TECHNOLOGY MEETS LIFE

@THE FACULTY OF BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES (BMS)

BMS 2021 Research Evaluation: 2015-2020

UNIVERSITY OF TWENTE.

In a vibrant, entrepreneurial, and high-tech environment, we embrace both practical innovations and fundamental puzzles. Our teaching and research are aimed to investigate and co-shape the technological society. Design is our attitude. We are curious and open-minded towards different views on technological innovation and its impact on policy development, human and institutional behaviour, and business operations.

CONTENT

ABSTRACT | In this self-assessment report, following the Strategy Evaluation Protocol (SEP) for 2021-2027, the faculty of BMS looks back onto the period 2015-2020. During these years, we have gone through a period of change and consolidation, starting as a freshly merged faculty (in 2014) and emerging as a uniquely positioned faculty where behavioural, management, and social sciences naturally fuse with each other and with technology. As such, we are perfectly aligned to address societal challenges and aid positive social change in a technology-driven world.

The reporting period was characterised by three main strategic initiatives to provide focus and foster change: the establishment of five cross-disciplinary research themes, the investment in thirty dedicated PhD and postdoc positions promoting cross-disciplinary cooperation and firmly connecting the social sciences and technology, and the founding of a strong infrastructural support facility: the BMS Lab. Additionally, we modernised the organisation and governance of the faculty to build a more efficient and flexible unit. Finally, important steps were taken to foster an open, inclusive, and healthy academic culture, geared towards collaboration and teamwork.

During the period of review, we managed to realise a considerable influx of new research expertise and (international) talent further strengthening our strategic profile. The overall research quality and societal relevance are illustrated with overviews of exemplary accomplishments reflecting the strategic focus on the research themes. We also provide a comprehensive list of examples of realised societal impact projects such as newly developed products, media coverage, and entrepreneurial activities. Special attention is paid to the BMS and UT-wide PhD policies and programmes as well as HR policies supporting all staff. In addition, several initiatives in terms of research support reflect the fast- and ever-changing requirements on privacy, ethics, open science, and data management. Throughout, critical notes are shared and room for improvement is identified.

Our self-assessment concludes by looking forward. The increasing scientific as well as societal interest for technology in society and the role of people in technology further craft exciting research opportunities for BMS. We outline steps to capitalise on these opportunities via the research themes, by strengthening the PhD programme and research support, and by practising what we preach: a vibrant, inclusive, collaborative, and 'people first' community of researchers where technology meets life.

A NOTE ON THE PROCESS: A TEAM EFFORT | Looking back at the process of writing this report, we can conclude that it has been a valuable experience. By involving a large group of junior and more senior staff members as well as research support colleagues, it was truly a joint effort. Along the way, it provided us with lots of reflective moments and insights, space for explicating our BMS narrative, and thinking about the steps we should take to set the stage for the future. We hope you enjoy reading it as much as we did in living it through and writing it down.

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ABBREVIATIONS (IN ALPHABETICAL ORDER)

4TU	Federation of four Dutch universities of technology (Delft, Eindhoven, Wageningen, Twente)
AECT	Association for Educational Communications and Technology
AERA	American Educational Research Association
AHA	American Heart Association
AI	Artificial intelligence
AISSR	Amsterdam Institute for Social Science Research (at UvA)
BDSI	Behavioural Data Science Incubator (at BMS)
BMS	Faculty of Behavioural, Management, and Social Sciences
CCVSD	Care Centred Value Sensitive Design
CCC	Complex Chronic Condition
CEO	Chief Executive Officer
CHOIR	Centre for Healthcare Operations Improvement and Research (at UT)
CTIT	Institute for ICT Research in Context (former UT)
CUNY	City University of New York
CWTS	Centre for Science and Technology Studies (at Leiden University)
DANS	Data Archiving and Networked Services- National archiving centre and repository for research data
DCC	Digital Competence Centre
DORA	Declaration on Research Assessment
DINALOG	Dutch Institute of Advanced Logistics
DSI	Digital Society Institute (at UT)
eGoBIT	Governance of Blockchain-based Infrastructure Transitions on Energy markets (project)
EAPL	European Association of Psychology and Law
EB	Executive Board
ECTS	European Credit Transfer and Accumulation System
ECIU	European Consortium of Innovative Universities
EEG	Electroencephalography
EEMCS	Faculty of Electrical Engineering, Mathematics and Computer Science (at UT)
EPOS	Experimental Psychological Graduate Research School
ESHPM	Erasmus School of Health Policy and Management (at EUR)
ERC	European Research Council
ET	Faculty of Engineering Technology (at UT)
EUR	Erasmus University Rotterdam
FB	Faculty Board
FC	Faculty Council
FTE	Full-time Equivalent
FWCI	Field-Weighted Citation Impact
GP	General Practitioners
H2020	Horizon 2020 (EU funding scheme)

ABBREVIATIONS (IN ALPHABETICAL ORDER)	
HBE	High-tech Business and Entrepreneurship (BMS Department)
HIB	Technology, Human and Institutional Behaviour (BMS Department)
ICO	Interuniversity Centre for Educational Sciences
IGS	Institute for Innovation and Governance Studies (former UT)
ING Bank	International Dutch Group Bank
INRA	National Institute of Agronomic Research
IOPS	Interuniversity Graduate School of Psychometrics and Sociometrics
ITC	Faculty of Geo-Information Science and Earth Observation (at UT)
KLI	Kurt Lewin Institute -interuniversity graduate school on social psychology and its applications
KLM	Royal Dutch Airlines
KNAW	Royal Netherlands Academy of Arts and Sciences
KPI	Key Performance Indicator
KU Leuven	Catholic University Leuven
LDT	Learning, Data analytics and Technology (BMS Department)
MESA+	Institute for Nanotechnology (at UT)
MIRA	Institute for Biomedical Technology and Technical Medicine (former UT)
MOOCS	Massive Open Online Courses
MSc	Master of Science
NGO	Non-Governmental Organisation
NIG	Netherlands Institute of Government – interuniversity research school for public administration and political science
NWA	Dutch Science Agenda (with NWO)
NWO	Dutch Research Council
OA	Open Access
OCW	Ministry of Education, Culture and Science
OS	Open Science
OSCT	Open Science Community Twente
PHIL	Philosophy (section within BMS department TPS)
UMC	University Medical Centre
RDM	Research Data Management
RIS	Research Information System
RUC	Roskilde University
RUG	University of Groningen
RUN-ISIS	Radboud University Nijmegen Institute for Science in Society
RWTH	RWTH Aachen University
S&T	Faculty of Science and Technology (at UT)
SBD	Strategic Business Development (at UT)
SEP	Strategy Evaluation Protocol
SERENE	Sustainable and Integrated Energy Systems in Local Communities (project)

ABBREVIATIONS (IN ALPHABETICAL ORDER)	
SIDN fund	A fund for projects that make the internet stronger or innovatively use the internet to foster societal debate
SIG	Special interest groups
SSH	Social Sciences and Humanities
STE	Socio-technical-ecological
STEPS	Science, Technology, and Policy Studies (research section within BMS department TPS)
STIS	Science, Technology, and Innovation Studies
STS	Science and Technology Studies
SUSTENANCE	Sustainable Energy System for Achieving Novel Carbon Neutral Energy Communities (project)
SWOT	Strengths, weaknesses, opportunities, and threats
T4P	Tech4People- BMS programme to foster cross-disciplinary collaboration, especially with technology
T&SP	Training and supervision plan
TechMed	Technical Medical Centre (at UT)
TEFCE	Towards a European Framework for Community Engagement of Higher Education
TD	Talent development
TGS	Twente Graduate School
TNW	Faculty of Science and Technology (at UT)
TPS	Technology, Policy and Society (BMS Department)
TU Munich	Technical University Munich
TUE	Eindhoven University of Technology
TUCCR	Twente University Centre for Cybersecurity Research
UC	University Commission
UFO	University job classification system
UM FASOS	University of Maastricht Faculty of Arts & Social Sciences
UM FHML	University of Maastricht Faculty of Health, Medicine & Life Sciences
UM WIJSB	University of Maastricht Department of Philosophy
UMC	University Medical Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisations
UT	University of Twente
UT-VU	University of Twente - VU Amsterdam
UVA	University of Amsterdam
UU	Utrecht University
VSNU	Association of research universities in the Netherlands
VU	VU Amsterdam
WP	Scientific Staff
WTMC	Graduate School of Science, Technology, and Modern Culture
WUR	Wageningen University
WWU Münster	Münster University
ZonMw	Netherlands Organisation for Health Research and Development

CHAPTER 1
INTRODUCTION

Real-world problems demand cross-disciplinary thinking and solutions, and our joint mission is to help to investigate and solve them. As the outcome of a merger of the Faculty of Behavioural Sciences and the Faculty of Management and Administration in 2014, the BMS Faculty at the University of Twente (UT)[1] forms a unique blend of behavioural, management and social scientists. Our disciplinary roots range from psychology to industrial engineering, health sciences, communication science, philosophy, business and public administration, learning sciences, and science and technology studies (STS). These roots are complemented with knowledge from other disciplines such as computer science, mathematics, history, and medicine. As such, we are a diverse and relatively large social sciences faculty[2]. This provides us with a unique position within a technical university. Technology is all around us. It forms a natural basis for inspiration and makes our colleagues from the technology faculties likely sparring partners for our work. This closely aligns with the long-term high-tech human touch approach of the UT and was recently strengthened by UT's newly developed vision, mission, and strategy: Shaping2030. Shaping2030 has a crystal-clear ambition: to be(come) the ultimate people-first University of Technology aimed at the maximum impact on people, society, and connections through the sustainable utilisation of science and technology.

During the years 2015-2020, BMS underwent and completed a repositioning process aimed at strengthening its research focus and societal impact. This repositioning process entailed a strategic set of actions, choosing a focused set of interconnected research themes as well as significant changes in terms of institutional structure and organising principles. We also realised an increase in research support facilities, with a faculty-wide, state-of-the-art, and technology-fuelled lab - our BMS Lab - as a highlight.

Given our societal driven and challenge-based ambition, the main challenge was to establish a clear and robust relationship between behavioural, management, and social sciences on the one hand and technology on the other. To integrate technology in our work, we foster different types of connections with techno--logy, ranging from technology as the object of study, focusing on its adoption, implementation, and societal impacts, to the use of technology as a tool for doing research or developing interventions. Based on these different types of connections and respecting the need to address grand societal and engineering challenges, we formed four cross-disciplinary departments, with **five shared** cross-disciplinary[3] and **interconnected research themes** among them. These research themes are: Emerging Technologies & Society, Smart Industry, Resilience, Health, and Learning. See Figure 1 for a visualisation of the organisational structure of our faculty.

We are a faculty whose focus on technology, societal embedding, and problem-solving orientation enables researchers to advance scholarship within and across their own disciplines. We do this together with fellow researchers working at other UT faculties and in active engagement with the regional, national, and international (academic) arena. The outcomes of the above-mentioned repositioning process allowed us to set the agenda for the future as an internationally leading research centre at the intersection of behavioural, management, and social sciences and technology.

1 Established in 1961, the UT is an international midsize campus university located in the Eastern part of the Netherlands (number of students at the UT varies between 10.000 (year 15/16) and 14.000 (year 20/21); the BMS Faculty has grown from about 3.700 students in the academic year 15/16 to almost 4.300 students in year 20/21.
2 Throughout this report, and for parsimony reasons, we will use the term social sciences in a broad sense, referring to the breadth of our cross-disciplinary orientation.
3 We use the terms cross-disciplinarity as an overarching term indicating cooperation between different disciplines or scientific fields including both multidisciplinary and interdisciplinary cooperation. Although theoretically the latter two can be differentiated, in practice they often blend and fluctuate over time.

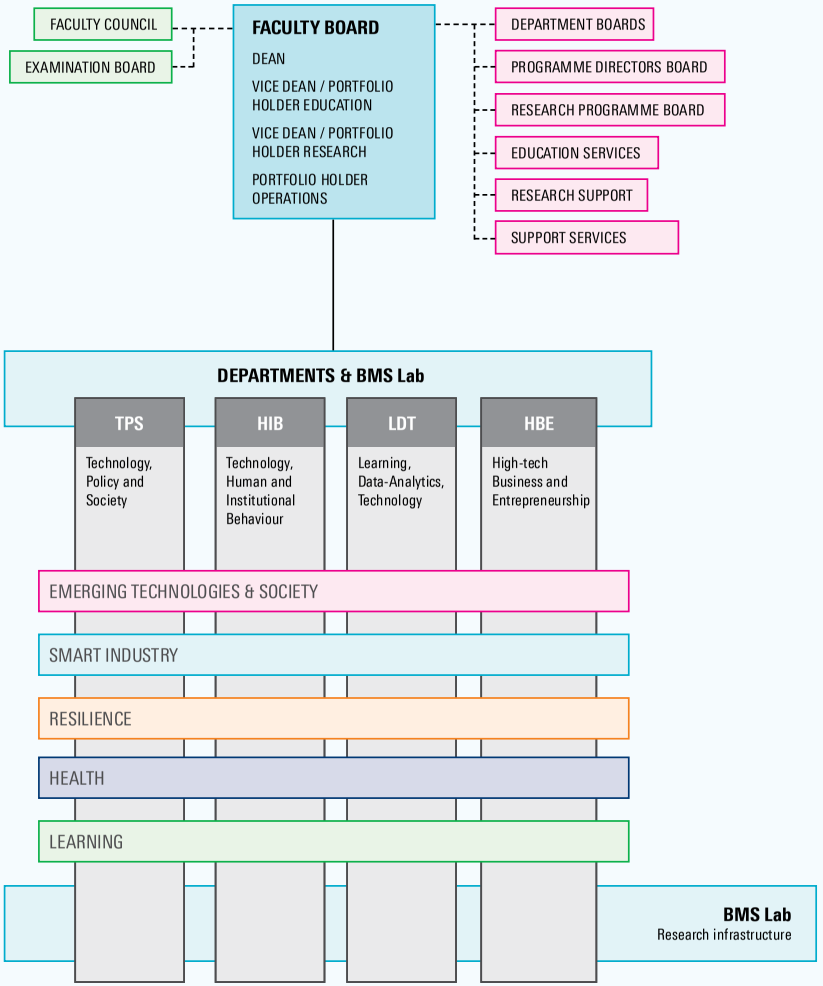


Figure 1. Organisational structure of BMS

The present report reflects upon our challenges and achievements in the past period and outlines our ambitions for the future. In Chapter 2 we describe our mission, vision, and strategy of the past six years including aspects of PhD policy and training, open science (OS), academic culture, and human resource (HR) policy. Chapter 3 provides the basis for our mission and strategy realisation: our governance structure, staff, including PhD candidates, and our funding sources. In Chapter 4 we highlight our main accomplishments in the past six years, with specific attention towards our main aim of firmly connecting the behavioural, management, and social sciences with technology. Throughout, we highlight both case studies (in blue boxes) and points of attention (in green boxes). The final Chapter 5 sketches the contours of our strategic plans for the next six years.

CHAPTER 2

MISSION, VISION, AND STRATEGY

Our research mission is to create a positive societal impact in a technology-driven society in which new technologies arise and develop at great pace and a large scale. We do this by studying the interaction between technology systems and human and institutional behaviour, and by utilising the increasing amounts of heterogeneous data generated by these interactions with the very same technology. Our impact endeavours aim at addressing (grand) societal challenges promoting health (management), safety and security, (life-long) learning, accountable and sustainable governance for business and public management, and societal technology-infused transformations. In the process, we aim to innovate research in the social sciences itself by challenging the social sciences to co-develop and use novel types of technological methods and interventions. From developing digital forms of nature and logistical solutions to tackling the workload in the legal system, to critically assessing the ethical challenges of human enhancement technologies, and to create technologies that modernise the social sciences and social science research themselves.

To accomplish this, and in line with the UT's profile as a technology-oriented institution of research and learning, our strategy has three foundations:

Foundation 1. Cross-disciplinary collaboration connecting social sciences and technology. We aspire to make connections not only in the traditional sense by examining the development, implications, and adoption of new technology, but also by using technology as a research method or as the basis for an intervention, and by approaching technology as a challenge to concepts, theories, and frameworks in the social sciences. Incorporating engineering and design sciences, we depict humans and societal actors as (co-)creators of technological advancement.

Foundation 2. Combining a global and local orientation. We seek to contribute to science and society in an international context. We foster international collaboration with other universities and institutions. At the same time, our work with societal partners also requires solutions tailored to local and regional contexts. In far-away and sometimes isolated areas, but certainly also in our own local Twente ecosystem within the European cross border region of the eastern Netherlands (EUREGIO).

Foundation 3. Entrepreneurship and innovation. This has always been deeply rooted in the DNA of the UT and our faculty. We consider engineering to be an attitude. Design thinking is our asset. Maintaining this leadership is of strategic importance. We actively stimulate corporate, social, and public entrepreneurship and tech-based business transformations, and support our staff to engage with practice.

THE PAST SIX YEARS

WHERE DID WE COME FROM? | In 2015, the merger faculty existed of close to thirty small research groups, nick-named 'the colony'. Each of those groups primarily worked with their direct disciplinary colleagues and had a strong orientation towards publishing in monodisciplinary journals. Furthermore, there was little cooperation between the two former faculties and with researchers from other faculties. Altogether, BMS was rather fragmented and relatively inward-looking.

In terms of research orientation, the BMS profile had become much too 'mainstream', losing the competition with social sciences faculties at non-technical universities, which offered comparable but often much larger research programmes. At the same time, BMS did not make use of its unique positioning within a technical university. Furthermore, instead of participating in a cross-disciplinary faculty review such as the current one, we participated in twelve different disciplinary research reviews, with strategic research funding and support placed in four different UT-wide institutes. Of these, the Institute for Innovation and Governance Studies (IGS) - the most obvious one for BMS researchers - contained eight different research spearheads. In short: we lacked a unique and coherent research programme.

Therefore, we needed to rediscover our niche. This niche is our connection to technology. By introducing different ways of connecting social sciences and technology, we started a change

process in which researchers were explicitly invited to position their research in relation to technology and the technological sciences. As such, the question for researchers was no longer "whether" they connect to technology but "how". Following many formal and informal discussions across the faculty, this change process was landmarked by a strategic document **BMS under STEαM**[4] (2016). With this policy brief, we introduced the current strategic profile of BMS and provided a vision to modernise the organisation and governance of the faculty to build a more efficient and flexible unit, subsequently developed over the next few years. This entailed the build-up of the four large cross-disciplinary departments (TPS, HIB, HBE and LDT), organised around their relationship with technology, and with an adequately fitting support staff on its side (see Figure 2). An important part of the change process formed a sequence of initiatives to facilitate and reinforce the emergence and development of the new strategic direction. The initiatives were adjusted and accelerated in response to a self-initiated midterm review (2018), focusing on the change process BMS was undergoing, emphasising possible improvements.

MIDTERM REVIEW | The committee highlighted the vitality amongst staff at different levels within BMS and the widespread internalisation of the new strategy. It concluded that "Capacity building and talent building of individuals are seen as essential and young motivated researchers are provided with opportunities. The atmosphere is one of collaboration more than of competition between individuals." Points of concern and opportunities for improvement were: (further) enabling PhDs to be a force for change within the faculty, more transparency and standardisation of PhD policies, strengthening the position of the theme chairs, and the high teaching load. Also, research integrity policies were considered appropriate but seemed to mainly exist on paper.

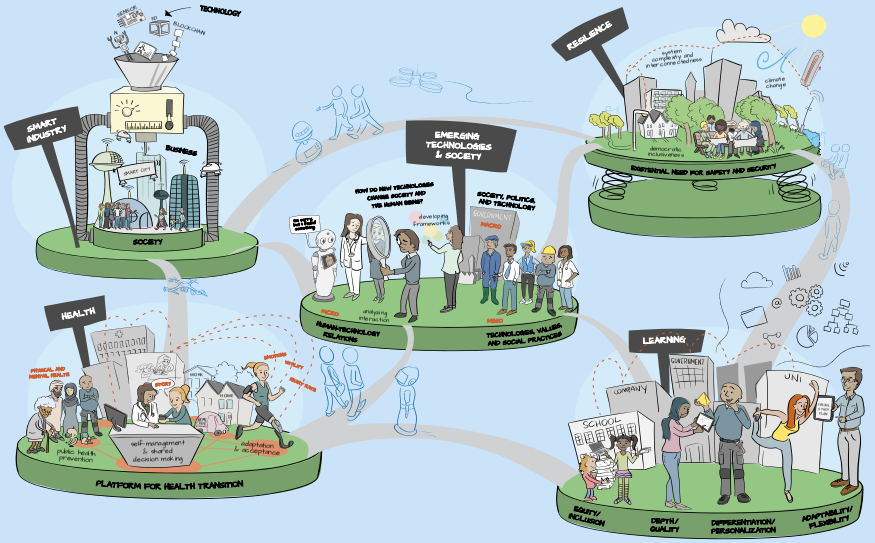
BMS STRATEGY: 2015-2020

Below, we provide more detail on each of the strategic initiatives throughout 2015-2020. First, we discuss those that primarily focused on strengthening the BMS research profile to encourage the cross-disciplinary nature and technological embeddedness of our work. This is followed by initiatives to further strengthen our people and community, focusing on creating a collaborative and responsible culture, HR policies, PhD policies and training, and our connection to society. In each of these sections, we mark those initiatives or adaptations that happened in response to the midterm review. We discuss the strategic initiatives per topic and provide a chronological overview of all strategic initiatives in Figure 7.

SHAPING OUR RESEARCH PROFILE

FOCUS ON FIVE CROSS-DISCIPLINARY RESEARCH THEMES |

As part of the repositioning process, we developed five key focal research themes for the period 2015-2025. These themes connect our strongholds, can count on sufficient critical mass within the faculty, are in alignment with the broader UT agenda, and – shaping the external orientation of our activities – clearly resonate with grand societal challenges. See Appendix A for a more extensive description of the themes, their thematic focus areas with an eye to the future, and their broader embedding within UT and beyond.



