

# ***Digital Sciences for Society***

## ***Final IFBDS report (in connection with Strategy 2027)***

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### **Context**

In the fall of 2020, an exploration of current initiatives in the field of digital sciences within Tilburg University was carried out. Based on this, outlines were drawn for a TiU-wide strategy in the field of digital sciences. Digital sciences are considered broadly here, including data science and artificial intelligence (AI), in direct relation to education, research, and impact.

On January 19, 2021, the report on the above exploration was discussed in the joint Executive Board and Deans Consultations (OCD). The OCD was positive about this exploration and decided to perpetuate and strengthen digital sciences within Tilburg University as a core theme, as part of the broader **Strategy 2027**. In this context, the inter-School deliberation table on digital sciences (*interfacultair beraad digital sciences* (IFBDS)) was established.

The IFBDS consists of representatives from all Schools, including TIAS (see Appendix 1 for the list of participants) and has already met for the fourth time on June 8, 2021 (see Appendix 2 for minutes of all meetings). The IFBDS is chaired by Boudewijn Haverkort (Dean TSHD). This memorandum was created with input and support from the full IFBDS. In addition to the regular IFBDS meetings, three specific working groups worked on specific questions regarding education (see "basic knowledge about" in Section 3), on identifying core areas in the field (see "innovation in" in Section 3), and on specific questions regarding reflection on (the introduction of) digital sciences (see "reflection on" in Section 3).

### **1. What choices can TiU make in moving toward 2027? (Vision & Direction)**

According to the IFBDS, it is strongly recommended to further expand and develop digital sciences as a strategic theme, at the intersection with social issues such as a distinctive positioning for Tilburg University under the motto "**Digital Sciences for Society**". With its background, Tilburg University has the potential to grow into an (inter)nationally recognized and authoritative university in this field, thus increasing its appeal to scientists, students, and external partners. Both in **research** (relevant social issues) and **education** (possible new study programs) and **impact** (contributing to social issues), Tilburg University can make its own mark, for which application of and reflections on the technology are just as important as the technology itself.

To improve the view of the broad field of digital sciences, the IFBDS decided to distinguish 4 sub-areas: (i) innovation **in** digital sciences, (ii) innovation **with** digital sciences, (iii) reflection **on** digital sciences, and (iv) basic knowledge **about** digital sciences. These sub-areas are explained in more detail in Section 3.

In addition to establishing **direction**, the operational **design** is important: in what way can our ambition be optimally organized? How can existing organizations and networks strengthen each other? Think here of JADS, MindLabs, Data Science Center Tilburg (DSC/T), Tilburg AI Special Interest Group (TAISIG), but also the academic collaborative centers as a work form (and content orientation) that touch on digital sciences, such as health or energy. Sometimes there is relevant expertise within the various Schools that is not yet (optimally) connected to these structures; this connection could be strengthened. In this way, existing organizational strength, knowledge, and skills can be used to achieve (more) synergy. The question of structuring is explicitly part of the **action plan** to be worked out in more detail (see Section 6).

**2. What ambition could the university show on the theme?**

Given:

- Digitalization is a huge driver of innovation in society, and in science, perhaps *especially* for Tilburg University;
- Globally, there is a sharply growing demand for highly educated talent in the field of digital sciences while the supply is lagging behind;
- Funding opportunities for digital sciences research and infrastructure are growing, sometimes (unfortunately) at the expense of the (traditional) humanities and social and behavioral sciences (*alpha- en gamma-wetenschappen*);
- Digital Sciences helps shape '*Understanding and Shaping Society*', precisely at the intersection with Tilburg University's "traditional strengths," there are huge opportunities here;
- To maintain future relevance and appeal, Tilburg University needs to focus heavily on digital sciences as a strategic theme.

Tilburg University currently already has 7 programs (2 Bachelor's, 5 Master's programs) that lie at the core of digital sciences (see accompanying table); currently these programs collectively accomodate almost 2000 students. In addition, there are a number of programs that have strong affinities with digital sciences, such as the bachelor Communication and Information Sciences, the Master's in New Media Design (TSHD) and the newly established Master's in Philosophy of Data and Digital Society (TSHD; starting in 2022).

