

The Design Science Perspective on e-Health Applications for Re- learning Purposes

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Systems developer program Gothenburg University 1984 – 1987

Project Management Chalmers 1998 – 1999

IT management Gothenburg University 2008 – 2011

Visiting researcher and instructor at Michigan State University 2014 – 2016

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Working on the business side 1986 – 2011

Programmer, systems developer, project management, development manager
(R&D ERP systems and distribution and logistics of pharmaceutical)

Own business Open Innovation

Open Data Institute node Gothenburg 2011 - 2021



Our loosely coupled group focuses on e-health from various perspectives. The foundation is that the context has a combined health approach, whether on a general level or more specific, such as stroke rehabilitation. The health approach is always combined with digitalization in some ways, whether it is software or hardware, like an information system or communication sensors. Added to this can be systematic processes, such as stakeholders' value.

We are always interested in further networking. Please approach us at karin.ahlin@kau.se



Background

Traditional relearning systems require a large number of clinical staff and are difficult to deploy because of high running costs. One solution is the design of Technology Enhanced Systems (TES), which have been recognized as highly useful for several treatment types when the TES are based on relearning approaches focused on adults with chronic diseases.

Recent studies highlight that different types of TES can be useful for relearning, combining various categories of technologies, such as: tele-relearning based on audio and videoconferencing, Internet-based therapy, serious game-based therapy and Virtual Reality based therapy.

Recent research studies have found that most adults prefer to rehabilitate in place, and that policy makers similarly favour this idea, but also that contextual and psychosocial factors must be carefully explored if TES can result in a beneficial impact.



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Technology Enhanced Systems

The global population is increasing significantly and therefore more medical and social services will soon be needed, designed to support adults. Traditional relearning systems require a large number of clinical staff and are difficult to deploy because of high running costs.

One solution is the design of Technology Enhanced Systems (TES), which have been recognized as highly useful for several treatment types when the TES are based on relearning approaches focused on adults.

Some TES have been repurposed learning systems designed for children; these are typically less useful. Effective approaches cannot be based on learning principles for children but must be based on andragogy (adult learning theory), which can be refocused for relearning and training.



Adult learning and re-learning

Based on andragogy, which means the method and practice of teaching adult learners [1].

The fundamentals for adult learning are:

1. The adults need to know
2. Self-concept
3. Learning from experiences
4. Readiness to learn
5. Orientation to learning
6. Internal motivation



