THE EUROPEAN FAMILY SUPPORT



cost
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Funded by the European Union

Designing Inclusive And Useful ICT Solutions For Families

Concepts, methods, tools

dr. Jure Trilar

Faculty of Electrical Engineering
University of Ljubljana

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Funded by the European Union

EuroFamNet Training School

Quality standards and evidence-based programmes in family support

Tenerife 7-9 September, 2022

Lecture structure

1. Conceptual framework
   - ICT usage in families
   - Family centered design (FCD) concept development

2. Developing ICT solutions
   - Prototypes
   - Existing digital services

3. Methods and tools
   - Evaluation methods
   - Automatisation, recommendation tool

Motivation for FCD concept development

- Project work, lack of appropriate approaches to developing user-friendly software for heterogeneous groups, gap in literature.

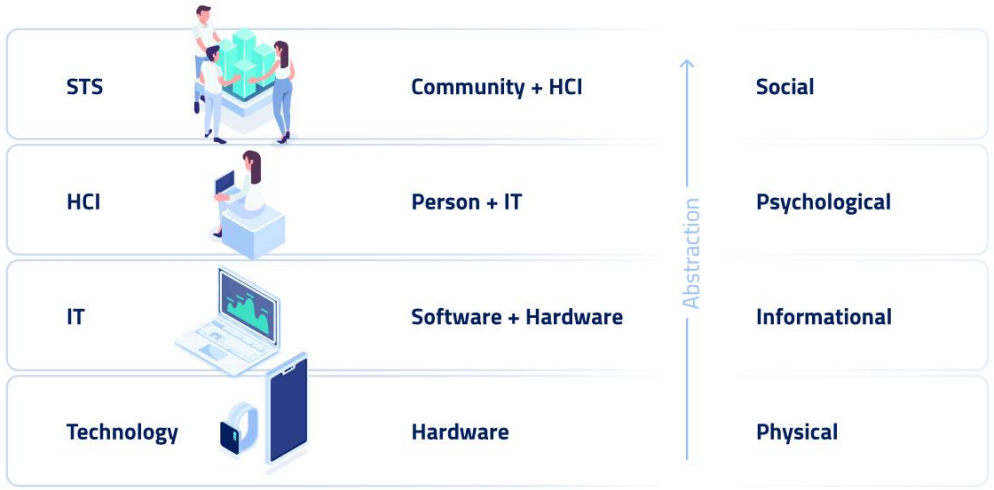
- **Interdisciplinary approach:** psychology, anthropology, sociology, UX, computer/mobile application programming

- Family-centered design – *FCD* for
  - Multi-generational communities (children-adults-seniors)
  - Different levels of digital competences
  - Involvement in collaborative processes supported by the use of electronic devices

Main research field (ICT)

Human computer interaction (HCI)

- Academic/reasearch
- Abstraction nuances[1]



User experience (UX)

- Applied/industrial
- Industry standards describe the usability of systems, software and products:
  - IEEE Std.61012, 1990 Ease of use, learning and understanding
  - ISO 9241-210:2010 Ergonomics of human-system interactions
  - ISO/IEC 9126-1:2000 Understandability, learnability, usability and attractiveness
  - …
- **Accessibility**
- **User-centered design – UCD**
- **Evaluation methods**

[1] Soegaard, Mads, and Rikke Friis. Dam. *Encyclopedia of Human-Computer Interaction*. Aarhus, Denmark: Interaction Design Foundation, 2013.

Research activities and articles

- **Concept design and functional specifications**
  - User habits analysis with an online survey
  - Semi-structured interviews on ICT use and family life
  - Creating personas
  - Definitions of ties between family members and smart city
  - Mental models
  - Motivational mechanisms to promote an active and healthy life
  - Human development goals questionnaire

ICT TO PROMOTE WELL-BEING WITHIN FAMILIES
Jure Trilar, Andrej Kos, Simona Jazbinšek, Lea Jensterle and Emilija Stojmenova Duh
Sensors 2018, 18(9), 2760. doi: 10.3390/s18092760

- **Prototype application improvements**
  - Semi-structured interviews with users of the app
  - Conducting user testing of the prototype application
  - Additions to functionality and user scenarios

