Review of: "Science desperately needs disruptive innovation"

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Interesting tool and comparison describing aspects of system-wide incremental and disruptive innovation behaviour in academic research and R&D-intensive industry.

Specific comments/suggestions:

1. The hi-tech world, especially technological startups and venture-capital funds, understands the high alternative cost of such stagnation – loss occurring by not trying other, less obvious, directions. *Pre-seed funding accelerators, angel investor networks and public industrial innovation subsidies are even more pertinent here as will typically support/fund the earliest stage, highest risk elements of disruptive innovation, VCs will typically come in later once major risks/uncertainties have been resolved to support scale up of the innovation and its integration into the target sector and markets.*
2. while InP is ingrained in the modus operandi of most scientific and industrial paradigms, disruptive thinking, which jumpstarts these fields from one phase to another, remains untaught, serendipitous, and yet highly desirable. *On the industrial side there are already extensive systems in place to systematically promote and nurture disruptive innovation. E.g., subsidy programmes from the European Innovation Council such as flagship Accelerator instrument targeted to deep-tech SMEs has an AI-driven gateway/evaluator framework to apply for funding that prioritises technical novelty and the level of market disruptiveness of the applicant's innovation. Various national frameworks such as Innovations Fonden (Denmark) and Innovate UK also specifically favour similar novelty and disruptiveness attributes.*
3. The **hi-tech** dataset was extracted from Crunchbase Data (data.crunchbase.com; Table 1). It refers to all types of funding rounds of hi-tech companies between 1991-2020 in: Cloud Storage, Mobile Apps, Quantum Computing, Artificial Intelligence, Big Data, Virtual Reality, Blockchain, Cryptocurrency, E-Learning, 3D Printing, Internet Of Things, SEO, Social Media, InsurTech, and Mobile Advertising. *How is it defined what is 'high tech' and what is not? What were the inclusion/exclusion criteria for placement in this list?*
4. In the first 8-12 years, the hi-tech DI slowly increases (i.e., Exploration stage) until a particular year when values begin to grow exponentially over1-5 years (Fig. 1; Exploitation stage). This trend change marks a disruption. *Could just as easily be an external factor affecting a particular technology market, rather than related to disruptive innovation from particular company/ies operating in that market. For example, political switch in African nation facilitating availability or rare earth metal used in superconductor devices for electronics/computing related sector. Increases commercial*

opportunity and hence investments without any significant disruptive innovation having taken place within the sector of focus. I would suggest complementing the investments data with another indicator of disruptive industrial innovation, such as patent citations, which have the advantage that they cover both technical and market attributes (Kuznets, 1962), there are extensive databases of publicly available information, and they cover most industries over extended periods (Grilliches, 1990; Paci et al., 1997).

5. the more Deep-Tech the discipline is, the faster tech giants exploit its disruption once it occurs, and attract much of the activity. *Unclear how this statement about tech giants exploiting the disruption is derived from the data that has been presented. Whilst a tech giant seizing a dominant market position would be expected to lead to a reduction in total number of investments in given sector, there are multiple other potential explanations for why this number may drop over time.*
6. A possible explanation is that they all are equally more sensitive to exogenous processes than endogenous ones. *Similar to the hi-tech graphs, the complex interplay between possible endogenous and exogenous factors means this index may be very hard to interpret based solely on the datasets that have been used to compile it.*
7. The Plateau begins when citations reach a Status Quo, i.e., certain studies are repeatedly cited as the pioneering of the discipline. This behavior is equivalent to the takeover by tech giants. *In the case of hi-tech, the plateau could just as easily be caused by investors starting to show less interest in market due to external factors and/or finance being attracted to other upcoming markets/sectors.*
8. The dizzying pace at which the high-tech industry is advancing and creating Disruption is unmatched by universities and research institutions. *Whilst this may be defendable at system-wide level, important to recognise that many of the hi-tech industry's disruptive innovations are borne out of basic scientific research, in some cases by university spin-off companies and many others with early collaborative effort between industry and academic groups. Most disruptive industrial innovation funding frameworks actively promote public-private partnerships.*
9. Despite their efforts to promote innovation and entrepreneurship, universities do not produce considerable breakthroughs. *Too strong. Could perhaps say 'relatively fewer truly disruptive breakthroughs', which would probably correlate with the vast minority 'ingenious star' academic publications mentioned earlier in the article.*
10. Today there is no established methodology for creating Disruption in hi-tech. *Suggest changing ‘established methodology’ to ‘Universally dominant established methodology’*
11. Nevertheless, the hi-tech industry developed a practical and powerful toolbox. *The 'toolbox', such as funding instruments commented above, is also instigated by public authorities and governments, who play a crucial part in stimulating industry-driven disruptive innovations like clean tech or medtech that if successful will create significant new value not only for the private sector but society too.*
12. Decision makers in universities, funding agencies, and research institutes should adopt a venture capital approach to boosting new disciplines. *Could argue this is already done by University tech transfer offices in promoting formal IP protection and spin-off formation. Using the article's terminology, this is when disruptive science transitions into disruptive high-tech. Not really clear what is being proposed here above and beyond that model.*
13. understanding of disruption activity and patterns, as manifested in the DI and DP measures *Is there scope to add further data types to the citations/publications metric used so far to gain further insight into possible causative factors*

for the observed stages 1-4 in the index, perhaps to better predict when transitions from one stage to another might occur?

References

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