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Could Science Fiction Induce Strategic Weak Signals?

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Abstract: Weak signals are essential for strategic behavior. Traditional strategic management frameworks resorted to environmental scanning as a measure of uncovering potential forces of disruption and their weak signals. Igor Ansoff expressed , as early as 1975 (Ansoff, 1975), the need for an approach to environmental discontinuities and how these discontinuities are preceded by " weak signals" made obscure by massive information "noises". Classic search for weak signals through environmental scanning has given way to more recent "modern" approaches depending on the exploration of the internet space (Van den Poel, 2013). And even more advanced approaches exploring surprises due to the occurrence of highly unlikely events or "Black Swans" (Taleb, 2007-2015).
Attempts so far have, to all appearances, ignored science fiction as a possible source of weak signals. This will be the focus of the following article.
The approach is qualitative. The article starts with an analysis of the concepts of weak signals, science fiction and strategic thinking. This is followed by an exploration of the relationship between science fiction data, weak signals and strategic business thinking. Supporting case evidence is drawn from actual company histories.
The article could enhance the concept of Big Data and the outcome of big data analysis.

Keywords: Strategic management, environmental discontinuities, weak signals, big data, science fiction.

1 The Problem

Weak signals are essential for strategic behavior. Traditional strategic management frameworks resorted to environmental scanning as a measure of uncovering potential forces of disruption and their weak signals. Igor Ansoff expressed , as early as 1975 (Ansoff, 1975), the need for an approach to environmental discontinuities and how these discontinuities are preceded by " weak signals" made obscure by massive information "noises". Classic search for weak signals through environmental scanning has given way to more recent "modern" approaches depending on the exploration of the internet space (Van den Poel, 2013). And even more advanced approaches exploring surprises due to the occurrence of highly unlikely events or "Black Swans" (Taleb, 2007-2015).
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2 What are Weak Signals?

Weak signals are messages of low frequency deduced from information or data.. They are often identified as part of a distant disruptive horizon changing assumptions and posing challenges. They suggest a potential for significant future

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change the underlying premise is that disruptions of economic, political, social and physical environments are always there and weak signals are the faint flickering light at the end of the tunnel. They carry an element of novelty, perspective, surprise, challenge and potential distant impact (Prescient, 2019).

Weak signals follow a path that could lead to a stronger signal and a shift to another phase of a life cycle. (Figure (1). Knowledge and noise are the determinants of the shape and speed of this path. Higher knowledge level and lower disruptive noise undermine weakness parameters thus enhancing the driving forces and elevating the signal to another echelon. Relationship between knowledge and noise create a change coefficient and a driving force that would influence the process of conversion of weak signals into strong signals.

Weak signals could also possibly be emitted at the very early stages of the S technology curves. Those curves start with a notion of a new technology and proceed towards an expansion phase before they embark upon a maturity phase... (Figure (2)). Multiple S curves lead to a repetition of the innovate entry phase and the flow towards maturity. Entry, could be argued, is synonymous with the emission of weak signals that become strong as the process develops.

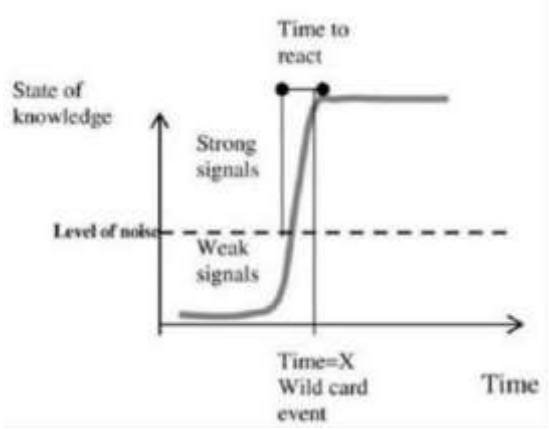

Fig.1: Knowledge and noise relationship within a weak signal context.

Source: Bernardino Chiaia, Artificial intelligence for infrastructure control and safety, 21

Weak signals could emerge as a rational consequence of events or as a random unexpected development within a vague context...

Cyber space and internet could nurture weak signals. Diagnostic data analysis could help tracking those weak signals within a cyber space. Latent semantic indexing (LSI) was used, for instance, as a weak signal identification medium. It is an indexing and retrieval method that uses a mathematical technique, singular value decomposition (SVD), to identify patterns in the relationships between the terms and concepts contained in an unstructured collection of text. Weak signals could emerge as a result.