School	Program	Type	#students*
TLS	Law and Technology (1 yr)	Master Program	200
	Data Science	Bachelor Program	175
TSHD	Cognitive Science & AI	Bachelor Program	700
	Data Science & Society (1 yr)	Master Program	250
	Cognitive Science & AI (2 yr)	Master Program	300
TiSEM	Data Science & Entrepreneurship (2 yr)	Master Programa	150
	Information Management (1 yr)	Master Program	150

\* academic year 2019-2020

We would like to formulate the **ambition** for Tilburg University in the field of Digital Sciences as follows:

- To further develop and strengthen the profile of Tilburg University as a humanities and social and behavioral sciences university, at the interface with and fueled by digital sciences, building on existing strengths.
- Tilburg University contributes (inter)nationally to education, research, and impact in the field of Digital Sciences.
- Tilburg University has national and international reputation as a leading university with unique knowledge at the intersection of human and social sciences on the one hand and Digital Sciences on the other, from strong disciplinary knowledge.
- As an authoritative university, Tilburg University applies its knowledge and expertise to societal challenges under the motto "Digital Sciences for Society."

Concrete **objectives** here (these will be made SMART in the action plan):

- increase research budget for digital technology and priority topics;
- ensure that more students and lecturers are provided with opportunities and, as a result, have relevant basic knowledge about Digital Sciences;
- collaborate more with external partners in public-private context;
- attract more students, lecturers, and researchers within the Digital Sciences domain, matching the ambitions in education, research, and impact.

### 3. In what areas can a breakthrough be achieved?

In order to develop a distinctive and appropriate profile for Tilburg University, the IFBDS has created groups within the broad field of digital sciences. We distinguish: (i) innovation **in** digital sciences, (ii) innovation **with** digital sciences (research emphasis), (iii) reflection **on** digital sciences, and (iv) basic knowledge **of** digital sciences (education emphasis). We elaborate on this four-part division below.

#### ***Innovation in digital sciences***

Innovation **in** digital sciences is about digital technology and, thus, goes much further, and requires deeper knowledge, than being able to innovate **with** digital sciences ("just applying"). Fully understanding digital sciences is conditional for credible and reliable research in the area of "reflection on" and "application of" digital sciences.

The so-called [ACM computing classification system](#), with a dozen main headings, has been used in the IFBDS to indicate what Tilburg University is already strong in, as well as to identify what is needed to achieve its ambitions. In the figure below, color-coding indicates where opportunities lie for Tilburg University to strengthen itself. The twelve indicated blocks form ACM's top-level classification; it is possible to "zoom in" at least two levels deeper via the interactive website, which is also necessary to properly understand the coloring made. However, not all parts are currently sufficiently expanded. The dark green areas are already strongly represented; the light green ones less so. The circled areas should be strengthened to be credibly step out with digital sciences. Elements from the pink areas will have to be co-developed but to a significantly lesser extent.

niet relevant	deels relevant	meer relevant	meest relevant
Hardware	Computer Systems Organization	Networks	Software Engineering
Mathematics of computing	Theory of Computation	Security & Privacy	Information Systems
Human-Centered Computing	Computing Methodologies	Applied Computing	Social & Professional Topics

### ***Reflection on digital sciences***

Reflection **on** digital sciences has several aspects. Firstly, the effect of the use of digital technology on the individual, on groups (of individuals), or on society as a whole can be studied in a more generic sense.

However, there may also be reflection on the use or implementation of digital technology in a very specific application context, such as the healthcare sector or logistics. This may involve ethical, legal, and philosophical issues; the impact of digital technology on the application domain is central here. How to study this, reflect on it, and possibly develop frameworks for it?

A final perspective is more fundamental-philosophical in nature: what is the meaning of technology, intelligence, etc., in the context of increasingly "smart" digital systems? How does this development of digital technology help determine our view of humanity?

