



# Effects of the durability of scientific literature at the group level: Case study of chemistry research groups in the Netherlands

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## ABSTRACT

In this study an analysis of the effects of the different types of durability on the bibliometric performance at the group level is presented. The scientific production during the period of 1991–2000 of a set of 158 Dutch research groups in chemistry is studied considering several bibliometric indicators in the perspective of the durability of the publications in terms of the citations received. Two citation windows have been considered for the analysis of the effect of the enlargement of the citation period, one including the citations received in the same period of publications (1991–2000) and a second one including eight years more (1991–2008). In addition, qualitative indicators provided by a committee of experts who evaluated the research groups have been analyzed in order to study the relationship between qualitative indicators and quantitative measures, in particular these of durability. Results show that production with “normal” durability is the most rewarded both according to bibliometric indicators and qualitative assessments given by experts. We also find that publications with a delayed pattern do not represent a major problem in the assessment of research groups, as those groups with a higher share of this type of publications do not improve their assessment when the citation window is substantially enlarged. Several discussions are presented regarding the importance of durability analysis in the framework of research assessment situations.

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## 1. Introduction

An important element of concern in research evaluation is the effect that the durability of the scientific literature and particularly the “delayed recognition” (Cole, 1970; Garfield, 1980) or “scientific prematurity” (Stent, 1972) can have on the indicators used in the evaluation of research and the development of research management and policy. Garfield (1970) claimed that “critics of citation indexes sometimes question their utility because many great discoveries were unnoticed by contemporaries and therefore not cited”. In this sense, experts in research assessment frequently face comments from researchers claiming that their publications “need more time” to become properly acknowledged. This is the reason why several researchers have studied the problem of delayed recognition and the so-called “sleeping beauties” (van Raan, 2004) showing that although delayed recognition actually does exist, it is not a very frequent phenomena in scientific publishing, thus being more a myth than a real problem (Glänzel and Garfield, 2004). Nevertheless, it is still a topic that challenges researchers in scientific communication nowadays (Wang et al., 2012).

The interest of studying the durability of publications is important for the practice of research evaluation, and in the words of Hook (2002) the “identification and dissection of the factors that contribute to “delay” are not only of interest to scientists, historians, philosophers, and sociologists. Their recognition may also lead to useful scientific and personal practices and be of value to those making science and technology policy”. From a critical perspective, Stent (1972) cited by Hook (2002), considers that a discovery can be considered as premature if it cannot be connected by a series of simple logical steps to canonical knowledge of the time and this disconnectedness is the reason why it is not appreciated by the relevant practitioners in the field at the time it is presented. In the views of this author it is even appropriate that the scientific community ignores (if not actually rejects) work that is premature, until it can be properly connected. In this view, delayed recognition is somehow the necessary price that both scientists as well as society must pay at the time to prevent being overwhelmed by attention to perhaps false and useless leads. Following Garfield and Malin (1968) and Costas et al. (2011) it can be suggested that situations of severe patterns of delayed recognition could be also linked to the own fault of researchers as they are not able to communicate their ideas in a proper way.

Recently a new methodology developed by Costas et al. (2010b) for the analysis of durability of scientific publications introduced a flexible tool for the analysis of the aging of publications. This

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methodology uses a classification of all papers in three general types of durability (“Flash-in-the-pan”, “Normal” and “Delayed” papers, their definition is given in Section 3.3). Thus it provides a response to the claim of Garfield for a “handy yardstick” to measure the durability of scientific publications. It also allows a more flexible and systematic identification of citation patterns related to delayed recognition. This new methodology has been already used to test the existence of the so-called “Mendel syndrome” (Garfield, 1979; van Raan, 2004) in the analysis of individual scientists (Costas et al., 2011). The results showed that the potential cases of “Mendelism” are rare and that enlarging the citation windows does not necessarily imply a significant improvement in the assessment of these researchers.

Building up on these previous developments in the analysis of *individual scientists*, we focus in this current study on the analysis of *research groups* in the field of chemistry. Research groups can be considered as the basic unit of the research system and their analysis is very common in bibliometric literature (Nederhof and van Raan, 1993; Bordons et al., 1995; Rey-Rocha et al., 2002; Calero et al., 2006). The analysis of the durability of the production at the level of research groups has never been analyzed before. This is important particularly in the light of the comparison of durability indicators with qualitative indicators, because it could provide new insights into the effects of literature obsolescence in the assessment of research performance.

