

Date: September 9th, 2016
Ref.no. BMS 2016.69a

Towards a Vision 2021

BMS under STEAM

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@BMS Technology meets Life

Introduction

This Policy Brief aims to provide the contours of a Vision document for the Faculty of Behavioural, Management and Social Science (BMS) at the University of Twente (UT). It is meant for discussion with the Board of the UT, the Faculty Council of BMS, the IGS Council and Program Committee, the board of Educational Directors of BMS, the heads of departments and relevant Scientific Directors of the Twente Research Institutes in transition. This document is based on an extensive orientation of the development of the faculty by the Dean in the course of the 2015-2016 academic year, discussions among the members of the BMS executive team, presentations with all academic units within the faculty, regular consultations of heads of departments, the contributions of a small group of 'co-readers' of a draft document and many individual conversations with members of the BMS faculty.¹

This document entails a vision of the longer-term strategy of the faculty as an academically rather than merely administratively integrated whole. Awaiting the outcomes of the UT-wide reform and interfaculty collaboration within the context of the renovated Twente Research Institutes and the future governing structure of the faculties - which is currently at the level of the University Board and University Council being prepared for decision-making by the end of 2016 - this document primarily concentrates on the mission and future academic structure of and within the faculty. In a way, this piece reflects the starting points and vision from which the leadership of the faculty engages in the current university wide discussions on structure and profile of the university. Whatever the precise outcome of the UT wide discussions, there is much work to be done at the level of the BMS faculty in terms of profiling, programming, restructuring, organization, professionalization of support and balancing budgets. Cross-university and external collaboration are part and parcel of the contemporary academic enterprise and will be more explicitly addressed and dealt with in more detail where necessary at the next stage, when the contours of the profile, structures and conditions of the UT wide research collaboration will have become clarified.

¹ We would like to thank Ciano Aydin, Ton de Jong, Ariana Need, Petra de Weerd-Nederhof, and Bernard Veldkamp for their constructive comments on a previous version of this Brief.

Taking the situation in year 2015/16 as point of departure, the time horizon of this Brief is the Year 2021. The message is clear and simple: be excellent in your academic core business, AND strong in innovative connections: *Interdisciplinarity is the future for BMS*.

In order to further develop its distinct profile as a significant Social Science Faculty at a University of Technology, cross-disciplinary work is needed, not only between fields within BMS, but also between the social sciences and the technical sciences. Historically speaking, modern technology is an example *par excellence* of the intricate connection and interrelatedness of human behaviour, institutional development, engineered and physical systems in providing solutions to emergent societal challenges. BMS in its current composition is excellently positioned to rise to the occasion, provided its incumbents show the agility to cross borders – in different respects – and cooperate, internally as well as externally with researchers and programmes, inside and outside the UT. A potential weakness – a high degree of internal diversity and fragmentation – might well become an asset: excellent in discipline, strong in connectivity. BMS is – or at least requires – an innovation in itself. BMS has to set its own benchmark.

This document constitutes the rounding off of the first exploratory stage of a multi-year process of repositioning BMS and its constituent parts as strategic partners to the HighTechHumanTouch (HTHT) mission of the UT. The purpose of the academic year 15/16 has been to start addressing the following longer-term agenda, which – after some preliminary background remarks – also provides the structure to this Policy Brief. After providing some background information about the preceding process (section 1), the Brief addresses:

- The Strategic Perspective – HighTechHumanTouch (HTHT) and Science and Technology in Society (STS) (section 2)
- The Organizational Perspective – collaboration, integration, flexibility, consolidation and professional support (section 3)
- The Research Perspective – Critical mass and interdisciplinarity under the new Standard Evaluation Protocol (SEP) (section 4)
- The Educational Perspective – Internationalizing core business (section 5)
- The Budgetary Perspective: the bottom line, is the bottom line (section 6)

Although the observations in this Brief have been shaped- inter alia - by many informal and formal meetings inside and outside the faculty, they need to be further adapted, elaborated and customized to BMS content and context in terms of history, research projects, teaching programmes and the university environment. The projected budgetary situation poses a tough challenge for the BMS faculty as a whole. As a next step, a reality check is needed at the operational level of the departments to ascertain, whether the assumptions underlying the development of the budgetary prognoses at the aggregated ‘macro’ level of the faculty presented here, in time can be synchronized with the operational educational and contractual commitments at the ‘micro’ level of departments and research groups. This can only be done by further involvement and discussion. It will take time. It deserves to get time. At the same token, the reality of the budgetary process dictates that time is ticking and that there is a need to act as

well. On the basis of the various discussions of this document, the aim is to arrive at a more detailed and elaborated budget and reform plan – including an explicit vision on external collaboration and international positioning – at the beginning of the next calendar year, as much as possible embedded in the regular cycle of the UT budgetary planning and control process.

1. Background: Two organizations, one Faculty

This document deals with a dynamic topic, changing under our hands and by our doing. In various respects, the future is already not anymore what it used to be at the beginning of the 2015/16 academic year. The subject matter – the ‘existing situation’ – has been changing over the past academic year, due to external changes, but also under the impact of various measures taken by the management of the faculty – one might think for example of the dramatic increase of student enrolment in the Psychology program caused by the change in internationalization strategy in the Fall of 2015 for the year 2016/17. The precise change in volume and the future robustness of this increase in student numbers at the start of 2016/17, is still uncertain. There are more examples. Various personnel measures have already been taken (for example the self-initiated merger of the two departments of Communication Science), anticipating the changes proposed in this Brief, but therefore also in a way changing the nature of the 2015 ‘point of departure’ taken in this document. Indeed, the lack of up to date ‘management and control information’ is one of the perennial problems we have to deal with and are currently working on. In the following, ‘data’ sometimes refer to the formal figures of the 2015/16 paper ‘budgetary reality’, sometimes we incorporate or anticipate changes that occurred in the meantime on the actual working floor for a more meaningful strategic projection. Over time, these differences will become synchronised. Despite the encouraging signs at the beginning of the 2016/17 academic year about the reversal of a trend, the overall default backdrop against which this document is written, may be depicted as one of retrenchment and decline. With the strategy outlined in this Brief, rather than a Big Bang, we are aiming at a strategy of ‘Manageable Decline’. Other things staying equal, we have to strive for a faculty likely to become ‘Smaller but (even) Better’.

This doesn’t mean we have no ambitions, or that we would reject growth if the chance occurs, nor that we do not aim at it if we see an opportunity fit. But at this point of time in the longer term development of the faculty we have chosen for a position of realism. This document should not represent an exercise in wishful thinking. We do not want to build a vision on projected future growth without the signals of such a development clearly at hand and ‘under control’. The idea underlying this presentation is therefore that consolidation proceeds possible growth. If this growth is to occur, it will have to follow from a deliberate internationalization strategy. The regional demographics on the middle-long term lead to no other conclusion. For effective internationalization we need time, internal consolidation and a shared strategy. Our strategy is entrenched with the conviction of having to give priority to deal with the steady decline of resources, following a steadily declining student enrolment in the past few years, and across the board of the many programs the faculty offers. Even if we are able to turn the

tides at this very moment, lagging budgetary consequences still will strongly affect the financial situation in the few years to come.

The fact that we take the year 2015/2016 as point of departure for this analysis, doesn't mean that nothing has been happening over that year. With a new Dean taking office in April 2015, after an interim period of over 12 months from the previous Deanship, there was a clear and recognized need to bring stability to an organization that in recent years had been subject to a host of reforms and changes at all kinds and levels. It was agreed with the Board of the University in the Fall Review of October 2015 to give priority to the *going concerns*. The preparation of the 2017 multi-year budget - in the second half of 2016 - would be used to induce and engage in a process to arrive at a shared strategic vision fitting new organizational arrangements, with a Horizon of 2021.

From an operational point of view full priority was given to a number of pressing and urgent issues, most notably a steadily declining student enrolment over a period of a few years to date and across a broad range of programmes of BMS programmes, particularly at the undergraduate level.

In addition, the always tedious but inevitable process to translate the formal merger of 2 separate Faculties at the start of 2014 into one administrative organization still required much time, energy and attention by the management of the faculty. Beyond paper, the 2014 reform was far from completed. Two separate organizational and administrative entities, with very different operational working processes, cultures and procedures in many respects still had to be integrated into one, consolidated administrative and managerial organization.

