

TWENTY-FIVE YEARS OF NOKOBIT – A BIBLIOMETRIC STUDY OF IMPACT

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ABSTRACT

NOKOBIT is an important annual event for many Norwegian information systems researchers. Yet, national conferences are regarded by some researchers as merely being meeting points of lower scientific standards. To assess the importance of NOKOBIT in the research community a bibliometric analysis of past NOKOBIT papers was conducted based on available national sources and Google Scholar. Data collection was challenging due to incomplete publication records. The results show that some NOKOBIT papers do attract a substantial number of citations. Moreover, the ratio of papers that is cited is encouraging and represents a positive sign of health for the conference in terms of relevance and quality. Our results suggest NOKOBIT proceedings make a worthwhile contribution to the research community. We recommend that NOKOBIT organizers place more effort on making full-text proceedings and its meta-information more consistently accessible.

Keywords: *bibliometrics, citations, research, impact*

1. INTRODUCTION

The annual Norwegian Conference for the use of Information Technology in Organizations (NOKOBIT – Norsk konferanse for organisasjoners bruk av informasjonsteknologi) has been the main national meeting point for information systems researchers in Norway since its inaugural conference in 1993. The main purpose of NOKOBIT is to serve as a venue for the exchange of research ideas among Norwegian academics with the presentation and discussion of peer-reviewed papers. NOKOBIT is currently co-organized and co-located with several sisters-conferences, including The Norwegian Informatics Conference (NIK), Norwegian Conference for Education and Didactics in IT subjects (UDIT) and Norwegian Information Security Conference (NISK), in addition to nationally important activities related to higher education and research policy such as the annual meetings for the National Councils for information sciences and computer science. NOKOBIT has also been one of the few venues where researchers are encouraged to submit contributions written in the Norwegian language. NOKOBIT has a wide thematic scope ranging from in-depth information systems topics and more general topics such as education. NOKOBIT has also served an inclusive venue where Ph.D.-students and early-career researcher have had an opportunity to present and get feedback on their first paper.

A prerequisite for being cited is the availability of papers to the public and the World Wide Web emerged around the time when the NOKOBIT conference series started. It seems to be a paradox that although the conference theme evolves around meaningful digitalisation in organizations most of the publications presented during its lifetime are not available digitally on the web.

The Norwegian incentive system for publications was first introduced in 2004 and one would expect to observe an intensified publication activity from 2004 onwards due to the increased pressure to publish at Norwegian higher education and research institutions (Sandnes 2018). According to the official NOKOBIT website Tapir Academic publishers published the NOKOBIT proceedings from 2005 to 2013. Prior to that it was rumoured that the proceedings were informal photocopied hard copies distributed to participants at the conference. In 2014, the NOKOBIT proceedings were registered as a series with its own ISSN-number and published in the BIBSYS Open Journal System (OJS) giving NOKOBIT papers a

higher score in the incentive system on par with entry tier journal publications. In 2016 the incentive system was revised with a bonus for international co-authorship and less punishment on multiple authorships (Haugen & Sandnes 2016). One may speculate that the new incentive system over time may lead to more international co-authors of NOKOBIT-papers in the years to come, yet it is too early to assess this hypothesis.

Through informal personal conversations with various scholars in Norway we have registered that opinions regarding national conferences in general and NOKOBIT specifically are mixed. Similar opinions are echoed via the CORE Computing Research and Education conference ranking website (<http://www.core.edu.au/>) which confirm that “*National conferences which are connected with a single country have (mostly) been removed from the CORE ranking list*”. However, regular NOKOBIT participants value the national meeting point as one can discuss research and education in a national context and exchange good practices. Academics returning or immigrating from abroad find NOKOBIT a useful forum for establishing a network in Norway. The critics of NOKOBIT states that a national conference has limited impact and that one should publish in international venues in order to succeed as an early career researcher.

This study set out to explore these claims. What is the impact of NOKOBIT? The impact of research is often quantified using citation counts (MacRoberts & MacRoberts 1996, Lindsey 1989, Folly et al. 1981) and journal impact factors (Moed 2010, Jarwal, Brion & King 2009). Citations have also been studied specifically in context of information systems, see for instance (Cocosila, Serenko, & Turel 2009, Hassan, & Loebbecke 2017, Thiede 2017). Citations and impact factors are indeed controversial topics (MacRoberts & MacRoberts 1996, Lindsey 1989, Folly et al. 1981). Still, citations and impact factors are practical and effectively the only available methods for pragmatically measuring research impact. In its defence, a paper that has generated a citation has generated some interest which can be used as hard evidence of impact.

