Review of: "Science desperately needs disruptive innovation"

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Potential competing interests: No potential competing interests to declare.

Dear Authors,

I had an opportunity to review your work. First of all, I would like to congratulate you for your fresh thinking and your frame of thought to improve the cross learning between hi-tech and science fields, to leverage the framework to assimilate hi-tech disruption mindset in science field.

The overall work you have done by collecting three different data sets and coming up with novel idea to generate Disruption Index and Disruption Pattern is really good. Though the overall work is good, I feel few changes could further improve your work and take it to higher level.

1. **Definition of Disruption:** I feel you could try to elaborate what kind of disruption you are talking about in your paper. To clarify the confusion surrounding the definition and usage of the term Disruptive Innovation that was originally coined by Christensen [1] in 1997, Markides [2] focuses on the actual phenomenon. He classifies overall disruptive innovation in two categories. First as Business-model innovation, which he defines as “the discovery of a fundamentally different business model in an existing business.” He further states that to qualify as business model disruptive innovation, the new business model must enlarge the existing economic pie, either by attracting new customers into the market or by encouraging existing customers to consume more. This is very different from radical new strategy. As an example, we could consider a food delivery app to deliver food at home, to improve the convenience, so that there is an increase in consumption and/or additional new customer base. Similarly, the other part is defined as disruptive technological innovation. Christensen[3] argues that "disruption is a process and not an event. It could take decades for the forces to work through an industry." With this clarity, we may understand that not all improved businesses qualify as Disruptive Innovation. We have to check every business model and innovative products introduced to qualify them as disruptive innovations. In your research work you are counting all the investments that are not outliers as a Base Parameter in the case of Hi-Tech and citations or number of publications as BP in case of Science/Tech-Science to calculate Disruptive Index. You may have to provide a sound theoretical backing for such a new definition.
2. **Comparing DIs calculated by using different BPs:** In your research work, since you are using different BPs for each of these three categories, to make the calculated DIs comparable you might have to provide strong theoretical support/argument.
3. **Trend change considered as Disruption:** In your results, you are arguing stating the trend change from slow DI

growth to increased growth rate of DI as disruption. In my view this trend change could mark the normal growth pattern of the field and may not necessarily capture disruptive innovations at play.

4. **Base Parameter (BP) of Remote-Science:** You are calculating DI of remote-science based on 10,000 most cited peer-reviewed papers between 1984 & 2020. I understand this is not a static parameter. As the time goes by few of the latest papers could be listed as part of this 10,000 most cited peer-reviewed papers, since they have more potential to get citations when furtehr new journal articles are published. Whereas, the other BPs for both hi-tech and tech-science are normally fixed parameters which may not change over a time horizon.
5. **Citation for a particular point in Discussion section:** Under the discussion section you are stating that the plausible reason for the systemic behaviour of DI for science field is the availability of internet and later became flat as disruption in science could have stayed flat without internet. If you have theoretical backing for this claim, it would be good to include it as citation, which is essential.
6. **General Citation Improvements:** Additionally, several paragraphs doesn't have any citations. These additional/improved citations could increase the credibility of your arguments.
7. **Formatting:** General formatting could be improved further to enhance the paper quality

I feel I have provided few constructive feedback, which hopefully might improve the overall quality of this research work, if implemented.

References

1. ^*Robert Birnbaum, Clayton M. Christensen, Clayton M. Christensen, Michael E. Raynor. (2005). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. doi:10.2307/40252749.*
2. ^*Constantinos Markides. (2006). Disruptive Innovation: In Need of Better Theory*. J Product Innovation Man, vol. 23 (1), 19-25. doi:10.1111/j.1540-5885.2005.00177.x.*
3. ^*Clayton Christensen. (2013). The Innovator's Solution: Creating and Sustaining Successful Growth. Harvard Business Review Press.*