As far as the research profile is concerned, the publication record shows that the baseline to start from does not yet reflect a history of strong research collaboration among the different constituent research groups of BMS, which currently make up for one faculty. A first inventory of research output indicated that out of a total of 3362 publications by BMS researchers counted over the period 2013 – 2015 (3 years) only 23 (i.e. 0.68%) reflected cooperation among researchers from the two former faculties MB and GW. Of the total number of 3362 publications 31% was written/published with members of own units (vakgroepen) without any external cooperation, 59% with researcher(s) outside BMS (of which 1,2% with researchers from the UT faculties of EWI/TNW/CTW) and 10% with other researchers within BMS as a whole.²

Although much remains to be done on these fronts, some clear progress has been made. Student enrolment for 2017/18 seems to reflect signs of recovery, which is particularly encouraging since it is taking place within programmes where deliberate strategic changes have been carried through since the second half of 2015 in terms of internationalization and bringing about a clear focus on behavioural science and technology. This shows potential for resilience in educational programmes for the faculty a whole.

² Data provided by the Strategic Office UT

Many separate administrative issues have been resolved or addressed for the future (e.g. educational organization and examination boards). Important administrative staff positions vacant since the end of 2015 have been refilled in the course of the Spring of 2016. A demanding reorganization at the Public Administration department has been successfully implemented within the past year. Many pending individual personnel cases have been addressed and handled. The Tenure Track-procedure has been reoriented and streamlined on the basis of the outcomes of the university-wide evaluation in the Summer of 2015. The cycle of annual HR reviews is in the process of being rejuvenated.

The Tech4People programme, dedicated at fostering innovative multidisciplinary cooperation with a clear technology component, has successfully run for two consecutive years: a total of 88 high-quality multidisciplinary proposals were submitted in the first round, and 66 in the second. In total 10 PhD, 10 postdoc and over a dozen exchange proposal grants were awarded and are currently well on their way. Many proposals that did not make it to the final round generated so much enthusiasm that they were continued one way or the other: with the help of small(er) BMS and fellow institute seed funds or by generating outside aid. The new (research) orientations also have found their way into the teaching programmes of the faculty. Although much work can and needs to be done in terms of positioning and outreach, all of them have started to bear the signs of strong and determined focus on social science and technology.

The appointment of the Dean of BMS as of January 1st, 2016 as acting Scientific Director of the IGS (Innovation and Governance Studies) Research Institute, joined by Ellen Giebels as Associate Dean Research BMS, has been used to start stocktaking of on-going developments at the research front (e.g. an integral data management plan, the opening of an advanced social sciences and Tech4People lab), identifying spearheads for research from a BMS faculty point of view in joint collaboration with the other faculties and research institutes, and to enact a strategic exploration of potential fruitful ways forward with the help of CWTS (and using the 2015 3TU Impact Analysis; final report due in the Fall of 2016).

The months of April-May-June 2016 have been used to step up internal consultations. This generated an intense process of deliberation and discussion at the level of research groups, departments, department heads, directors of educational programmes, IGS programme council and among the supporting staff, about the future direction of the BMS faculty as constituent unit of the UT. A facilitating, but in terms of planning also complicating factor was that at the same time university-wide discussion about repositioning of the UT Research Institutes as part of the overall University strategy and governance structure took place. This discussion is still ongoing and bound to be rounded off in the Fall of 2016, delineating the new conditions under which strategic and university-wide research (5 year) planning and programming is to take place in the foreseeable future.

2. Strategic profile: STS @ a HTHT University

A crucial question in the faculty broad consultations was: How to position a Social Science Faculty at a University of Technology? Why and how to integrate natural and behavioural science into a comprehensive approach to engineering: *Analysis, Design, Organization* – the 3 O's (*Onderzoek, Ontwerp en Organiseer*) – that constitute the cornerstones of the UT philosophy to education and research?

Our answer is that, first of all, the BMS profile has become too much 'mainstream', losing the competition with less eccentrically situated universities that offer comparable programmes in terms of teaching and research. Therefore, we need to rediscover our niche. This niche is our connection to technology. For this, we can build upon the various ways in which BMS departments relate the social sciences to technology. Such a unique profile fits the HTHT profiling mission of the UT and will potentially make us more attractive to students who cannot do elsewhere what they can do here, providing them with a convincing reason to cross the IJssel. To this end, internal collaboration is key. We will stimulate the formation of clusters of chairs or research groups – in line with the upcoming UT strategy to organise faculties in terms of capacity groups consisting out of six or seven strategically related Full professorships and PI's (Principal Investigators). Later in this document, four new clusters are envisaged for the future governance of the faculty. Next to the integration of teaching under the Twente Educational Model (TEM) and a drive at combining the joint delivery of teaching programs at the faculty level, new and renewed SEP proof BMS/IGS research programmes will be put in place that will all relate the social sciences to technology and will be aimed at stimulating – 'incentivise' – not only administrative, but also substantive intellectual collaboration across the various groups, both within as among the projected organizational clusters.

Second, our programmes need to benefit from the common orientation towards technology in all of our programmes, by developing joint courses, projects or even modules. This will not only further profile our programmes as 'Twente' programmes, but it will also make it possible to offer good and attractive programmes with less faculty, an indispensable ingredient of a faculty which aims at 'doing more with less'.

Finally, and more than ever, we need to develop strategic cooperation with think-alike universities in the international arena. To this end and in line with the UT strategy, we have changed the language of instruction of our teaching programs, and in various other ways already promoted the internationalization of our master and PhD education. We have established a new BMS Internationalization Committee, which, next to initiating concrete actions at raising our international profile and visibility, aims at making an inventory of existing and potentially broader international partnerships that various groups within the faculty maintain in order to seek synergy and opportunity for institutionalised international strategic partnership, for research, but also the development of dual and joint degree programs.

The proposed profiling as a Faculty of Social Science and Technology reflects and takes up a broader, underlying trend. Many, highly ranked contemporary 'Technical Universities' around the world make or already have made the transformation to becoming full-fledged Universities of Technology by incorporating humanities and social sciences – broadly understood – into the core of the rank and file and stock of their offerings, collaborative research and education efforts. As part of this development, historically well-established relationships between 'engineering' and 'management' or 'ethics' and 'engineering' have broadened to include the concern for human behaviour and institutional norms and regulation. 'Arts and humanities' - like history, philosophy, ethics, aesthetics, and science and technology studies - have become a quintessential ingredient for 'design', entrepreneurship, and to address the look and feel – the human touch - of technical artefacts and systems from the standpoint of the user or a general public. At the same time, under the emerging conditions technology offers an incredible amount of new ways to do social science and as such operate at the forefronts of contemporary social science research: to innovate it, to advance theory development, and to increase application potential. At the same time, the sometimes naïve belief in unlimited possibilities of 'big data' and 'technical science', or the 'hard scientific nature' of 'computational social science' that would even 'turn management into science' needs some proper counterweight from knowledgeable social scientists, devoted to studying the role of technology in modern society and approach the interrelationship of human built technological systems from an impressive body of knowledge represented by social theory, the arts and humanities.

The longstanding ambition of the UT to operate as a 'dual' university in incorporating technical and social sciences in one university-wide mission is to be invigorated. A vision of duality has to be transformed into a vision of integration.

Integration is a mutual process. From the viewpoint of Social Science the development towards Engineering as a strategic and contextual frame of reference implies that an attitude towards 'objective' and 'positive' science is giving way to the inclusion of normative science, human needs and societal problems oriented analyses. Not only in terms of applied ethics and philosophy, but also in terms of looking for practical solutions for human needs. This ambition pushes practical problems and human values forward as central concerns for - both social and natural - science-based teaching and research. This is - for example - being reflected in the Twente Educational Model (TEM), which has been implemented over the past 4 years.

An engineering orientation implies a focus at real-life problems, human well-being and grand societal challenges. It entails an ambition to 'design' and 'develop' next to the generic scientific mission to 'explore' and 'understand'.

A practical orientation also feeds empirical research, which in a time of Big, large scale, real-time and heterogeneous, non-standardised Data requires the ability to work across traditional distinctions between qualitative, quantitative and computational methods. This calls for joining up multiple methods and stimulating pragmatic and innovative approaches in terms of experimentation,

learning from doing and adaptive decision-making; modelling, simulation and visualisation rather than Blueprints and Grand Design.

When approached from the perspective of the engineering sciences, the context within which contemporary science-based engineering is to be conducted, mirrors the developments described for the social sciences. Leaving aside for a moment the still strong differences in terms of mathematical and computational orientation and methods in use, the art and act of technical engineering has moved into the direction of social science in the broad sense of the word. 'Management' of technology has become a longstanding concern among engineers. Attention has shifted from a focus on (technical) 'functional requirements' to the inclusion of organizational structures and incentive – 'management' - systems as part of the engineering enterprise. Lately this development found, for example, a new peak in the broad attention for 'Nudging' and 'Behavioural Data' as integral parts of the industrial and systems engineering enterprise.

