Digital Context and Open Science

A Chance for Architecture?

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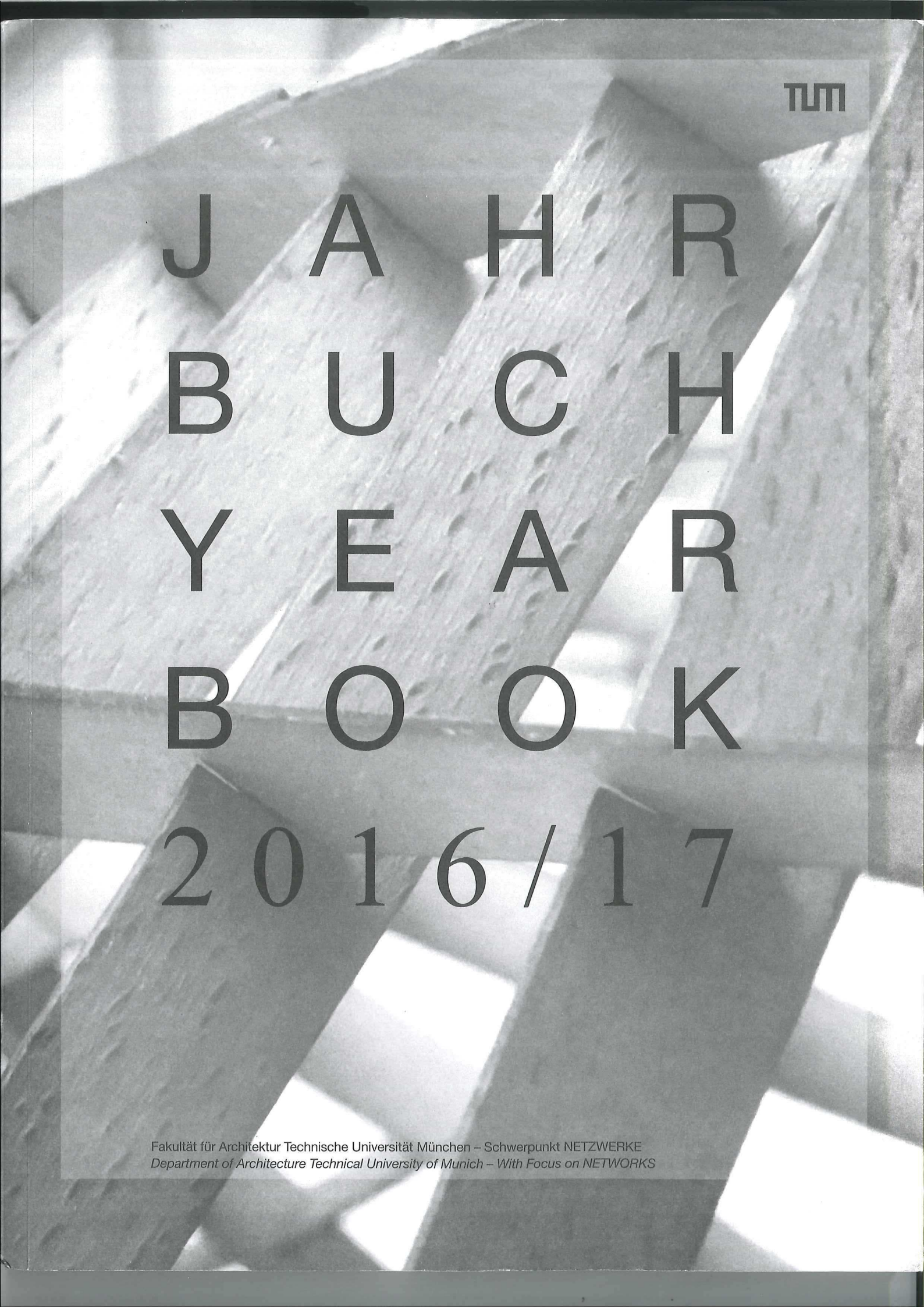

JAHRBUCH YEARBOOK 2016/17

Fakultät für Architektur Technische Universität München – Schwerpunkt NETZWERKE
Department of Architecture Technical University of Munich – With Focus on NETWORKS

netWORK – Tillmann Klein *and* Frank van der Hoeven *about Digital Context and Open Science – A chance for Architecture?*

Tillmann Klein, *Guest Professor Department of Architecture TU Munich, Editor in Chief JFDE Journal of Façade Design and Engineering*
Frank van der Hoeven, *Director of Research Faculty of Architecture and the Built Environment TU Delft, Editor in Chief Open Access Platform TU Delft*