Smart industry: smart manufacturing and business models for the circular economy in the 4th industrial revolution
Resilience: smart cities, sustainable communities, and safe societies
Learning: 21st-century skills, educational technology, and the future of learning
Health: person-centred health technology, health care systems and the transformation of healthcare
Emerging Technology & Society: interplay of new technologies and societal transformations

Figure 3. Five cross-disciplinary research themes of BMS

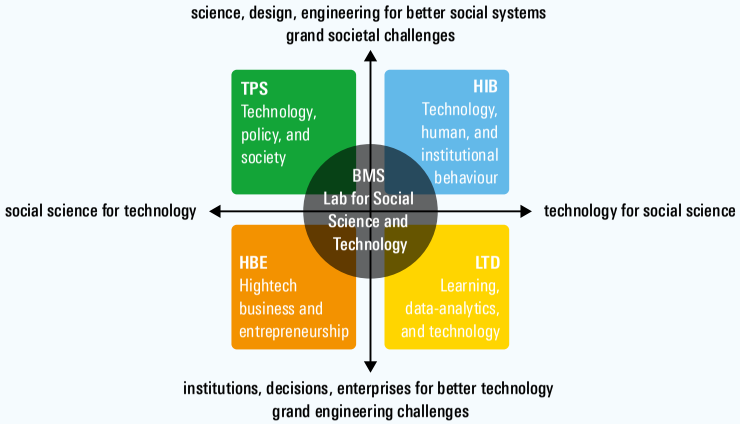


Figure 2. Positioning BMS at the crossroads of social science and technology

The themes have natural and potentially mutually reinforcing overlap in terms of content, such as health interventions fostering patient resilience, optimising system operations in hospitals aiding patient recovery times, and learning skills aiding discussing moral values vis-à-vis disruptive technologies. We conduct research with an eye to cross-cutting perspectives. For example, one focus area within the resilience theme concentrates on technological interventions that are beneficial to dealing with calamities on a community level (e.g., neighbourhood WhatsApp groups) as well as the individual level (e.g., eHealth interventions). Another focus area taps into potential drawbacks of new technology, such as the digital divide, preventing equal access to and participation in business, health, or educational settings. The themes also have a shared approach regarding innovative methodology, data-analytics, and data science as well as the use of new technology as a research tool. All themes share the multi-scaled domain challenges (of complex systems) triggered by modern technology, interconnecting the micro-, meso- and macro-level.

Next to their position in one of the departments, our researchers connect to one or more of these themes. Every theme group functions as a vibrant community in which our researchers can connect, learn, and develop their research ideas and practices. For each theme, a designated chairperson with a programme team is in place. Together, they serve as an accelerating force oriented towards community network building via an online theme knowledge-sharing platform (in Teams), and by organising workshops and joint writing sessions, as well as stakeholder initiatives, such as the Risk & Resilience festival (see below). Together with their programme teams, the chairs coordinate, connect, and captain integrated and interconnected research programmes vis-a-vis strategic research funding opportunities. An important aspect within the themes is not only to promote cross-disciplinary collaboration, but also to identify and facilitate structural partnerships within UT, with other research institutions, and with relevant societal partners.

4 STEαM stands for the close relationships between Science, Technology, Engineering, Arts (Humanities & Design) and Mathematical disciplines.

IDEAS AND COLLABORATION GENERATOR: RISK & RESILIENCE FESTIVAL

Annually, this festival includes over 700 (inter)national visitors from industry, governmental agencies, and universities. In line with the BMS impact ambition, the focus is on transcending disciplines and domains, focusing on human, organisational and societal levels. The sessions at the Risk & Resilience Festival are a mix of keynotes of renowned international scholars and parallel interactive meetings. Between the sessions, there is room for networking with students, UT alumni, experts, and representatives of businesses, government, and societal organisations. The Risk & Resilience Festival has been the start and stage of many initiatives, such as the collaboration agreement with the Dutch military. The activities and visibility of the festival were some of the main reasons that the academic leadership of the 4TU Centre for Resilience Engineering and its joint DeSIRE programme at its incubation resided with the University of Twente.

In response to the midterm, and after some shifts in chairpersons, we have strengthened the position of the research themes in several ways. First, they are playing a key role in internal review boards, such as for the Signature PhDs. More recently, we have doubled the time available for chairing to one day a week, primarily with the aim of more integrated and longer-term grant strategy development. Annually, we have also reserved an amount of €500k for them jointly, to support teams of researchers with extra time for grant writing purposes. Like the position of educational programme chairs, this allows them to leverage with department heads in identifying the most suitable staff members to contribute to such grant writing and theme development. We have also reserved €300k annually for creating ties between acquired grants and the wider research programmes during their term and upon completion. As of 2021, the theme chairs will be consulted for new academic positions with strategic relevance to a theme. A stronger organisational embedding also provides them with a better position to play a strategic role in building solid external partnerships.

LAUNCH OF TECH4PEOPLE PROGRAMME | The Tech4People (T4P) programme – initiated in 2015 – was dedicated to fostering innovative cross-disciplinary cooperation with a clear technology component. Investments were made along four lines:

1. PhD and **postdoc projects** stimulating researchers to work together in cross-disciplinary and pioneering projects;
2. an exchange programme for researchers for cross-disciplinary stays;
3. scholarships to invite internationally recognised leading scientists in the social sciences and technology field;
4. start-up investments in innovative research infrastructure.

The T4P programme was successfully run for two consecutive years: a total of 88 high-quality cross-disciplinary proposals were submitted in the first round and 66 in the second. In total 10 PhD projects, 10 postdoc positions, and over a dozen exchange proposals were awarded. Many proposals that did not make it to the final round generated so much enthusiasm that they were continued one way or another. Several of these matured into substantive proposals and attracted outside funding. See Appendix B for an overview of Tech4People projects.

In response to the midterm, another 10 'BMS Signature' PhD positions were strategically funded from internal BMS means to speed up the transition to a truly integrated social sciences & technology faculty. This allowed PhDs as a force for change towards closer links with technology and the five research themes. As we learned from the Tech4People PhD projects that it was quite difficult to find suitable candidates, the potential PhD candidate needed to be already designated and able to present the proposal for a review committee. Often, excellent master students that we educated ourselves were invited to actively participate in setting up the proposal. Of the 59 proposals submitted in the two rounds, 10 were granted (see Appendix C). A few others we found so promising that we gave them a bridging grant (temporary position) to be able to let the proposal mature in a larger proposal for external funding. Again, multiple initiatives were continued.

BIRTH OF THE BMS LAB (FORMERLY TECH4PEOPLE LAB) | As a large investment in innovative research infrastructure, the BMS Lab started in 2016 as a faculty-wide platform to catalyse outstanding technology-mediated and innovative research. Its mission is to infuse social sciences and technology. To this end, it provides over 500 m2 of high end-lab facilities, a plethora of innovative equipment to carry out research, software development capacity, lendable resources, and research platforms. One example is TIIM, an app-based software platform aimed at providing researchers with the capability to study participants long-term or repeatedly (e.g., Cohort, longitudinal or experience-sampling studies) and present them with (sets of) interventions. It provides a digital research infrastructure for master assignments, PhD studies, staff research, and contract research, and is used extensively throughout the faculty and beyond (via e.g., licenses used by hospitals, ministries). BMS Lab also offers computing capacity, secure data storage, and high-performance computing. BMS Lab has built up to eight FTE permanent staff and offers guest and flex appointments for a similar number of external researchers.

Following the midterm review, and as of 2019, BMS Lab also includes the **ExperiVan** (Figure 4), a mobile lab on wheels that enables field research with participants from the street and difficult to access participant groups (such as minorities or those of low socioeconomic status). It can also be used for public engagement purposes.
Strongly tied to the BMS Lab, the Behavioural Data Science Incubator (BDSI) was also launched in 2019, consisting of an interdepartmental team of frontrunners in data science. In 2020, the team was expanded with the appointment of three dedicated data scientists. The mission of the BDSI is to spark innovation and accelerate data-driven research by organising hackathons, journal clubs, brainstorm sessions, and workshops. Fostered by an extensive investment in computing power, BDSI supports everything from data collection (e.g., historical Twitter data on the coronavirus crisis) to a full-blown data science product (e.g., student projects on low-cost eye-trackers with a €2 endoscope camera). The team also joins grant writing initiatives.


Figure 4. The ExperiVan in action

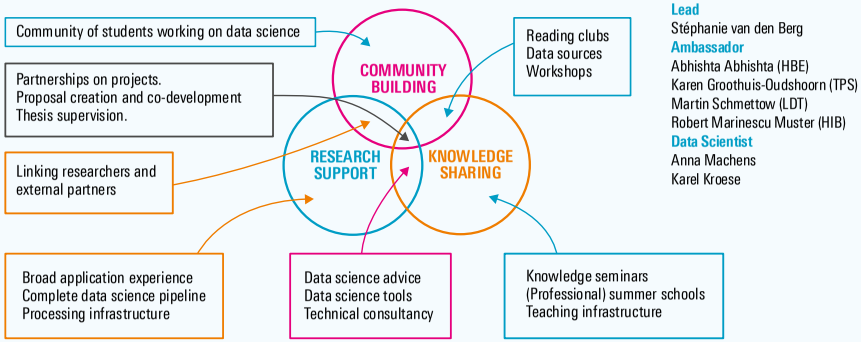


Figure 5. BDSI initiative

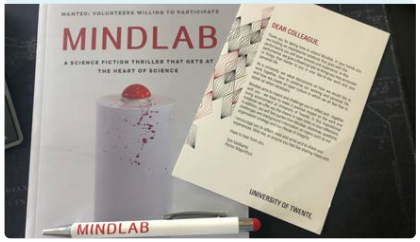
SHAPING OUR PEOPLE AND COMMUNITIES

ACADEMIC CULTURE | Our aim to foster a collaborative community is facilitated by the design of strategic rather than disciplinary departments as well as by overarching research themes. It is materialised by embracing the practice of cross-disciplinary research and stimulated with incentives like our Signature PhD projects and topical funds (e.g., our recent Covid-19 Fund). In addition, we commend colleagues who have shown a collaborative team and celebrate achievements with, for example, the Cooperation Award in the Dean's annual New Year's speech. Another spearhead focuses on knowledge transfer of champions – colleagues with high experience and success in acquiring research funding. We have organised several workshop sessions where such champions actively engage with the future generation, for example, during the BMS research conference in 2018. A next step in developing our collaborative approach is the introduction of Accelerator Grants to promote interdepartmental cooperation of particularly younger and recently arrived staff on new spearheads of BMS (such as health care systems).

We invest in responsible research by providing the infrastructure and helping to create and maintain the organisational prerequisites for professional and responsible research, from grant support, ethics, research data, and privacy, to data management and archiving. These initiatives feed into the UT's academic, social and corporate integrity, joined in UT's House of integrity. This integral integrity policy and framework was established in 2020 and conforms to the Netherlands Code of Conduct for Research Integrity. It includes scientific integrity education for all PhD candidates, mandatory ethical assessments for all BMS research, a data management policy, including guidance on safe storage and sharing of research data, registration of staff's ancillary activities, and investing in cultural game-changers, such as Active Bystander training programmes and the theatre production Mindlab.

MINDLAB: THEATRE AS A MIRROR FOR THE ACADEMIC COMMUNITY

Mindlab, a theatre performance about life in academia, was initiated by BMS as a non-conventional way to foster a healthy academic climate through reflections and conversations, empowering the academic community to take actions for improvement. It touches upon the "recognition and rewards" agenda formulated by Dutch research policy organisation such as NWO and VSNU, but also addresses topics such as integrity, social safety, and diversity and inclusion matters. Mindlab premiered in February 2020 and was performed about ten times for the UT both on-campus and online (after the coronavirus crisis broke out). As a sign of BMS valuing and stimulating the multiplicity of perspectives and identities in the workplace, the faculty leaders (e.g., FB, department heads) were present at the premiere of Mindlab. Afterwards, a website aired with testimonials of a variety of staff, including senior leaders, and an inspirational Mindlab notebook was distributed with a leaflet of our rector. Additionally, follow-up discussion sessions were spontaneously organised in several sections, and in coordination with central HR, two research and teaching groups piloted with a follow-up module to further stimulate engagement with openness, safety, and inclusivity. This pilot was positively evaluated and therefore will be broader implemented soon. Mindlab also sparked the attention and interest of the larger academic community, including the Minister of Education, Culture and Science (OCW) Ingrid van Engelshoven. Mindlab is now continuing its tour outside the UT with a first stop at Utrecht University this fall, leaving an increasingly aware UT community.



Although our BMS community is already quite diverse in terms of nationality, age and gender (see Chapter 3), efforts for more diversity and inclusion at higher staff levels, especially gender balance, are supported by the university-wide Hypatia programme (established to attract female full professors) and by the UT incentive fund for female mid-career staff. Both initiatives were embraced and supported by BMS. The BMS Faculty has committed itself to achieve a 50/50 ratio of male/female full professorships by 2025. This ambition is aided by a new round of the Hypatia programme in 2021-2022.

We also acknowledge the importance of dual careers and work-life balance, and therefore actively implement a spouse programme[5], assisting the life partners of new academic staff in finding employment at UT (in collaboration with other UT faculties) or in the region. Furthermore, one of the strenghts of BMS is that it offers junior staff (e.g., assistant professors) the possibility to develop themselves by fulfilling roles that are traditionally taken on by more senior staff, such as theme and departmental section chairs, but also as being part of the current report's writing team.

HR POLICIES | In response to the midterm, we also critically revised our HR policies. Specifically, the experience of high workload and developing new ways of talent development were addressed. In 2017, we had already ended the tenure track system due to its focus on quantitative box-ticking evaluations of individual performances. We renewed the Career Committee (an internal board advising the dean on internal promotions) with the main goal to allow diversity of career paths, to encourage boundaryless careers, and to support individuals' and teams' choices in their roads towards impact-driven research (and teaching). Our main principles of work are inspired by important new policy developments like DORA and Recognition & Rewards from VSNU, and the latest UFO criteria. The composition of the committee has been enlarged to include a diversity of academic functions at BMS, and new templates for self-assessment have been developed. These templates ask for narratives and qualitative critical self-reflection about the impact of academic work of an applicant along with six criteria: 1) impact-based teaching, 2) impact-based research, 3) academic citizenship behaviour, 4) teamwork & leadership, 5) personal and/or professional accomplishments, and 6) explicating one's goals for the future. In 2021-2022 these templates will make the basis for all career and talent development discussions and the development of supportive policies at BMS.

As the high workload is strongly related to our high teaching load, the faculty has dedicated part of the strategic research budget to match the allowance of the O&O component (research money allocated to the faculty based on the teaching amount) for all staff, which lowers their educational tasks by half a day per week. In addition, we are lobbying with the Executive Board (EB) to further increase the UT funding of teaching-related research time. This is also conducive to strengthening the connection between research and teaching, which we find of the utmost importance and will become a key focus in the further development and implementation of the UT's "new master vision" under Shaping2030. Finally, the reduction of workload is arguably aided by the transition to larger and more flexible organisational units, our new research support services unit and a newly developed (multi-annual) capacity planning and budgeting system. Capacity planning has already been gradually introduced over the past few years to create transparency and to aid conversations with staff about a fitting work package and a reasonable and fair distribution in (relative) workloads.

5 This is for example done in collaboration with the Expat Center East-Netherlands who now also offer Dual Career Service (inspired by the successful collaboration with UT on this aspect).

The development of individual researchers is supported by the UT's Centre for Training & Development, and an increasing research support team. With the assistance of our own BMS grants advisor and a dedicated officer at the UT's Strategic Business Development (SBD) division, we have been investing in tailormade advice for individual researchers, based on maximum fitting grant schemes. For eligible staff who aspire to join talent schemes (such as NWO), a support structure and procedures are in place. The departments play an important role in identifying and supporting talent targeted towards realistic goals. All too often in the past, staff members were aiming for grants out of their league or not fitting with their profile, resulting in wasted resources and time, and – even more important - frustrating experiences for the individual researchers.

The UT has an active mentoring system that staff can subscribe to, and regularly individual mentoring trajectories are arranged for in cooperation with the departments. The recruitment and hiring of new potentially tenured faculty members are also delegated largely to the departments. This talent-based approach complements the challenge-based approach which characterises the UT way of working in teaching and research development, while in return our reforms influence the Shaping2030 elaboration of HR across the UT.

PHD POLICY AND TRAINING | We place high value on educating and guiding the next academic generation in general; PhDs are the backbone of our research programme. The UT's Doctorate Board is responsible for the doctorate programmes but has granted a mandate to the Twente Graduate School (TGS) for its duties and powers in the doctorate programmes. The mission of TGS is to train and educate excellent researchers to present and promote excellent research via clustered or separate doctoral programmes. TGS registers and monitors all doctoral students and coordinates the doctorate education. Since 2014, and with the introduction of a PhD Charter, the PhD process is dedicated to quality assurance, comprising elements such as registration, selection, admission, terms of agreement, assessment/ evaluation, defence, cum laude, integrity, IP, objections, complaints, and disputes. Key elements are:

- A TGS approved Training and Supervision Plan (T&SP) at the start of the PhD trajectory. It includes supervision agreements and the planning of an individual educational programme of 30 ECTS (equivalent to six months of full-time education).
- A Qualifier Exam. This go/no-go moment takes place in the second half of the first year (with the option of a 3-month improvement period) and serves to evaluate whether the candidate can be expected to finish the PhD in time. The qualifier committee includes at least one independent senior researcher.
- Progress monitoring. Each year the PhD candidate and supervisor assess progress in an annual interview.
- Admittance to the PhD defence if the training programme is completed and the thesis meets the PhD programme requirements. The PhD thesis is evaluated by an independent committee consisting of 4-6 members where each committee member independently completes an assessment form. At least two full professors in the committee need to be from an external academic institution.
- The UT policy is accompanied by an electronic PhD monitoring system (Hora Finita).

The educational programme for PhD candidates consists of in-depth subject-specific courses, academic skills, and career orientation, in roughly equal shares, to be determined by the thesis supervisors and the doctoral candidate. Certain courses, such as on research integrity and data management, are mandatory for each PhD candidate. The purpose of the activities is to support the doctoral programme and to help the doctoral candidate to obtain the exit qualifications. ECTS can also be obtained by taking courses as offered by the UT Centre for Training & Development or by e.g., attending national and international conferences and summer schools, and participating in activities of national research schools.

In the past years, we have strengthened our links with national research schools in several respects. Next to participating in (boards of) other research schools previously accredited by the KNAW (e.g., EPOS, ICO, IOPS, NIG, and KLI), and after successful transference of the NIG presidency to Utrecht University in 2019, we have attained the leadership of the WTMC national research school in 2018 (see Attachment). WTMC has been a long-standing international prestigious and leading school in STS studies. The national research schools provide PhD candidates with a platform for courses, but also for building an academic social network.

EMPOWERING THE PHD COMMUNITY: GIVING VOICE TO NEEDS & IDEAS

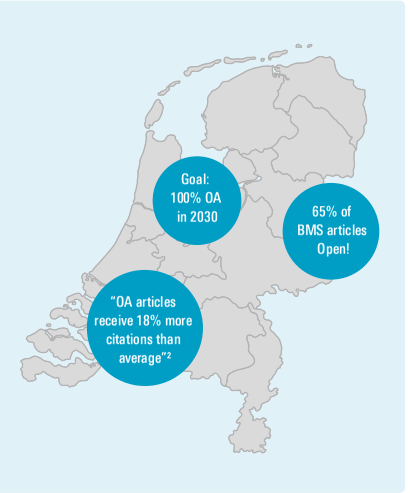
The BMS PhDs for PhDs network was established to expand and deepen the network among PhD candidates of BMS and to foster reciprocal relationships with the FB. The aim is that BMS PhD candidates feel more connected to each other, feel that their needs and concerns are being heard, which in turn supports the development of PhD policy-making that targets their needs. A PhD Portal was set up to facilitate information flows, providing comprehensive information about a variety of aspects of the PhD trajectory, such as PhD training and support services and serving as a low-key point of contact.
With financial support of the faculty, various workshops and social gatherings were organised in the past years. This included, for instance, a workshop in collaboration with 3310 School for Millennials during which PhDs could reflect on their career and life decision-making. Workshops and social gatherings continued throughout the recent pandemic-related lockdowns, tailored to what PhD candidates needed in these challenging times. A hybrid training on productivity hacks and an online escape room event to stimulate social interactions are two of those need--driven events. The BMS PhD for PhD community is also linked to the broader UT PhD community PNUT.

Following the midterm, and to further involve the PhD community and optimise the PhD experience, the BMS network of representatives BMS PhDs for PhDs has been formalised and meets about five times a year with the vice-dean of research and the BMS research support office. Additionally, newly attracted PhDs receive extra attention and support from the faculty and their departments to better deal with the cross-disciplinary and innovative nature of their projects. For example, they received larger financial budgets covering expenses such as software development and dedicated support from BMS Lab. Also, smaller PhD community learning groups have been formed within and across departments.
Jointly with and coordinated by the BMS PhD network, we have distributed a survey among PhDs twice in the past years (in 2018 and 2020) to monitor their experiences with -for example- TGS courses, their curriculum wishes, and wellbeing issues (also following the coronavirus crisis).

CONNECTING WITH SOCIETY

Establishing a research culture that fosters openness, transparency, and societal engagement has been an important goal of our faculty. It increases public accountability and (potentially) societal trust, and it arguably sparks innovation. Embracing the transition towards Open Science (OS), the UT support is organised in a Digital Competence Centre (DCC), with e.g., monthly thematic sessions on FAIR data and research support facilities. The UT offers the UT journal browser (national agreements for 100% OA), additional tailormade agreements, support on Taverne Amendment and author versions in UT's Research Information System (RIS).