Attention is demanded of civil and mechanical engineers to think in terms of services rather than artefacts. Not only has the vision of the T-Shaped engineer widely entrenched engineering programmes and curriculum development, but also more in general humans and social systems have been brought well within the reach of the legitimate domain of 'engineering systems', be it often still in a rather limited role as 'users', 'clients' or 'stakeholders'.

We see a movement from science-based engineering to engineering-based science. Experimentation, interventions and innovations bring about new scientific questions. Not only in Nano-technology or natural and medical life-sciences, but also in terms of issues of cognition, privacy, accountability, safety, security, ethics and responsibility that come with modern, 'disruptive' technology based and 'engineered innovations'. This inevitably will bring attention for the 'whole' human being to the core of engineering. Subsequently, the classical orientation at industrial sectors and traditional engineering sectors – e.g. water, energy, transport, traffic, infrastructure – is gradually giving way to a movement in which 'Sectors & Silo's' are being replaced by attention for 'Cycles and Societies'.

The Internet of Things (IoT) will not only contribute to an increased attention for 'autonomous systems' (robots, drones, automotive) but also demand attention for Systems of Systems – the boundaries of which are encompassing or including human, social and institutional systems - into the engineering equation. The attention is shifting from the analysis of 'complicated' systems towards the understanding, design and formation of dynamic, 'complex' systems.

In the context of engineering and innovation, the relationship between natural, biological and social sciences is changing. Increasingly complexity science becomes the bridge between engineering, technical and social science. In any case, the 'Dual nature' of the UT has given way to a vision of 'systems integration' in conducting modern academic higher education at a research university.

Instead of 'bridging the divides' among natural science, engineering and humanities it has become critical to be able to integrate systems and teams of

experts from different disciplines. Technology Transfer has transformed into Tech entrepreneurship. Technology assessment has developed into the constructive art and craft of managing added value and optimize the value-chain. 'Optimization of functional requirements' under the current disruptive and therefore 'systemic' circumstances often spills over and translates into the need for being capable to balance normative – social, political and cultural – trade-offs and account for it: responsible innovation.

HTHT: Technology, Society, People

For BMS, this is the way to go. Rather than contemplating the past, BMS should already be setting its mind on how to face and address the future. The UT has always profiled itself as a university for technical and social sciences, combining 'high tech' and 'human touch'. In order to create a sharper profile for our educational programmes, a stronger focus in our research programmes and a firmer basis for societal relevance and valorisation is needed. Time has come to further orient the social sciences towards technology and stimulate further integration of the attention for natural and engineered systems, human and institutional behaviour and decision-making and management in a time of 'Big Data and New Statistics'. The interrelationship of technology, society and people increasingly constitutes a core domain for research and technology in and of itself.

The previously outlined developments have induced an evolution of this field already well established in the US, most notably at universities like MIT, Carnegie Mellon or Georgia Tech. Recently, highly regarded and rather 'traditional' Technical Universities at continental European mainland – for example Munich and Aachen - follow suit. They invest considerable resources to the build-up of schools and divisions dealing with the role of STS (Science and Technology in Society; also broadly understood and encompassing culture, policy, governance, politics and enterprise systems) and the other way around: how does society, human behaviour and the quest for the advancement of human wellbeing affect technological achievement? For some of them, the UT and particularly parts of the BMS faculty serve as a beacon.

This development is to be understood against the backdrop of the development of the critical role of technology in modern society, a point of departure, which hardly needs further introduction or clarification here. If there is one theme that runs across the various debates with rather broad ranges of the faculty, it is that the social sciences- as well as engineers and natural scientists for that matter – have developed a wealth of different concepts and frameworks to address roughly the same aspects and phenomena in contemporary society. This creates difficulties in understanding each other and thus complicates collaboration. But at the same it is a sign of the times that the strong interplay of technology, human life and social institutions in an age of 'big data and new statistics' gives rise to many common developments – usually represented these days as "Grand Challenges" – to be addressed in academic research and higher education. This harnesses hope that there is more common ground than one might be able to see at first sight, or some others sometimes seem to hope for.

The relations between science, technology, and society, therefore, are not only a domain of study for the academic field of Science and Technology Studies; they can form the basis of all work done in a Social Science Faculty at a University of Technology. Because of their profound impact on people and society, after all, technologies help to shape the main domain of study for the social sciences we have at the UT: human behaviour, societal structures, institutions and processes, business and entrepreneurship, education, communication. Also, precisely because of their profound societal role, technologies ask for policy, governance, accountability, ethics, and critical reflection. Moreover, technologies are providing an even more sophisticated infrastructure for doing social science research, ranging from big data and computational social sciences to sensor networks and 3D devices in order to study human actions and interactions.

In sum: the development of modern society lumps together hitherto well-established and meaningful academic divisions of labour, specializations and 'disciplines'. The Network Society, The Digital Society, The Big Data Society, the Smart Society, The Surveillance Society, The Circular Economy Society, The Metropolitan Revolution Society, The 3rd and 4th Industrial Revolution Society, The Sustainable Society, The 21st Century Skills Society - different concepts refer to similar, at least related, historical and technological developments in our lifetime. Disciplinary specialists face a common quest for understanding, designing and redeveloping substantial quarters of our modern and still increasingly globalizing human habitat.

The need for 'comprehensive analysis', 'systems thinking', '(complex) system science' and 'inclusive engineering' – also in the social sciences – is more acute than ever, and called for by many respected academic institutions in Science and Engineering. Society, behaviour and human life are more and more being included when meaningful borders of 'technological systems' have to be drawn: the dynamics of social-technical systems (STS) make-up for large part of the essence and dynamics of modern technology development.

The higher education and university enterprise system in and of itself is part – not just bystander - of this transformation. Just as the rest of society and like it or not: science is changing and so is higher education as well as the way in which research and education is conducted, funded and organized.

BMS under Steam: Technology meets Life

All roads lead to where we stand. The formation of BMS knows many stories. Arguably, the reform has been brought about from an ambition to establish a constituent, carrying, self-conscious and 'co-creating' Faculty of Social Sciences – a comprehensive concept encompassing also behavioural science, management and humanities - at a university of (also conveniently labelled) engineering and technology.

Let us think about the future role of BMS in terms of the *UT Institute for Social Science and Technology*. An institute, which is not just following, but also setting the agenda for teaching and research related to the current and future role of science and technology in contemporary society.

At BMS, Technology meets Life: biological life, individual life, life styles, social life, human life, the good life, cycles of life, life in the digital society, personal life, private life, public life, corporate life, urban life, community life, family life, entrepreneurial life, organizational life, managerial life, administrative life, bureaucratic and political life. Prosperity, inclusion, sustainable development, human wellbeing, health, safety, security, resilience and personal development become critical standards in the assessment and quality of the Human Touch in the development of a Digital Society and the assessment of impact of technological development in a changing land and its increasingly global environment.

The formation of a comprehensive Faculty of Social Science at a Technical University – with the establishment of BMS - may well be perceived as the institutional reflection of a global trend. A trend not every other university or institution of Higher Education is able to adhere to, simply because the preconditions don't exist there. It is a trend, which under the current circumstances signals considerable advantages. Worldwide “technical” STEM (Science, Technology, Engineering, Math) programmes, both in research and teaching still show growth in the face of declining resources and investments in ‘the social sciences’ as such. Among engineering and technology programmes it is increasingly being accepted that innovation, design and entrepreneurship require inspiration, knowledge and experience from the arts, the humanities and the social sciences, including knowledge of ethics, law, culture and human behaviour, going well beyond the knowledge of venturing and ‘how to write a business plan’.

STEM related programmes still reflect growth in research budgets and investments. It is the Arts and Social Sciences which have the potential to provide creativity and human touch to the design oriented programmes at a ‘School of Engineering and Design’ with the ambition of contributing to solutions and making the difference in designing approaches for solving pressing societal problems. Combining STEM and Arts, therefore, can put BMS under *Steam*, reflecting both the mission and the drive of an engaged and motivated Social Science Faculty at a modern University of Engineering and Technology, in and of itself in transition.

Integrating Social Sciences and Arts with STEM is not a process of subordination or assimilation. It is, and it should be, a mutual process. Required development by now has gone way beyond the ‘assessment’ of the risks and potential of new technology, assimilation of certain ethical, entrepreneurial or communicative considerations to get technology ‘implemented’, or the design of smart seductive strategies for the blessings to be ‘communicated’ and for ‘nudging’ users so the engineered artefacts are actually becoming ‘adopted’.

There is nothing wrong with these important concerns, but there is so much more than a merely instrumental role for social science in service of technology. Machine learning, computational social science and algorithms on their own do not make sense, leave alone that they reflect the dynamics and evolution of human life in all its variety and intelligence. They require theoretical context and understanding. International High-tech business is often as much interested in getting access to an understanding of (Big) Human Behavioural Data, as it is to

purchase BAT (best available technology) or the latest technical innovation on the market. Giving meaning and making sense is as important as making chips and generating digits.

