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Scientific Publication in Software Engineering

Prep Report - Seminar 1

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PQ1 What is Science?

For me science is two things; first it is the process of creating and discovering new knowledge that further our understanding of our world. Second it is the collection of this knowledge documented for the scientific community as well as the rest of the world to use.

The method used to find the knowledge shall be defined and documented in such way that someone who is not the original researcher can, if it is possible to find or setup an identical environment, follow it and get the same result. This is important to make it possible to verify the research and avoid or at least decrease the risk that someone is making things up. The methods used shall also be such that any findings are, with a high probability, justified to be true [Schafersman 1997].

Finally it is important that the knowledge is documented and published. Without documenting and publishing the knowledge for the scientific community as well as everyone else science would not advance instead everyone would need to discover everything from scratch, defeating the purpose of science. Publishing results as well as the methods used for getting them also makes it possible for the community to verify the results and assessing the quality and suitability of the method used.

PQ2 How is science different from engineering?

I think that the main difference between science and engineering is that science is about furthering our understanding of the world by creating new knowledge while engineering is to apply existing knowledge to solve problems. Engineering might invent new things but not necessarily create new knowledge or understandings which is important in science. Instead an invention in engineering might be to combine or apply existing knowledge in new ways or in new environments.

PQ3 How is science different from a process improvement project in a company?

While a good process improvement project share some properties with a scientific method such as a well documented method for introducing the change and collecting metrics to see what effect the change in process have. However, a process improvement process most probably would not result in a publication published and might also not create any new knowledge that take the understanding of process improvements projects further.

However, in software engineering research a process improvement project can be a good way to measure how well a process works in a certain setting because you can hopefully get measurements before, during and after in an organization with the same people and in the same environment.

PQ4 What kind of science is Software Engineering?

Software Engineering is about the processes, tools and activities for producing software systems. It is its own distinct field but sometimes touches on computer science and, because software development is a human heavy process, social science is also relevant. The involvement of humans as well as the complexity of the processes make qualitative methods important to find and create understanding in Software Engineering research, it is hard to isolate a few measurable parameters in such environments. However, where it can be done, quantitative methods are also important to give weight to claims and make them more generalizable. This makes Software Engineering research a field where it is common to use both qualitative or quantitative methods, or methods combining the two.

PQ5 Why is publication important in science?

Publication is important in science because without documenting and publishing the results science would not advance but instead stand still and everyone needs to discover everything from scratch. It is also important to publish results to get them peer-reviewed and let the community asses the validity of a claim or result.

Also see the answers for PQ1 and PQ6.

PQ6 Why is a scientific/research community central for scientific processes?

A scientific community is important to develop and validate trustworthy methods for conducting research. Without a community that can review, validate and asses the correctness of both methods and results the quality of the research would degrade.

Also see the answer for PQ1.

PQ7 What are the two most common bibliometric measures out there and how are they calculated?

The most common bibliometrics seems to be the *ISI Journal Impact Factor* and the *h-index*.

ISI Journal Impact Factor is an indicator on the impact of a specific journal. It is calculated from the average number of citations per paper published in that journal during the two preceding years divided by the number of papers published in that journal during that time [The Karolinska Institutet Bibliometrics Project Group 2008].

H-index is an indicator of the productivity and impact of a scientist. It is calculated as "A scientist has index h if h of his or her N_p papers have at least h citations each and the other $(N_p - h)$ papers have $\leq h$ citations each."[Hirsch 2005]

References

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