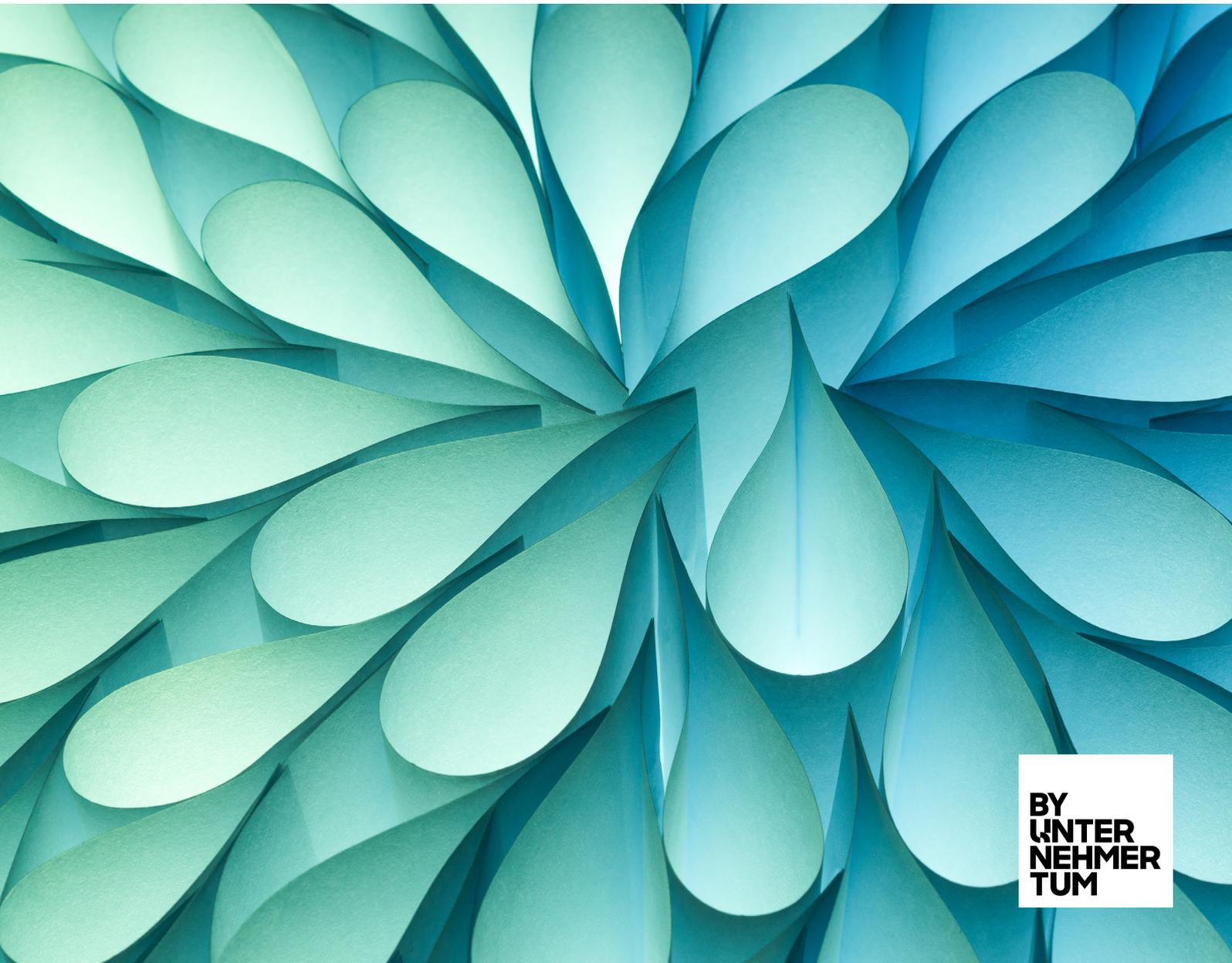


Artificial Intelligence for Boards

-Gearing up for the
Future of Business



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“Artificial Intelligence is the game changing element in digital transformations going forward. I strongly recommend executive and supervisory boards to review the topic and its implications thoroughly and take action!”

Siegfried Russwurm,
Chairman of the Supervisory Boards of
thyssenkrupp and Voith

How AI challenges board members—individually and collectively

If you were a board member attending Davos in 2017, you might have been surprised (as was the World Economic Forum itself) at the force with which AI had arrived at the center of the business community. Perhaps you felt relieved watching Sergey Brin confess on stage how he, too, had been skeptical of the AI efforts at Google X—after all, he knew from his Computer Science training in the 90s that AI would not work. Famously, he later performed a ‘volte-face’ and went all-in with a full-blown ‘AI First’ strategy. Chances are you returned from that conference and placed AI prominently on your technology roadmap, kicked off an AI group, and possibly even included AI as an important element in your external communication. And lo and behold, before long, the first pilot projects started showing fascinating results, and start-up pitched their solutions.

Fast forward to 2020. You might be wondering why your AI initiatives haven’t led to large scale jumps in speed, scale, quality, or cost efficiency, combined with a pipeline of profitable new offerings. In case you are disappointed, you are not alone: In a recent survey, 7 out of 10 companies reported “minimal or no impact of AI”^[1]. You might start asking yourself whether the AI revolution is overblown.

But what if AI isn’t the problem? What if the problem is you?

Yes, you successfully maneuvered previous technology waves: Mobile, Digital, and Big Data, to name just a few. You took them seriously and acted with determination, delegating the task to the unit in charge and holding it responsible for results. However, AI is a rather different animal, putting more pressure on you as the board to become educated and directly involved in a serious way.

First, as a transformative, general purpose technology, AI has the power to substantially change business opportunities, company risk, investment logic, people and skills requirements, processes, structures, and more. Also, AI has a value destroying and creating effect in the competitive landscape: Existing business models can quickly become obsolete as new competitors emerge, often from adjacent industries. Thus, AI is surely worthy of board attention. Second, to develop, deploy and scale AI solutions, close collaboration is required among the different parts of your company over the life cycle of a process, product, or service. For AI solutions, data writes code. Thus, in contrast to

traditional software products, changes in input data and code are not independent, and with AI it is difficult to modularize the development, testing, and maintenance process—traditionally a requirement for scaling. Instead, development and maintenance of AI is a team effort that cuts across traditional board responsibilities.

Third, once you manage to scale AI, entirely new risks emerge. AI acts at an unprecedented speed and scale, and every outcome is measured and documented. Even a slight bias or incorrect processing can have severe negative consequences on financial returns, reputation, or shareholder value. Unexpected ethical and liability issues may arise, accompanied by novel cybersecurity threats. At the same time, corporate processes require a redesign to ensure fast and data-driven decision making.

And last, you cannot ‘off-load’ AI by simply choosing the best tech supplier. AI is not plug-and-play: your own data are involved, and ‘make-or-buy’ is much more a continuum than it is a discrete decision. Structuring the right partner relationship can be a strategic challenge in itself, but even the best supplier will not let leadership off the transformational hook.

The goal of this report is to describe how AI affects company board roles—individually and collectively—and to provide guidance on how to manage the change. Our discussion here draws from our extensive experience applying AI in business, complemented by a series of in-depth interviews with C-level executives.

We begin by reviewing what every board member needs to know about AI. We then briefly summarize some important aspects of the process of AI transformation. The core of our discussion considers how AI affects various individual board roles. Of course, every board differs in its composition. In this discussion, we assume a board structured rigorously along functional lines and address the AI topics in that manner. Our observations can then readily be applied to boards, where these functions are aggregated or covered differently.

Chief AI and Data Officer (CAIDO), might make sense—not merely as a transitory but as a permanent position.

We then extend the discussion to members of the supervisory board to understand AI to fulfill their own tasks and also to appoint management board members with the right skillset.