BMS@UT

The UT Strategic Vision 2020 is based upon four principles:

1. International excellence as a condition
2. An enterprising habitus and entrepreneurial attitude
3. Innovation and flexibility in combining disciplines
4. An orientation at societal challenges and real life problems

Given the background analysis presented here, there is ample reason to take on the UT mission for 2020 as departing point for developing the BMS Strategy 2021, as an *Institute for Social Science and Technology*. There is, however, no standard model to follow, nationally or internationally. BMS houses a wealth of different disciplines, even more than traditionally were being identified by the 'disciplinary' organizational build-up of the two former faculties. The broad range of academic disciplines actually represented by the rank and file of current BMS faculty – many of them operating at a level of quality and impact well above world average – is not easily found elsewhere under one and the same roof, providing both a challenge and an opportunity for future development. BMS operates within the distinct context of a University of Technology (and engineering), which brings along an entire set of requirements and opportunities not easily applicable or available to the 'average' Social Science Institute in the Netherlands, or even 'around the globe'.

BMS is – or at least requires – an innovation in itself. There is no standard format to be copied among the regular Social or Behavioural Science Faculties or Management Schools at Comprehensive Universities, nor at the other Technical Universities of the Netherlands. The size of the faculty as such is substantive enough to be able to make a difference, provided the efforts to make the difference are not scattered but consolidated. BMS has to set its own benchmark. Nostalgia towards the comfort zones of traditional and familiar disciplinary 'homes' faces the realities of the current – and at the working floor not yet always appreciated – demand for 'critical mass' in the highly competitive research funding environment, both nationally and internationally. These developments need a mirror image in teaching.

Rather than sorting out and reducing variety by competitive selection along disciplinary lines, the way forward to achieve economies of scale and scope in the context of BMS is to seriously adhere to one of the core strategic principles of the university: 'be excellent in your academic core business, and strong in innovative connections'. *Interdisciplinarity is the future for BMS.*

3. Organization@BMS

On the basis of the UT strategy HTHT considerations, the accompanying Tech4People investment programme, the ambition for BMS to become an indispensable foundation for carrying out the UT mission, and the need to build

an efficient and flexible organization, we target four large clusters. These clusters act as capacity groups in the making, each contributing from its designated perspective to the various joint research- and teaching programmes for which BMS carries responsibility.

The grouping is in line with the UT ambition to introduce capacity groups and capacity budgeting in the form of larger clusters, consisting of several – at least 4-6 – full-professorships and PI's (Principal Investigators). In our case, the clusters are deliberately not formed along disciplinary lines, even if this would have been feasible, but on the basis of implicit or explicit affinity in ways to interconnect social science and technology.

The four clusters presented here are formed to jointly facilitate the joint educational programmes of the faculty as well as the joint research programmes of the faculty and institutes, by creating intellectual 'home bases' for groups beyond disciplinary lines. Also, pragmatic and organizational considerations play their role. The clusters preferably have to represent stable building blocks for a lean and professionally run and supported academic organization, with an efficient management cycle and control process able to replace the currently way too fragmented, time consuming and therefore often inefficient – and underspending – interplay of over 22 separate administrative units, each of them too small to cope with the challenges outlined in the previous sections and currently requiring way too much 'micro-management' by senior leadership of faculty and departments.

The clusters in the making have to provide the opportunity for decent organizational capacity and support to engage in effective further planning and development of the common BMS mission outlined. As capacity groups they have to be able to operate as rather stable organizational units, not only comparable in terms of size and 'capacity' for teaching and research, and therefore stable and longer term 'capacity budgeting', but also to accommodate and adapt to the predictable changes and developments over time in teaching and research programs for which they provide the 'capacity'.

Although we envisage a division of labour in terms of primary responsibilities and lead roles in the development of our research and educational programs, we do not a priori aim at a one to one relationship between clusters and (research and teaching) programs. In a time of 'multiple methods' as the basis for scientific progress, we envisage a future where all our educational, research and valorisation programs require contributions from all four clusters, be it most likely in different combinations, mixtures and volumes of 'capacity'. Overarching topics like "health", "cities", "manufacturing", "emerging technology" or "learning" clearly may and have to benefit from the capacity and expertise represented by all four units – rather than just one or two - in order for the intellectual and disciplinary diversity and organizational capacity within BMS to be fully exploited.

The groups in clusters envisaged here, share a common basis but are also sufficiently different among each other to stimulate programmatic multidisciplinary cooperation in research and education on a day to day basis. The different clusters are envisaged to all contribute to the different teaching and

research programmes, which BMS is providing or has to (re)develop under the new Standard Evaluation Protocol (SEP). The framework of clusters as a whole is therefore meant as platform for inducing and facilitating collaboration, not a system of closed and monolithic entities, leave alone 'sub-faculties'. The structure serves as an experiential device to explore the potential and possible variation of interrelations among various groups in building future-oriented, forward looking research programmes and teaching initiatives, reflecting BMS' strategic ambitions in this area. These programmes – also the existing ones - are strongly in development.

In creating innovative connections, new interdisciplinary crossovers are being encouraged and supported by the regular and strategic funding process under the regime of the new UT research policy and institutes. For both research and teaching, real-life societal problems as well as the ambition to make a difference and have true societal impact should be leading. Societies do not restrict themselves to disciplinary or organizational boundaries. We also expect further pressure and incentives for faculty sharing and joint collaboration in the delivery and carrying out of our educational programmes. The pro's and con's of moving into the direction of a faculty wide bachelor will be explored as part of the scenario study of how to cope with the upcoming challenges for the faculty under different financial assumptions.

The organizing principles for the envisaged clustering are:

- 1) Clusters share a (dominant) way of interconnecting social science and technology: social science for technology, social science of technology, social science by technology, social science in technology.
- 2) Within the clusters different levels of analysis are represented: in the context of joint research and educational programmes they are able to address the individual, community, institutional, and system levels.
- 3) In the context of joint research programmes, all cluster groups engage in the academic cycle of addressing domains and challenges, using concepts, employing a variety of concepts or methods and practicing valorisation in the broad sense of the word: generate social impact. Each of the clusters will therefore be able to take a primary role in the joint development and carrying out one of the 4-5 major research programmes for BMS under the lead of the BMS portfolio holder research envisaged under the new governing structure for the UT faculties as a whole.
- 4) Different research themes and domains (e.g. health, learning, industry, locality) are addressed within each cluster, to advance cross-fertilization (e.g. on important scientific concepts such as well-being, optimization, customization, adaptation, resilience, responsibility, legitimacy, or trust).
- 5) Taken together the four clusters constitute a balanced, stable and longer term strategic platform for engaged and effective faculty wide collaboration and cooperation in the design, development and implementation of joint education and research programmes as well as for societal outreach initiatives, while allowing for an effective and stable multi-year human resource planning and transparent budgeting-system.

Taken together, this leads to the proposal of the following four tentative clusters as the working organization for the year 2016/17 and anticipating the new UT wide organizational and administrative structure expected to be introduced from the Fall of 2017 onward. It should be added that the labels and acronyms are for pragmatic use here and reflect work in progress. Over the next year they will have to be reviewed from a 'communicative' point of view for a perhaps more intuitive and externally recognizable labelling and presentation:

1. The Technology, Policy and Society cluster (TPS)

Social Science for Technology

Profile: studying science and technology in relation to the advancement and development of society, in order to explore ongoing and future developments and contribute to the quality of scientific and technological practices in order to generate new academic, strategic societal and policy perspectives at the horizons of socio-technological research in social science and engineering.

Groups included: HTSR-CSTM-PHIL-STEPS-CHEPS

2. The Technology, Human and Institutional Behaviour cluster (HIB)

Social Science of Technology

Profile: studying social and behavioural science from the perspective of the role of technology in contemporary society in relation to human and institutional behaviour from a multiple scale, multi-systems perspective, in terms of personalisation and human well-being, risk and trust, power, responsibility, accountability, resilience and change.

Groups included: CW-PA-PCRS-PGT

3. The Technology, Data-analytics and Decision-support Systems Cluster (DDS)

Social Science by Technology

Profile: studying social science and data analytics for data driven customized human decision support and learning systems with the help of technology and technologically generated data and data analytics and by doing and computational behavioural research in various strategic domains of science and technology development.

Groups included: CPE-ELAN-IST/OWK-OMD

4. The High-tech Business and Entrepreneurship Cluster (HBE)

Social Science in Technology

Profile: integrating social and engineering science into a techno-entrepreneurial environment at various levels of social innovation and management of technology in society in order to arrive at actionable knowledge for innovating business-models and socio-technological enterprise systems with optimized solutions, sustainable impact strategies and responsible social-technical business models for open innovation.