It is important to get more in the vanguard from the great strength that Tilburg University has in this area; there are good opportunities here within developments at the national level (the ELSA labs of the Dutch AI Coalition) and at the EU level (regarding the theme of digital sovereignty), where involvement already exists. There is already a solid knowledge base regarding this topic within Tilburg University.

### ***Innovation with digital sciences***

Innovation **with** digital sciences is about applying and using digital sciences in research focused on societal themes. Based on the inventory mentioned in the introduction and supplemented with additional input from all Schools, the IFBDS has prioritized the following application domains:

- Climate and energy transition
- Health & Well-being
- Law & Technology (Digital Sovereignty)

The first two themes are in line with the two *impact themes* on which Tilburg University has focused and based on which academic collaborative centers are (to be) developed. The third theme is so strongly represented within Tilburg University that prioritization seems obvious.

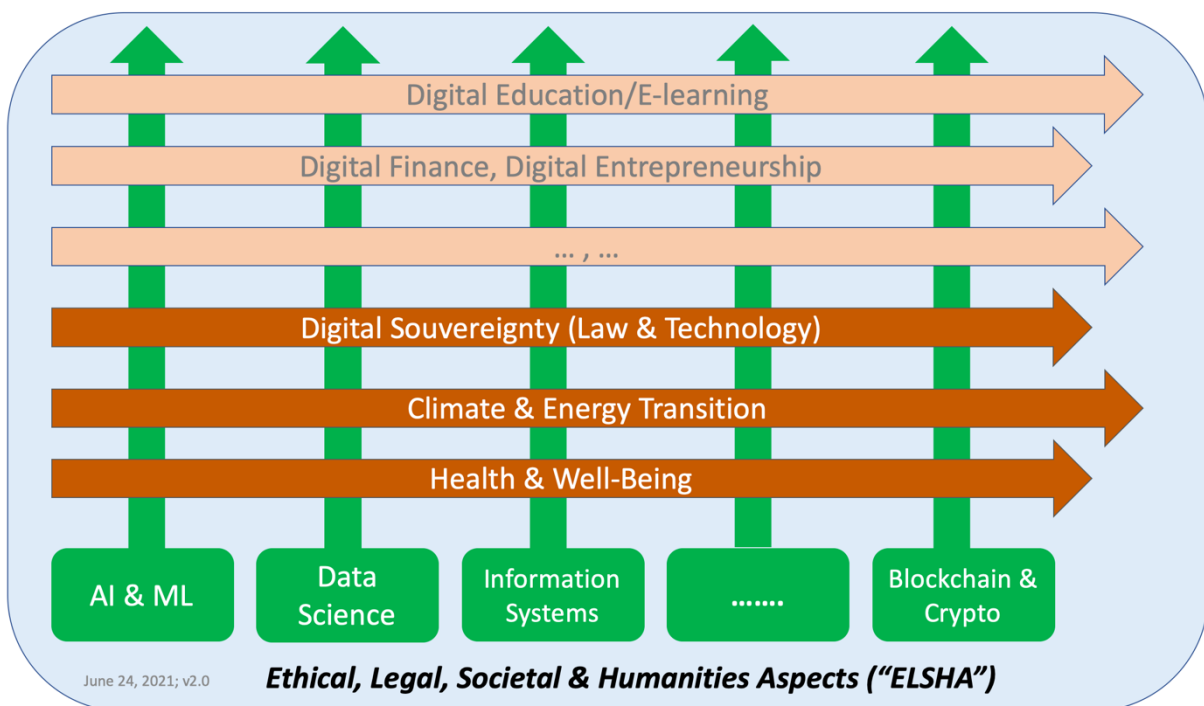
In addition, three other themes are considered very promising:

- Blockchain, fintech

- (e)Learning - digital education
- Digital transformation, -entrepreneurship, and -leadership

The above is an initial proposal, *not a rigid framework*. The idea is to be able to move organically with relevant developments. It may be that new themes are added and existing ones dropped after a while. That is why a *two-track policy* is proposed, so that (also new) promising themes can develop into fully-fledged themes. The framework of criteria for weighing this will again be examined. Themes other than those mentioned above are not less relevant to Tilburg University or to specific Schools but are, as we now see, adequately worked on within their own Schools; the question that must always be asked is in what way working across School boundaries can be of benefit.