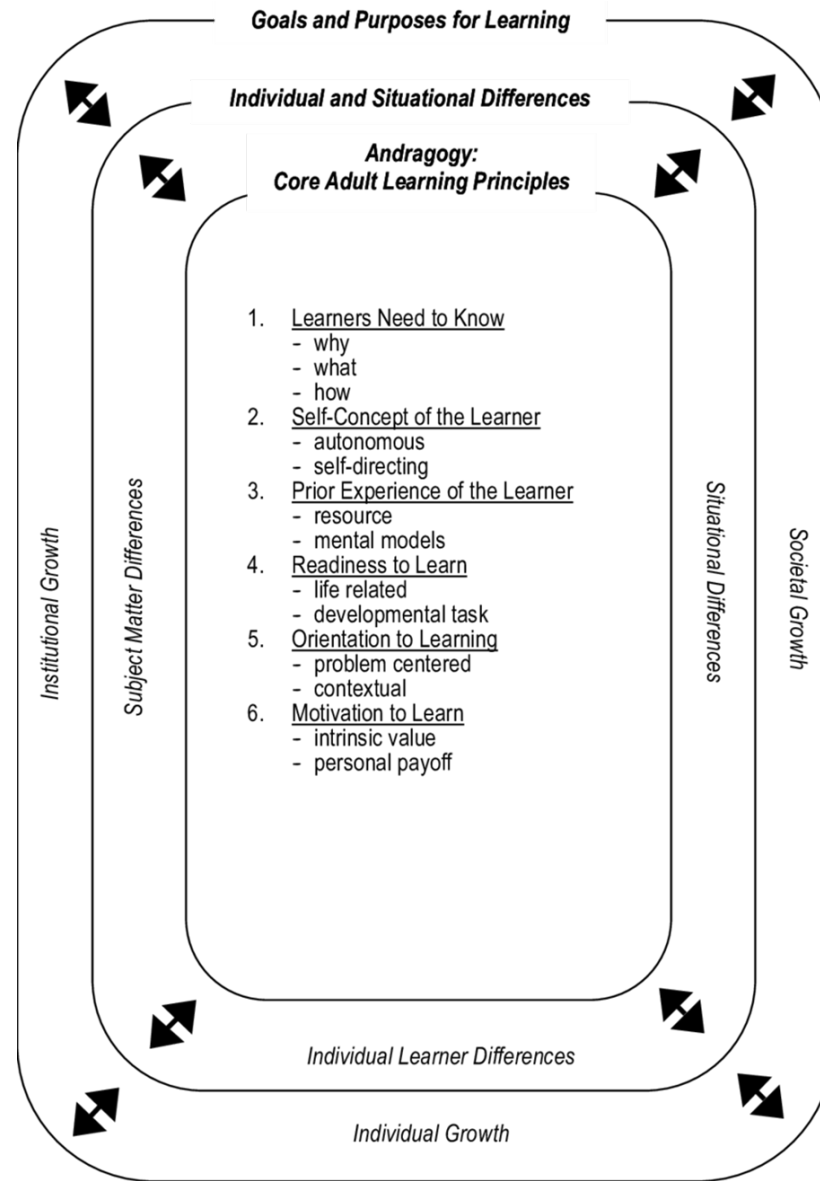
Knowles' Adult learning theory

The adult learning theory (andragogy) highlights that adults tend to learn differently than traditional children's education that is usually referred to as pedagogy [1].

Knowles et al. [1] suggested that adults should actively participate in the planning, development, and implementation of the learning process.



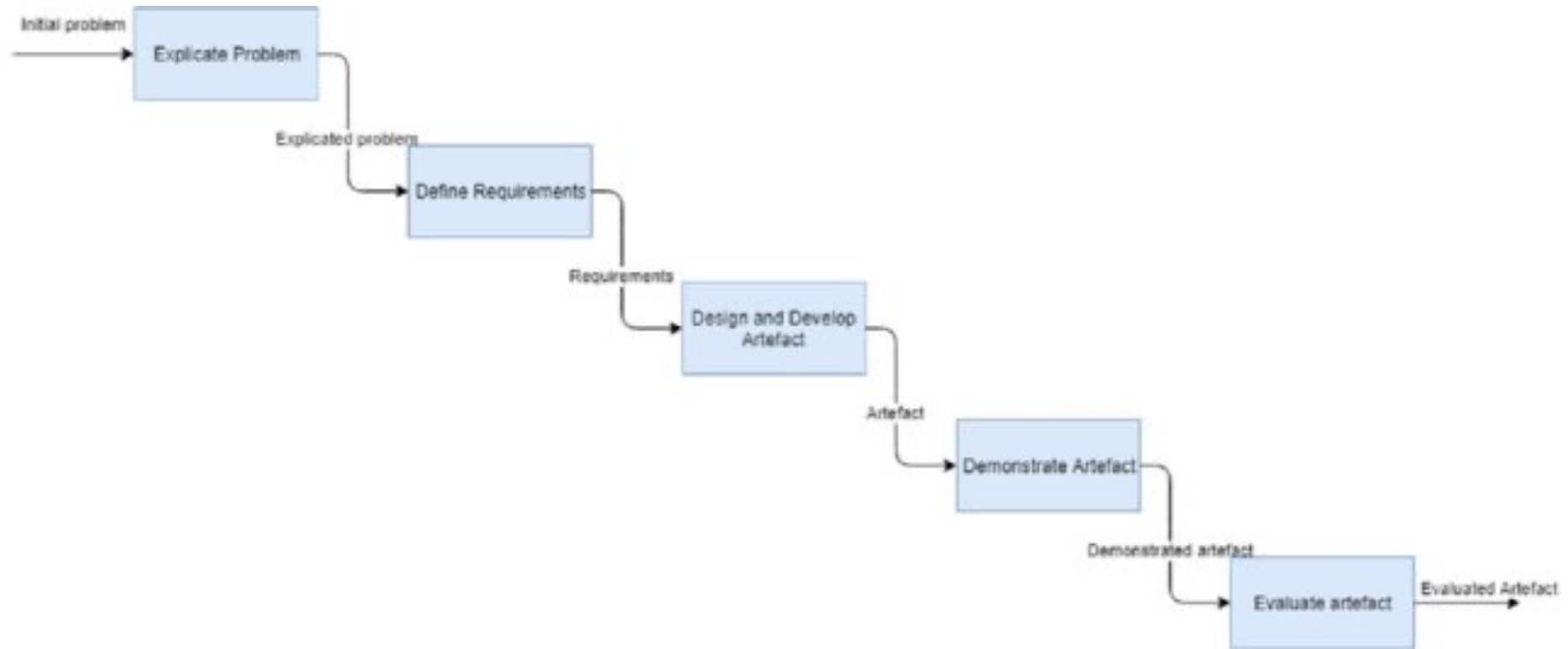
Andragogy in practice Model



Source: [1]



