for AI

Trying to install AI in NPD without a system in place is like putting a dozen players on a football field with no huddles, 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 firms recommend a *systematic process for implementing major new technologies*. The problem is in the case of AI, while many articles and consulting firms provide tips, hints, and lists on how to proceed, no comprehensive publicly available end-to-end system frameworks exist for deploying AI in NPD.

Background on technology development and adoption models

The deployment of new technologies and new ways of working is not new to NPD people; thus, numerous models or frameworks for technology development (TD) or acquisition and implementation have been proposed and successfully used for almost three decades. Thamhain first proposed a *technology development model* in 1997, modified from the Stage-Gate® process[**] for NPD.[50] Shortly after, Cohen and colleagues developed and used a similar *modified gated model* for technology development at ExxonMobil Chemical.[51] The metallocene project, a new catalyst for polymerizing olefins to yield polyolefins with engineering properties, led to this technology model's creation (a project that the author helped on). Koen and colleagues in 2002 show a summary technology model for the *fuzzy front end* of innovation in the *PDMA Handbook*,[52] and a full and detailed technology model, Stage-Gate-TD, followed.[53]

A study of six firms, which implemented such TD models, helped validate the approach, and concluded that companies must create a more flexible approach for technology projects when compared to NPD: The technology model should incorporate "Iterative loop backs, recursive use of the model, redefining development goals and objectives based on generated new knowledge, and flexibility in timing".[54] A number of firms, besides ExxonMobil Chemical, have indeed developed their own versions of these models; for example, 3M employs a five-stage new-product gating process, called NPI, for developing new products, which is fed by a three-stage technology development process, called NTI, shown in Figure 3.[55]

A comprehensive summary of these technology development (TD) models is in Aristodemou et al,[56] which includes a multi-branched model for *development, acquisition and/or modification of a new technology, and its deployment* in the business – see Figure 4.[57]

Features of the new acquisition process model

The proposed Acquisition and Deployment model is shown in Figure 5. It has a number of features based on best practices uncovered above and by others, as well as actions to avoid or mitigate identified reasons for failure. Some key features include:

[**] Stage-Gate® is a legally registered trademark of R.G. Cooper in Canada and the EU; and of Stage-Gate International in the USA.

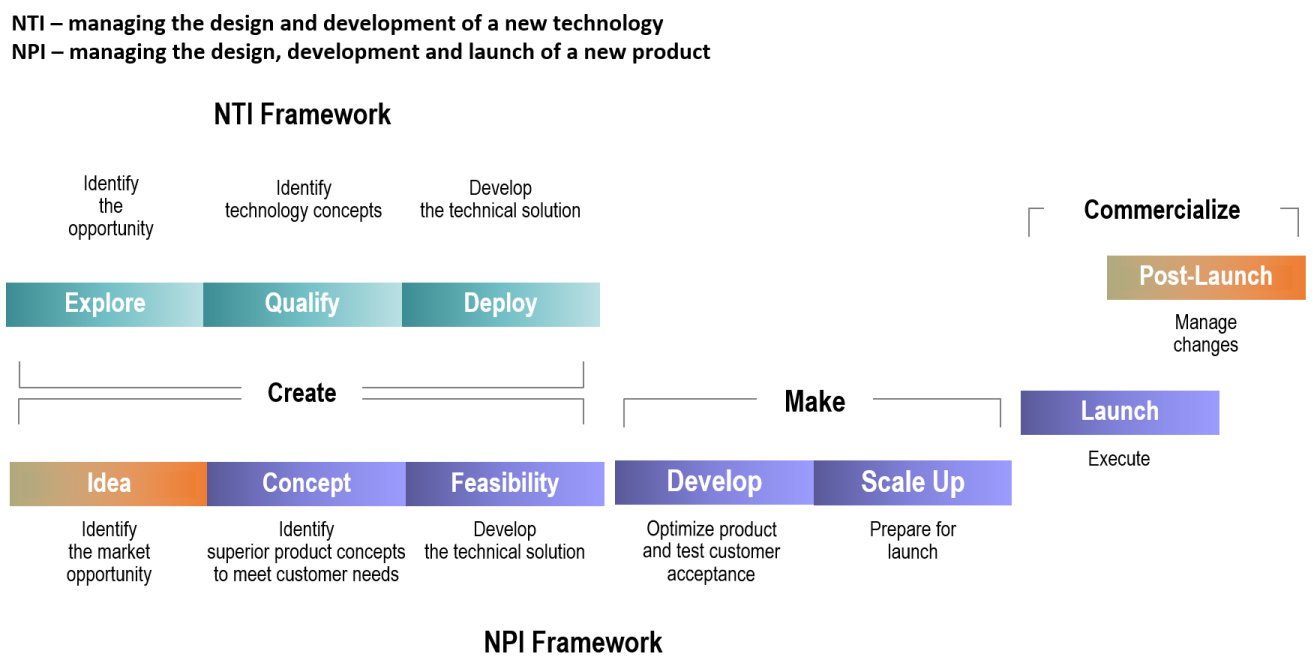


Figure 3: 3M's two innovation processes – NPI (bottom diagram) for new products, and NTI (top) for developing new technologies. Source: Gehring, 2011.