We conclude by listing the 8 top priorities for Boards in the AI Journey.

“Going after new market opportunities in an established industry, we as a young company had to build our ‘unfair advantage’ by leveraging the latest technologies from day one. Of those, data-based AI was clearly a massive game changer and completely underestimated in the industry before.”

Jochen Engert, CEO FlixMobility

CEO: Competitive Advantage/Strategic Direction; Organization; Values and Ethics; Leadership; Transformation

CFO: Forecasting and Planning; Risk Management; Budgeting and Investments

CIO: Data Governance and Infrastructure, Cybersecurity, Applications@Scale, Make-or-Buy

CTO: Technology for New Products and Services, R&D Process, Tech Scouting/ Collaborations

COO: Production, Logistics and Integrated Supply Chain, Procurement, Quality, Shared Services

CHRO: Talent, Skills and Reskilling, Culture and Change Management, HR Processes and Bias

CMO/CSO: Marketing, Customer Relationship and Data, Sales

We round out the management board review with a discussion of when a new role, the

What every board member should know about AI

While no one expects you to become a technical expert, here's what you, as a board member, need to know about AI:

Inductive Learning: Artificial Intelligence (AI), and more specifically its largest subfield, Machine Learning (ML, which we will focus on here), is all about inductive learning. It is a machine-based system that takes in data, pursues a goal, performs a 'best-guess' prediction/action, and receives some form of feedback, gradually improving its predictions/actions over many such cycles. By contrast, traditional computing uses deductive logic; that is, it follows 'instructions' (sometimes billions of them). Real-world systems that apply AI are typically a combination of both types of learning, a dynamic loosely analogous to the coordination of right and left brain hemispheres (or what Nobel Laureate Daniel Kahnemann calls 'system 1 and system 2').

Data: Since data are the lifeline of AI, your data strategy in regard to the classic 5 V's (volume, variety, velocity, validity, and value) needs to be a central concern when adopting AI. How much data you require depends on the problem and the AI algorithm. A simple rule of thumb is that the more data you have, the less subject matter know-how is required for the problem at hand. This has led to some frustration among functional experts and engineers, watching 'ignorant' data scientists successfully optimize their work. The converse is also true: The less data you have, the more you need to understand the underlying dynamics of the problem. In the extreme case, where you understand the dynamics perfectly, you might not need any external data at all. Go and chess, where the program knows the rules, are two such examples. Indeed, by purely internal means, namely, via simulation (self-play), AlphaZero—the AI program designed to master such games—generated all the data needed to excel.

Interpretation of Results: AI uses extremely rich algorithms. Applying them, one can 'discover a pattern anywhere', so AI does not accept the performance measures of classical statistics (such as confidence intervals on observed data). Instead, the only valid performance measure of an AI algorithm is the quality of predictions of future states, or in more pragmatic terms, predictions based on fresh data, which the system has not seen before. The essence of learning is to 'effectively generalize to such new situations'. As a board member, you will need to assess the results. By far the most powerful tool we can offer for this is visualization, accompanied by standard prediction performance measures (such as accuracy). Learning to demand and interpret results in this way is mandatory.

Speed, Scale and Learning Architectures: Another critical property of AI is its unprecedented speed. Electronic signals travel more than a million times faster than brain signals. Via our modern digital infrastructure, ma-

chine-based intelligence also attains new scales. Since AI improves with the volume of data, you should always centralize learning in your organization, although you can continue to act globally. A useful metaphor in this regard is autonomous vehicles: They drive autonomously, but individual cars don't learn. Instead, they transmit their data to a central point, where the algorithm learns from all data and is tested, and the new version is then downloaded (i.e., copied and distributed) to all vehicles at specified intervals.

Deep Learning and Deep Reinforcement Learning: It is in the nature of inductive learning that there cannot be a universal 'best' algorithm: anything could be a pattern. And indeed, we use a wide variety of algorithms in many business applications. However, for specific problems, some algorithms currently work better than others. Most famously, neural networks unexpectedly led to drastic improvements in computer vision and natural language processing (NLP) around 2012—and rebranded as 'Deep Learning' re-emerged as the mainstream AI technology. Vision and language are not only the longest standing hard problems in AI, but are also of enormous practical importance: Vision allows machines to interact with the physical world, and language allows them to interact with humans. Building on those advances, Deep Reinforcement Learning (DRL), an even more advanced technique replacing labeled data with sparser feedback rewards, has led to dramatic breakthroughs in games (with superhuman performance across all classical games) as well as in robotics. DRL is just beginning to enter the business world, primarily via controlling machines. However, while Deep Learning approaches can be very powerful when data are plentiful, their inner workings are often not easily explained (this is the 'black box' problem).

Scaling AI: Since the programmer specifies only the 'learning rule', AI algorithms at their core are comparatively simple and the basic concepts quite accessible. The flip-side, however, is that such algorithms require training data to become useful. This fact has critical consequences for leveraging AI: Because you cannot isolate the software from the data, modularization is difficult and adequate tooling has not yet been developed. As a result, successful pilots are often deceptively easy, but scaling and maintaining AI becomes fiendishly hard. One must keep track of the 'data versions' the algorithm was trained on and continuously manage the so-called ML Pipeline as a developer-to-user workflow. Mastering AI at Scale remains one of the toughest business challenges today.

Make-or-Buy Decisions: The intertwining of data and algorithms also means that AI is not plug-and-play. This, combined with the data-dependent, statistical nature of the prediction, renders particularly tricky the contractual management of tech suppliers being considered for

‘building’ and possibly ‘maintaining’ an AI application (in particular, as the data they require often belong to you). ‘Make-or-Buy’ is no longer a clear-cut decision, but rather is replaced by a continuum of partnership structures.

Bias, Risk, and Ethics: First the good news: AI is incredibly powerful at identifying outliers and detecting risks, as well as acting on them quickly. This is why AI has become indispensable in detecting fraud and money laundering, assessing compliance, and more. On the downside, AI introduces its own risks: For instance, cybersecurity becomes even more business-critical when actions have been automated. Also, the data AI was trained on determine its predictions and actions. If training data were biased towards men, the algorithm will be as well. While everyone understands that this requires some care, some wonder why this has become such a big issue. One reason is AI’s unprecedented speed and scale, which dramatically amplify mistakes. Another is the fact that everything is measured and can be changed by re-engineering (contrary to most human actions), thus inviting controls. Moreover, many dilemmas—for example, the famous ‘trolley problem,’ which presents the ethical nightmare of having to choose between pulling a lever that redirects a trolley so that it kills one person and letting the trolley stay its course so that it kills five people—have never been faced by humans, so we lack ethical guidelines. Other rules, such as ‘equal treatment,’ have in the past not required hyper-precise definitions, but with AI one is forced to choose among methods for achieving this goal: groups are different and not everyone can be treated exactly the same, so is ‘on average’ enough? However, once you’ve learned to ‘interpret results’ of AI (see above), you will be able to assess the business risks and ethical impact of many trade-offs. This will not solve all dilemmas – in particular all leading language models self-trained on the internet reveal how biased our communication still is today – but you will be able to make informed judgement calls within the new business environment and trigger the appropriate countermeasures.

AI and Humans: Paradoxically, artificial intelligence seems to be more clearly defined than human intelligence. Note, however, that nowhere have we attempted to define the ‘level of intelligence’ of AI—a question often at the center of discussions of human intelligence—but only AI’s ‘performance on specific problems’. This is deliberate. After all, ‘submarines don’t swim’—that is, machines solve problems differently from humans. We no longer measure cars with respect to horses, for example; we accept that the two do different things. The same attitude is appropriate with regards to AI.