Lately, "Open Science" has been discussed in the university context. Open Science became possible through digitalisation and the increasing Internet bandwidth that users have at their disposal. From the current point of view, it is a natural development that is starting to have a drastic impact on our environment.
But what does Open Science include? First of all, it means the possibility to disseminate or share knowledge and information in a new digital way. 'Open' in this sense refers to easy availability. But it does not necessarily mean that all information will be shared without any restrictions. The discussion around Open Science also includes altmetrics to measure the broader societal and economic impacts of science, incentives and reward systems for researchers, business models, data management, and governance. Open science is first of all fair. It is the technology behind the philosophy: knowledge is power and power should be shared.

One side of the equation highlights the new opportunities: research results can be made available to others online. Worldwide there are many academics who do not have the same level of access to scientific knowledge that we have here. And that is also true for private individuals and industry. Hence Open Science might in the end provide a better connection to our target groups and be more responsive to societal challenges. Digital file formats such as pdf and e-publication are rather cheap. Online search and online print-on-demand services allow exchange and sharing and even lead to new forms of debating. We can already observe the effect of this, with some journals executing the review process through open online communication. Can there be any better way to engage scientists in a transparent debate?
And at least one striking argument: universities are in most cases publicly funded, which means that in return the public should have the right to benefit from findings directly. In the end it is all about making an impact on science, society and the economy.
The other side of the equation is also clear: it threatens the business model of traditional publishers. It might diminish the impact of publications that rely on the aesthetics and haptics of physical artefacts. And there is a concern that freely available knowledge will be used without respecting authors' rights. In order to prevent such unwanted use, licenses have been developed to clearly communicate under which conditions contents can be shared: the "Creative Commons".

The context of the architectural discipline
Our discipline lies between the areas of art, design, engineering and the humanities. Thus, our products are multifold: there are designed artefacts, artworks, public presentations, policy papers, books, monographs, professional publications but also classical journal papers. This is pretty unique and our impact cannot be easily measured by the citation indexes only. However, we are forced to demonstrate our impact in a measurable way for two reasons. First, our globalised environment is becoming more and more competitive. We are competing not only at a national level but we work on the international stage as well. Students come from all over the globe and our performance is observed with much interest. Secondly, and perhaps more importantly, a measurable impact is the only way to improve our work and part of this is the improvement of our dissemination strategy.
Our aim is to improve the built environment and built quality and we wish to achieve recognition in this field. Our means are equally science-based and design-based. And let us be clear about it: in terms of demonstrating our impact, in the past we have underperformed in comparison with other academic disciplines.

Why is a new approach needed?
Owing to the global financial crisis and the resulting slump in the housing sector, over 50% of jobs have been lost in the architectural services sector in the Netherlands, compared with before the crisis. Currently the situation is slowly improving. In Germany we had a similar situation between 2000-2002. What we bitterly observed was that the value of architectural services was massively questioned – especially the design related early phases. This raises the obvious question: what is the value of good design?
Now that the digital world has arrived on the doorstep of our discipline, it will surely influence this debate. In the same way that we step into an Uber taxi, compromising the classical taxi business, clients are looking at optimising the cost-benefit ratio of our work for them.
Naturally, we are focusing on teaching architectural skills to our students. We have mentioned before that we worked in a hybrid discipline that requires a broad education and the curricula are packet with courses that we believe are useful. But are we not losing sight of the big picture? For which future professional sector are we preparing them? We need to focus on a number of questions: how will architects work in future and what will constitute architectural services? How will that affect our academic work? How can we demonstrate the impact that we have to ultimately strengthen our position?

Strategies to measure impact
The question is now what Opens Science can mean for our profession. First let us take a look at the strategies we have at hand today to measure our impact. It is rather easy to do it when and what we cite with scientific journal paper publications, assuming that the author is the same as the researcher. It more difficult with build artefacts or monographs. Appreciation by public peers and critiques is measurable. For example, what does the review say? How large are the sales and download numbers? Can the work be found on the bookshelves of stakeholders and architect's offices?
Societal impact can be measured by improvements to the built environment and living conditions or by influence on policy making. We understand that proving this is a difficult task. Other criteria that are a little easier to measure are public presentations, exhibitions or even the number of students educated.
In a not-so-distant future, in a world of smart metering we may even assess the energy costs of the objects we have designed, or possibly changes in the real estate value of buildings designed by us, or user satisfaction.
Economic impact can be demonstrated by the number of jobs created and start-up businesses, and turnover as a result of the work. It is interesting to observe that the awarding of many research grants is closely tied to the expected economic impact of a project. Here we need to come up with a plan for measurable results.
What becomes clear is that a mix of different approaches is required to measure the impact of our discipline and we have not really started to explore any of those yet.