However, a citation can also be negative if it stems from criticism (Catalini, Lacetera & Oettl 2015). Citations can also easily be manipulated through self-citations and citation cartels. In such instances citations do not reflect positive impact. Citation coverage is another challenge (Larsen & Von Ins 2010, López-Illescas, de Moya-Anegón & Moed 2008). Language bias is one known problem (Van Leeuwen 2001) and citations are known to frequently escape the citation databases often as a result of errors in the meta-information (Asano et al. 1995, García-Pérez 2010). Academic disciplines have varying citation patterns and one should make comparisons across disciplines with great care (Glänzel et al. 2011, Zitt, Ramanana-Rahary & Bassecouard 2005).

2. METHOD

2.1 Information sources

Unfortunately, there is no single source of detailed information about past NOKOBIT conferences as the official NOKOBIT web page is sparse in terms of substantial content. It was therefore necessary to collect information from several additional sources. The proceedings from 2012 to 2018 are available via the Open Journal System (<https://ojs.bibsys.no/index.php/Nokobit/issue/archive>) with a complete list of contributions and links to articles in full text. We did not consistently include 2018 in our analysis as we considered the conference to be too recent to have acquired a substantial number of citations. Moreover, a dataset is available for the sister conference NIK (Sandnes & Grønli, 2018) with data up to and including 2017 making comparisons for this range possible.

For the years 2012 and 2013 the entire conference proceedings published by former Tapir Academic Publishers with table of contents and the papers are available online. For all year prior to 2012 we were unable to find a systematic repository of NOKOBIT conference programmes or full-text papers as full-text articles back to 2010 disappeared when Tapir Academic Publishers were acquired. In fact, the

NOKOBIT web page (<https://www.nokobit.no/>) only lists a series of ISBN numbers of conference books back to 2005. In addition, some authors have deposited their articles in full-text on an ad-hoc basis through personal initiative throughout the history of NOKOBIT. For this study, we did not have access to past printed NOKOBIT-proceedings.

The national Cristin database (<https://www.cristin.no/>) was also solicited for information as it should contain complete publication records for Norwegian authors back to 2004, but the results showed that most NOKOBIT authors have not systematically registered their publications in the Cristin database. The records are thus incomplete, and in some instance the chapters are registered on several different instances of the main anthology. For instance, for 2010 we were only able to identify 5 NOKOBIT entries in Cristin. For this study information about past NIK conference locations (<https://nik.no/konferanser/>) were also used as NIK and NOKOBIT have been co-organized in the same location in throughout most of the NOKOBIT history.

Citation data were manually acquired using Google Scholar. Google Scholar is known to be the most flexible and lenient in terms of indexing (Kousha & Thelwall 2008, Harzing & Van der Wal 2008, Gehanno, Rollin, & Darmoni 2013, Halevi, Moed, & Bar-Ilan 2017) capturing more citations than other engines such as SCOPUS, Clarivate Analytics Web of Science and ResearchGate as citation counts can vary greatly between different databases (Meho & Yang 2007). However, a presence of a citation is not necessarily the absolute and complete truth as there may still be many undetected citations. However, Google Scholar provides an unbiased and transparent, though cumbersome and labour-intensive, platform for citation analysis.

2.2 Data collection

The data used in this study were acquired using both a top-down and bottom-up approach. Since detailed information about the papers in each proceedings was only available for the year 2012 to 2018 a top down approach was taken to get citation and visibility statistics for papers prior to 2012. This was done by searching for NOKOBIT for each of the years in the conference history. The paper info and citation counts were recorded for each search. A problem with this approach is that it does not capture NOKOBIT papers without some sort of NOKOBIT identifier in its meta-information.

A bottom-up approach was taken for the years 2012-2017 where the paper information was available. This involved a specific manual Google Scholar query for each paper title. This allowed us to collect more complete citation and visibility statistics even for NOKOBIT papers without, with incomplete or with erroneous NOKOBIT metadata. In some instances, authors had also published their papers with identical titles in other venues. These are often extended, and reworked, versions published in archival journals or international conference proceedings. Citations to such papers were discarded as our scope was limited to NOKOBIT.

Each entry was manually quality assured for the likelihood of being a NOKOBIT related entry. Moreover, some papers had multiple Google Scholar records. For example, the paper “THE EFFECTIVENESS OF DATA PRESENTATION FORMATS: AN EXPLORATORY STUDY” (Johannessen and Fuglseth, 2014) has two citation records with two citations to each entry of which only one is common to both. There are therefore only three unique Google Scholar citations to this paper. According to the Google Scholar help pages, citation records with the identifier [CITATION] is explained as follows: “*These are articles which other scholarly articles have referred to, but which we haven't found online*”.

The paper “TOWARDS A PROCESSUAL PERSPECTIVE ON ARCHITECTURE - Building an Information Infrastructure for Personalized Medicine” (Aanestad, Sæbø & Grünfeld 2014) was one of several papers with both a citation record (with citations) and an actual record (without citations). In these cases, Google Scholar has been unable to identify these two sets of records as the same item. The data collection step revealed several inconsistencies in the data as some titles were in lower case, some in

all upper case and some with both (the current author instructions states that the titles should be all in capital letters).

