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DISRUPTIVE TECHNOLOGIES: THE DRIVING FORCE OF TOMORROW'S STRATEGIC THINKING

Prof dr m s s el namaki
Retired dean Maastricht School of Management
Dean, AIT, Canada

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ABSTRACT
Those who try to formulate a business strategy today are more likely than not to resort to common modes that evolved over the past two or three decades. Many of those have, however, become obsolete. And those who would attempt at resorting to those yesterday's strategic thinking frameworks will, more likely than not, end up empty handed. They will find worn out concepts and fragile frameworks. Porters 'Five forces, competitive advantage, strengths and weaknesses and threats and opportunities among others sound hollow in today's world of generative artificial intelligence, IoT and GTP.

What is the replacement, one may ask? The replacement in the author's view is a strategy formulation process induced by disruptive technologies. This driving force will not only shape the cellulite and contents of today's strategies thinking process but also have a long arm reaching far beyond today's time horizon.

And this will be the focus of the following article.
The article's core hypothesis is that the process of strategic thinking of tomorrow is driven by technologies that have very recently or never existed before. Novel technologies or technologies that have never existed before will reinvent the foundations of strategic behaviour.

The article analyses the premises of this "driving force" and concludes with a conceptual model demonstrating the possible outcome of the interaction between technology and strategic thinking.

Analysis is qualitative. Underlying premises are drawn from contemporary pertinent research. The ultimate conceptual model is deductive exploring relationships between variables and their possible derivative outcomes.

KEYWORDS: Technology. Disruptive technology. Novel modes of strategic behavior.

1.0 The fading of yesterday's strategic thinking concepts

Management literature is awash with prescriptive remedies. Something fore behavioural ills, more for restructuring maladies, and even more for strategy failures. Many of those prescriptions are rooted in decades-old conceptual frameworks that were developed by old time "gurus" and many of those frameworks have also lost relevance thanks to disruptive events.

Three names would top the list of yesterday's management scholars: Igor Ansoff, Peter Drucker, and Micheal Porter. They represent three schools of thought and three-time spans (with a measure of overlap here and there). Igor Ansoff's pioneering work on corporate strategy dates to the sixty's and represented, at a point of time, the nearest thing to a breakthrough. Drucker's work first appeared in the mid-fifties and introduced a collection of fresh insights into the working of corporate management. Porter's work on competitive advantage first appeared in 1980 and constituted a landmark in terms of strategic thinking within a competitive environment. All three were "heroes" in their time, providing novel conceptual frameworks that addressed core management issues of that era.

Dramatic technologies and economic events of the past decade casted doubts over legacies endorsed for decades. Those developments induced a creeping feeling that the need is there for a new set of strategic thinking paradigms (El Namaki, 2012).

And artificial intelligence emerged as the novel driving force of this strategic thinking.

2.0 Technology as the prime driver of tomorrows strategic thinking concepts

Disruption is an occurrence that interrupts events, processes, systems, or paradigms. It is a violating force. Disruption of an event, a system, or a process is tantamount to discontinuity and a suspension or even a reversal of what is considered a normal flow.

Roots of disruption, in management, are discussed in Christensen's work on innovation (Christensen, 1997). He introduced the idea of "disruptive innovation" or a process of rapid anticipation of future needs and equally rapid development of congruent products, services, and processes. In the process he separates modern technology into sustaining and disruptive, with sustaining technology resorting to incremental improvements to an already established technology, while disruptive technology reflects anticipation of a separate set of parameters. The anticipation and adjustment would lead to market shake ups and the eventual replacement of dominant operators by nimble small innovators.

"The term, however, quickly took on a life of its own." (El Namaki, 2018)

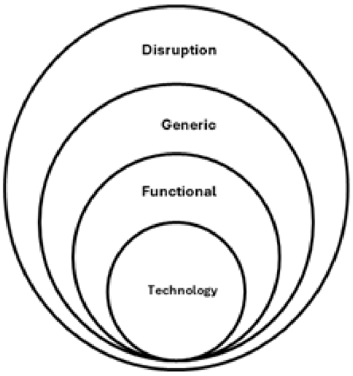
It is the author's contention that disruption could be generic or functional.

Generic disruption is a force or a bundle of forces that cut across systems and reconfigure constituent elements. Generic disruption cuts across industries, markets organizations and functions. It does not arise from competitors in the same industry or even from companies with a remotely similar business model but from distant and previously unidentified driving force. It blends forces drawn from separate unrelated strands of technology, primarily, to create dramatic value enhancing and rule changing propositions (El Namaki, 2014).

More relevant here is functional disruption or the force that undermines one or the other aspect of system-related functional performance and technology is the prime one. (El Namaki, 2015).

Technologies that significantly alter the way that businesses or entire industries operate, are labelled disruptive and seem to be a leading source of functional disruption. In the seminal work of Klaus Schwab (2017), The Fourth Industrial Revolution, he describes how this fourth revolution is characterized by technological advances. It is a grey concept today, but it gains focus within contemporary events.

