



# BISE Student

## From Desk Drawer to Center Stage: Highlighting the Value of Student Theses

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### 1 Introduction

In today's academic practice, at the end of most of the study programs worldwide students submit a thesis, which often disappears into a non-public university archive or desk drawer, never to be seen again. Many of these works are being carried out with great thoroughness and produce results of high practical and scientific value for other students, researchers, and practitioners. Looking back into the past, there are many examples of ideas from student theses that changed the world, such as Carl Friedrich Gauss' research in 1799 on "A new proof of the theorem that every integral rational algebraic function of one variable can be resolved...", Alan Turing's work in 1938 on "On Computable Numbers, With An Application to the Entscheidungsproblem", or recently in 2001 Rebecca Mercuri with her work on "Electronic Vote Tabulation: Checks and Balances".

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Following in the footsteps of these geniuses, in 2021 alone over 500,000 students in Germany have received university-level degrees, according to the Federal Statistical Office (Federal Statistical Office 2022), each of which was completed with some form of written thesis (e.g., a bachelor's or master's thesis). However, the magnitude and potential of this source of knowledge is currently scarcely used. The main problem lies in the fact that most theses are often not revised into papers. After submitting their thesis, students often go straight into professional life and simply do not have the necessary time, motivation, or know-how to attend the typical scientific publication process of conferences or journals. This includes, among other things, shortening the thesis to a few pages, revising the text several times, and translating it into English, if necessary. This work can also only very rarely be taken on by the examiners of the thesis or colleagues at the university, as the effort would exceed the available resources. Consequently, student theses are not submitted to appropriate outlets and thus often not published.

In order to pave the way towards a more open knowledge culture that thrives on all potential sources, we must boldly rethink what constitutes valuable scientific knowledge and the way it is shared through technical information infrastructures. Facilitating discovery, usage, and extension of all knowledge, the open knowledge ideally allows anyone for whatever purpose to freely access, use, modify, and share it, limited only by measures that preserve provenance and openness (Open Knowledge Foundation 2015b). In this sense, it is not enough to offer free access to raw data or information in order to promote openness. Open knowledge is what open data becomes when it is useful, usable, and used, which means that it is accessible, understandable, meaningful, and able to solve real

problems. Hence, knowledge needs to be useful (Open Knowledge Foundation 2015a).

In this regard, a rethinking in the public and private sectors has become apparent in recent years under the collective term *open knowledge*. Many projects such as Wikipedia, the Open Government Partnership Initiative, or numerous Citizen Science projects provide community created knowledge. The goal of the open knowledge movement is to open access to knowledge as well as to expand and share it with all levels of society. For example, the Open Knowledge Foundation defines that knowledge is only truly open when everyone “can freely access, use, modify, and share it – limited at most by measures that preserve the origin and openness of knowledge” (Open Knowledge Foundation 2015b). However, such a barrier-free exchange between knowledge creators and knowledge consumers, or even the merging of these two roles, is currently still the exception.

Our vision is to create, disseminate and expand knowledge. We firmly believe that we can only move forward as a society if we build on existing knowledge. A functioning democracy is built on free access to knowledge and education, and this is also one of the society’s core responsibilities in the digital age.

In hope of improving the current situation regarding the publication of student theses, the Karlsruhe Institute of Technology in cooperation with the BISE Journal have developed BISE Student (<https://bise-student.io>), a platform to facilitate the transfer of knowledge from student theses – starting with the area of Information Systems – to society. BISE Student aims to make the publication of excellent student theses much easier for students and universities. It provides an open and highly visible platform that makes the inherent knowledge usable and, thus, reveals the real value of bachelor’s, master’s, and diploma theses.

