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접근성 개선과 GPII 효과를 위한 이론 탐색

In Search of Theoretical Framework for Accessibility and GPII

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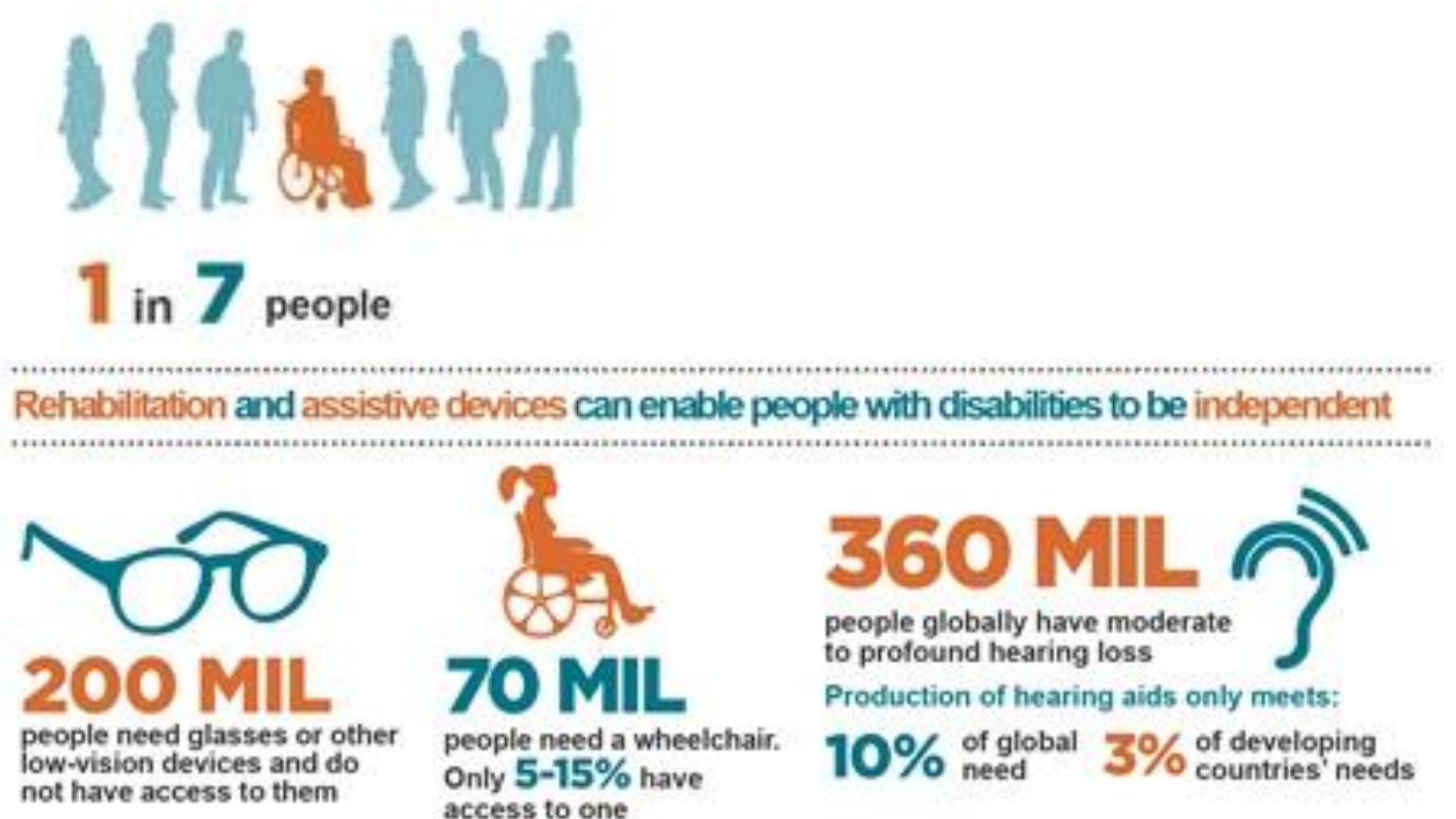
- Intro: Global Issue and Accessibility
- Need for Accessibility
- Accessibility Guidelines for the Aged
- Theoretical Background of Accessibility
- GPII Auto-Personalization Framework
- Conclusion: New Perspectives on Accessibility