2.3 Analysis

Citation and visibility data were manually organized and processed using Microsoft Excel and statistical analyses were performed using JASP version 0.10.0 (JASP Team 2019). Frequency counts were analysed using non-parametric procedures and ratio data were analysed using parametric procedures when meeting their underlying assumptions. Citation analyses are reported for the 25-year range 1993 to 2017, but in some cases 2018 statistics are also included for reference.

3. RESULTS

3.1 Top-down results

3.1.1 Total citations

We identified an accumulated total of 641 citations to NOKOBIT papers using google scholar throughout its entire history. The breakdown of citations per year is shown in Figure 1. Clearly the first few years the number of citations is relatively low, and we were unable to find any citations to papers from the proceedings in 1996 and 1999. The peak year is 2005 with a total of 97 citations followed by 2012 with 72 citations and 2011 with 67 citations.

Overall, the number of citations per year appears to have increased over the year and a non-parametric Spearman correlation shows a statistically significant positive correlation ($r_s(26) = 0.497, p = .01$). The number of citations for the last two years (2017 and 2018) is as expected as it takes some time for other papers to emerge that cites these NOKOBIT articles.

We were unable to find any proceedings available online prior to 2012, while all the proceedings from 2012 and onwards are available online. We therefore conducted a between-groups comparison of citations to NOKOBIT papers for the offline duration (1993-2011) and the group of online papers (2012-2018). A non-parametric Mann-Whitney test revealed that there is a highly significant difference between these groups ($U = 20.00, p = .007$). Clearly, the offline group exhibited fewer citations ($M = 4.0, SD = 2.3$) than the online group ($M = 9.7, SD = 5.0$). This finding supports the claim that publishing the proceedings online with open access gives better visibility and attracts citations compared to just maintaining printed proceedings.

3.1.2 Citations per paper

Figure 2 shows the number of citations per paper. This statistic is computed by taking the total number of citations per year divided by the number of papers visible in google scholar this year. Note that one would usually calculate this statistic based on the total number of papers in the proceedings for that year, but this information was not available. The numbers are therefore artificially high. The number of citations per paper ranges from 0 to about 7 except for the year 2005 which exhibited 32.3 citations per paper. Inspection of the citation data reveals that this peak was caused by one paper with 83 citations, namely Arild Jansen's (2005) "Assessing E-government progress—why and what". Jansen's paper is thus the most highly cited paper in the history of NOKOBIT.

3.1.3 Most cited papers

Table 1 lists the 20 most cited papers in the history of NOKOBIT. After Jansen's top cited paper follows Molka-Danielsen et al. paper with 27 citations, Habib's paper with 16 citations and Røstad and Jez's papers with 15 citations. The citation patterns follow Lotka's law quite nicely (Pao, 1985), i.e., that one paper is likely to solicit many more citations than the other papers, and that most papers will attract few citations with approximately an inverse square drop-off. Note that Lotka's law originally was used to explain the number of publications produced by a group of researchers.

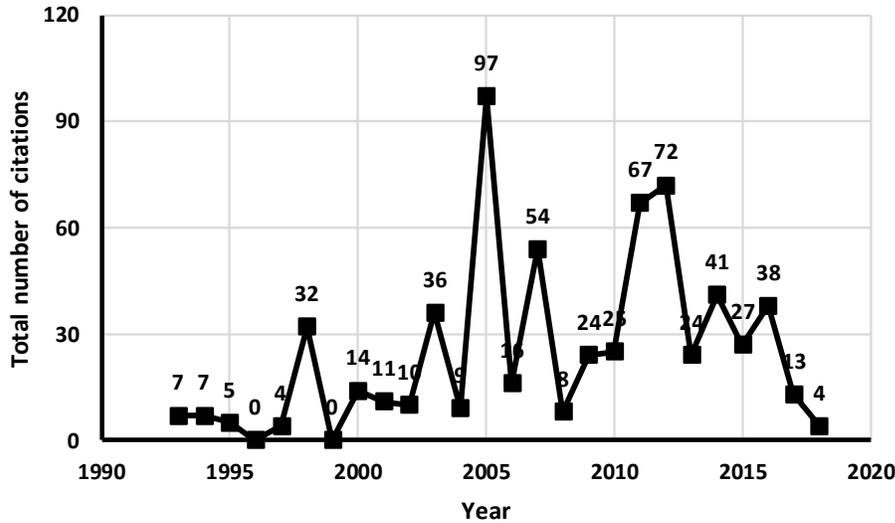


Figure 1. Total number of citations per year.