Nevertheless, one can ask how current AI differs from human intelligence. We already mentioned speed and scale. Another difference is that AI is trained on narrow fields (i.e., ‘Artificial Narrow Intelligence’); after all, we want AI to perform specific tasks. Within the narrow confines of those fields, AI can then exhibit ‘strategic thinking and creativity’, as famously demonstrated in Chess and Go. One flaw of most current AI is that it remains quite data- and energy-hungry, although in this respect we are seeing continuous progress. Also, what AI lacks entirely is ‘common sense’—that is, taking actions on the basis of obvious insights from other areas of real life. An AI trained purely on financial data, for example, will not react to a fire in the next room. Whether we will ever see a broader ‘Artificial

General Intelligence’ may be a stimulating topic for fireside chats, but it currently has no board relevance.

A close look at the AI transformational journey

While this paper focuses on the changing nature of specific board roles in an AI-driven business world, there is the equally important transformational aspect of a company getting from point A to point B with regards to AI. Given the myriad publications on this topic, we only summarize the most critical aspects here:

1. Assess your company's AI maturity and set your priorities accordingly

One can roughly distinguish four company maturity levels in AI adoption: Experimenters, who have successfully completed their first pilots, Practitioners, who have an AI strategy and have begun real deployment, Professionals, where AI is in production and broadly embedded in the organization, and Shapers, where the organizational DNA is transformed and AI is at the core of the competitive strategy. The transformational tasks differ along this journey. Most companies are in the very early stages. The board should perform an AI maturity assessment to be aware of the current situation, its limitations and pitfalls, as well as the core priorities this situation entails.

“AI and digital technologies, combined with deep industry expertise, can help companies reshape their manufacturing and supply chains in order to adapt to a post-Covid world. We have now a unique opportunity to make industrial and infrastructure systems more productive, more resilient and more sustainable. When designing a future board, it is critical to ensure a deep understanding of how technologies can help us to drive this transformation.”

Roland Busch,
Deputy CEO and CTO of Siemens AG

2. Act as role model—living and fostering change

AI will arguably have a greater impact on processes and offerings than any recent technological change (including Digitalization 1.0). Misperceptions, fears, and resistance abound. As a board member, you act as a leader and role model for the rest of the company—first and foremost by bringing clarity to complexity.

In order to do this, you yourself must develop a basic intuitive understanding of AI and learn some associated new skills. You must then live the change: The strategic direction, priorities, data-driven actions, support of innovation/experimentation, and—yes—even the upgrading of the board's competencies regarding AI should figure prominently in your communication and actions.

3. Embrace AI as a transformational journey—well beyond IT

For your company to truly leverage AI and generate value-creating results while avoiding value-destroying traps along each stage of the maturity journey, a comprehensive programmatic approach is required. Such a program starts by developing a guiding AI strategy and vision, then identifying and prioritizing use cases, professionally developing AI solutions, and finally guiding the organizational change process with proven knowledge and best practices and standards. At the same time, all AI-enabling factors in your company must be upgraded, including data and ML infrastructure, people and talent, organization and governance, and, ultimately, suppliers and partners.

IT has an important role to play, but since data—and thus ‘content’—can no longer be separated from algorithms, users are an integral part of the AI transformation. As a result, every AI initiative requires joint ownership by the business user and technical/process experts. Within and beyond the IT organization, AI requires new skills and paradigms to an extent not known in Digital or Big Data waves. Processes and applications have to be re-considered from a data perspective, and data pipelines have to be built—collectively affecting all parts of the organization. Arguably, the IT department itself is subject to the largest transformation, as it must move much closer to the operational units and acquire new technical, business, and user-interaction skills. However, well beyond this, AI is truly a company-wide transformation.

How AI is changing the role of the individual C-suites

THE CEO

A tale of two companies:

The head of the supervisory board of a large European Company asked in early 2020 how the company is faring in the AI race compared to its largest competitor (numbers 1 and 2 in the world). The CEO of the competitor's company publicly announced plans for global AI leadership, provided substantial funding, and was trusted internally and externally through believable actions. He also took private lessons from AI experts. In contrast, the inquirer's own CEO did not include AI in his communication, and internally the relevance of AI was challenged: As a consequence, AI was pursued only in a small, isolated "pet" team. As might be expected, the difference in the adoption and impact of AI between the companies was drastic; so was the assessment by shareholders and customers.

Core responsibilities	AI-triggered challenges	Typical problems/ misconceptions
Leadership	<ul style="list-style-type: none"> Walk the talk on AI New requirements for board leadership team 	<ul style="list-style-type: none"> Not educating oneself (succumbing to buzz) 'Delegating AI', camouflaging with 'fancy hires/titles'
Competitive advantage/ strategic direction	<ul style="list-style-type: none"> New business models (threats/ opportunities) in the age of AI with completely new players attacking 	<ul style="list-style-type: none"> Focusing internally and taking incremental actions, without once challenging existing structures from an 'AI first' perspective
Values and ethics	<ul style="list-style-type: none"> AI raises ethical questions that didn't need to be addressed before 	<ul style="list-style-type: none"> Neglecting the topic or search for 'rules-based' solutions
Organization	<ul style="list-style-type: none"> Interdependence of humans and machines in processes and structures Organizing for AI 	<ul style="list-style-type: none"> Seeing AI as 'just another tool', merely adopting or slightly adapting past approaches
Transformation	<ul style="list-style-type: none"> Company-wide transformation and reskilling process 	<ul style="list-style-type: none"> Underestimating impact

Leadership: The behavior and demonstrated priorities of the CEO first and foremost set the tone for the entire company. The CEO is Employee Number One. In addition, CEOs also carry primary responsibility for the composition and mode of interaction of their leadership teams. In carrying out these functions, CEOs need to be authentic and decisive. Everyone watches how CEOs behave and act as well as what behaviors and actions they demand (or tolerate) in others. Inaction—but also ‘fake’ communication or actionism—will suffocate any AI effort.

“The grand challenges of our times require new approaches, wherein Digitalization and Artificial Intelligence can be key. To this end, we need to collaborate across organizational units and top management must provide the necessary frame with direction, dynamics and degrees of freedom. Jointly, we will learn and identify the best paths to reap the benefits of AI.”

Reinhard Ploss, CEO Infineon

Competitive Strategy: CEOs are also responsible for a company’s overarching strategy, and they have to be alert, in particular, to new business opportunities and threats. In one sector after another—not just in Silicon Valley—we have seen companies with AI-driven business models striving for industry dominance.

“Many companies make the mistake to put AI only on a level with very advanced use cases and shiny lighthouse projects. AI simply is one of the most important factors for competitive advantage that every company needs to be able to apply. It is nothing magical. The job of the CEO is to demystify AI to create acceptance, reduce fears and start a real transformation – with value adding use cases. You cannot afford not using AI.”

Stefan Vilsmeier, CEO brainlab

Just observe Netflix moving from media delivery into becoming the preeminent content provider, Nvidia becoming a global force in autonomous driving, Ant Financial offering the most comprehensive financial services of any global bank, and many more. In all such cases, the AI-enabled business model differs substantially from that of incumbent players and cannot succeed merely through incremental changes. Missing such a threat or opportunity is arguably the biggest

blunder a CEO could commit.

Values and Ethics: CEOs also carry ultimate responsibility for the mission and values of a company with respect to all stakeholders: employees, customers, governments, shareholders, and society at large. For instance, even the most sophisticated tech players have proven unprepared for the ethical challenges posed by AI. While this is often attributed to a ‘black box’ opacity of particular algorithms, this perception is misleading. As discussed above, the core of the issue is the speed and scale of AI action, combined with its measurability and capacity for re-engineering. CEOs need to be able to interpret data, understand what may be achieved, and foresee the consequences. Only this will enable CEOs to make responsible judgement calls, trigger effective actions, and properly respect legal or regulatory requirements (e.g., avoiding discrimination). One thing CEOs will quickly learn is that ‘simple ethical rules’ fail when it comes to AI, as such rules are easily perverted when subject to precise algorithms^[2]. Imagine an algorithm, for example, that is required to protect the environment and decides to kill all humans as the optimal way to achieve that goal. Such ‘collateral damage’ effects are ubiquitous in one form or another.