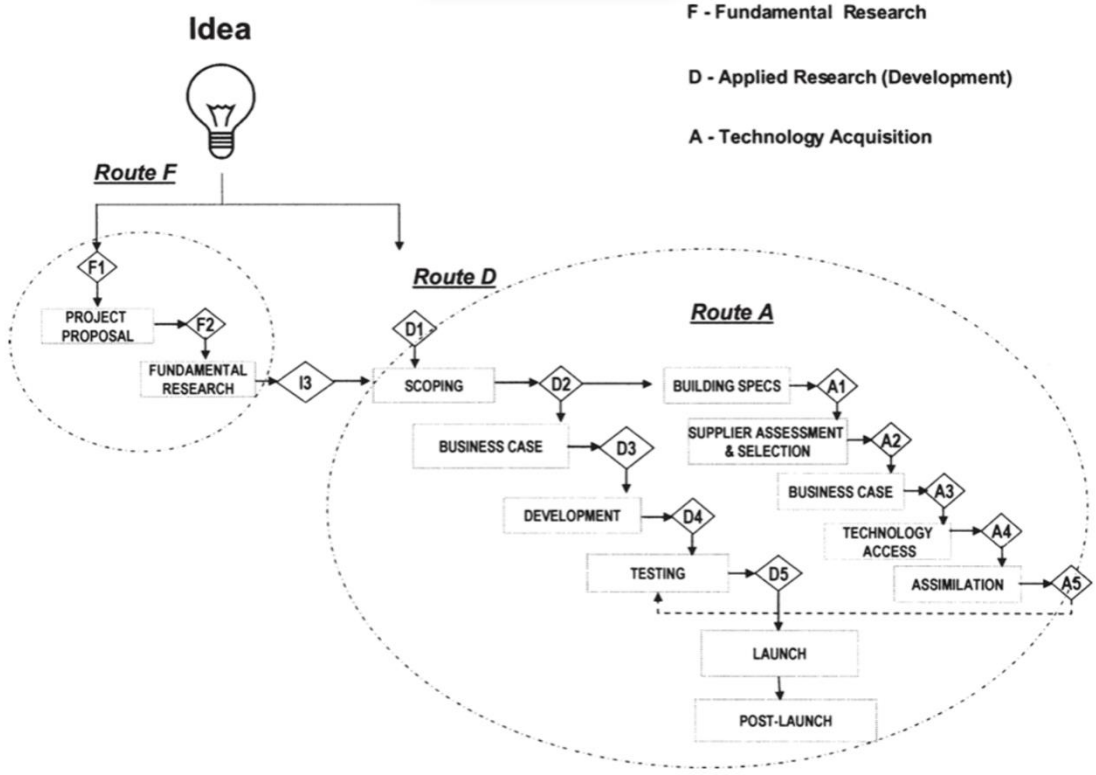


Figure 4. The Technology Acquisition Process using a modified Stage-Gate model (source of figure: Cáñez et al, 2007)

The model in Figure 5 is a stage-wise model, much like previous TD models, with incremental but increasing commitments of resources at each stage. Such a stage-and-gate model is designed to *mitigate risk*, much like buying a series of options on an risky investment.

- There are go/no go decision points (the gates) built in to *stop the AI project* if it gets into trouble (or to change direction, perhaps selecting a better application area).
- The decision points or gates also feature management sign-offs, where *management buys into the project* and commits resources for the next stage.
- A focus on *understanding user needs* is built in through VoP (voice of process) in order to avoid a common failure reason of a "solution looking for a problem".
- A robust *front-end homework stage* – including VoP, technical assessment, vetting possible AI vendors, and building a fact-based Business Case – is part of the model (Stage 1 in Figure 5).
- Numerous *iterations or "loop backs"* are built into the stages – built-and-test iterations – into order to allow experimentation and pivots. This approach is borrowed from the Agile Development methodology, where projects are undertaken often with limited definition and changing information.
- A piloting stage or "proof of concept" stage (Stage 3 in Figure 4) is a key feature of the model, where the selected application *is piloted with close monitoring*, which often results in needed improvements.
- The AI initiative is undertaken by a *cross-functional, empowered team* or Task Force with people from IT, RD&E, operations and source-of-supply, marketing, etc.