RETHINKING FAMILY-CENTRED DESIGN APPROACH TOWARDS CREATING DIGITAL PRODUCTS AND SERVICES
Jure Trilar, Veronika Zavratnik, Vid Čermelj, Barbara Hrast, Andrej Kos and Emilija Stojmenova Duh
Sensors 2019, 19(5), 1232. doi: 10.3390/s19051232

- **Public services and testing platform**
  - Focus group on the development of customised interfaces
  - Focus group on testing platform needs
  - Experiment: unmoderated remote testing of the eTax portal

FAMILY-CENTERED DESIGN: INTERACTIVE PERFORMANCE TESTING AND USER INTERFACE EVALUATION OF THE SLOVENIAN EDAVKI PUBLIC TAX PORTAL
Jure Trilar, Tjaša Sobočan and Emilija Stojmenova Duh
Sensors 2021, 21(15), 5161. doi: 10.3390/s21155161

Families and ICT usage within families

Surveys on:

- Household form
- Division of labour
- Spending time together
- Use of modern technologies
- Health and care for family members
- Time management
- Shared goals
- Developmental tasks by generation

Interdisciplinary qualitative discourse, thematic analyses/triangulation, interviews etc:

- Motivational factors, gamification
- Family persona creation (typical virtual families, UX method)
- Mental models (grouping common needs/solutions)

ICT usage within families

Insights for digital solutions design and development approaches:

- Recuring themes were communication, time management (activities, tasks, goals) and health.
- ICT can be used for schedule organisation and family support to benefit more family time spent together, instead of reducing this time.
- ICT can establish beneficial use for aging population.
- Common processes to be presented in accesible way, common experience instead of customised user interfaces based on device

Family centered design concept

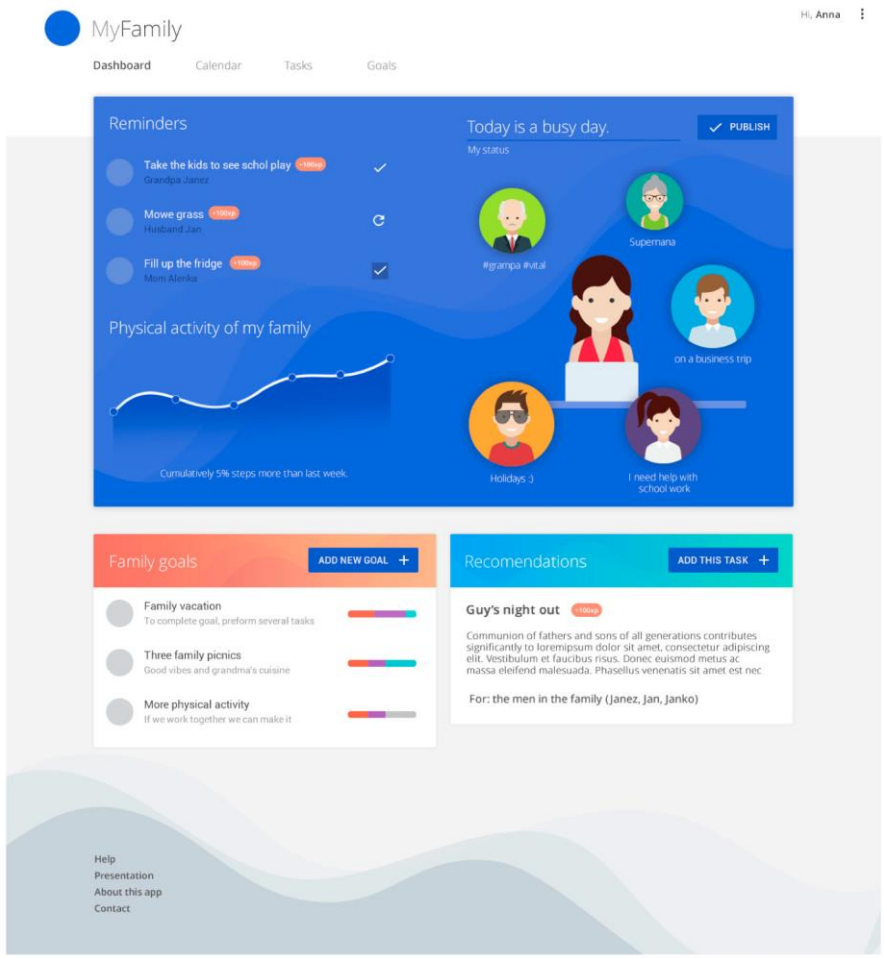
Enhanching User Centered Design methodology