Organization: Overall organizational structure is typically also decided by CEOs in conjunction with the board as a whole. Such decisions require an implicit (or explicit) paradigm of core company processes that may change dramatically in a man-and-machine world. Integrated, AI-supported (or AI-driven) demand forecasting + production planning + pricing, for example, could require the crossing of traditional responsibility areas, with strong implications for organizational structure. Understanding the organizational changes needed requires a basic understanding of the nature of the technology involved

AI Transformation: One specific decision the CEO must make is how to structure the AI-driven transformation itself. A precursor to this challenge has been how CEOs have addressed digital transformations. In some regards, AI is a natural continuation of those transformations but requires deeper technical skills and challenges more aspects of work in a fundamental way. We will review some people-related aspects of the transformation in the CHRO section below and the CAIDO discussion at the end.

“Shaping AI into a powerful tool in any corporation is a transformational process that requires continuous attention and support of the management board. Beside enabling the teams that drive AI adoption, understanding as well as highlighting AI’s benefit for our organization is crucial for a successful scaling of AI to an enterprise level.”

Frank Mastiaux, CEO EnBW

THE CFO

At the core, CFOs are responsible for finance and control, including budgeting and forecasting, as well as risk management. AI affects these tasks in a fundamental way, and this raises some challenges. As a result, however, the CFO receives an entire new set of tools that renders him one of the most powerful ‘information managers’ in the company with a decisive contribution to steering the corporation.

Core responsibilities	AI-triggered challenges	Typical problems/ misconceptions
Budgeting and investments	<ul style="list-style-type: none"> • ‘Investment under uncertainty’ models for AI (similar to innovation) 	<ul style="list-style-type: none"> • AI investments treated as IT invests
Risk management	<ul style="list-style-type: none"> • Accountability for AI risks and regulatory requirements (black boxes, black swans, and black sheep) 	<ul style="list-style-type: none"> • Not appreciating/managing the distinct competence and risk profiles of AI
Forecasting, planning, and risk detection	<ul style="list-style-type: none"> • Lead user role for automation of tasks with AI (planning, forecasting, and compliance/risks) 	<ul style="list-style-type: none"> • Lack of appreciation of performance (strengths/weaknesses of AI in forecasting)

Budgeting and Investments: Applying AI to specific challenges and opportunities carries an inherent uncertainty. While there is an increasing body of experience involving the performance of AI in a wide range of use cases, there always remains a dependence on the variable quality, quantity, and availability/timeliness of the data. This uncertainty increases with the complexity (and, normally, the correlated value) of the AI solution.

“You have to leave the traditional approach, because an AI project does not have such a clearly measurable return, especially in the beginning. Therefore, you have to put money aside in the investment budget and say with that we develop and explore now.”

Matthias Weber,
CFO Sandoz Germany

As a chief transformation officer explained to us: AI investments should be treated similar to investments in innovation or agile product development. These must follow a staged approach with regular milestones (gates, sprints). The process is the joint responsibility of the user and the development team, with finance at the table from the start. The overall ear-marked budget should be stable (i.e., not seen as ‘discretionary spending’), but the precise direction (and potentially even abortion) of the process should be considered at each milestone. It would be a severe mistake if the CFO were to treat AI as an IT investment and expect a full-fledged schedule, list of deliverables, and NPV from the start. Such uncertainties are among the factors that burden contractual arrangements with third party providers for AI services.

Risk Management: The CFO is often also responsible for assessing major financial risks to the company. As discussed, AI is an excellent tool for detecting many risks, but it also introduces its own risk categories around action liabilities, regulatory, and legal issues. Compliance can be tricky, since most such regulations are set-up in a rules-based way—with all of the challenges this entails, as previously discussed—and, in addition, often demand ‘code transparency’ in order to ensure that such rules are observed. However, AI often doesn’t naturally lend itself to rules-based transparency (nor do humans, for that matter—consider the absurdity of demanding your thoughts to follow ‘rules’). The actions of AI are measured precisely, can be monitored, and can often be forced into specific regulatory patterns more readily than human actions. What is often hard is inspection or reconstruction (‘explanation’) of what went wrong, unless specified beforehand. Regardless, the CFO has to understand the probabilistic nature and high-level structure of critical AI and thus assure legal safety. For example, after an accident it might be hard to assess whether AI recognized a traffic sign. However, if you specify beforehand that you need to know what traffic signs AI identifies, these can, of course, be generated and stored explicitly and thus be readily available. Many practical problems are of this kind and can be addressed in a similar way, possibly in an explicit preemptive dialogue with the regulator. Such structures also render AI risks ‘insurable’.

excellent lead users of AI, and the widespread, strong statistical knowledge present in their teams allows them to interpret results correctly. As a result, CFOs often have the role of demonstrating to their board colleagues concrete AI applications in internal processes, thus supporting data-driven discussions.

“In challenging times, the first priority of a CFO is keeping a company’s balance sheet and cash position healthy. At the same time, however, he or she must assure investment into transformative technologies. Nowadays, most of these are built on AI.”

Levin Holle, CFO Deutsche Bahn

Planning, Forecasting and Risk Detection: Finally, many functions within a CFO’s own domain, such as planning, forecasting, and risk detection (but also order processing and invoicing), are excellent candidates for automation through AI solutions. Fraud and money-laundering detection as well as compliance can hardly be addressed at all anymore without AI. Also, irregular patterns and outliers in financial data or market data—pointing to other potential risks—are standard application areas for AI, as are physical and financial forecasting, planning and fully automated order processing. Thus, CFOs are

THE CIO

The CIO has one of the most critical roles in the successful implementation of AI-based applications. However, many IT organizations today are more focused on maintaining traditional IT infrastructure and enterprise software (SW), than on transitioning to a software stack supporting AI (Software 2.0). This extends the longstanding discussion about 2-speed-IT: How to ensure a leading-edge support of AI-based solutions while continuing to serve legacy applications. As a result, there is also a continuing discussion of the overall role of CIOs within their organizations in driving AI and of the CIO’s relation to the AI core team (which we will discuss later in the section, “Need for a ‘CAIDO’?”).

The CIO needs to manage the differences between the AI unit (wherever this is located) and traditional IT, expressed in often conflicting development/work cultures. In addition, the CIO organization should maintain a close, rich communication with the user community. This requires fundamental changes. For instance, it is unlikely to be achieved by communicating overwhelmingly via SLAs.

Typically the CIO has the deepest subject matter expertise on AI of all the board members and acts as a critical sparring partner for all other board members.

Core responsibilities	AI-triggered challenges	Typical problems/ misconceptions
Data governance and infrastructure	<ul style="list-style-type: none"> Data governance Establishment of AI infrastructure (ML Pipeline) 	<ul style="list-style-type: none"> No adjustments of approaches and guidelines to AI
Cybersecurity	<ul style="list-style-type: none"> Cybersecurity in the age of AI 	<ul style="list-style-type: none"> Unpreparedness for security of automated processes (beyond traditional ‘data security’)
Applications@scale	<ul style="list-style-type: none"> Scaling and maintaining AI-based solution 	<ul style="list-style-type: none"> Accrual of so-called ‘technical debt’ via legacy processes
Make-or-buy decisions	<ul style="list-style-type: none"> Adopt partner approach to ‘data-based SW’ development and maintenance 	<ul style="list-style-type: none"> Lack of methodology for ‘make-or-buy decisions’ in AI

“I am deeply convinced that AI is the greatest transformation in the history of the company.”