Early 2020, BMS distributed an OS survey amongst staff. The outcomes showed that OS was generally embraced, with three types of reasons for not adopting OS principles: financial obstacles, lack of knowledge, and – sometimes – motivational reasons. In response, our faculty has taken diverse additional measures for stimulating and helping researchers with open research, data storage and publishing. We bring OS opportunities actively to researchers' attention (e.g., through Open Research Data Grants), we have installed our BMS **Open Access Fund**[6] in 2019, and BMS has visibly positioned two information specialists and a data steward as part of BMS research support. They support researchers with data paragraphs for grants, Research Data Management (RDM) plans, preregistration, and archiving data. We also closely monitor and communicate (the importance of) OS publications to our staff, and yearly celebrate the best-performing groups with a tailormade cake.



BMS sections with the most Open Access peer-reviewed journal articles[1]	%	#
Cognitive Psychology and Ergonomics (CPE)	94	15
Philosophy (WIJSB)	83	20
Human Resource Management (HRM)	80	4
Psychology, Health & Technology (PGT)	76	57
Communication Science (CS)	73	24
Department of Governance and Technology for Sustainability (CSTM)	73	24

Try out the Journal Browser library.wur.nl/WebQuery/utbrowser to find the scientific journals in your field in which you can publish Open Access for free or at a discount as a corresponding UT author. Check out utwente.nl/openaccess for more information!

1 Data from Pure Research Information 2018
2 doi:10.7717/peerj.4375

Figure 6. Example sheet of celebrating Open Access successes (INT'L Open access week 2019)

6 This fund mounted up from €30k to €100k annually, following increasing requests.

We consider Citizen Science an important aspect of OS principles of inclusion by bringing the public to the forefront of research design and initiation. Supporting our pivot toward Citizen Science is the DesignLab, a UT-wide initiative to foster transdisciplinary research by facilitating collaborations between academics and external partners. We are structurally involved in the DesignLab by a BMS professor as co-director and ten research fellows from the different cross-disciplinary BMS research themes. Furthermore, about 10 BMS researchers are central partners in TopFit Citizenlab, an initiative facilitating Citizen Science in health involving the University of Twente, Saxion University of Applied Sciences, and many regional health organisations.

STRUCTURAL FRAMEWORKS FOR COOPERATION | In the past years, we have invested in setting up and formalising structural and collaboration arrangements, particularly with partners from practice. This is important for at least two reasons. First, it is in line with our vision on valorisation, a two-way process of iterative cycles where research and practice are co-designed in networks of researchers and social partners, from early technology assessment to implementation policies. This partnering implies a much broader approach than the translation of research outcomes to practice or doing research where questions from practice are answered by research. Next to co-designing research and practice, valorisation also allows for a more central position of the process of doing research. This accelerates innovation and scientific discovery.

Second, as important issues are already conferred and settled, for example, practicalities about data access, confidentiality issues, and project governance, setting up such frameworks aid smooth, efficient cooperation. New project opportunities can be easily incorporated in the overarching frameworks and need not to be negotiated separately, thus saving time and using momentum. Especially for PhD projects, taking part in projects under the umbrella of structural partnerships arguably benefits the progress and the quality of the PhD project, and thus is more likely to result in a positive PhD experience. As it is also less fragmented and less opportunistically driven, successful projects are likely to intensify collaborations and facilitate follow-up projects.

INTERNATIONALISATION | Next to collaboration with practice, we also work in academic research alliances, aligned by our research orientation, and based on carefully crafted joint agreements. Within our EUREGIO there is a long-lasting academic partnership with WWU Münster. Regarding our faculty, such partnerships focus on public administration and -more recently- business administration. Since 2017, joint projects and endeavours are stimulated and financially supported with the WWU-UT Strategic Collaboration Grant scheme. Within the Netherlands, and since 2020, there is a structural university-level collaboration with the Free University Amsterdam (VU) on all research themes. With the BMS Faculty in the lead, a joint resilience programme Creating secure societies: Resilience in action was developed. Within Europe, we closely work with like-minded universities in the European Consortium of Innovative Universities (ECIU). This is reflected in e.g., close collaboration between BMS Lab and comparable, complementary labs such as at the University of Stavanger (Norway) and TEC de Monterrey (Mexico). At the faculty level, we have invested in close collaboration with niversities enriching our profile, such as with the University of Waterloo (Canada) in the domain of health, and with the University of Oulu (Finland) in the domains of Learning and Health. All initiatives comprise PhD and staff exchanges, expert visits, and joint grant acquisition efforts.

Generally, we actively promote an international outlook for all staff and several staff members hold combined positions at other universities, for example, at the University of Technology Sydney (Australia), Aalborg University (Denmark), Adam Mickiewicz University (Poland), and Northwestern University (USA). Staff of the faculty have furthermore taken leadership roles as board members of international scientific organisations and the editorial boards of international journals, typically emphasising our technology connection.

UT-WIDE DEVELOPMENTS

Repositioning the BMS Faculty was helped by UT2020, the UT-wide reform, effectuated in 2018, transferring the responsibility for research planning and funding to the faculties. Internal research budgets were no longer allocated by UT's four research institutes (IGS, MESA+, MIRA, CTIT), but were relocated to the faculties to foster the development of integrated and sustainable research programmes. It allowed for better coherence between research and educational programmes. It also secured strategic research investments and the building up of our own research support office. This included coordination of nominations for prizes, as well as the use of the research information system PURE to increase the visibility of researchers and to support management in reporting on products and activities of staff.

The UT has entered the new decade with an ambitious new vision, mission, and strategy: Shaping2030. As 'the ultimate people-first university of technology' we are rapidly expanding on our High Tech, Human Touch philosophy and the unique role it potentially affords us in society. Building on our rich legacy in merging technical and social sciences, the UT-wide focus is on five distinguishing research domains: improving healthcare by personalised technologies, creating intelligent manufacturing systems, engineering for a resilient world, shaping our world with smart materials, and engineering our digital society. BMS is also closely involved in emerging UT-wide research initiatives in energy and (cyber) security. These broader themes and initiatives are closely aligned with our BMS research themes (see Appendix A).

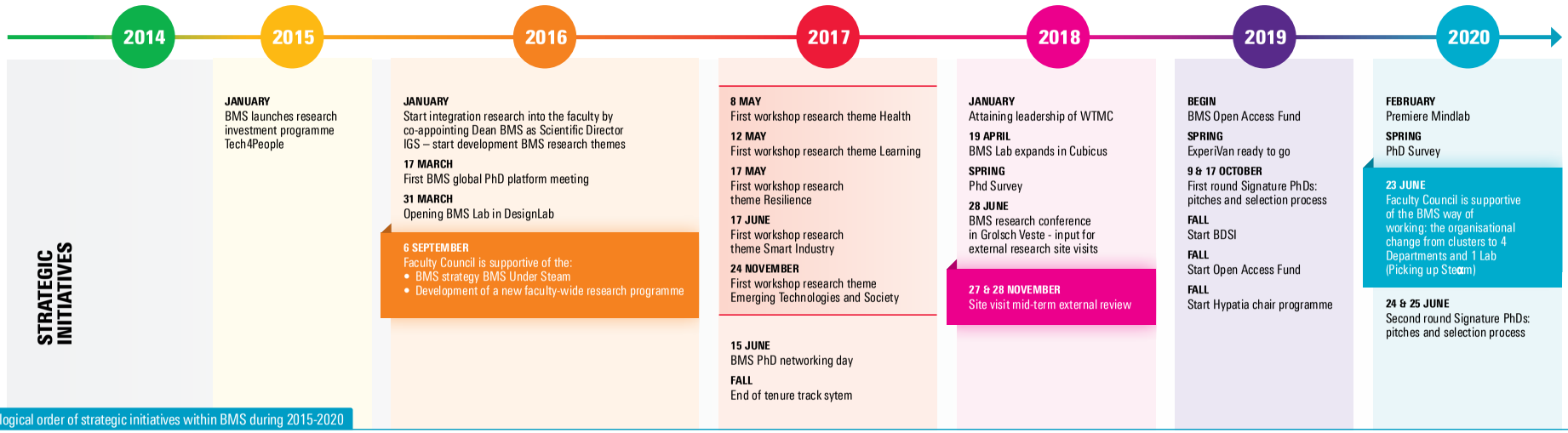


Figure 7. Chronological order of strategic initiatives within BMS during 2015-2020

CHAPTER 3
EVIDENCE

We accomplish our strategy and goals with a governance structure, staff (including PhD candidates), and funding. Our aim is two-fold: 1) a solid base, not necessarily growth in terms of numbers, and 2) advancing scientific breakthroughs and positive societal impact with our unique research profile.

GOVERNANCE

The Faculty BMS has a board with five members: the dean (Theo Toonen), vice-deans for research (Ellen Giebels), education (Ciano Aydin), and operations (Marion Kamp), as well as a student assessor (in the current review period: Fabian Klaster and Kevin Heerema). The Faculty Board (FB) is responsible for the management and governance of the faculty and meets weekly, joined by the support managers for research and teaching, the HR manager, and the controller. Every four weeks, the FB and support managers are joined by the department chairs. Four times a year the FB convenes with the department heads, theme chairs, and educational directors to discuss strategic issues. In addition, and depending on the agenda, guests are regularly invited. Each of the four departments has a management team with a department chair and secretary, who meet once a month. The five theme chairs each convene with their programme teams on a regularly basis (approx. every four weeks) and meet with each other and the vice-dean for research every six weeks. The Faculty Council (FC), representing both staff and students, provides advice to the FB on all matters relevant to the faculty and has the right of consent to key issues such as faculty regulations and proposals for new chairs. The FB and the FC convene every six weeks.

To align university and faculty governance, members of the FB have monthly meetings with their counterparts from the other faculties and the university's EB (representatives). The deans convene in a strategic council and the vice-deans in the university commissions (UC's) for research, education, and operations. At least twice a year, the EB and the FB jointly have a strategic session, guided by the annual plan of the faculty.

Via linking pins within the faculty, close and structural relationships are established with the three remaining, outward-looking institutes: MESA+, Techmed, and DSI. That is, BMS senior staff are part of steering boards of the three institutes and co-navigate the joint and integrated research directions (e.g., strategic investment programmes), and provide easy access to relevant expertise. Other BMS staff form part of dedicated project teams often tied to new UT strategic investment programmes, such as on energy (Mesa+) or robotics (DSI). For the UC for research, institute directors join in on an alternating basis.

STAFF

The research staff is divided into scientific staff (full, associate, and assistant professors), researchers (post-docs and junior researchers), and PhD candidates. The PhD candidates are further divided into internal candidates and external candidates. Appendix D presents the distribution per year. At the aggregate level, the research time of scientific staff constitutes on average 45% of their total hours. For researchers and PhD candidates, the actual research time is about 80%. At the level of individual academic staff members, allocated research time may vary across years and individuals, depending on programmatic and performance considerations (e.g., externally funded projects and/or the acquisition of PhD candidates). Increasingly, staff members can also enter personal career development paths emphasising research, teaching, and/or valorisation (under the new "recognition and rewards" policy).

In the period under review (2015-2020), research time is fulfilled by full, associate, and assistant professors in a ratio of about 1-1-2.5. Our research FTE's have been rather stable over the years 2015-2020, but there is a slight decrease in overall FTE in 2020 as compared to 2019, caused by the finishing of several large projects in 2020. This is expected to recover in the coming years as in 2020 grants equal to 67 FTE were secured and -recently - many new staff members were appointed.

Although we are actively engaged in working and steering groups of all UT institutes and our agenda--setting influence has improved over the past years, creating and maintaining a mutually rewarding and equal relationship with the technical faculties remains a challenge. This needs attention from both the FB and EB.

Linked to our people first orientation, we have been attracting about a dozen new full professorships with a good representation over the diverse domains and with a largely international background. Additionally, we have been able to recruit over 20 assistant professors at the department levels, with the specific profile and assignment to transcend disciplinary borders. This expansion in terms of personnel has also been made feasible because of our improved financial situation and better business management and control system, brought about by the implemented financial, organisational, and educational reforms.

The relatively stable total headcount in recent years conceals several fundamental changes in the profile of BMS staffing. Global interest in the BMS profile has led to many new people joining. This has also been accompanied by internal dynamics. For example, although support and momentum for the development path taken are largely present, we do notice that not everyone has adopted our new strategy and way of working. Therefore, we sometimes did not offer continued employment to colleagues who were excellent scholars but who had no affinity with technology[7]. At the same time, staff members were also leaving because they received very attractive offers from other institutions because of their unique and successful UT profile, showing that BMS is a good launching pad. Jointly, the exit and/or retirement of staff and fitting in of new staff members took extra efforts and adjustment from everyone involved, and this was arguably complicated by the coronavirus crisis.

DIVERSITY OF STAFF

The BMS staff is characterised by increasing diversity over the years and is now composed of 40 nationalities. 36.5% of the staff members come from abroad: 28% from the European economic region and 8.5% outside the European economic region. UT's long-standing focus on the internationalisation of education is now extended. In line with the new UT policy, BMS is increasingly aiming to explicitly develop research-focused internationalisation plans. As such, and via the BMS research themes, strategic international partnering will play a role in further extending the cross-disciplinary and transdisciplinary (i.e., extending to the collaboration with societal actors) focus of our research.

The average age of the scientific staff of the Faculty BMS is currently 41.8 years (48.8 for scientific staff and 33.8 for researchers and PhDs). The faculty is working on better-balanced teams of younger and senior staff members to stimulate cooperation, new ideas and innovation in general. Ideally, research teams have a pyramidic structure, which is not always the case right now. Some groups would benefit from an influx of young, enthusiastic researchers bringing in new perspectives, others could profit from more seniority and leadership. Our efforts for more balance within and across groups, tie in with HR policies in relation to succession. We historically have high numbers of female staff, with an increasing number of female assistant professors and full professors. The 2020 drop in the ratio of associate professors – which we expect to be temporary- can partly be explained by various associate professors being promoted to full professor in the past year.

A concern is the relatively high percentage of non-employed PhD candidates who lag in progress and are not firmly embedded. In these cases, minimal requirements for starting a PhD are not met, such as a solid research plan, sufficient resources, and an adequate supervision team. Initiated by our faculty and in cooperation with TGS, a university-wide policy document on this matter is currently discussed within the Doctorate board.

PHD CANDIDATES

Appendix E shows that since 2015, 280 PhD theses were completed, with an average of 45 per year. The year 2020 was an outlier with only 26 theses defended, which can be largely explained by postponed defences due to the coronavirus crisis. As a legacy of the past, the number of external or externally financed PhDs is stable, but also relatively high (around 55%). We are proud to have so many of these PhD candidates because we consider that a way to make an impact. At the same time, it comes with challenges: over 70% of terminated or unfinished PhD trajectories also concern external or externally financed PhDs. Furthermore, the high number of dropouts in 2013 can be explained by a policy shift and grand clean-up of PhD archives, instigated by the acting rector at the time. As of 2014, all PhD candidates had to be admitted to TGS to be eligible to defend their thesis.

As can be seen from Appendix F, a total of 13 theses were awarded a cum laude distinction (about 5%) in the period of review. Four of these were PhD candidates who were not employed by UT. Specifically, these are PhD candidates who are facilitated by their employer to do a PhD, which seems to be a more effective construction than external PhDs doing it in their own time. These PhDs are also more likely to be embedded in strategic partnerships, which is an important foundation of our faculty's strategy.

7 This does not mean that all research of our staff must have a technology component. In fact, we find it important to have room to support projects that do not entirely align with the technology aspect, but offer substantive challenges (e.g., thematically, cross-disciplinary, impact) and reflect distinctive individual and collective research profiles and passions.

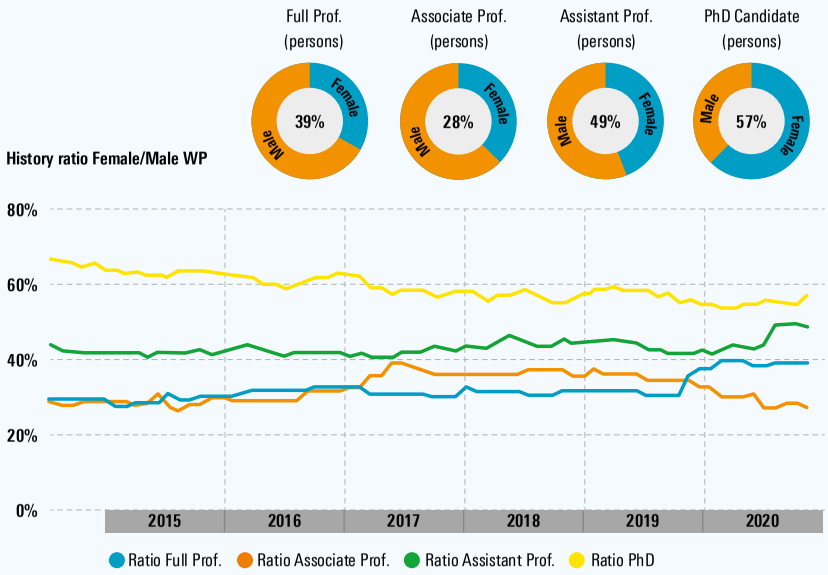


Figure 8. Historical trend in the ratio between female and male scientific staff

FUNDING

The BMS Faculty is financed through three sources of funding: (1) direct funding for teaching and research from the ministry of education (first flow; including PhD bonuses[8]), (2) research grants from national funding agencies (NWO, ZonMW, KNAW; second flow), and (3) contract research with (inter)national societal partners (also including Horizon 2020 and ERC grants, third flow). As can be seen from Appendix G, the total funding for both research and teaching in the period 2015-2020 has remained rather stable over the six years, with about 75% coming from direct funding and 25% from external funding. From the external funding, the largest part concerns contract research (about 20%), including ERC grants. Overall, the external funding is somewhat lower in 2020: this is arguably due to the relatively large number of projects finished in 2019/2020 and will recover in the coming year due to a recent grant acquisition starting in 2021.

Due to the coronavirus crisis and a hack at NWO, several grant schemes are delayed for 6 months or even longer. This not only leads to delayed funding income, but sometimes also creates issues for personal careers as career steps are often dependent upon grant acquisition and grant progress. We are aware of this issue and try to accommodate individual needs as much as possible.

Currently, our faculty benefits from a healthy financial situation. Due to educational improvement, the student influx is solid, providing the faculty with a secure financial base. In addition, the novel way of budgeting, in which more means are transferred directly to the research groups and the realisation of better contribution margins on running projects, complete this positive financial outlook.

8 A financial compensation after PhD graduation for time invested by the supervisor(s) (lump sum fees per university (type).

CHAPTER 4
ACCOMPLISHMENTS

For the BMS Faculty, scientific quality and societal relevance are closely related, as most of our research is conducted with recognition and appreciation for both generalization and application. The list of indicators chosen and presented in Figure 9 highlights 1) our profile connecting social sciences and technology, ranging from PhD projects to large grants, 2) our entrepreneurial, design orientation, and its reflection in media attention 3) our successful BMS community building, 4) our active and structural engagement with societal partners, and 5) our open science focus.

	Research quality	Relevance to society
Demonstrable products	(Open access) journal articles and reviews Technology infrastructure Designs	Guidelines for a professional readership Websites and serious games for practice
Demonstrable use of products	Use of software and facilities Citation of articles	Projects in cooperation with societal parties References in public domains
Demonstrable marks of recognition	Grants awarded to major collaborative research projects Research grants awarded to individuals	Financial and material support by society Membership of civil-society organisations Public prizes and exposure: (social) media attention

Figure 9: Chosen indicators

ACADEMIC PROFILE AND RECOGNITION

Our academic profile focusing on the relationship between social sciences and technology has had a significant boost from strategic initiatives such as the T4P programme, Signature PhDs, and BMS Lab. For example, when we look at the projects conducted with BMS Lab we notice a steady increase in projects overall, but particularly with the larger projects, we see an increase in cross-disciplinary projects and projects in collaboration with external stakeholders (see Appendix H). For example, in the PhD Signature project "Moments of connection" the work on digital natural environments, is connected to research on storytelling to enhance social engagement and connectedness for the elderly. This internally funded PhD project, executed jointly with two care organisations, led to the acquisition of an NWO grant for the Growing Roots: Connecting Elderly through Virtual Nature Spaces project, involving additional care organisations. Our aim to interact with technology is also reflected in intensified relationships with the technical faculties, such as participation in the NEDAP University with ET and with EECMS in the Twente University Centre for Cybersecurity Research (TUCCR).

Our distinct profile has not only led to recognition via prestigious government assignments, such as the national evaluation of the CoronaMelder app administered by the Minister of Health, Welfare and Sport, but also to the awarding of many prestigious grants, including several with BMS researchers as consortium leaders. This includes an NWO-gravitation grant (in 2019) and three succeeding European Commission (EC) Horizon2020 grants running from 2013 onwards.

NWO-GRAVITATION - ETHICS OF SOCIALLY DISRUPTIVE TECHNOLOGIES | Researchers in the field of ethics and philosophy of technology have acquired the largest collaborative grant funded by the Dutch Research Council (NWO) dedicated to a consortium of world-class researchers. This gravitation programme revises time-honoured key philosophical concepts such as autonomy, justice, and responsibility, as these are being challenged as a result of new technological developments. The revisions should lead to a new outlook and a firmer grasp on the significant effect technological advancements have on, for example, the fields of Artificial Intelligence (AI), synthetic biology and climate technology. In the coming ten years, almost €18Meuro will be dedicated to furthering the field of emerging technologies with the aid of a large group of PhD and postdoc researchers, staging the future generation of researchers in this field.