Figure: Domains of disruption



3.0 Technology disruption: Technologies that never existed before

Novel technologies or technologies that never existed before or are at the threshold of discovery are emerging at a breath-taking pace. Two of those are especially relevant to strategic thinking: the first is the race for superior capacity and speed within a nanometre framework and the second is the search for an extension or a substitute of the electronic mode of data communication and storage.

3.1 The race of the nanometres: GAA architecture

An ongoing race towards narrower nanometres is led by key industries operators in the United States, Taiwan, China, and Korea. Others are Germany and India, who do not want to be left behind, are joining the fray. This nanometre race revolves around achieving smaller but potent internal components of chips. Reason is Moore's

Law claim that the maximum number of transistors on silicon chip wills double every two years, a claim that is losing credence.

The standard length of transistors was, for some time, ten nanometres. Twenty and sixteen nm chips had, however, problems with copper transistor interconnection and the challenge of moving currents through small wires and small nanometres. The GAA architecture, a next generation foundry micro fabrication process provided a next technology solution. It emerged as a response to the race among the microchip industry for the fastest, finest and most energy-efficient circuitry. Gate-all-around or GAA transistors are in fact an upgraded transistor structure where the gate can meet the channel on all sides. These separate horizontal sheets are vertically stacked so that the gate surrounds the channel on all four sides. The outcome is a superior electrical signal passing through and between the transistors thus improving chip performance (ALMS).

GAA transistors are poised to become part of the most advanced chip designs soon. These transistors can be manufactured at an "accommodating" cost, striking a balance between cost of mass production of advanced chips and enhanced performance. GAA's reduced leakage and lower energy consumption make them, moreover, superior to older designs.

In short, semiconductor manufacturers are chasing this GAA technology in search of improved electrostatic properties, increased performance, optimized chip design, and reduced power usage. (Avi Gopani, January 5, 2022). IBM's 2 nanometre chip provides an illustration. The "new" chip has quadrupled cell phone battery life, increased laptop function performance, assisted in language translation and finally, delivered faster internet access.

3.2 New physics and the rise of the Photons

Researchers at the National Institute of Standards and Technology (NIST, USA) were able to develop an optical switch that can redirect light between computer chips using nanometre-scale gold and silicon components. The light can pass between chips in twenty billionths of a second! Researchers claim this is the fastest light has been rerouted between chips to this point, and it could change the way we transport data in certain systems. Photons travel much faster than electrons (Benson T, Jan. 8, 2021).

Optical computers hold a lot of promise. In theory, a fully optical computer would run faster and operate at lower temperatures than electronic systems. By using nonlinear optics, it is possible, in theory, to build logic gates like those used in conventional processors. There are, however, many practical and technological hurdles to overcome before photonic computers play a significant role. (Butler S., May 11, 2022).

Progress along both directions quoted above as well as other innovative research could lead to a chip that combines photonics and electronics. These will be chips with bandwidth, speed, processing, and computing abilities that are currently unthinkable. By integrating many novel components, their capabilities will increase exponentially compared to electronic chips. "Programmable photonics will provide a field with enormous potential given complementarily with electronics ("highlights Jose Company. (Universität Polytechnical de Valencia, Oct. 19, 2020).

One of the most serious bottlenecks in current AI systems is not the speed of the computation but the delay and energy cost of moving data between processors. Photonic computing uses light instead of electrons to store information and to perform computations, offering the promise of faster analogue computer processing with lower energy overhead. Light intelligence, a photonics computing company in Singapore, and Light matter, a photonics computing company in California, runs modern artificial intelligence (AI) models with high accuracy and high energy efficiency.

While the Light intelligence chip is designed for solving optimization problems, Light matter's system tackles a broader range of tasks. It can perform image classification, natural language processing, and reinforcement learning tasks.

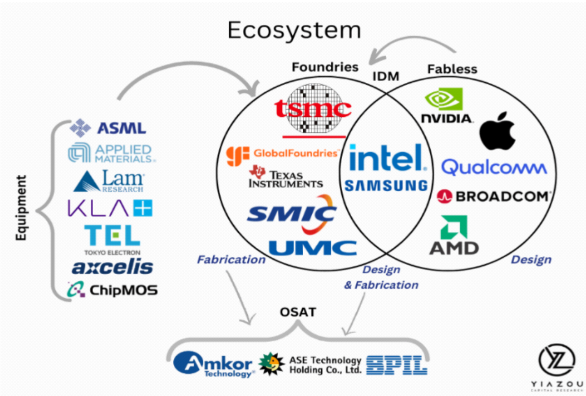
Photonic computing continues to face challenges like analogue noise, integration difficulties, and the high energy cost of moving data between chips. Recent research suggests that photonic computing is finally stepping out of the lab and into real-world relevance, and photonics can tackle vastly different problems with architectures tailored to each. (Ananya Palivela, April 21,2025)

3.3 The dynamics of the chip industry Eco-system

Players within the chip industry belong to an ecosystem. This ecosystem encompasses fabricators (fabs), foundries, and equipment makers. The Fabs do the design in the first place. The foundries do the fabrication while the equipment makers put together the technology that would deliver the chip. The following diagram illustrates the roles and the relationships between the players.