Groups included: CMOB-HRM-IEBIS-FA-NIKOS-TMS

When granted the opportunity, we deliberately choose a guided, organic approach – rather than a big bang – to the introduction and organizational development of these clusters in the context of BMS. This is done partly to respect the call for

continuity in the face of all turbulent changes of the past, but also to be able to follow an adaptive strategy, capable of dealing with changing external developments. We also believe that creative and innovative connections, substance and content, not disciplines should be leading in a translational, challenge and design driven organization of research and teaching programmes. Final decisions about the organizational structure may be adapted accordingly. The moment for decision-making in this respect will be the Fall of 2017, with the introduction of the new UT steering model at the level of the faculty and institutes.

In order the secure collaboration and the solid implementation of the academic and financial strategy outlined in this Brief and for the working floor to reap the benefits of the grouping of capacity groups into clusters, a well-designed new planning and control cycle and strong (strategic) HR management are key to achieve our goals. We strongly need to improve the management information and management control system, which requires close collaboration with the UT management. The vision and future perspective of the BMS faculty will be focus point in the annual HR performance interviews and the subsequent long-term personnel planning discussions with all scientific groups and departments. In addition, we will use the UT reorganization in the light of the new research cooperation and the introduction of a new faculty governance system to launch a quality improvement programme of the BMS administrative services and support, leading up to a potent and flexible organization where full professors and principal investigators are being assisted by well-chosen, talented and more broad-oriented scientific staff and professional support in carrying out their duties and ambitions. This implies substantial improvements in the selection of new staff and development of current administrative staff.

Table 3.1. Permanent staff new clusters

Staff	TPS		HIB		DDS		HBE	
	2016	2021	2016	2021	2016	2021	2016	2021
(full) Professor	8,0	5,9	10,5	6,6	6,1	4,7	10,1	8,2
(adjunct) Professor	0,0	0,0	0,9	0,9	3,0	3,0	1,0	1,0
Associate Professor	9,0	7,6	7,5	7,1	5,6	4,6	8,3	8,3
Assistant Professor	10,1	9,1	24,4	23,7	14,3	13,3	18,8	18,8
Lecturer	0,0	0,0	2,7	2,7	3,4	1,0	3,8	3,8
Researcher	12,9	11,9	0,5	0,0	2,0	2,0	0,8	0,8
Other	0,8	0,0	0,0	0,0	1,0	1,0	0,0	0,0
Total permanent staff	40,8	34,5	46,6	41,0	35,4	29,6	42,8	40,9

Taken together, and leaving details aside, the four clusters presented here constitute a rather stable and robust but still flexible platform and organizational framework for staging the further development of the BMS faculty as outlined in the previous section. The individual clusters are currently about 35-45 fte permanent staff in size, stable over the planning period towards 2021 which, *ceteris paribus*, will be characterised with a decrease of tenured faculty allowing at the planning horizon for clusters of 30-40 fte permanent staff (see Table 3.1.). Differences can be explained and attributed to stable differences in educational

missions or external research orientation and funding. Although more and detailed analysis is required, financial risks appear equally distributed across the 4 proposed clusters. The same applies to the spread of full-professorships and adjunct professors TT positions with that perspective.

An assessment in terms of educational load and PhD education still has to be conducted, but initially no structural deficits or misbalances seem to have to be expected. The four clusters each share common educational missions – internally, externally or in terms of faculty wide educational service functions. They are mutually interdependent on one another in developing joint SEP proof Research programmes.

The relevant question at this stage of institutional development of the faculty is not so much the structuring in clusters in and of itself, but how the different disciplines and groups are best combined into externally relevant and overarching academic research and teaching programmes, which may be expected to make the difference and – because of that – stand a decent chance of flourishing under the current and emergent circumstances. *Collaboration is the future at BMS.*

4. Research@BMS

Critical mass and cross-disciplinarity under the new KNAW/VSNU/NWO Standard Evaluation Protocol (SEP)

The external and international profile of the faculty BMS will be largely shaped by the research programmes it conducts. Future research programmes of BMS are technology oriented in terms of scope, methods, locus and scientific purpose. Participation in external programs will have to meet this standard as well. In various occasions this will require a research reorientation in the direction of key practical and scientific questions in the interrelationships among people, society and technology.

BMS in many areas represents solid academic expertise in terms of institutional, social and human behaviour, a strong reputation in contemporary data analytics and information systems and is operating in the context of a design, decision and action – valorisation - oriented university strategy. For an overview of recent visitation scores, see Table 4.1. This provides BMS research with an excellent point of departure and ample opportunity to operate at the frontline in various domains of the growing field of research in institutional and human behaviour, collective action in social networks, and governance, policy-making and management in and of high tech social-technical systems.

Table 4.1. Visitation scores

	Quality	Productivity	Relevance	Viability
TPS				
CHEPS	4,5	4,0	5,0	4,5
CSTM	4,5	4,5	5,0	4,5
HTSR				
STEPS	5,0	5,0	4,5	4,0
PHIL	4,0	4,0	5,0	5,0
HIB				

CW	4,0	4,5	5,0	4,0
PA	4,0	4,0	4,0	4,5
PCRS ³				
PGT ²				
DDS				
CPE	4,0	4,0	4,0	4,0
ELAN				
IST	4,5	4,0	5,0	4,0
OMD	4,0	4,5	4,5	4,0
OWK/IST/OMD	4,5	4,5	4,5	4,0
HBE				
IEBIS				
BA (CMOB, FA, HRM, NIKOS, TMS) ⁴	Very good (2)		Very good (2)	Good (3)

The future research programmes should focus on broad themes that connect technology and the engineering sciences with society and the social sciences, and have clear anchor points within the UT (other research institute programmes), on a national (e.g. the Nationale Wetenschapsagenda, NWO themes), and international level (Horizon2020).

An important development for the next 5 years will be that university research reviews will be conducted under the regulations of the new Standard Evaluation Protocol (SEP). This protocol stipulates two points of departure, which are constitutive to the consolidation and redesign of future BMS research programmes. SEP distinguishes two important levels of responsibility in the developing and programming of research: the Research Group Programme level and the Institute Level.

Research Group and programme level

'Research units have its own clearly defined strategy and be sufficiently large in size, i.e. at least ten research fte's among its permanent academic staff, including TT and not including PhD candidates and postdocs; minimum number; larger units are preferable'

Institute level (Faculty or Research School)

'A group of researchers with an articulated shared mission, operating within one or more research programmes under the same management'

The Management at the Institute level i.e. (currently still) the Dean and Scientific Director, is responsible for the development of a forward looking research strategy and corresponding solid research organization with clear programmatic coherence and academic leadership.

The faculty of BMS momentarily counts around 165 fte tenured staff. If we discount for fte devoted to part-time but permanent teaching staff (therefore basically without research time), a little over 150 fte remain with an average of

³ Participating within current research evaluation Psychology

⁴ SEP

30% teaching related and institutionally funded research time (i.e. excluding NWO and EU funding). Such a rough estimate, plus an anticipated decline of tenured staff (*ceteris paribus*) to about 140 fte by 2020, indicates a BMS research capacity for 3 to 5 SEP-proof research programmes, depending on collaboration with, for example, other UT Faculties and or external programs under one and the same academic programme leadership, i.e. (shared) directorship.

According to the SEP, programmes have to reflect unequivocal leadership (i.e. an Academic Research director) and prove to be a viable, i.e. truly joint research programme, with a shared, future-oriented strategy, planning and programming. It should also be clearly living in the daily routine of the researchers belonging to the programmes.

In addition to the previously mentioned 12 disciplinary research programmes currently in place, the BMS research has been organized in 8 IGS spearheads:

1. Techno studies
2. Management and Entrepreneurship
3. Innovation and Governance
4. Water
5. Health
6. Safety and Security
7. Education and Training
8. Energy

Also, other institutes (CTIT, MESA, MIRA) and faculties have spearheads that BMS researchers contribute and orient to. The ambition is to further strengthen the cooperation with CTW and ITC in the context of building the UT High Tech Business Institute proposed and supported by the Board of UT, and the strongly emerging cross-faculty collaboration in the areas of 'Smart Cities' and 'Digital Society'.