HORIZON2020 - GO-LAB, NEXT-LAB, AND GO-GA | The Go-Lab project and its successor Next-Lab showcase the appealing potential of the interplay between technology and learning at primary and secondary school. The projects resulted in a digital platform for inquiry learning in STEM (Science, Technology, Engineering, and Math), offering the largest number of virtual and remote labs in the world (already more than 900) free of charge. Global measures against the coronavirus crisis have caused the number of Go-Lab users to double in a short period surpassing 50.000 sessions each month. Testifying to their success, the EU highlights these large projects as scholarly examples of reaching impact. Recently, the EC funded a follow-up project GO-GA implementing the successful learning ecosystem in Africa, by combining contextually adapted and engaging digital content with the capacity development of teachers across Africa. Additionally, the insights developed in these projects account for various spin-offs within the learning theme, and has helped a new generation of researchers, to recently acquire large (European) grant funding.

All prominent personal grants acquired in the review period entail a clear and distinctive connection with technology (see Appendix I). Interestingly, and in line with our broadening focus on the connection, there is a gradual shift visible from 'social sciences for technology' grants to 'technology for social sciences' grants. In terms of recognition for senior and junior staff we see acknowledgement of "traditional" and new scientific communities, regularly highlighting the technology, application, or entrepreneurial nature of the work (See Appendix J for examples). Notably, the largest proportion of these recipients are female and were helped in building their research profile by internal support programmes such as the previously mentioned UT Incentive Fund.

PHD PROJECTS | In terms of our research profile, important steps have been made with the appointment of 20 Tech4People and Signature PhDs. Of the total group of 280 theses completed in the period 2015-2020, an increasing number include a relationship with technology. This has increased from 35% in 2015 to 65% in 2019[9]. Notably, many of the 2019/2020 projects not including technology focused on another BMs foundation: entrepreneurship. Overall, over 80% of the PhD theses about has been teaming up with societal partners. Together, this not only works as a force of change for the faculty, but because of their unique profile, we expect these PhD graduates to be better positioned for their future of work. In terms of project progress, the average completion time gradually improved from 5,8 years on average for PhD candidates starting in 2012 to 4,6 years for PhD candidates who commenced in 2015.

Although the completion time of PhD trajectories has significantly shortened, we anticipate a slight increase in the coming years due to delays with data collection because of the coronavirus crisis.

When we take a closer look at the overview of cum laude awarded PhDs (Appendix F), we see a good fit with our research themes. Although about half of them constitute no clear technology component, this concerns mostly theses defended in the early review period.

Fusing the worlds of social sciences and technology also comes with challenges. For example, our technical support staff in BMS Lab and our social sciences staff often depart from different standards and speak different 'languages'. This means that extra effort must be made to meet mutual expectations. As these projects usually are innovative 'high risk, high gain' projects, we also need to accept that some projects fail. Even when accounted for on the organisational level, this can be a stressful experience on an individual level, especially for junior researchers.

9 Due to the coronavirus crisis, the year 2020 can be considered less representative (it was about 60%).

PUBLICATIONS | The following five publications representing the research themes are not necessarily the most cited, but those that represent the breadth in approaches, including agenda-setting, the different ways of cross-disciplinary collaboration, the close connections with technology, the interplay with societal impact, as well as recognition by peers.

RESILIENCE | Van den Broek, T., A. Need, M.L. Ehrenhard, Priante, A. & Hiemstra, D. (2019). The influence of network structure and prosocial cultural norms on charitable giving: A multilevel analysis of Movember's fundraising campaigns in 24 countries. Social Networks, 58, 128-135.
This article advances our understanding of collective action via computer-mediated communication. It highlights the focus of this theme on the resilience of people towards socially disruptive technology. The authors received in 2014 one of the six worldwide awarded Twitter #datagrants for studying online cancer awareness campaigns such as #Movember.

SMART INDUSTRY | Nieuwenhuis, L.J.M., Ehrenhard, M.L., Prause, L. (2018). The shift to Cloud Computing: The impact of disruptive technology on the enterprise software business ecosystem. Technological forecasting and social change, 129, 308-313.
This study analyses how the shift to cloud computing has profound impact on the value creation logic within the entire enterprise system business ecosystem as it changes from goods-dominant to service-dominant. The study thus illustrates the far-reaching consequences smart industry has on business models, (digital) integration of firms and entire business ecosystems.

LEARNING | McKenney, S. & Reeves, T. C. (2019). Conducting educational design research (2nd ed.) London: Routledge.
The second edition of this award-winning book on design research is globally used to educate the future generation of researchers. Educational design research blends scientific investigation with the systematic development and implementation of solutions to educational challenges.

HEALTH | Derks, Y. P., Klaassen, R., Westerhof, G. J., Bohlmeijer, E. T., & Noordzij, M. L. (2019). Development of an ambulatory biofeedback app to enhance emotional awareness in patients with borderline personality disorder: Multicycle usability testing study. JMIR mHealth and uHealth, 7(10), e13479.
This paper focuses on the development of a personalised biofeedback app for mental healthcare in co-creation with psychiatric patients. It illustrates the trans-disciplinary nature of health research, as a technical UT Faculty (TNW) and a major mental healthcare provider in the Netherlands were also part of the team.

EMERGING TECHNOLOGIES | Kuhlmann, S., Stegmaier, P., and Kornelia Konrad, K. (2019). The tentative governance of emerging science and technology—A conceptual introduction. Research Policy, 48, 1091-1097.
This introduction to a special issue offers a conceptual framework to study governance approaches for emerging technologies. Its central idea is that emerging technologies are often governed in tentative ways to cope with uncertainties and the highly dynamic development of emerging technologies. Since tentative forms of governance can be empirically observed in many fields of emerging science and technology, this essay illustrates the cross-cutting function of the theme within the BMS ecosystem.

When we turn to the total set of BMS publications, we identify a modest but steady increase in the overall Field-Weighted Citation Impact (FWCI)[10] since 2015. When we conduct a conservative search with the term technology as a selection criterium for either title or keyword, we not only see a steady increase in the number of such publications over the years, but also in their impact. Interestingly, the overall FWCI of this publication set, which constitutes 12% of the total, is relatively high (2,33), revealing that their worldwide impact is about 2,5 times the expected impact. We also witness an increase in publications following international collaboration, reflecting our internalisation strategy (see Appendices K & L).

10 This is a weighted metric (based on the field of science, age and type of publication) that is calculated so that the global average is 1. If your publication has an FWCI of 1, regardless of how old or in which field it is, then it has an average impact. An FWCI of 1.50 means 50% more cited than expected.

CREATING IMPACT

PRODUCTS | With our entrepreneurial DNA, we have been highly focused on solving real-life problems and creating 'tangible' outputs – what some would call a 'design and making' tradition. The overview below highlights different types of products that are being developed within each research theme to advance both the scientific field and practice.

RESILIENCE | Centre for digital inclusion
The centre supports parties pursuing digital inclusion, internationally, nationally, provincially, and locally. Based on a strong scientific basis, this centre answers questions such as: How can government instit utions digitally include difficult-to-reach groups in their services? What digital skills do employees need and how can these be improved? With a strong international team and a base at the UT, we spread our mission: access to the internet as a prerequisite for societal participation now and in an increasingly digital future.

SMART INDUSTRY | MOOC Supply Chain Innovation: How Technology Can Create a Sustainable Future
This MOOC is a free-to-access, 18+ hour course on the Future Learn platform, to understand how new technologies can make supply chains more sustainable and learn how to deal with today's trends. The six sections include: the role of IT in supply chains, business process management and enterprise architecture and sensing in the supply chain. Delivered in collaboration with colleagues from the ET faculty, over 21000 students enrolled on this course and the reviews from verified learners rated it 4,8/5.

LEARNING | The datateam® method Data use is increasingly considered to be important for school improvement and increased student achievement. The data team® method for data-based decision making, can be used in a small research team of teachers and school leaders, to collaboratively use data to solve a certain educational problem within the school. The data team® procedure makes it possible for the team members to work on their own professional development as well as improving their educational practice by solving specific problems. Over 30 Dutch schools are already participating.

HEALTH | Infection manager This example of a digital product to improve cross-border patient safety regarding infection prevention and control was developed in cross-border cooperation with academic and societal partners in the EurSafety Health-net project. It used the Cehres roadmap developed by our faculty, an often-used guideline for the participatory development and implementation of eHealth technology that offers an approach to systematically anticipate stakeholders' (e.g., healthcare workers, management) needs and values, and to guide design and facilitate implementation. The project also resulted in a dissertation as well as several publications in high impact journals.

EMERGING TECHNOLOGIES | Framework for an ethical assessment of research and innovation
This product is the result of the SATORI project, funded by Horizon 2020, comprising 17 partners from 12 countries. This project aims to develop common methods, standards and approaches for the ethical assessment of research and innovation within Europe and can be utilised by a variety of assessors, including research ethics committees, funding agencies, policy makers, industry, NGOs, and others.

MEDIA COVERAGE | Interestingly, the UT research that received the most media attention in the review period (over more than tens of millions of unique readers of newspaper articles about the research) did not have a direct technology component but boosted our alertness regarding resilience engineering and safety and security issues. It concerned the research performed by a cross-disciplinary team on the evaluation of the Dutch governmental response to the crash of Malaysia Airlines flight MH17 on 17 July 2014. This catastrophe had an enormous impact on the Netherlands and throughout the world, on a human, social and political scale. The evaluation was commissioned by the minister of Security and Justice and the Dutch parliament and involved analyses of relevant (top-secret) documents, interviews with responsible ministers, top-level administrators, and officials active in the response, as well as victims' families. The political impact of the evaluation was very large and included extensive media coverage and public debates as well as a public hearing in parliament. After the Twente MH17 evaluation was published, The National Manual on Decision-Making in Crisis Situations was largely updated. The Dutch national crisis plan for aircraft accidents also included the lessons learned.

At the other end of the spectrum- basically from crisis & establishment to joy & youth – an initiative that has gained a lot of positive attention was the **eSportslab**. It was jointly developed by the Faculties BMS and EECMS with our students playing a key role. Most of the attention and engagement happened on YouTube, thanks to the involvement of influencer GameMeneer and broadcasting of the **University of the Netherlands**. Such initiatives also demonstrate our future-oriented focus on the new generation of students.

Reflecting on our media experiences, we recognise media attention as an indicator of impact but – beyond this – also see it as a means to promoting behavioural, social, or political changes. This is very much in line with our entrepreneurial and hands-on attitude. We realise that we are much less visible than others in our media engagement, such as writing opinion pieces for newspapers. However, we have supported three UT young BMS scholars to become one of the KNAW Faces of Science, blogging about their views of academia in relation to society. Since 2018, the BMS Lab also has its own website and social media channels through which people can learn about the activities and potential of BMS Lab.

We are currently not using the media optimally to our advantage. The UT has a corporate social media account, but none exists for our faculty. Although the BMS Lab and several research groups have active social media account, this is not more broadly embedded. Our ambition for the years to come is quite straightforward: to launch a more robust (social) media strategy built on our inspirational core message "At BMS technology meets life". This will enable us to communicate the societal relevance of the research carried out at BMS in a constant stream, firmly linked to our five research themes.

ENTREPRENEURSHIP | Our accomplishments in entrepreneurship build on the success of Venture Lab International, an accelerator based on social system theory in the entrepreneurship context, which helped over 300 tech-based start-ups and social enterprises and provided data for multiple PhD theses. BMS is involved in several initiatives, including Panther, a growth accelerator programme with KU Leuven, and coaching of social enterprises like STAR-T (an initiative for refugee entrepreneurship that has been nominated recently for the award of the European Social Fund). We closely collaborate with Novel-T (UT's dynamic and vibrant ecosystem that accelerates entrepreneurship and high-tech innovation) in developing entrepreneurship education and join forces with the 4TU (the federation of four Dutch universities of technology) in research on entrepreneurship education.

We are part of a new REACH initiative in collaboration with WWU Münster and the University of Applied Sciences Münster. This initiative is a EUREGIO start-up centre dedicated to the collaborative start-up of entrepreneurial structures and includes joint teaching programmes and strategic collaboration grants. The faculty also provides entrepreneurial (summer) courses for staff and students. Increasingly, we have been considering entrepreneurship as more than start-ups, focusing on the transformation of business within organisations in relation and interaction with operational and 'real life' technological development ('intrapreneurialism'). Thus, we see for ourselves a role in redefining (social, public, and corporate) entrepreneurship as part and driver of an ongoing process of technological innovation. One such example within our own organisation is the development of the Theatre play Mindlab, another is TechYourFuture.

TechYourFuture – a collaboration between the UT and two Universities of Applied Sciences in the Eastern region (Saxion and Windesheim) – is the centre of expertise for science and technology. Next to helping children to discover and develop their own talent in technology, it is aligned with Technology Pact to create solutions and practices for attracting, developing, and retaining a diversity of technology talent from the perspective of life-long learning. Making optimal use of regional and cross-institutional collaboration and public-private partnerships, the many collaborative research projects always have a broader social and economic significance for education, (prospective) professionals and (technical and social) companies. All knowledge and products from research are made available in open source the website, via newsletters and via publications for practice. It has, as part of the UT/BMS strategy and with energetic input from BMS and other UT faculties, gradually but deliberately developed into a platform supporting the cooperation within a broader and still emerging teaching and community learning network for and with technology in the eastern [part of the] Netherlands. A new strategic plan has been recently adopted by the founding members and forms one of the steppingstones for an ever-closer cooperation with engineering, vocational training, applied science and business and social service organisations in the eastern Netherlands.

Over the past years, we have increased structural cooperation with external partners. In the fields of emerging technologies and resilience, there is close cooperation with the government at all levels, from municipalities to ministries, from law enforcement agencies to border control, from the national tax agency to the Netherlands Environmental Assessment Agency. For example, in smart industry - one of these fields - collaboration with societal partners often takes the form of field labs, mostly with consortia involving businesses and knowledge institutes. Another example of structural cooperation with external partners is a project - of which our faculty is a key partner - that explores the impact of autonomous cleaning robots on cleaners to understand the impact of this innovation on existing staff. Groups in the field of learning have long-lasting research- practice-partnerships with educational institutions, and with organisations in terms of life-long learning trajectories. Supported by the Netherlands Enterprise Agency and the Top Sector Energy, we work with public and private partners on a digital learning and development environment for the energy transition (e.g., the installation sector). In the domain of health, there is a long-term institutional collaboration with many healthcare institutes (hospitals, mental healthcare providers) in the eastern part of the Netherlands. We contribute to risk and safety initiatives through partnership with Twente Safety Campus and a new knowledge centre for a secure digital society developed in collaboration with DSI, the strategically important municipalities of Apeldoorn and Zwolle in the eastern part of the Netherlands, and the province of Overijssel.

COLLABORATION WITH COMPANIES IN PORT OF TWENTE | Within the Smart Industry theme, we frequently and structurally collaborate in research projects on logistics, often co-funded by the companies and by DINALOG (Dutch Institute of Advanced Logistics). One example of this is the research project TrucksAndBarges.nl. This project sets out to research opportunities to make better use of data to anticipate future transport patterns. The introduction of "anticipatory logistics" would allow companies to make better use of river barges, a sustainable alternative to more polluting trucks that also contribute to road congestion. Several companies together with researchers from the industry theme developed algorithms and models to test this concept based on actual data from the companies. Arturo Pérez Riveta was one of the lead researchers on this project. Arturo, at that time a PhD candidate in Twente originally from Honduras, embraced the opportunity to test models he developed earlier as part of his PhD project. A follow-up with Pineapple studios turned the results into a serious game. This game, freely accessible via trucksandbarges.nl, has since then been used to train many students and practitioners of Port of Twente companies in anticipatory logistics, and has been adopted by other universities, such as the University of Chicago (USA). The partnership with Port of Twente is ongoing, through various projects. For example, we are currently establishing a regional Learning Community for the workforce in Smart Logistics.

INTEGRATION OF STAFF IN EXTERNAL ORGANISATIONS | The value of BMS expertise within society is reflected by all the BMS staff seconded to advisory panels and governance boards, where they provide critical insights to government, industry, and charitable organisations. Next to a variety of advisory board memberships for Ministries and the Dutch parliament, these include chair of the UNESCO World Commission for the Ethics of Science and Technology, presidency of the council of Informatics platform, supervisory board member of the Maxima Hospital, chairman of the water authority Vechtstromen, and advisory board member of the TU Munich centre for Science, Technology, and Society. An internal audit of the UT's extent of community engagement specifically highlights BMS as a Faculty highly dedicated to developing research-driven policy advice on a national and international level (TEFCE report, p. 33).

ASPECTS OF RESEARCH STRATEGY

In terms of PhD policies, several improvements were made. The results of the BMS surveys conducted helpful in the ongoing dialogue between the BMS research office, the BMS PhD community and TGS, with the aim to improve the PhD trajectories. In the past period, adjustments to the (TGS) curriculum (both in terms of data courses and career opportunities) were made, better fitting with the wishes of the BMS PhDs. Also, the position of PhD counsellors was strengthened providing extra capacity and more and better access to information. Two ideas that materialised with the help of the PhDs for PhDs platform within the faculty are the 'BMS Starting Points for the PhD Trajectory' and the 'BMS PhD Fund'. The first is a comprehensive document of the minimum facilities, provisions, and funding possibilities PhD candidates should be able to benefit from throughout their PhD trajectory. The second followed from the observation that individual PhD budgets for activities and professional development often do not cover opportunity-driven PhD development goals. To stimulate PhD candidates in their activities and professional development (e.g., travel opportunities, summer schools, etc.), the BMS PhD fund was established. It supports PhD candidates in additional learning and development activities, such as a longer research visit at a foreign research facility. Also, for PhDs who experienced a delay in their project due to the coronavirus crisis, a three-month (full-time) extension of their contract was arranged for.

OPEN SCIENCE | One of the most noticeable effects of the OS focus of our faculty is the OS focus of many (lead) projects, such as the cases highlighted in this narrative. Additionally, it is also visible in the increase in Open Access (OA) publications over the past years, from about 28% in 2015 to 67% in 2020. Furthermore, many BMS researchers have joined the newly set-up Open Science Community Twente (OSCT), a cross-disciplinary, bottom-up community to promote, learn, share, and discuss OS practices. Citizen science has also played an important role in many projects, often aided by the DesignLab infrastructure (e.g., the evaluation of the CoronaApp).

We have introduced many separate and successful initiatives for open science, but we still need to further develop an integral OS programme. This needs to be aligned with the UT's facilities and ambitions but setting our own marks. Now, adoption is too often dependent upon individual chairs, who do or do not actively promote open science within their groups.

BENCHMARK | We like to learn from and be inspired by others. Yet, as it is almost impossible to find social sciences faculties in technological universities with the same profile, and traditional ranking are based on disciplinary fields[11] or entire universities, we explicitly consulted the midterm review committee for advice on how to best choose our benchmark. The committee acknowledged our difficulties and advised a historical benchmark, which has been the focus of our assessment above.
However, given our keenness to learn from others, our own centre for Higher Education Policy Studies (CHEPS) took up the challenge to perform an alternative way of benchmarking for BMS. To this end, they explored specific indicators that were most closely aligned with our strategic profile with a UT developed tool, UMultirank. This led to the identification of several comparison institutions, which we complemented with interesting or partner universities through our subjective knowledge. The results (depicted in Appendix M) showed that (1) the University of Twente is strongest in knowledge transfer, but (2) there is potential to learn from each of those institutes but on different dimensions. For example, we should look at the University of Basel as it is among the top performers concerning research (citations, open access), and internationalisation (joint publications). Roskilde's regional engagement is another learning option for BMS, as is the professional publication strategy at the University of Passau. Transatlantic comparisons (US, Canada) appear primarily interesting for establishing a higher citation rate[12].

As further exploring this is a time-consuming endeavour, and the coronavirus crisis has complicated such exchanges, we will start up such an exploration in the fall of 2021. A first exchange is settled with Aalborg University (part of the benchmark in the Midterm report), which currently preparing a merger between social sciences and engineering sciences.

11 Depending on the ranking (Times, Shanghai) BMS covers 6-10 different fields.
12 Yet, this transatlantic advantage is arguably connected to the rankings' data sources (Scopus and WoS) being biased towards US-based journals.

CHAPTER 5

THE FUTURE SIX YEARS

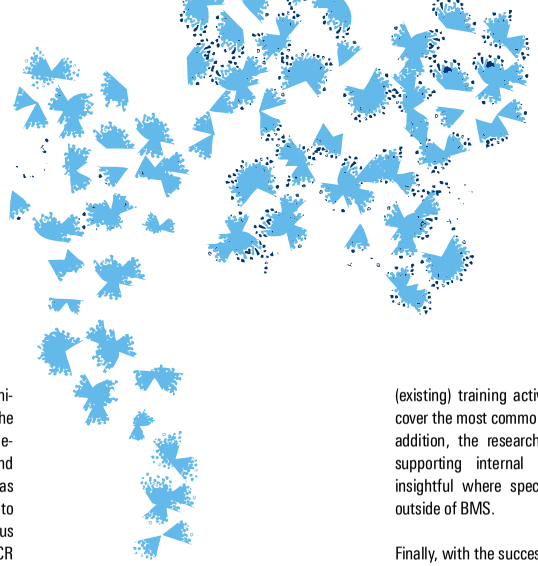
On 31 May 2021, a group of junior scholars and senior management participated in an online SWOT session. It was followed by some additions and internal discussion. As the points raised resonated with the faculty board and were recognisable, this resulted in the following SWOT analysis and several follow-up activities for the future.

