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Opinion Article

Would it be possible to be working with scientific research and not publish papers?

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Abstract

Scientific work is generally evaluated by scientific publications. The comparison between different working groups, therefore, can often be performed based on criteria such as number of publications and quality of journals. A relatively obsessive behavior for the next paper may be a consequence of this panorama. This article presents the opinion of the authors about the real importance of publishing papers within the scientific research process. Some comments on the stages of the research process are derived from concepts present in the literature related to the design process. Even though the research and design processes are different in objectives and methods, this comparison allows us to understand the fundamental importance of scientific publications. Scientific papers make public the information that must be absorbed, matured, reproduced, proved by the scientific community.

Introduction

Daily scientific work, as a professional activity, requires planning, discipline and method.

Funding activities are necessary, seeking resources from agencies that finance research activities. The feasibility of this process involves the publication of results through scientific papers, which can serve as a measure of performance.

The daily life of this vicious circle often leads researchers to a kind of obsession with the publication of the next paper to be published.

Pursuing a better journal with a greater impact factor is necessary!

Publishing more and better is necessary! Publishing too much is necessary!

But… would it be possible to work with scientific research and not be publishing?

This paper expresses the authors' opinion on the need to publish articles as a mandatory step for those working with scientific research. The text has three chapters, and this introduction presenting the theme in case. The next chapter discusses stages of the research process usually followed by scientists acting as researchers. The third and final chapter concludes the discussion and addresses the issue of paper publications.

Stages of the research work

Research work is comparable, to a certain extent, with design work, even if the objectives and methods are not the same. John Chris Jones, in his famous book 'Design Methods' [1], presented a characterization of the design process that will be considered here as a starting point. Jones led discussions on design methods during the 1960s and in 1970 presented the first edition of his book, which became a reference on the subject and translated into several languages.

Considering the design work, Jones proposed that any design activity be divided into three stages: divergence, transformation and convergence. Jones may have proposed these three steps having in mind the categorization or classification of the design methods, but these three steps will be considered here as a reference for the discussion.

In a nutshell, during the first of these three steps, divergence, the designer literally moves in many directions looking for references on how the problem he needs to solve has been solved before. It is a stage, in which the designer seeks information related to the project in which he will be involved, the problems to solve, the techniques available, the costs, the difficulties etc. Divergence aims at enlarging the workspace to increase the probability to find a suitable solution.

Once properly fed with information, in the next step, called transformation, the designer creates the solution of the problem. In this stage in which the designer acts as a complete human being, having his training and his instincts, emotions and rationality working so that his thinking machine synthesizes the intended solution. Then, the designer with the solution in mind goes to the last stage, the convergence stage, in which the development of the solution will occur so that it can, finally, be implemented. The end result may, then, be a report describing the solution.

Based on these ideas, professor Paulo Kroeff de Souza created an update course for engineers on 'design methods'. This course, initially offered through the local society of engineers between the late 70s and the beginning of the 90s of the 20th century was also offered to an interesting mix of undergraduate and extension students in the "Universidade de Ijuí". Finally it was adapted for use in undergraduate engineering courses [2] at the Federal University of Rio Grande do Sul.

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An adaptation of the course on 'design methods' for graduate courses has led to a course on 'design and research methods' [3]. This adaptation led to the concept of three stages for the research process, inspired by the three stages of design activities, even if with different approaches and different methods. The research activities were imagined as three stages, namely: familiarization, experimentation and persuasion.

The familiarization stage is a stage in which the researcher seeks to understand the phenomenon he is studying and of the state of the art of research in the area. Current theories may not be as accurate in describing a natural phenomenon. Thus, this phenomenon may require minor corrections in the current theory or it may require profound changes in the paradigms that guide the current work of researchers, but the path followed will always be the same.

The next stage is the structuration in which the researcher organizes the perception of the problem and the phenomenon formally described. The researcher creates the explanation for the phenomenon under study and the set of hypothesis that will guide the activity. The objective is to synthesize an explanation that, if successful, will be acquired knowledge and if sufficient, will solve the problem. This stage may involve extensive experimentation.