Investing in up-to-date knowledge of digital sciences ("*innovation in*") is essential for reliable and credible application of technology ("*innovation with*") and "*reflection on*" digital technology. This can be visualized as follows: from a number of strong cross-School content building blocks (the green blocks), knowledge and skills are contributed for working on socially relevant problems (the horizontal arrows; with darker and lighter color, to indicate prioritization).



This framework forms an important basis for our activities in digital sciences. The vertical arrows describe our competencies in various subfields of digital sciences; the horizontal arrows describe the orientation of the use of that knowledge and skill in socially relevant application domains. It is important to emphasize an inclusive approach here; changes and adaptations are possible both vertically and horizontally; the visualization forms a frame of thought, helps to structure, and invites discussion and should certainly *not be* seen as limiting. In the action plan (see Section 6), this will be further elaborated; in doing so we will, among other things, link more strongly to the aforementioned ACM classification.

### ***Basic knowledge of digital sciences***

Finally, basic knowledge **about** digital sciences is very important to be able to carry out education and research well. A distinction can be made here between basic knowledge for lecturers and for students: what basic knowledge do our lecturers (to be able to carry out education and research well) and our students (to be able to present themselves well on tomorrow's job market) at least need?

One thought is a *basic course* for every student, possibly an inter-School program for which all Schools offer a perspective on digital sciences (and thus appeal to all students). The basic knowledge extends beyond a specific programming language; it also involves models and concepts behind such a language or the technology in a more generic sense, ways of thinking ("computational thinking"). The idea is to contribute the use (and relevance) of digital sciences from the perspective of *social issues*. In this way, students and lecturers are introduced to a context relevant to them in which digital sciences contribute to solution approaches.

Students who would like more in this area can choose a *specific Bachelor's or Master's degree* (for example, "digital sciences in postmodern history"), or can specialize further in a minor or major. Specializations are also conceivable, such as AI and culture or culture within the Data Science program. In addition, it is important to examine whether a digital sciences accent can be placed within *existing courses*, where relevant (e.g., programming).

Some relevant *themes* to consider in more detail (for the intended foundation course as well as for minor, major, or even Bachelor's and Master's programs) are contextual knowledge (interpreting and reflecting on -use of- digital sciences), offering a toolbox (basic techniques for editing and analyzing textual and numerical data), explainable AI (making algorithms understandable and comprehensible), security and privacy (legal aspects of computational techniques), and implementation of computational projects (overseeing and managing implications).

Another relevant element in this context is about *facilities*. This might include making high-performance computing facilities more widely accessible (to lecturers and students), but also offering more targeted support for computer exams. There are also ideas about setting up data labs and data challenges (in collaboration with external partners).

#### **4. What relevant external developments are important?**

Digital technology is a huge driver of innovation. Digital transformation is internationally recognized as crucial to focus on. Internationally, it is visible that there is an enormous (increasing) demand for graduates in the field of (digital) technology. Also the number of students in secondary education who choose a sciences & technology (N&T) or science & health (N&G) profile has been following a rising trend for years (TiU internal research, fall 2020).

In addition, it is visible that resources for STEM degrees (science, technology, engineering and mathematics) are increasing, at the expense of the humanities and social sciences (Van

Rijn Committee, May 2019). In addition, Tilburg University is currently not involved in discussions such as on the sector plan STEM education while we (currently admittedly fragmented and poorly visible) do have relevant basic knowledge available and deliver students for this labor market. The importance of digital sciences for solving social issues is growing significantly.

The challenge is to proactively respond to these developments instead of (only) reacting to them. Tilburg University has extensive knowledge and expertise in the field of digital sciences and a strong background in humanities and social sciences with which a credible and distinctive proposition can be developed: precisely at the intersection of technology and social issues! Based on the idea: "*alpha + beta + gamma, that's delta*".

