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. Successful products 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 successful engineers is limited to engineering methods. Additional skills are acquired by experience. Unfortunately experience cannot be transferred 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
- hysterical
Product Creation Cycle

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

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ETproductCreationCycle
2 Levels of Experience

For Whom

What

User Experience

By Whom

Creation Experience

How

Product Creation Process

- product documentation
- design

User

Product

Architect

Product manager

Engineers

Project Leader

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ETuserAndCreationExperience
Bridging the gap between Experience and Engineering

Humans have Experience

Sense, smell, feel

Emotions, Opinions

Architecting

Devices

Analysis, Definition

Engineering

Verifications

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ETarchitecting
Example Time Shift recording

20:00
start movie

21:00
broadcast

22:00
record
play

23:00
end movie

view

view

talk

phone rings
pause viewing

finish conversation
resume viewing

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E TexampleTimeShifting
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?

1. programmed recording of other station
2. very long phone call
3. Dad zaps

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

Phone rings
Pause viewing
Finish conversation
Resume viewing
Start movie
End movie
View
Talk
Record
Play

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ETexampleTimeShiftingWhatIf
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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ESI
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>
<tr>
<td>...</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

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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

- Application software
- Domain specific sw
- Domain hardware
- Operating system
- Computing hardware
- Compilers
- Other SW tools
- Case Tools
- Methods
- Procedures

Product oriented

Means oriented

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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

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### Changing Education model in time

<table>
<thead>
<tr>
<th>Do</th>
<th>Exercise</th>
<th>Practical training</th>
<th>apprentice-ship</th>
<th>Peer coaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interact and Listen</td>
<td>Lectures:</td>
<td>Explain</td>
<td>Seminars</td>
<td>Workshops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Show examples</td>
<td></td>
<td>Conferences</td>
</tr>
<tr>
<td>Read</td>
<td>Handbook</td>
<td>Course material</td>
<td>Magazines</td>
<td>Journals</td>
</tr>
</tbody>
</table>

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**time**
## Increasing Initiative required

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<th>Do</th>
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</table>

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- **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
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