



Course and Examination Fact Sheet: Autumn Semester 2020

11,202: Digital Health

ECTS credits: 2

Overview examination/s

(binding regulations see below)

Decentral - examination paper written at home (individual) (15%)

Examination time: term time

Decentral - Presentation (in groups - all given the same grades) (85%)

Examination time: term time

Attached courses

Timetable -- Language -- Lecturer

[11.202.1.00 Digital Health](#) -- Englisch -- [Kowatsch Tobias](#)

Course information

Course prerequisites

Interest in the **multi-disciplinary** field of **Digital Health** at the intersection of **health economics, information systems research, computer science, and behavioral medicine**.

Learning objectives

The promise of more personalized, patient-centered and outcomes-based healthcare is real, worthy, and within reach (Harvard Business Review, October 2019), **NHS teams up with Amazon to bring Alexa to patients** (The Guardian, July 2019), **Apple Heart Study demonstrates ability of wearable technology to detect atrial fibrillation** (Stanford Medicine News, March 2019), **In the midst of a global pandemic and a US recession, US digital health companies raised \$5.4B in venture funding across the first six months of 2020. The sector is on track to have its largest funding year ever.** (Rocket Health, 2020)

What are the **implications** and **rationale** behind the recent developments in the field of **digital health**?

Digital Health is the use of **information and communication technology** for the **prevention** and **treatment** of diseases in the everyday life of individuals. It is thus linked to topics such as digital health interventions, digital biomarker, digital coaches and healthcare chatbots, telemedicine, mobile and wearable computing, self-tracking, personalised medicine, connected health, smart homes or smart cars.

In the **20th century**, healthcare systems specialised in **acute care**. In the **21st century**, we now face the challenge of dealing with the specific characteristics of **chronic conditions**. These are now responsible for around 70% of all deaths worldwide and 85% of all deaths in Europe and are associated with an estimated **economic loss of \$7 trillion between 2011 and 2025**. Chronic diseases are characterized in particular by the fact that they require an intervention paradigm that focuses on **prevention and lifestyle change**. Lifestyle (e.g., diet, physical activity, tobacco, or alcohol consumption) can reduce the risk of suffering from a chronic condition or, if already present, can reduce its burden. A corresponding change in lifestyle is, however, only implemented by a fraction of those affected, partly because of missing or inadequate interventions or health literacy, partly due to socio-cultural influences. Individual personal coaching of these individuals is neither scalable nor financially sustainable.

Against this background, the question arises on how to develop **evidence-based digital health interventions (DHIs)** that allow **medical doctors** and other **caregivers** to **scale** and **tailor long-term treatments** to **individuals** in need at **sustainable costs**. At the intersection of **health economics, information systems research, computer science, and behavioural medicine**, this lecture has the objective to help **students** and **upcoming healthcare executives** interested in the **multi-disciplinary field of digital health** to better understand the **need, design and assessment of DHIs**.



After the course, students will be able to...

1. understand the importance of DHIs for the management of chronic conditions
2. understand the anatomy of DHIs
3. know frameworks for the design of DHIs
4. know evaluation criteria for DHIs
5. know technologies for DHIs
6. assess DHIs
7. discuss the advantages and disadvantages of DHIs

Course content

To reach these learning objectives, the following topics are covered in the lecture and will be discussed based on concrete national and international examples including DHIs from the **Center for Digital Health Interventions** (www.c4dhi.org), a joint initiative of the Department of Management, Technology and Economics at ETH Zurich and the Institute of Technology Management at the University of St.Gallen:

1. Motivation for Digital Health

- The rise of chronic diseases in developed countries
- The discrepancy of acute care and care of chronic diseases
- Lifestyle as medicine and prevention
- From excellence of care in healthcare institutions to excellence of care in the everyday life

2. Anatomy of Digital Health Interventions

- Just-in-time adaptive interventions
- Digital biomarker for predicting states of vulnerability
- Digital biomarker for predicting states of receptivity
- Digital coaching and healthcare chatbots

3. Design & Evaluation of Digital Health Interventions

- Overview of design frameworks
- Preparation of DHIs
- Optimisation of DHIs
- Evaluation of DHIs
- Implementation of DHIs

4. Digital Health Technologies

- Technologies for telemedicine
- Mobile medical devices
- Virtual, augmented and mixed reality applications incl. live demonstrations
- Privacy and regulatory considerations

Course structure

The **Digital Health** lecture is structured in **two parts** and follows the concept of a **blended treatment** consisting of **on-site sessions** and **complementary online lessons**. In the first part, students will **learn** and **discuss** the topics of the four learning modules in **weekly on-site sessions**. Complementary **learning material** (e.g., video and audio clips), **multiple-choice questions** and **exercises** are provided **online** via Canvas.

In the second part, **students work in teams** and will use their knowledge from the first part of the lecture to critically assess DHIs. Each team will then **present and discuss the findings** of the assessment with their fellow students who will provide **peer-reviews**. Additional **on-site coaching sessions** are offered to support the teams with the **preparation** of their **presentations**.