Design Science Research [2]



Problem Statement [2]

Investigating and analysing practical problems

Precisely formulated problem

Be of general interest

Significant for some practice

Underlying causes may be identified and analysed

Can address radical innovations with no specific problem stated



Problem Statement – example

General problem (see, e.g., [3], [4])

Older population

Rehabilitation at place

Favoured by policy makers

Significant problem (see, e.g., [3], [4])

Few softwares for stroke patients are designed using the knowledge of the speech therapists

Few softwares for stroke patients in native languages, such as Swedish



Define requirements

Outline a solution to the explicated problem [2]

Viewed as a transformation of the problem into demands [2]

Should be defined for functionality, structure, and environment [2]

Who is the stakeholder? [6]

Ethical considerations [6]



Define requirements [3], [6]

Systematic processes

Individualized learning plan

Consider users' previous practices and knowledge

Involvements of relatives and friends

Individualized technical requirements

Usability of graphical interface

Personal integrity

Technical stability



Development of prototype [2]

The development of the artefact should create an artefact that addresses the explicated problem

The prototype should fulfill the defined requirements

It includes determining the functionality and its structure



Speech and Language Assessment System (A-ning) Overview
The assessment and implementation process: Patient's page [4]



The assessment and implementation process: *Speech therapist's page [4]*

L-sida 14

UPPGIFT

A7. INFORMATIVT TAL
Beskrivande tal – Tematisk bild

INSTRUKTION/DELUPPGIFTER

Visa P-sida 17!

Patienten ska göras uppmärksam på detaljerna om de inte beskrivs spontant. Cirka tio händelser kan beskrivas med meningar i valfri ordning. En sammanhängande berättelse förväntas ej.

Beskriv den här bilden. Tänk dig att jag inte ser den. Berätta vad som händer?

POÄNGSÄTTNING

Poäng: Enligt manual

A8. INFORMATIVT TAL

Berättande tal – Förlopp

Visa ej P-sida!

Händelseförloppet ska beskrivas med minst fem moment i logisk följd.

Beskriv ett restaurangbesök. Hur går det till? Vad gör man först? Vad händer sen? Tänk att du/ni berättar för någon som aldrig varit på restaurang.

Alternativuppgift kan ges om patienten är helt obekant med händelseförloppet vid ett restaurangbesök. Patienten kan då i stället berätta om ett annat händelseförlopp med minst fem kronologiska moment, t ex baka en sockerkaka eller byta däck på bilen.

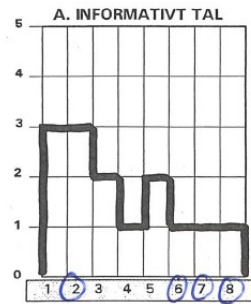
Poäng: Enligt manual



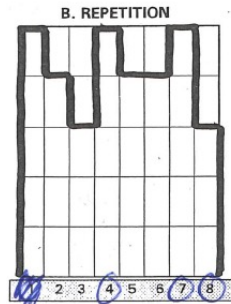
Papper-pen and digitized TES [4]