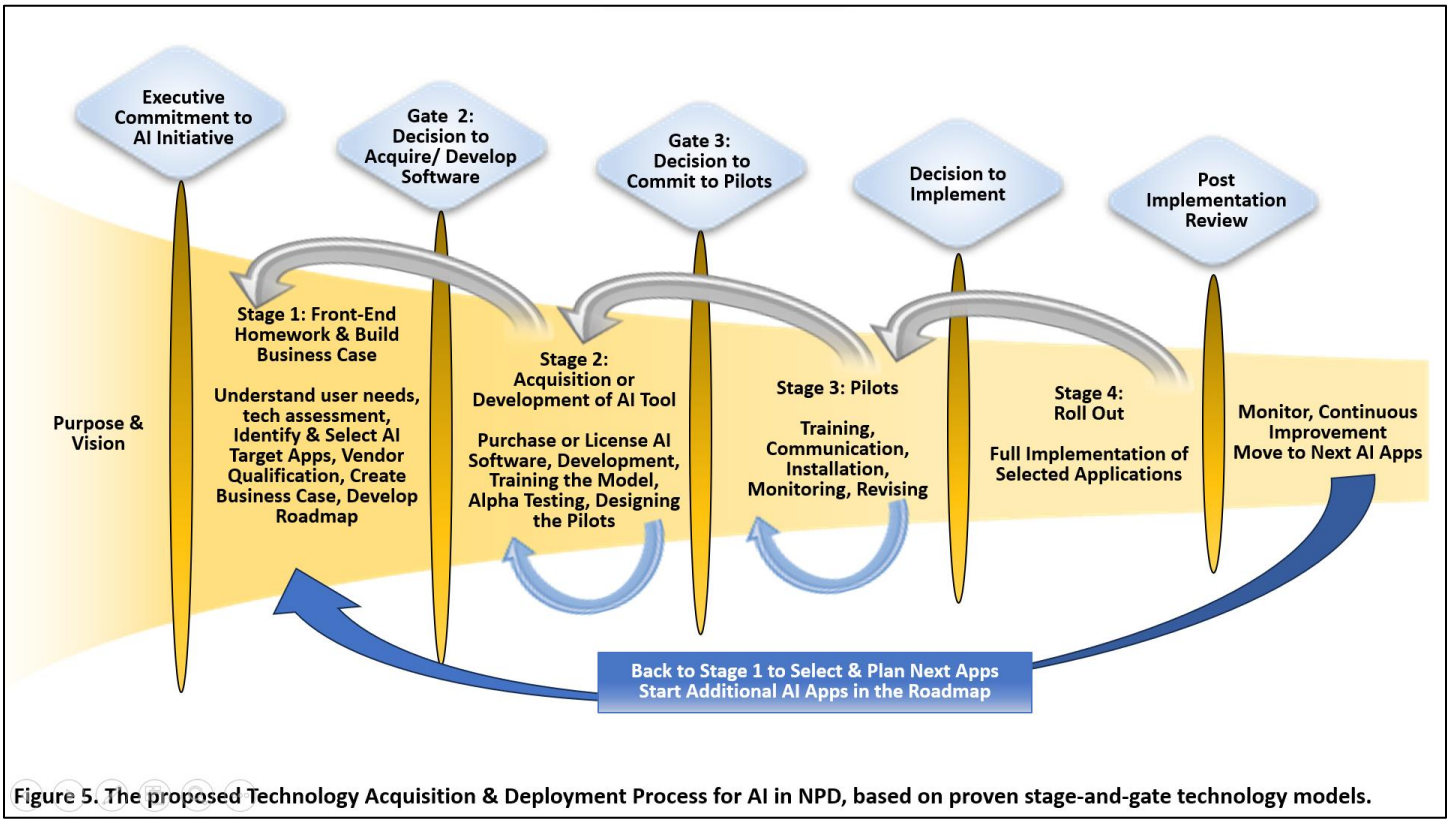


Figure 5. The proposed Technology Acquisition & Deployment Process for AI in NPD, based on proven stage-and-gate technology models.

A stage-by-stage walkthrough of the process

This walkthrough can be followed by referring to Figure 5.

Idea and Initial Screen:
Start at the top! Deploying AI in NPD must be a *senior-management-sponsored initiative*… that is, a top down, not a bottom-up effort. The leadership team must commit in principle to implementing AI in NPD, and define a broad vision for this "AI in NPD" initiative: its mission, scope, purpose, goals, and objectives. Senior management does should not specify more than that, nor should they get into details, such as specific applications to target within NPD.

Next, senior management must create a cross-functional, empowered Task Force – a dedicated, multifunctional team to drive the AI project. This team includes NPD people (RD&E, marketing, operations, source-of-supply), and depending on whether the company will likely develop its own software or not, some or all of the following people: data scientists, a business analyst, an IT engineer, a data engineer, and a full-stack developer (a person who is capable of developing both client and server-side software).[58] The Task Force should have a strong capable leader (but not the "traditional project manager") with good people skills, and have one or more executive sponsors on board. The Project Leader reports directly to the senior management group, who are the "gatekeepers" at each gate.

Once all is in place, and next steps are agreed with the Task Force, management signs off on Stage 1 of the initiative and the needed resources (Gate 1).

Stage 1 – Front-End Homework and Building the Business Case:
This stage is a *detailed investigation stage*, which defines and justifies the AI initiative: It identifies the target application(s) in NPD, recommends the software solutions, creates a roadmap for further applications, and determines the AI initiative's business attractiveness prior to heavy spending. This stage is the *critical homework* stage, comprising key tasks often found to be weakly executed or missing, such as VoP to understand user needs, and probing risks and ethical issues.