BISE Student aims to achieve four principal goals. First, our main goal is to increase the visibility and, thus, the benefit of student theses. In particular, the platform aims to reduce the publication effort of theses by providing a very simple and fast publication process, while ensuring that quality standards are met. Second, in the spirit of the open knowledge movement, the goal is to provide access to student theses (and thus to the knowledge they contain) to as many people as possible without restrictions. In science, access to knowledge is often only possible for payment or locally limited (Piwowar et al. 2018). This has certainly its justification, due to the high expenditure for publishers which arise during a publication process (i.e., copy editing etc.). Therefore, it is difficult to publish a large number of student works in this way, which in turn is a major limitation to the free dissemination of knowledge. Third, BISE Student aims to make the publishing process as transparent

and secure as possible, so that at any time the process is traceable, a subsequent change cannot be made unseen, and thus ultimately the trust in the system and the publication should be increased. Fourth, the platform’s goal is to enable anyone interested in the project to easily participate and help to operate and evolve the platform. In this way, BISE Student is not only less reliant on a single party and its influence, but also increases its digital resilience and sustainability.

## 2 How Does BISE Student Work?

Following the platform’s four principal goals of high knowledge visibility and process transparency as well as low barriers to knowledge dissemination and system participation, BISE Student’s design takes a highly decentralized approach by building upon peer-to-peer and distributed ledger technology (DLT). Best known for enabling blockchains, DLT allows for “the operation of a highly available, append-only database (a distributed ledger) that is maintained by physically distributed storage and computing devices (referred to as nodes) in an untrustworthy environment” (Kannengießer et al. 2020, p. 42:1). While decentralization adds to the BISE Student’s complexity (e.g., through additional computational and storage redundancies), because of the design choice the platform architecture is innately public, less reliant on individual parties, and enables active community involvement in its content, operation, and development. The platform also inherits some of the more prominent qualities of distributed ledgers, which include their tamper resistance and censorship resistance and ability to democratize data (Beck et al. 2017; Kursh and Gold 2016).

As depicted in Fig. 1, the system architecture consists of three loosely coupled components. The essential functions of the platform, which include the publication process, post-publication administration, identity management, and index keeping, are implemented in form of a collection of smart contracts. Smart contracts are software programs deployed to a distributed ledger, like for example a blockchain, and provide functions that can be called via transactions (Kannengießer et al. 2021). For instance, to initiate the publication of a thesis on BISE Student, the author needs to send a transaction containing all mandatory data (e.g., title of the thesis) to the BISE Student submission contract. All BISE Student smart contracts are deployed to the *bloxberg* blockchain, which is operated by an international consortium of research institutions to support researchers by providing services across institutional boundaries and facilitate collaboration (Kleinfurfer et al. 2022). By using a proof-of-authority consensus mechanism for coordinating the nodes in the network,

