

Science and Technology Challenges, Direction and Governance

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In significant jurisdictions, legislators are considering how best to regulate the development and use of artificial intelligence (AI) applications to enable their benefits to be realised, while also addressing their potential harmful impacts and the existential risks they pose. The same or similar issues may already be on some board agendas. What approaches and policies should boards adopt to secure the advantages of AI and other scientific and technological advances while mitigating associated risks? Are directors aware, informed, and ready to discuss such matters? What support do they need? Should board memberships be reviewed?

AI and other developments challenge legislatures, regulators, and governance approaches and practices. Scientific and technological knowledge and understanding and their applications are advancing more quickly than arrangements to monitor, control, and regulate the actual and possible consequences of their use. The pace of their emergence and adoption is such that governance and regulatory frameworks and activities are struggling to catch up and cope. In some fields the speed of learning and evolution is such that if a possible use is overlooked or potential is not spotted, a company that misses an opportunity might be left behind.

New approaches and different thinking might be needed. Scientific advance and innovation, exploitation and roll-out processes often involve collaboration. There may also be multiple connections and relationships with development and deployment partners to forge, review and/or refresh. A board's



perspective and governance arrangements may need to embrace networks of co-operative activities and ventures that may require different approaches and a variety of collaborations with the commercial, public sector, and voluntary bodies. How do directors ensure opportunities are identified, objectively assessed, and responsibly pursued?

The Significance of Science and Technology

The areas in which a company might be affected by scientific and technological developments and their significance can vary. In some sectors, continuing research and development may be essential if a company's offerings are to remain competitive. Boards could consider whether existing or evolving technologies might better support enabling and supporting processes, or the development and adoption of a new business model. The corporate, business, public policy and regulatory environments, and value chain practices and relationships, may or might not be conducive to applications of science and technology.

The relevance and impact of science and technology can depend upon customer requirements and corporate and stakeholder aspirations. Boards should ensure organisational, business, and operating models and practices that remain relevant and competitive. As challenges emerge, threats evolve

and opportunities are identified, corporate networks and supply chain partners may vary in their awareness of possibilities and abilities to respond to them. Some may have a longer-term commitment to research and development and easier access to required skills and available funding, than others. How might a shared longer-term focus be achieved?

Boards should have honest conversations about whether they and corporate management are aware of contemporary scientific and technological developments, their implications and whether a company's governance arrangements are appropriate. How might trends and breakthroughs best be monitored, reviewed, and reported? Boards of companies whose differentiators and activities are highly dependent on certain technologies may need to take a longer-term view that extends across a resilient supply chain and beyond the terms of office of a CEO or Government. Do arrangements, capabilities, and relationships in place enable rapid responses? Applications usually require data. Is needed data, collected?

Corporate Science and Technology Capabilities

Boards should ensure they have a realistic and current understanding of a company's scientific, technological, and other capabilities in relation to challenges, opportunities, and developments in its situation and context. Scientific and technology direction should be clear, coherent and fundable. The resulting strategy and policy should be long-term, joined-up, and should embrace required skills, supporting infrastructure, and relevant connections and networks. They should enable agile and rapid responses to opportunities and threats. To what extent should a board focus or pursue a portfolio of initiatives? Is risk appetite clear and agreed? Are arrangements in place for effective competitive bidding and informed peer review?

Corporate capabilities should match the role that boards feel a company might play in value chains, for example as a prime or sub-contractor. A key consideration could be whether a particular sector or local or national market is big enough to support corporate aspirations. There may be cross-sector applications, export opportunities, or possibilities for international collaboration that could be explored. How might income generation requirements be reconciled with the protection of IP? Holding onto IP might offer greater freedom of action, but applications may need to be responsible as well as entrepreneurial. They could be related to shared risks such as those identified by the World Economic Forum's Global Risk Reports.

Investors should be alert to signs of inflexibility and a lack of openness to new ideas. Some bureaucratic organisations are slow-moving and vulnerable to the loss of know-how and intellectual property. Is enough being done to protect them? Is a company assembling what will be required? Are desired

behaviours and practices encouraged, incentivised, and/or rewarded? Can the company work with and retain creative spirits and innovators? Do management and risk management practices discourage them? How might a high dependency upon foreign and/or a particular technology be reduced and its continuing availability future-proofed? What more could be done to involve smaller companies?