Elements:

- **Analysis of common communication methods**
- **Common activities and objectives in day-to-day activities**
- **Inclusive processes**
- **Taking into account access, accessibility and skills in ICT**
- **Content relevance through generational development tasks**

Prototype application

- Iterative development with families‘ involvement
- A range of functionalities:
  - User profiles and integration with others
  - Tasks and assignments, reminders, calendar
  - Common goals
  - Elements of gamification
  - Physical activity monitoring
  - Integration with the 24@Life commercial app
- User testing
  - Good usability score (SUS), improves over time (except for elderly)
  - Good user experience rating (UEQ), decreases over time
  - Work load rating (NASA-TLX) increases over time



FCD experiment in existing digital services

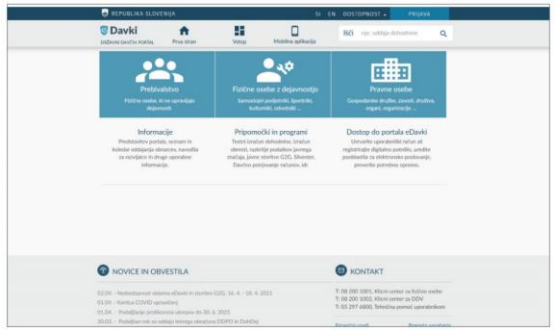
- Existing public digital solutions - the Slovenian tax portal eDavki

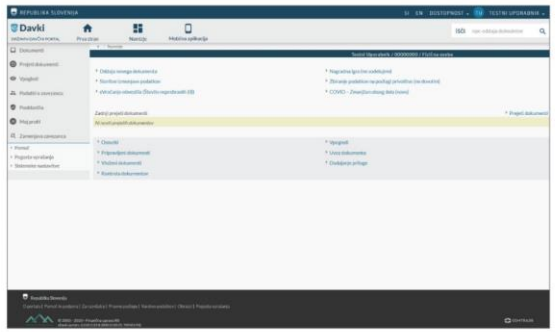
- Customised eDavki interface (with FCD elements):
  - Taking into account access, accessibility and skills in ICT
    - W3C Web Content Accesibility Guide (WCAG) 2.1
  - Content relevance through generational development tasks
    - Content relevance of the set of forms for different generations

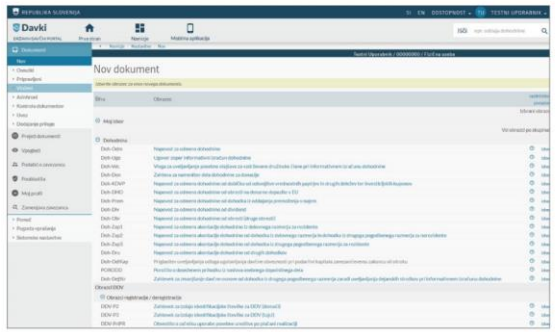
- Experiment involved
  - Developing an interactive platform and tools for unmoderated remote testing
  - Accesibility recommendation tool (WCAG 2.1)
  - Extensive user testing nad automated data processing, comparing:
    - FCD-inteface vs. original interface and
    - usage between generations