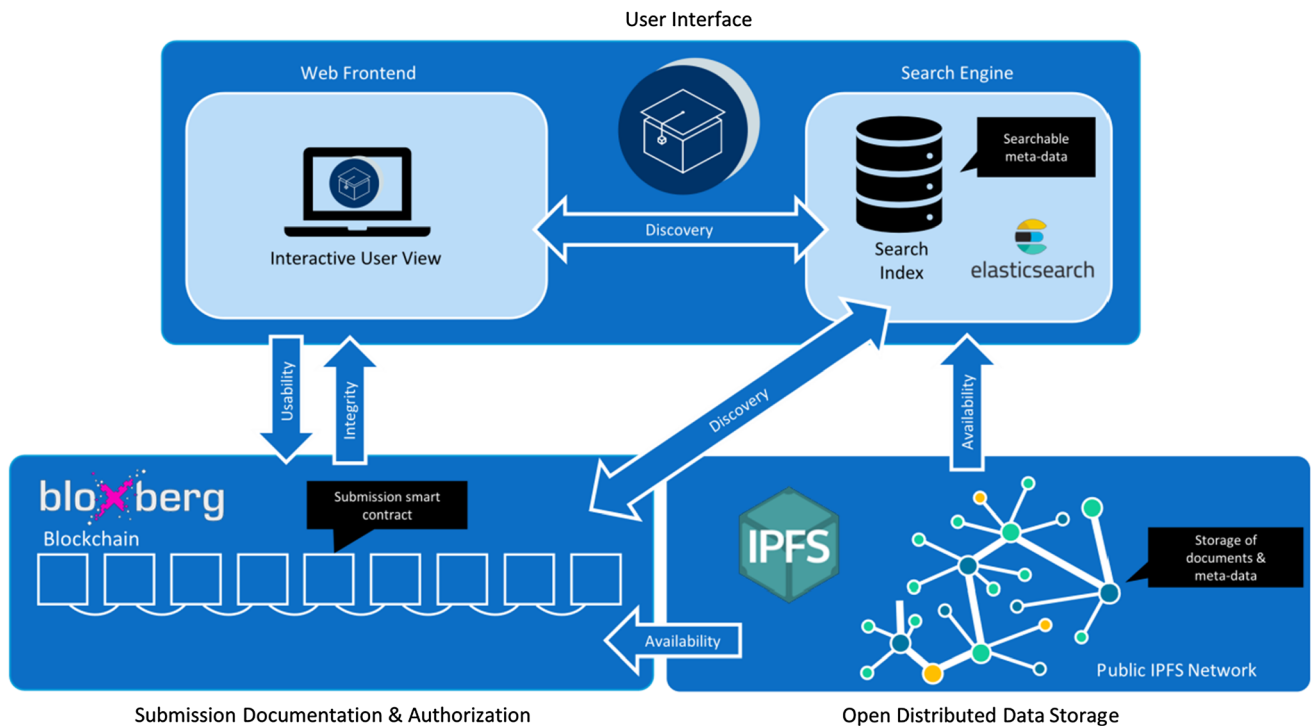


Fig. 1 BISE Student architecture overview

bloxberg is also more energy efficient when compared to networks using a proof-of-work mechanism (e.g., Bitcoin).

While using a blockchain like bloxberg has many benefits, storage of large amounts of data is not one of them. The cost of the redundant validation and storage of data on each of the participating nodes increases with data size (Sunyaev et al. 2021). BISE Student therefore stores thesis data and accompanying meta data off-chain using a decentralized storage network, the Interplanetary File System (IPFS). The IPFS is an autonomous peer-to-peer

network designed to store and share data. Anyone can participate by setting up a node and providing files to their peer nodes. Files are retrieved by their content and not by the storage location. This means that the hash value of a file is used to identify the nearest storage node within the IPFS network that can provide a copy of the file. The file hash thereby acts as retrieval key and as a means to verify the integrity of a file. To minimize the amount of data stored on-chain while still ensuring immutability, BISE Student only needs to store the IPFS hash values of these data on

