Aalto University
School of Electrical
Engineering

Electronics and Design Workshop - Kick off

Salu Ylirisku, 9.1.2019

ED Workshop

- **You will learn**
  1. to use a design process to create and communicate well-founded design concepts
  2. to develop functioning interactive prototypes using Arduino and related technologies
  3. to use functioning interactive prototypes as proof-of-concept in a user-centred manner

Three Courses with Shared Resources

- **ELEC-C9820 – Electronics and Design Workshop (5 cr.)**
  - This is a design-driven version of Sähköpaja run in English. Additional credits will be considered.
- **ELEC-A4010 – Sähköpaja (8 cr.)**
  - This is the traditional long version of the Sähköpaja course
- **ELEC-A4910 – Sähköpaja (5 cr.)**
  - This is a shorter version of the Sähköpaja course, differing mainly in the project work amount

Design Process & Technical Exercises

- **Design process and technical exercises are organised in parallel**
- **Technical exercises are organised weekly, and supervised by tutors at Sähköpaja space**
- **There are particular times (announced soon!) when the assistants are available**
  - This week: Thu 12-14 & 14-16, Fri 10-12
  - Exercises are found on MyCourses (at Sähköpaja the printed instructions will be only in Finnish)
  - You don't need your team in the exercises – grouped on the spot

Design Process & Technical Exercises

- **Design Process is coordinated during the Wednesday Common Sessions**
- **The first period will be mostly workshops**
  - Useful Games
  - Ideation
  - Gaming
  - Physical Forms
- **Second period is mostly prototype building & tutoring**
- **Last part is user testing and finalising presentation**

Common Sessions
(tentative schedule)

ED Workshop (Wednesdays 10-12 @TU5)

1. **Kick-off**
2. **Useful Games Workshop**
3. **Ideation Workshop**
4. **Gaming Workshop**
5. **Physical Forms Workshop**
6. **Concept Review**
7. **3D Modelling Tutorial**
8. **Team Tutoring**
9. **Team Tutoring**
10. **Team Tutoring**
11. **Team Tutoring**
12. **Prototype Presentations**
13. **User Testing workshop**

Sähköpaja (Mondays 10-12 @TU2) in FINNISH

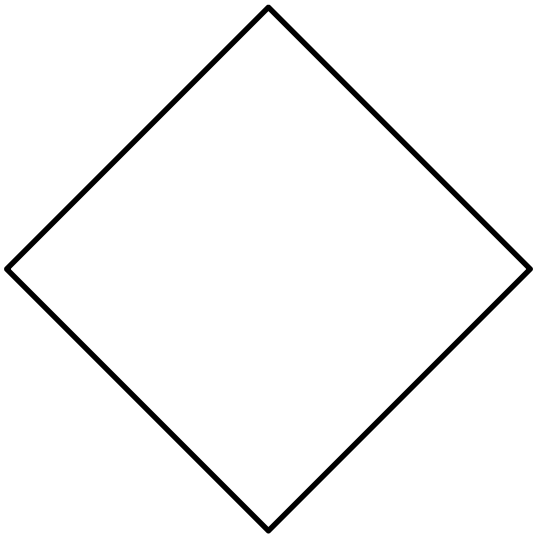
1. Introductions
2. Teaming up, Arduino examples
3. Basics of Arduino programming
4. Sensors
5. 3D printing and OpenSCAD
6. Aalto Ventures Program (AVP)
7. Aaltonaut, prototyping
8. Arduino buses (SPI, I2C, UART)
9. Radio technology and Freakduino
10. Arduino radios
11. Laser cutting, PCB making
12. Basics of electronics
13. User interfaces, measuring tools

Useful Games

- **Useful games are such that help develop skills that are needed outside the game**
  - Finnish baseball -> learn to throw grenades
  - Typing challenge -> learn to write with a computer
  - Duolingo -> a foreign language
  - Robot wars -> all kinds of building skills
- **There are a ton of these games**
  - Learning alphabet, words, geography, mathematics, programming, literature, etc.