FCD experiment interfaces

Original interface

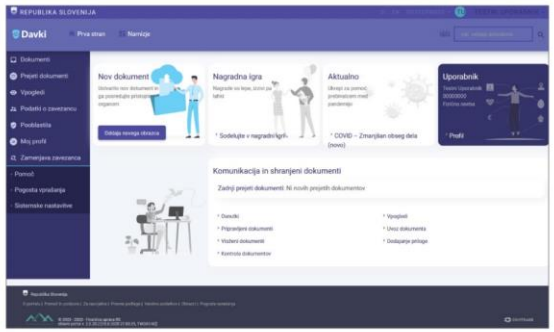


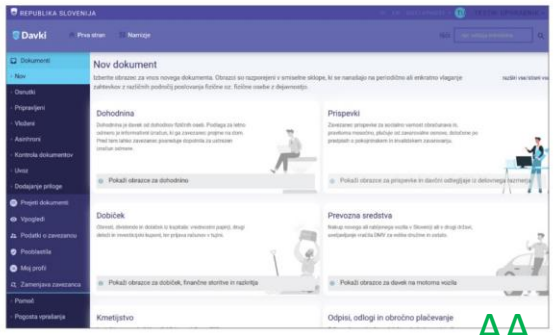




FCD- interface

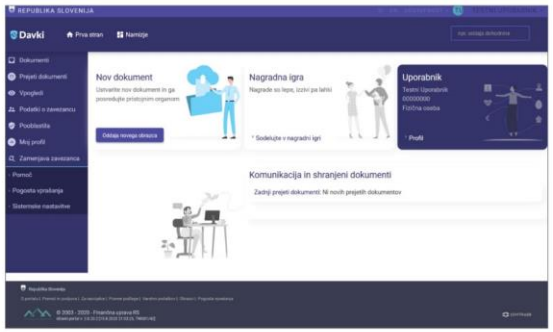


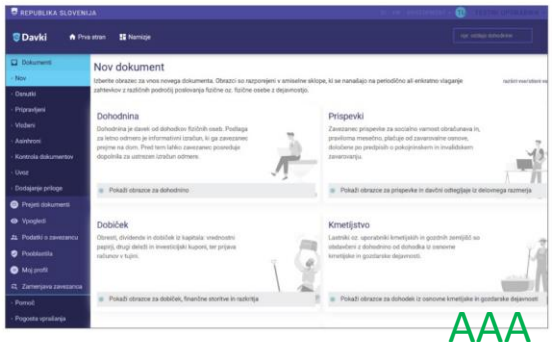




AA





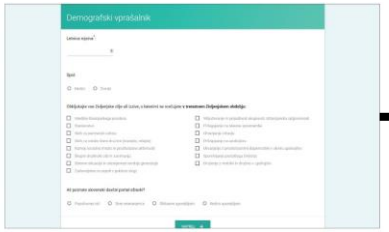


AAA

User testing platform



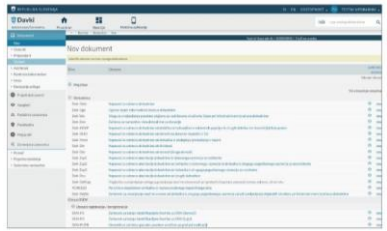
Introduction, video, consent

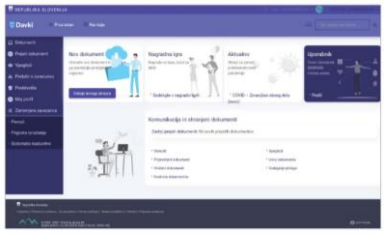


Demography



Instructions for solving tasks





Solving tasks in one or another interface

...