When taking all of this into account, the following 5 BMS research lines emerge as the starting point for further planning and research programme development:

- 1) **Health:** Health Technology, Health care systems and the Transformation of Healthcare
- 2) **Learning:** 21st Century Skills, Educational Technology and The future of Learning
- 3) **Resilience:** Smart Cities, Sustainable Communities and Safe Societies
- 4) **Industry:** Smart Manufacturing and Business models for the Circular economy in the 4rd Industrial Revolution
- 5) **Emerging Technologies** and Life in the Digital Society (overarching)

In its current form these are working titles. In the Fall of 2016 IGS will stage a faculty wide research conference to elaborate these themes, and translate them into 'roadmaps', 'calls' and 'working packages' for further elaboration and development.

Next to the collaboration with other faculties and UT Research Institutes, the research lines will be developed in joint collaboration with external partners in

the region as well as abroad, representing business, government, and civil society in the designated areas of health, learning, resilience, and industry. A more detailed presentation of already existing institutionalized partnerships is beyond the scope of this Brief, but will be elaborated in the Fall as part of the envisaged BMS/IGS Research Conference. The research collaboration in external international networks may be expected to become ever more important in the near future and will have to become part and parcel of the research programming at BMS. In the planning period to come, The BMS faculty should exhibit more ambition in taking the lead as program initiator and coordinator of research programs at the European (EU; Horizon) and global level.

Each of the different programmes presented here as a starting point for discussion and programming, is primarily rooted in two clusters, but – as stated before - will require the participation of all four clusters in order to be able to fully exploit the BMS potential and generate sufficient capacity to pass the future SEP thresholds of a capacity of 10-15 research fte as part of the tenured staff which is being put forward for review and research programme assessment. Particularly the position of the OMD group requires particular attention as a designated partner and pillar of probably all 4-5 programs which may be envisaged at the level of the faculty. Well located within the Data Science and Decision-support Cluster (DDS) and historically strong connected to educational analytics and research, we have already embarked upon a strategy of combining and consolidating all social and behavioural sciences methods and techniques under one, faculty broad umbrella, with OMD as the pivotal unit to be extended and expanded in terms of expertise, while enlarging the scope of research orientation to the other fields which BMS is to cover (next 21st Century skills). Agreements have already been stricken in terms of contributions to the domains of health and participatory governance. Stronger connections to the (technical) business and entrepreneurship programs are under discussion, also in relation to social and business analytics groups of CTW and EWI.

It will take a deliberate and carefully guided transition process to integrate the current 14 or so smaller research programmes that are or have recently been under review, into the 4-5 research lines envisaged by this document.

At its initial stages, and given the current distribution of research capacity across the 4 clusters, we foresee the following collaborations across the clusters in research programme development:

Health: TPS and HIB, with substantial contribution from DDS

Learning: DDS and TPS, with substantial contribution from HBE

Resilience: HIB and TPS, with substantial contribution from HBE

Industry: HBE and HIB, with substantial contribution from TPS

Emerging Technology: All, with TPS in the lead

The envisaged programmes have clear external anchor points. We need to invest more time in a systematic inventory of the current and emergent research funding environment together with the European office and the incoming leadership of the UT Research Institutes, but a preliminary and very incomplete exploration already

suggests various options. In the upcoming months, Table 4.2. is to be extended and elaborated for national and international research consortia and agenda's, 4TU, Zwaartekracht, etc.

Table 4.2. Research lines and funding environment

Themes	UT	National (NWA/NWO)	EU
Health	MIRA	NWA: gezondheidszorgonderzoek, preventie, behandeling	
Learning	CTIT	NWA: hersenen, cognitie en gedrag	
Resilience	ITC, CTIT	NWA: - Veerkrachting en zinvolle - Conflict and cooperation - Smart livable cities	Secure societies: protecting freedom and security of Europe and its citizens
Industry	CTW	NWA: smart industry	
Emerging Technologies	MESA		Europe in a changing world: inclusive, innovative and

Towards the future

The different programmes distinguished here are obviously not mutually exclusive. They are interrelated and supposed to amount to a complementary faculty broad research profile and strategy, eventually to be externally evaluated at the faculty level as a whole. To this end preparations for relevant international benchmarks for the faculty of BMS and its emergent research profiles, will be made with the help of CWTS and the UT Strategy Office (a strategic exploration study, carried out in joint collaboration with the faculty of ITC).

There is a strong common basis to further build upon. The various programmes address overarching questions. The role of technology in society has triggered many fundamental questions in terms of human behaviour, morality, privacy and security, amounting for example to a global quest for 'responsible entrepreneurship' and 'responsible innovation' that apply to all. The development of New, 21st Century statistics, machine learning, computational behavioural science and social and urban analytics in an age of an abundance of ('big') heterogeneous data opens many new avenues and perspectives for social science research in the various research lines indicated. The design orientation at UT requires attention for design concepts, actionable knowledge, action perspectives, and ways to link knowledge- and information systems to early warning and decision systems at the level of self-organizing individuals, professionals, entrepreneurs, manufacturers, urban smart grids and distributed collective, corporate and public service and enterprise systems. Autonomous systems and the Internet of things needs to be trusted and be considered safe, secure, accountable and reliable.

Knowledge of institutional and human behaviour accumulated by responsible research and innovation requires the integration of technological and social complexity sciences. This gives rise to all kinds of overarching and multi-scaled scientific challenges. How to combine explanation with exploration and

forecasting? How to do things right and do the right things? How to reconcile resilience with prevention, privacy with security, prosperity with sustainability, trust with non-linear change, disruptive innovation with social stability, and taking social responsibility with receiving public blame?

In line with the new SEP protocol, research programmes not only need to address research themes, scientific contributions and societal impact, but also provide a good and solid research infrastructure. Several steps have been taken, as part of the Tech4People Initiative and under IGS policy, in building up a state of the art social and behavioural science lab, both in terms of physical infrastructure, as in terms of modern data-management. Our technology orientation particularly calls for attention, because the data collected is often quite invasive and collected over longer periods of time, e.g. they include physiological (body) measurements and interventions, daily movement patterns, video recordings of (crisis) decision-making, or log data of critical business operations. This requires additional guidelines for how to collect, process and store this type of data. Up-to-date facilities are crucial, not only because they reflect a professional research organization, but also because it is increasingly required by scientific journals and grant providers. This often includes approval of an (medical) ethical committee, data sharing, and secure and sometimes even certified storage facilities. It is also in line with the growing awareness for good research practices in line with ethics and privacy regulations, and as reflected in university wide developments such as the instalment of a Committee Scientific Integrity and a privacy officer. Future planning therefore should leave enough space for investments in research infrastructure, which not only implies shared technical facilities, but sufficient and adequate research assistance as well. *Facility sharing is the future within BMS.*

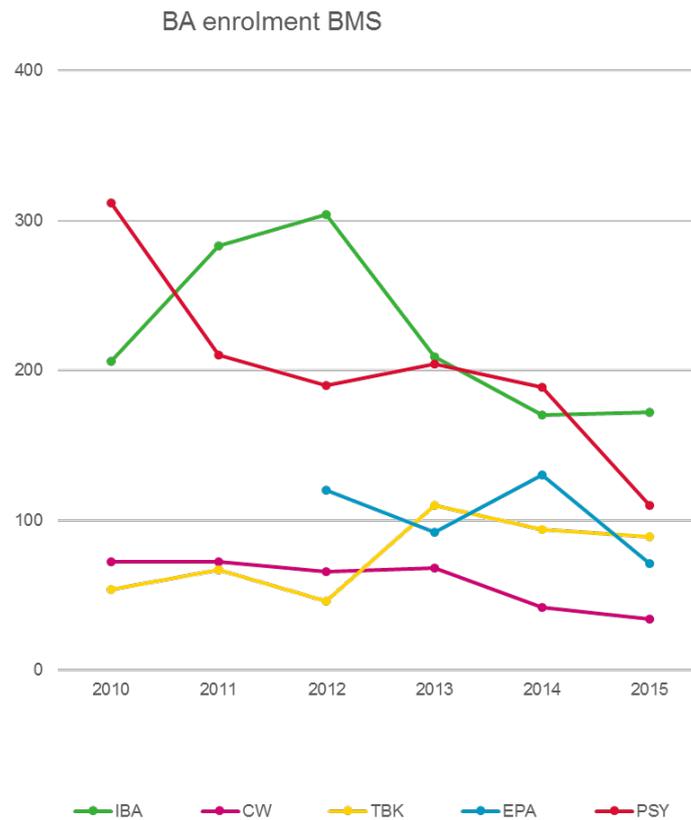
5. Teaching@BMS

The educational perspective – Internationalizing core business

BMS houses teaching programmes in the full range of pre-university education, bachelor and master education, service education (RESTS, statistics) and post-academic education (PLD). The bachelor, master and PhD programmes form the backbone of our activities. With respect to strengthen the latter, various initiatives have been taken over the past year, in- and outside the UT Graduate School. Here we leave PhD and PLD aside for a moment. They will be addressed separately later this year as part of the strategy process.