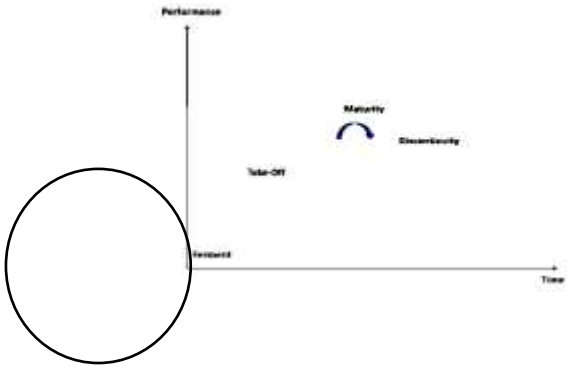

Fig.2: Weak signal potential within an S curve context.

Source: The Innovation S-Curve, Gal's insight, July 25, 2015.

Weak signals could also emerge as a black swan or an unpredictable extreme event. Black swan events are unprecedented or asymmetric events that occur unpredictably and are rationalized after the fact. One can label it as a metaphor that describes an influential surprise event that is often rationalized after the fact with the benefit of hindsight. They are unexpected events of large magnitude and consequence and a dominant role in history. This takes place within an environment that overvalues what we know, and is blind to what we don't know.

Black swans events are described as "outliers" or incidences lying outside the realm of regular expectations. They represent aberrations from past experience or practice. They also carry an extreme 'impact'. "Human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable" (Talib, 2007). A black swan is the nearest thing to a weak signal. They have three traits: rarity, extreme impact, and retrospective (though not prospective) predictabilit

3 What is Science Fiction?

Science fiction is defined as "fiction dealing principally with the impact of actual or imagined science on society or individuals …. (Merriam Webster, 2020) Science fiction content is imaginative, but based on science. It relies heavily on science to configure its settings, characters, themes, and plots.

One way of analyzing science fiction is segmenting it into soft and hard. "Hard" science fiction is fiction putting emphasis on scientific detail and accuracy while "Soft" science fiction places emphasis on social sciences from sociology and psychology to philosophy. Hard science fiction rely on sciences that explore the workings of the natural world as physics, chemistry and biology while soft science fiction deal with intangibles related to human behaviors, interactions, thoughts, and feelings . Science fiction works dealing with technology and undiscovered science are more likely to be of the hard genre while those that deal with temporal setting and future history are likely to belong to the soft genre.

A prime science fiction contribution is that of redefining the essence of human and societal functions. It enables a reflection on the way one interacts with others, with technology, with the environment and with the future. It projects a vision for the future and creates a link between the present and the future. A future that can be proposed, modified, refined, and discussed (Z, 2016).

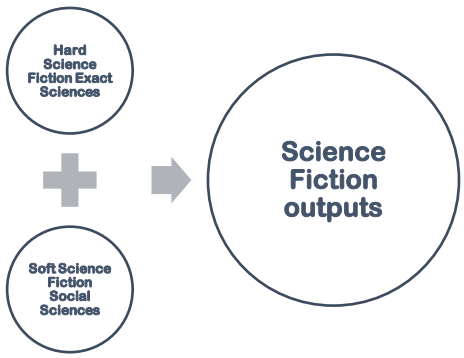

Fig.3: the building blocks of Science Fiction.

Source: El Namaki, 2019

4 Does science fiction deliver weak signals?

Seen broadly, science fiction induces a reflection on the ways people interact, approach technology, manage resources and deal with the environment. It contrasts the images of the present with those of the future and projects the complex ways this future could evolve. It generates dream-like scenarios and issues cautionary signals against malignant consequences of human hubris. By pursuing this paradigm, science fiction has consistently transmitted signals of yet to evolve future technologies and social phenomena. Weak signals that lacked the roots of today's realities yet envisaged new industries, functions and products without the strictures of money or technological capability.

Design fiction an apparent derivative of science fiction, provides signals. It is a thought experiment, a way of purposefully imagining the future without the constraining tentacles of technology and economic realities. It resorts

to fictional future scenarios in order to transmit weak signals as to the future shape of functions and products to come. (Gibbs , 2017). Design fiction emits signals that could inspire future products and events and usher strategic directions.

Weak signals could relate to a variety of future "disruptions". These could go all the way from the economic and sociocultural to the political and technological. A quantitative methodology to detect very early signs of emerging technologies or technology weak signals was developed in 2019 (Eulaerts O, 2019) An analysis of a massive volume of scientific publications over the 1996 to 2018 period have led to the identification of several scientific weak signals. Text mining and scientometrics indicators provided the research tool that led to the identification of 256 relevant weak signals in the fields of energy, environment, health, biotechnology, and ICT. Each signal was rebuilt in a technology monitoring system. That could reveal key features of the technology e.g. Who are the leading countries, the main industrial and academic actors, the stage of development or the current trends, or what the potential future applications are. (Eulaerts et al, 2019)

5 And do Science fiction's weak signals translate into data?

Science fictions works contain a very wide variety of data. Attempts were made to develop a structure for these data through information visualization, being a convenient medium for dealing with unstructured mass of information typical for science fiction. It is based on information design, computer graphics, human-computer interaction and cognitive sciences. It involves selecting, transforming and representing abstract data in a form that facilitates human interaction for exploration and understanding (Dumais, 2005).

