Data Management and Library 2025 Connecting the Future

February 2020

DATA MANAGEMENT AND LIBRARY (DML)

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

We hereby present you with Vision 2025 of the **Data Management and Library** (DML) department of Eindhoven University of Technology: Connecting the Future. This vision outlines the new department profile and the three strategic themes the department will focus on in the coming years to allow for the modernization and further development necessary to be able to service our scientists, support staff and students in the best possible way. By focusing on these themes, we will ensure that the TU/e will continue to be one of the best universities in the world in respect of developments in the field of Open Science, Research Data Management and General Data Management. These themes have become an integral part of the professional scientific playing field and require scientists, support staff and the entire university to make quite some adjustments in a short amount of time. In addition to focusing on these three themes, we will continue to develop the customary services of the university library and archive.

By combining both 'customary' and 'renewed' services, we continue to build on the original qualities of the university library and archive: the ability to process and disclose data in a structured and uniform way to create valuable information. In a society that is becoming ever more digitized and which increasingly depends on the right data, our vision and corresponding profile allow us to effectively contribute to the overall strategic 2030 goals of the Eindhoven University of Technology.

For this vision to be successful, it is essential that we have the support and trust of the people who are responsible for its implementation. We will have to work hard the coming years to realize our ambitions. I would like to thank everyone for all the input, support, commitment and valuable ideas they have contributed to this vision.

Inspired after reading the vision and do you see opportunities for cooperation? Do not hesitate to contact me. Connection and cooperation are key elements of our new vision. Therefore, I gladly like to extent the hand of cooperation.

With kind regards,

Merle Rodenburg, MSc
Managing Director Data Management and Library (DML)

Content

New profile, new name:
Data Management and Library

Combination of customary services and data management

Data Management and Library is the new name of the former Informatie Expertise Centrum. Our vision of the future and our new department profile are reflected in this name. The coming years, our department will transition from a department primarily focused on library and archive services into a department that, in addition to the customary services, will also provide high-quality services with a strong focus on data management. Our new profile will help us support the university in meeting the data, document and information need of the various primary and operational processes within the university and thus contribute to realizing the goals as defined in the TU/e 2030 Strategy. We will play a key role in data management and access to (scientific) information for educational, research, valorization and operational purposes.

Transition to open

We will do this by strongly focusing on chain cooperation and by using our high level of professional expertise. Data Management and Library will provide expertise, advise and support to scientists, support staff and students in the ever more complex world of data and information management and with respect to the transition into open science, open education and an open society.

TU/e 2030 Strategy

The TU/e 2030 Strategy is our starting point. We will use this long-term ambition to determine how we can contribute to the realization of the goals defined in the strategy. To realize the overall ambition of the TU/e, we need to focus, make choices and continuously seek ways to do the right thing in the right manner. In the most smart, efficient and effective way possible to allow for innovation. Meaning that we have to develop new services, with new key priorities, both substantive and in relation to our way of working.

IDENTITY AND CORE VALUES

Education, research and valorization based on reliable data and information

Data Management and Library's mission is to provide all scientists, support staff and students with reliable data and information. Data and information, they need to perform at their best. This includes e.g. the provision and retention of scientific information (e.g. scientific literature and databases), operational information (e.g. the TU/e archive), but also the provision of reliable and accessible research data for leading scientific education and research. We will disseminate the desired data and information as efficiently and effectively as possible to increase the scientific and social impact of these data and information. We believe that the ability of the TU/e to perform its core tasks - scientific education, research and valorization -, is based on the availability of high-quality data and information, in the broadest sense, and that it will help us enhance our contribution to society.

Four core values

Data Management and Library has ample experience with data management. By means of our university library, we have been providing all TU/e employees and students with access to a wide collection of scientific information for years and help them search for, use and share the information. With 'Archive By Design', Data Management and Library has set the trend in the academic world of archival science. In the coming years, we will use this expertise to further professionalize the field of data and information management throughout the university. Both in respect of data generated through research and education and through our operational processes. To realize this ambition, we have embedded our core values - *data driven, customer oriented, progressive and connective* – in our day-to-day activities: Data Management and Library – Connecting the future.

Connecting the Future: envisioning 2030

A fast-changing world

The world is changing faster than we can anticipate. Enormous amounts of data are currently being produced and this amount will continue to grow. It is becoming increasingly easy to use (in)formal networks to link data to new technologies. Our scientists and students are at the heart of the playing field where these technological and social developments are being created and therefore require Data Management and Library to provide them with up to date and advanced services. Hence, we are on the verge of implementing a data-driven way of working and management throughout the university.

The professionalization of Research Data Management is currently still in the developmental phase. However, in 2030 it will be 'business as usual' within every scientific research. Research data will automatically be retained, verified and disclosed for further interpretation and processing. All research data will be FAIR (Findable, Accessible, Interoperable, Reusable), scientific discoveries will be accelerated and the number of discoveries will probably increase due to the fact that multitudes of reliable multidisciplinary data sources will be available.

Open Science

In 2030, the TU/e will be a strong technical open science university that will disseminate scientific results through global networks, without any human interference. The digital university library will support Open Science in a high-quality manner. People and machines will be able to easily access scientific output via global open access databases, eliminating the need for local retention and/or dissemination. Moreover, it will provide scientists with ample opportunity to engage in changing partnerships with partners outside their own university, and outside local organizational structures. The local catalogs of the library will play an increasingly minor role, given the fact that in the future access to the university's own scientific collection no longer needs to be managed or only needs to be managed to a lesser extent. Since all scientific output will be accessible via open access databases over time. International partnerships within the digital library will have become even more important to ensure that our students and scientists can make the best possible use of the available Open Science methods. 2030 will prove that the transitions from closed to open and from local to international are interlinked.

Analyze impact

The main task of the digital university library is to support scientists and students in their search for correct and reliable data in an overload of information. In addition, research analytics services are increasingly used. This requires for research, publications, data and substantive expertise to be linked. Services that focus on analyzing the impact of scientific input in public databases, both for societal and scientific purposes.

We have further strengthened the position and impact of the university by distributing the information, data, publications and other scientific output generated by the TU/e in the best and most open possible way. Ensuring that our goals of the TU/e 2030 Strategy are within reach.

Further development of analysts

In 2030, the academic, support and educational staff will all work in a data-intensive way. Of course, our organizational data will be FAIR and will automatically be combined into one big data & documents archive. Information and business analysts have become standard profiles as part of the support staff. This is the result of the course to further develop the profiles, which course was set out in 2018 to professionalize the supply of information and BI reports. These analysts are the experts of the support staff, who know how to use our (operational) data in the best possible way and how to help others gain a better understanding of these data. By doing this, our analysts establish a link between the opportunities provided by the accessible self-service data and the advanced technologies of data scientists. Giving controllers, HR consultants and research and educational policy officers the opportunity to search the TU/e data and gain new insights for the entire university. And jointly accelerate innovation within education, research and business operations.

We are ready to connect with the future? Will you join us?

