University of St.Gallen

Course and Examination Fact Sheet: Spring Semester 2020

8,810: Digital Health Project

ECTS credits: 3

Overview examination/s

(binding regulations see below)
Decentral - examination paper written at home (individual) (15%)
Decentral - Presentation (in groups - all given the same grades) (85%)

Attached courses

Timetable -- Language -- Lecturer
8,810,1.00 Digital Health Project -- Englisch -- Kowatsch Tobias

Course information

Course prerequisites

Students should be interested in the **multi-disciplinary** field of **Digital Health** at the intersection of **health economics**, **information systems research**, **computer science**, and **behavioral medicine**. Attendance of the **Digital Health** course (7,800) is **advantageous** but **not required**.

Please note that you need to set up a **mobile application development environment** and a **smartphone emulator** (i.e., React Native in combination with either Android Studio for Windows, Mac, or Linux or XCode for Mac). You will get detailed instructions for the installation and usage of that software. Programming skills may be helpful but are not a requirement in this course.

Moreover, your personal computer must meet the following requirements: (a) Windows 7/8/10 (64-bit), (b) MacOS 10.14.4 or higher, or (c) Linux GNOME or KDE desktop 64-bit distribution capable of running 32-bit applications GNU C Library (glibc) 2.19 or later. For each setup, **12 GB of available disk space**, a minimum of 4 GB RAM (8 GB RAM recommended), and a 13" display (15" or larger recommended) are required.

Finally, a smartphone with either iOS 12 (or higher) or Android Version 8 (or higher) is required to test the digital health interventions of the course participants.

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), **Industries like healthcare are quietly adopting chatbots to free up busy professionals' time and offer guided, personalized experiences to consumers** (CB Insights, October 2019), **Digital health companies raised a total of $4.2B across 180 deals through the first half of 2019. If this pace holds steady, the sector is on track for an $8.4B year in 2019 - and may even top 2018's record-breaking annual funding total.** (Sean Day, Rocket Health, 2019 Midyear Digital Health Market Update)

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, personalized medicine, connected health, smart homes or smart cars.

In the 20th century, healthcare systems specialized 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 **behavioral 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, implementation**, and **assessment of DHIs**.

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

- understand the importance of DHIs for the management of chronic conditions
- discuss the opportunities and challenges related to DHIs
- better understand the design, implementation and evaluation of smartphone-based and chatbot-delivered DHIs

Course content

To reach the learning objectives, students will work on the following topics:

1. Motivation for Digital Health

- The rise of chronic diseases in developed countries
- Lifestyle as medicine and prevention of chronic diseases

2. Design of a Digital Health Intervention (DHI)

- Overview of design frameworks for health interventions
- Development of a conceptual model for a DHI
- Implementation of a smartphone-based and chatbot-delivered DHI

3. Evaluation of DHIs

- Overview of evaluation methods and evaluation criteria for DHIs
- Evaluation of a smartphone-based and chatbot-delivered DHI

Course structure

The lecture is structured in **two parts** and follows the concept of a hybrid therapy consisting of **on-site sessions** and **complementary online lessons**. In the first part, students will **learn and discuss** the topics of the three learning modules in **weekly on-site sessions**. Complementary **learning material** (e.g., video 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 **develop** a **smartphone**-based and **chatbot**-delivered health intervention with **MobileCoach** (www.mobile-coach.eu), an **open-source software platform** for digital interventions and ecological momentary assessments. Each team will then **present and discuss** their resulting **digital health intervention and evaluation results** with their fellow students who will provide **peer-reviews**. Additional **on-site coaching sessions** are offered to support the teams with the **design and evaluation of their digital health intervention**, and with the **preparation** of their **presentations**.

Course literature

1. Collins, L. M. (2018) **Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: The Multiphase Optimization Strategy (MOST)** New York: Springer.
2. Corneta, V. P., and R. J. Holden (2018) **Systematic Review of Smartphone-Based Passive Sensing for Health and Wellbeing** Journal of Biomedical Informatics (77:January), 120-132.
3. Coravos, A., S. Khozin and K. D. Mandl (2019) **Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes** Nature Digital Medicine 2 Paper 14.

4. 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.
5. 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.
6. Kvedar, J. C., A. L. Fogel, E. Elenko and D. Zohar (2016) **Digital medicine's march on chronic disease** Nature Biotechnology 34 (3), 239-246.
7. Michie, S., L. Yardley, R. West, K. Patrick and F. Greaves (2017) **Developing an Evaluating Digital Interventions to Promote Behaviour Change in Health and Health Care: Recommendations Resulting From an International Workshop** Journal of Medical Internet Research 19(6):e232.
8. Nahum-Shani, I., S. N. Smith, B. J. Spring, L. M. Collins, K. Witkiewitz, A. Tewari and S. A. Murphy (2018) **Just-in-Time Adaptive Interventions (JITAIs) in Mobile Health: Key Components and Design Principles for Ongoing Health Behavior Support** Annals of Behavioral Medicine 52 (6), 446-462.

Mandatory material

The mandatory material will be provided via the online learning platform Canvas no later than April 30, 2020.

Additional course information

If you have any **further questions** regarding the **Digital Health Project** lecture, then please contact **Caterina Berubé** (cberube@ethz.ch).

Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form
Decentral - examination paper written at home (individual) (15%)

Remark
Online exercises and peer-review (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.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text 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. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- 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.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
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Examination languages
Question language: English
Answer language: English

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2. Examination sub part (2/2)

Examination time and form
Decentral - Presentation (in groups - all given the same grades) (85%)

Remark
Presentation of team project

Examination-aid rule
Practical examination
No examination-aid rule is necessary for such examination types. The rules and regulations of the University of St. Gallen apply in a subsidiary fashion.

Supplementary aids
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Examination languages
Question language: English
Answer language: English

Examination content

The examinations will cover the four building blocks of the lecture:

1. Motivation for Digital Health
2. Design of Digital Health Interventions
3. Evaluation of Digital Health Interventions

Examination relevant literature

Mandatory material

The mandatory material will be provided via the online learning platform Canvas no later than April 30, 2020.

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Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW21) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination typestarting from the beginning of the bidding on 23 January 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 16 March 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 6 April 2020

Please consult the fact sheet again after these deadlines have expired.