Stage 2 is a tough and time-consuming stage, and some Task Forces might wish to skim through it quickly. Bad idea! Although the research field into what drives success in AI applications is still evolving, available evidence. together with the reasons for failure cited above, suggests a strong correlation between thorough front-end homework and successful AI implementation. Key tasks are:

1. *Get the Task Force members up to speed on AI* and its potential role in NPD. There are a lot of misconceptions and misinformation about AI created by sensational media stories, which may lead to unwanted prejudices. Besides formal courses and seminars, a number of resources are available from legitimate sources such as *Forbes, Harvard Business Review* and others valid publications, including a "Resources" article in *Research-Technology Management.*[††]

2. *Add the needed expertise:* Many firms lack internal expertise or experience with AI, even in their IT department. Thus, get help! Add an experienced outside advisor or a consulting firm's people to the Task Force.

3. *Focus!* Figure 1 shows about 40 possible applications of AI in NPD,[59] which is somewhat overwhelming. Attempt to cut down this long list of possible applications in Figure 1 by undertaking an informal screening to

[††] Resources for AI for NPD are in Cooper & McCausland, 2023, endnote 2: Available at www.bobcooper.ca
Other resources are available including YouTube videos (same website).

yield a handful of promising target areas (note: VoP, the next task below, is *not a shotgun approach*: You cannot research every possible application in depth). AI is a powerful predication tool which can be applied to *make better decisions with economic consequences*. Thus, using "making better decisions" as a guide, identify and understand the potential decisions in NPD where AI could be used to advantage. To assist in this focusing effort, use the criteria in Table 1, but at this early point and with limited information, do the screening informally.

Table 1: The Seven Factor AI Application & Solution Evaluation Scorecard

#	The Seven Factors (Rating Criteria)	What Each Factor Means: The sub-questions within each factor. Note: a consensus "Low" of (if "Low" or "1 out of 5" on any one factor may be good reason to Kill the application/solution).	Score on 1-5 Scale
1	Vision & Mission Fit	How well does the proposed AI application & solution align with the vision & mission of our AI initiative? How important to the vision & mission is this AI app & solution?	Low to High
2	Magnitude of Opportunity	How big a problem does the AI solution address? Is this a major "point of pain" for potential users with a large impact? Can the solution be applied in many locations in the company or just this one?	
3	Technical Feasibility	What needs to be developed & what's the size of the technical gap? Are the technical barrier large? Or does the ideal solution already exist off-the-shelf? Are the technical risks and barriers minimal? Is the solution 'do-able' technically? (*score this "5 out of 5" if high tech feasibility*)	
4.	Leverages Core Competencies	Do we have the needed IT, technical, operations, and other skills & people to implement the AI solution? Does the acquisition & deployment of this solution leverage our technical skills? Can we do it?	
5	Legal/Ethical	Is the AI solution legal? Is is ethical? Is it consistent with our policies on ethical or SHEL (safety, health, ethical, legal) issues? Will our customers' information & our employees be protected? Is there human oversight of the AI solution?	
6	Financial Impact	If the AI solution works technically, & is indeed rolled out, what would the magnitude of the impact be (in dollars per year)? Is this a reliable estimate, fact based, or a pure guess?	
7	Risks	Have the risks been identified? Are they minimal or acceptable? Is there a reasonable plan or way to mitigate them?	

The 7 rating criteria above are scored 1-5 on "Low" to "High" scales for each AI Application. But first, the Task Force must develop the scales, defining "anchor phrases", that is, what a "High" or "Low" score means in the context of their business, especially for the Financial criterion.

4. *Conduct a user needs assessment (VoP)* on the short list of applications: Don't lose sight of the business value that AI brings: *making better decisions.* Much like doing VoC in a new product project, identify the relevant users and their managers, and interview and listen to them: Assess their needs, and identify their points of pain and the problems that AI might solve. Attempt to quantify the potential impact of AI, by asking: "If this decision could be improved by X%, what would the impact be on the bottom line?". Also, listen to users' likes and dislikes, what works and does not, what they think they want or need in terms of a better solution, and record "user stories". This interview is not about "selling the wonders of AI", but a serious attempt to understand the problem before determining whether AI might help, and then seeking the right AI solution.