Developing Science and Technology Strategies

The nature and positioning of a science and technology strategy within an overall corporate strategy will depend upon a company's purpose, priorities, situation, and context. A portfolio of corporate initiatives could involve further exploitation of existing technologies, possible applications of emerging technologies, and riskier investments in the development of new technologies. So much may be happening in different fields that a company might be spoiled for choice. Board strategies should provide direction and criteria for prioritisation. The latter could embrace areas where collective responses are needed to shared threats likely to have the biggest adverse consequences as well as other arenas of opportunity.

When developing strategies relating to science and technology the progress of possible applications of interest should be closely monitored. Timing can be critical. On occasion, it might be necessary to accelerate certain developments while a window of opportunity still exists. Innovation and discovery strategies may also need to take into account the possible scientific and technological implications of other strategies. For example, cost-cutting exercises might take out much of the data that could be used by emerging technology. How might this be prevented? Should such data be safeguarded and stored rather than deleted?

Some science and technology strategies may need to be defensive as well as proactive. For example, increased connectivity creates greater cyber vulnerability. AI can be used to initiate cyber-attacks, to undermine and/or distort understanding. AI may be needed to counter the malevolent AI initiatives of others. The speed with which some systems can learn means AI might be required to catch up, keep pace, and remain in the game. Once a company has fallen behind in its offerings, defences, or business, organisational, and/or operating models, it might become vulnerable and/or unable to catch up. In this situation, what should a board do?

Science and Technology Guidance

Boards may need to decide where and how to apply evolving science and emerging technologies and when and for what purpose. Clear and regularly reviewed guidance should be provided. What opportunities and/or problems should be addressed and in what order? How might breakthroughs be

capitalised upon and applications with perceived potential quickly scaled up? Tough choices might be required. With hindsight, not all projects backed by a company may turn out to be the right ones. Some viable and hopeful initiatives may need to be side-lined or stopped to allow resources to be redeployed to more promising ones.

For some technology companies, deciding which developments to back and which applications to select for further development is a major challenge. Are there promising initiatives elsewhere that could be imported or might represent co-creation opportunities? Available resources are rarely unlimited in relation to what could be pursued. Innovation for its own sake can be expensive and difficult to apply. How might likely timescales best be assessed when there are uncertainties and opinions may differ on commercial prospects and potential benefits? Should a project progress naturally or should it have a fixed development timetable?

A board might also wish to consider whether the appointment of a Chief Scientific and/or Technology Officer might enable a more strategic and joined-up approach to issues concerning science and technology. Close working relationships would be needed with other senior executives such as the Chief Financial Officer when arranging funding. Ideally, this should be multi-year if a longer-term strategic approach is adopted. In such circumstances, boards should remember that regulations and Government policies, priorities, and incentives can change. A longer-term focus and approach may be needed to be flexible and adapt.

Remaining Open and Preserving Flexibility

Boards should remain flexible and open to alternatives and emerging possibilities. Some companies are so focused on their own technologies that they overlook or ignore better options. Substitutes and other developments may attract supporters and opponents as events unfold and differing preferences emerge. How might a board ensure assessments are realistic and honest and choices are objective and informed? Do decision makers take account of both costs and potential? For projects under review, are these converging or diverging? Are limits being reached in relation to what is available or could be achieved? What backup is in place?

A board should avoid the risk that a company might become locked in or overly dependent upon a technology and/or an IP it does not control or own. Are 'Plan Bs' in place and regularly reviewed? Are contractual provisions inflexible? Arrangements, strategies, and policies should be kept under review. At what point might collaboration enable an obstacle to be overcome? Is a new or different corporate process for assessing possible collaborations required, and how should it be developed? How might a company enhance collaborative advantage? What arrangements for small technology companies to become niche partners would be helpful?

How should innovation be enabled to continue in periods of continuing crisis and/or during transition and transformation journeys? Depending upon options, available resources, and core capabilities, choices may need to be made between corporate and/or collaborative innovation and buying off the shelf. Much will depend upon prospects, rationale and whether or not what is required is perceived as a means to achieving much more important and significant ends. On occasion, what turns out to be attractive opportunities might be missed. Boards may need to consider what obstacles might get in the way of what otherwise could be.