The persuasion stage is the third step and corresponds to the stage in which the researcher must convince his fellows that the valid theory does not explain the phenomenon he has been studying and that his observations and updates to the current theory contribute to building a more appropriate way to describe natural phenomena. Convincing (or persuading) peers is necessary because the current theory needs to be adapted constantly, always including new results of experimentation.

To set a good parallel between the design and research processes consider the main flow of information. The design process involves a flow of information from the designer to nature, as the designer creates things and can change nature as a result of his creative processes. However he may also need information about the aspect of nature he is acting upon. This means that the design process may involve research sub-problems. Conversely, the research process, involves an opposite flow, from nature to the researcher, who tries to understand how nature works. However, he may have to design experiments to interrogate nature. This means that the research problem may involve design sub-problems. But, there is a difference in the final stage of the research process, in which the results obtained with scientific research are absorbed by established scientific knowledge.

The fact that both design and research problems contain sub-problems involving design and research is what leads to the analogy between the stages of divergence, transformation and convergence of the design process and the familiarization, structuration and persuasion stages of the research process. So, at this point, we want to establish that there is a very probable extensive commonality of behaviour between, on the one hand, scientific researchers in physical, earth, biological, medical, social and other sciences and, on the other hand, engineering, architectural, information and other designers. These people have in common a combination of method, creativity and rigour in their endeavours.

The role of scientific publications

The importance of scientific publications, with these ideas in mind, is evident. Publishing to ensure recognition of scientific work in progress is necessary, just as publishing to ensure continuity in the work of the research group is necessary. Publishing so that the results can be evaluated by peers is necessary, as well as publishing to add the contribution of the working group to the current set of theories is also necessary.

The persuasion stage, as discussed in the previous chapter, and scientific publications as an objective in itself, is very important. As a consequence, there are different types of publications, suitable for different situations. The scientific article, as it is currently conceived, is the most noble and efficient tool for disseminating results. However, there are other possibilities, such as the short articles or communications, or the reviews, among other alternatives.

The articles called communications aim to allow the dissemination of results before they are subject to internal confirmation by the working group and subsequent elaboration of a complete article describing the experiment and presenting the results. It is useful when a remarkable result, must be disseminated quickly to alert the scientific community, and also, to guarantee the primacy of the new discovery for the working group.

Review papers evaluate and compare the content published in previously published articles. These papers may be focused only on a critical assessment of what has already been published on a particular subject. However, these review papers can also use a critical review of previous approaches and add new contributions, promoting a better addressing of the results presented.

In fact, the persuasion stage is a mandatory part of the stages of any research action. The initial step in the process is the evaluation of a phenomenon in the light of the theories currently accepted by the scientific community. If the second step leads to new results, the next step must include a strong interaction between the working group that obtained these results and the scientific community, configured with the publication of scientific articles.

So, usually, the act of publishing a scientific article is a mandatory part of the persuasion step. If a researcher has managed to achieve new results, he cannot keep those results in his drawer. When he continues in his research work, he himself must be able to analyze phenomena in the light of a body of knowledge already including his results. In addition, his results can lead to different conclusions when analyzed by other researchers, with different backgrounds.

The previous chapter depicts circumstances in which both design and research projects can lead to demands for scientific research. Major research topics are, usually, associated with teaching actions at various levels and the results may be fully disclosed. Of course, not all research actions take place in a public environment, allowing full disclosure of results. The consequence in these cases is a delay in the disclosure of results.

In many contracts to fund research actions, there are confidentiality clauses usually establishing deadlines for the disclosure of results after the conclusion of these contracts. These deadlines may, in some cases, require a few years. There may be ethical issues associated with these contracts, but they may be justified in the light of the interests of the applicants for these contracts.

However, the publication of scientific results through scientific articles continues to be mandatory in research actions, due to the iterative nature of research processes, the application and constant evaluation of the theories in use to describe the behavior of nature and the occasional structuring of new theories based on responses from the scientific community.

In the particular cases of research actions carried out in a private environment, the dissemination of results to the scientific community remains necessary, even if delayed by a few months or even a few years.

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