5. *Do a technical assessment.* Most firms lack the internal IT skills to develop their own AI software, so will need to seek out an already developed solution – see box, next page.[60] Many vendors and excellent AI solutions exist for NPD. Thus, having narrowed the field of applications, familiarize the Task Force with the possible AI solutions and vendors. Sources like Capterra and Gartner identify possible solutions, and provide brief assessments of each. And the websites of suppliers typically give a good overview of the AI products and user case examples. Setting up a demo online is easy. Working with your source-of-supply people, begin the qualification and rating of the vendors and solutions. Note that not every AI tool delivers as advertised; so, do the due diligence: An MIT report recommends an *AI alignment exercise* to ensure that scientific, stakeholder, and application consistency exists.[61]

6. P*rioritize and select* the proposed applications or use cases, solutions, and vendors. Table 1 provides valid prioritization criteria in the form of a *seven-factor scoring model*, based on similar proven models for technology development.[62,63] In addition, since the Business Case usually includes an estimated NPV, go one step further and determine the Productivity Index – it's an *excellent metric to help prioritize projects* when resources are constrained, and is easy to calculate from the NPV. [64]

In-House Versus Outsourced Solutions

Creating the entire system in-house gives you total control of the end system, while eliminating external managerial and contractual issues and conflicts. This approach is suitable for firms that have much of the AI or IT skill-set inside and want to utilize the project to expand the current capabilities of their AI team. But this initiative is a major one, with high economic and administrative costs.

Companies can also outsource their AI solutions and integration to outside vendors that already have the required expertise and support capabilities for the job. They have experience with the client's type of requirements and can provide the software solution and assist in its implementation .

When selecting projects, don't try for a moon shot! Rather, undertake this AI initiative one step at a time, limiting it initially to one or two of the attractive but moderate-to-lower risk applications; it's difficult to predict outcomes until some experience is gained. Other applications can be put on hold and entered into the Applications Roadmap as future projects. A series of smaller but quick wins builds confidence across the business, and will inspire more potential users to take part in similar AI implementation pilots.[65]

7. *Evaluate your internal capabilities*. Once the use cases are identified and prioritized, the Task Force must map out how these applications align with the company's existing technology, skill set, and technical competences. Education and training can help bridge the technical skills gap internally, while vendors can facilitate on-the-job training.[66]

8. *Build the Business Case,* which includes recommending the application(s) and vendor(s) as well as undertaking the financial analysis, including quantifying the economic benefits of AI for that application. For benefits that are *qualitative*, such as superior ideation, or better product optimization, *impute an economic value for these benefits* and use cost-benefit analysis. Note that the lack of a strong and "provable" Business Case has been cited by firms as the reason they are hesitant to move ahead with AI in NPD.[‡‡] As part of the Business Case, prepare a Risk Registry, noting identified risks, their likelihood and impact, and mitigating actions. Similar to risk assessment, identify the *ethical issues* and how they will be handled, consistent with corporate policy.

9. D*evelop the action plans* – a fairly detailed plan for the next stage, namely the purchase, licensing, or development of the software, the choice of vendor, and the timeline and resources required. Also, create a *tentative plan* through to roll-out, including the design of the likely pilots.

10. Create an A*pplications Roadmap* – a very tentative longer-term plan, with placemarks for the next logical applications, based on the prioritization above. These are the selected applications to be done after

[‡‡] Based on research cited in the article, and also on a private survey of member firms and ensuing discussions at Pennsylvania State University ISBM's (Institute for the Study of Business Markets) Annual Members "AI in B2B Marketing" Conference, Chicago, IL, Sept 2023.

these initial use cases are implemented. Note that this Roadmap is very tentative, and will be redrawn several times once the initial use cases are complete and some results are known. (An illustration of an Applications Roadmap is shown in Figure 6, based on a process equipment company – pumps, valves, and agitators; disguised).