Domain-specific and specialized chips are expected to continue to gain prominence over general-purpose ones, as several industries (such as automotive) and certain AI workloads would require customized approaches to designing chips. However, a widespread adoption of application-specific integrated circuits˙ Remains less clear, as the development and maintenance of such hardware can be costly and could divert focus from other AI advancements. But here's where gen AI tools can allow companies to design more specialized and competitive products like custom silicon.

Figure Semi conductor eco-system.



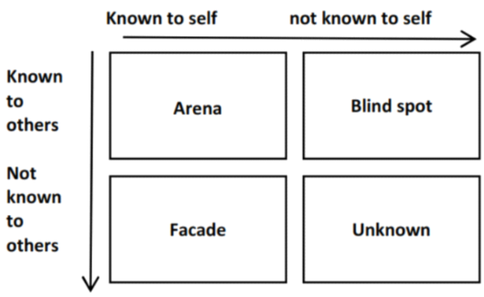
Source: https://www.linkedin.com/pulse/global-chip-war-intensifying-competition-evolving-engr-md-adib/

4.0 What strategic thinking behaviour then?

The technology driving force analyzed above could be segmented as known or unknown. So, also strategic thinking patterns or concepts. The known unknown analysis is the product of

An analytical approach to exploring future fog in this context could be done with the help of the so called "Johari window" , an approach developed in 1955 and called after the two developers, psychologists Joseph Luft and Harrington Ingham in order to help people understand their relationships with themselves and others ( ).The approach came later to be known as " the knowns and unknowns concept" or Rumsfeld Matrix, a decision-making framework that maps and evaluates the various degrees of certainty and uncertainty. What the concept conveys is the existence, in knowledge, of knowns and unknowns and that progress emerges from tackling the known unknowns and the unknown unknowns!

Figure The Johari Window



Source : Luft, J.; Ingham, H. (1955). "The Johari window, a graphic model of interpersonal awareness". Proceedings of the western training laboratory in group development. Los Angeles: University of California, Los Angeles.

The assumption is that any phenomenon has a: "Known" or "Unknown." state or attribute. The first state, the "known" state implies presence and even knowledge of the relevant or pertinent subject data. The second state or the "unknown" indicates non knowledge or even awareness of the respective data base. Industries, and researchers, may demonstrate either of four "conditions":

- ❖ First condition (A): Unknown Knowns
- ❖ Second condition (B): Known knowns
- ❖ Third condition (D): Known Unknowns
- ❖ Fourth condition: (C): Unknown Unknown.

Interaction of driving force parameters would lead to a position within the strategic space. Strategic behaviour would vary according to the emerging relationship between each of the respective variables. Put differently, four modes of strategic behaviour could emerge from the interrelationship between the different states of strategic thinking and technology.

- ❖ or continue or pursue past patterns
- ❖ B or anticipate or project perspective outcomes of new parameters
- ❖ C or explore or prospective outcomes of the unknown dimension.
- ❖ D or Risk or jump in the dark based on science fiction-like assumptions.

These modes of strategic behaviour deviate from "traditional" modes resulting from past strength and weakness or opportunity and threat framework.

Figure: Technology and strategic behaviour. Known / unknown analysis.

Strategic thinking
Unknown/Known Continue (A)
Unknown/known: Anticipative (A)

A

Unknown/Unknown: Explore (C)
Unknown/
Known:
Anticipative

Unknown
Creative/ Novel
Known/Unknown: Risk taking (D)
Known/Known: Continue (B)

Known
Conventional

Known/Unknown
Applied/Emerging/Never.

Technology Traits

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- A or continue or pursue past patterns
- B or anticipate or project perspective outcomes of new parameters
- C or explore or prospective outcomes of the unknown dimension.
- D or Risk or jump in the dark based on science fiction-like assumptions.

These modes of strategic behaviour deviate considerably from "traditional" modes resulting from past strength and weakness or opportunity and threat framework.

5.0 Summary and conclusions

Those who try to formulate a business strategy today are more likely than not to resort to common modes that evolved over the past two or three decades. Many of those have, however, are becoming obsolete. And those who would attempt at resorting to those yesterday's strategic thinking frameworks will, more likely than not, end up empty handed. They will stumble across worn out concepts and fragile operational skeletons.

What is the replacement, one may ask? The replacement in the author's view is a strategy formulation process induced by disruptive technologies. This driving force will not only shape the cellulite and contents of today's strategies thinking process but also have a long arm reaching far beyond today's time horizon.

The article's core hypothesis is that the process of strategic thinking of tomorrow is driven by technologies that are emerging or have never existed before. Novel technologies or technologies that have never existed before will reinvent the foundations of strategic behaviour.

The article analyses the cause and effect between those two driving forces and concludes with a conceptual model demonstrating the possible outcome of the interaction between technology and strategic thinking.

Analysis is qualitative. Underlying premises are drawn from contemporary pertinent research. The ultimate conceptual model is deductive exploring relationships between variables and their possible derivative outcomes.

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