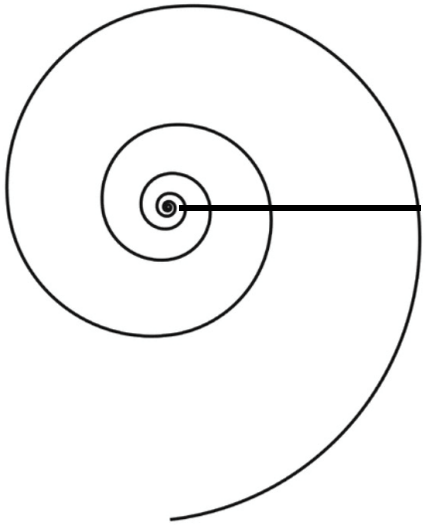
Design Process - Basic Models

Diamond Model



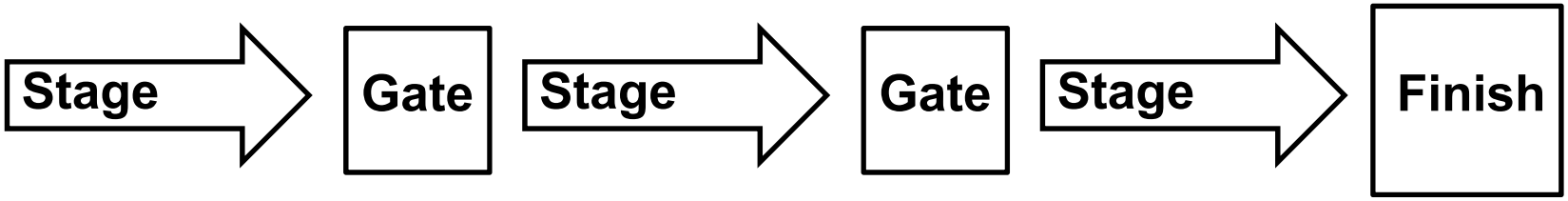
Council, D. (2007). Eleven lessons: Managing design in eleven global companies. A study of the design process.

Spiral Model



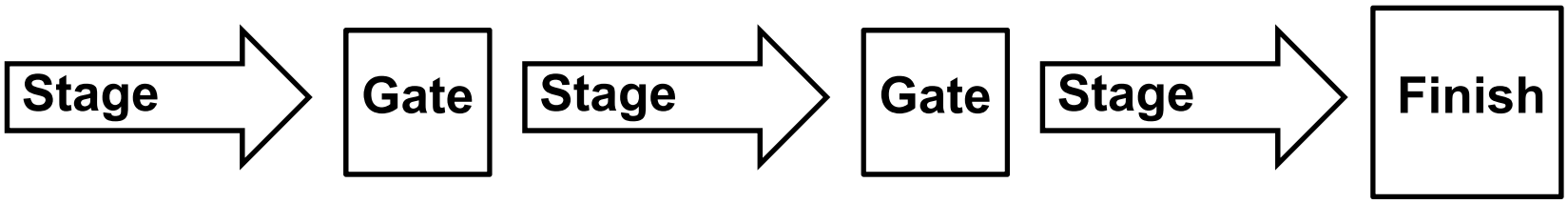
Boehm, B. (1986). A spiral model of software development and enhancement. *ACM SIGSOFT Software Engineering Notes*, *11*(4), 22–42.

Design Process vs. Design Project



Cooper, R. G. (1990). Stage-gate systems: a new tool for managing new products. *Business Horizons*, *33*(3), 44–54.