One of those attempts derived eleven kinds of content from science fiction data sets. Those included robots, androids or AI computers, battles, romance, magic, time travel, interplanetary, multi-species, sentient species , beasts , psychic powers and novel technology among others.Gephi software and "modularity" application led to a pattern of association of contents . Three groups of related clusters emerged out of this exercise group: 1. (Orange Nodes) Novel Technology, Interplanetary, Multi-species, and Robots, Androids or AI Computers; 2. (Purple Nodes) Battles, Psychic Powers, Beasts, Magic, and Time Travel; 3. (Green Nodes) Romance and Aer Catastrophe (Elise Fu, 2018).

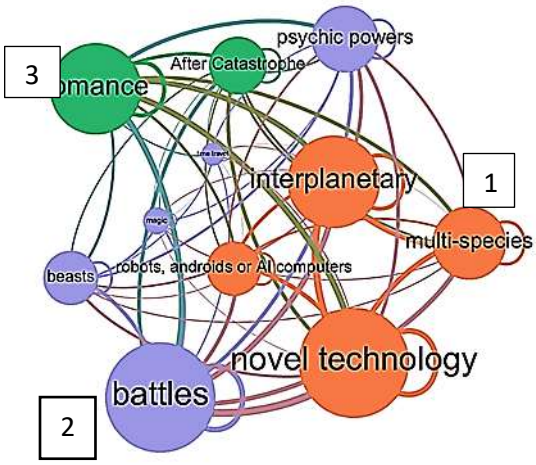

Fig.4: Moodularity based science fictions "nodes"

Source: Fu, 2018

6 How early Science Fiction weak signals have led to today's products.

Science fiction's weak signals transmitted decades ago have led to the emergence of products and services considered main stream by our today's standards. The following three cases illustrate three of these cases.

Case one: Man machine communication

Many science fiction products feature voice activated software. The idea featured in "2001: A Space Odyssey" episode where HAL 9000, the sentient A.I. who controls the systems of the "Discovery One spacecraft", performs voice

activated interactions with the crew. A.I. voice activated assistants are common occurrence since the early introduction to a mainstream audience for the first time in the iPhone 4s in 2011 (Dormehl, 2018). A science fiction concept delivering a previously unknown communication function with an arena, and a product.

Case two: Warfare drones

Drones put to use as hostile agents within a military conflict is a common theme in science fiction products. The concept is being introduced in real life warfare today. Swarm drones deployed in squadrons with a competency for independent thinking and coordinated maneuver are being introduced in warfare scenarios today.

Technology is yet to mature but the process is progressing fast. Future drone swarms are likely to possess the capacity to assess targets allocate Tasks and conduct operations with or without human interaction. Advances in

Swarming technology are confidential but rapid progress is in the making. (Guardian, 4 Dec 2019). Hybrid composition of drone swarms creates a whole that is more potent than the parts. (Kallenborn, 2018).

Case three: driverless cars

In 1964 the science-fiction author Isaac Asimov wrote an essay in The New York Times putting forward a number of projections 50 years hence... He stated "Much effort will be put into the designing of vehicles with 'robot-brains'—vehicles that can be set for particular destinations and that will then proceed there without interference by the slow reflexes of a human driver." Fifty some years later, in 2017 his prediction came true. Major technology corporations as Google and Tulsa are competing in the introduction of the first to sell self-driving vehicles to the public. Google car offers lessons about how science fiction can become fact (The Atlantic, 2014). . In a sense, Google's self-driving car constitute, in the authors view, a dramatic new vision for human transport.

7 And what impact will it all have on business strategic thinking?

It is more likely than not that compelling shifts in business strategic thinking will emerge as a result of the above mentioned analysis. Shifts that will render many of the strategic thinking fundamentals of the past decades irrelevant. One can hypothesize that:

- Environmental scanning will be replaced by analysis of dynamic data sets and clusters.
- Weak signal tracing technologies will constitute a fundamental element of strategic thinking.
- Predictive data analysis will constitute a prime driver of the strategy formulation process.
- Inter industry synergy based on signals that were once weak will become a prime strategic theme.
- Dynamic enhanced big data will provide the prime input into the strategy formulation paradigm.
- Strategies will shift away from products to functions.
- Division of strategic horizons into long and short will subside. A time span based on strategic outcomes time will become the yardstick.
- Cross industry arenas will replace existing industry boundaries.

