Publishing Research Results: The Research Process

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Abstract

The research process starts from the idea. From a researcher's point of view, there exists a problem without a solution. As Sir Isaac Newton noticed: apples fall down and not up. What was behind this observation? Newton was interested in phenomena in nature and the observation became a giant leap in science as the ideas were developed into a model of gravity. What was the process which took place within the framework of the observation, the modeling, and then extensions and new applications of the model?

The research process starts from ideas, or the observations [1, 2]. These are further developed in the researchers mind as she attempts to describe and to explain the phenomena. She may also want to make predictions and ultimately control the phenomena. Consequently, the researcher first tries to get a deep understanding of the phenomena, she wants to find answers to questions like why, what and how. Nowadays, the first step in practice means that the researcher makes a literature survey to establish what has been studied previously within the research topic. If the researcher has expressed the topic as a research question, after the literature survey she can refine the original research question to match existing knowledge and to find a research question or problem that has not yet been answered or solved.

The literature survey raises the following issues: What literature is the researcher looking for? Where can one find literature that addresses the research question? Where does the literature come from? Why is it published for general use? Is there some kind of established process for publishing research results?

When the research question is established or the research topic is otherwise clearly determined, then one can start to outline the research plan. In the field of information technology, and within communications engineering, the research generally includes some experiments. The experimental setting should be designed, keeping in mind the research question. When a model for the phenomena has been found, the experiments may reveal limitations or constraints that cannot be easily detected from the theoretical model. With the model parameters, it is also possible to predict what might happen when the parameter values are set outside the range used in the earlier experiments.

When the actual research has been completed the next step is to publish the results of the research project. The forum is selected, the templates are downloaded, the actual writing takes place and finally the manuscript is submitted. Many questions lie inside this simple procedure. Who are the authors, who can be considered as having participated in the research project, i.e. who actually contributed to the research, who should be included as authors in the manuscript, who should be mentioned in the acknowledgements? When the research question was refined the literature was surveyed. How should knowledge from the literature to be included in the manuscript? Which references should be present, how are they selected? Answers can be found from proper consultation of peers, supervisors, or other members of the research team. In addition, careful reading of the literature is important to get an understanding of the research groups active within the research field. Starting points are articles from well-known researchers, or from internationally recognized research groups, and over-view or state-of-the-art articles.

Literature found from databases maintained by scientific publishers is generally available for researchers [3, 4, 5]. Access requires contracts between organizations and then the articles can be conveniently downloaded. The sources for literature retrieval are classified into three classes: primary

sources consisting of the actual scientific articles, secondary sources like indexes, collections of abstracts, or review-articles, and tertiary sources as catalogs from publishers and libraries.

Nowadays many metrics exist to evaluate scientists and the quality of scientific research [6]. Simple metrics only count how many publications an author has published without considering the significance of the research. More meaningful metrics include a citation count for an article [7, 8, 9], an impact factor for a journal [10], and the h-index for the scientist [11]. Scientists try to get high values, since they are then more respected, and they may get better funding for their research, and awards or fellowships of scientific organizations. The metrics mentioned are rather generally used in the evaluation of research and researchers. Anyhow, one must keep in mind that they all have both strengths and weaknesses. The evaluation of the research work is not so straightforward, but combining information from several sources gives a more correct view to the quality.

The scientific society is an autonomous system. From the publishing point of view it governs submission of the manuscript, the review process, criticism, and feedback. The manuscript turns into an article in the publishing process and after that, the researcher is ready to start the research process again from the beginning.

Index Terms: Research process, research article, manuscript.

REFERENCES

[1] P. Järvinen, ``On Research Methods´´, Opinpajan Kirja, Tampere, Finland, 2004.
[2] J. W. Creswell, ``Research Design. Qualitative, Quantitative, and Mixed Methods Approaches´´, Sage Publications, 2003.
[3] IEEE Xplore Digital Library. From: http://ieeexplore.ieee.org/Xplore/dynhome.jsp. Retrieved: Oct. 22, 2010.
[4] Elsevier ScienceDirect. From: http://www.sciencedirect.com/. Retrieved: Oct. 22, 2010.
[5] SpringerLink. From: http://www.springerlink.com/home/main.mpx. Retrieved: Oct. 22, 2010.
[6] M. J. Kumar, ``Evaluating Scientists: Citations, Impact Factor, h-Index, Online Page Hits and What Else?´´, IETE Tech. Rev., vol. 26, pp. 165-168, 2009.
[7] Google Scholar. From: http://scholar.google.com/. Retrieved: Oct. 22, 2010.
[8] Scopus From: http://www.scopus.com/home.url. Retrieved: Oct. 22, 2010.
[9] ISI Web of Knowledge. From: http://apps.isiknowledge.com/. Retrieved: Oct. 22, 2010.
[10] Journal Citation Reports. From: http://admin-apps.isiknowledge.com/JCR/JCR. Retrieved: Oct. 22, 2010.
[11] J. E. Hirsch, ``An index to quantify an individual's scientific research output´´, PNAS, vol. 102, no. 46 16569-1657, Nov. 15, 2005.