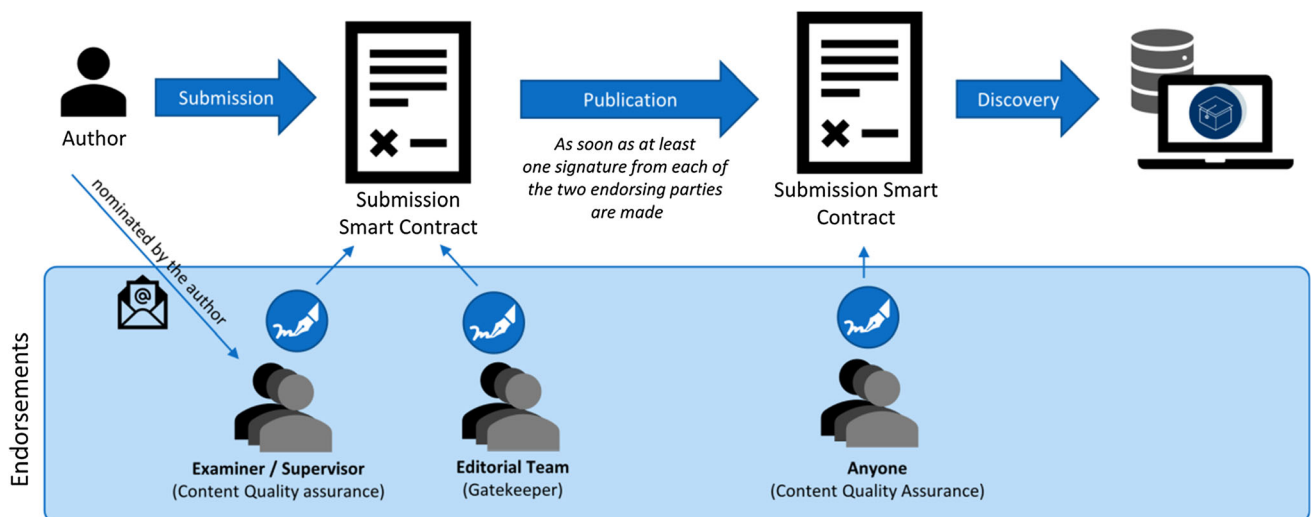


Fig. 2 Overview of the BISE Student publication process

the bloxberg blockchain. This way, the implemented decentralized storage solution in combination with the bloxberg blockchain allows to efficiently store, update (e.g., revise the stored thesis) or retract data, and to transparently track and verify any changes.

The third component of the system is the platform's user interface implemented as a website. It provides a user-friendly way of interacting with the decentralized components that users expect from a modern publication repository, including a submission form, administration areas, a fast search index, advanced retrieval filters, direct file access, and a comprehensible file change history. In order to create a familiar user experience, which does not require additional technical knowledge, the user interface had to be implemented using established web technologies that currently still require a centralized web server infrastructure. While the user interface is therefore the only centralized component of the platform, it is also the only non-essential component. Guided by the goals of transparency and barrier-free access, all essential functions of BISE Student can be used only with a crypto wallet connected to the bloxberg blockchain and an IPFS node.

Moving from the architecture to the publication process, BISE Student is specifically designed with the unique requirements and limitations of student theses in mind (Fig. 2). One of the central pillars of today's scientific publication landscape is the peer-review process. While it has proven itself to be an effective quality control mechanism, it also comes with a huge overhead for all involved parties. Editors need to recruit qualified reviewers, reviewers need to become familiar with the work and give their feedback, and authors usually need to revise their work several times. As discussed earlier, this overhead often exceeds available resources of institutions and students. With BISE Student, students can publish their theses much faster by utilizing a reputation-based endorsement system that simplifies the publication process while still including quality control mechanisms. BISE Student's publication process consists of five steps. First, the student initiates the process by submitting the thesis via a web form that entails the essential information about the thesis (e.g., author and supervisor). Second, the student signs a smart contract that interacts with the Bloxberg blockchain. Third, to ensure the quality of the theses (e.g., methodological rigor), BISE Student will request endorsements from the supervisors or examiners that graded the respective thesis and are therefore already highly familiar with the thesis content. At least one of the examiners or supervisors involved in a thesis are required to vouch for the quality of the thesis. This means that after the publication of a thesis on the platform, the names of the endorsers will be published alongside with the thesis. Since it is in the best interest of an examiner or supervisor to have their name

associated with works that are up to scientific quality standards, the examiner's reputation is utilized as proxy signal for potential readers. Fourth, once the thesis has been endorsed by at least one of the involved supervisors or examiners, BISE Student editorial board checks whether the submission process is complete and also signs the submission contract. In the final step, the thesis is automatically published and listed on the BISE Student website under an open-access license. From this point on, any reader of the work who is positive about the excellence of the work can likewise endorse it to further promote its visibility. For more details on the publication process, the technical details of the system, and the project as a whole, we would like to refer to the BISE Student whitepaper (Sturm et al. 2022).

### 3 By the IS Community, for the IS Community

BISE Student was not just built to enable students to publish their theses but as an asset for the information systems (IS) research community at large. By giving student theses a dedicated platform in the extensive IS research space, the newly created knowledge becomes more visible and, therefore, accessible and usable for the entire IS community. The consolidation of student works also holds the potential to accelerate theses contributions by allowing authors to stand on the shoulders of their fellow students, rather than answering the same research questions or collecting similar data over and over. Published theses might also provide methodological guidance by showcasing different approaches to similar research goals. Like conference contributions, recently published theses could even serve as an indicator for new and upcoming research trends. However, the critical prerequisite for all of this to happen is the actual publication and accessibility of theses. To this end, the tailored publication process of BISE Student helps to minimize process barriers (process overhead and cost) and incentivize students to publish their theses. The implementation based on DLT and distributed data storage creates high process transparency and data availability, which will foster users' trust in the platform and published theses and creates a long-term perspective for the sustainable operation of the platform. However, this perspective based on decentralization also requires participation.