All in all strategic thinking concepts will undergo radical shifts in terms of triggers, insights, instruments, modes, goals and ultimate outcomes.
Time may constitute a constraint, however. Events are unfolding at a breathtaking pace and contemporary patterns of strategic thinking are losing momentum.

Change will also touch approach and conduct of research in strategic thinking. Tradition has it that research in strategic thinking starts with a hypotheses that should be systematically tested. AI introduced, however, a fundamental shift in this approach. Data provides now the point of start and data analysis looks for correlations that could lead to a hypothesis. AI becomes then a weak signal identification mechanism or a tool for potential research locus rather than as a method for generating definitive conclusions. (Cha, Nov 1, 2020).

8 Summary and Conclusions

Weak signals are essential for strategic behavior. Traditional strategic management frameworks resorted to environmental scanning as a measure of uncovering potential forces of disruption and their weak signals. Igor Ansoff

expressed , as early as 1975 (Ansoff, 1975), the need for an approach to environmental discontinuities and how these discontinuities are preceded by " weak signals" made obscure by massive information "noises". Classic search for weak signals through environmental scanning has given way to more recent "modern" approaches depending on the exploration of the internet space (Van den Poel, 2013). And even more advanced approaches exploring surprises due to the occurrence of highly unlikely events or "Black Swans". (Taleb, 2007-2015). Attempts so far have, to all appearances, ignored science fiction as a possible source of weak signals.

The article explores the fundamentals of science fiction and weak signal component of the concept. It identifies clusters of science fiction analytical frameworks and how these lead to weak signals. It father relates the weak signals to new products and functions that emerged in the course of the past decade or two, and it proposes a set of implications of this development to strategic thinking. Prime among those is a change of the trigger of the strategic thinking process.

References

[1] Ansoff I (1975), "Managing Strategic Surprise by Response to Weak Signals", California Management Review, December 1, 1975 ,

https://doi.org/10.2307/41164635

[2] Van den Poel D ," Weak signal identification with semantic web mining", Expert Systems with Applications ,Volume 40, Issue 12, 15 September 2013.

[3] "Identifying Weak Signals is Vital for Strategic Foresight", PRESCIENT, 2019.

[4] Macmillan N A, "Signal Detection Theory", International Encyclopedia of the Social & Behavioral Sciences, 2001.

[5] The Innovation S-Curve, Gal's insight, July 25, 2015

[6] Bernardino Chiaia, Artificial intelligence for infrastructure control and safety, 21 January 2020

[7] The Innovation S-Curve, Gal's insight, July 25, 2015

[8] Taleb, Nassim Nicholas (22 April 2007). "The Black Swan: Chapter 1: The Impact of the Highly Improbable". The New York Times. Retrieved 20 January 2016.

[9] Eulaerts O., Joanny G., Giraldi J., Fragkiskos S., Perani S., Weak signals in Science and Technologies - 2019 Report, EUR 29900 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-12387-3, doi:10.2760/50544, JRC118147.

[10] Gibbs A., "Using science fiction to explore business innovation, PWC , 5 Sep 2017.

[11] Ariana Eunjung Cha , Artificial intelligence and covid-19: Can the machines save us? The Washington Post 1 Nov 2020

[12] Pierre Rossel, "Beyond the Obvious: Examining Ways of Consolidating Early Detection Schemes," in Technological Forecasting and Social Change 78, 2011, 375-385.https://doi.org/10.1016/j.eswa.2013.03.002

[13] Better Business Through Sci-Fi, The New Yorker, Nick Romeo, July 30, 2017

[14] Fu E., "Visulalizing the content of science fiction with Gephi", April 19, 2018 ·

[15] Bernardino Chiaia, Artificial intelligence for infrastructure control and safety, 21 January 2020. https://www.stradeeautostrade.it/tecnologie-e-sistemi/intelligenza-artificiale-per-controllo-e-sicurezza-delle-infrastrutture/

[16] Dumais S, "Latent Semantic Analysis". Annual Review of Information Science and Technology. 38, 2005 .

[17] Cha A E , " The Washington Post, "Artificial intelligence and covid-19: Can the machines save us?" Nov 1, 2020).

[18] Are drone swarms the future of aerial warfare? - The Guardian https://www.theguardian.com/news/2019/dec/04/are-drone-swarms

[19] Kallenborn Z., Swarmsof mass destruction : the case for declaring armed and fully autonomous drone swarms as WMD, May 28, 2020, Modern War Institute.

[20] Rosen, R "In 1964, Isaac Asimov Imagined the World in 2014", the Atlantic, Dec 31, 2013.