Design Process vs. Design Project



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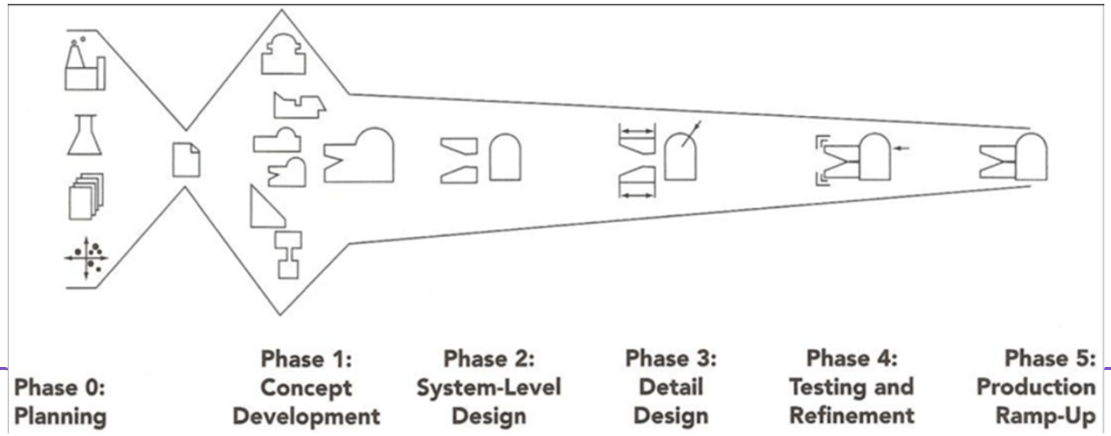
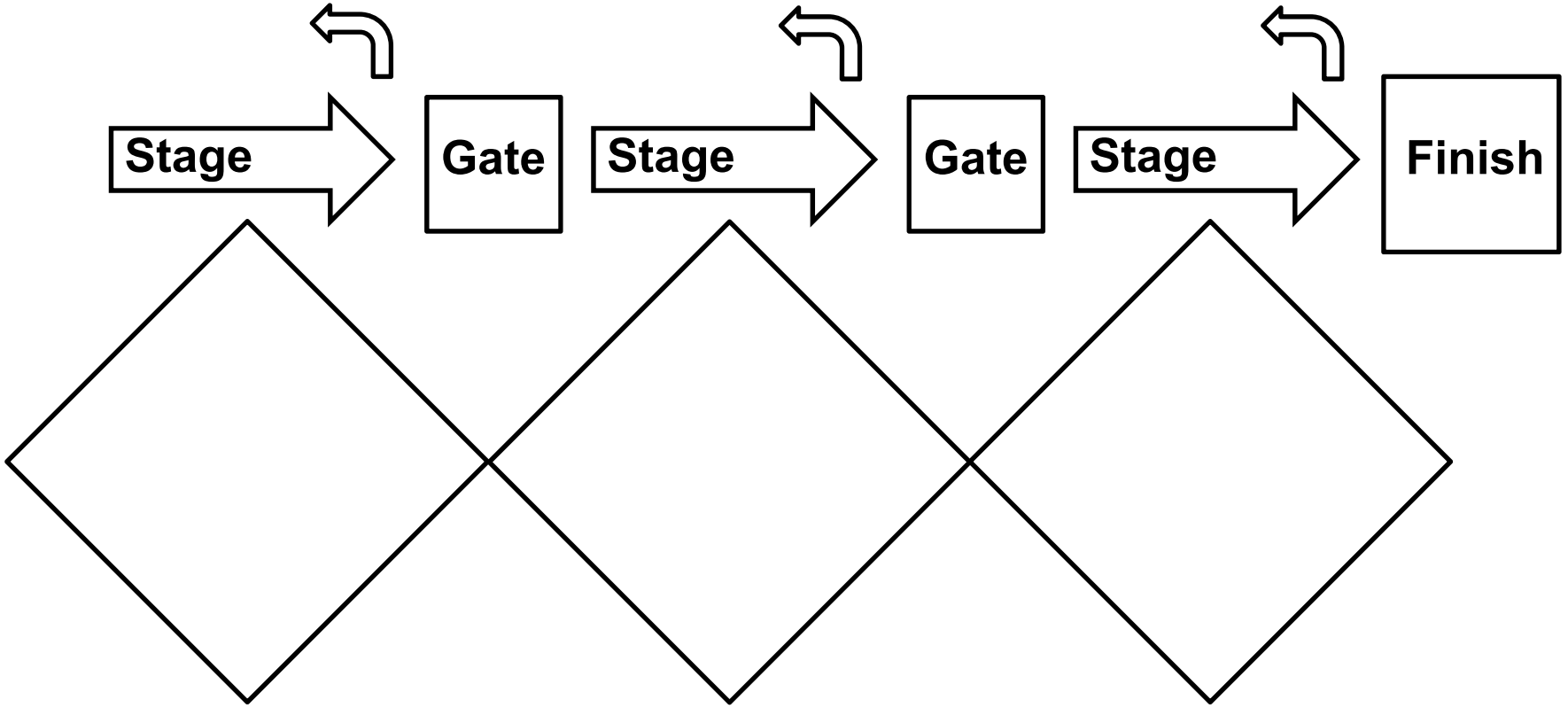
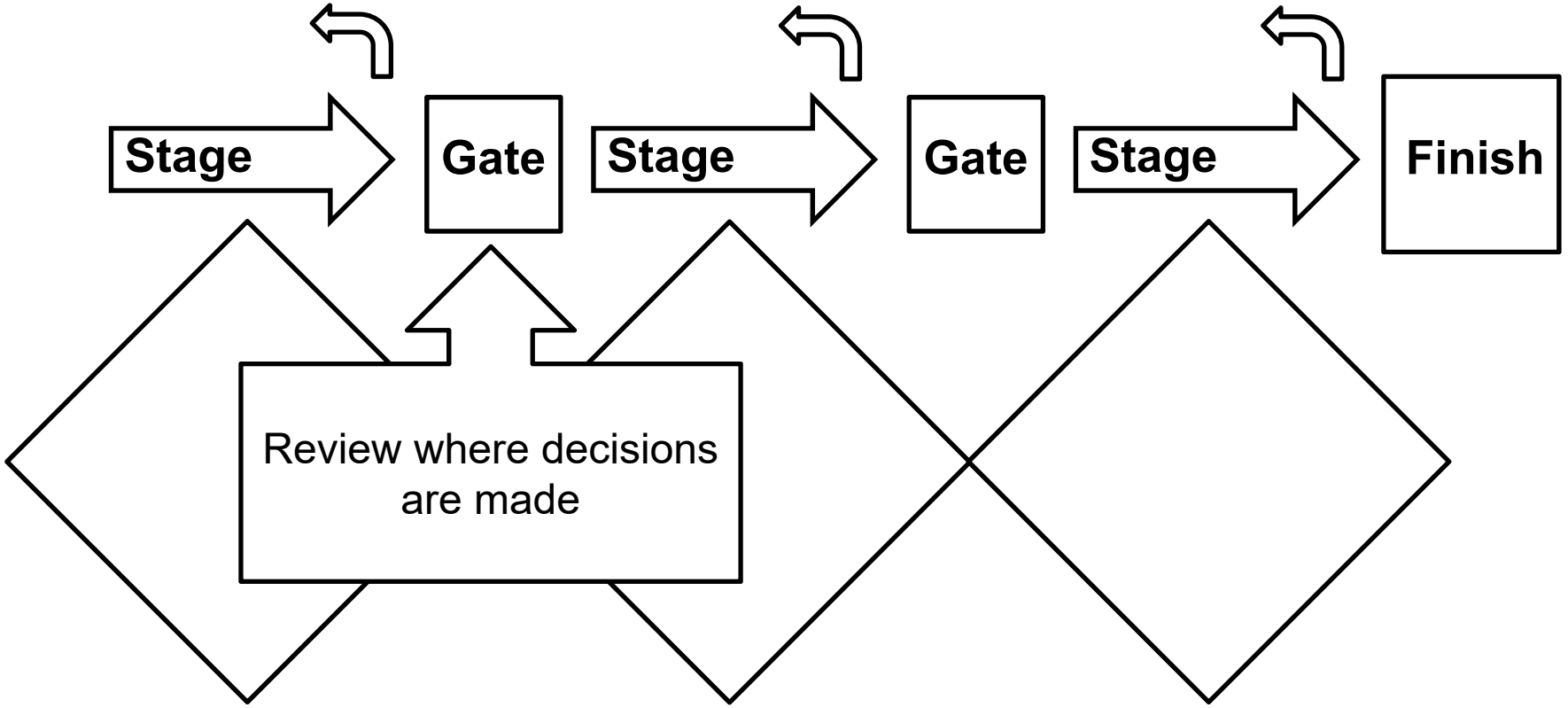