Strategic themes 2025

Three focus areas

In the coming years, the new developments within Data Management and Library will focus on three strategic themes. Each theme will be based on our vision 'Connecting the Future'. Within the themes, we will seek connections at all possible levels: (re)new(ed) connections with our customers: scientists, support staff and students. Connections in the various chain processes as part of the integral services within the TU/e. And connections between data streams and systems, in collaboration with partnerships, in international academic networks and connections with society as a whole.

In the period 2020-2025, these themes will be further developed by means of a multiannual program.
1. Connecting the Future by Open Science
2. Connecting the Future by Research Data Management
3. Connecting the Future by General Data Management

The coming years, priority will be given to significant further development of the above themes.

The urgency of Open Science

The TU/e is currently undergoing the transition from 'Science' to 'Open Science'

The past years, the Netherlands has strongly advocated the development of Open Science as a standard within science. International developments, mainly on a European level, political developments both in the Netherlands and abroad and ambitious plans developed and supported by (inter)national coalitions, including NPOS and Plan S, clearly prove one thing:
Open Science is here to stay.

The TU/e, including all of its students and scientists, is currently undergoing the transition from 'Science' to 'Open Science'. Meaning that the TU/e has to clearly define, jointly with its scientists, its course and ambition to further shape this transition in the coming years, to move from 'Open Science principles' to 'Open Science implementation'.

Enhance accessibility, transparency and confidence in science	Open Science provides scientist and the university with the important means to enhance the accessibility to, transparency of and confidence in scientific results. Today, where science is ever more often labelled an opinion, and politics and society increasingly demand for investments in science to be made transparent, this is a critical aspect for the entire academic world. It allows for Open Science to step out of the shadow of 'idealism' and become an important means to the credibility and the impact of science as a whole. This is both important for the reputation of the TU/e and for the (future) career of our own scientists and collaborating partners. Open Science will become reality for the future generation of scientists and the TU/e, as employer and academic institute, has the important task to support this transition in the best possible way for both the scientists and our students.
External accountability	In addition to the intrinsic motivation to define Open Science as a key priority the coming period, the matter is also high priority because of externally imposed accountability. Both the Dutch government and external funders (including NOW and the European Commission) impose clear requirements in respect of Open Science for the research funding they provide. Due to the increasing binding nature of these requirements, both the financial and reputational risk for individual scientists and the university is increasing. Meaning that we need to further support the focus on Open Science from an accountability point of view in the coming period, to help scientists where possible to find the simplest way to compliance.

Urgency of Research Data Management

Safeguarding scientific integrity	In the context of Open Science, Research Data Management is also a focus area essential to maintain the confidence in science as a whole. Proper Research Data Management basically allows for reproduction of scientific research and is therefore essential for safeguarding scientific integrity. Research Data Management focusses on proper management of all research data to ensure that no data are lost, modified without permission or manipulated and to ensure that research data remain findable, useable and accessible to others. In addition, proper Research Data Management also ensures that data are retained and disclosed in a safe and sustainable way pursuant to privacy, security and compliance laws and regulations (whether or not imposed by external research funders). For a university that focuses on scientific education and research, Research Data Management is not only important for the integrity and reliability of individual scientists, but clearly also for the university as a whole.
Innovation through Data Driven Science	Research Data Management combined with Open Science - or: disclosing large amounts of research data - provides numerous innovative opportunities for the future. Data Driven Science has been advancing rapidly the past years and the use of AI is expected to further increase in almost all fields. With EAISI, The TU/e is clearly differentiating itself in the field of Artificial Intelligence the coming years and aims to be part of the European Top. Artificial Intelligence is already playing a key role in TU/e's research and education. Access to large amounts of data sets, and thus Research Data Management, is therefore essential. To safeguard scientific integrity and to allow for the intended innovation and acceleration within scientific education and research, extra focus on Research Data Management is fundamental for the future of the entire university.

Urgency of General Data Management

Reliable data when taking decisions that have impact

The past years, the TU/e has more and more shifted towards a data-driven way of working and management. A large number of decisions, with significant impact, have been taken based on data. For example, decisions whether or not to allocate places to a certain study program based on a decentralized selection. And decisions in respect of internal business operations regarding the need to expand the size of offices, educational areas and laboratories.

Based on data sources, which are often combined, reports and analyses are made to gain a better understanding of the need for and the consequences of far-reaching decisions. Choices that strongly impact the primary process.

The past years, the university has heavily invested in the professionalization of an integral Business Intelligence environment to increase the understanding of our underlying data. During this multiannual program, we mainly focused on the last stages of processing data into information for decision guidance reports. During this development, it became clear that subsequent steps are also needed at the beginning of the chain process to enhance the accuracy and reliability of complex reports. The reliability of a report almost fully depends on the quality of the underlying data. Quality standards for the quality of data are especially essential when multiple data sources are being combined. The TU/e is still in the early stages of developing such quality standards, but has major ambitions regarding a data-driven way of working and management. That is why the focus on General Data Management is so essential the coming years.

Compliancy to laws and regulations

By focusing on General Data Management, data management will be lifted to a higher level throughout the university. This will not only increase our own opportunities in respect of management based on the right data, but the university will also gain a better understanding of the way the existing laws and regulations are currently being interpreted in respect of management and processing of underlying data.

By professionalizing General Data Management, the TU/e will be able to comply with various laws and regulations now and in the future, including the General Data Protection Regulation, Archives Act, the Netherlands Higher Education and Research Act, Equal Treatment Act, The Government Information (Public Access) Act, Open Government Act, Standards for Remuneration Act, etc.

Without structural focus and the definition of central quality standards for general data management, it is fairly impossible for an institute to provide the necessary support in a targeted way and to safeguard compliancy.

Connecting the Future by Open Science

"We value Open Science. As a societal organization, TU/e is focused on generating and disseminating knowledge. We will share our results and data and apply international standards. In our industry collaborations, we strive for maximal disclosure of results and findings."

"Digitization is a multi-faceted process which touches on every aspect of our activities. We need to equip our students with skills for the digital age. Our laboratories have become data intensive and the systems used to organize education and research are all digital. Research processes and facilities are impacted by the many benefits of digital technologies, with data science as its most prominent example. We aim to be at the forefront of developments concerning data and intelligent systems research."

Increase impact

Open Science has become more common practice the past years and will be the new standard for scientific research in the future. Compared to the initial period when Open Science was driven by idealism, it is now more widely used to increase the impact of scientific research. Giving individual scientist the opportunity to present themselves, to increase the visibility and reputation of a research group, faculty and the university and to disseminate scientific results as widely as possible to interested parties outside the academic world. To us, Open Science is not a target in itself. It is a means to increase scientific and social impact.