Matthias Ulbrich,
CIO Porsche

Data Governance and Infrastructure:

The CIO's first critical responsibility today is for the data and IT infrastructure and (often) governance, and thus for the 'soil' of AI applications. An effective data strategy relies fundamentally on data acquisition, data availability and integration, as well as speed of access and data quality. The performance of most ML algorithms depends on massive amounts of data, as well as on their quality and timeliness. This should be 'raw data', stored in data lakes, rather than excerpts of copies, which have sometimes characterized traditional data warehouses. Moreover, labelled data are required for training the algorithms of the most common 'supervised' ML. This puts an even higher burden on the CIO to collaborate effectively with users and to design company-wide data pipelines and AI architectures. The CIO is traditionally responsible for defining and implementing the processes and standards for acquiring, handling, and processing data. At the same time, ML algorithms often require specific software, hardware, and storage for superior performance.

Cybersecurity: The more processes that are automated via AI, the more sensitive cybersecurity becomes. CIOs themselves must become early adopters of AI: Since AI is frequently used in cyber attacks, it becomes indispensable for the defense. Moreover, cyber-risk increases when the target can now be an AI-powered automated action instead of just data. Finally, unless proper care is taken, cyber corruption may hide behind probabilistic actions and remain unnoticed for some time. Not surprisingly, insurance products for cybersecurity have become one of the fastest growing markets.

all these processes, the CIO and the IT function are critical. How quickly they can be fully trained and mobilized often determines the speed of AI deployment.

Make-or-Buy: Last but not least, the CIO often has an important role in 'make-or-buy' decisions. These range from standardized infrastructure decisions (e.g., the use of cloud resources) to contracting technical partners for IT solution development. The intertwining of (company) data and AI solutions, combined with the statistical nature of the results, raises many critical concerns about IP ownership, contract and delivery management, and business practices when sourcing services for AI. Managing such a process professionally is much more demanding than traditional software and services procurement. The CIO organization needs to live up to those changes.

“The CIO plays a key role as he needs to strengthen the interface between the traditional IT organization and the AI teams as well as supporting a stronger collaboration between IT.”

Dirk Ramhorst,
CIO Wacker Chemie

Applications at Scale: In order to create significant company value, AI needs to be deployed at scale. This is notoriously difficult since data pipelines, feature libraries, versioning/updating, automatic deployment, and many more factors need to be professionally managed—although no standard infrastructure and workflow has to date been established. In

THE CTO

The CTO role is most common in technology-driven product and services companies. Having just adapted to an increasing share of software in offerings, many CTOs are now stretched with the further switch to AI. On the other hand, those who have mastered the challenge are a key pillar of the AI transformation and can be a superb competitive assets for company boards. The support of internal processes is typically in the CIO realm, except for the very R&D processes themselves, where AI enables highly promising new opportunities.

Core responsibilities	AI-triggered challenges	Typical problems/ misconceptions
Technology in new products and services	<ul style="list-style-type: none"> Changes in AI-powered product paradigms Transformation of the service business model 	<ul style="list-style-type: none"> Misperception that AI only adds features to a product but does not change it fundamentally. Lack of experience with “autonomous products” and the long-term data dependencies of “trained” algorithms
Technology scouting and collaboration	<ul style="list-style-type: none"> Definition of external AI partner organizations Integration of AI in the technology scouting process 	<ul style="list-style-type: none"> ‘Not invented here’ syndrom Lack of experience of how to effectively collaborate with start-ups
R&D process	<ul style="list-style-type: none"> Generative AI technologies and simulation in R&D process 	<ul style="list-style-type: none"> Incompatibility between the paradigms of SW 1.0 and SW 2.0 processes

Technology of New Products and Services: The CTO can face unprecedented changes in value drivers and features when AI is integrated with product offerings. Whether it is autonomous vehicles or AI-driven wind farms, many of the traditional product paradigms are shifting.

“To benefit sustainably from AI technologies it is essential to adapt entire product life cycles, development and supporting processes. Resulting challenges caused by AI should not be underestimated. For example, legacy processes and the way of solution development must be redesigned and people must learn and think differently, ideally in a business sector overlapping approach.”

Michael Tagscherer,
CTO Giesecke+Devrient

Until now, products have been designed, developed and tested to the point that their actions are nearly completely predictable.

AI-based products act and react autonomously—as with, for example, the numerous decisions required for autonomous driving units to navigate safely through traffic or, to take another example, the algorithms that assess the credit risk of customers. The experience with these types of products varies across applications. Also, the probabilistic nature of AI can render it more difficult to determine wrong behavior in advance. The CTO thus needs to be aware the different technical characteristics of ML algorithms and develop guidelines for the application of AI within products. These guidelines should state the safety requirements and appropriate risk profiles necessary for different types of products. For example, in safety-critical processes or products, only low-risk and easily

explainable models can be applied. Similarly, to ensure a virtually bullet-proof cyber-security that would prevent, for instance, an autonomous vehicle from being hijacked, it is advisable to design it by continually adapting cybersecurity measures to ever more sophisticated tests on adversarial attack vectors and strategies.

Often an even more immediate challenge is the fundamental shift in the service business model—frequently a core profit driver of product businesses. Predictive maintenance has become an expectation of many customers and most R&D teams are fully capable of delivering this. However, without adjusting the business model, they risk triggering a profit dip via a declining service need. This constitutes a significant business risk, since service can account for more than 40% of the entire margin. Designing technical solutions for an innovative service business, including many novel customer-centric offerings, requires excellent collaboration between the CTO and CMO organizations

R&D Roadmap and Process: Within the domain of the CTO, numerous fields of application for different AI solutions exist. Therefore, AI needs to be incorporated into the technology roadmap, and systematic, long-term development and application plans for AI need be created and executed. These might include fostering AI-related research in certain areas relevant to the company. Due to the rapidly changing nature of the field, these plans need to be revised and updated frequently. Important applications for AI within the product and technology domain include new AI-powered methods for developing and generating products such as intelligent simulation, development tools, and research acceleration (e.g., drug development for pharmaceutical companies). Also, cross-functional requirements increase. For instance, AI-based conversational agents require intense interactions and collaboration within R&D, but also with IT, customer service, marketing, and other parts of the organization.

“Reinsurance has been at the forefront of leveraging Artificial Intelligence for business. Complementing our strong internal skills, we have profited strongly from collaborations with innovative start-ups.”

Thomas Blunck,
Member of the Executive Board of MunichRe

Technology Scouting, Talent and Collaborations: Access to the right capabilities and resources is essential for incorporating AI within the product landscape and development process. The CTO must decide which aspects to pursue in-house (and build up the required capabilities accordingly, jointly with HR) and which elements to source externally either via outsourcing or dedicated partnerships offering the potential for synergies. For the make-or-buy decisions and the selection of external sources, potential long-term dependencies and lock-in effects must be regarded closely.

Of course, AI can also be used as a tool supporting the identification of new technologies and making it more transparent for all involved stakeholders during the scouting process.

THE COO

The COO is one of the prime users applying process-centric AI solutions. Being in charge of ‘running’ the core operations of the company, many high-value applications of AI fall within the COO’s responsibility. While many companies do not have the COO role in the board, the challenges discussed here apply equally to the divisional directors or production/procurement directors, respectively.