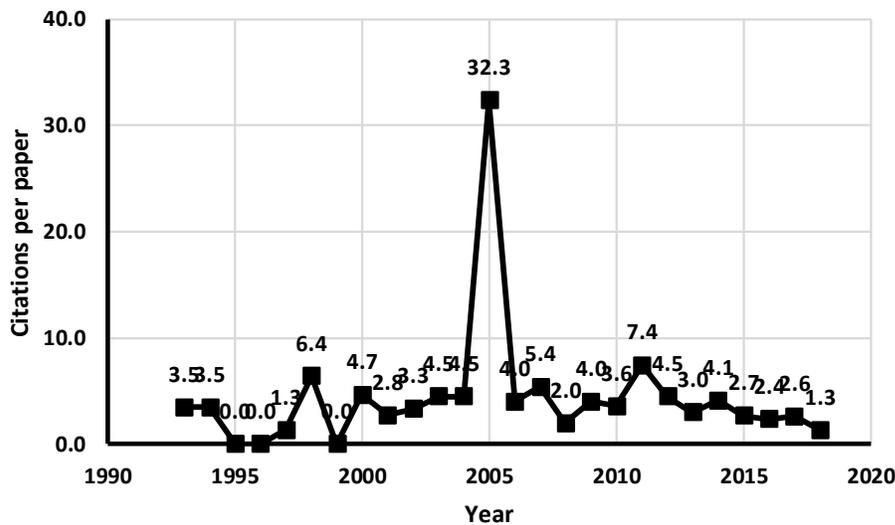


Figure 2. Citations per paper per year.

Another observation is that several of the papers listed in Table 1 appears to be the first paper (or one of the first papers) written by master and Ph.D.-students co-authored with experienced supervisors. Could this be evidence of the power of new perspectives and ideas brought in by students, refined and quality assured by experienced researchers? This explanation remains a mere speculation as we are unable to explore this question in more detail given the limitations of the available data.

Inspecting the results in Table 1 one may observe that the h-index of the NOKOBIT conference is 11. Note that the h-index is likely to be higher if the analysis was based on more complete meta-information. For comparison, Sandnes and Grønli (2018) estimated that the h-index for the sister conference NIK was 16. However, this estimate was based on complete publication records.

Rank	Citations	Author(s), title, year.
1	83	Jansen, Arild. "Assessing E-government progress—why and what." (2005)
2	27	Molka-Danielsen, Judith, et al. "Teaching languages in a virtual world." (2007)
3	16	Habib, Laurence. "Domestication of e-learning technologies: A preliminary conceptual framework." (2003)
4	15	Røstad, Lillian. "Access control in healthcare information systems" (2009)
5	15	Jez, V. "Searching for the meaning of multitasking." (2011).
6	12	Eikebrokk, Tom R., and Øystein Sørebo. "Technology acceptance in situations with alternative technologies." (1998)
7	12	Nilsen, Hallgeir, and A. Larsen. "Using the personalized system of instruction in an introductory programming course." (2011)
8	12	Stendal, Karen, et al. "Initial experience with virtual worlds for people with lifelong disability: Preliminary findings." (2011)
9	12	Kydland, Frederik, Judith Molka-Danielsen, and Susan Balandin. "Examining the use of social media tool "Flickr" for impact on loneliness for people with intellectual disability." (2012)
10	11	Bratteteig, T. (1998). The Unbearable Lightness of Grouping Problems of Introducing Computer Support For Cooperative Work. (1998)
11	11	Dalberg, Vibeke, S. Jensen, and John Krogstie. "Increasing the value of process modelling and models." (2005)
12	11	Zach, Ondrey. "ERP system implementation in small and medium-sized enterprises." (2012).
13	11	Elragal, Ahmed, and Moutaz Haddara. "Big Data Analytics: A text mining-based literature analysis." (2014)
14	10	Nilsen, H. "Action research in progress: Student satisfaction, motivation and drop out among bachelor students in IT and information systems program at Agder University College, Nokobit." (2006)
15	10	Iden, Jon, F. Steindal, and B. Stokke. "The Implementation of IT Infrastructure Library (ITIL) in Norway: Progress, success factors and benefits." (2007)
16	10	Merschbrock, Christoph, Ann Karina Lassen, and Tor Tollnes. "Integrating BIM and gaming to support building operation: the case of a new hospital." (2014)
17	9	Munkvold, Bjørn Erik, Ilze Zigurs, and Deepak Khazanchi. "Augmenting online learning with real-time conferencing: Experiences from an international course." (2011)
18	9	Bygstad, Bendik, and Nils Pedersen. "Arkitektur handler om praktisk arbeid i organisasjonen, ikke en tegning." En forskningsagenda om IT-arkitekters utfordringer, (2012)
19	9	Strand, Knut Arne. "Concurrent Design Approach to the Design of Customized Corporate E-Learning." (2012).
20	8	Bygstad, Bendik, Asle Fagerstrøm, and T. Østensen. "Exploring the relationship between software development processes and IT based business innovation. A quantitative study in Norway." (2004).