Our current BA and MA programmes have mainly developed along the lines of traditional disciplines and content, with a trend of declining student numbers (see Figure 5.1. below), and offering too few Bachelor programmes in English. Moreover, budgetary constraints increasingly urge us to run the programmes we offer with fewer faculty, while - at the same time - Master programmes should attract more students to become truly viable.

Figure 5.1.



As indicated: from an international perspective, large parts of the academic future lies with multi- and interdisciplinarity, across the traditional borders of natural and social science or engineering and humanities. Marketing research – also at the UT - among high school students shows that broad undergraduate programmes – like University Colleges teaching Liberal Arts and Sciences (LAS) – are still facing a bright future. Contrary to many narrowly defined disciplinary programmes, they continue to show potential for growth. One might expect the same for graduate and undergraduate studies in social, behavioural and management science with a strong STEM component, offering at least the option to qualify and major in that direction at various domains.

Overview of measures already taken

To turn the tides of student enrolments in various programmes, various initiatives have been deployed since the Fall of 2015:

- Implementing the UT Strategy and programme to internationalise MA-education;
- Strongly revising of the Business Administration (BA) master program in terms of the introduction of 5 clearly recognizable HTHT tracks, focus on Technology & Innovation, integrated double degree collaboration with ECIU partners and a marketing profile in Innovation and Entrepreneurship.

- Internationalising the BA Psychology by turning the programme into an English language curriculum and making it more strongly technology oriented;
- Redesigning the Communication Science Programme towards a more Technological and STS orientation, potentially including a computational track;
- Developing a strategy to reposition the EPA/PA programmes, with a horizon of three years:
 - Internationally, by linking it to the German *Excellenz Initiative* in the form of a joint programme with University of Münster at the BA level;
 - Nationally, by developing a Dutch *Bestuurskunde* stream as part of the Master in Public Administration, potentially developing in a Netherlands School of Local Governance (Engineering and Technology; including Technologies that Decentralize the World, Smart Cities, The Metro(politan) Revolution; “Mayors that rule the world”; The transformation of (local and regional) health care, distributed service delivery and circular economy; smart grids, self-organization and self-governance; resilience and the city;
- A marketing analysis about the future of different kind of programmes, in general;
- A market analysis and shared long term outlook of regional demographics in the Twente region in particular (how to give access to second generation immigrants; how to expand in the region just outside the core Twente recruitment area) – also the ‘second generation’ potential along influx HBO/professional tracks in our MA’s;
- Initiatives to improve positioning of programmes on short run: the internationalization of MA’s, embedding in technology – domain as well as method (more STEM oriented) (CS, Psych, PA, High Tech Business Programme);
- (participation in) New MA’s: Smart Cities; High Tech Clothing; STS/Systems Analytics (with Stevens) and various double degree programmes with suited international partners are in the making.
- Together with the Board of the University discussions have been revitalised about the development of a High Tech Business Institute on the basis of previously approved proposals as well as more clearly stated ambition and articulated strategy in the area Professional Learning and Development (PLD; including executive PhD projects) as an integral part of the BMS educational strategy. Plans to be elaborated over the Fall

In order to strengthen our bachelor programmes, we will follow two lines. First, we will continue to work on the *profiling* of the programmes as technology-oriented. We will do so in four ways:

- The *domains* of our programmes will be more explicitly studied in relation to technology: technologies have a profound influence on human beings and on contemporary society, and therefore the domains that we study in our programmes (governance, human behaviour and perception, business,

communication, learning) can only be addressed adequately when we take the relations between science, technology, and society into account.

- The *methods* we use are explicitly technology-oriented. Not only because we explicitly focus on computational methods in social science, but also because we use technological means to generate social-scientific data: sensor networks, Wi-Fi tracking systems, et cetera, partly integrated in the Living Smart Campus project.
- All of our programmes have a *design* orientation, making valorisation an intrinsic element of our approach. Besides studying human beings and society, we also develop interventions: we design curricula, policies, online therapy and conflict interventions, business plans, communication structures and plans, et cetera.
- The content of our programmes specifically focuses on the role of *technology* in their domains of study and application: we focus on *internet*-based therapy, *high tech* business, *technology*-mediated communication, *governance of technology*, et cetera.

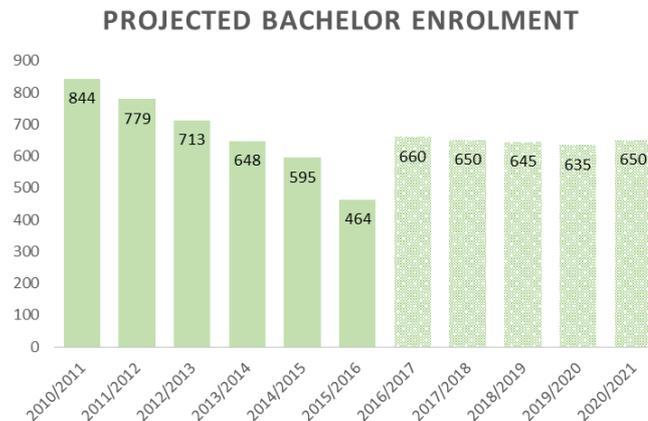
Several lines are already in place to build upon this profiling, like the methodology line in all programmes (profiling the programmes with computational social science and technology-based data collection), and the RESTS line (Reflection on Science, Technology, and Society). In the academic year 2016-2017, these common possibilities will be further explored and developed, with and by the BMS programme directors, and an implementation plan will be made. The focus will be on expanding the RESTS line with teaching in technology; making the design orientation of all programmes more explicitly visible; highlighting the role of technology in the domains of the programmes more explicitly; and developing a new marketing strategy to communicate the profile of our programmes in a better and more appealing way.

A second line in the strengthening of our bachelor programmes concerns the creation of more synergy between the programmes. Also these possibilities will be explored in the academic year 2016-2017, in its various degrees of integration between the programmes:

- In order to increase efficiency, in relation to the joint profiling ambition of the programmes, we will explore possibilities for *common courses and projects*, as elements of modules within the TOM system. Basic introductions into social science might be shared among programmes (in courses), as well as their common orientation towards technology (e.g. in projects).
- A further step in creating synergy between programmes would be the development of joint *modules*. Given the common profiling of our bachelor programmes, there will be more room for common modules, possibly with a programme-specific project (making the modules not entirely 'joint') to relate the content of the module explicitly to a problem or question within the specific disciplines.
- The most integrated version of synergy between all programmes would be a model in which the programmes share a common basis in, say, the first year, and start to differentiate in the course of the programmes. Especially if the number of students in some bachelor programmes stays below 100-120, this might be both an efficient and profiling way to keep offering our bachelor programmes in relation to our research profiles. A first step in exploring this possibility will be an orientation on the organization of the bachelor programmes at Roskilde University, which has a very similar educational profile (project education,

oriented towards combining social sciences and technology). This perspective will be explored and developed further in the course of the Fall-Winter semesters 2016/17.

Figure 5.2.



Beside this explicit focus on our bachelor programmes, we will continue to work on the following educational topics:

- Master programmes: our initiatives at the masters' level are embedded in the university wide master internationalization initiative, which will be reported upon separately. Ambition is to establish programmes that may count on a regular enrolment of 60-80 students as a threshold.
- The educational directors have agreed to explore the possibilities of the development of Joint minors, STEM-related, which may also serve as substitutes for pre-master programmes; this could be expanded to the development of joint exchange packages in the context of the internationalization strategy and possibly related to CuriousU/Summer school initiatives)

6. TheBudget@BMS

Bottom line, is bottom line

Research is crucial for profiling and standing of the faculty. Teaching is core business at BMS. If it drops in terms of student enrolment and productivity, it is raining at the working floor of faculty and departments. The trend of declining student numbers from 2012 up until the 2015/2016 academic year, presented above, has a severe negative impact on the financial results of BMS till 2021, with a peak in 2018.

BMS is convinced that by the measures that are already taken and by redesigning the programmes to a more Technological and STS orientation in the planning period under consideration here, we are capable of reversing the declining trend of the past few years and to bring about a steady influx of at least 600-650 undergraduate students annually. This will take a structural recovery of undergraduate student enrolment of about 215 students compared to the academic year 2015/2016.