Strengths	Weaknesses
• Unique profile, shared largely among staff, and openness for collaboration with the rest of UT. • New stable organisation: four departments, one lab, research in five focal themes. • Infrastructure for research (BMS Lab, new research support team, BDSI, etc.).	• Still in the transition to a new organisation: not all structures and policies are in place (e.g., HR: talent development, external PhDs), hence feelings of uncertainty and unclarity among staff. • High and over the years fluctuating teaching load, further impacted by the recent coronavirus crisis.
Opportunities	**Threats**
• Good partnerships (esp. VU, WWU Münster, 4TU, ECIU). • Increasing interest for technology in society and role of people in technology, also in sector plans for social sciences and humanities and design engineering, and research funding (NWO, EU). • Location in Twente: 'rurban' region, cross-border EUREGION with Germany.	• Potential funding reduction for social sciences and/or larger discrepancies with engineering faculties in UT (following UT and central government re-allocations making a distinction between technical and non-technical sciences). • Engineering faculties still need to realise UT's 'people-first technology' mission. • Other universities turn towards tech-orientation, and an entrepreneurial mindset too.

The participants in the SWOT exercise added that BMS acts as a thought leader on the relationship between social sciences, humanities, and technology. They noticed that in recent years staff members have increasingly embraced the revised profile, and that they increasingly strive to connect (the efforts of) our faculty to the efforts made and initiatives launched by other UT faculties and institutes, while implementing UT's vision and mission Shaping2030.

PRIMARY ACTIONS FOR THE FUTURE

Life-long learning is not only a key research theme of the faculty, but it also applies to our BMS research strategy. Although we have made considerable progress, we are (still) in a transition phase and our strategy, mission and vision require constant attention. With an expansion of our research support unit, including a new research support manager in 2021, we have made an important step forward. For example, she initiated a yearly cycle of joint meetings in which the department boards together with the theme chairs and business and research support formulate realistic five-year goals that are strongly connected to the future research plans and strategy, including staff developments, and trends in the research field and society at large. This fits within the continued shift in focus from quantitative to qualitative indicators of which the current report is reflective as well. Furthermore, and next to the points of attention highlighted in the green boxes throughout this report, we picture developing our strategy for the coming years along five key lines.



1. FURTHER DEVELOPING OF DOMAIN PLANS AND STAFFING | Increasingly, we have been engaged in developing domain plans. Domain plans typically contain an overview of research and teaching, their connection, where they stand and should be heading, and what this means in terms of staff (capacity). Considering recent and upcoming retirements, new fields and chairs have been identified and recruitments processes have been started up. The plans are supported with strategic research means.

For **Health**, we have been able to attract top scholars from abroad who match our new profile perfectly. This should translate into a centre for behavioural change interventions and a specific focus area in the field of health care systems, furthering the ties with smart industry. A first step in this direction has been made by a recently acquired H2020 grant – together with EEMCS – for the RE-SAMPLE project on complex chronic condition management. We will further invest in people-centred 'focus areas', such as developing holistic perspectives on health (e.g., integrating mental and physical health and different types of care) and developing value-based, technologies and responsible AI solutions for healthcare delivery.

For **Learning**, we concluded that it was fitting to invest in our internal talents, leading to two recent female professor appointments. Four key zones of work are articulated for the coming period: Sensors for monitoring learning; continuing professional learning (lifelong learning); technology-enhanced learning tools and environments; and data-informed learning optimisation. In line with this focus, a recently acquired NWO open competition grant (together with Nijmegen University) focuses on advanced speech technology and learning analytics for personalised reading education.

Smart Industry has made a start extending its focus on Artificial Intelligence (AI). This is not a new technology, but the current abundance of data and ever increasing computing power make AI more feasible to address complex real-world challenges. Supported by the Dutch government and industry, two professorships were established, one jointly with ING bank, and the other with KLM. These positions will be linking pins between the corporate data science teams and smart industry researchers, PhDs, PDEngs, and students. We also envisage the entrepreneurship and change segment of the industry theme to be further developed as a concept ready for academic innovation at the first 'Entrepreneurial University of the Netherlands and Europe'.

The domain plan of Resilience is underway, aligning with the UT-wide development of resilience as a prominent research theme and connecting to the UT-VU collaboration and the 4TU Resilience Engineering Centre. The thematic focus on sustainable communities was recently strengthened in the field of energy with the acquisition of two Horizon 2020 proposals on smart grid implementation (in 2021 jointly with Faculty EEMCS: SERENE and SUSTENANCE). A recent NWO open competition grant was acquired combining network science with public administration to understand how local and regional governance networks make us resilient to future cyber-security disruptions. Within the TUCCR collaboration, a new chair Cyber Security and Network Science will be established.

With its agenda-setting nature, magnitude, and long-term perspective, we foresee the gravitation grant on the ethics of socially disruptive technologies to be the linchpin in our Emerging Technologies and society theme. We have invested in its larger embedding in the faculty and UT, to reap the rewards of this highly prestigious and ground-breaking research programme. The FB made a special long-term agreement with the gravitation programme management to invest and put extra energy in the valorisation and practical applicability side of this fundamentally 'free research' programme.

2. ADVANCING RESEARCH SUPPORT DEVELOPMENTS | While BMS initially focused on OA publications, we are now increasingly moving on to other aspects of OS and working towards an integral OS programme. We have reserved more financial means and support capacity in our annual budgeting plans to further support this transition. The most recent development is the setting up and funding of our own OA journal led by BMS emerging technology researchers in cooperation with the University Library. This diamond peer-reviewed journal will allow researchers world-wide to publish in an open, highly visible, and profiling platform at no cost.

Analogue to the very successful BMS Teaching Academy, we will establish a BMS Research Academy. With younger researchers increasingly positioned to be a driving force, we have realised that some of the more senior staff seem to be lagging somewhat behind in the adoption of new research directions (e.g., OS requirements) and the mastering of new research methods. An area for upskilling staff is the teaching of statistical methods which shifted from SPSS to R. Using open access statistical software such as R makes it easier than ever to engage in OS practices like sharing code.

The research academy will aim to support the continuing professionalisation of all researchers in a variety of research-related skills. We aim to make this continuing professionalisation an additional topic in the annual personnel review talks for researchers. Concurrently, the research academy will provide a collection of (existing) training activities, workshops, courses, etc., that will cover the most common topics that require continued learning. In addition, the research academy aims at community building, supporting internal knowledge dissemination and making insightful where specific expertise can be found within and outside of BMS.

Finally, with the success of BMS Lab and with the consent of the rector, the first steps are made to make it a more UT-wide facility, further strengthening our connection with the other faculties and institutes. Also, we will be investing in additional measures to "manage expectations" of our researchers vis-à-vis our technical staff in BMS Lab and facilitate cooperation and coproduction in the context of new, innovative, and high-risk research strategies and initiatives.

3. PRACTISING AN INCLUSIVE, COLLABORATIVE, PEOPLE FIRST CULTURE | The transformation of the faculty over the past few years generated a lot of new elan and perspective but has also been a process which demanded a considerable amount of energy and transition stress at the work floor. With a generally high teaching load, work pressure remains a point of attention. We will further invest in diversifying and tailoring the task package according to individual competences, preferences, and performance. This allows for careers with a (temporarily) stronger focus on research, education, or valorisation. Similarly, we aim to recruit young(er) and talented academics with a more diverse portfolio, thus also looking for excellence potential in teaching and valorisation.

In 2020, we have finalised the envisioning of our new policy on Responsible and Impact-Driven Work in academia at BMS. Its main idea is that BMS commits to the process of talent development (TD) as a learning process of the BMS employees in their individual functions and their team roles. To achieve that, we will change the TD cycle at BMS from a one-shot annual appraisal talk between a researcher and a team leader towards a three-step process that includes "preview" (discussions about strategic talent development at the department level), "team review" (teamwork and team performance discussions at the team level), and "talent review and recognition" talks (discussions about individual career paths).

The main reform here would be from the HR management of personnel to strategic human resource development with more room for talent development and further alignment with UT's strategy Shaping2030. We are aware that the translation of this reform into actual HR activities and staffing requires a reform of HR in itself, not only within BMS but within the entire UT. It also adds to signals of mostly new and junior staff that HR seems to be more focused on serving the FB and academic leads instead of focusing on the needs of individual staff members. In 2021, we have initiated a change trajectory specifically focused on this HR transition process. Due to the ongoing 'battle' for talent, this trajectory will also entail a dedicated HR policy for successfully attracting the best candidates for our open positions. This becomes increasingly important because of the recent Collective Labour Agreement of all Dutch research universities, which prescribes tenured positions after about one year of employment, possible leading to less staff mobility and further emphasising the importance of timely and critical selection.

In terms of a healthy academic climate, we noticed that progress is being made, moving from paper to practice, aided by initiatives such as Mindlab, collective celebration of successes àn efforts, and with the explicit support of BMS and UT leaders. Such initiatives will receive follow-up and are further incorporated in standing practices and policies. We also seek progress in two interconnected areas. First, following two recent cases where a complaint was filed with the UT's Scientific Integrity Committee about our research (staff), we have realised that not only for complainants but also for defendants these are highly stressful events. From the perspective of good employership, we will invest in social-emotional and procedural support for our colleagues confronted with such a complaint (which we have now provided on an ad-hoc basis). Second, as our research on societal challenges touches upon topics raising increasing public debate, we focus on better preparing our researchers for and anticipate potential confrontations. Part of our Research Academy portfolio will be a module on doing research on sensitive topics and the societal and communicative dynamics surrounding them.

4. BUILDING A BMS RESEARCH INFORMATION SYSTEM (RIS) AND CATALOGUE | One of our main conclusions in the past period, and prompted writing this report, is that we do not have adequate business information systems. Information is hard to get by, not complete, and insufficiently solid. We also lacked integrated project information on content, finances, and project collaborators. It also is too person-dependent as staff are currently requested to fill several systems, such as PURE, themselves, with no checks and balances in place. It left us with most information having to check manually. This needs to be improved as it prohibits us from doing proper and prompt strategic analyses and making better informed strategic choices, both in terms of content and in terms of capacity planning. We also need to make better use of past experiences on e.g., prizes and award nominations, which are often crucial to career development. We currently do not have a database with (un)successful examples that we can learn from.

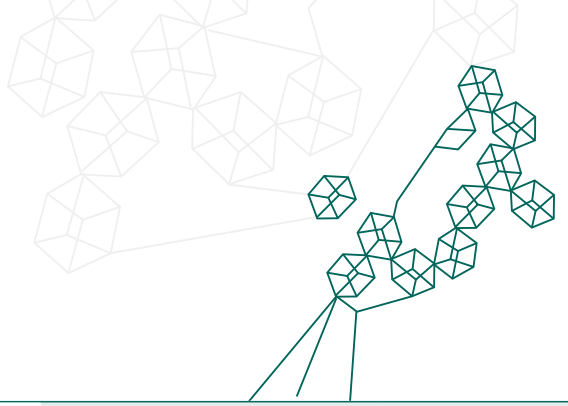
The absence of adequate and integrated administrative and academic business information systems is not new and has also been concluded from the midterm report process. Other UT faculties have indicated they experience the same problems. We have addressed the issue several times with the EB as it encompasses university-wide systems which we cannot change on a faculty level. Unfortunately, until now, little improvement progress has been made. We expect that following the inauguration of the new EB in September 2021 this issue will be prioritised.

5. STRUCTURAL MONITORING OF PHD TRAJECTORIES | Our aim for the next years is to further allow our PhDs to be a driving force for change in the faculty. At the same time, the growing number of PhDs working on cross-disciplinary projects requires continued attention. We will also invest in a healthier balance between BMS employed and non-employed PhDs, working towards a 50/50 division. For non-employed PhD candidates, we will give priority to candidates that are part of strategic collaborations. As it also concerns an inheritance from the (long) past and we do want to breach commitments to individual candidates, we are looking for ways to opportunities for repair and identifying red flags in running trajectories by active engagement with supervisors and PhD candidates. We will also take preventative measures. From 2022 onwards, and with the departments in the lead, each incoming PhD candidate and project will be more closely screened, documented, and monitored on its quality and potential, supervisory arrangements, and fitting with the BMS strategy. We believe this to be in the best interest of all parties involved as well as benefitting the quality and societal relevance of the work.

A final word concerns the retirement of the current dean by 1 April 2022. To us, it is important that the new dean and FB have sufficient space to lead us into a new era with a fresh perspective and new elan. We trust that the directions set so far provide an excellent starting point for this.

BMS has come a long way since 2015, and steαms on relentlessly. At the BMS Faculty, technology meets life: now and in the future!

APPENDICES



Appendix A. Research theme descriptions and embedding

Resilience	Thematic focus areas and domain challenges	Embedding
At the Resilience program, we study the impact of socio-technical-ecological (STE) transformations on well-being and safety in cities, communities, and society at large. Such transformations entail digitalisation, water and energy, or safety and conflict. In this programme we perform inter- and transdisciplinary research that contributes to our understanding of how (the design of) resilient systems of human behaviour, community-level networks, and macro-institutional structures moderate the impact of STE transformations on well-being, sustainability, safety, and inclusiveness.	Smart cities Sustainable communities Safe societies: crisis management, polarisation, undermining crime, digitalisation, cyberthreats.	UT Shaping 2030 theme: Engineering for a resilient world UT Institute: Digital Society Institute UT centre: TUCCR 4TU centre: Resilience Engineering Knowledge & innovation hub Apeldoorn VU-UT collaboration

Smart Industry	Thematic focus areas	Embedding
At the Smart Industry program, we focus on the 4th industrial revolution, which is not only a technological but also a societal challenge that requires a responsible "human touch" approach for understanding and harnessing the driving forces behind the "high-tech". In this theme, questions on the origins, developments, and consequences of this digital transformation of the business, people and society are addressed.	Smart logistics Human-machine symbiosis (nature of work, employment, and management) Business model and market implications (circular economy platforms) AI and digitalisation	UT shaping 2030 theme: creating intelligent manufacturing systems UT Institute: Digital Society Institute UT centre: TUCCR NEDAP Academy Knowledge & innovation hub Apeldoorn VU-UT collaboration National: NWA roadmap

Health	Thematic focus areas	Embedding
At the Health research programme, we use a cutting-edge and cross-disciplinary approach to seek scientific and data-driven knowledge about the factors that contribute to a healthy and sustainable society and the application of that knowledge to enhance mental health, healthcare, and wellbeing by connecting and empowering people. This programme aims to shape 'the future of health' in which different care environments (e.g., home settings, GP offices, community centres, hospital environments, mental health care, online environments) are connected and blended through of (digital) technologies.	Persuasive technology Personalised eHealth Health systems engineering Design for health and wellbeing	UT Shaping2030 theme: improving healthcare by personalised technologies UT Institute: TechMed Topfit citizenlab EurSafety Health-net

Learning	Thematic focus areas	Embedding
Learning is the cornerstone of societal development. Within the Learning program, we aim to contribute to current societal challenges, by researching on how learning can be understood, supported, and measured. Through collaborations with practitioners, socially responsible research in which theoretical and methodological breakthroughs, for example, related to big data and technological innovation in learning are aspired.	Sensors for monitoring learning Lifelong learning Technology-enhanced learning tools and environments Data-informed learning optimisation.	UT Shaping2030 theme: engineering our digital society UT Institute: Digital Society UT initiative: Lifelong Learning UT initiative: Pro-U & Pre-U Knowledge & innovation hub Apeldoorn TechYourFuture

Emerging Technologies	Thematic focus areas	Embedding
The 'Emerging Technologies' research programme puts the interaction and co-evolution of technology and society centre stage. We investigate how new and emerging technologies affect society, culture, and human existence, how emerging technologies can be shaped in responsible ways and how socio-technical transformations unfold. We study socio-technical change at the micro level of individual users, human-technology relations and research and development work, the meso-level of social practices and organisations and the macro-level of societal and political structures, governance processes, socio-political debates, and cultural change. We evaluate emerging technologies based on ethical frameworks and stakeholder perspectives and develop approaches for responsible research, innovation, design, and governance.	Governance of innovation Responsible research and innovation Inclusive digital society Ethics of emerging technologies	UT Shaping2030 theme: shaping our world with smart materials UT Institute: MESA+, DSI 4TU: Centre for Ethics & Technology Knowledge & Innovation Hub Apeldoorn Gravitation programme (NWO) on ethics of societally disruptive technologies

Appendix B: Tech4people project

Project title	Main applicant	Department	Others involved
PhD projects			
Real-time telemonitoring of biosignals and cognitive craving to reduce relapse rates in alcohol addiction	Matthijs Noordzij	LDT; HIB	EEMCS
Development of innovative business models for smart and sustainable local energy systems	Kornelia Konrad	TPS	ET
Closing the gap between the real world and the lab? Agent technology to extrapolate behaviour change in the lab	Tatiana Filatova	HBE; TPS; HIB	EEMCS
How Twitter awareness campaigning affects cancer prevention and early detection behaviour	Michel Ehrenhard	HBE; HIB	EEMCS
Inside the emotional brain of voters	Martin Rosema	HIB	S&T
Prominence of public sector messages in the buzz of the digital age.	Wolfgang Ebbers	HIB	ET
Design and implementation of ICT-based communication systems in victim-offender mediation.	Sven Zebel	HIB	EEMCS
Digital divide	Alexander van Deursen	HIB	EEMCS
Time to care! Using sensor technology to dynamically model social interactions of healthcare professionals	Maaike Endedijk	LDT; HIB	EEMCS
Factors enabling an early detection of university-industry collaboration.	Kasia Zalewska-Kurek	HBE	S&T
Postdoc projects			
Human-Robot Relationships and the Good Life	Wolfgang. Ebbers	HIB; TPS	EEMCS
Designing sustainable second-generation bioenergy supply chains: an agent-based modelling approach	Martijn Mes	HBE; TPS	S&T, ITC
Developing a Multi-Modal Simulation for Training Good Interpersonal Sensemaking	Paul Taylor	HIB	EEMCS
Google Glass for VIPs: user-validated accessibility standards for smart glasses	Thea van der Geest	HIB	EEMCS
Systemic wrongs and collective engagement following the transition of Dutch Youth Care	Martin van Gerven	HIB	EEMCS
Game based learning: Online, unobtrusive assessment of competency	Ton de Jong	LDT	ET
Machine-based mapping of innovation journeys	Anneke Sools	HIB; TPS	EEMCS
Identifying parliamentarian debate styles	Henk van der Kolk	HIB	EEMCS
Data mining and machine learning in preventive health care	Chintan Amrit	HBE; TPS	EEMCS
Portfolio analysis to optimise the value of innovations in imaging for the hybrid operating room	Marjan Hummel	TPS	S&T, ET

Appendix C: Signature PhD grants

Project title	PhD/ Main applicant	Research theme/ Departments involved	Others involved
The psychosocial requirements for trust in Human-Agent teams	Esther Kox / José Kerstholt	Health; Emerging Technologies / HIB	EEMCS
Working with Robots-as-Managers: How Worker Dignity is shaped in Algorithmic Management	Laura Lamers / Jeroen Meijerink	Smart Industry; Resilience / HBE; TPS; HIB	
Smart Circular Construction Ecosystems	Yifei Yun / Devrim Yazan	Smart Industry; Resilience / HBE; HIB	
What's your story? Fostering the energy transition by means of segmentation, behavioral targeting and narratives	Romée Lammers / Jordy Gosselt	Resilience; Emerging Technologies / HIB; HBE; LDT	
Enabling strategic adaptability in negotiation - A reflective method to improve skill-based learning	Henrike Fitschen / Aldis Sigurdardottir	Learning / HBE; LDT; HIB	
eGoBIT - Governance of Blockchain-based Infrastructure Transitions on Energy markets	Florian Helfrich / Peter Stegmaier	Smart Industry; Emerging Technologies / TPS	EEMCS
Framework for responsible and accountable deprivation area mapping in support of pro-poor policies" (FRAME-PRO)	Isaac Oluoch/ Michael Nagenborg	Emerging Technologies / TPS	ITC
AIRLIFT: application of Unmanned Aerial Vehicles (UAVs) for humanitarian logistics	Robert van Steenbergen / Martijn Mes	Smart Industry; Resilience / HBE; TPS	
Adaptive computer-based learning environments	Sharanya Lal / Tessa Eysink	Learning/ LDT	
Moments of connection: Combining interactive ambient technology and narrative technology to promote connectedness in older adults	Kars Otten / Thomas van Rompay	Health/ HIB	Radboud UMC

Appendix D: Input of research staff

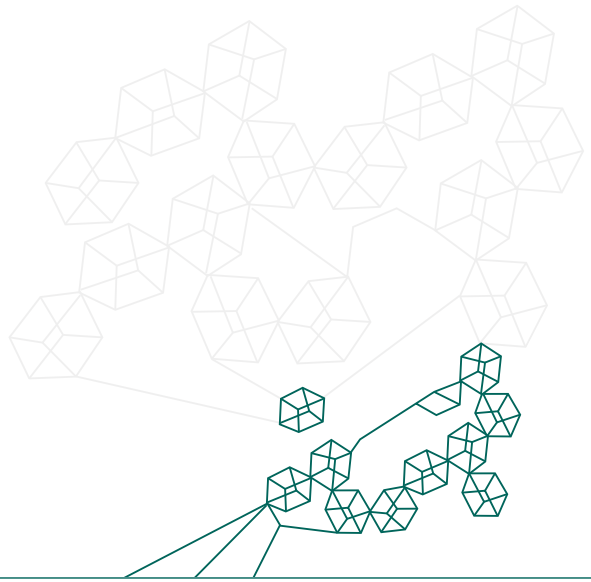
	2015		2016		2017		2018		2019		2020	
	n	FTE[9]	n	FTE	n	FTE	n	FTE	n	FTE	n	FTE
Scientific staff												
Assistant Professor	110	97	108	95	106	91	102	90	100	88	119	107
Associate Professor	36	33	41	37	43	38	43	37	43	38	40	36
Full Professor	45	37	41	35	42	37	42	35	42	36	41	35
Postdocs[1]	83	70	82	71	65	53	79	64	76	62	87	72
PhD Candidates[2]	84	81	87	85	89	87	74	72	58	57	74	71
Total Research Staff[3]	**358**	**318**	**359**	**323**	**345**	**305**	**340**	**298**	**319**	**281**	**361**	**321**
PhD Candidates UT-Employees[4]	3	-	4	-	6	-	13	-	12	-	16	-
PhD Candidate Sponsored[5]	37	-	40	-	35	-	31	-	26	-	23	-
PhD Candidate Externally funded[6]	86	-	102	-	105	-	106	-	94	-	88	-
PhD Candidate External7	80	-	72	-	71	-	74	-	110	-	127	-
Support staff	95	76	101	79	99	81	99	81	102	83	104	88
Visiting fellows	54	-	61	-	53	-	52	-	49	-	38	-
Total staff[8]	**710**	**393**	**735**	**402**	**708**	**386**	**702**	**379**	**700**	**364**	**741**	**409**

Note: The numbers and FTEs presented in the table below are research staff totals. This means that this includes teaching activities. Due to the way the financial data is organised within BMS and the UT, it is at this point impossible to present only the research component. Within BMS, all staff has a minimal of 20% research time (funded from the education budget (the so-called O&O-component) and the primary research budget). The estimate from the finance department for additional research time on an aggregate level is about 25%. In other words, the estimate is that 45% of the numbers presented above, represents research input (including PhD supervision).