From principles to implementation

The coming years, Data Management and Library will play an essential role in counseling and guiding the university in its transition from 'open science principles' to 'open science implementation'. To this end, we will develop a university-wide Open Science program in collaboration with the General Affairs Department, the Executive Board and scientists. The program will contain ambitions and actions with respect to:
• Open access publications and the link to management of the library's collections
• FAIR research data
• Open software
• Acknowledgement and appreciation of researchers
• Impact, industry collaboration and social engagement

Brainport Multi Helix Ecosystem as Open Science Couleur Locale

There have also been developments outside the academic world that further drive and strengthen the transition towards Open Science. Eindhoven University of Technology is firmly rooted in Brainport, which is transforming from a triple helix (government, business, education) into a multi helix. Citizens, customers, consumers, designers, artists and corporations are part of the network region, which focusses on the creation of connections between technology, design and social innovation. This unique multi helix ecosystem provides a rich basis for the development of an Open Science 'couleur locale' within the Open Science program to enhance the international knowledge region and the position of the Technical University.
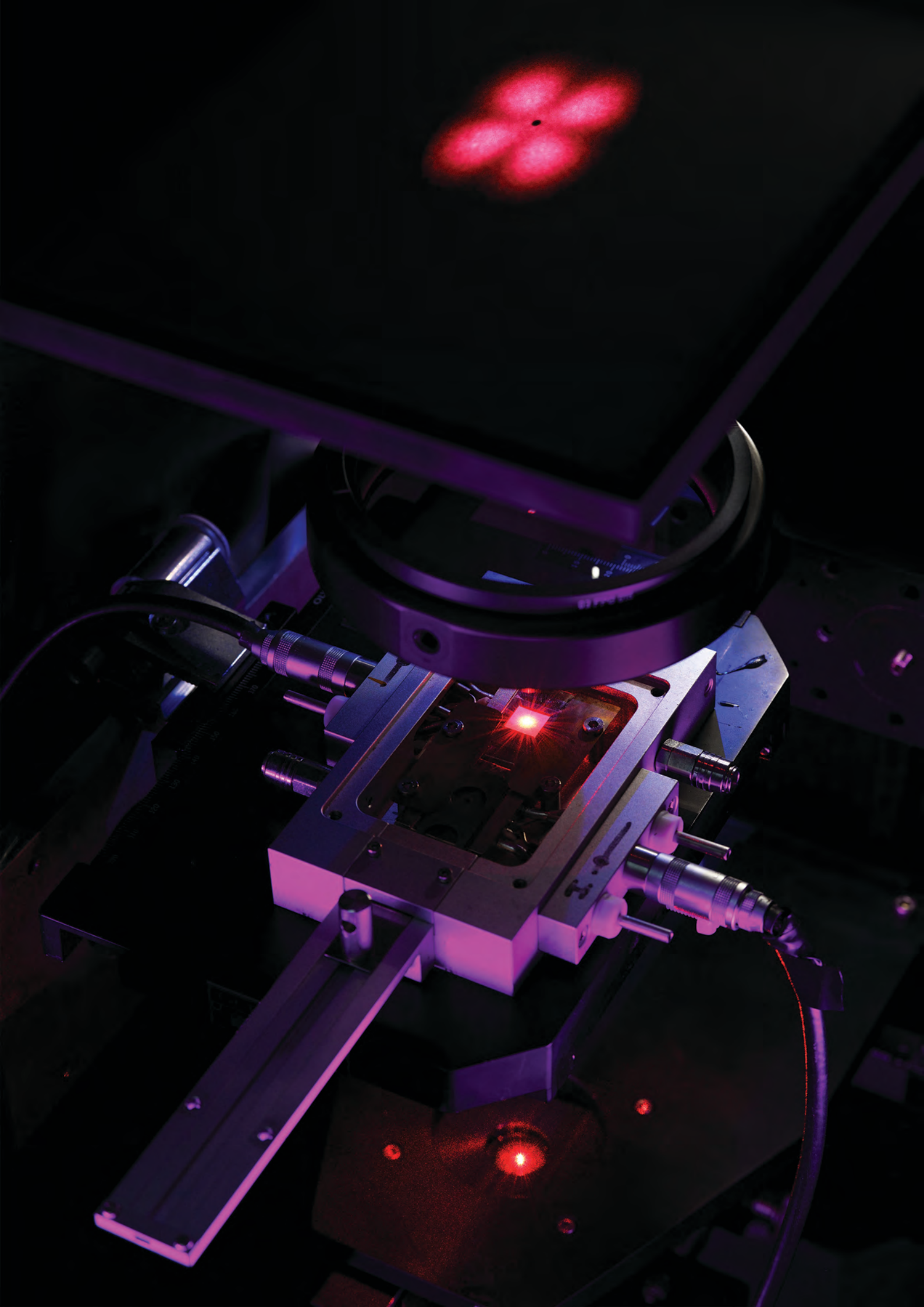
Connecting the Future by Research Data Management

"TU/e actively promotes the five values of research integrity: trustworthy research, intellectual honesty, openness, independence and responsibility toward society. "

"Digitization of research and education is fundamental to the quality of both. We aim to use state-of-the-art, personalized digital solutions to support the performance of our researchers and students. Whether for course management, Open Science, big data, or facilities for scientific experiments, we need to adapt to new demands in education and research, such as online life-long learning and research data management. To offer the best support, we need stable and proven solutions, such as cloud-based or third-party solutions. For education and research, tailored solutions may sometimes be necessary. If we use standardized, well thought-out solutions as much as we can, we will have time and energy to provide tailored advice when necessary."

"We aim to create the necessary digital infrastructure for obtaining and processing research results, from electronic microscopes and big data to living labs. Following the principles of Open Science, we aim to provide open access to our results and their underlying data through digital platforms. To offer the best support, we need stable and proven solutions, such as cloud-based or third-party solutions."

Data intensive and multi- disciplinary

Research is becoming more data intensive and multi-disciplinary. Proper Research Management is not only necessary to safeguard scientific integrity. In the future, reuse of data will become even more valuable and will therefore be the prospective 'new gold'. By recording, combining and digitally disclosing scientific research results and the underlying (meta) data, the data will become even more valuable, which will increase the impact of the research. Moreover, Research Data Management does not only contribute to the reproducibility and reliability of the research results of individual scientists, science groups, faculties and the university, but also to academic research as a whole.

