Design Philosophies Applied in an Elder Home Monitoring System

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How do we design a smart home system that is useful and usable?

Agenda

◆ Introduce Smart Home Prototype

◆ Discuss Design Philosophies

◆ Provide implementation examples

◆ Field Test Results

Who, or what is I.L.S.A. ?

◆ The **Independent LifeStyle Assistant**^{TM} monitoring system (I.L.S.A.)

◆ Research program funded by the National Institute of Standards and Technology and Honeywell Laboratories

◆ Goal: develop a **near-term** implementable monitoring system for the purposes of monitoring, supporting, alerting and reporting the activity of an elder person living independently, and defer the need for a formal care-giving facility.

◆ November 2000 – July 2003

Field Test and User Profile

◆ Fielded at 2 facilities (7 independent living apartments and 4 homes) for 4-6 months
  - ➢ 11 of elders
  - ➢ 1-3 hours of training

◆ Profile of Target User
  - ➢ living independently
  - ➢ no regular assistance from formal caregiver, and adult children or friends as informal caregivers
  - ➢ no problems with dementia

Methods

Intrusiveness?
Cognitive Effort?

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Design
Philosophies  →  Functionality  →  Results
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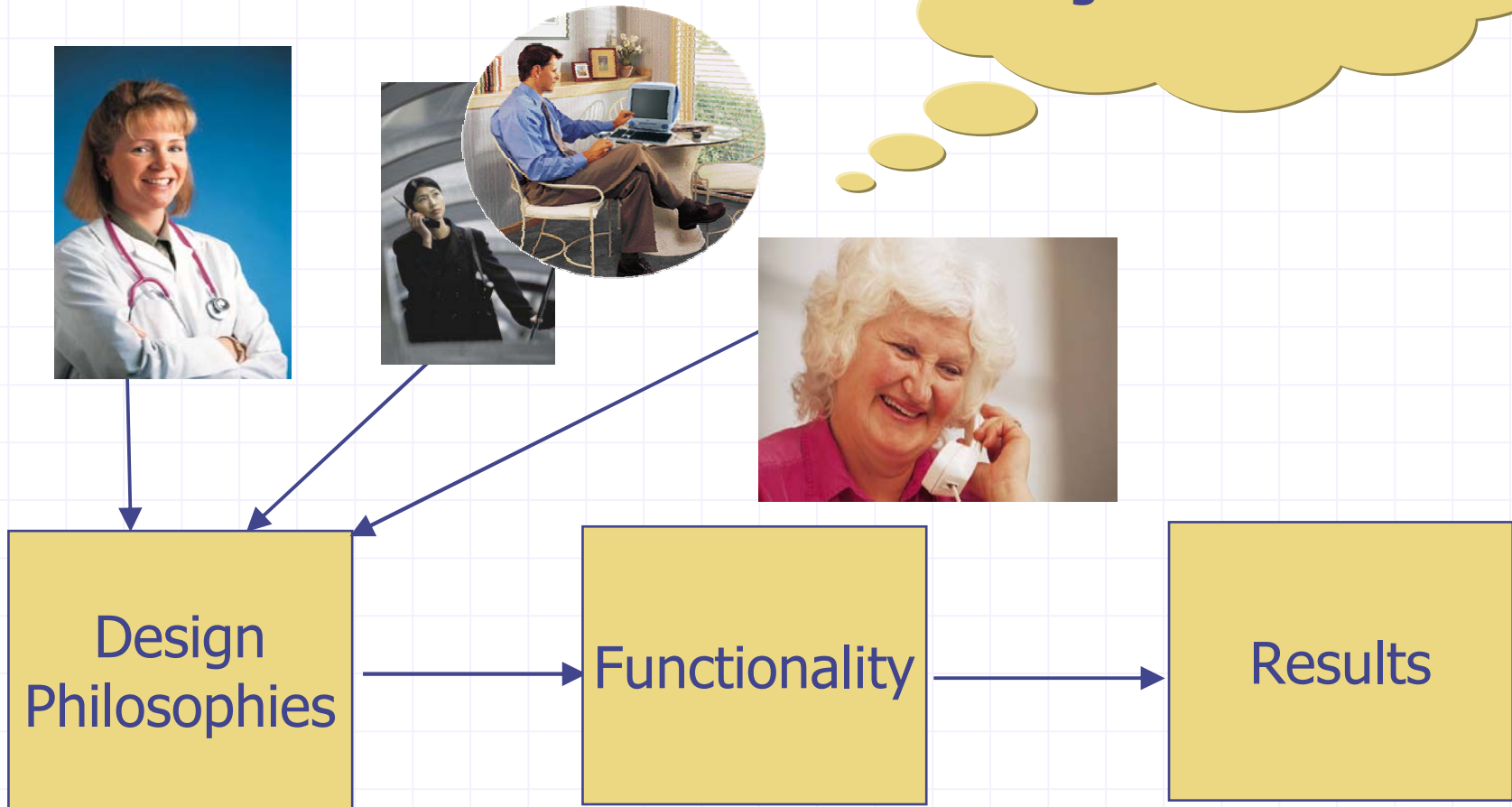
Design Philosophies