The potential of Open Science
The potential of Open Science for our discipline is obvious. Ultimately we wish to be read, measured, evaluated and recognised by others. Here Open Data and Open Access publishing are some of the opportunities. Scientific content is made available for everyone to read and use for free. The rights stay with the authors and only the conditions under which data and publications can be used are regulated by means of Creative Commons licences. That is socially responsible and also potentially increases impact. But of course it is a turning around of traditional research practice and publishers' business model. In publishing we may see various models but the essence is that we will move to paying to be published, and no longer paying for using content.
But there are also some other potential advantages of Open Science. WorldCat (https://www.worldcat.org/), for example, is a worldwide catalogue of library resources. A good way to measure the impact of architectural publications would be to analyse which libraries contain certain books and information.
A growing universe of Internet of Things sensors can measure and evaluate certain aspects of the designs we build as long as the data that is produced in this process is free and open.

Open Science and Open Design?
Above we talked about the means of our discipline: Science and Design. Can we also extend the discussion around Open Science towards Open Design?
Here is one interesting example: BIM (Building Information Modelling) might not be a completely new approach but what is new is the extent to which we will apply it in future. In England all public buildings must be executed using BIM. What exactly that includes is being debated right now. But we are heading towards an integral planning process using digital 3D models. This means that all planners will include their information in one single file or database and this raises a new question: who is the owner of the file? And how can it be ensured that knowledge is not disclosed to unwanted parties: design decisions, detailed solutions but also technical details about the building systems used. The problematic is two-fold. We are afraid to compromise our architectural services if buildings are replicated here or even in China. And on the other hand, one might still be liable for a replicated technical solution that is not fault free or that does not make sense anymore when taken out of its context. We need to solve this issue.
The music industry has fought long battles to protect the rights of musicians and their business models. This has led to completely new ideas for selling music. We download, or stream via online servers. Still some of us like to buy CDs and LPs for their intrinsic value. So can't we assume that we will solve the IP and liability issue for our discipline in the future? We are used to be paid on a project to project basis. That is not likely to change but questions might be allowed: which part of our work is unique and requires our immediate services? Which part is repetitive and represents a different type of value for clients? Are there any new types of architectural services that we can imagine as a result of an open digital world?

Examples of open digital design business
The following examples can be viewed as an inspiration for new dissemination ideas:

- WikiHouse *(https://wiki-house.cc/) has been around for a number of years already. It is a creative international platform for everyone to engage in the development of an open source building package. Designers and ordinary clients can download Creative Commons-licensed building plans and customise them using SketchUp. Own designs can be produced locally by creating jigsaw puzzle-like pieces out of plywood with a CNC router, requiring a façade and interior finish later on.*

- *The start-up company* TheNewMakers *(www.thenewmakers.nl/) develops digitally-designed and CNC-manufactured furniture systems but also mass customised living units. This allows the company to offer a number of stepped service packages: design, design and built, or just sales of predesigned digital production packages.*

- *Most of us know the professional magazine* DETAIL. *Its success is based on showing how prominent designs are translated into detailed solutions. Architects are happy to be published here and share their information. Again, it is about making an impact and being recognised by others. Interestingly there is no fear that colleagues might steal these ideas. We can imagine some forms of digital project libraries that work with the same incentives: being read and being cited for our work by colleagues. The digital format would even make it possible to measure views and downloads. The block chain as a digital ledger might be one of the tools used to keep track of design contributions in BIM-based architecture. It would be an interesting approach to measuring the impact of design offices.*

Conclusion
This paper discussed the meaning of Open Science and its consequences for design within the architectural discipline. It showed the need for a change and should stimulate reflection on the potential of a changing academic environment.
One thing is clear: the trend towards Open Science and Design cannot be stopped. Open Access is already changing the traditional publishing world and it will continue to have an impact on the value discussion. The question about the potential of Open Science and Design can be viewed from two sides: how can it increase the impact that we have? But also in reverse: how will it change the way we are working today?
Our discipline will remain diverse in terms of its products and forms of dissemination; Open Science and Design offers great opportunities to enlarge visibility and impact, not only for scientific publications but also monographs and designed artefacts. Finally, it opens the door to a much needed value discussion and will increase the measurability of the work we do.
Universities have the duty to explore and exploit these new developments. We can achieve completely new types of architectural services propelled by new digital opportunities.

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