(Inter)national collaborations

Therefore, international attention has been focused on the professionalization of Research Data Management within universities and research institutes the past years. Resulting in e.g. several national and international collaborations and coordination points to support a joint approach towards Research Data Management. The Eindhoven University of Technology has also initiated good and promising projects and has developed services to support Research Data Management by using market products in the research infrastructure to the extent possible to support our processes in the best possible way. Where possible, we substantively tie in with the developments of our strategic partners and partner universities to support cooperation within research and education outside the TU/e in the best possible way.
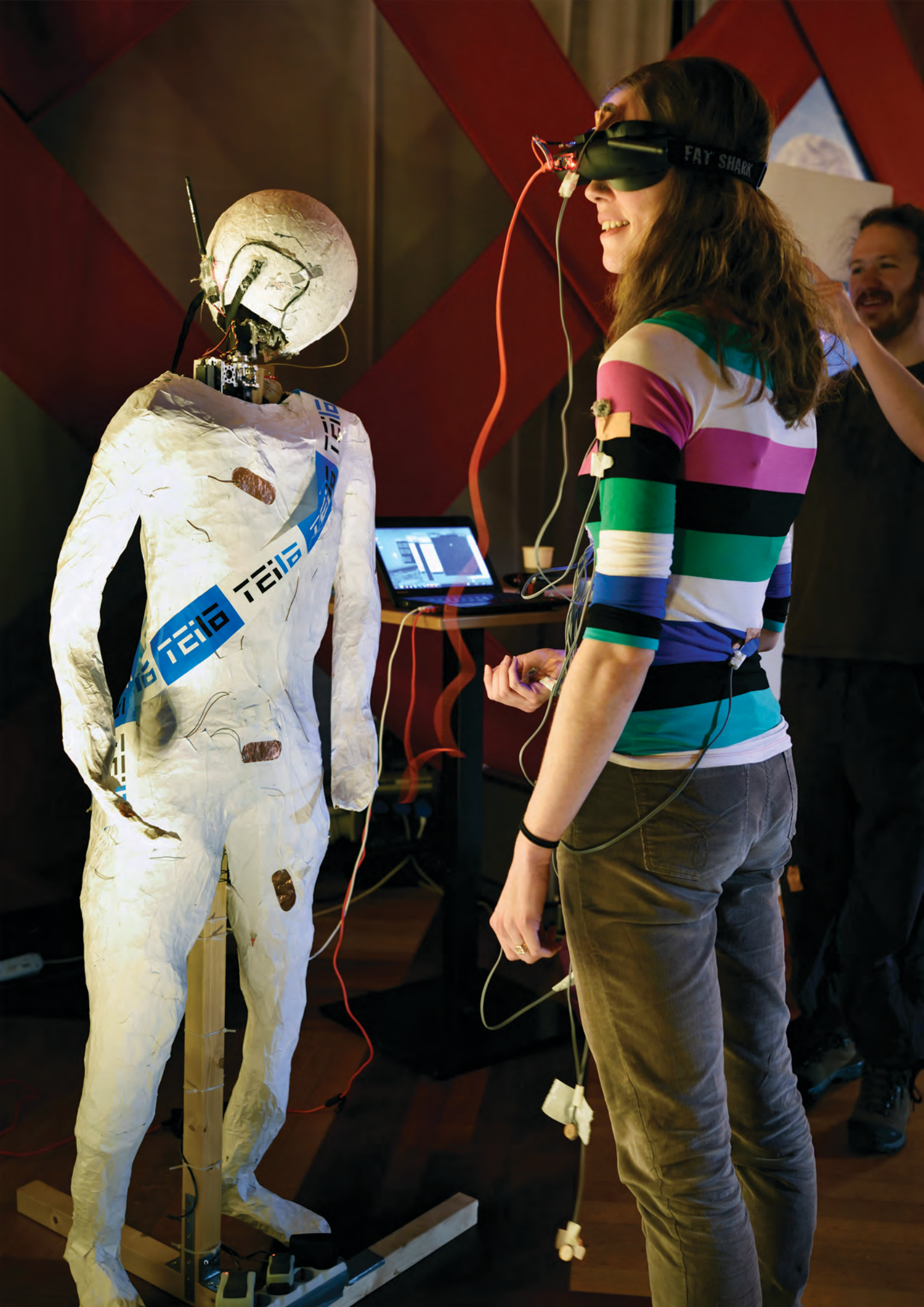
Chain cooperation to accelerate development

Research Data Management (RDM) entails much more than IT related subjects. At almost all universities, Research Data Management is therefore substantively supported by a central policy making department, the IT department and the university library, of course in close liaison with the scientists in their role as customer. Within the TU/e, the various disciplines have also worked towards further development of RDM these past years and there are excellent opportunities to enhance this chain cooperation and accelerate the developments in respect of Research Data Management by means of collective priorities and force.

Governing role RDM

Data Management and Library wants to take on a joint governing role in the area of Research Data Management in the future by combining the various expertise and by cooperating within a multiannual RDM program. We, jointly with our partners within the university, are giving direction to the program and are developing the strategy the TU/e is following in this area, based on internal and external developments. Where necessary, we adjust the strategy accordingly. This will enable us to determine (policy) frameworks for the entire university in respect of the recording and disclosure of research results and the underlying data. And seize the opportunities for the university by combining the available data and disclosing and sharing the research results and underlying data.
This may include the disclosure of data to our direct collaboration partners that have strict authorization, within the own research group, deliberately in a broader external context or fully open access, accessible to everyone. Furthermore, a structured approach towards Research Data Management will increase the university's opportunity to work, jointly with external partners, on large datasets. By collecting more external data, enriching these data and conducting (further) research, the TU/e is working jointly with external parties towards solutions for social challenges and issues.

FAIR data

Data Management and Library is supporting scientists and supporters within faculties to use the research data to the best of their ability. Based on our principle to work towards an RDM program that will focus on FAIR data within the entire university.

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Findable	People and computers can easily find the data and meta data, machine-readable meta data are essential for automatic findability of data(sets)
Accessible	the rules for access and use are specified and a user knows how to get access to data (including authentication and authorization). The principle 'as open as possible, as closed as necessary' applies.
Interoperable	the data can be integrated (preferably automatically) with other data and used in applications for workflows, analyses, retention and processing
Reusable	the data are optimized for reuse (whether or not in another setting). For that to be possible, the source of the data has to be clear and standards are used to view the data and in the meta data.

Policy

For this to be possible, Data Management and Library, Information Management & Services, the General Affairs Department and scientists are working together to establish an RDM policy, which policy is the basis for e.g. infrastructure, incentives, privacy & security, data stewardship, education, training and of course the financial model.

Data stewardship encompasses all duties and responsibilities in respect of support relating to the proper care and handling of data during the various phases of the research process.

The guiding principle is that researchers are primarily responsible for their own research data (NFU 2016). Data stewardship will be very important when putting the RDM policy into practice. The role of the data stewardships performed by Data Management and Library will be generic. Furthermore, we will build a specific network of faculty data stewardships in cooperation with IMS. We will jointly use our expertise to answer the various questions of scientists to the best of our ability.