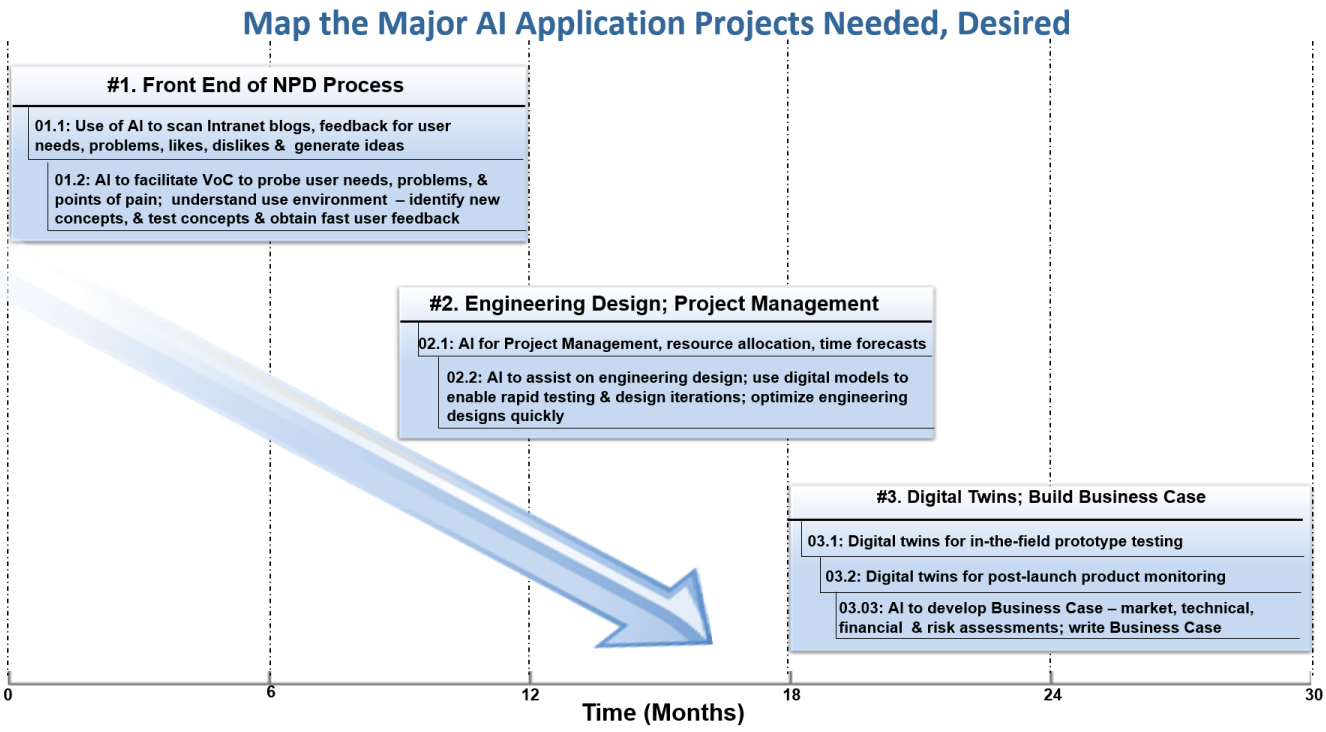


Figure 6. Create the Applications Roadmap – a tentative plan for future AI use case projects.

Depending on the magnitude and complexity of the proposed AI initiative, this Business Case stage may be split into two parts: Part A, undertake the homework and propose some tentative decisions on target applications; and Part B, a more detailed investigation, building the formal Business Case, and developing the Action Plan and Roadmap. Breaking Stage 1 into two parts requires inserting a check-in or "mini-gate" review with management after the first part is done.

The result or deliverable from Stage 1 is a Business Case, including the definition of target applications, their financial and business justification, and an go-forward Action Plan and longer-term Applications Roadmap.

Gate 2 – Decision to Acquire or Develop Software:
Here, senior management meets with the Task Force and reviews the Business Case and proposed Action Plan. Popular financial metrics, such a NPV, are appropriate here as go/no go criteria at this important gate meeting. Also, use the Seven Factor Scorecard in Table 1 at the meeting to focus discussion and solicit each executive's viewpoint. If the decision is "go", senior management signs off on acquiring or developing the AI software, and commits the needed resources.

Stage 2 – Acquisition & Development of Software Solutions:
The nature of this stage varies depending on the software route your firm has elected. If you intend to develop the AI solution yourself, perhaps backed by a major AI platform such as IBM's Watson, then this Stage 2 Development stage of your initiative becomes *an internal IT project* – namely writing and testing software

code. Thus, you should *revert to your company-approved IT development methodology*, which might involve more stages than are outlined in Figure 5. Generally, like most internal major IT projects, it will likely use the *Agile-Scrum method* and *way of working*, involving multiple short sprints, with many test-and-build iterations and demos. This Agile method fits within the stage-wise model in Figure 5, namely Agile-Stage-Gate.[67]

At the other extreme, if the application involves a vendor simply providing an AI-based service, the vendor may do most of the work for you. For example, if the application is *idea generation* or *concept development*, firms, such as AMS, Ai Palette, or AIM,[§§] use their own software and people, and execute much of the project from this point onward, but still working with your Task Force.

Many firms elect an initial AI application that requires either buying or licensing the AI software. If licensed, the software is usually hosted on the vendor's server, and the SaaS model is used (Software as a Service). Note that users distinguish between two types of AI suppliers: tech giants and small players. Tech giants, such as Amazon Web Services, Google Cloud, and Microsoft Azure, provide significant computing capabilities through cloud services and *standardized solutions*, while smaller vendors offer more *customized solutions*.[68]

Working with the vendor, complete the installation of the software, getting assistance both from the vendor and your consultant. Before the software is up and running, it usually must be "trained". *Data preparation* for training is huge task, and is reported to take *the most time of any activity* in the AI project, up to 80% of the time spent from start to deployment.[69]

Once the AI tool is trained and operating, be sure to undertake the essential internal tests or *alpha tests*. Most AI software does not work 100% well first time – it often has glitches or produces erroneous answers and data. So, the system must first be first tested rigorously and then fixed. Too many user cases reveal AI tools being implemented in pilots that yield wrong answers – not a good start!

Next is designing the pilots: These are "proof of concept" tests of the AI software and system *in operation with real users* for each target application. First, set *clear, measurable and transparent objectives for the pilots:* Objectives must be consistent with the Business Case from Stage 1, and senior management's original goals and objectives; they must also be measurable and realistic.

And do *put metrics in place* from the beginning of the pilots. One of the most glaring deficiencies in the deployment of Agile Development, especially in physical product firms, was *the lack of metrics*. Users usually agreed that Agile was a "wonderful new system"; but few could produce valid fact-based performance improvement results.[70] Examples of useful metrics are "development time reduction by X%" or "increased pace of innovation" (number of projects per month); less quantifiable results such as "improved quality of ideas generated" or "more positive customer experiences" should still be measured, but by using opinion-based 1-5 scales.