## 2. Objectives

The main objective of this paper is to combine the analysis of various indicators (both quantitative and qualitative) used in research evaluation at the group level, and to study their relationship with the three types of durability mentioned in the foregoing section.

The main research questions that we want to answer are: can the assessment of research groups be significantly affected by the different durability types observed in their output? Does international collaboration have any relationship with the durability of scientific publications of research groups? Can experts in peer review assessment panels be able to somehow perceive the durability of the publications of the research groups that they are assessing?

## 3. Data and methods

In this paper outcomes are presented from a study of publication output and international impact of academic chemistry researchers in the Netherlands. The study was performed on behalf of the International Review Committee on Chemistry in the Netherlands (VSNU, 2002). This Committee was established in 2001 by the Association of Universities in the Netherlands (VSNU) for a quality assessment of academic chemistry research (van Raan, 1996). Ten universities were involved in this research assessment procedure: Radboud University Nijmegen, Leiden University, University of Groningen, Delft University of Technology, Eindhoven University of Technology, Twente University, Utrecht University, University of Amsterdam, Vrije Universiteit Amsterdam, and Wageningen University Research Center.

The period of analysis is 1991–2000 for source publications. Their citation impact has been collected for the same period (1991–2000) and also an additional period of citations has been considered: 1991–2008.

The study is based on 18,160 papers in chemistry covered by the Web of Science (WoS). These papers were published by 600 senior researchers, who were associated with chemistry research programmes on December 31, 2000. The names of the senior scientists were provided by VSNU. The researchers were aggregated

into about 158 research groups. For each group the full time staff members were selected.

In a first step, for each senior scientist all relevant publications from 1991 to 2000 were extracted from our Web of Science based publication data system. This includes all publications listing the researcher either as first author or as co-author. In a verification-round, researchers were asked to verify whether publication lists were correct and complete. We also performed a test ourselves, aimed at identifying and deleting publications authored by other scientists having similar names. As a result, we are confident that we obtained a highly valid publication data for all chemistry groups in this study.

In the following paragraphs the different sets of indicators used in the analysis are described.

### 3.1. Qualitative indicators of assessment (VSNU, 2002)

In the first place we describe the set of indicators resulting from the review of Dutch chemical research, these are the qualitative indicators provided by the Review Committee.<sup>1</sup> An assessment of each of the following aspects was required for each research programme and group. These aspects of the evaluation procedure are discussed in more detail here, to provide insight into the working method of the committee, and the level of detail of the decision making. It should be noted that the members of the Review Committee were asked to draw up a preliminary conclusion on the basis of the self evaluation report before the first meeting, and the bibliometric report was handed over just before the first meeting of the Review Committee. The report describing the evaluation process and the outcomes clearly states that “In view of some restrictions of the method of bibliometric analysis, the Committee based its assessments primarily on the self-evaluations provided by the Faculties, on the site visits and on the Committee Members knowledge of the field. The bibliometric results were consulted to check the outcome of that process; only in cases of unresolved disagreement, experts more familiar with the specific area were asked for additional comment. However, it should be pointed out that in the vast majority of programmes the correlation between the two types of assessment was good” (page 16 of the Report, VSNU, 2002).

#### 3.1.1. Quality

Academic quality is based on the quality of the output of the research group: dissertations, academic publications, professional publications (where relevant), patents (where relevant), other academic products (tests, prototypes, software). Scores were from 1 (low quality) to 5 (excellent). More precisely, a score of ‘5’ means that according to the review committee the group belongs to the top 5% in the world.

Aspects of the assessment include academic level of the publications, with respect to publication media (e.g., journal status), originality and coherence of the research, and contribution to the development of the discipline or area. Due regard is given to the international standing of (the members of) a research group in assessing the quality of its achievements. Note is taken of participation in international cooperative projects, membership of editorial boards of international journals, academic awards, invitations to international conferences, visiting professorships, research funding acquired from NWO, the Dutch national research council.

<sup>1</sup> The aim of the VSNU procedure was ambitious: evaluation within the next five years of all main disciplines (e.g., physics, chemistry, biology, psychology, sociology, linguistics, in total about 25 major disciplines) in all thirteen Dutch universities. Also, a certain ‘foresight’ element was included: an assessment of each group in terms of its ‘long term viability’ (van Raan, 1996).

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