Excellent support for and within faculties

To be able to provide excellent support, education and training to the scientists, our scientists of the future, the students, a chain cooperation with other areas of expertise is essential. The past years, the TU/e has invested in the creation of several networks within the faculties to support the scientists. An example of such network is the Research Support Network (RSN from the Innovation Lab), which helps scientists raise external funding for their research. Another example is the network of IT for Research (IMS) in which a number of linking pins are located near the researchers to forward any specific technical questions from the scientists to the IT back office. It is our vision to have Data Management and Library strengthen the various networks for research support already available near the faculties by means of Research Data Management experts in order to support scientists based on a common professional attitude. For example, by combining the various areas of expertise into one research support group within each faculty, enabling the various supporting services to jointly support the faculty across the full spectrum of research-related questions. The various experts are working together based on the concept of one (virtual) team. In such a team, it doesn't matter who you turn to for which question, he or she will forward the question to the appropriate expert or consult with the best person to answer the question.
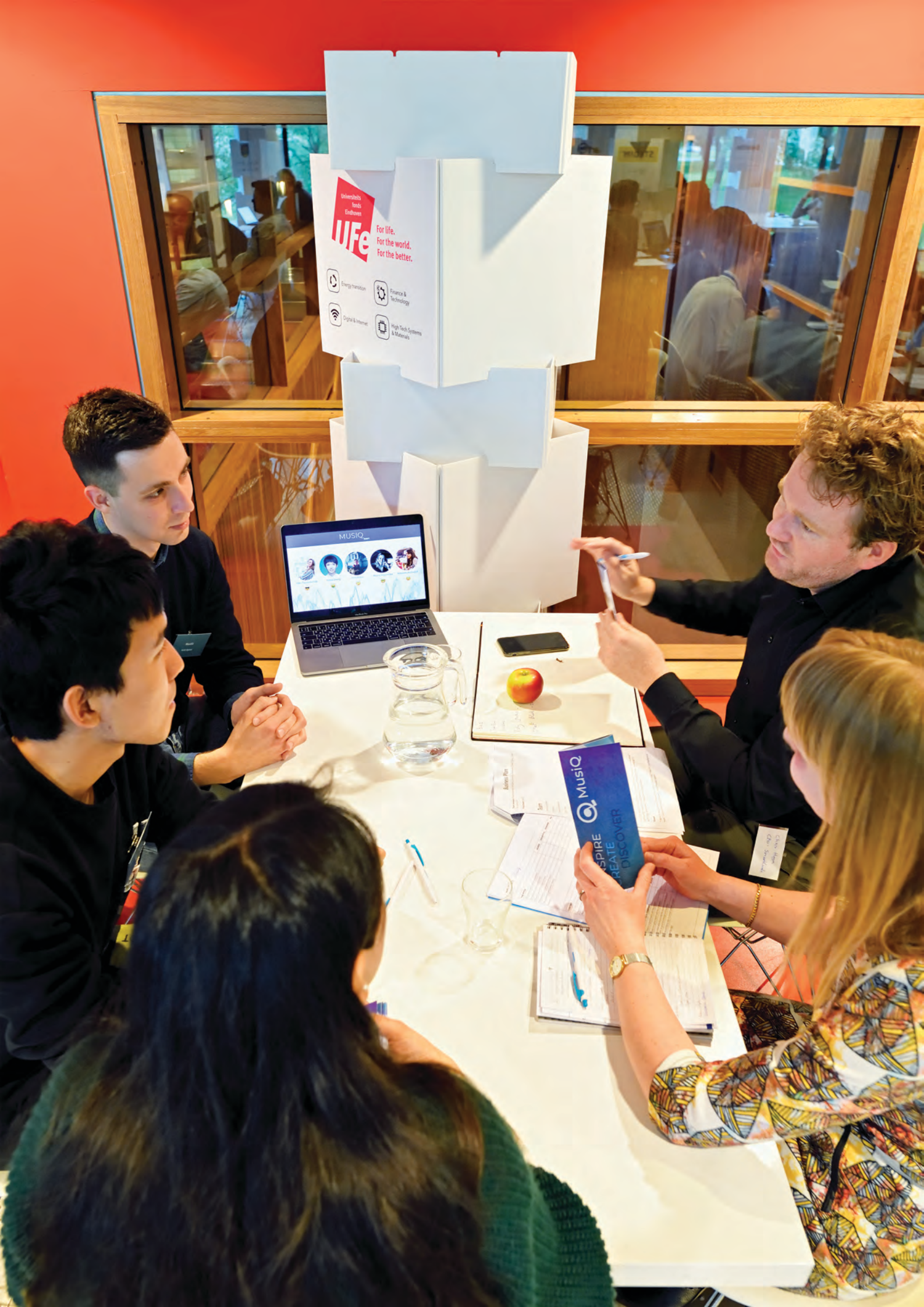
Connecting the Future by General Data Management

"Achieving cooperation between students, scientific staff and support staff requires our support services to quickly adapt to new developments in education and research. As people are the best agents of change, we will focus our energy on developing personal expertise and skills. Our support staff will work in multifaceted teams, be a member of both a division and a university-wide service chain and focus on cross-disciplinary support programs such as campus facilities, 'research life cycle' and 'hire to retire'."

"Our goal to be among the leading institutions in education and research needs the full support of our auxiliary processes. The high-quality support of our support staff is essential to our achievements in education and research."

"Staff professionalism means that our people have an in-depth knowledge of what drives education and research. They understand what researchers and students care about and how they operate, and can deliver high-quality support that helps them achieve their goals. Our support staff takes pride in being professionals: they have a hunger for knowledge in their field of expertise and do not shy away from being a true partner in discussions. Researchers and students value the opinions and insights of our expert support staff. Our professionals are thinkers and doers with a no-nonsense and result-driven way of working. Together, we create a university of science and technology that ranks among the best."

Enabling digital transformation

The strategic theme General Data Management represents: 'connecting the future by enabling digital transformation'. The past years, chain cooperation across domains has become ever more important to support the primary process in the best possible way. Not only people are entering into more structural relationships in new networks, also various source systems and associated data streams are becoming more intertwined. This applies to data within research, education and valorization and for data streams as part of business operations. A familiar example is the Business Intelligence environment, which has been successfully set up in the past three years using an integral approach. Colleagues from various supporting services are jointly working in one team and about ten different sources are being disclosed to create one integral reporting environment