The deliverables to the next gate include the Plan for the Pilots, and a updated Business Case and Applications Roadmap.

[§§] AMS: Applied Marketing Science's AI tool undertakes an Internet search, identifying thousands of customer comments about problems, likes, and dislikes about products in a given product-market arena, leading to product ideas. AIM's new Blueprinter AI-aided tool helps to undertake B2B VoC interviews much more efficiently than traditional methods.

Gate 3 – Decision to Commit to Pilots:
This gate is much the same as Gate 2: Senior management meets with the Task Force, reviews of the software installation and alpha testing, along with the updated Business Case and the Plan for the Pilots. If go, they sign off on the decision to move into piloting and commit the needed resources.

Stage 3 – Pilots:
Implement the one or more pilots, according to the Plan. Key tasks are:

- *Communications:* Users may have fears about job loss, loss of responsibility or authority, or morale issues. Deal with these fears openly.
- *Training:* The lack of training and knowledge is often cited by firms as a barrier to implementation. Be sure to include ample training, both at the outset of each pilot and in real time (during the pilots as issues arise).
- *Monitoring the pilots:* One outcome you can be sure of is that not everything will go 100% as planned. Provide the Task Force the necessary resources in order to monitor the pilots closely – don't set up the pilots, turn the switch, and walk away! Your Task Force should be on top of problems, and take quick action to resolve them.
- *An executive sponsor locally:* Some firms recommend appointing an executive sponsor at the pilot location… someone the Task Force can turn to locally for help or intervention.
- *Practice continuous improvement*: Assess the results, both as the pilot is underway and at completion. Ask: "Have the pilots achieved their objectives?" And if gaps – there usually are – understand the reasons why. *Root cause analysis* a good way to pinpoint problems before devising actions to fix and revise the AI system.

If the pilots are unsuccessful, then work to understand why, create a new Action Plan and Business Case, and iterate back to Gate 2. This is not a defeat, but merely a learning experience. But if reasonably successful, move forward!

There are still a few more tasks before Gate 3 and management's sign off on full Roll-Out, namely updating the Business Case and the Applications Roadmap based on what was learned in the pilots and new information gleaned since the last gate; and creating a Plan for the Roll-Out.

Gate 4 – Decision to Implement:
Here, senior management reviews the pilot results to date and the updated Business Case, and if go, approves the Roll-Out Plan and the resources to undertake the roll-out: equipment or software, time, and people. If the Plan also includes starting the next project in the Roadmap in parallel, that too is reviewed and approved in principle.

Stage 4 – Roll-Out:
The Roll-Out Plan is implemented. It proceeds much like the pilots, but scaled, and with benefit of experience and confidence gained during the pilots. The key tasks highlighted above – communication, training, metrics and performance monitoring, and continuous improvement – apply here as well in the defined target areas and applications.

If conditions and resources permit, and once the Roll-Out is working smoothly, the Task Force can consider beginning the next applications projects in the Roadmap, illustrated in Figure 6. This often will require looping

back to previous stages in the deployment model of Figure 5 – to the Business Case or Acquisition/Development stages.

Post Implementation:
A post implementation review is held once the Roll-out Plan has been executed, the installed AI system is working smoothly, and results are available. Senior management meets again with the Task Force, this time to review actual results versus promised results, and reasons for the inevitable gaps. If not done already, steps are mapped out to tackle any remaining deficiencies.

At this point, this AI application project may be designated as "done", but the work does continue! The Task Force still monitors and improves the process: The process of *continuous improvement* never ends! But by now, the Task Force is likely heavily into the next application in the Roadmap.

The Time to Act is Now!

The world has witnessed a number of technology waves that have changed society and business. The First Industrial Revolution (led by steam power, 1780), the Second Industrial Revolution (mechanization and communications), and the Information Age are three major technology-driven waves that had huge impacts, creating both big winners and some losers – see figure 7. At first, the duration of these revolutions – the "adoption window" – was quite long (85 years for the First Industrial Revolution): Industries back then took many years to adopt the new technologies and to adjust. These adoption windows are *remarkable predicable* as seen by the *best-fit dashed line* in Figure 7 – and they are becoming shorter, and more thus more intense. Based on the trend line, expect the current AI wave to *have an adoption window of about 13 years*, peaking by 2028-29. Coincidentally, the much-awaited AGI (Artificial General Intelligence), capable of performing cognitive tasks on par with humans, is expected by about 2028 (Losey, 2023; Jafari, 2023).[71,72]