1 Comparable with category 'Onderzoeker': Researcher
2 VSNU category: 'Werknemer-promovendus': Employed doctoral candidate (by UT)
3 Total research staff according to the SEP requirements consist of assistant, associate, and full professors, postdocs and employed doctoral candidates
4 VSNU category: 'Promoverende medewerker': University employee that is obtaining a doctorate in combination with another job function
5 VSNU category: 'Beurspromovendus': Doctoral candidate funded by a grant from another organisation
6 VSNU category: 'Extern gefinancierde promovendus': Externally funded doctoral candidate (e.g. by the company they work at)
7 VSNU category: 'Buitenpromovendus eigen middelen': Doctoral candidate funded with private means
8 'PhD Candidates UT-Employees' are part of different staff categories (e.g., support staff) and therefore not included in the total staff count
9 FTE's are rounded towards the nearest integer

Appendix E: PhD candidates

Enrolment		Succes rates[3]						
Starting Year	Enrolment (male/ female)	Total (M+F)	Graduated in year 4 or earlier	Graduated in year 5 or earlier	Graduated in year 6 or earlier	Graduated in year 7 or earlier	Not yet finished[5]	Discon-tinued
2012 (T[1]-8)	21/32	53	15 (28%)	23 (43%)	31 (58%)	35 (66%)	1 (2%)	17 (32%)
2013[2] (T-7)	47/54	101	17 (17%)	20 (20%)	29 (29%)	29 (29%)	42 (42%)	30 (30%)
2014 (T-6)	37/36	73	25 (34%)	38 (52%)	42 (58%)	N/A[4]	14 (19%)	17 (23%)
2015 (T-5)	27/42	69	19 (28%)	28 (41%)	N/A[4]	-	26 (38%)	15 (22%)
2016 (T-4)	35/35	70	21 (30%)	N/A[4]	-	-	36 (51%)	13 (19%)
Total	**167/199**	**366**	**97 (27%)**	**-**	**-**	**-**	**119 (33%)**	**92 (25%)**



1 T = 2020, the final year of the current reporting period
2 This year includes 34 PhD candidates that started some time before 2014, and due to administrative reasons have received a fictive start date 01-01-2013
3 Success rates are cumulative
4 This is the current year (2021), which has not been processed into the administrative system
5 This is the number of PhD candidates that had not yet been finished at the start of 2021 staff categories (e.g., support staff) and therefore not included in the total staff count

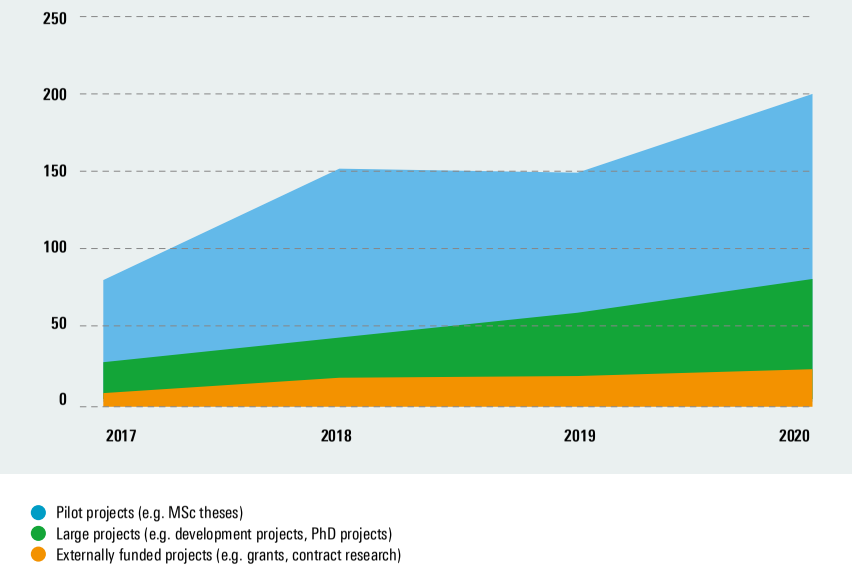
Appendix F: Cum laude PhD graduations

Year	PhD candidate	Title PhD Project	Focal Research Theme	Connection with technology?
2019	Esther van Laar	What are E-ssential skills? A multimethod approach to 21st-century digital skills within the creative industries	Resilience, Learning	Technology as a platform
2019	Koen Degeling	Simulation modelling to optimise personalised oncology	Health	Advanced technology as a research method
2019	Maarten Hoekstra external	*In Dutch* De bijdragen van de businesscase: een verkennend onderzoek naar de functies en de eigenschappen van een nieuw besluitvormingsinstrument in de (semi-) publieke sector	Smart Industry	-
2019	Koen de Koning	Modelling human behaviour in coupled human and natural systems	Resilience	Advanced technology as a research method
2018	Marlies Kok external	Percutaneous coronary interventions from various perspectives	Health	Technology assessment
2018	Maarten Renkema	Innovating HRM for employee-driven innovation: A multilevel perspective	Smart Industry	-
2018	Michelle Kip	Early health technology assessment of point-of-care and laboratory diagnostics: Methods and applications in acute and primary care	Health	Technology assessment
2016	Joppe van Driel	The filthy and the fat: Oeconomy, chemistry and resource management in the age of revolutions, 1700-1850	Emerging Technologies	Technology assessment
2016	Tijs van den Broek	When slacktivism matters: On the organisation and outcomes of online protests targeting firms	Resilience	Technology as platform
2016	Arjan Frederiks	On the use of imagination by entrepreneurs	Smart Industry	-
2015	Desiree van Dun external	Improving lean team performance: Leadership and workfloor dynamics	Smart Industry	-
2015	Suzanne Janssen	A self-determination theory perspective on mentoring relationships at work	Learning, industry	-
2015	Esther Klaster external	Toward more effective regional networks: A multi-method study on top-down stimulated networks within the Dutch public-policy areas of education and employment	Resilience	-

Appendix G: Funding

Research unit	2015	2016	2017	2018	2019	2020
Funding	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**
Direct funding[1]	€33.130 (67,3%)	€33.696 (67,8%)	€33.454 (70%)	€35.369 (71%)	€35.792 (69%)	€38.751 (75,3%)
Research grants[2]	€2.493 (5,1%)	€2.997 (6%)	€3.010 (6%)	€3.002 (6%)	€3.179 (6%)	€2.775 (5,4%)
Contract research[3]	€11.505 (23,4%)	€10.784 (21,7%)	€9.716 (20%)	€9.692 (20%)	€10.771 (21%)	€8.450 (16,4%)
Other[4]	€2.072 (4,2,%)	€2.239 (4,5%)	€1.730 (4%)	€1.510 (3%)	€2.124 (4%)	€1.483 (2,9%)
Total funding	€49.200 (100%)	€49.716 (100%)	€47.910 (100%)	€49.573 (100%)	€51.866 (100%)	€51.459 (100%
Expenditure	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**	**k€ (%)**
Personnel costs[5]	€38.246 (78,9%)	€38.424 (79%)	€39.040 (79%)	€39119 (79%)	€39.220 (78%)	€41.121 (84%
Material costs	€783 (1,6%)	€933 (2%)	€890 (2%)	€875 (2%)	€807 (2%)	€675 (1%)
Other costs	€9.462 (19,5%)	€9.313 (19%)	€9.247 (19%)	€9572 (19%)	€10.117 (20%)	€7.358 (15%)
Total expenditure	**€48.491 (100%)**	**€48.670 (100%)**	**€49.177 (100%)**	**€49.566 (100%)**	**€50.144 (100%)**	**€49.154 (100%)**

Appendix H: Trend in BMS Lab projects



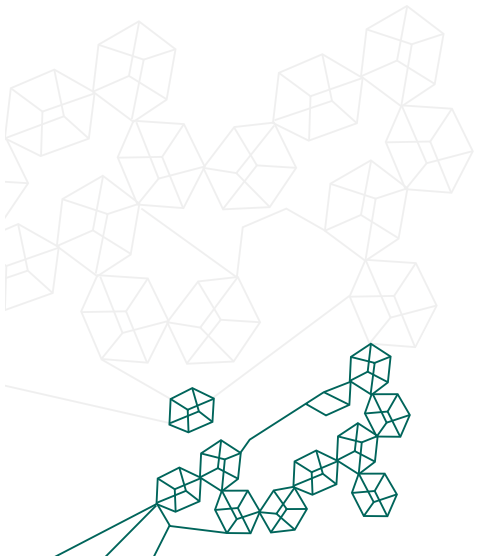
1 Direct funding ('basisfinanciering' / lump-sum budget): This includes funding for education
2 Research grants obtained in national scientific competition (e.g., grants from NWO and KNAW)
3 Research contracts for specific research projects obtained from external organisations, such as industries, government ministries, European organisations (e.g., ERC), and charitable organisations
4 Funds that do not fit into the other categories
5 This includes all personnel (e.g., research, teaching, and support staff)

Appendix I: Overview of personal grants

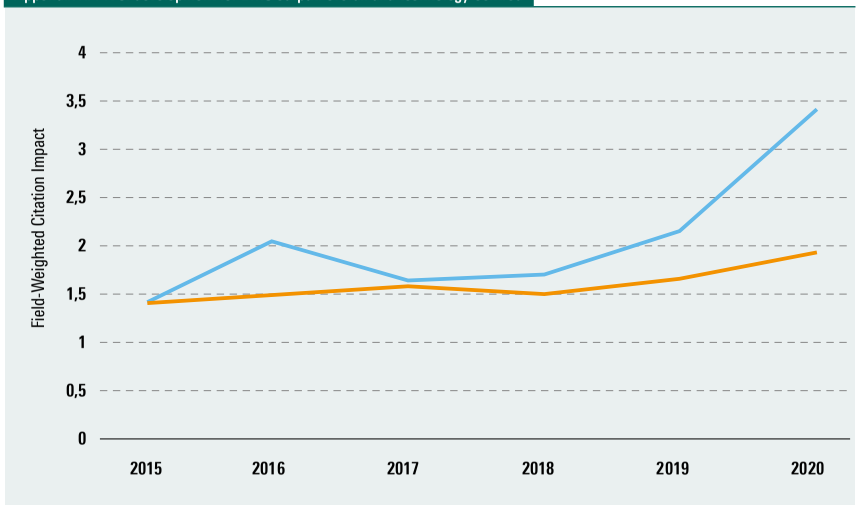
Year	Personal grants	Award holder	Research theme	Technology link
2020	NWO VIDI Grant	Tatiana Filatova	Resilience	Development of methods and computational models that account for socio-economic dynamics in models for climate change adaptation.
2020	Marie Sklodowska-Curie Individual Fellowship	Russel Chan	Health	Creaction of a neurocognitive model of motor learning representation for the elderly, using supervised machine learning with electroencephalography (EEG) and behavioural data to predict cognitive and motor states.
2019	NWO VENI Grant	Derya Demirtas	Smart Industry/ Health	Development of a comprehensive data-driven modelling framework for emergency facility deployment, leveraging optimisation, metaheuristics and data science.
2018	NWO VENI Grant	Suzanne Janssen	Smart Industry	Understanding the nature and consequences of smart (communication) technologies in organisations: the relevance of technology to employees and to examine how they experience those technologies and put them into practice.
2018	Marie Sklodowska-Curie Individual Fellowship	Stéphanie Gauttier	Emerging Technologies & Society	Assessment of the impact of human enhancement technologies used at work on employees and their performance.
2017	ERC Consolidator Grant	Jean-Louis van Gelder	Resilience	Virtual reality technology in combination with smartphone applications are used to instil a future-oriented mindset in offenders.
2017	ERC Starting Grant	Tatiana Filatova	Resilience	New behavioural data on climate adaptation decisions collected in multiple survey waves using mobile applications.
2017	NWO VENI Grant	Saskia Kelders	Health	Web-based gamified interventions and mobile apps to increase wellbeing.
2017	NWO VIDI Grant	Saskia Nagel	Emerging Technologies & Society	Research on the ethical consequences of blending our minds with technologies.
2017	NWO VIDI Grant	Alexander van Deursen	Resilience	Study of IoT skills in field experiments in the home.
2016	ERC Starting Grant: Processing Citizenship	Annalisa Pelizza	Resilience	Script analysis methodology of interoperable data systems.
2015	NWO VENI Grant	Aimee A.L. van Wynsberghe	Emerging Technologies & Society	Incorporating ethics into the design process of robots known as Care Centred Value Sensitive Design (CCVSD).
2015	Marie Sklodowska-Curie Individual Fellowship	Aleisha Clarke	Health	Development, implementation & evaluation of evidence-based mental-health programmes for children.
2014	NWO VICI Grant	Peter-Paul Verbeek	Emerging Technologies & Society	Development of a theory of technological mediation, aiming to theorise how technologies play a mediating role in scientific practices, ethical frameworks, and religion.
2014	NWO Research Talent Grant	Gréanne Leeftink	Health	Development of new planning and control approaches to optimise the organisation of multiple shared resources through mathematical modelling and simulation.

Appendix J: Examples of individual recognitions of senior and junior staff

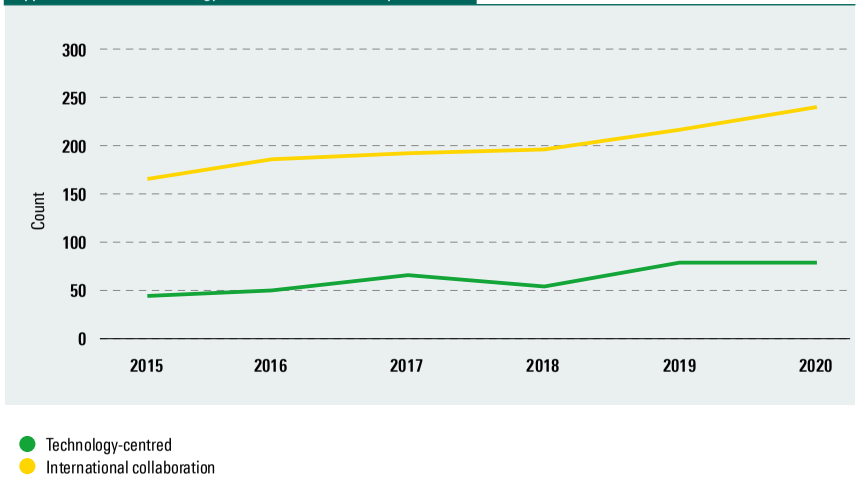
Emerging Technologies & Society	World Technology Award, category Ethics- Peter Paul Verbeek -2017	Keynote at the public outreach conference Rethinking Culture and Science: Opportunities, risks and developments of the digital revolutions organised by the German National Library in the context of the German Presidency of the European Council.
Smart Industry	Best HRM Scientist in The Netherlands- Tanya Bondarouk- 2018	Best (PhD) student paper award in the operations management division, Academy of Management Desiree van Dun-2015
Resilience	Fellow status awarded by Association for Psychological Science- Ellen Giebels - 2017	EAPL Early Career Award - Simon Oleskiewicz - 2018
Health	Contributions in Positive Health Award from the International Positive Psychology Association- Ernst Bohlmeijer- 2019	Young Investigator Award, American Heart Association (AHA) - Derya Demirtas-2015
Learning	Distinguished Development Award by the Association for Educational Communications & Technology (AECT) Ton de Jong- 2017	Emerging Scholar Award - AERA, SIG Educational Change - Mireille Hubers-2018



Appendix K: FWCI development for BMS output: overall and technology-centred



Appendix L: Trend in technology-centred and international publications



Appendix M: Benchmark to several comparison institutions

	Research				International orientation			Regional engagement		
	Citation rate	Interdisciplinary publications	Professional publications	Open access publications	International academic staff	International joint publications	International doctorate degrees	Regional joint publications	Income from regional sources	Regional publications with industrial partners
U Twente	**B**	**A**	**D**	**C**	**A**	**B**	**A**	**D**	**C**	**B**
Tampere U (FI)	C	C	C	B	–	B	C	C	–	A
U Basel (CH)	A	C	–	A	–	A	–	D	–	A
Roskilde U (DK)	C	C	C	D	A	C	C	A	C	A
U Münster (DE)	B	C	C	B	A	B	C	D	–	D
Oulu U (FI)	B	B	C	C	–	A	B	D	C	C
Penn State U (USA)	A	B	–	D	A	C	C	B	–	C
U Passau (DE)	C	D	A	D	A	B	C	D	D	C
Carnegie Mellon U (USA)	A	B	–	C	A	B	A	D	–	C
Georgia Tech U (USA)	A	A	–	D	A	B	A	D	–	C
U Waterloo (CA)	B	B	–	D	–	B	E	D	–	D

Note: A=best tier, E= worst tier.

Appendix N: Terms of Reference

The board of the University of Twente hereby issues the following Terms of Reference to the assessment committee of the Faculty of Behavioural, Management, and Social Sciences (BMS). The assessment committee will be chaired by prof. Hub Zwart and will be assisted by an independent secretary, Elian Bogers, Msc.

1. INTRODUCTION: RESEARCH ASSESSMENTS IN THE NETHERLANDS | In the Netherlands, the boards of the universities, KNAW and NWO are responsible for the quality of the research at their institution. As part of their quality assurance cycle, all academic research in the Netherlands is evaluated every six years. The executive board of the relevant university, the board of NWO or the board of KNAW commissions the research assessment and determines which research units are to be evaluated each year. For the coordination of the assessment, all research organisations associated with VSNU, KNAW and NWO use the Strategy Evaluation Protocol (SEP). The main goal of a SEP evaluation is to evaluate a research unit in light of its own aims and strategy. In the self-evaluation, the unit reflects on its ambitions and strategy during the previous six years as well as for the future in a coherent, narrative argument, supported wherever possible with factual evidence. This fact means that there should be a direct relationship between the arguments with regard to the aims and strategy on the one hand and the type of robust data underpinning the self--evaluation on the other. The SEP assessments help to monitor and improve the quality of the research conducted by the research unit. Additionally, the relevance of research contributes to fulfilling the duty of accountability towards government and society. The boards of the institutes may use the outcomes of the research evaluations for quality assurance purposes and institutional strategy development. The protocol itself is reviewed every six years in order to move along with important developments in research.

2. OBJECTIVES OF THE RESEARCH ASSESSMENT OF THE FACULTY OF BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES | The committee is requested to assess the quality of research conducted by the Faculty of Behavioural, Management and Social Sciences as well as to offer recommendations in order to improve the quality of research and the strategy of the Faculty of Behavioural, Management and Social Sciences. The committee is requested to carry out the assessment according to the guidelines specified in the Strategy Evaluation Protocol. The evaluation includes a backward-looking and a forward-looking component. Specifically, the committee is asked to judge the performance of the unit on the main assessment criteria and offer its written conclusions as well as recommendations based on considerations and arguments.

The main assessment criteria are:

1. Research quality
2. Societal relevance
3. Viability of the unit

During the evaluation of these criteria, the assessment committee is asked to incorporate four specific aspects. These aspects are included, as they are becoming increasingly important in the current scientific context and help to shape the past as well as future quality of the research unit.

These aspects are as follows:

1. Open Science: availability of research output, reuse of data, involvement of societal stakeholders.
2. PhD Policy and Training: supervision and instruction of PhD candidates.
3. Academic Culture: openness, (social) safety and inclusivity and research integrity.
4. Human Resources Policy: diversity and talent management.
5. The main assessment criteria and the four specific aspects are described in detail within the Strategy Evaluation Protocol.

In addition to these criteria specified in the Strategy Evaluation Protocol, the board requests the committee to pay attention to the following additional questions as well as to offer its assessment and recommendations:

1. How do you assess the development and realisation of the BMS strategy, especially concerning the five focal themes and its objectives?
2. How do you assess the way BMS implements its research strategy and how BMS facilitates its research activities of staff?
3. How do you assess the interaction between BMS and other institutes and faculties of the UT? Does collaboration with other faculties add to a successful implementation of the BMS strategy?

3. COMMITTEE REQUIREMENTS: STATEMENT OF IMPARTIALITY | The members of the committee are requested to sign a statement of impartiality before they conduct their assessment work. In this statement, the members declare that they have no direct relationship or connection with the Faculty of Behavioural, Management and Social Sciences.

4. SCHEDULE OF THE ASSESSMENT AND REPORTING | The self-evaluation and the site visit form the main sources of information for the committee, on which basis it draws up its report. The self-evaluation will be sent no less than [>=4] weeks prior to the site visit, together with the Strategy Evaluation Protocol and the programme for the site visit.

The site visit at the Faculty of Behavioural, Management and Social Sciences will take place on from 31 October – 3 November 2021. The project leader of the BMS research assessment will contact you about logistical matters and other relevant issues related to the research assessment approximately two months prior to the site visit.