Data-driven way of working and management

Faculties and services increasingly base their decisions, both at a university and national level, on information generated by such data-driven reporting environments. We continue to professionalize our data-driven way of working and management. The TU/e receives an increasing number of requests from external parties to provide data to deepen the understanding of the public value. The quality and reliability of this (control) information is to a large extent determined by the correctness of the source data (in dozens of different sources) and the possibility to combine these data. This requires, for the first time, more explicit attention for the field of data management, in which field the TU/e wishes to further grow to maturity. In 2019, the Executive Board took an important step by formally appointing several deans and directors to be 'data stewards' for specific data domains.
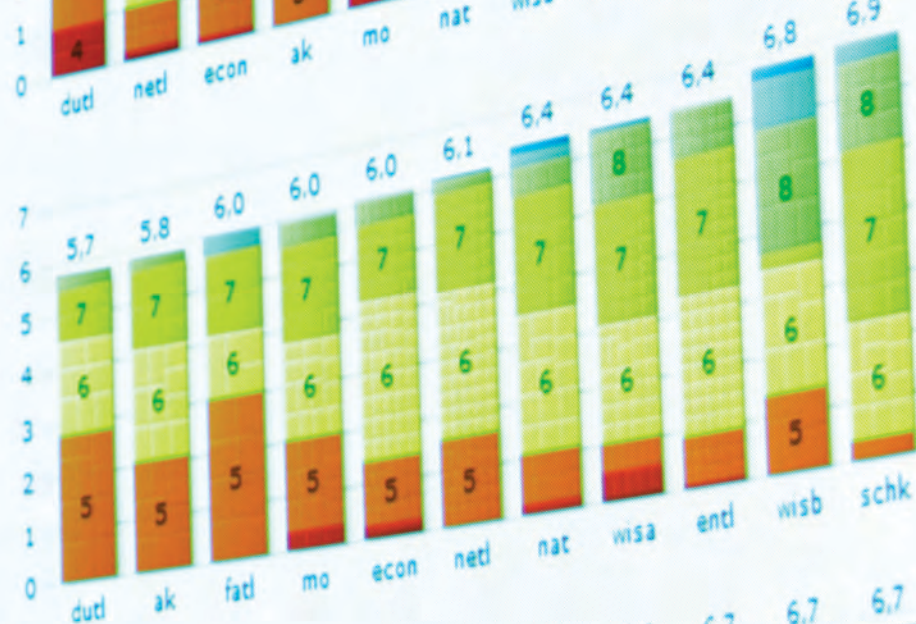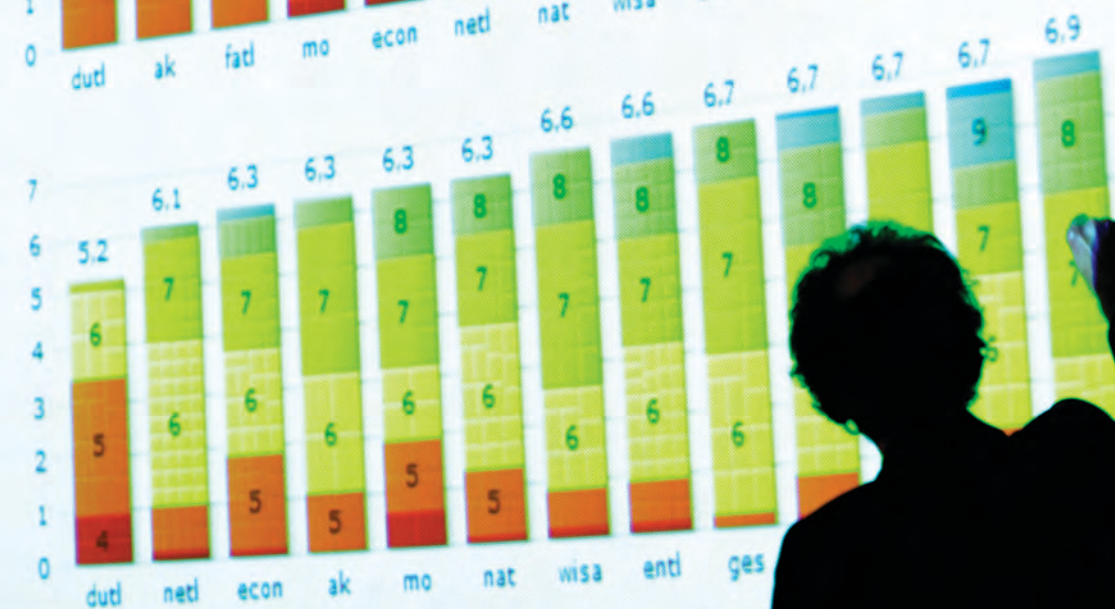
Visualization high school data

Data management as a field	To support the deans and directors with their new responsibility, central frameworks and high-quality support are needed. Data Management and Library has ample experience in establishing quality frameworks and in supporting document management. In the 2020-2025 period, Data Management and Library will use this expertise, which will be further strengthened the coming period, to support General Data Management throughout the university, the primary process and the supporting processes in the best possible way. Hence, Data Management and Library is the department that positions data management as a field. For example, those frameworks can be used to work on Research Data Management and General Data Management. Based on this key role, Data Management and Library is trying to liaise with partners within the university.
Compliancy, efficiency, effectivity and innovation	Initially, by professionalizing data management we seek to ensure compliancy, work more efficiently and subsequently increase effectivity. The ultimate goal is to enable innovation based on data analyses to support the strategic goals of the TU/e. By increasing the level of maturity of a data-driven way of working, we are able to better manage e.g. educational innovation, research and valorization and the operational processes within our university. In the future, we will not only use data and Business Intelligence to provide descriptive analyses, but data and Business Intelligence will be increasingly used to provide explanatory, predictive and maybe even prescriptive analyses.
One strategic framework for research data management, general data management and business intelligence	After a successful program phase for Business Intelligence, BI will be fully incorporated into the existing line organization the coming period. The operational BI Cluster will be incorporated within Information Management & Services (IMS). Data Management and Library will conduct the strategic activities to (further) develop Business Intelligence. Data Management and Library's approach towards General Data Management will be based on an integral strategic (policy) framework, which jointly combines the (further) development of General Data Management, Research Data Management and Business Intelligence under one umbrella. That way, Data Management and Library will be able to properly provide the university with data and information services. Important chain partners in these processes are Information Management & Services (IMS), the General Affairs Department (Dienst Algemene Zaken – DAZ) and Concern Control. It is a joint effort in which all parties have their own expertise and responsibilities to ensure a reliable chain cooperation.
Training of data management	It is expected that in the future more and more jobs will depend on reliable data analyses and an associated understanding of these analyses, such as an HR consultant, research project officer, policy officer, controller or project manager. Therefore, Data Management and Library pays explicit attention to the process and educational side of data management. To ensure that data management is both embedded in the organization and in education and training for employees.
Non-invasive data governance model	Data Management and Library uses a '*non-invasive data governance model*'. This growth model uses the existing functions and roles within the university in the best possible way and takes a programmatic approach to ensure the entire organization is gradually growing to data maturity. The model will be completed by means of the internationally leading 'Data Management Body of Knowledge', which is developed by the Data Management Association International. This programmatic approach gradually addresses the following eleven knowledge areas: data governance, data architecture, data modeling & design, data retention & operations, data security, data integration & interoperability, documents & content, reference & master data, data warehousing & business intelligence, metadata and data quality.

Data Management and Library as the connecting factor

National specialist networks

The Eindhoven University of Technology has a large number of national and international collaborations. Data Management and Library is also used as connecting factor outside the TU/e. For many years, parties in the Netherlands have been working closely together in specialist networks, including the UKB (the Dutch consortium of university libraries and the National Library of the Netherlands), the Academic Platform for Information Services and Records Management, the Academic Heritage Foundation, the National Coordination Point Research Data Management (in Dutch LCRDM) and several working groups focused on research infrastructure and research analytics.

As member of several national networks, we actively participate in a large number of specialist working groups, which focus among others on Open Science, Open Access, Research Data Management, Research Analytics, Meta Data Management, etc. These working groups provide a professional networking environment and create expert groups, which give advice to e.g. the National Platform Open Science (NPOS), the Open Science Ambassadors and the Association of Universities in the Netherlands (in Dutch VSNU).

We, in cooperation with the 4TU.Federation, have been facilitating the 4TU.Centre for Research Data for years in order to provide researchers with a reliable long-term archive for open access research data: for retention and reuse of applied, technical-scientific research data.

International collaboration

By actively participating in the vibrant Dutch networks, the TU/e is continuously seeking and finding partnerships with international partners. By combining knowledge and expertise in national expert groups, we can divide the workload and properly tie in with international developments, with a strong focus on Europe.

For example, we seriously consider the choices other (European) countries and partners are making during the so-called Big Deal negotiations. And we are learning from each other's success stories and points of improvement. In addition, all international parties use the views, knowledge and expertise of other countries and partners to establish high-quality training and support.