Course literature

1. Cohen, A.B., Dorsey, E.R., Mathews, S.C. et al. (2020) **A digital health industry cohort across the health continuum** Nature Digital Medicine 3(68)



- Collins, LM (2018) **Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: The Multiphase Optimization Strategy (MOST)** New York: Springer.
- Corneta, VP, and Holden, RJ (2018) **Systematic Review of Smartphone-Based Passive Sensing for Health and Wellbeing** Journal of Biomedical Informatics (77:January), 120-132.
- Coravos, A., Khozin, S., and K. D. Mandl (2019) **Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes** Nature Digital Medicine 2 Paper 14.
- Hekler E. Tiro J.A. Hunter C. M. & Nebeker, C. (2020) **Precision Health: The Role of the Social and Behavioral Sciences in Advancing the Vision** Annals of Behavioral Medicine 10.1093/abm/kaa018
- Katz, D. L., E. P. Frates, J. P. Bonnet, S. K. Gupta, E. Vartiainen and R. H. Carmona (2018) **Lifestyle as Medicine: The Case for a True Health Initiative** American Journal of Health Promotion 32(6), 1452-1458.
- Kvedar, JC, Fogel AL, Elenko E and Zohar D (2016) **Digital medicine's march on chronic disease** Nature Biotechnology 34(3), 239-246
- Kowatsch, T., L. Otto, S. Harperink, A. Cotti and H. Schlieter (2019) **A Design and Evaluation Framework for Digital Health Interventions** it - Information Technology 61(5-6), 253-263.
- Mathews, SC, McShea, MJ, Hanley, CL et al. (2019) **Digital health: a path to validation.** npj Digital Medicine 2(38)
- Nahum-Shani, I, Smith SN, Spring BJ, Collins LM, Witkiewitz K, Tewari A and Murphy SA (2018) **Just-in-Time Adaptive Interventions (JITAs) in Mobile Health: Key Components and Design Principles for Ongoing Health Behavior Support** Annals of Behavioral Medicine 52 (6), 446-462.
- Powell AC, Torous JB, Firth J, Kaufman KR (2020) **Generating value with mental health apps** BJPsych Open 6(2):e16. Published 2020 Feb 5. doi:10.1192/bjo.2019.98
- Safavi K, Mathews SC, Bates DW, Dorsey ER, Cohen AB (2019) **Top-Funded Digital Health Companies And Their Impact On High-Burden, High-Cost Conditions** Health Affairs 38(1):115-12
- Sim, I. (2019) **Mobile Devices and Health** The New England Journal of Medicine, 381(10), 956-968.

Mandatory Material

The mandatory material will be provided via the online learning platform Canvas no later than November 22, 2020.

Additional course information

In the case of the President's Board having to implement new directives due to the SARS-CoV-2 pandemic in AS2020, the course information listed above will be changed as follows:

- The on-site sessions and coaching sessions will be conducted online via Zoom.
- The recordings of the course will be made permanently available.
- The lecturer informs via Canvas on the changed implementation modalities of the course.
- Course content such as live demonstrations or on-site guest lectures will likely be cancelled.

The examination information listed below would be changed as follows:

- The group presentations will be cancelled and the group work will be assessed based on the submitted slides (in groups - all given the same grades, 85%).
- Further details about the group work and examination will be communicated via Canvas.

Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form

Decentral - examination paper written at home (individual) (15%)

Examination time: term time

Remark

Online exercises and peer-review via Canvas

Examination-aid rule



Term papers

Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship which is a published template in StudentWeb.

The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the chosen citation standard such as APA or MLA.

For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B., Juristisches Arbeiten: Eine Anleitung für Studierende, newest edition respectively, or according to the recommendations of the Law School).

The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into texts in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C., Lern- und Arbeitsstrategien, newest edition respectively).

For any work written at the HSG, the indication of the page numbers is mandatory independent of the chosen citation standard. Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.

Supplementary aids

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Examination languages

Question language: English

Answer language: English

2. Examination sub part (2/2)

Examination time and form

Decentral - Presentation (in groups - all given the same grades) (85%)

Examination time: term time

Remark

Presentation of team project

Examination-aid rule

Presentations

In presentations, aids for visual presentation can be used. These aids can be specified or restricted by the lecturers.

Supplementary aids

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Examination languages

Question language: English

Answer language: English

Examination content

1. Motivation for Digital Health
2. Anatomy of Digital Health Interventions
3. Design & Evaluation of Digital Health Interventions
4. Digital Health Technologies

Examination relevant literature

Mandatory Material



The mandatory material will be provided via the online learning platform Canvas no later than November 22, 2020.

Please note

Please note that only this fact sheet and the examination schedule published at the time of bidding are binding and takes precedence over other information, such as information on StudyNet (Canvas), on lecturers' websites and information in lectures etc.

Any references and links to third-party content within the fact sheet are only of a supplementary, informative nature and lie outside the area of responsibility of the University of St.Gallen.

Documents and materials are only relevant for central examinations if they are available by the end of the lecture period (CW51) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 42 are relevant for testing.

Binding nature of the fact sheets:

- Course information as well as examination date (organised centrally/decentrally) and form of examination: from bidding start in CW 34 (Thursday, 20 August 2020);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 42 (Monday, 12 October 2020);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 42 (Monday, 12 October 2020);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the registration period in CW 44 (Thursday, 29 October 2020).