The committee is requested to report its findings in an assessment report drawn up following the SEP guidelines and format. The committee is asked to send the draft report to the Faculty of Behavioural, Management and Social Sciences no more than eight weeks after the site visit. The Faculty of Behavioural, Management and Social Sciences will check the report for factual inaccuracies; if such inaccuracies are detected, the committee will ensure that they are corrected. The committee will then send the final version of the assessment report to the board. The board publishes the final version of the assessment report.

On behalf of the Executive Board of the University of Twente,

Prof. dr. ir. Tom Veldkamp
Rector Magnificus

ATTACHMENT

NETHERLANDS GRADUATE RESEARCH SCHOOL OF SCIENCE, TECHNOLOGY AND MODERN CULTURE (WTMC)

Self-Assessment 2018-2020

Stefan Kuhlmann,
Andreas Weber,
Anne Beaulieu,
Elize Schiweck (WTMC)

June 2021

WTMC

CONTENT

1. INTRODUCTION

The Netherlands Graduate Research School of Science, Technology and Modern Culture (WTMC) is a collective effort of Dutch scholars studying aspects of the development of science, technology, and modern culture. Science and technology studies form the core of the work, but there are also strong inputs from philosophy, cultural studies, and innovation studies. WTMC started as a network back in 1987 and was officially accredited as an interuniversity graduate research school by the Royal Netherlands Academy of Arts and Sciences (KNAW) in 1995. Accreditation has been reconfirmed in 2000, 2005, 2011 and 2017. The UT has hosted WTMC for many years. From 2005 till 2017, the University of Maastricht hosted and led the Research School. In January 2018, WTMC returned to the University of Twente, with the Faculty of Behavioural, Management and Social sciences (BMS) as hosting faculty: the cross-disciplinary focus of this Research School on science and technology in society perfectly fits the ambition of BMS to understand, co-engineer and evaluate technology and innovation in society. PhDs candidates as well as colleagues all over the world praise WTMC for its training and network efforts. Or in the words of Jackie Ashkin, since 2019 PhD candidate at the Centre for Science and Technology Studies (CWTS) at Leiden University:

"WTMC has proven invaluable for graduate students like me, who come to the field from other disciplinary backgrounds. The training schools provide both breadth and depth of knowledge, arming me with an increasingly substantial insight into the field of STS and a series of practical skills for engaging in research. While not every topic is directly relevant to my PhD, I have come away from every WTMC engagement with something new to think with. WTMC also provides a crucial social platform since many of my peers are spread across multiple departments and institutes in the country and I would not otherwise have an opportunity to meet and exchange ideas with them. WTMC is really a unique institution, both in the Netherlands and abroad, and it is undeniably one of the highlights of completing a PhD in STS in the Netherlands."

This positive picture is confirmed by Alan Irwin, prof. in the Department of Organisation at the Copenhagen Business School who chaired an international peer review committee assessing the quality of WTMC in 2017:

"WTMC is one of the most prominent doctoral schools worldwide in the field of science, technology and innovation studies (STIS). It provides an excellent academic environment, in terms of research and teaching, for its doctoral candidates. WTMC makes an outstanding contribution to society. WTMC builds upon an excellent research foundation within its field and is therefore excellently equipped in terms of future research capacity. On that basis, we assess WTMC as being of world-leading quality regarding its doctoral training activities."

The present self-evaluation 2018-2020 is an interim update of the self-evaluation 2017 that was presented to the committee. Section 7 contains a review of achievements considering the recommendations by the committee.

2. THEMATIC SCOPE OF WTMC

The excellent international reputation of WTMC in the field of STIS builds upon a combination of factors, summarized in the self-evaluation of 2017:

1. The strengths of its participating institutions (cf. the summary of the SEP evaluations of the institutes participating, see p. 34) and the outstanding scientific quality of WTMC members, e.g., as assessed in terms of the research output of WTMC senior members (cf. Appendix A);
2. The genuine and long-term commitment to, and experience with, trans-institutional advanced training, benefiting from, and contributing to, thirty years of cooperation;
3. An educational model specifically devised for providing dedicated high quality, advanced training to PhD candidates in STS;
4. A well-developed series of established practices and modes of organisation aligned with the educational model.

WTMC is organised around three clusters of questions. These also form the backbone of the training programme. Besides these clusters of questions, the Graduate School also pays attention to its founding disciplines, such as history, philosophy, and sociology.

DIAGNOSIS OF THE MODERN RESEARCH SYSTEM | This cluster focuses on the history of national research systems, and on the relationships between the different levels of the research system, the general system, and between science and society. The formation of new networks, systems, and actors is a key aspect within this theme. This is studied from historical, sociological, and cultural approaches perspectives, both quantitatively and qualitatively.

TECHNOLOGICAL DEVELOPMENT AND SOCIETAL REGULATION | This cluster focuses on the role of technology in society and the way in which they co-construct each other. How do technical systems and technical artefacts emerge and develop? What is their role in modern society? These studies inform new perspectives on the politics of technological culture and new forms of technology assessment. The history of technology in the Netherlands has been an important topic.

CULTURAL ROLES OF SCIENCE, TECHNOLOGY AND RATIONALITY | This cluster focuses on the cultural, philosophical, and normative consequences of the intertwinement of science, technology, and modern culture. Questions related to this theme concentrate on the way in which boundaries between science, technology and society are generated, and how science and technology are represented and presented in philosophy and political writings.

The above-mentioned thematic foci, as well as an active network of individuals and institutional members allow WTMC to achieve its four main objectives:

1. to provide high quality, advanced training for PhD candidates who study science, technology, and modern culture, and thus to create new generations of scholars with a solid background in this cross-disciplinary field (often referred to as STS or STIS – 'Science, Technology and Innovation Studies');
2. to stimulate and coordinate high-quality research about science, technology, and modern culture;
3. to contribute to societal debates about the role of science and technology in society;
4. to promote the visibility of STS as a field amongst research funding agencies, universities, and others concerned with research and education policy.

3. MEMBERS

WTMC aims to organise excellent PhD education and to co-ordinate research programmes of the main Dutch centres in science and technology studies, i.e., those at the UT, and the universities of Amsterdam, Eindhoven, Groningen, Leiden, Maastricht, Nijmegen, Rotterdam, and Utrecht (as of 2020). There are two groups of institutional members: establishing universities (paying a higher infrastructural contribution) and participating universities resp. institutions. The collaboration of the members is codified in a mutual agreement (Gemeenschappelijke Regeling) signed in 2018.

Establishing members

University of Twente Faculty | BMS: TPS department (section STEPS + section PHIL)
Vrije Universiteit Amsterdam | Faculty of Science: Athena Institute
Maastricht University | Faculty of Arts and Social Sciences + Faculty of Health, Medicine & Life Sciences
Utrecht University | Faculty of Geosciences
Eindhoven University of Technology | Faculty Industrial Engineering & Innovation Sciences
Leiden University | Centre for Science and Technology Studies

Participating members

Radboud University | Science Faculty: Institute for Science in Society
University of Amsterdam | Faculty of Social and Behavioural Sciences
University of Groningen | Faculty of Behavioural and Social Sciences
Erasmus University Rotterdam | Erasmus School of Health Policy & Management
Royal Netherlands Academy of Arts and Sciences | Rathenau Institute

Each institutional member delegates research staff and PhD candidates to WTMC; there are also individual members. Appendix A provides an overview of staff (124) and PhD participants (75) active in the period 2018-2020.

4. ORGANISATION

4.1 BOARD

At present, the academic director of the school is Prof. Dr. Stefan Kuhlmann from UT. Prof. Dr. Ir. Harro van Lente from Maastricht University chairs the board, consisting of members drawn from participating academic groups plus one external, non-academic member (state 2020):

- Dr. Agnes Meershoek (Maastricht University)
- Dr. Barbara Regeer (Free University Amsterdam)
- Prof. Ellen Moors (University Utrecht)
- Prof. Floor Alkemade (Technical University Eindhoven)
- Prof. Sarah de Rijcke (University Leiden)
- Dr. Paul Diederen (Rathenau Instituut)
- Prof. Valerie Frissen (SIDN & Leiden University)

PhD candidates are represented by:

- Tessa Roedema (Free University Amsterdam)
- Ivan Veul (Radboud University Nijmegen)

The coordination of the training programme is in the hands of Prof. Anne Beaulieu, University of Groningen and Dr. Andreas Weber, UT.

4.2 ADVISORY BOARDS

International Advisory Board: Pierre-Benoît Joly (National Institute of Agronomic Research (INRA) in Paris), Barbara Prainsack (University of Vienna), Sergio Sismondo (Queen's University), Lucy Suchman (University of Lancaster).
Educational Committee: Willem Halffman (Radboud University Nijmegen), Bernike Pasveer (Maastricht University), Thed van Leeuwen (Leiden University), Harro Maat (Wageningen University), Koen Beumer (Utrecht University), Kornelia Konrad (UT), Selen Eren (RuG), Jackie Ashkin (Leiden University).
Research Committee: Anique Hommels (Maastricht University), Amade M'charek (University of Amsterdam), Barend van der Meulen (UT).

4.3 MANAGEMENT TEAM

Academic Director: Prof. Dr. Stefan Kuhlmann, UT-BMS
Secretariat: Elize Schiweck, UT-BMS

5. EDUCATIONAL PROGRAMME

5.1 STANDARD TRAINING PROGRAMME 2018-2020

The WTMC PhD Training Programme is an intensive training programme for PhDs that contributes both to the production of a] high-quality dissertations highly visible in society and to the b] education of skilled, independent researchers in the field of Science and Technology Studies (STS). The history, sociology, and philosophy of science and technology – science and technology studies (STS) – form the core of the work, but there are also strong inputs from cultural and innovations studies. Registered PhD candidates receive a diploma when they have completed four workshops and two summer schools (equivalent to 22 ECs). Two scientific training coordinators are in charge of creating, organising, and facilitating all workshops, summer schools and writing workshops. A model curriculum looks as follows:

Academic year 1	Participate in WTMC spring workshop (3 EC) Participate in WTMC summer school (5 EC) Participate in WTMC autumn workshop (3 EC)
Academic year 2	Participate in spring workshop (3 EC) Participate in summer school (5 EC) Participate in autumn workshop (3 EC)
Training programme finalised (= 22 ECs)	
Academic year 3	Voluntary participation in writing workshops, organised twice a year, and other networking activities such as excursions.
Academic year 4	Voluntary participation in writing workshops. organised twice a year and other networking activities such as excursions.

During these events, the coordinators also function as informal sounding boards and mentors for participants. Beyond, they have an advisory role for the WTMC director, and in the teaching committee and the board.

The priority of WTMC summer schools and workshops is the training of all-round STS researchers. This is the national component of the training. The completion of dissertations also requires the support of the universities participating in WTMC. The design and implementation of the local component is ultimately the responsibility of the university in which the PhD candidate is based. The national component of WTMC is geared towards providing an overview and acquaintance with a range of methods. In-depth mastery of specific methods is acquired by PhDs during their specific project and supported by additional training where necessary. The national component broadens PhD candidates' knowledge of research skills and helps them to reflect on these skills in four ways, by:

1. introducing the main themes and theories of STS research;
2. providing an overview and introduction in the key methods and methodologies of STS research;
3. practicing the written and oral presentation of research, as well as the appropriate giving and receiving of feedback on presentations;
4. reflecting on the PhD candidates on their academic and professional development, and on issues relevant to the successful completion of a PhD, including reputation, motivation, ambition, relations with supervisors;

The first two elements stress the broadening dimension of the research skills and crafts training (about two-thirds of the skills training effort in the workshops and summer schools). The last two support self-reflection by PhD candidates (about one-third). In order to achieve the above-mentioned aims, WTMC uses four modes of training STS research skills and crafts: (a) workshops and summer schools (b) writeshops (c) other activities and opportunities provided by WTMC.

A) WTMC WORKSHOPS AND SUMMER SCHOOLS | WTMC offers a two-year cycle of workshops and summer schools (see list below) that focus on key themes and methods of current STS research. Prior to workshops and summer schools, candidates receive a programme with texts and assignments to prepare in advance. Candidates are expected to spend 40 hours preparing for each workshop (= 3 ECs) and 80 hours for each summer school (=5 ECs). All workshops and summer schools are in English and always attract international participants. All PhD candidates present their work at either a workshop or summer school least once during the first two years of the WTMC training programme. Each of the summer schools or workshops entails lectures from leading scholars in STS or from professionals in whose institutions STS plays an important role. The training events also broaden the candidates' knowledge of and expertise with STS research skills as well as encourage critical reflection on when and how to apply such skills during skills sessions. In order to stimulate WTMC PhDs to read classics in the field, each event entails one session during which a classic study of the WTMC Core Literature reading list is discussed.

Workshop Care, Spring 2020, Soeterbeeck

WTMC Summer Schools and Workshops 2018-2020

Date	Type	Title (& program link)	Key teachers
05/2018	Workshop	Doing Comparison	Joe Deville, Anna Harris, Sarah de Rijcke
08/2018	Summer School	Infrastructure	**Anchor teacher:** Elizabeth Shove **Other lecturers:** Ruth Oldenziel, Hilmar Schaefer, Anique Hommels, Rob Hoppe
12/2018	Workshop	Smart	Darryl Cressman, Fenneke Sysling, Martijn de Groot, Jason Pridmore, Merel Noorman
05/2019	Workshop	Postcolonial	David Ludwig, Esther Turnhout, Alana Helberg-Proctor, Nishant Shah, Christoph Rausch
08/2019	Summer School	Experimenting or How to Change the World with STS	**Anchor teacher:** Michael Guggenheim **Other lecturers:** Willem Halffman, Klasien Horstman, Bernd Kräftner, Nelly Oudshoorn
11/2019	Workshop	Open	Frank Miedema, Colette Bos, Evelyn Wan, Ismael Rafols, Paul Wouters
06/2020	Workshop	Care as Concept, Method, Ethic	Israel Rodriguez Giralt, Iris Wallenburg, Esha Shah, Christian Ernsten
Cancelled due to Covid19	Summer School	Failure	Edward Jones-Imhotep
01/2021 (this event replaced the summer school of 2020)	Winter School	A New Political Sociology of Science	**Anchor teacher:** Pierre Benoît-Joly **Other lecturers:** Ismael Rafols, Melanie Peters, Soraya Boudia, Johan Schot, Elena Cavagnaro

B) WTMC WRITING WORKSHOPS | WTMC PhDs complete the training programme roughly in the first two years of their appointment. As soon as they have completed five out of the six workshops/summer schools, they can take part in other activities, on a voluntary basis. A writing workshop is organised twice a year. These are the occasions to discuss and receive feedback from senior academics and peers on their writing (dissertation chapters or draft articles). Texts are distributed in advance. The total amount of preparation depends on the number of participants. Each writing workshop ends with a dinner enabling PhD candidates to maintain and extend their network of contacts with peers and senior scholars in the field.

C) OTHER ACTIVITIES AND OPPORTUNITIES PROVIDED BY WTMC | WTMC is a vibrant network of scholars, and it provides PhD candidate opportunities to take part in many activities, such as the 'Annual Meetings', 'Practice Workshops', 'Field Trips' or 'Perspective Days' (see section 7, below). WTMC also offers new and first year PhD candidates enrolled in the WTMC programme the opportunity to do one course in one of the Science & Technology Studies and Innovation Studies (research) masters in the university institutes that participate in WTMC. Moreover, WTMC maintains and manages a list server on which members can post relevant information on conferences, opportunities for funding, vacancies, et cetera. For the PhD candidates, there is a distinct list server that informs candidates on whatever is relevant for their training.

5.2 CORONAVIRUS CRISIS INITIATIVES & CHANGES TO THE STANDARD TRAINING PROGRAM IN 2020

Not surprisingly, the Coronavirus crisis and related restrictions have affected most of the WTMC activities in 2020. Important events of the WTMC training programme (Summer School 2020; Autumn Workshop 2020) had to be cancelled due to the anti-pandemic measures in the Netherlands and abroad. The omission of key elements came with critical effects for the thematic breadth and quantitative scope (EC credits) of our training programme, for community-building among PhDs and with teachers, and finally also for the financial basis of our network (dropping income, changing expenditure). Since March 2020, the Training Coordinators, the Director, and the secretariat, in close consultation with the WTMC Board, the Education Committee, and the PhD representatives, had explored and decided on short and medium-term measures to cope with the situation. In autumn 2020, the Training Coordinators prepared a few alternative activities that can be done entirely remotely and be self-paced to some extent. These activities allow WTMC PhD candidates to both attain the learning goals of the programme and to connect with other PhDs and members of the STS community. Beyond short term problem-solving, our discussions have triggered reflections about the long-standing conventional structure of the WTMC training programme, also after the current coronavirus crisis: are there options for more diverse and hybrid (physical, virtual) training modules that can be combined in flexible ways? The Education Committee, Board, Training Coordinators and Director will continue to deliberate in 2021 and inform the WTMC community soon.

The cancellation of a summer school and the Autumn workshop in 2020 had made it difficult for some WTMC PhDs to finish their WTMC training programme in time. Therefore, in order to create more flexibility, WTMC has designed Virtual Electives for up to 3 ECTSs that are open to all WTMC students of the present cohort. The Virtual Electives replace one WTMC workshop with 3 ECTSs. PhD candidates of the present cohort can therefore finish their training programme with five training events (Workshops and Winter/Summer schools) plus the new WTMC Virtual Electives (up to 3 ECTSs). The new WTMC Virtual Electives consist of two types of activities: reading group (1 ECTS) and methodology track (1 ECTS). Each track is led by a senior WTMC scholar; themes covered include in a first instance ethnography, bibliometrics, computational methods and modelling (offered by CWTS, Leiden). Next tracks could cover network analysis and discourse analysis (TUE) and action research (Athena Institute, VU). Upon a successful evaluation, and if there is a long-term need, WTMC is prepared to prolong it and potentially open it up to external PhD candidates.

6. AWARDS

For many years WTMC researchers have been receiving prestigious national and international awards for their work. Appendix B shows prominent examples for the years 2018-20.

7. WTMC EVALUATION 2017

As mentioned above, the international evaluation panel assessing WTMC in 2017 had a very positive assessment of the relevance and performance of the graduate school. The panel saw no need for any substantial changes in the training programme. The panel did make specific suggestions for the further productive development of WTMC, which, in the words of the panel, "should be seen as hopefully-constructive proposals for further consideration rather than as fixed recommendations or requirements." The following table offers an overview of panel proposals and actions taken and achievements made by WTMC 2018 – 2020.

Panel proposals 2017	Achievements 2018-2020
"The cross-disciplinary configuration of WTMC … raises a set of questions in terms of selecting – and balancing – topics and methods as a focus for WTMC. We recommend that this reflection and review of academic activities should explicitly continue."	The Training Coordinators and the Academic Director ensure that: • Topics related to all three main research strands of WTMC – classical and emerging topis – are addressed along the sequence of training events. • Methods and methodologies are addressed in all WTMC training events and are foregrounded in various exercises. Discussions of presentations and readings also explicitly address methodological choices. • Each invited lecturer is requested to indicate explicitly which methods will be addressed in lectures and exercises. • A series of Virtual Electives (3 ECTS) has been launched in 2020, with a focus on methods and methodologies. The presentations and deliberations of the WTMC Annual Meeting in 2020 had as a guiding theme "STS and Method".
"There is scope for even greater attention to be paid within WTMC to the intersections and interactions between the constituent three research strands (Science; Technology; Modern Culture)."	While most training events focus on one of the three strands, connections to the other strands are regularly addressed and explored. For example, the Spring 2020 workshop on "Care work" focussed on the WTMC thematic strand "Modern Culture" and included relevant aspects of the strands "Science" and "Technology".
"The Panel recommends that WTMC considers the further fostering of bottom-up initiatives by PhD candidates."	Several bottom-up initiatives by PhD candidates have been undertaken: • The Annual Meetings have featured panel discussions organised by PhD candidates ("STS and Engagement" in (2019); "Crossing/pushing boundaries of methodology" in 2020). • The PhD representatives on the WTMC Board have launched a survey of needs and suggestions by the current PhD cohort.
"The Panel proposes that foreign participants are selected …, for example, to foster dialogue and interaction between national PhD candidates and those from the Global South. (…) It might be possible to find a means of actively encouraging international participation." "Also, the panel encourages WTMC to continue to reflect upon ethnical and cultural diversity."	Two places for PhD researchers from "non-conventional contexts" (e.g. Global South) are offered per event (registration fee is waived), aiming to enrich the intellectual scope of events. The format of training events online during the coronavirus crisis allowed a truly global participation. WTMC is exploring if and how online format can be used in the future.
Whilst there is a considerable focus within WTMC on phase 1 activities, phase 2 could benefit from greater (…) attention: (...) in particular, greater attendance at supervisors' days and PhD candidate presentations.	PhD candidate presentations play a prominent role in all training events. Also, PhD candidates organised own thematic panels at the WTC Annual Conferences. Two annual Writing workshops provide PhD candidates with a platform to present their research and discuss it with seniors.
It is important that the best balance is achieved between local training and national schemes such as WTMC.	This balance continues to be sensitive issue for national graduate research schools in NL, not only for WTMC. Some Dutch universities have launched their own local graduate training programmes, potentially competing with national schools. WTMC is keeping an eye on this development and has regular contacts with local graduate training programmes.
The potential for employment in non-academic positions is specifically important. It may therefore be relevant for WTMC to be more proactive in the way(s) it addresses this potential.	At the 2018 Annual Meeting a panel was organised on "STIS knowledge in high demand" - Success stories by WTMC Alumni working in non-academic jobs. In 2019, WTMC offered the first ever "Perspectives Day". Current WTMC members and WTMC alumni met to share perspectives on career opportunities after finishing a WTMC dissertation. A new format "Practice Workshops" was introduced, aiming to provide PhD candidates with hands-on information on professional environments for later employment. As a first effort in January 2020, the Rathenau Institute organised a one-day training workshop providing evidence for policy making. Members of the Educational Committee organised a "Field Trip" for PhD candidates to the Dutch Ministry OCW on November 21, 2019. A LinkedIn alumni platform was revived, with currently more than 260 members (https://www.linkedin.com/groups/119434/).
The Panel did reflect upon whether selected WTMC events could be opening up to larger publics in order to foster societal debate.	In Autumn 2020, Professor Valerie Frissen (Leiden University) entered the WTMC Board as representative of civil society organisations. She is also CEO of the SIDN Fund.
The Panel did … raise questions about … the low level of enrolment of PhD. (…) effort should be taken that (numbers) do not fall further below what seems to be the low point of recruitment in 2016.	PhD enrolment has gone up again and is currently quite stable.