A-ning ÖVERSIKT - SPRÅKLIG FÖRMÅGA

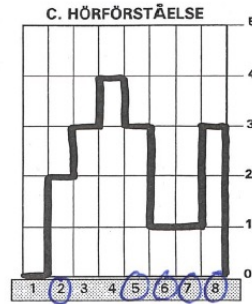
TESTPOÄNG	
TOTALT	MEDEL
84	1,9



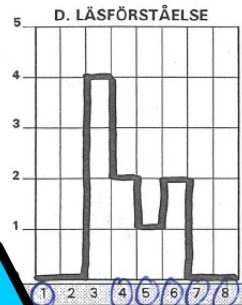
MEDELPOÄNG 1,8



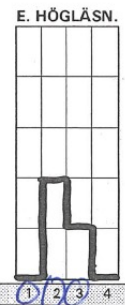
MEDELPOÄNG 4,1



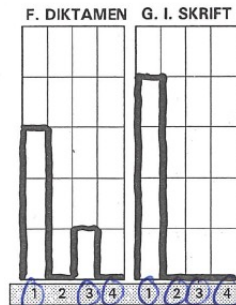
MEDELPOÄNG 2,1



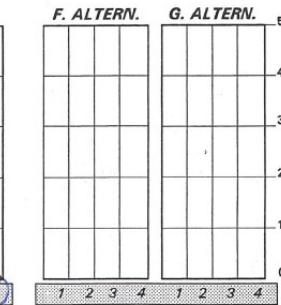
MEDELPOÄNG 1,1



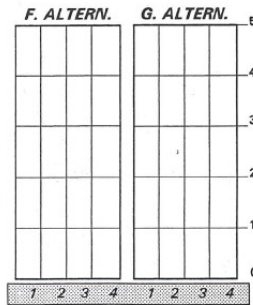
MP. 0,8



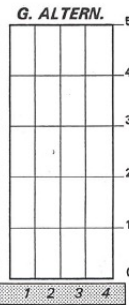
MP. 1,0



MP. 1,0



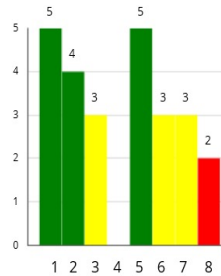
MP. _____



MP. _____

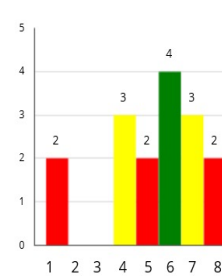
A-ning ÖVERSIKT-SPRÅKLIG FÖRMÅGA

A. INFORMATIVT TAL



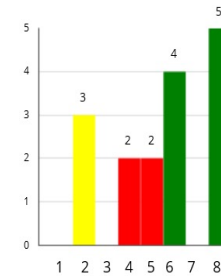
Medelpoäng : 3.57...

B. REPETITION



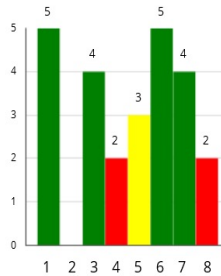
Medelpoäng : 2.4

C. HÖRFÖRSTÄELSE



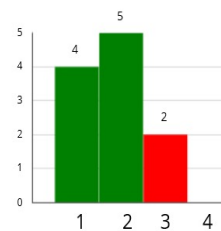
Medelpoäng : 2.6...

D. LÄSFÖRSTÄELSE



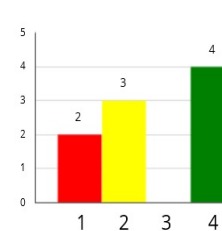
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E. HÖGLÄSNING



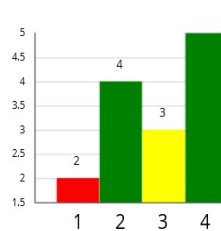
Medelpoäng : 3.6666...

F. DIKTAMEN



Medelpoäng : 2.25

G. INFORMATIV SKRIFT



Medelpoäng : 4.5

TESTPOÄNG	
TOTALT	MEDEL
116	3.2222



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Demonstration [2]

Uses the developed artefact in an illustrative or real-life case

The goal is to show if the artefact can solve an instance of the problem



Evaluation [2]

How well the artefact fulfills the requirements

To what extent it can solve the practical problem



Evaluation

Based on pre-defined requirements, functional evaluation

Based on a specific model, e.g., Knowles' model or adult re-learning [5]
or UTAUT (Unified Theory of Acceptance and Use of Technology) [4]



Discussion

The users needs to require a digitized artefact

Understanding who is the user in focus

The ethical concerns related to the user

The user in focus while gathering requiriements and designing

Use professionals' knowledge while designing

Pre-determine the evaluation factors

Communicate in favour of users, professionals, and policy makers



References

- [1] M.S. Knowles, E.F. Holton III, R.A.Swanson, "The adult learner: The definitive classic in adult education and human resource development", Routledge, pp.406, 2014.
- [2] P. Johannesson and E. Perjons, An introduction to design science. Springer, 2014.
- [3] A. Ahmad, P. Mozelius and K. Ahlin, "Testbed requirements for technology enhanced stroke rehabilitation to support independent living", in Editor (Ed.)^(Eds.): 'Book Testbed requirements for technology enhanced stroke rehabilitation to support independent living' (INSTICC Press, 2019, edn.), 2019.
- [4] A. Ahmad, K. Ahlin, and P. Mozelius, "Technology Acceptance of an Online Speech and Language Assessment Application for Stroke Patients-the Medical Caregivers Viewpoints", In Special Track: TESR: Techology Enhanced Re-learning, along with GLOBAL HEALTH 2021, IARIA XPS Press, 2021.
- [5] Ahmad, A. , Mozelius, P. & Ahlin, K. (2021). Speech and Language Relearning for Stroke Patients- Understanding Users' needs for Technology Enhancement. In Proceedings of Thirteenth International Conference on eHealth, Telemedicine, and Social Medicine (eTELEMED 2021), Nice, France, July 18, 2021.
- [6] K. Ahlin and K. Snyder, " Person-centred health care resting on digitization and systematic processes", In Special Track: TESR: Techology Enhanced Re-learning, along with GLOBAL HEALTH 2021, IARIA XPS Press, 2021.