Ulrich, K., & Eppinger, S. (2003). *Product Design and Development*. New York, USA: McGraw-Hill.

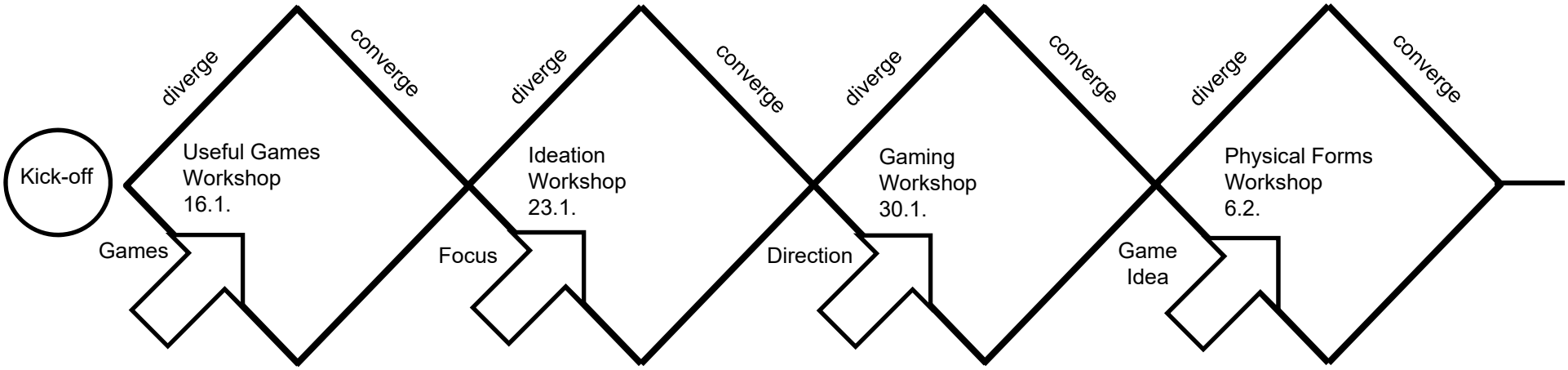
Design Process vs. Design Project



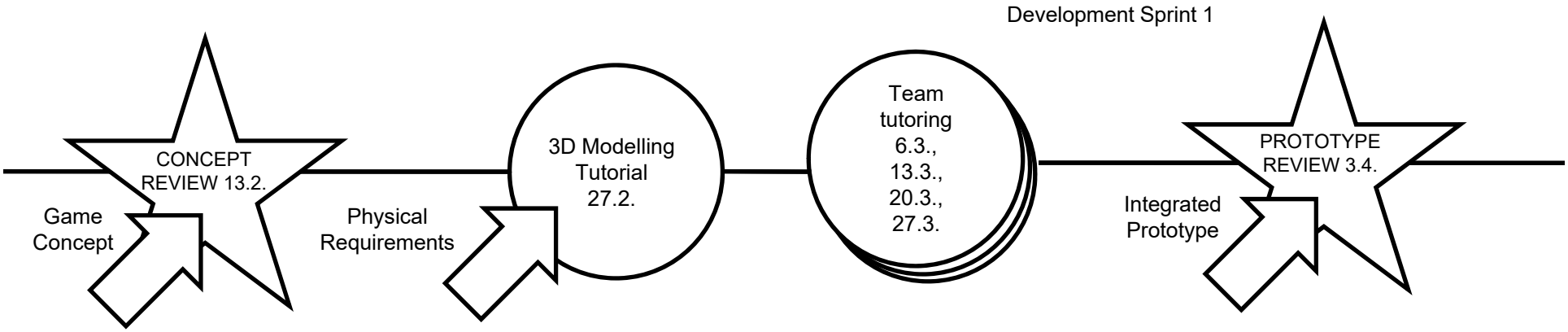
Design Process vs. Design Project



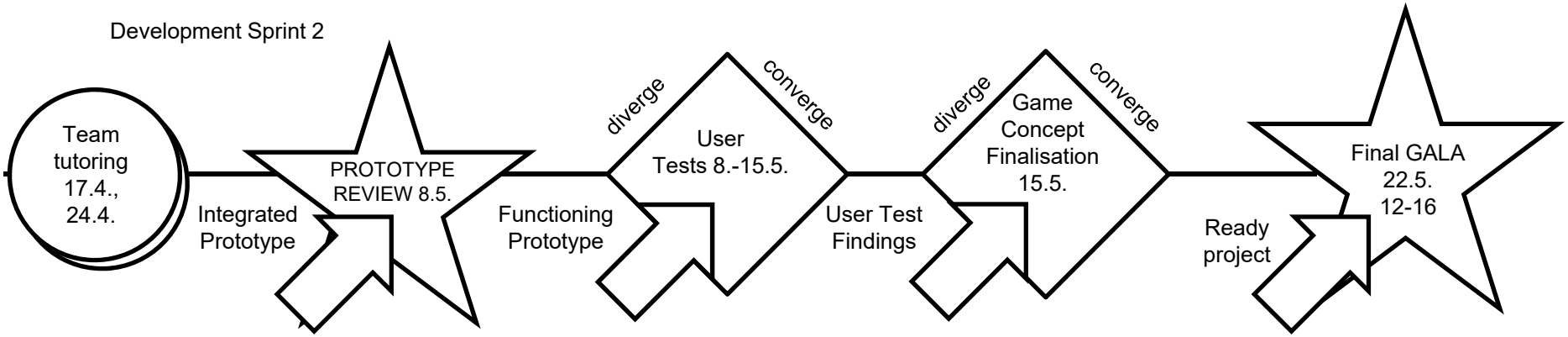
Design Project – Part #1/3



Design Project – Part #2/3



Design Process – Part #3/3



Theme – Useful Games

- **Teams**
  - Verneri, Ishaan
  - Vilis, Hien, Niko
  - (Dias, Adilet)

Deliverables

- **Personal Learning Diary**
  - Returned in the end of each period (III, IV, V)
- **Project Wiki**
  - Team intro, focus, presentation files, links to (re-)sources (code, schematic)
- **Presentations**
  - Concept presentation (end of period III)
  - Prototype presentation (end of period IV)
  - Final Gala presentation (end of period V) + poster
- **Functioning Interactive Prototype**

Learning Diary

- **Cover the full process**
  - Lectures, exercises and project work
- **Focus on things that you learn**
  - Write about what do you think about what you have done and plan to do?
  - Include especially things new to you / puzzling / surprising matters
  - The use of references is a plus!
- **Length**
  - 12-20 pages in total

Grading is based on the following

- **Learning diary (40%)**
- **Active participation (20%)**
- **Project, presentations and documentation (40%)**

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- **Official assessment criteria:**
  - active participation in collaborative sessions
  - collaborative design process (rigour, management, documentation)
  - collaborative design outcome (relevance, functioning, presentation)
  - individual reflection (coverage, use of references)

Getting a good grade

- Be active in the common sessions
- Document your activities well in your learning diary – also of your consideration of Sähköpaja lectures (Salu translates)
- Do the exercises and show your comprehension of them them in your diary
- Explain how you contributed to the prototype and to team wiki
- Involve users in your design process also as input