Global Issues and Accessibility

- Statistics on Disabled people in the world



WHO (2011). World Report on Disability



2015

Percentage 60+

- 30 or over
- 25 to 30
- 20 to 25
- 15 to 20
- 10 to 15
- 5 to 10
- Less than 5
- No data

2050

Percentage 60+

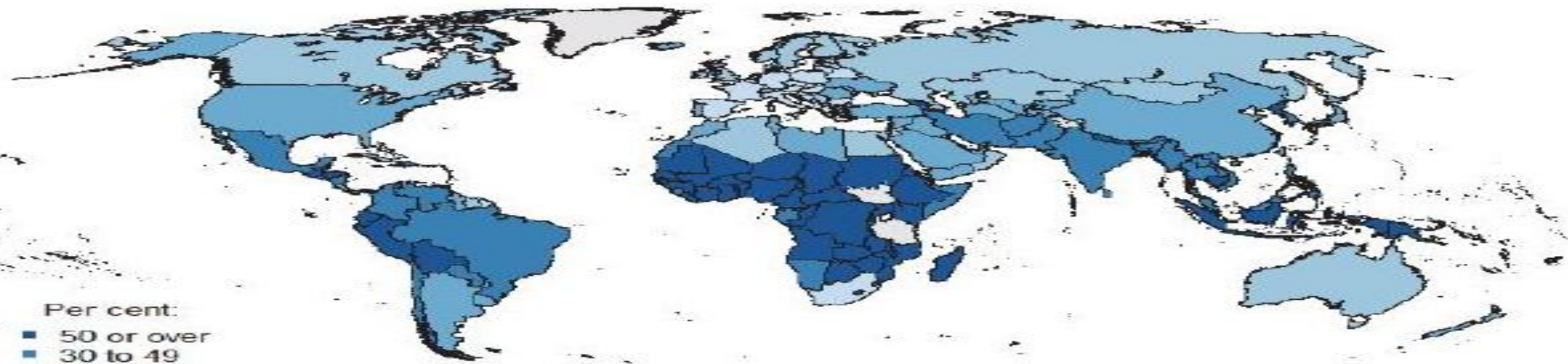
- 30 or over
- 25 to 30
- 20 to 25
- 15 to 20
- 10 to 15
- 5 to 10
- Less than 5
- No data

UN World Population Prospects: Statistics on aged

Data source: United Nations (2015).

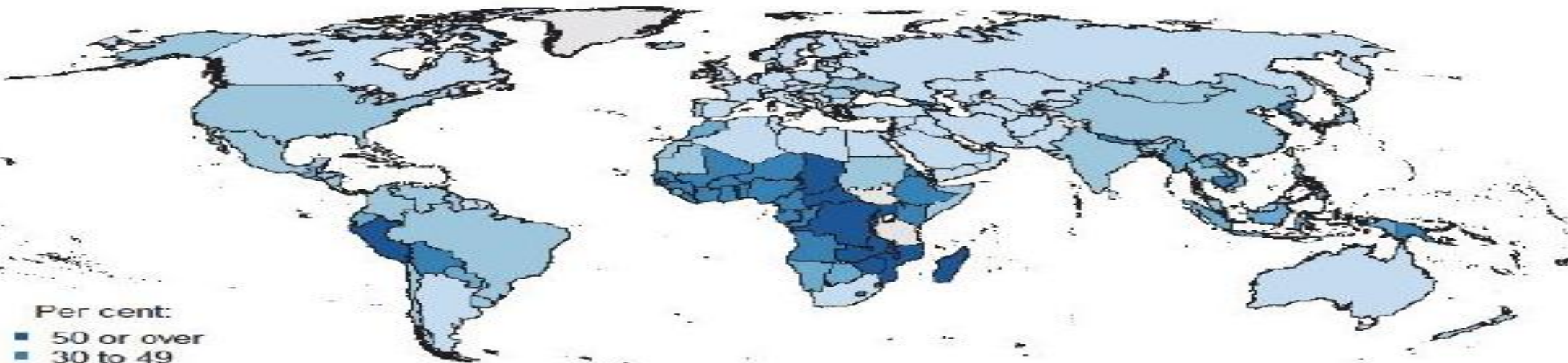
Labour force participation of persons aged 65 years or over, by sex, 2015

