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  

B  

C  

depressed

desperate

hysteric
Product Creation Cycle
2 Levels of Experience

For Whom

User Experience

What

User

Product

By Whom

Creation Experience

By Whom

Architect

Product manager

Project Leader

Engineers

How

design

product documentation

Product Creation Process
Bridging the gap between Experience and Engineering

Humans

Technological Devices

Experience

Sense, smell, feel

Emotions, Opinions

Architecting

From Fuzzy to SMART

Engineering

Analysis, Definition

Verification

Architecting for Humans; How to Transfer Experience?

Gerrit Muller

version: 1.3
March 6, 2013
ETarchitecting
Example Time Shift recording

20:00
start movie

21:00
broadcast

22:00
record

23:00
end movie

view

phone rings
pause viewing

play

finish conversation
resume viewing

view
talk

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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?

20:00  21:00  22:00  23:00

start movie

broadcast

end movie

1. programmed recording of other station

record

1. programmed recording of other station

view

talk

play

2. very long phone call

play

play

3. Dad zaps

phone rings

pause viewing

finish conversation

resume viewing

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Visual Basic Prototype: enables "experiencing"

Requirements specification
Many tables, mostly addressing details

2.1.1 Real-time data requirements
2.1.2 Implementation detail
2.1.3 Non-real time data requirements

<table>
<thead>
<tr>
<th>1.1 Software Requirements</th>
<th>1.1.1 Real-time data requirements</th>
<th>1.1.2 Implementation detail</th>
<th>1.1.3 Non-real time data requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>1.1.1.1 There must be no disruptions in output of video signal during the operation of VCR</td>
<td>1.1.3.1 User must be able to pause and unpause a title, played from HDD, while (s)he is watching it</td>
<td>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)</td>
</tr>
<tr>
<td>1.1.1.2 Responsiveness for non real-time data is less than 150ms (the time for writing a block on HDD) for 2kB of non-video data</td>
<td>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</td>
<td>1.1.3.2 User can jump forward and backward in a title, from HDD, during watching of this title</td>
<td></td>
</tr>
</tbody>
</table>
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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ETexperienceFactors
How to “SMART”en Experience?

- define
- measure
- predict
- verify
### Infinite Experience Space

<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>
</tbody>
</table>

...  ...

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Size of experience space  $\infty$
It is not that bad :-)  

Many nice and successfull 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
- Domain specific sw
- Domain hardware
- Operating system
- Computing hardware

Means oriented

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

Product oriented

- Application software
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Means oriented

- Compilers
- Other SW tools
- Case Tools
- Methods
- Procedures
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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interact and Listen</td>
<td>Lectures:</td>
<td></td>
<td>Seminars</td>
<td>Workshops</td>
</tr>
<tr>
<td></td>
<td>Explain</td>
<td></td>
<td></td>
<td>Conferences</td>
</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>Journals</td>
</tr>
<tr>
<td></td>
<td>Course material</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**time**

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*Architecting for Humans: How to Transfer Experience?*

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ETeducationLifecycle
### Increasing Initiative required

<table>
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<tr>
<th>Do</th>
<th>Exercise</th>
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<th>apprentice-ship</th>
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<td>Interact and Listen</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Highly organized**
- **Well specified**
- **Small scope**
- **Few (if any) stakeholders**

- **Initiative required**
- **Uncertainty rules**
- **Large scope**
- **Many stakeholders**

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ETeducationLifecycleAnnotated
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