8. SWOT ANALYSIS

The Board of WTMC has discussed several important strengths, weaknesses, opportunities, and threats (SWOT) to the development of the graduate school in the coming years (see table below).

STRENGTHS | Drawing on 35 years' experience WTMC has been able to set up, maintain and constantly further develop an excellent cross-disciplinary training programme. This was and is possible because the school is borne by a strong inter-university network in the Netherlands, with virtually all leading STS scholars committed to support WTMC, individually and via their respective organisation. This has generated an excellent reputation of WTMC in the European and global STS community. As a proof for this recognition, in 2016, the globally active Society for Social Studies of Science (4S) granted WTMC the first ever "4S Infrastructure Award".

WEAKNESSES | All WTMC events are tailor-made which requires a lot of academic and organisational labour. Therefore, the current training programme is costly. For the labour-intensive events to be organised, the current busines model requires memberships fees to be high, some members say: too high. Also, the membership conditions (institutional; individual) are quite complex and require bureaucratic effort. Another uncertainty (rather than a weakness) is a consequence of WTMC's excellent international reputation: the interest of STS groups at non-Dutch universities to join WTMC is growing, yet if the school would become a multi-national network, the role for the participating (and fee paying!) Dutch universities and their respective local PhD training programmes might become diluted.

OPPORTUNITIES | The group of institutional members in the Netherlands (currently 11) could be extended. Among interesting candidates with PhD research that fits WTMC are Wageningen University & Research and Tilburg University. WTMC could also attract more regular PhD researchers for the training programme (currently 75), within the member organisations (e.g., the UT, with faculty BMS focusing on technology and innovation in society) and beyond. In Europe, several universities with strong STS programmes are interested in establishing firm institutional links with WTMC (e.g., RWTH Aachen). The necessity for and experience with offering parts of the training programme during the Coronavirus crisis via online formats has shown the considerable international demand for online workshops, schools, and MOOCs. Making this part of the overall training profile could help to both further strengthen the academic reputation and to increase financial income (event fees). A step further in this direction could lead to "franchising" of training modules with international partners as hybrid co-hosts (virtual and physical). Other opportunities could arise with efforts to re-position the WTMC training program carefully vis-à-vis new cross-disciplinary developments (e.g., Meta-Science).

THREATS | For a diverse range of reasons – e.g., too high membership costs, increasing engagement in international markets, questioning the need for institutional support in NL, competition with local graduate programmes at member universities – the readiness of longstanding institutional members to invest in WTMC might become undermined. This could also hold for the hosting UT. Another potential threat is one of the school's very strengths: the broad cross-disciplinary scope of STS-related research covered by WTMC may trigger a loss of epistemological identity and academic excellence.

Strengths	Weaknesses
• Excellent interdisciplinary training programme • 35 years experience • Strong inter-university network in NL, with leading STS scholars committed to support WTMC • Excellent reputaion in global STS community (4S, EASST)	• Current training programme is costly and generates structural financial deficit • Membership fees are high • Membership conditions (institutional; individual) are complex and bureaucratic • Unclear: WTMC is national or international network
Opportunities	**Threats**
• Broadening of institutional membership in NL • More PhD participants (also beyond members) • EU universities as members (e.g. Aachen) • International online participations in workshops, schools, MOOCs (income; reputation) • "Franchising" of training modules with internat. partners • Positioning vis-à-vis new interdisciplinary developments (e.g. Meta-Science)	• Fading support by NL institutional members and of hosting university • Broad interdisciplinary scope of STS may create loss of identity and or excellence

OPPORTUNITIES | The group of institutional members in the Netherlands (currently 11) could be extended. Among interesting candidates with PhD research that fits WTMC are Wageningen University & Research and Tilburg University. WTMC could also attract more regular PhD researchers for the training programme (currently 75), within the member organisations (e.g., the UT, with faculty BMS focusing on technology and innovation in society) and beyond. In Europe, several universities with strong STS programmes are interested in establishing firm institutional links with WTMC (e.g., RWTH Aachen). The necessity for and experience with offering parts of the training programme during the Coronavirus crisis via online formats has shown the considerable international demand for online workshops, schools, and MOOCs. Making this part of the overall training profile could help to both further strengthen the academic reputation and to increase financial income (event fees). A step further in this direction could lead to "franchising" of training modules with international partners as hybrid co-hosts (virtual and physical). Other opportunities could arise with efforts to re-position the WTMC training program carefully vis-à-vis new cross-disciplinary developments (e.g., Meta-Science).

THREATS | For a diverse range of reasons – e.g., too high membership costs, increasing engagement in international markets, questioning the need for institutional support in NL, competition with local graduate programmes at member universities – the readiness of longstanding institutional members to invest in WTMC might become undermined. This could also hold for the hosting UT. Another potential threat is one of the school's very strengths: the broad cross-disciplinary scope of STS-related research covered by WTMC may trigger a loss of epistemological identity and academic excellence.

Appendix A: WTMC researchers and PhD candidates

Researchers (up till 2020)		
1	Yegros-Yegros, dr. A.	Leiden-CWTS
2	Calero-Medina, dr. C.	Leiden-CWTS
3	Costas Comesana, dr. R.	Leiden-CWTS
4	Eck, dr. Nees Jan van	Leiden-CWTS
5	Franssen, dr. T.	Leiden-CWTS
6	Holtrop, dr. T.	Leiden-CWTS
7	Meijer, dr. I.	Leiden-CWTS
8	Tijssen, prof. dr. R.J.W.	Leiden-CWTS
9	Wouters, prof. dr. P.	Leiden-CWTS
10	Noyons, dr. E.C.M.	Leiden-CWTS
11	Leeuwen, dr. Th. N.	Leiden-CWTS
12	Rijcke, dr. S. de	Leiden-CWTS
13	Traag, dr. V.	Leiden-CWTS
14	Valkenburg, dr. G.	Leiden-CWTS
15	Vermeulen, dr. N.	Leiden-CWTS
16	Waltman, dr. L.	Leiden-CWTS
17	Weijden, dr. I. van der	Leiden-CWTS
18	Brenninkmeijer,	RUG-Behavioural Sciences
19	Burman, J.T.	RUG-Behavioural Sciences.
20	Dekker, J., prof. dr.	RUG-Behavioural Sciences.
21	Derksen, dr. M.	RUG-Behavioural Sciences.
22	Schleim, dr. S	RUG-Behavioural Sciences.
23	Beaulieu, dr. A.	RUG-Campus Fryslan
24	Swart, dr. J.A.A.	RUG-SSG
25	Windt, dr. H.J. van der	RUG-SSG
26	Asselt, dr.ir. M.B.A. van	UM- FASoS
27	Bijsterveld, prof. dr. K.	UM- FASoS
28	Bont, prof. dr. R. de	UM- FASoS
29	Cressman, dr. D.	UM- FASoS
30	Harris, dr. A.	UM- FASoS
31	Hendriks dr. R.P.J.	UM- FASoS
32	Homburg, dr. E.	UM- FASoS
33	Hommels, dr. A.M.	UM- FASoS
34	Koenis, dr. S.	UM- FASoS

Researchers (up till 2020)		
35	Lachmund, dr. J.	UM- FASoS
36	Lente, prof. dr. H. van	UM- FASoS
37	Meacham, Dr. D.	UM- FASoS
38	Mesman, dr. J.	UM- FASoS
39	Mody, prof. dr. C.	UM- FASoS
40	Pasveer, dr. B.	UM- FASoS
41	Peters, dr. P.	UM- FASoS
42	Post, dr. J.	UM- FASoS
43	Pott, prof. dr. H.J.	UM- FASoS
44	Saaze, dr. V.	UM- FASoS
45	Schleper, dr. S.	UM- FASoS
46	Sharon, dr. T.	UM- FASoS (until 2018)
47	Somsen, dr. G.	UM- FASoS
48	Supper, dr. A.	UM- FASoS
49	Swierstra, prof. dr. T.	UM- FASoS
50	Vaage, dr. N.	UM- FASoS
51	Vall, dr. R. van de	UM- FASoS
52	Wachelder, dr. J.C.M.	UM- FASoS
53	Ward, dr. J.	UM- FASoS
54	Wenz, dr. K.	UM- FASoS
55	Wesseling, dr. L.	UM- FASoS
56	Wyatt, prof. dr. S.	UM- FASoS
57	Zeiss, dr. R.	UM- FASoS
58	Engel, dr. N.	UM-FHML
59	Horstman, prof. dr. K.	UM-FHML
60	Krumeich, A	UM-FHML
61	Meershoek, dr. A.	UM-FHML
62	Penders, dr. B.	UM-FHML
63	Albert de la Bruheze, dr. A.A.	UT-STePS
64	Konrad, dr. K.	UT-STePS
65	Kuhlmann, Prof. dr. S.	UT-STePS
66	Oost, dr.ir. E.C.J. van	UT-STePS
67	Pelizza, Dr. A.	UT-STePS
68	Stegmaier, Dr. P.	UT-STePS

Appendix A: WTMC researchers and PhD candidates

Researchers (up till 2020)		
69	Visscher, Dr. K.	UT-STePS
70	Weber, Dr. A.	UT-STePS
71	Boenink, dr. M.	UT-PHILOSOPHY
72	Brey, prof. dr. P.A.E.	UT-PHILOSOPHY
73	Molder te, prof. dr. H.	UT-PHILOSOPHY
74	Verbeek, prof. dr. P.P	UT-PHILOSOPHY
75	Boon, Dr. W.	UU-Innovation Sciences.
76	Farla, dr. J.	UU-Innovation Sciences.
77	Frenken, prof. dr. K.	UU-Innovation Sciences.
78	Heimeriks, dr. G.	UU-Innovation Sciences.
79	Hekkert, prof. dr. M.	UU-Innovation Sciences.
80	Moors, dr. E.H.M.	UU-Innovation Sciences.
81	Peine, dr. A.	UU-Innovation Sciences.
82	Raven, prof. dr. R.	UU-Innovation Sciences. (until 2018)
83	Kwa, dr. C.	UvA-AISSR
84	M'Charek, dr. A.	UvA-AISSR
85	Mol, prof. dr. A.	UvA-AISSR
86	Broerse, prof. dr. J.	VU-Athena Inst.
87	Regeer, B.J. dr.	VU-Athena Inst.
88	Zuiderent-Jerak, dr. T.	VU-Athena Inst.
89	Zweekhorst, prof. dr. M.B.M.	VU-Athena Inst.
90	Sadowski, dr. B.	TUE-IE&IS
91	Romijn, dr. H.	TUE-IE&IS
92	Höffken, dr. J.	TUE-IE&IS
93	Wieczorek, dr. A.	TUE-IE&IS
94	Verbong, prof. dr. Ir. G.P.J.	TUE-IE&IS
95	Aarts, Prof. dr. N.	RUN-ISIS
96	Halffman, dr. W.	RUN-ISIS
97	Krabbenborg, dr. L.	RUN-ISIS
98	Meulen, dr. B. van der	Rathenau (until 2019)
100	Est, dr. ir. R.	Rathenau
101	Diederen, dr. P.	Rathenau
102	Bal, prof. dr. R.	Erasmus-iBMG

Researchers (up till 2020)		
103	Bont, dr. A. de	Erasmus-iBMG
104	Zwijnenberg, prof. dr. R.	Leiden: Fac. Literature
105	Maas, dr. H.	UvA-Fac. of Ec. And Buss.
106	Pols. mw. prof dr. J.	UvA, Medical Ethics
107	Burg, mw. dr. S. van der	Wageningen University
108	Maat, dr. H.	WUR-Tech. & Agrar. Dev.
109	Turnhout, mw. Prof. E.	WUR
110	Dr. J. McAllister	Leiden University
111	Prof. dr. J. Slatman	Tilburg University
112	Prof. dr. H. Dijstelbloem	UvA
113	Dr. A. Scharnhorst	DANS-KNAW
114	Dr. J. Harbers	RUG
115	Prof. dr. S.S. Blume	Emeritus
116	Prof. dr. ir. W. Bijker	Emeritus
117	Prof. dr. T. Dehue	Emeritus
118	Dr. R. Hagendijk	Retirement
119	Dr. J. Jelsma	Retirement
120	Prof. dr. L. Leydesdorff	Emeritus
121	Prof. dr. N. Oudshoorn	Emeritus
122	Prof. dr. A. Rip	Emeritus
123	Dr. W.A. Smit (UTwente)	Retirement
124	Prof. dr. G. de Vries	Emeritus

WTMC - PhD candidates active 2018-2020			
1	Carboni	Chiara	2020+
2	Eren	Selen	2020+
3	Greubel	Carla	2020+
4	Grijseels	Mike	2020+
5	Han	Yingying	2020+
6	Hoek	Joyce	2020+
7	Horn	Annemarie	2020+
8	Kuijper	Syb	2020+
9	Niet	Irene	2020+

WTMC - PhD candidates active 2018-2020			
10	Roedema	Tessa	2020+
11	Stalenhoef	Hanna	2020+
12	Wang	Jing	2020+
13	Lamers	Wout	2019-2020
14	Ashkin	Jackie	2019+
15	Beiermann	Lea	2019+
16	Bieszczad	Rose	2019+
17	Bommel, van	Natascha	2019+
18	Brasil	André	2019+
19	Kotsou	Georgiana	2019+
20	Leemput, van de	Dirk	2019+
21	Petzold	Denise	2019+
22	Pijkeren, van	Nienke	2019+
23	Siffels	Lotje	2019+
24	Veul	Ivan	2019+
25	Wojtynia	Niko	2019+
26	Borst	Robert	2018+
27	Huizinga	Sabrina	2018+
28	Koretsky	Zahar	2018+
29	Pinzon Camargo	Mario	2018+
30	Rossem, van	Wouter	2018+
31	Shanley	Dani	2018+
32	Spronck	Veerle	2018+
33	Suci Lestari	Yuana	2018+
34	Summeren, van	Luc	2018+
35	Allison	Rachel	2017+
36	Benedictus	Rinze	2017+
37	Bek	Patrick	2017+
38	Bruno	Matthew	2017+
39	Dekker	Henk-Jan	2017+
40	Dorst	Hade	2017+
41	Gregory	Kathleen	2017+
42	Heerings	Marjolijn	2017+

WTMC - PhD candidates active 2018-2020			
43	Horbach	Serge	2017+
44	Petzer	Brett	2017+
45	Raap	Sanne	2017+
46	Schuijer	Jantien	2017+
47	Stevens	Marthe	2017+
48	Waes, van	Arnoud	2017+
49	Wojcik	Andrea	2017+
50	Zuijderwijk	Jochem	2017+
51	Andrade Sastoque	Ernesto	2016+
52	Duijn, van	Jorijn	2016+
53	Kam, de	David	2016+
54	Manders	Tanja	2016+
55	Mertens	Mayli	2016+
56	Rees, van	Pieter	2016+
57	Salas Girones	Edgar	2016+
58	Semmerling	Linnea	2016+
59	Vrscaj	Darja	2016+
60	Waal, van der	Esther	2016+
61	Dieker	Marith	2015+
62	Egher	Claudia	2015+
63	Ivanova	Dara	2015+
64	Roelofs	Caspar	2015+
65	Smit	Jorrit	2015+
66	Tejada Gomez	Maria	2015+
67	Vegter	Mira	2015+
68	Verkade	Nick	2015+
69	Gammon	Andrea	2014+
70	Cramer	Tessa	2014+
71	Moes	Floortje	2014+
72	Schoor, van der	Tineke	2014+
73	Weingartz	Sarah	2014+
74	Willems	Willemine	2014+
75	Wit, de	Esther	2013+

Appendix B: WTMC Awards 2018 to 2020

2020 | WTMC scholar Cyrus Mody, a historian of science and technology at the Faculty of Arts and Social Sciences, Maastricht University, received an NWO Vici grant of €1,500,000 for his research project 'Managing Scarcity and Sustainability: The Oil Industry, Environmentalism, and Alternative Energy in the Age of Scarcity'. Professor Mody's research project looks into the oil industry's relationship to this debate around the scarcity of resources. Some oil executives were leading figures in this debate, and many oil companies were looking into alternative energy sources, such as nuclear and solar energy.

2020 | Athena Institute wins a 2020 Making and doing award: Nicole Goedhart, Teun Zuiderent-Jerak, Jacqueline Broerse (Athena Institute, VU Amsterdam) and Christine Dedding (Metamedica, Amsterdam UMC) have been awarded one of the three 2020 STS making and doing prizes for their project Learning while doing: vlogs about digital inequality'. In this project, in cooperation with the city of Amsterdam and multiple community centres, vlogs were co-created with women living in disadvantaged neighbourhoods of Amsterdam to unravel the complex interactions between ICT use and socio-demographics. The vlogs give deep insights into (online) difficulties the involved women experienced in the digitised society and emphasize the complexity of digital inequality and urgency for action. With the making and doing award, the Society for Social Studies of Science (4S) acknowledges researchers who have demonstrated scholarly excellence in not only formulating and enacting but also sharing theoretically informed engagement practices beyond the academic paper and book. The project is awarded especially for: "working with materialities and developing capabilities oriented to the resolution of interrelated social problems: digital, gender and income inequalities. The doing is in the making with others.".

2020 | ERC Synergy Grant for WTMC scholars: Willem Halffman, Institute for Science in Society, Radboud University Nijmegen, and chairman of the WTMC education committee, and Cyrus Mody, Maastricht University, have been awarded an ERC Synergy Grant for their project "NanoBubbles: How, when and why does science not correct itself?" (October 2020). Co-winners of the grant are Raphaël Lévy (project coordinator, Université Paris Sorbonne Nord) and Cyril Labbé (Université Grenoble Alpes). Scientific research is based on the idea that any errors made must constantly be corrected. But in practice, it can be difficult to undo mistakes or exaggerated claims made in the past. This can lead to an erosion of trust in science. In the NanoBubbles project, data scientists, nano scientists and science researchers will investigate how erroneous claims in nanobiology can be rectified.

2019 | Trudy Dehue, science sociologist and philosopher, emeritus professor of the RuG, and long-standing member of WTMC, has been awarded the KNAW Academy Medal. The prize was awarded to Trudy for starting the societal debate on important issues in science, in particular the sciences devoted to people: psychology, psychiatry, and brain research.

2019 | Pieter van Rees (RUG) was awarded a Fulbright Scholarship to do part of his research on citizenship education at City University of New York (CUNY).

2018 | Maarten Derksen received the prestigious Cheiron Book Prize 2018 for his book Histories of Human Engineering: Tact and Technology.

2018 | Joost Van Driessche, former WTMC PhD member, has been awarded the Praemium Erasmianum Foundation Research Prize for his dissertation entitled Muishond: Techno-Scientific, Literary and Ethical Movements of Language (2016). The Praemium Erasmianum Foundation annually awards Research Prizes to young academic researchers in the humanities and social sciences, who have written a PhD dissertation of outstanding quality at a university in the Netherlands.

2018 | At the 2018 conference of the European Association for the Study of Science & Technology (EASST) in Lancaster (UK) the Chris Freeman Award was given to Marianne Boenink, Harro van Lente and Ellen Moors for their book Emerging Technologies for Diagnosing Alzheimer's Disease: Innovating with Care (Palgrave MacMillan 2017). This award is given in honour of Chris Freeman, to a publication which is a significant collective contribution to the interaction of science and technology studies with the study of innovation. Selection is based on the successful development of social approaches to the dynamics of innovation, originality, and better understanding of the pursuit of innovation for societal and environmental goals

2018 | Niki Vermeulen (Edinburgh University /CWTS, Leiden University) and her Edinburgh colleague, Bill Jenkins, have created app-based walking tours of Edinburgh that explore the city's heritage in the history of science, technology, and medicine. They have been awarded the Tam Dalyell Prize, awarded annually for excellence in engaging the public with science. If you were in Edinburgh on 15 April 2018, you could hear Niki give the Tam Dalyell Prize Lecture on April 15th as part of the Edinburgh International Science Festival 2018.

2018 | On 26 January 2018, during its 42nd Dies Natalis, Maastricht University awarded an honorary doctorate to Lucy Suchman, Professor of Anthropology and Sociology of Technology at Lancaster University. Professor Sally Wyatt, former Academic Director of WTMC, was her 'honorary supervisor'. Professor Suchman is well-known to the WTMC community, as she was the summer school anchor teacher in 2003, and a member of the international committee that reviewed WTMC in 2010. And of course, she is the author of Plans and Situated Actions (1987, and substantially revised in 2007), a book which did much to stimulate the field of human-computer interaction. Through her research and teaching, she has also made major contributions to feminist technology studies, ethnography, and science and technology studies. Her work has also been recognised by others. Lucy Suchman was the recipient of the 4S Bernal Prize in 2014, and of the Lifetime Research Award from the Association of Computing Machinery (ACM) Special Interest Group on Computer-Human Interaction. More details, pictures and videos of Lucy Suchman's lecture & acceptance of the honorary degree (and a short video about her work), the bestowal of the honorary degree, and Sally Wyatt's Dies lecture can all be found on these Maastricht University website.

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