◆ Physical appearance of system components

◆ Modes of system-elder communication

◆ Demands of system from elder, including data and maintenance

◆ Cognitive demands to impose on user

Physical Appearance of Components

The physical appearance of components should not be intrusive to the elder

Why?

- ◆ Object to wearable devices (e.g. panic button)
- ◆ Do not want to advertise frailty

Implementation examples

- ◆ Did not use wearable devices
- ◆ Used passive sensors such as motion detectors and pressure pads instead of buttons or noise-activated devices

System-user communication

Direct communication between the client and the system should be limited to the telephone and web pad. I.L.S.A. should also minimize its communication of system and client status such that the interference on the client's lifestyle can be lessened.

SIFT

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Socially non-intrusive

Why?

- Minimize perceived intrusiveness
- Minimize number of interactive devices and centralize status information (e.g. medication, mobility)

Implementation examples

- With the exception of medication or mobility related warnings, ILSA did not initiate communication with the user
- Functional modes for suppressing most ILSA communications

Data requirements from elder

The client should not be required to directly provide data about his/her own status. I.L.S.A. should make use of available data from the client's interaction with the system to determine the client's status.

Implementation examples

- ◆ The system does not request information from the elder.

- ◆ With the exception of indicating occupancy within the home, elder status was deduced from interaction data, such as webpad usage and telephone reminder responses.

Cognitive demands

I.L.S.A. should avoid demanding excessive cognitive effort from the elder

Implementation example

- System setup
- Medication configuration

Results - Devices

- In general, elders were comfortable with the passive devices. They were aware of them but did not find them intrusive.

- Feelings of "being monitored" and loss of privacy were forgotten within a day or two after installation.

- Open to include simple devices such as buttons or switches to provide ILSA with more accurate information

Results – System-User Communication

- Clients want more user-initiated interaction with the system.

- Clients want to contest the conclusions presented by the automation and provide direct feedback.

- Reactions to system initiated communication were consistent with our assumptions. Users found phone reminders useful, but also intrusive.

Results – Data Requirement

◆ The participants were eager to provide input, but the complexity of the device prevented them from doing so.

◆ Although the participants were willing to provide input, passive monitoring is still required.

◆ Participants were interested in their own status information.

Results – Cognitive demands

- Cognitive level placed limitations on devices used e.g. looking at phone receiver and remembering which button to press

- Automated telephone systems are disturbing to lifestyle and cognitively overwhelming, violating both the intrusiveness and cognition design precepts.

- Participants wanted to understand the inner workings of the system. They wanted to take an active role instead of being monitored.

Conclusions

- Use single or dual-function **simple devices**, and **provide feedback** to reassure elder (e.g. LED on medcaddy).

- Fear for loss of privacy is alleviated with familiarity of the system

- Elders want to provide feedback about their own status, but on their own terms.

- The availability of status information was empowering for the users, and helped increase user interaction and user acceptance of system.

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I.L.S.A. References and Additional Information

Visit the I.L.S.A. web site for links and references to other publications and related work:

http://www.htc.honeywell.com/projects/ILSA