

The impact of a proposal for innovation measurement in the software industry

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Abstract

Measuring an organization's capability to innovate and assessing its innovation output and performance on the market is a challenging task. We proposed a comprehensive model and a suite of measurements to support this task. In the current paper, we have reflected on the impact of the work. We have mainly relied on quantitative and qualitative analysis of the citations of the paper.

CCS Concepts: • **Computer systems organization** → **Embedded systems**; *Redundancy*; *Robotics*; • **Networks** → *Network reliability*.

Keywords: innovation, impact, relevance, measurement

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1 Introduction

Innovation measurement in SE was a challenge—we contributed with a measurement framework in *Towards innovation measurement in the software industry* [2].

The paper is structured as follows: Section 2 summarizes the contribution of *Towards innovation measurement in the software industry*. In Section 4, we describe a content analysis of the articles citing *Towards innovation measurement in the software industry*. Section 5 discusses the research identified

in Section 4 that has extended our work. In Section 6, we discuss the research which documents the use of our work in industrial settings. Section 7 concludes the paper with some suggested directions for future research.

2 Summary and main contributions of *Towards innovation measurement in the software industry*

What was done.

3 Methodology

For understanding the impact of *Towards innovation measurement in the software industry*, we have relied on the classification schema for academic citations proposed by Teufel et al. [5]. We also considered the taxonomy proposed by Bornmann and Daniel [1]. However, based on a pilot application we found Teufel et al. [5] more straight forward and sufficient for our analysis. The decision is further supported by prior experience of using Bornmann and Daniel's taxonomy in software engineering literature [4].

The categories in the schema we used are listed and briefly described in Table 1. To separate any industrial application of our work we added a separate category.

On February 24, 2020, the *Towards innovation measurement in the software industry* had over 72 citations in Science Direct and Scopus, 61 in Web of Science Core Collection, and 234 in Google Scholar. To get a relatively complete picture of how this work has impacted further research, we decided to analyse the 234 citations on Google Scholar.

In a pilot, the first two authors classified ten randomly selected articles and discussed the use of categories. Thereafter, they divided the 234 articles among them and independently classified them. The procedure followed is briefly summarized below:

- Exclude citations where the full-text is not available.
- Exclude articles which are not written in English.
- Exclude articles that do not cite *Towards innovation measurement in the software industry* in the full-text.

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- From the title, abstract and the publication venue judge the discipline of the publication (e.g. software industry, manufacturing, farming or automotive).
- Only for conference papers and journal article, search for the citation to *Towards innovation measurement in the software industry* in the full text, for each citation in the paper read the entire paragraph containing it to understand the context, then classify the citation based on categories in Table 1.

4 Overview of the papers citing *Towards innovation measurement in the software industry*

Exclude papers 64 (52 were not written in English, 6 were inaccessible in full-text, 5 did not cite *Towards innovation measurement in the software industry* in the body of the paper and 1 was a duplicate citation).

Grey literature: 53 citations are from what we have classified as grey literature. Of these 53, 2 are technical reports, 10 are book chapters and 41 are theses.

In total there are 108 conference papers and 76 journal articles citing *Towards innovation measurement in the software industry*. The analysis of their use of *Towards innovation measurement in the software industry* is summarized in Table 2.

The paper has nine self citations (including one from a thesis).

When looking at the literature, where there is no stated connection to the context of software industry we see that the literature encompasses several diverse fields including the following: automotive, banking, economics, farming, forestry, health sector, human resources, logistics, manufacturing, mechatronics, NGOs, oil industry, politics, restaurants and transportation.

While discussing the citations the following reference will be useful [3] We can use this to also articulate why we have relied on citations as a way to reflect on the paper.

5 Positioning in consideration of the recent state of the art and practice

What has been done after this (partly we'll get it from the previous section). Open innovation seems to be the area in SE that has been a follow-up of our work.

6 Expected impact

Here it would be nice to show cases in industry not counting Ericsson. Perhaps we can get it from Section 4?

7 New emerging ideas and current vision

What will be done, possibly

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Nauman covers: Who found it relevant (would be good to have some qualitative data on how they ref the paper). Why did so many cite it?

Henry

Possibly Richard?

Table 1. Categories of citing papers from Teufel et al. [5]

Category	Sub-category	Description
Weakness	Weak	Weakness of the approach pursued in <i>Towards innovation measurement in the software industry</i> , Weakness in the definition, model, entities, attributes, or measurements of innovation as proposed in <i>Towards innovation measurement in the software industry</i>
Contrast/Comparison	CoCoGM	Contrast/Comparison in Goals or Methods (neutral)
	CoCoR0	Contrast/Comparison in Results (neutral)
	CoCo-	Unfavourable Contrast/Comparison (current work is better than the work in <i>Towards innovation measurement in the software industry</i>)
	CoCoXY	Contrast between a cited method and the method in <i>Towards innovation measurement in the software industry</i>
Positive sentiment	PBas	author uses the work in <i>Towards innovation measurement in the software industry</i> as a starting point
	PUse	author uses definitions/models/measures
	PIUse ¹	author uses the work in <i>Towards innovation measurement in the software industry</i> in industrial settings
	PModi	author adapts or modifies definition/model/measurements presented in <i>Towards innovation measurement in the software industry</i>
	PMot	this citation is positive about approach or problem addressed in <i>Towards innovation measurement in the software industry</i> (used to motivate work in current paper)
	PSim	author's work and the work in <i>Towards innovation measurement in the software industry</i> are similar
	PSup	author's work and the work in <i>Towards innovation measurement in the software industry</i> are compatible/provide support for each other
Neutral	Neut	Neutral description of cited work, or not enough textual evidence for above categories.

Table 2. Results of an analysis of the citing papers

	Total	Weak	Comparison / Contrast	Positive	Neutral	Jrnl.	Conf.
Self citations	9	0	0	2 (PBas:1, PMot:1, PModi:1)	6	5	1
From software re- lated fields	44	0	0	17 (PBas:4, PModi:2, PUse:7, PMoti:4, PSup:1)	27	24	20
Others	72	0	2	21 (PBas:2, PModi:2, PUse:14, PMoti:2, PSim:1, PSup:2)	48	57	15
Total	116	0	2	38 (PBas:6, PModi:2, PUse:21, PMoti:6, PSim:1, PSup:3)	75	81	35