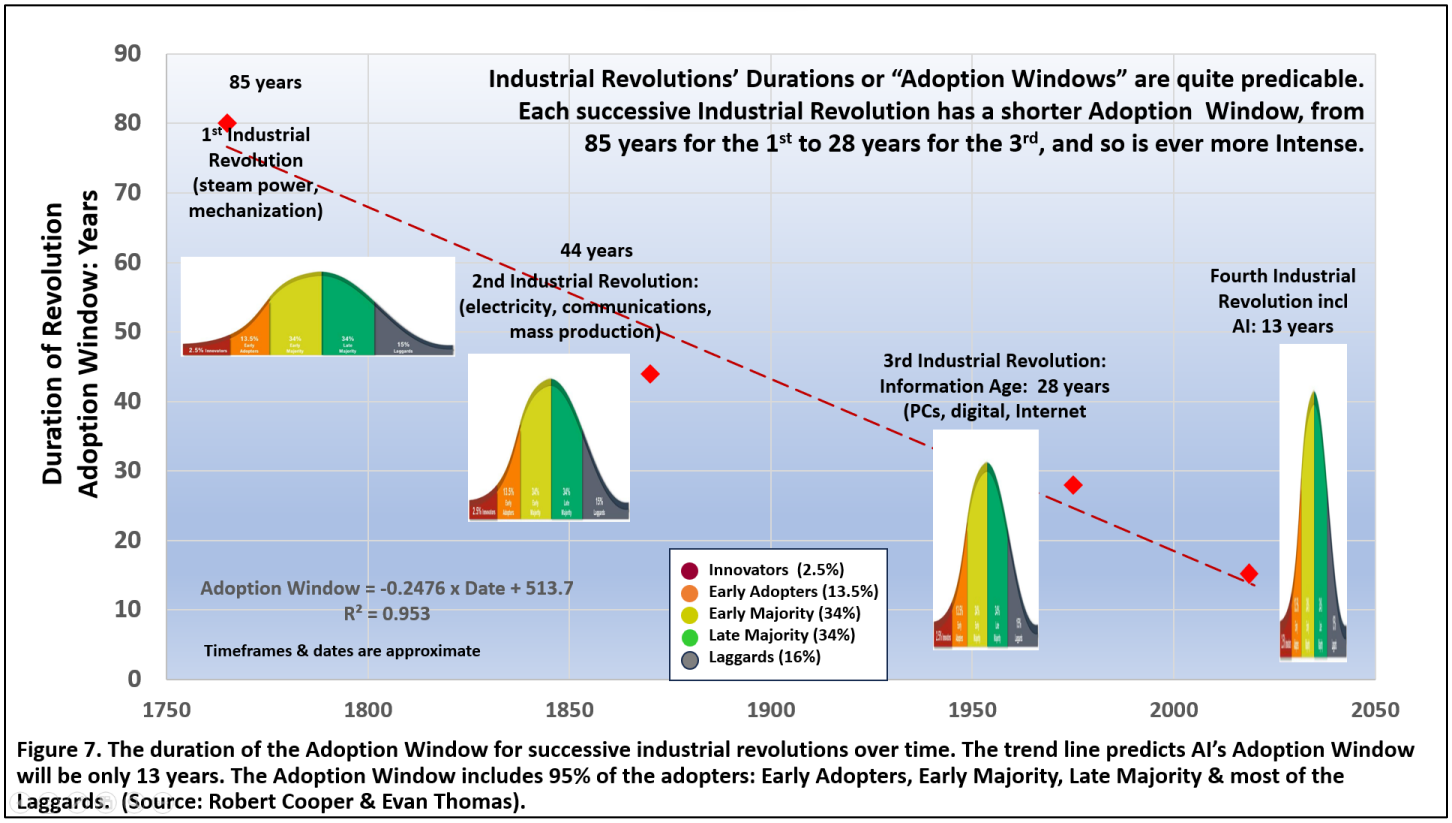
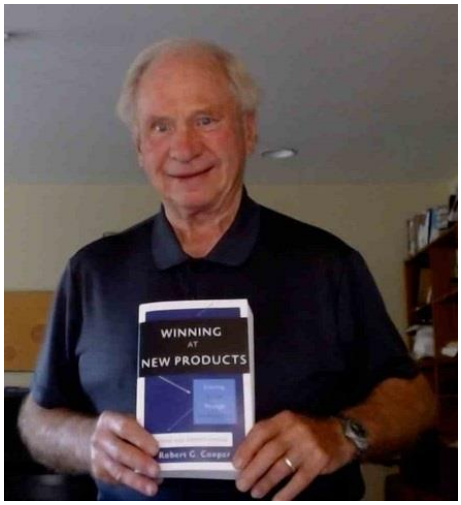


Figure 7. The duration of the Adoption Window for successive industrial revolutions over time. The trend line predicts AI's Adoption Window will be only 13 years. The Adoption Window includes 95% of the adopters: Early Adopters, Early Majority, Late Majority & most of the Laggards. (Source: Robert Cooper & Evan Thomas).

Time is running out for those firms that have not yet begun the AI journey! But it's not too late to get on board. The message is this: Get up to speed on AI in NPD and use the *technology acquisition and deployment model* outlined in this article to guide your path forward; get some outside help, assess internal users' needs and your skills; put a plan in place, and undertake some pilots. 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!



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