## 5. How do the TiU values (connected, curious, caring, and courageous) relate to the theme mentioned?

**Connected:** Digital sciences with its disruptive nature is a prominent topic in today's social debate. In addition to knowledge about digital sciences, an important opportunity for Tilburg lies in the application of the technology and the reflection on it. The added value actually lies in the connection with people, organizations, and society. Research generates new knowledge and insights that are returned to education. Finally, in its own way, digital systems also connect people (literally), how that happens and what effect it can have is an important research theme for Tilburg University.

**Curious:** Digital sciences are a relatively new field that is rapidly emerging. This development has been given an enormous boost in recent years by the increased processing power and storage capacity of computers. This has also led to an increase in the application of and reflection on technology, which is more relevant than ever. Tilburg University likes to move into new horizons but with its feet grounded, from its strength.

**Caring:** Digital Sciences present an opportunity and a challenge. One of the major challenges is that humans are not lost sight of (due to *technology push*) or even supplanted (new technology, robots, AI). Tilburg University can make a solid, relevant, and scientific contribution to this debate at the level of people, organizations, and society as a whole.

**Courageous:** Digital Sciences are taking off, internationally, nationally, regionally, and locally. The stakes are high, especially for industry. In this respect, the role of science as an independent and critical institution is crucial, especially when things get exciting. Scientists are under increasing pressure these days (from social media and other sources), so the trick is to dare to address difficult themes. Finally, it is also courageous to actively embrace digital sciences as an enabler of "SSH 2.0".

## 6. In conclusion

The IFBDS has been active since the beginning of 2021; much preliminary work has been done in the period September–December 2020. On March 16, April 19, May 17, and June 8, 2021, meetings were held with representatives from all Schools. Digital Sciences as a

strategic topic has several aspects as outlined above that are all relevant to preparing Tilburg University for the future.

The IFBDS does not stand alone; connection will be sought with other deliberation tables, such as (1) Innovative educational developments (think of new forms of e-education, or education supported by virtual and augmented reality), (2) Substantive priorities in overarching research the (think of energy, health) and (3) Positioning and connecting with university activities in ecosystems (pre-eminently digital sciences is such an activity).

There are also clear interfaces with various "aspect themes" such as (but not limited to) (a) Internationalization (projects, networks, research funding), (b) ICT strategy (facilities such as supercomputing, access, support, data repositories), and (c) Budget Allocation Model (proper core funding).

With this memorandum, the IFBDS reports on the issues and priorities identified. With this, the **direction** has been determined. From the summer onwards, steps will be prepared for the concrete **design** and **implementation**, in close consultation with the OCD. A small working group will make a concrete **action plan**. The IFBDS can be consulted as a sounding board group. The action plan will pay attention to a further elaboration of the content (in line with the groups created and presented in Section 3) as well as to an organizational design and embedding. In addition, we intend to organize one or more "round table sessions" with representatives from the field to further shape and refine the initiative.