Table 1. The 20 most cited papers in the history of NOKOBIT (top-down results)

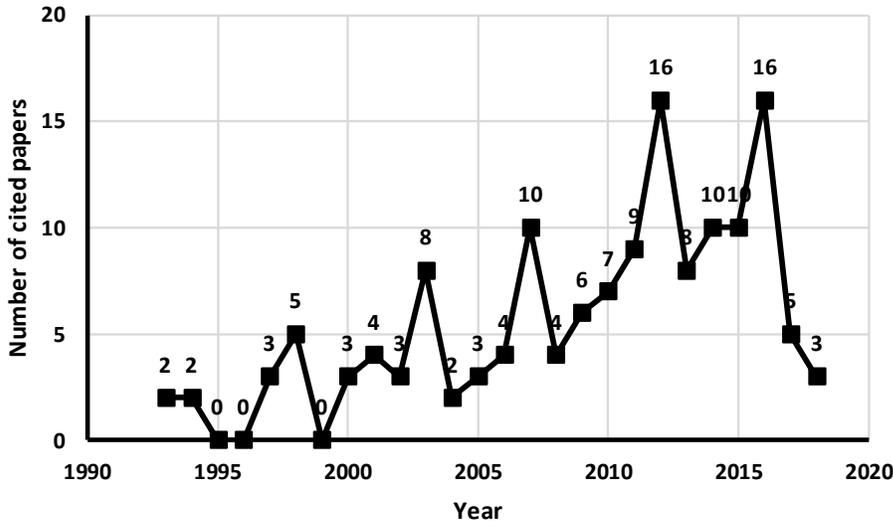


Figure 3. Number of cited papers per year.

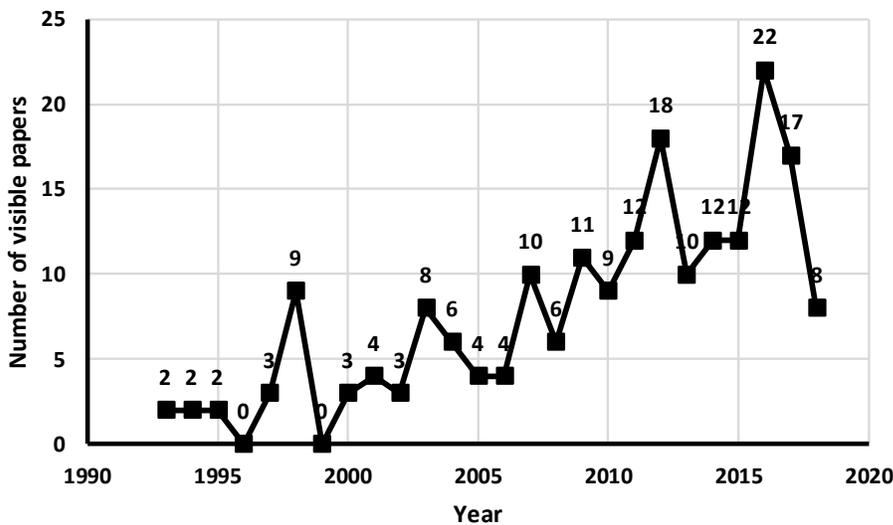


Figure 4. The number of visible papers per year.

3.1.4 Number of cited papers

To assess the healthiness of the conference in terms of relevance and quality, we observed the number of papers that has been cited instead of absolute citations counts. Figure 3 shows the number of papers that are cited. The Figure shows that there has been a steady increase from two papers cited during the first conference to a peak of 16 papers cited during 2012 and 2016. This increase is confirmed by the highly significant strong positive correlation ($r_s(26) = 0.721, p < .001$).

Inspecting the data one can observe a cyclic pattern with a period of four to five years. During each four or five years there is a peak followed by a drop which then gradually increase to the next peak four or five years later. Hence there was a peak during 1994, 1998, 2003, 2007, 2012 and 2016. We have too few details about the conferences to explain this pattern. It is also possible that this pattern is occurring simply

by chance. One speculation could be that the conference has been touring around different locations and that certain conference locations somehow affect the solicitation of citable, hence quality papers. However, a visual inspection of the conference locations did not reveal any obvious patterns besides that UiS conferences have always occurred in a valley in terms of the number of papers cited. The peaks occur at HiMolde (1994), HiA (1998), UiO (2003), HiO (2007), UiN (2012) and UiB (2016), while the immediate valleys occur at UiO (1995), NTNU (1999), UiS (2004), UiA (2008), UiS (2013), Westerdals (2017). If this cyclic pattern persists, we could then perhaps expect the next peak to occur during 2020 or 2021, with a steep drop the following year.

3.1.5 Paper visibility

A paper that is cited gain visibility, and one may argue that a paper that is made visible have a larger chance of being cited. We therefore explored the number of visible papers as shown in Figure 4. Figure 4 looks very similar to Figure 3 as cited papers become visible. However, for some of the years there are more visible papers than cited papers. The visibility of NOKOBIT papers has increased steadily over the years demonstrated by the highly significant and strongly positive correlation ($r_s(26) = 0.853, p < .001$). Only two papers are visible for the first NOKOBIT conference in 1993, while 22 papers are visible for 2011. There are no papers “on the radar” for the years 1996 and 1999.