Core roles	AI-triggered challenges	Typical problems/ misconceptions
Production	<ul style="list-style-type: none"> AI-enabled production management (customization, availability) New generative concepts Intelligent automation replaces off-shoring 	<ul style="list-style-type: none"> Incremental approach, missing holistic potential Led by traditional engineering optimization paradigms Failure to quickly adapt manufacturing footprint strategies
Logistics and integrated supply chain	<ul style="list-style-type: none"> Quantum leaps in performance via holistic AI-driven reengineering 	<ul style="list-style-type: none"> Lack of E2E thinking Belated ‘AI First’ approach
Procurement	<ul style="list-style-type: none"> New supplier optimization methods New economics of services 	<ul style="list-style-type: none"> Being outsmarted by more AI-savvy suppliers
Quality	<ul style="list-style-type: none"> New requirements of AI-enabled products New quality assurance methods 	<ul style="list-style-type: none"> Lack of understanding of AI failure modes and risks
Shared services	<ul style="list-style-type: none"> AI replaces labor cost arbitrage 	<ul style="list-style-type: none"> Failure to switch paradigm

“Artificial Intelligence is the most powerful new tool to optimize operations across the board: production, infrastructure and networks, all the way to customer- facing commercial processes.”

Karsten Wildberger,
Board Member and COO – Commercial of E.ON

Production: For discrete production processes, many applications of AI are already in use, primarily around predictive maintenance. As noted above, AI can foster entirely new production approaches creating structures that can only be produced using new additive production methods.

Moreover, the more AI supports automation, the weaker becomes the labor-cost arbitrage argument for off-shore manufacturing, in particular when adding global supply chain risks. Using AI aligns production footprints with the market instead.

Within the process industry, applying AI allows for holistic control and optimization of the process, replacing traditional and more limited linear control systems. Google, for example, allowed the cooling of its data centers to be controlled by a self-learning AI system, leading to significant savings in energy consumption.^[3]

A common trap is to focus on an incremental optimization of individual steps of a process. While these projects might bring in some value, greater value is often achievable via a full transformation of the production process.

“For our company, AI will play a key role in the coming years. AI allows us to optimize production as well as SG&A processes in a holistic way and realize completely new efficiency potentials. However, we as a company have to approach the topic step by step and learn how AI creates the most value for us.”

Martin Weidlich,
Member of the MAHLE Management Board

Logistics and Integrated Supply Chain:

In the field of logistics and supply chain management there is a longstanding tradition of using mathematical methods for optimization. However, AI adds completely new tools that allow for the use of much larger amounts of data and make possible a significant leap in performance. AI can be used to optimize many processes, from demand forecasting to production steering. Furthermore, AI allows us to optimize entire systems, whereas traditional methods emphasize the optimization of parts. Accordingly, making full use of AI requires—as described above—a holistic approach, not just an optimization of the different steps in the process.

But a further automation of the supply chain through the use of AI also leads to greater vulnerability to unexpected events and makes it harder to predict response patterns. Thus,

the COO needs to develop an understanding of robust AI systems.

Procurement: As procurement is a data-driven process, AI offers great potential here. AI can help find new and better suppliers, optimize running contracts, sift through tons of procurement data to find elements with saving potential, optimize prices in auction based contracts, and integrate data from various sources for a continuous supply risk assessment.

Companies need to be careful not to miss the boat here. Once suppliers and competitors rely on AI-based systems, companies who miss the connection may find themselves in a rapidly deteriorating competitive position.

Quality and quality management: In terms of quality management, the use of AI is both a great opportunity and a great challenge. On the one hand, AI-based systems enable improved quality assurance. For example, computer vision-based systems can automatically inspect all parts at virtual zero marginal costs, whereas previously only random visual inspection was considered economical. On the other hand, the use of AI in the product itself requires a whole new understanding and approach to product quality issues. As discussed above, AI's unprecedented speed and scale drastically amplify mistakes, while the machine learning algorithm renders it challenging to predict the behavior of the AI-based systems in all circumstances.

Shared Services: Shared Services in Finance, IT, and HR today pool – and often off-shore – routine processes. These are, however, among the first candidates to be fully automated, with AI addressing the limited tasks still requiring judgement or ‘intelligence’. These activities range from reading and classifying documents to simple communication and decision making. In India, where business process outsourcing is a major industry, providers sounded the alarm bells on the traditional approach based on labor cost arbitrage about five years ago. All providers are now trying to switch their offering towards AI solutions, shifting towards a competence-based business model. The COO should understand such paradigm shifts, the changed economics involved, and the phase-out of the labor arbitrage model in such services.

THE CHRO

In the long run, the integration of AI solutions into corporate processes will dramatically affect the daily work of nearly all employees. At the same time, HR topics are amongst the most persistent and sensitive bias issues in AI. The CHRO is therefore critical for the success of the AI transformation in terms of talent/skills, culture, and change management. A central challenge is to assure HR’s own understanding of a human-and-machine world.

Core roles	AI-triggered challenges	Typical problems/ misconceptions
Talent, skills, and reskilling	<ul style="list-style-type: none"> Acquiring, developing, and retaining AI talent Adding AI to traditional roles Reskilling of people affected by AI 	<ul style="list-style-type: none"> Challenge to assure experience/ skills in the HR team itself to address its needs and consequences (e.g. reskilling) Limited collaboration with technical teams
Culture and change management	<ul style="list-style-type: none"> Change towards human-and-machine processes Employee AI fears 	<ul style="list-style-type: none"> Lack of experience of human and machine world Insufficient communication on the topic
HR processes	<ul style="list-style-type: none"> Strong bias in leading language programs trained on the Internet AI assistance of HR processes 	<ul style="list-style-type: none"> Missing experience in efficient methods to identify and correct bias Expertise and technical support in balancing tool leverage and ethics

Talents, skills, and reskilling: The AI transformation will lead to completely new role profiles. First, there will be a surge in the need for technical skills (such as data scientists or ML engineers). Therefore, the CHRO—in conjunction with all the business managers—needs to define such new role profiles (or the extension of existing roles) with required AI capabilities. These identified capabilities and new skills must be incorporated into a comprehensive HR strategy. Within the HR strategy, the CHRO also needs to specify how such skills can be acquired (externally) or developed (internally) and how talents can be retained successfully. This HR strategy needs to be aligned with and support the company’s technology roadmap.

Second, for those employees whose current tasks are affected by AI, reskilling and learning opportunities with clear progression paths forward will be required. The CHRO needs to clearly and actively communicate these professional learning and development opportunities and why they are necessary. Many CHROs today struggle with identifying and tailoring the right programs.

AI talents are scarce and often require a specific set of incentives and a distinct working culture. It is the CHRO’s responsibility to implement enabling measures and work-

ing conditions that will attract these talents, but also fit the company. Requirements begin with access to data—often a critical selection criterion of applicants—and go on to include state-of-the-art infrastructure (computing power, software, etc.), challenging projects, clear career paths, and flexibility (e.g., of working hours). Hiring and retention success depend quite critically on these factors.

Culture and Change Management: All board members will be challenged to both imagine and manage the transition towards a human-and-machine business world, but HR is most directly affected by employee questions, fears, and needs. It is crucial for the CHRO to critically assess his or her own team and ensure the appropriate upskilling. The CHRO then needs to develop a strategic workforce concept and communicate this actively. The very term ‘artificial intelligence’ and its widespread connotations raise fears that the more technical term ‘machine learning’ never did. The CHRO needs to address those fears, eliminate misconceptions, motivate people, and in general manage the cultural transformation and change process. Often employees do not have easy access to correct and unbiased facts about AI. Offering

relevant and easy-to-understand information is, therefore, an important first step in the cultural transformation of the company towards a new human-and-machine reality.

“CHROs are in a pivotal position for the adoption of Artificial Intelligence. The combination of hype and fear out there is not helpful to drive an engaged, productive adoption of this important technology in companies. Therefore, a lot of energy and dialogue is required to guide employees through the transition.”

Alexander Eckert,
Global SVP HR Gerresheimer AG

Apart from formal communication, training programs, and structural changes in the workplace, opportunities for interacting with AI in less formal ways need to be created. The more interaction employees have with various aspects of AI, the better they will understand the abilities and limitations of AI, leading to an overall increased interest and acceptance of the new technology. Creating several touchpoints throughout the value chain will, therefore, also reduce the resistance towards AI in general and towards the AI transformation within the company.