In terms of our financial planning the lower limit for the undergraduate student enrolment for the coming academic years are:

Table 6.1. BA enrolment

	Academic year	IBA	PSY	CW	EPA	TBK	TOTAL
Historical	2010/2011	206	312	72	200	54	844
	2011/2012	283	210	72	160	54	779
	2012/2013	298	190	64	115	46	713
	2013/2014	195	197	63	88	105	648
	2014/2015	156	183	40	126	90	595
	2015/2016	164	107	33	71	89	464
Targets	2016/2017	145	325	60	50	80	660
	2017/2018	150	300	65	50	85	650
	2018/2019	155	275	70	55	90	645
	2019/2020	160	250	75	55	95	635
	2020/2021	160	250	80	60	100	650

A steady influx of 600-650 undergraduate students is the minimum for sustaining the current undergraduate education organization. In the academic year 2016-2017 BMS will analyse the operational efficiency, seek synergy opportunities and integration between the undergraduate programmes and will determine the base line limit for each programme. If it turns out that a combination of achieving the thresholds in combination with efficiency gains cannot be realized, a different strategy has to be followed. Scenario studies will be conducted this Fall, ranging from broadening existing programmes to exploring the potential faults and merits moving towards one common, faculty broad BMS BA programme. This in order to be able to move swiftly in case the need arises for a quick and thorough action and reorganization of the educational structure for the years 2019/20 and beyond.

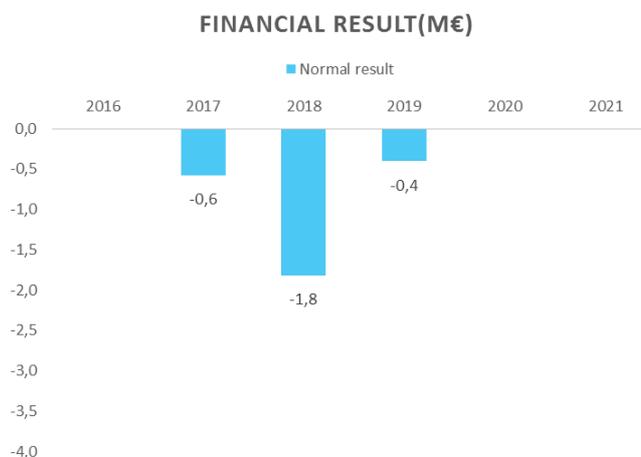
The ambition for the master programmes is to count on a regular enrolment of 60-80 students as a threshold. BMS has taken initiatives for increasing the number of Master students and working towards joint and double degrees for our one year MA programmes as part of the UT MA internationalization strategy. Reliable results and expected outcomes of these measures will not become manifest until 2016-2017, so that effects at this point in time are not reliable enough to take any financial benefits into account. In September we expect to be able to provide more clarity on the development of the enrolment of master students.

In any case, it will take some time before BMS can fully benefit from correlated positive financial effects from the increase of the undergraduate (already to be expected in the year 2016/17) and master students. BMS will therefore be confronted with a financial gap in the coming years (see Figure 6.2. below).

The question is how to deal with this, hopefully, temporary gap. The only viable countermeasure available to the faculty – apart from an integral reorganization in the year to come - is not to fill future vacancies till 2021 caused by natural attrition and by the ending of temporary employment contracts at their moment of expiration. Analysis provides that with this measure BMS will achieve a balanced budget in 2019/2020⁵.

⁵ The figures presented in this Policy Brief are based on the BMS budget 2016-2018 updated with the latest insights till 1 July 2016. These figures may vary according to the final BMS budget 2017-2021.

Figure 6.2.



Compared to 2016, this will lead to a significant reduction of the workforce (see Table 6.3. below), at a time we hope to achieve that student enrolment, at least as the BA level, is expected to go up.

Table 6.3. Workforce reduction scientific staff

Workforce reduction (fte)	2017	2018	2019	2020	2021
Professor	-1	-4	-6	-7	-11
Associate Professor	-1	-1	-1	-2	-3
Assistant Professor	-5	-17	-23	-26	-27
Lecturer	-11	-19	-20	-20	-20
Cumulative reduction⁶	-18	-41	-49	-55	-61

Not filling future vacancies caused by the termination of temporary employment contracts will lead to a number of additional negative and potentially undesirable effects:

- relatively young, upcoming and promising staff is largely responsible for teaching; many of them are on temporary contracts.
- the existing imbalance in the ratio Professor/Lecturer will increase and will make the educational programmes relatively much more expensive and, more importantly, will contribute to an imbalanced – ‘skewed’ - build-up of clusters and departments/sections within;
- the lack of the influx of new and younger staff may be expected to have a negative impact on dynamism and top performance of the faculty, as well as future research leverage capacity and impact;
- it will be harder for the permanent staff to keep up with the innovations still required or imminent in the ongoing developments in teaching and research development.
- eventual slack to effectively use the opportunities and leverage potentially available to the BMS faculty at its current stage of development, will mostly be reduced below sustainable levels.

⁶ Reference date 1 May 2016. The reduction will be made within the permanent and temporary staff (with teaching activities). Researchers and other staff categories are in table 6.3. not included.

These effects will have an unfavourable impact on the quality of the educational programmes and the ambitions with research outlined earlier. To counter them the BMS financial strategy will focus on stimulating voluntary attrition and external mobility over the next few years of about 15-18 fte at senior staff levels. The corresponding released resources will be reinvested with the goal to keep or attract between 25 to 30 fte (out of the otherwise 70 fte disappearing temporary positions over the next 3 years) of the best young talents or replace temporary positions with new ones. BMS expects that the implementation of this strategy requires pre-financing and will probably effect the result in total with M€ 1,5 negatively (see Figure 6.4. below). BMS will earmark this projected negative result in the budget as a specific outcome target.

The above mentioned strategy does not include the support staff. The norm for support staff within faculties is 20% of the total staff. BMS has currently a support staff less than 20%. Therefore, at this moment, it is foreseen that there will be no reduction in support staff.

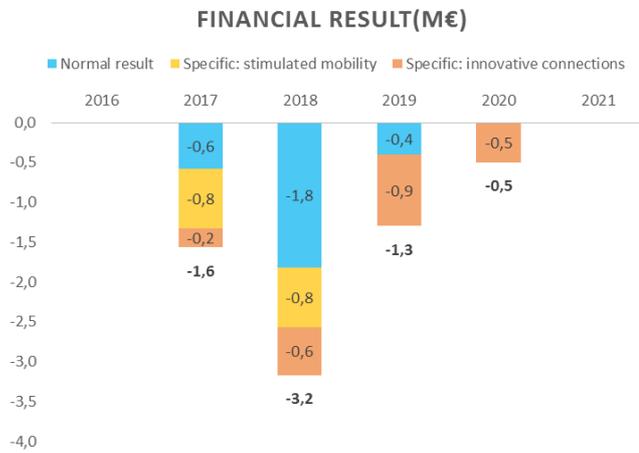
Figure 6.4.



The previous strategy, if effective, will result by 2020 in a smaller and slightly younger faculty with a balanced budget. But next to the maintenance and innovation of the existing stock and portfolio, it is necessary to be able to do investments in renewal, particularly in activities related to the collaboration with other faculties. These are currently under construction as part of the reorientation of the collaboration in the UT Institutes and the participation in UT themes in development. Particularly the linking up and effective participation in the Health Cluster (Health Care systems analysis), the High Tech Business Programme (Financial Engineering; also for Health Cluster) and the development and consolidation of the exquisite starting position of BMS in the area of 21st Century Skills and the development of all levels of education – from primary to higher education - in the context of policies for the digital knowledge society, requires innovation at the level of adjunct or full-professorships. To kick-start these multidisciplinary research lines particularly in connection to the other faculties, BMS needs to recruit for the period 2018-2020 at least 3 newly appointed and external Full Professors or Tenure Trackers, with 6 fte direct support in the form of Assistant Professor, Postdoc or Lecturers. This requires approximately an additional investment of M€ 0,9 for the coming years.

The expected results are visualized in Figure 6.5. below. BMS will earmark this projected negative result in the budget as a specific outcome target.

Figure 6.5.



For the faculty of BMS allowable deficits are for the period 2017-2020 necessary to develop our academic core business as outlined in the earlier sections of this Brief. It should be noted that in the financial strategy presented here BMS did not yet take the allocation of the policy oriented budgets associated with the maximization of the PhD budget into account. We would expect that the vision and concept represented in this Policy Brief will contribute to the desired profiling of the UT as a full-fledged HTHT university in the context of national policy and higher education ambitions. We are confident that by 2018 the BMS faculty under STEAM and construction will be competitive enough in terms of adding substantial value to the distinct profile of the UT in a national context to command at least M€ 1,0 of the reserved policy oriented profiling budget, that will come structurally to the benefit of BMS' development. This profiling budget would be invested in joint collaboration with the other faculties and used to facilitate the vision of mutual integration outlined before. It is up to the Board to decide that BMS will use this budget for earlier covering of planned and targeted deficits that will be encountered or whether such a profiling budget could or should be used in expanding the multidisciplinary research lines and institutional cooperation with the other faculties.