We also conducted a between-groups comparison of visible papers for the offline duration (1993-2011) and the group of online papers (2012-2018). A non-parametric Mann-Whitney test revealed that there is a highly significant difference between these groups ($U = 9.00, p < .001$). Clearly, the offline groups exhibited fewer visible papers ($M = 5.2, SD = 3.7$) than the online group ($M = 14.1, SD = 5.0$). This finding supports the claim that publishing the proceedings online with open access gives better visibility and just maintaining printed proceedings. This is also consistent with the results obtained for the total number of citations discussed in Section 3.1.1 where online papers were associated with more citations than offline papers. This evidence thus supports the claim that papers that are available online will gain visibility, will be read and consequently will get cited. A more in-depth bottom-up analysis of visibility is provided in Section 3.2.2.

3.2 Bottom-up results

3.2.1 Citation counts

The top-down results based on google scholar only are somewhat incomplete as one may have missed certain citations due to incorrect or inaccurate metadata resulting in incorrect indexing. We therefore performed a second bottom-up analysis based on titles from the conference programmes. These were available in print form for the Tapir proceedings in 2012 and 2013, while the paper titles for 2015-2018 are available via the Open Journal System (OJS). A separate google citation search was performed for each paper.

Figure 5 shows the number of citations obtained querying for each title respectively and searching for NOKOBIT and year. Clearly, there is a large discrepancy between the two groups as searching for citations using the individual titles from the proceedings table of contents identifies significantly more citations than simply searching for NOKOBIT and year in the query ($U = 3.0, p = .019$).

These discrepancies can probably be explained by missing or incorrect metadata. The search for papers using the titles shows that these papers are indexed in several ways, and some of these do not include NOKOBIT in the metadata. Consequently, the citations shown in Figure 1 are highly misleading, yet probably they give a relative indication of magnitude and trends. Also, the actual number of citations to NOKOBIT papers is probably much larger than the 641 citations identified by the top-down analysis. On average only 34.1% of the citations were detected using the top-down analysis compared to the bottom up analysis. Assuming that this percentage is representative for the remaining years we can estimate that the actual number of citations is likely to be closer to 1850 citations.

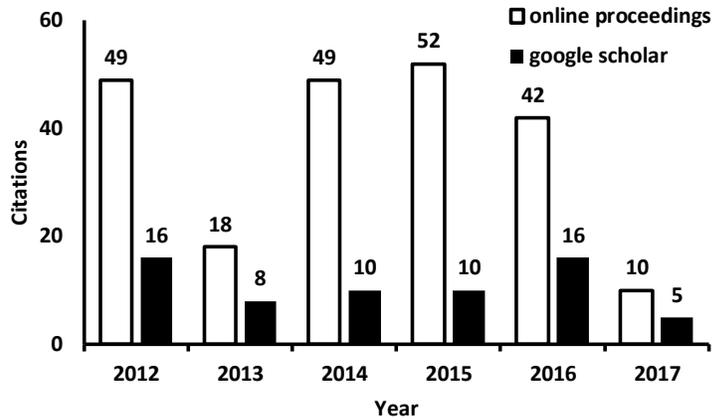


Figure 5. Number of citations per year based on paper titles (online proceedings) and conference name and year (google scholar).

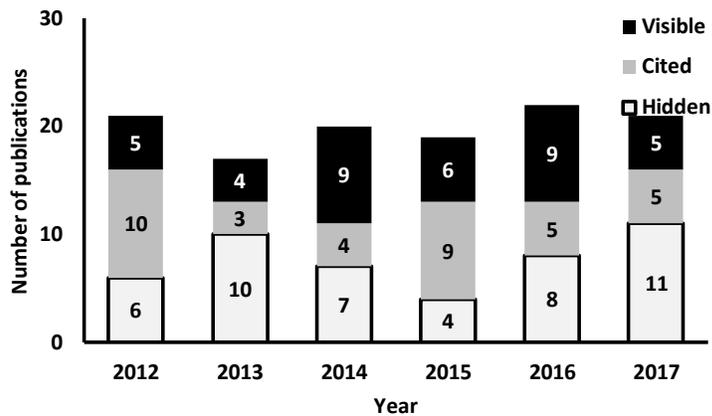


Figure 6. Publication types per conference proceedings.

3.2.2 Visibility type

Figure 6 shows how the papers in the proceedings for each year are distributed in terms of papers that are not visible, that is, they give no match when searching using google scholar, and visible papers, that is, papers with a unique google scholar entry and papers that are simply cited. A cited entry does not have their own record but are captured through citations in other publications indexed by google scholar. A visible paper on google scholar is one which has a home where google can have a link to.