External strategic partners

In addition to the existing and often long-term specialist networks, Data Management and Library will increasingly focus on the strategic partners and collaborations of the university as a whole the coming years. Meaning that extra attention will be given to cooperation in respect of the strategic themes within Brainport, with our alliance partners of Utrecht University and Wageningen University and Research, the 4TU.Federation and with the EuroTech Universities. This cooperation is not entirely new. EuroTech already has an expert group, which focuses on Open Science.

Join forces and increase visibility

The reason why we work together in respect of several themes is comprehensive. On the one hand a cooperation offers the opportunity to join forces when you have limited people and means. You are able to achieve more together than on your own. In addition, through cooperation we gain new perspectives. And we are able to use the principles already proven by similar knowledge institutes.

On the other hand, by cooperating based on strategic themes, we increase the visibility of these themes in an overall context. Furthermore, through these collaborations, the TU/e is providing expertise to a large audience.

Further development of customary services

Library and archive services

In addition to the three strategic development lines, Data Management and Library will continue to provide its customary services. The library and archive services are essential for students, scientists and support staff when executing their day-to-day activities. The focus of both library and archive has shifted from analogue to digital the past years and that digitization is likely to increase. Moreover, Data Management and Library will ensure that the TU/e complies with the Archives Act with respect to management and access of the TU/e archives.

Customer-oriented

We will certainly improve the customary services where necessary to be able to stay in line with any new developments and support the university in the best possible way. We will invest in the innovative (information) services required within the university. We know the information requirements of students, scientists, support staff and management and will align our faculties, systems and services accordingly. Our customers know our vision and the services we offer. We are accessible, open and committed and regularly ask our customers' opinion to be able to meet their needs even better. We offer proactive advice and help our scientists and students find, use, process and share information. We will further streamline the processes within our department and assess where improvement is needed to do things in an even better and smarter way so that the various teams can further drive the transition we envision from within.
This means that we have to follow the new developments and trends for our customary services:
1. University library
2. Education
3. Archive
4. Academic heritage

1. UNIVERSITY LIBRARY
The paste decades, the university library has performed two core activities: disclosure of the scientific collection to students and employees and archiving and dissemination of TU/e's scientific output by means of our own repository and associated shop window website.

Digital library

The amount of content within the university library has significantly increased the past years. This development has been coupled with the transition into a digital library. In 2018, the digital science collection accounted for no fewer than 98.5% of the total collection costs. This significantly changed the function of the physical university library. The newest scientific literature can be consulted online any time any place and the (physical) library now provides a quiet study environment for students.

Increasing requests for advice

Our customers greatly benefitted from the analogue to digital transition. Now, scientists and students can access large amounts of scientific information much easier and faster. Data Management and Library provides access to an extensive scientific collection, consisting of electronic magazines, electronic books, scientific databases and the physical collection of the library in the Metaforum and the archive.

The impact of the analogue to digital transition on the internal operations of the library has been less noticeable. The library still negotiates the scientific collection with publishers, makes choices in respect of which (digital) magazines, books and databases to purchase and manages and discloses its own scientific collection to employees and students of the TU/e. Since the publishers' business model is shifting from payment for access to scientific content (subscriptions and books) to payment for publications (Article Processing Charges), the back-office activities of the library will significantly change over time. The current operational management of the collection and the associated back office management activities are expected to become virtually redundant in an Open Science world. At the same time, the number of requests for advice to support the search for reliable scientific information will potentially increase, because the amount of content to be accessed continues to grow and the reliability of this content can no longer be guaranteed.

Library Information Management

A renewed digital library calls for further development of the current services. Analyses focused on research results and impact, support to make the added value of scientific research clear. Data Management and Library will continue to develop to better understand the scientific and social impact of scientific output, varying from (scientific) publications to the disclosure of datasets. To make this possible, more attention will be paid to Library Information Management, using data to perform the desired analyses.

Retention policy including decollection

Since the new scientific collection of the university library is nearly entirely purchased digitally, the actual value of the analogue collection in the physical library is decreasing annually. Indeed, the supply of new analogue content is minimal. Meaning, that the coming years we will focus again on the retention policy, including decollection, both in the current archives and in the physical library. It is hereby essential to thoughtfully consider which content to retain and which content to destroy.

Beloved study and resource center for concentration

The physical library is becoming less and less essential for the disclosure of the scientific collection. However, it is still as popular as ever as study and resource center where students can study in silence in the vicinity of other students. The concept of a quite study and resource center, which provides daily support in finding scientific information, will be further embraced the coming years. With this unique study and resource center, Data Management and Library is contributing to a pleasant campus for a diverse group of students.

From local to central

Where the past years, the TU/e's own repository and associated shop window website have become more important, partly to allow the university to facilitate green open access and the website 2.0 project, the coming years we may see a different movement. In an Open Science environment, it is no longer strictly necessary for the TU/e to have its own repository to facilitate green open access, since all scientific content will be fully open access available via publishers over time. The added value of a repository will shift from the role of 'source' to 'content assurance', to retain a backup of the scientific output, independent of publishers. This is a legitimate basis for a repository. However, a repository is more effectively and efficiently set up if it is no longer managed locally, but in a national network (including universities of applied sciences, research institutes etc.). The fact that national big deals with publishers are entered into in an increasingly wide consortium also fits in with the movement. Data Management and Library will verify within the existing national networks if this vision of the future is recognized and if the movement can be taken on together. And if yes, which movement will bring this about internally at the TU/e.

Acknowledgement and valuation

The university library of the future will have a new role within the university, building on existing expertise. Universities have committed to work on a new balance in respect of acknowledgement and valuation of scientists. Meaning less emphasis on the number of publications and citations and more emphasis on other domains, including education, valorization and leadership. This will bring about a movement to define this new way of acknowledgement and valuation: with more emphasis on quality of work, stimulation of Open Science and with attention for both individual qualities and ambitions and for team performances.

The coming years, each university, UMC and research institute will develop the new national framework in respect of assessment, development and promotion and define assessment criteria and narratives for all key domains and team performances that are unique for the organization. Data Management and Library, in close collaboration with the General Affairs Department, will also contribute to the framework by means of Research Analytics and Open Science services.

Research support

Above developments entail a significant change for all library services of Data Management and Library. Causing the focus to shift from collection management to research analytics. With the aim to make the impact of scientific results clear, to increase the impact where possible and to provide support in finding reliable scientific information. By doing this, Data Management and Library is building on the expertise within the research support department, which has been set up the past years.
Due to this changing position and the fast-changing world, it is necessary to annually reassess the activities of Data Management and Library in respect of customer orientation and effectivity and to not only focus internally on strong connections, but to also find partnerships in national and international specialist networks.

Curricular strands based on three strategic themes

2. EDUCATION
In the future, the education provided by Data Management and Library will focus on coordination of cohesive curricular strands within the three strategic themes: Open Science, Research Data Management and General Data Management. Since the curricular strands are a means to effectively transfer knowledge to all three strategic themes, the target groups of our study programs are also becoming broader.

Our target groups no longer only consist of students. We have also developed curricular strands for scientific staff (Open Science and Research Data Management) and supporting staff (General Data Management). Making education the cornerstone of our strategic pillars. We can only realize the ambitions defined in our vision by providing education in respect of all strategic themes.