HR processes: One of the most frustrating aspects of top-performing natural language programs is the lingering bias with respect to gender, skin color and more. What was originally thought of a problem of carelessly selecting training databases has persisted in the top-performing language platforms, self-trained on the Internet – a reflection of the inherent biases in human communication today. The effect on the system can be very subtle, buried in the direct and indirect connotations of thousands of words. At the same time, AI has proven to be incredibly effective in interpreting humans and there is an enormous incentive to render HR processes more effective, systematic, scalable, and ‘reviewable’ via the use of AI. The enormous challenge is the combination of the two. At the same time, the mere fact that the recommendations of AI programs are systematically measured, also allows to surface and track such biases and address them explicitly by renormalizing outputs and results. HR needs to be on top of these developments and technologies, in order to use and advise on their use, so fairness and top-performance can be improved perhaps beyond the often disappointing levels achieved in many companies today. Thus, the arguably biggest challenge is at the same time an enormous—and it is up to HR to make sure it has the expertise to lead in this realm of technology and ethics.

THE CMO

Marketing and Sales have arguably been the single largest application area for early AI-based solutions over the last few years, with an increasingly finer segmentation and targeting. Customer data is a critical asset for the company and especially for the CMO, while also being highly sensitive and increasingly regulated, especially in Europe. Thus, the CMO needs to become among the most AI-savvy members on the board.

Core roles	AI-triggered challenges	Typical problems/ misconceptions
Marketing	<ul style="list-style-type: none"> • Beyond 'segment-of-one' to current context, from targeting to offering • AI-optimized customer journeys • AI-optimized targeted advertising 	<ul style="list-style-type: none"> • Slow transformation of marketing into a data-driven 'technical' department
Customer relationships and data	<ul style="list-style-type: none"> • Managing a wealth of customer touch-points and data 	<ul style="list-style-type: none"> • Balance between superior service and customer unease (or legal data protection issues)
Sales	<ul style="list-style-type: none"> • Online prevalence and 'human-and-machine' data- driven management of sales force management 	<ul style="list-style-type: none"> • Inexperience in change management of physical sales force

Marketing: Leveraging the ever increasing body of customer data and interaction points has been the biggest megatrend in marketing in recent years. In the consumer space, the famous 'segment-of-one' has long ceased to be the limit. With AI, you can further differentiate in what specific context the individual is at that moment. Some companies have gone from one message to all customers per week to multiple messages to every individual customer per day.

“Customer-facing processes are the lifeline for a customer focused, inspiration and tech driven company such as ours. And Artificial Intelligence – properly applied – is the single most powerful tool set going forward.”

Sebastian Klauke, Member of the Executive Board of Otto Group, responsible for E-Commerce

Demand forecasting, advertising, messaging, targeting of offers, customization of products and services—all of these have undergone a major transformation powered by AI. CMOs, CIOs, and CTOs have learned to collaborate whether proactively or forced 'the hard way' by markets and competitors.

AI thus drastically changes the marketing function, causing it to become totally data-driven and increasingly technical. 'Intuition', traditionally valued as the ultimate skill, has almost become a derogatory term. For instance, the dominant channel for advertising is now online, where everything is optimized by AI. As a CMO, you would be in serious trouble if you made the once-acceptable claim, 'Half of my advertising budget is wasted—but I don't know which half'. Marketing departments must meet the new demands (infrastructure, skillset) and allocate resources towards implementing AI-driven approaches.

While the above perspective has often been associated with B2C marketing, it now encompasses B2B, creating online customer journeys and continuous interactions along the way. Similarly, in the machine world, ubiquitous sensors are providing a wealth of data of usage and performance states so as to allow for critical improvements and targeted offerings.

Customer relationships and data: While in the best of cases these developments might lead to a much closer customer relationship, there are many traps. In Europe a large body of regulations around customer data, most prominently GDPR, needs to be observed. But all across the world, the balance between enabling superior customer service and risking the perception of privacy intrusion, surveillance, and manipulation needs to be respected. Also, automated customer interactions (e.g., via chat bots) can be a source of delight or a turn-off, depending on the implementation. Thus, it is important for the CMO to keep in mind the potential negative sides of AI products for the brand and for customer experience.

“We have already started to use AI in our marketing cloud and in product data generation, among other things. But I am convinced that marketing and also my role will change profoundly with AI. We, as a marketing team, have to put much more focus on data than we do now, and this is fundamentally changing the way we work.”

Christian Sallach,
CMO & CDO, WAGO Kontakttechnik

Sales: The large impact of AI on marketing almost directly translates into a similar impact on sales. For the rapidly increasing online transaction market, this is obvious. Even for many offline transactions, such as cars, most of the ‘action’ also already happens online, powered by AI. But even when a physical sales force is prevalent, AI-powered support for ‘next best offer’ and ‘effective sales-force management’ is becoming ubiquitous. Formerly intangible knowledge of the individual sales representative is now digitized and transparent and can be used as input for AI applications. This allows for more informed AI-supported decision making and management.

Need for a CAIDO?

Given the wide range of new expertise required and the extensive demands of the AI transformation, the question arises whether the board should be strengthened via a new dedicated role in charge of the AI journey: the Chief AI and Data Officer (CAIDO). In some ways this role resembles the Chief Digital Officer at the onset of the Digital Age. But we would argue that the CAIDO role requires even deeper technical expertise and involves more permanent tasks.

“Even for ‘digital native’ companies, Artificial Intelligence (AI) is a step change and the role of a Chief AI and Data Officer in the company board is critical — not only to challenge the status quo from an ‘AI First’ perspective but also to clearly message the importance of AI to the rest of the organization and global top talent that supports this step change.”

Ralf Herbrich,
SVP Builder Platform and AI at Zalando

The key responsibilities of a CAIDO are threefold:

1. Challenge the status quo from an ‘AI First’ perspective

The CAIDO brings to the table in-depth AI expertise and has a distinct and more independent perspective on the existing infrastructure and business model. From an aspirational ‘AI First’ perspective, the CAIDO analyzes and challenges the current situation. Also, as an independent role, the CAIDO does not have the potential domain bias of the existing board members (CIO, CFO, etc.) when establishing overall priorities.

2. Drive AI initiatives throughout the company

Without the responsibility for other functional tasks, the CAIDO can commit entirely to driving AI initiatives forward. For a company to reach a high maturity level in AI requires fundamental changes in infrastructure, data, people, organization, processes, and the partner/supplier ecosystem. A dedicated board member responsible only for pushing AI projects can tackle problematic issues more effectively and with greater strength.

Moreover, AI initiatives need orchestration and coordination on a company-wide level, typically supported by an AI Center of Excellence (COE). The CAIDO is responsible for ensuring the overall alignment of AI activities and for successfully overseeing the existing initiatives throughout the complete lifecycle. Without top-level oversight of the complete AI portfolio and programs, duplication of efforts and waste of resources is likely. Additionally, effective coordination can create synergies for the company—for example, by leveraging existing datasets for other related use cases.

The CAIDO should also assume more permanent roles beyond oversight of the central AI talent pool. Given the critical role of data for AI, one obvious area needing oversight is data access and governance. Depending on the personality, priorities, and capabilities of the CIO, other areas, such as AI partner and ecosystem management, could be added. To be clear, this could affect typical responsibilities of the CIO, and thus the interaction between CAIDO and CIO need to be highly collaborative and carefully balanced.

3. Serve as a sparring partner for other board members

Last but not least, the CAIDO is the AI expert on the board, viewed as a team. The CAIDO serves as the sparring partner for other functions, raises important competitive issues in strategic discussions, and points out new opportunities and risks (perhaps already encountered elsewhere in this fast-moving field and shared via the AI community).

