Abstract

The ultimate goal of Product Creation is to create products which give the user a great experience. User experience is very intangible. Product engineering focuses on tangible requirements. Successfull product require both sound engineering as well as creative design. The question is how to obtain a workforce, which is capable of both activities?
The education of successfull engineers is limited to engineering methods. Additional skills are acquired by experience. Unfortunately experience cannot be transfered from one engineer to the next. Such a transfer is approximated by active personal development.
Did you ever program a VCR or PVR?

A  depressed

B  desperate

C  hysteric
Product Creation Cycle

- Factory
- Retailer or Provider
- Product
  - Architect
  - Project Leader
  - Engineers
  - product documentation
  - design
- User
- Product manager

Architecting for Humans; How to Transfer Experience?

Gerrit Muller

September 9, 2018
2 Levels of Experience

For Whom

By Whom

What

User Experience

Creation Experience

User

Product

Architect

Product manager

Project Leader

Engineers

How

design

Product documentation

design
Bridging the gap between Experience and Engineering

Humans

Sense, smell, feel
Emotions, Opinions

Experience

From Fuzzy to SMART

Architecting

Technology

Analysis, Definition
Verification

Devices

Use

Appliances

Engineering

Have

Use

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Example Time Shift recording

- **20:00**: start movie
- **21:00**: broadcast
- **22:00**: record
- **23:00**: end movie

- **view**
- **talk**
- **play**
- **record**

- **phone rings**
- **pause viewing**
- **finish conversation**
- **resume viewing**
Construction limits intrude in Experience

- number of tuners
- number of simultaneous streams (recording and playing)
- amount of available storage
- management strategy of storage space
What if?

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1.1 Software Requirements

1.1.1 Real-time data requirements
1.1.1.1 Access to the non-real-time data must be done in such a way that it does not interfere with the real-time data.
1.1.1.2 There must be no disruptions in output of video signal during the operation of VCR.
1.1.1.3 Responsiveness for non-real-time data is less than 150ms (the time for writing a block on HDD) for 2KB of non-video data.

1.1.2 Implementation detail
1.1.2.1 Management of HDD content must only be possible through the TOC in order to prevent unauthorized access to content of HDD.
1.1.2.2 Visual feedback is provided to the user via On-Screen Display.
1.1.2.3 User input is provided via the RC.

1.1.3 Non-real-time data requirements
1.1.3.1 User must be able to pause and unpause a title, played from HDD, while (s)he is watching it.
1.1.3.2 User can jump forward and backward in a title, from HDD, during watching of this title.
1.1.3.3 Names of titles should be derived from the information from the EPG (name of the program to be recorded, time and date of registration).
Factors influencing the User Experience

- environmental factors
  - social status
    - relation
    - family
  - group influence
    - fashion
  - culture
    - taboo
    - cultural
  - location
  - time

- personal factors
  - education
  - mental status
    - trauma
    - emotional status
  - physical status
    - allergy
    - handicap
  - religion
    - taboo
  - preferences
    - taste

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version: 1.3
September 9, 2018
ETexperienceFactors
How to "SMART"en Experience?

- define
- measure
- predict
- verify
<table>
<thead>
<tr>
<th>People</th>
<th>Number of People on earth</th>
<th>$O(10^9)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Human lifespan in seconds</td>
<td>$O(10^9)$</td>
</tr>
<tr>
<td>Location</td>
<td>Square meters of planet earth</td>
<td>$O(10^{14})$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*</td>
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</table>

Size of experience space

$\infty$
It is not that bad :-) 

Many nice and successful products exist!
Key Success Factor: Feedback

Obtain feedback from real users:

- Observe
- (Dare to) Listen
- Experiment
- Use short development cycles

Don't stay in the development lab
The world of the construction

Product oriented

- Application software
- Operating system
- Domain specific sw
- Domain hardware
- Computing hardware

Means oriented

- Compilers
- Other SW tools
- Case Tools
- Methods
- Procedures

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Engineers are educated in construction disciplines

- Programming languages
- Operating systems
- Algorithms
- Data structures
- Formal specification and verification techniques
- Analysis, simulation techniques
Product Creation is much more than Engineering

Product Creation = Engineering + Creativity

Known:
- Facts
- Notations
- Methods
- Tools
- Patterns

Creativity:
- Intuition
- Observation
- Trial and error
- Lateral thinking
- Collection of references

Education ↔ Experience
Educational Material per education stage

Available educational material

- Kindergarten
- Elementary school
- High school
- University
- On the job training
- Holistic perfection
## Changing Education model in time

<table>
<thead>
<tr>
<th>Do</th>
<th>Exercise</th>
<th>Practical training</th>
<th>apprenticeship</th>
<th>Peer coaching</th>
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<td>Interact and Listen</td>
<td>Lectures:</td>
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<tr>
<td></td>
<td>Explain</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Show examples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read</td>
<td>Handbook</td>
<td></td>
<td>Magazines</td>
<td></td>
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<tr>
<td></td>
<td>Course material</td>
<td></td>
<td>Journals</td>
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</table>

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**time**
## Increasing Initiative required

<table>
<thead>
<tr>
<th>Do</th>
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<th>Apprentice-ship</th>
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<td>Lectures: Explain Show examples</td>
<td>Seminars Workshops Conferences</td>
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<tr>
<td>Read</td>
<td>Handbook Course material</td>
<td>Magazines Journals</td>
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<table>
<thead>
<tr>
<th>time</th>
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<tbody>
<tr>
<td>highly organized</td>
</tr>
<tr>
<td>well specified</td>
</tr>
<tr>
<td>small scope</td>
</tr>
<tr>
<td>few (if any)</td>
</tr>
<tr>
<td>stakeholders</td>
</tr>
<tr>
<td>initiative required</td>
</tr>
<tr>
<td>uncertainty rules</td>
</tr>
<tr>
<td>large scope</td>
</tr>
<tr>
<td>many stakeholders</td>
</tr>
</tbody>
</table>
Prerequisites for continuous successful product creation

- Awareness of engineers of human aspects
- Active personal development drive of engineers
- Awareness of managers of education models
- Active motivation by managers
To create an User Experience

Design Experience is needed

Success requires feedback

Experience is not predictable and never guaranteed
Experience Transfer

Design experience is not transferable
education is no substitute

Regular education =
Transfer of Engineering methods
+ Training

Transfer is approximated by
personal development

Personal Development =
On the job training
+ feedback
+ continuous personal education