Resulting in high-quality education with themes specifically focused on a target group. We will closely cooperate with Education and Student Affairs (for students) and HR Professional Development (for employees) in respect of these themes. Meaning that Data Management and Library will use the knowledge and services of other supporting departments to ensure a proper knowledge transfer in respect of the themes for which we have the necessary expertise at our disposal.

This will evolve into a broad curriculum, including subjects such as scientific integrity in literature research/citing, which useful information to find in the media, open access scientific publications and the peer review process, applicable copyright and licenses when publishing scientific information, texts and software, data management plan courses, facts and fiction regarding metrics and the basics of general data management in practice.

Offline and online education

Data Management and Library is already responsible for providing information skills and open science education to more than 4,100 students each year, from bachelor to PhD. These study programs are still mainly taught in the classroom. The future requires more flexible education, both offline and online. Students and employees require help in finding, using, processing and sharing data and information the moment they individually need it as part of challenged based learning or as part of their day-to-day work.

Personal learning path

We will interlace the way we provide education with the personal learning path of students or employees. We will move from our current 'on campus education' to 'online education'. However, you can also find us in the physical library to help students and employees with their questions in a more flexible way. Providing students and employees with the opportunity to follow education, ask for help or to find the desired study material later as online reference at any given time. Our employees focus on the professional role and expertise within education and use the knowledge and skills of other departments when taking on a more facilitating role.

3.   ARCHIVE

Automatic retention and destruction

As archive manager, Data Management and Library is responsible for implementing the Archives Act throughout the university. The past years, Data Management and Library invested a great deal of effort into making the TU/e archive future-proof and into improving the efficiency and effectivity of the associated processes.
The transition from analogue to digital archiving constituted an important part of this process. Currently, the digital archive already consists of several process applications equipped to automatically retain information that is worth archiving and to destroy this information over time pursuant to legislative guidelines. The information objects that should be retained long-term or permanently are stored in the pre-deposit.

SensUs

Nanopore technology based biosensor

Dido Curwiel, Guusje Geenen, Roos Munnik and Iris Viskaal
Lorentz Casimir Lyceum

The purpose of the biosensor

Nanopore mechanism

Nanopore membrane

Microchip

Sensor I

Sensor II

Blood vessel

Manufactured tube

Why monitor anti-CCP?

SensUs

Diagnosing rheumatoid artritis in a fast, compact way with a biosensor

Stan van de Gevel, Anna Goorissen, Lucas Lahaije , Daan Slangen
Van Maerlant Lyceum

The Problem

Determining the diagnose of rheumatoid artritis can take up to three weeks or even longer. According to several papers starting early with the treatment affects the outcome of the disease positively after several years. It is there for crucial that we start as soon as possible with the treatment. On top of that bearing great pain for several week is something we definitely not want. So therefore our biosensor aims to shorten the time it takes to diagnose a patient.
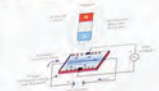
Our solution

Our biosensor wil help the general practitioner to diagnose the patient accurate and fast. This wil be done trough a clever combination of our biosensor and set list of questions for the patient. With the results of both the general practitioner we will be able to diagnose the patient in a short time span so the treatment of patients can start early.

The Biosensor

Our biosensor is designed to be fast and easy in use. The only thing the gp has to do is to take blood from the patient and add it to the biosensor. The biosensor will measure the quantum of anticyclic citrulinated peptide in your blood. To measure the quantum of anti-ccp our biosensor uses special beads. Under influence of a magnetic field the beads are magnetized without a magnetic field there is no magnetization. The beads are coated with ccp so when the blood is added the ccp and the anti-ccp will form an antigen-antibody-complex. Then the magnetic field is activated the other particles will be washed away. When only the complex is left, we can start with the measurement. For this we will be using the hall effect. With the magnetic field active we can measure the voltage gradient and with that we can determine the quantum of anticyclic citrulinated peptides in your blood.

Digital guiding principle including integral retention and destruction policy

To allow for digitization, a large number of document flows have been substituted. The original analogue information has been digitized, following a fixed process. As a result, the digitized version is now considered the original version and the guiding principle and the analogue document no longer has any value. However, a full transition from an analogue to a digital way of working has not been realized yet. We will continue this transition in the coming period.

As part of data management, the retention period and destruction deadline are also defined at the same time to comply with the statutory requirements as defined in the Archive Act and the GDPR among others. This legislation does not only draw attention to documents, but also to data in (source) applications, which may be used to develop these documents. Both the document, analogue and digital, and the data in the (source) application, which data are used to create the document, must be retained or destroyed.

Self-archiving without human interference

The program Verzekerd Digitaal Werken (digital working in an assured way), which is at an advanced stage, contains the necessary elements to allow for the life cycle of a document to be fully digital. The available elements can also be used to structurally continue automatic archiving, without human interference. As a result, people will automatically work and archive in a process-driven way. Self-archiving to the intended process application will become a trend. And scanning of analogue documents will no longer be necessary. It is expected that, as with a number of traditional library activities that will be greatly impacted by the transition, an important part of the current executive back-office archive duties will also disappear over time.

4. ACADEMIC HERITAGE

Connecting the Past

Data Management and Library is also responsible for acquisition, documentation, conservation, digitization and presentation of the TU/e's academic heritage. History is captured by means of an online TU/e encyclopedia, a TU/e image database and by means of administering a collection of classical equipment.
In the academic heritage field, Connecting the Future expressly means Connecting the Past. Meaning that Data Management and Library will seek more partnerships to propagate the university's history and to communicate the origin and development of the university to a larger audience. Focus will be shifted from retainment and conservation to propagation and communication.

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Organizational development

Transformation

To realize Data Management and Library's vision 'Connecting the Future' and to focus on a more efficient and effective organization, further development is needed, which development will also bring about a major change. Initially, we are required to undergo a major transformation, while we continue to provide the existing services.

This transformation is defined by challenges in respect of three main aspects:

- Substantive: from library and archive to data management and Open Science
- Organizational: from executive and controlling to advisory and strategic
- Financial: from a collection budget to open science publication expenses and funding for the necessary transition of services.

In addition, this transformation has to take place rapidly for Data Management and Library to be timely ready to:

- serve as guide for a data-driven way of working and management; to guide the students, scientists and support staff during their own transition towards Open Science, Research Data Management and General Data Management.

From librarian and archivist to Chief Data Officer (CDO)

The new profile of Data Management and Library also requires a new director's profile. The director's profile will undergo a transition from librarian and archivist to Chief Data Officer (CDO). By looking through the eyes of the CDO, the organization will look at data from a different perspective. Data can be regarded and used as capital of the TU/e. The primary task of the CDO is to clearly define the major data challenges the entire organization has to face and to render it possible for the organization to meet these challenges. Data Management and Library will start providing this service the coming years.

We are convinced that if we work towards the results defined in this vision, a connected future is within reach. Based on that belief, we are able to work together, both internally and externally, to realize the necessary transition of the whole department. We are looking forward to work with you towards this transition.

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      recognition and rewards of academics."

Colophon

DATA MANAGEMENT AND LIBRARY (DML)

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TECHNOLOGY