## **Appendices**

1. Members of the IFBDS
2. Reports IFBDS March 16, April 19, May 17, and June 8 (all in 2021)



## Appendix 1 Members Inter-School Deliberation Table Digital Sciences

Name	Position	Areas of Expertise
Katrijn van Deun	Associate professor, TSB	Statistical Computing, Data Statistics and Computational Statistics. <a href="https://www.tilburguniversity.edu/nl/medewerkers/k-vandeun">https://www.tilburguniversity.edu/nl/medewerkers/k-vandeun</a>
Inge Bongers	Full professor, TSB, TRANZO	Evidence-based management in mental health care <a href="https://www.tilburguniversity.edu/nl/medewerkers/i-m-b-bongers">https://www.tilburguniversity.edu/nl/medewerkers/i-m-b-bongers</a>
Stephan Hollander	HoD Accounting, full professor, TiSEM	Financial Accounting; including influence of technological developments on information environment of companies; <a href="https://www.tilburguniversity.edu/staff/s-hollander">https://www.tilburguniversity.edu/staff/s-hollander</a>
Kenny Meesters	Assistant professor, TiSEM	Information Management and Systems <a href="https://www.tilburguniversity.edu/nl/medewerkers/k-j-m-g-meesters">https://www.tilburguniversity.edu/nl/medewerkers/k-j-m-g-meesters</a>
Emile Aarts	Full professor, TiSEM, TAISIG	Department of Econometrics and Operations Research <a href="https://www.tilburguniversity.edu/nl/medewerkers/emile-aarts">https://www.tilburguniversity.edu/nl/medewerkers/emile-aarts</a>
Frank Bosman	Researcher, TST	Theology, society, online/offline world, games, symbolism, and sense-making <a href="https://www.tilburguniversity.edu/nl/zoeken?search=frank%20bosman">https://www.tilburguniversity.edu/nl/zoeken?search=frank%20bosman</a>
Nico de Groot	Information Manager TST	Library and IT Services <a href="https://www.tilburguniversity.edu/nl/medewerkers/n-c-degroot">https://www.tilburguniversity.edu/nl/medewerkers/n-c-degroot</a>
Eric Tjong Tjin Tai	Full professor, TLS	Private, business and labour law <a href="https://www.tilburguniversity.edu/nl/medewerkers/t-f-e-tjongtjintai">https://www.tilburguniversity.edu/nl/medewerkers/t-f-e-tjongtjintai</a>
Esther Keymolen	Associate professor, TLS, TILT, TAISIG	Philosophy of data-driven technology <a href="https://www.tilburguniversity.edu/staff/e-l-o-keymolen">https://www.tilburguniversity.edu/staff/e-l-o-keymolen</a>
Emiel Krahmer	Full professor, TSHD	Cognition and communication, computational linguistics <a href="https://www.tilburguniversity.edu/staff/e-j-krahmer">https://www.tilburguniversity.edu/staff/e-j-krahmer</a>
Marie Postma	Associate professor, TSHD	Department of Cognitive Sciences and AI <a href="https://www.tilburguniversity.edu/nl/medewerkers/marie-postma">https://www.tilburguniversity.edu/nl/medewerkers/marie-postma</a>
Pieter Spronck	Full professor, TSHD, TAISIG	Computer science, programming, artificial intelligence, machine learning, game research <a href="https://www.tilburguniversity.edu/staff/p-spronck">https://www.tilburguniversity.edu/staff/p-spronck</a>
WJ van den Heuvel	Full professor, TiSEM, JADS	Information Systems <a href="https://www.tilburguniversity.edu/nl/zoeken?search=wj%20van%20den%20heuvel%20tilburg">https://www.tilburguniversity.edu/nl/zoeken?search=wj%20van%20den%20heuvel%20tilburg</a>
Max Louwerse (up to and including June 8)	Full professor, TSHD, MindLabs	Cognitive Psychology and Artificial Intelligence <a href="https://www.tilburguniversity.edu/staff/m-m-louwerse">https://www.tilburguniversity.edu/staff/m-m-louwerse</a>
Toni Sfirtsis	Associate professor, TIAS	Strategy Innovation & Future Leadership <a href="https://www.tias.edu/over-tias/profiel/toni-sfirtsis">https://www.tias.edu/over-tias/profiel/toni-sfirtsis</a>
Martin van de Broek ( <i>official secretary</i> )	Program Manager Academic Services	Impact Team <a href="https://www.tilburguniversity.edu/nl/onderzoek/impact/creating-value-data">https://www.tilburguniversity.edu/nl/onderzoek/impact/creating-value-data</a>
Boudewijn Haverkort ( <i>chair</i> )	Dean TSHD	Cyber-physical systems, internet technology, energy systems, cybersecurity <a href="https://www.tilburguniversity.edu/staff/b-r-h-m-haverkort">https://www.tilburguniversity.edu/staff/b-r-h-m-haverkort</a>
Frits Grotenhuis	External consultant	<a href="https://www.grotenhuisadviseert.nl">https://www.grotenhuisadviseert.nl</a>

## **Appendix 2 Reports Inter-School Deliberation Table on Digital Sciences**

- Report meeting deliberation table Digital Sciences March 16, 2021
- Report meeting deliberation table Digital Sciences April 19, 2021
- Report meeting deliberation table Digital Sciences May 17, 2021
- Report meeting deliberation table Digital Sciences June 8 , 2021