Although there are variations across the years when aggregated, the data show that only 31.6% of the papers are successfully indexed by google although they all have a home at OJS, while 30% of the papers are identified via citations from other papers. A massive 38.3% are not found on google scholar despite they have a presence on the web. All in all, we conclude that the 68.3% of the papers are not correctly identified by google scholar. It is our assessment that this is a reason for some concern.

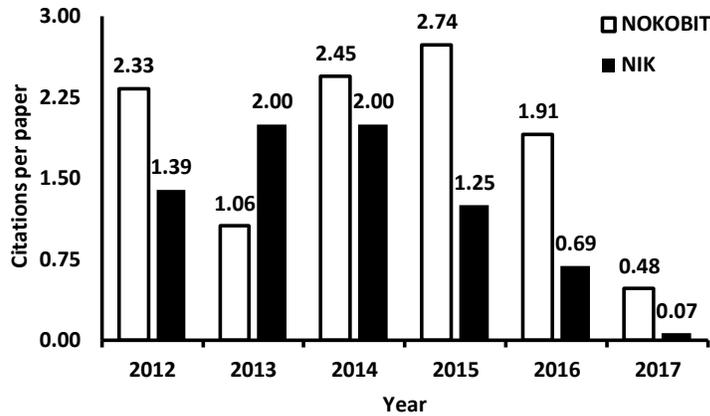


Figure 7. Citations per paper for NOKOBIT and NIK during 2012-2017.

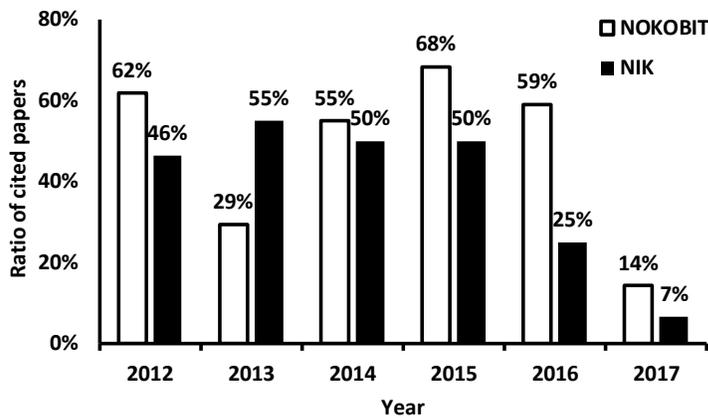


Figure 8. Ratio of cited NOKOBIT and NIK during 2012-2017.

3.2.3 Citations per paper

We also wanted to explore if there were any connections between the number of citations to NOKOBIT and NIK papers since the two conferences are co-located and one could hypothesise that certain locations would attract authors of better papers than other. The data for the NIK comparisons is taken from Sandnes and Grønli's (2018) study. A non-parametric Spearman's correlation test showed that there was no correlation between the two conferences ($r_s(25) = 0.002, p = .992$).

Figure 7 shows the ratio of citations per paper for NOKOBIT and NIK during 2012-2017. The measure of citations per paper allows the comparison of conferences as it is less connected to the number of papers. Clearly, NOKOBIT has a higher ratio of citations per paper ($M = 1.827, SD = 0.882$) compared to NIK ($M = 1.233, SD = 0.756$) except for the year 2013 where NIK had twice as many citations per paper compared to NOKOBIT. However, a paired t-test shows that this practical difference was not statistically significant ($t(5) = 1.68, p = .152$). The lack of statistical significance is probably due to too few data points and large variations in the data. It is likely that a larger range of years would reveal a significant difference. This result indicates that there could be a reason to suspect that NOKOBIT papers attract more citations than NIK papers, but the lack of significance means that this is yet inconclusive. We may speculate that this non-significant practical difference could be explained by the theme of NOKOBIT papers often addressing "the big picture" through recognizable general phenomena or problems that more researchers can relate to, while NIK papers are often highly specialized addressing specific technical details only of interested to very few researchers. NOKOBIT and NIK could be classified as two

unique fields of study, namely information systems and computer science. Although it is generally accepted that publication measures should not be compared directly across disciplines due to different publication and citation practices, see for instance (Zitt, Ramanana-Rahary & Bassecoulard 2005), we believe that in this instance the uncorrected cross field comparison is a relevant exercise because we may gain more insight into the effects of the broad versus the narrow scope. If data shows a higher citation activity among NOKOBIT papers, and this can be attributed to a wider or more general scope, then one may also argue for reconsidering the scope of NIK. Could NIK learn from NOKOBIT? Will the interest in, and relevance of NIK benefit from a wider scope than what is currently practiced?

We also compared the ratio of papers cited for NOKOBIT and NIK for the same interval of years as also this is a measure that is both independent on the number of papers and number of citations. Hence it allows comparisons to be made independently of different publication and citation traditions. Ratio of papers cited also represents a measure of conference quality. Again, Figure 8 shows that a larger percentage of NOKOBIT papers are cited ($M = 48.0\%$, $SD = 21.3\%$) compared to NIK papers ($M = 38.8\%$, $SD = 18.9\%$), except for the year 2013 where a larger proportion of NIK papers were cited. Note however that this practical difference was not statistically significant ($t(5) = 1.130$, $p = .310$) due to the few data points. It is likely that the difference would be statistically significant with a larger range of years.