Clearly, such a role comes with a few challenges.

Most obvious is the scarcity of strong candidates. As documented by the initial revelation of Sergey Brin from Alphabet, AI has only recently become a mainstream subject, even in Computer Science. As a result, there are hardly any AI experts who also have a strong transformational experience at large companies. Young disruptive entrepreneurs with a strong AI background are rare; also, adding them to an established board, possibly without granting them their own significant budget, has not worked particularly well for CDOs in the past.

The other challenge is that a cross-functional transformation officer without explicit operational authority is always fully dependent on the CEO. This is not a healthy dynamic for a high performing board team. By comparison, chief restructuring officers (CROs) with a transformational agenda (albeit a very different one) have worked out well due to their clear operational mandate.

“Appointing new board members - whatever their designation – to strengthen the skill set in technology and Artificial Intelligence requires a proper preparation. In particular, the role has to be empowered with a strong budget commitment and operational responsibility if the transformative expectations are to be fulfilled.”

**Sabina Jeschke,
Member of the Management Board for
Digitalization and Technology,
Deutsche Bahn AG**

The upshot is this: Firstly, it depends on whether you already have a CIO or CTO on your board and what skill-sets they cover. Beyond that, if you can find an integrative, experienced, and knowledgeable person, accepted by the board as strengthening the team, then adding a CAIDO could be an enormous asset. In practice, we expect companies to review their experiences and lessons learnt with CDOs (typically a more transitory role). This will allow them to decide, whether and how to add a CAIDO in a truly constructive way.

“I am convinced that it is necessary to represent data- and cloud competence on the board level in form of a C-level function. In addition, the responsibility for scaling AI needs to be co-shared by the business units. Genuinely fostering collaborative, iterative, cross-functional teams is one of the top critical success factors for whether an AI projects succeeds or fails.”

**Carola Wahl,
Board Member, ex-CTMO Axa Switzerland**

“AI will become increasingly important for every company and board. As supervisory board member, to provide valuable advise and monitor to the companies activities, personal upskilling is inevitable to understand AI. We will need more diversity, humbleness and expertise in supervisory boards to fulfill our jobs.”

Sabine U. Dietrich,
Independent Supervisory Board Member
(incl. Commerzbank)

Getting the Supervisory Board ready for AI

Not only the management board but also the supervisory board should play a central role in the AI transformation.

The supervisory board has two principal duties by law: to monitor and to advise the management board. In order to fulfill these duties, supervisory board members themselves should be in a position to understand an AI-driven business. Similar to the management board, not every supervisory board member must become an expert in AI, but all members should have at least a basic understanding of the subject.

“Bringing AI into the supervisory boards will be one of the major challenges in the next years. Currently, the digital transformation is one of the key topics in the supervisory boardroom. We will have to prepare in due course for topics such as Artificial Intelligence and possibly increase our efforts in learning together as supervisory board members”.

**Pauline Lindwall,
Multiple Board Member and winner
of the Women’s Board Award 2020**

The supervisory board will encounter two possible situations: The management board may or may not have already begun their AI journey and gained significant experience and expertise. Either way, the supervisory board needs to understand AI themselves in order to be able to monitor (first case) or advise (second case).

First and foremost: Since as a supervisory board you need to nominate the management board members, the discussions in this report of the change introduced by AI can guide your future choices. For each individual role, you might assess what is lacking and what adjustments to make.

Second, in order to monitor the company effectively, the Strategy and Technology Committee in particular must evaluate the technology roadmap of the company as well as the availability of the necessary skills to execute the roadmap. This may include an upskilling project for the management team of

the company, in case they have not proactively undertaken AI-related training. Monitoring the risks resulting from the application of AI in the business will also become a second important duty for the supervisory board. Investing in new AI-driven business models will bring about different investment cycles with possibly extensive investment periods, similar to other innovation-driven decisions. So, investment committees might also have to adjust their methods in order to cater to the changes in the investment cycle. Last but not least, compliance with all legal requirements, proper business risk assessments, as well as broader ethical and reputation issues must be monitored. For instance, the supervisory board may opt to provide ethical guidelines for the use of AI to the management team.

“All members of the Board need to recognize data as a strategic asset. They have to analyze and understand the importance and value of data for their specific business model. But data only creates value when it gets refined into information, and information, in turn, is used to drive decisions and actions in the business. Therefore, Boards need to be ready to invest in this refinement process and organize the responsibility for data and AI in line with how important they are for the business model.”

Wolfgang Hauner,
Head of Group Data Analytics, Allianz SE

What to do next – the journey into the AI age

AI is here to stay and will continue to increase in importance. It can be compared to China's entering the world economy 20 years ago. All boards need to adjust to it—embracing its opportunities and managing its risks.

When setting out to lead your company during the AI journey, we see seven key imperatives:

1. Educate yourself to bring clarity to complexity: Only when you yourself develop an understanding of how AI works will you be able to focus your team on the important aspects.

2. Objectively assess the AI maturity of your company: Developing a realistic view of the current situation and its limitations lets you set the right priorities for advancing the AI transformation.

3. Develop an AI Strategy that incorporates an 'AI First' perspective: Using a data-driven approach to understand the highest-value fields of application of AI within your company is paramount. But you have to go beyond the status quo and understand the art of the possible: How might AI affect your industry and your business model? Which fundamental sources of value might disappear? What is the new moat?

4. Organize the transformational journey: A programmatic approach is required to steer through AI transformation, and you need to assign ownership for this journey. A CAIDO might be the right person for this (see discussion above); the alternative is to allocate those responsibilities within the existing board setup.

5. Provide sufficient resources: AI transformation is a marathon, not a sprint. Mere proof of concepts will have no impact if you do

not set the right level of ambition. Also, be prepared of novel challenges when scaling an AI solution.

6. Address deep employee concerns: More than other transformations, a successful AI journey depends on the skill, resilience, and comfort of your team. It's important to address employees' fears, facilitate reskilling, and create the right environment for AI talent to thrive.

7. Make things happen in a constrained world: Refrain from complaining about the many obstacles. Instead, adopt a patient, but systematic approach to get things done irrespective.

[1] S. Ransbotham, S. Khodabandeh, R. Fehling, B. LaFountain, D. Kiron, "Winning With AI," MIT Sloan Management Review and Boston Consulting Group, October 2019.

[2] A very classic illustration were Isaac Asimov's (1950) 3 rules for robots.

[3] MIT Technology Review 2018 - "Google just gave control over data center cooling to an AI" <https://www.technologyreview.com/2018/08/17/140987/google-just-gave-control-over-data-center-cooling-to-an-ai/>

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About appliedAI

The appliedAI Initiative, Europe's largest non-profit initiative for the application of artificial intelligence technology, aims to bring Germany into the AI age and offers its wide ecosystem of established companies, researchers, and startups neutral ground on which to learn about AI, implement the technology, and connect with each other. appliedAI is part of UnternehmerTUM, Europe's leading Entrepreneurship and Innovation Center.

www.appliedai.de

About Odgers Berndtson

For over 50 years, Odgers Berndtson has been helping some of the world's biggest and best organisations find the senior talent to drive their agendas. Odgers Berndtson delivers executive search, assessment and development to businesses and organisations varying in size, structure and maturity. Across over 50 sectors, whether commercial, public or not-for-profit and draw on the experience of more than 250 Partners and their teams in 29 countries. Odgers Berndtson's strength lies in the partnerships they develop. They form strong relationships with talented people, clients seeking to find them, and between their own teams who connect them together. It is because of the deep, non-transactional and lasting partnerships, that Odgers Berndtson's clients can acquire, develop and retain their strongest leaders.

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