Ensuring Agility and Resilience

Resilience might be difficult to achieve without certain technologies and retaining a stake in some development paths. Boards should encourage foresight and the assessment or imagination of future generations of usable technologies. What might the next scientific and/or technological breakthroughs be and what is likely to follow them? A company with a longer-term approach might seek and retain a stake or involvement in successive waves of innovation. This may require multi-disciplinary working with multiple teams drawn from different combinations of collaborators. Are people prepared for this and properly supported?

With some risks highlighted in the World Economic Forum's 2023 Global Risks Report, we are collectively in a race against time. Every effort should be made to speed up handovers and decision points along scientific and technology development paths. Some established and bureaucratic companies might have to become more entrepreneurial. Their boards may need to encourage more responsible risk-taking. Collective capabilities might have to be developed and closer collaboration encouraged. Quicker funding decisions may also be required before a trend such as global warming becomes unstoppable.

Boards face difficult choices which may have significant consequences. For example, how do they, and those who advise them know which cyber-security system might be best when malevolent attacks are AI-enabled? Being resilient and able to recover, cope and stay current will become increasingly important. Technological leaders that are connected, networked, and open to collaboration possibilities could become prime targets. Cyber, financial, and other forms of resilience should be regularly stress tested. Activity and investments in countries with differing perspectives, allegiances and views on the protection of IP should be avoided.

Prioritisation and Collective Responses

Whether or not an eco-system and procurement and other processes are conducive to innovation can determine whether a company's science and technology strategy is likely to encounter favourable winds. Boards may vary in their

willingness to encourage dialogue and connections and share sensitive data. Confident and determined ones may recognise that innovation is a collective responsibility. Opening up and encouraging demanding customers, suppliers, and collaborators can often accelerate it. Smart companies work with customers and suppliers to achieve sustainable and responsible outcomes that benefit all parties.

Boards should also consider how they and their executive teams may better determine when development is good enough to prototype or bring to market. At what point might it have sufficient functionality or otherwise be ready for use? Knowing when to launch or release a first offering may enable it to be refined or further developed with the help of feedback from early users. Elaboration can follow. Early adopters may suggest adaptations and further development paths which might be explored in collaboration with those most likely to benefit. Increasingly, collective responses to shared existential threats are required.

As windows of opportunity to address existential threats close, science and technology strategies may become more urgent and their governance a higher priority. Implementation may have to be more determined. Finite resources will need to be deployed where they can have the biggest and quickest impact. Activities and operations that many people have vested interests in, and whose outputs are still in demand and greatly enjoyed, may have to be rapidly run down and discontinued. Resources they consume may be required for other more urgent priorities such as collective survival in the face of existential threats. Contracts may need to be terminated, livelihoods lost and hopes dashed to avoid greater future disruption.

Enabling While Retaining Control

Many boards choose to ignore the negative consequences of the greater use of digital and other technologies. These include increased energy demand and carbon emissions and the use of rare metals and other finite natural capital to provide the hardware required. Technology applications should be monitored and controlled. The possible negative consequences

of AI and Artificial General Intelligence (AGI) urgently need to be considered by corporate boards. Intervention arrangements should be put in place to avoid situations like the loss of two Boeing 737 aircraft and all their passengers when their autopilots could not be turned off.

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AI applications can rapidly analyse large quantities of data and provide summaries on demand. They can remain up-to-date, handle complexity and address regulatory and reporting requirements more quickly than most professionals. However, they optimise without value judgments. AI and current existential challenges raise moral and ethical questions. The values and inputs of directors can be critical. Integrity continues to be a

personal quality that should be sought in company directors. Boards need members and advisers who are ethically aware, exercise independent judgment and instinctively 'do the right thing'.

Ultimately, whether science and technology helps or harms us will depend upon what they are used for, by whom, and for what purpose. Competing applications may present contending versions of knowledge and reality that are continually evolving, whether diverging or converging. Boards' awareness of possibilities, risks and threats, the monitoring arrangements they put in place and where, when and how interventions can and do occur may have a significant impact on lifestyles and livelihoods and consequences and outcomes. The decisions and choices of boards will determine our prospects and those of future generations.

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