3.2.4 Effect of language

In Sandnes and Grønli's (2018) previous study of NIK publications, it was found that papers written in Norwegian acquired no citations compared to their counterparts written in English. To explore if the same was the case for NOKOBIT papers the papers in the range with complete publication information was grouped by language. There was a total of 106 papers written in English and 16 papers written in Norwegian. A Mann-Whitney test revealed that there was no significant difference between the groups ($U = 928.0$, $p = .257$) as English language papers exhibited a similar mean number of citations ($M = 1.9$, $SD = 2.7$) to the papers written in Norwegian ($M = 1.5$, $SD = 2.5$). Hence, we have no reason to conclude that writing papers in Norwegian is a disadvantage as it is for NIK. One reason could be that some NOKOBIT papers have a more local relevance addressing organizational issues with a national emphasis while NIK papers typically address global computer science problems with limited local context.

4. LIMITATIONS

The results presented herein give an approximate description of the citation profile of NOKOBIT. As the presence of citations gives no indication of the absence of citations these estimates are therefore likely to be lower bounds that only scrapes the surface of the iceberg. The lack of complete and consistent meta-information about past NOKOBIT proceedings is the main reason for the uncertain results. Certain publication records were also ambiguous as several entries show traces of double manuscript deposits, double publications and unsystematic citations to such multiple sources.

The lack of information about past proceedings made it impossible to assess other effects such as possible influences on the Norwegian publication incentive system and its revision on Norwegian information system researchers' publication practices. Also, given more complete publication records it would have been relevant to assess the effect of different publication types such as informal photocopies proceedings, Tapir printed proceedings and the OJS open archive on citations.

This study does not address UDIT papers and their effect on NOKOBIT papers. UDIT is a relatively new conference that has been hosted as part of NOKOBIT with papers published in the NOKOBIT proceedings. We did not include UDIT data in our analysis. Relevant questions to ask is if UDIT has affected the impact of the conference as a whole or taken attention away from, or strengthened, NOKOBIT. However, the data investigated does not reveal any noticeable signs of such effects.

It must also be noted that the citation situation described herein represents a snapshot at the time of data collection. The citation profile is thus likely to change over time as certain papers accumulate citations.

5. CONCLUSIONS

A bibliometric analysis of NOKOBIT conference proceedings was reported. The results show that NOKOBIT papers do get cited and that they are of interest to the research community making NOKOBIT a substantial scientific venue. In fact, our results suggest that NOKOBIT shows signs of assimilating more citations than the companion conference NIK despite the fact NIKT both has a longer history and longer traditions for systematic meta-information and full-text archival of papers. The study also revealed that the NOKOBIT organizers seemingly treat NOKOBIT as a working conference with relaxed practices for archiving past proceedings, exemplified by the following statement about past proceedings on the NOKOBIT web site (freely translated): “*a pdf file can possibly be found using Google Scholar*” casually listing only ISBN numbers of past proceedings.

Based on this study, we make the following four recommendations to the NOKOBIT community:

1. *Provide open metadata for all NOKOBIT publications*: The entire history of NOKOBIT publications should be made available through standardized meta-information records. This will help increase visibility, allow for better indexing and attract citations.
2. *Make the back catalogue of NOKOBIT publications openly available*: It is hard to get hold of NOKOBIT publications prior to 2011 for younger or international researchers which do not know people with the printed editions of past NOKOBIT proceedings in the bookshelves of their offices. This also increases visibility and attract citations.
3. *Enforce more stringent quality checks on meta information*: Ensuring more consistent formatting of meta-information such as consistency in use of capital letters, author names, and conference name will greatly help indexing and correct recording of citations. Perhaps a dedicated proceedings chair with the right competences could be one pragmatic way to achieve such a goal?
4. *Periodically perform bibliometric analysis of NOKOBIT proceedings and use the results to develop the conference*: Bibliometric analyses allows the impact of the conference to be assessed. Also, the citations grow gradually, and the citation profile may change over time, especially if a particular study at one point gets renewed relevance to the research community. More complete and open availability of consistent meta-information, and paper full texts will make future bibliometric analyses complete and more accurate.

Our work with this study has made us reflect over the risks associated with relying on small open access publishers and what happens to archival data if such a publisher goes out of business, discontinue parts of their portfolio, or undergo reorganizations. What happened with some of the online NOKOBIT proceedings when Tapir Academic Publishers were acquired by Akademika Publishers is a hard-earned lesson. It reminds us of the importance of systematically depositing preprints or open access full texts in institutional or preferably national archives. This ensures more robust long-term availability of our work and prevent the risk of voids that may emerge with occurrence of unfortunate events.

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