



# Is Replicability Essential for Production of Knowledge?

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## Overview:

In scientific, observational and statistical studies, reliability is significantly important to validate the result obtained from an experiment/ study or computational research. It ensures that different researchers obtain the same result when the study/experiment is replicated using the same methodology. If the results remain same with high degree of reliability, then only, the output data can be accepted universally or in other words, knowledge can be produced for larger public.

## Hypothesis:

Keeping in consideration, the process of the creation of knowledge, it is hypnotized that replicability is an essential prerequisite for production of universally accepted knowledge.

## Assessment:

To prove this hypothesis, one can very well propound that despite following the same methodology process, if an experiment produces different results and fails to maintain its replicability, it cannot be deemed to be accepted by the larger public.

Result-I	Experiment – Attempt I
Result-II	Experiment – Attempt II
Result-III	Experiment – Attempt III

Scenario – I

Result – I, Result – II and Result – III remain identical

Conclusion: The result achieved can be counted as universally acceptable as it passes the test of replicability.

Scenario-II

Result-I, Result – II and Result – III differ from each-other.

Conclusion: Cannot be deemed as knowledge as fails the test of replicability

## Chart: Understanding Replicability as key criterion for knowledge creation<sup>1</sup>

However, if the result remains same each attempt after the experiment, the output transcends in the periphery or acceptable/recordable knowledge, which can be referred to for its use in public domain. The above chart clearly depicts the role played by replicability. It is to be noted that while in other sciences, replicability is considered to be a key criterion and a prerequisite to research being accepted, in economic domain, it doesn't possess same importance. This is mainly attributed to adoption of different methodology by different institution for the same purpose.

### **Case Study: Computational Studies/ Medicine/ Psychology/ Economics**

In the field of computational as well as statistical studies, one can very well note the importance of replicability. The data sets and codes have been formulated in such a way that computation proceedings can be executed innumerable times with identical result. For example, the rules of computation strictly allow that if anyone does computation process e.g. for two plus two, the result will always be four. This replicability is the key aspect for creation of knowledge and any user at any point of time following the same methodological process, would obtain identical result. However, a most famous example, which throws light on an irreproducible result, is of University of Utah chemists Stanley Pons and Martin Fleischmann, who reported (March 1989) the production of excess heat through a simple equipment consisting of an electrolysis cell containing heavy water and a palladium cathode. Till then, the generation of excess heat could only be explained by a nuclear process called cold fusion. Despite having attracted a lot of media coverage internationally, other experiments could not replicate the result over the next several months.

### **Emergence of Replicability Crisis:**

In recent decades, the scientific community is experiencing a phenomenon called replicability crisis, where many earlier accepted and published results fail the test of replicability, thereby challenging the earlier accepted knowledge, thus leading to a knowledge crisis. The crisis is often discussed in the fields of psychology, pharmacology and medicine.

Previously accepted results fail in a re-test, which often requires new research/ need for new medicines for the same condition treated successful before. Other natural and social domains are also experiencing this replicability crisis. Similarly, in the field of economics, there has been conspicuous presence of replication crisis as econometric results are often delicate and tend to change with time. Mostly

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<sup>1</sup> Illustration mine

depending upon plausible estimation procedures or data preprocessing techniques, the economic results tend to lead to conflicting results, if done by different researchers/ institutions. Therefore, one can very well elucidate that while replicability is essential for creation of knowledge and for its acceptance by a wider public, replicability crisis leads to degeneration of previously accepted results, thus, loss of knowledge.

Noticeably, the scientific community is constantly engaged in re-validating the already conducted research mostly in medicines, pharmacology, immunology etc. from the point of view of replicability. In medicines and cancer research, they have been witnessing severe replicability crisis as a sizable number of already conducted research fails to repeat its previous result. Consequently, the scientific community has been forced to resort to new experiments to meet constantly emerging challenges in these domains. Similarly, in the field of behavioural science, a study conducted in the year 2018 indicated that only about 62% of the earlier results were successfully reproduced.

### **Complementarily between Replicability and Scientific Progress**

Nonetheless, while Replication is a key characteristic for scientific progress, the mere confirmation of original findings must be replicated through a number of experiments, so that it can lead to recordable knowledge. In this regard, the scientific community assumes tremendous task of not only resolving the replicability crisis but they also have even greater responsibility to replace, if needed, the original findings with revised, much accepted theories in the light of the fact that replication alone is not sufficient to resolve the crisis. Therefore, a constant effort is required to be made vis-à-vis creation of acceptable knowledge for the greater public. And for that, there is a need to make replication efforts more generative and engaged in theory-building irrespective of domains like psychology, economics, behavioural science, chemistry or medicine. Many suggest that involvement of original author is a prerequisite for conducting any replication efforts as the published methodology is often too non- descriptive and vague. Lastly, it won't be incorrect to point out that while Replicability is essential for creation of knowledge, replicability crisis is equally important for continuously improving the findings with never research.

### **Sources**

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**Brief Biography of the Author:**

Bhavna Saxena is an academician, author and a bibliophile, who is currently working as a Librarian at Apeejay School International. She possesses a Master Degree in Library & Information Sciences and has around 10 years of experience of working in libraries in India and abroad.