As a project envisioned from the IS research community for the IS research community, everyone interested in BISE Student can participate and contribute in various ways. First and foremost, the biggest value of a publication repository is the provided knowledge base. It is key to build up and continuously extend the number of publications, community awareness and active engagement. By reading

this editorial, the first step is already taken, which is learning about the project. Spreading the word, actively using the platform, and encouraging fellow researchers and especially students to visit and use the platform are the next steps forward. Every one of us in the IS community is an important part of the scientific advancement. Another way of participating is to support the BISE Student infrastructure by sharing computational, network, and storage resources. The decentralized approach allows to simply setup an IPFS node and join the BISE Student collaborative storage cluster. The cluster automatically mirrors the entire thesis library to the participating nodes, which in turn burden a share of the overall download traffic and provide additional resilience for the system. Participation is also possible by supporting the bloxberg blockchain. Bloxberg invites any research organization to become a member of their global blockchain initiative and host one of the network's validator nodes (Kleinfurher et al. 2022). In doing so, not only BISE Student will benefit but also an increasing number of scientific applications running on the bloxberg blockchain. The future development of the BISE Student envisages a continued increase of the platform's degree of decentralization and therefore allows for even more community participation. This includes the implementation of an open community-based governance structure that comprises editorial and development decisions. For example, the community will be able to decide on the publication of theses, award outstanding publications, and vote on novel platform features. Moreover, the codebase of BISE Student will be migrated into an open-source project that allows the community to maintain and evolve the platform. More information on these forthcoming and the currently available ways of partaking in the project can be found in the BISE Student whitepaper (Sturm et al. 2022).

The creation, dissemination, and expansion of knowledge are the core responsibilities of science. We believe that shedding light on the extensive knowledge base that student theses offer has the potential to make a substantial contribution to the IS community, open scientific work, and to the democratization of knowledge. BISE Student can be seen as a venture for tapping this knowledge base and taking an open and welcoming approach towards the next generation of researchers, may they choose a career in academia or not. Bringing together an active community of supporters will turn this venture into a true IS community effort.

For this to happen, active engagement of the community is crucial. Started in 2019, the bloxberg consortium has already brought together 55 international research organizations in less than three years to advance science and enable society as a whole to secure data through DLT. The rapid growth demonstrates a high interest of academia in decentralized information infrastructures. Creating useful

artifacts that leverage the potential of such an emerging technology and thereby demonstrating the applicability of DLT beyond crypto currencies as well as considering societal matters like the open knowledge movement, lies in the very nature of the IS field. While in its current form the BISE Student platform primarily caters for the IS community, the idea of strengthening open knowledge through decentralization is not limited to one field of research or one type of publication. With enough support, the idea could start to reshape today's scientific communication with all its prevailing flaws. Since we strongly believe in this idea and the BISE Student platform, we would hereby like to call upon the entire community to participate in BISE Student. Besides the above-described avenues of participation, the most important contribution is spreading the word and encouraging submissions. To aid in this task, the project website (<https://bise-student.io>) provides a variety of promotional material, like flyers, tutorial videos, presentation slides, and posters that advertise the platform and also explain the publication process. You can freely hand out the material to students, colleagues, other departments, libraries etc. We would like to encourage you to test and incorporate the platform in your teaching and research workflow as a useful source of knowledge. Since BISE Student is an emerging project that embraces openness, we would also like to hear about your thoughts on the platform and welcome any feedback on what can be done to further improve BISE Student. It is now up to the IS community to decide if the core idea of decentralized, open publishing of student theses can take root in the IS field and, looking ahead, may flower to provide better approaches to scientific publishing.

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