- Participate in the common presentations (concept, proto, gala)

Passing

- **Participating in common sessions & tutoring 75% of time**
- **Doing 50% of exercises**
- **Delivering a diary that covers the activities in the course + explanation of contribution to prototype + wiki**

Arduino tutoring starts this week!

- **Arduino tutoring is organised at the Sähköpaja space already today!**

- **Tutoring times from week 1:**
  - Mon 12-14, Wed 12-14, Thu 12-14 & 14-16, Fri 10-12
  - Other tutoring times will be announced soon

- **To get a head start, check out Arduino and Teensy 2.0 online**
  - http://www.arduino.cc
  - http://www.pjrc.com/store/teensy.html

Resources in the Sähköpaja Space

- Assistants – use them always!
- Components, Arduino shields, bread boards
- PCs (Win/Linux) and BW printer that is mostly used for PCB design printouts
- Batteries and powers
- Solder irons, drills, Dremel, carver
- PCB (printed circuit board) making tools incl. reflow oven
- Measuring tools, stereo microscope
- 3D printers (5x Ultimaker & TAZ 5)
- Laser cutter (cuts 3mm veneer, acrylic, paper, carves glass)
- Foam board and acrylic boards for casing
- Teachers have also their stash… and additional purchases will be made

Rules of the Sähköpaja space

1. **Do not borrow USB cables away from the space (e.g. to your home)**
2. **Never try to charge alkaline batteries!**
3. **Beware of LiPo batteries**
   - They are quite hazardous when handled inappropriately
4. **If you do not know how something works, ask before trying**
5. **Respect others' stuff**
6. **Clean after yourself and disconnect!**

Tasks before the next session

1. **Do at least Exercise 1 on MyCourses in Sähköpaja Space**
2. **Collect examples of interesting ‘useful’ games and prepare a presentation (15 mins/team) for inspiration**

3. **Check out examples of earlier Sähköpaja projects**
   - Inspiration from previous Sähköpaja projects is encouraged to get a feel for what kinds of things you might create
   - You find references in the Sähköpaja MyCourses page