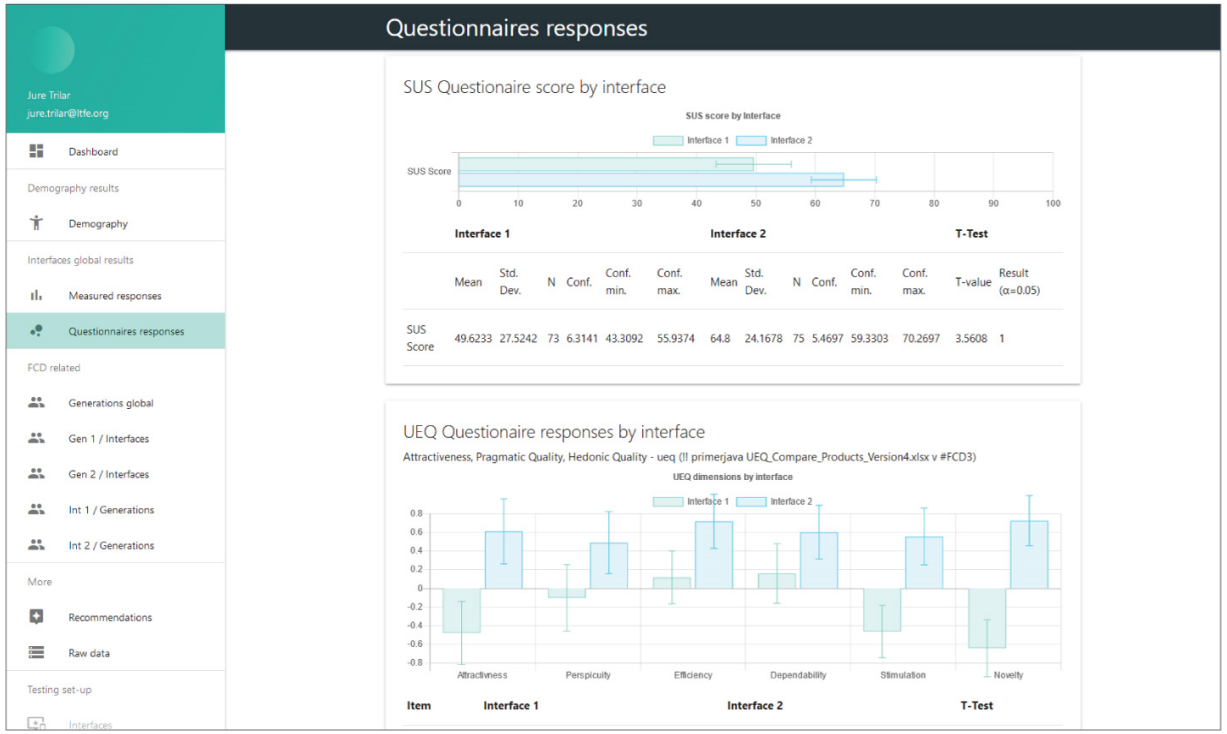


SUS, UEQ, NASA-TLX Questionnaires



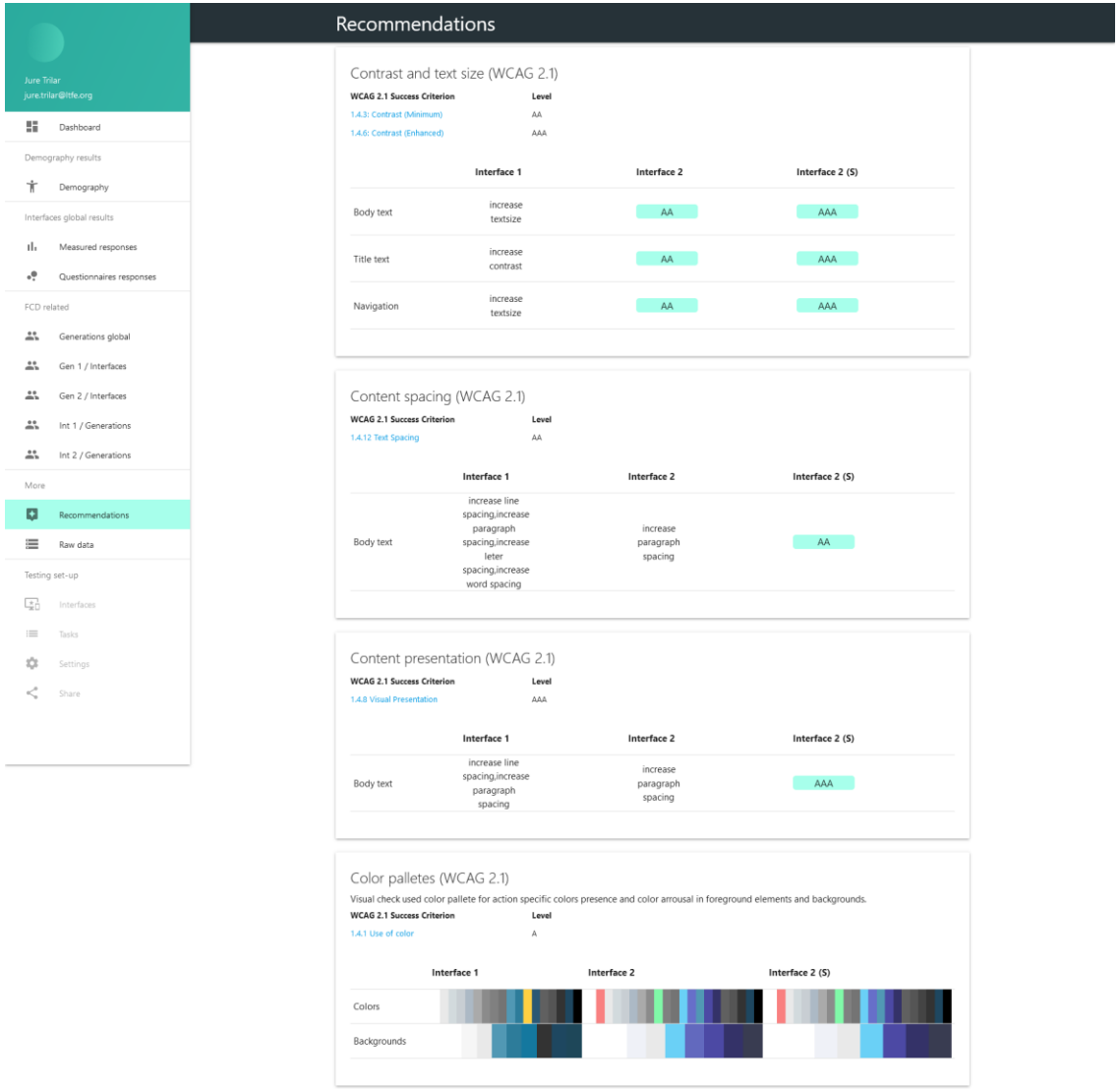
Conclusion, thanks, opinion

Automated data analysis platform



- General testing summaries
- Comparisons of test results:
  - Measured results of use
  - Questionnaires results
- Graphical plots
- Descriptive statistics
  - Measures of centrality and dispersion
- H0 testing:
  - Student T-test/Mann-Whitney U test
- Extract all data for processing in other tools (MS Excel, SPSS...)

Recommendation tool



- Automatic comparison of specific elements between multiple interfaces
  - WCAG 2.1 accesibility criteria
  - Comparing other visual assets

FCD experiment results

Main conclusions

- Where differences are statistically significant, they are in favor of FCD interfaces

- Seniors: *evaluate* FCD interface as better
- Adults *perform* better than seniors in original interface
- Seniors: *perform* equally as adults in FCD intefaces

FCD concept

- Development and validation of a new approach to designing technology solutions - family-centred design.

- FCD is an **upgrade** to existing User experience field
  - using **UX evaluation methods**
  - using guides, standards, i.e. **WCAG 2.1 accesibility criteria, DigComp,..**

- Interactive **tools** for effective design of interactive technology solutions that meet the needs of user groups with mixed characteristics.

UX evaluation methods

UX evaluation instruments:

- User ***performance,*** task based measurements
  - Effectiveness (**success** rate)
  - Efficiency (**time** on task)
- User ***evaluation***, standard questionnaires of overall/scenario experience
  - System Usability Scale (**SUS**), index
  - User Experience Questionnaire (**UEQ**), measures 6 dimensions:
    - Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, Novelty
  - NASA-Task Load Index (**NASA-TLX**), 6 dimensions:
    - Mental, Physical, Temporal demand, (own) Performance, Effort, Frustration

Accesibility conformance

Accessibility benefits all users!

- W3C Web Content Accesibility Guide (WCAG) 2.1
  - 78 criteria to respect
    - For visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities
  - 4 principles:
    - Perceivable
    - Operable
    - Understandable
    - Robust
  - A (lowest), AA, and AAA (highest) levels of critera conformance
  - Testable statements that are not technology-specific

(Some) lessons learned

- Inclusive digitalisation
- Involve practitioners/policy makers/users troughout the whole research/design/implementation process - listen more than talk
- Be observant and learn of own biases
- „If you only have a hammer you tend to see every problem as a nail.“ – experiment, learn new approaches, methods…

Thank you!

Questions?