Males



Per cent:
■ 50 or over
■ 30 to 49
■ 20 to 29
■ 10 to 19
■ 0 to 9
■ No data

Females



Per cent:
■ 50 or over
■ 30 to 49
■ 20 to 29
■ 10 to 19
■ 0 to 9
■ No data

| Global Issues and Accessibility

- Statistics on ageing in the world

Table 2.3. Global ageing trends: median age by country income

Country income level	Median Age (years)			
	1950	1975	2005	2050
High-income countries	29.0	31.1	38.6	45.7
Middle-income countries	21.8	19.6	26.6	39.4
Low-income countries	19.5	17.6	19.0	27.9
World	23.9	22.4	28.0	38.1

Note: Middle estimate.

Source (91).

WHO (2011). World Report on Ageing

| Need for Accessibility



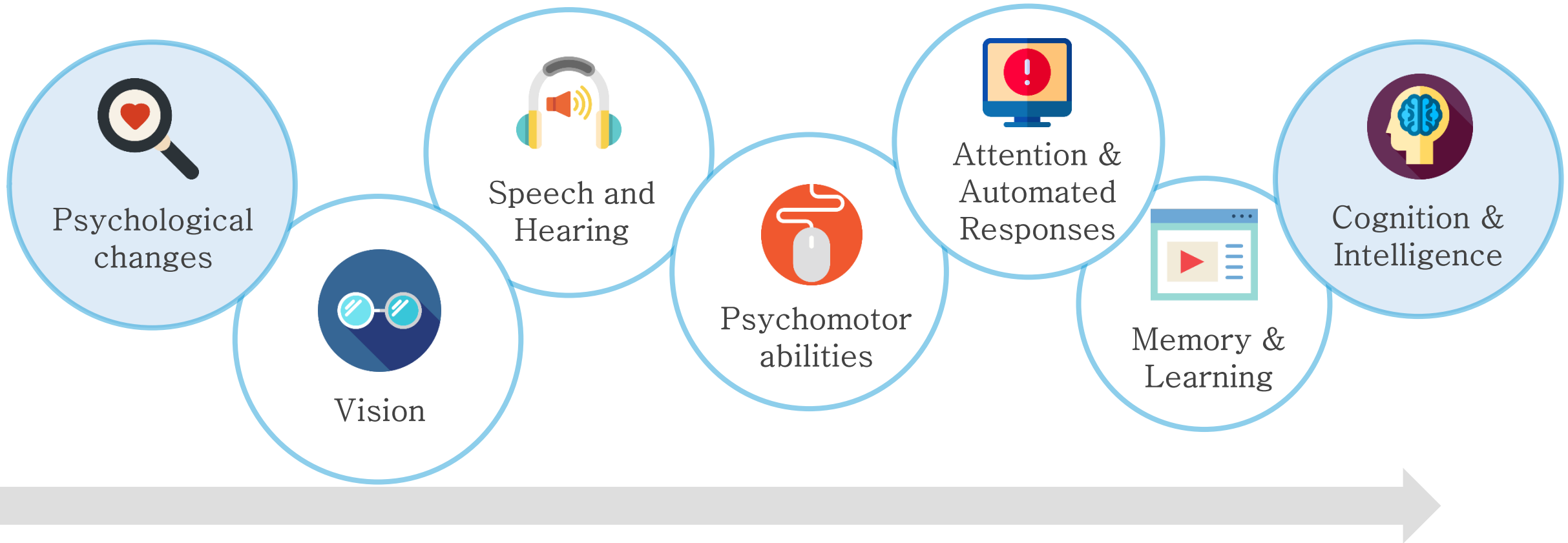
- Differentiated for the Disabled
- Accommodated for the Aged
- Leveling for Different Digital Literacy
- Differentiated for Preferences

| Interface Design: Hawthorn. (2000).

- 1) Vision in older people and implication for HCI design**
- 2) Speech and hearing in older people and implication for HCI design**
- 3) Psychomotor abilities in older people and implication for HCI design**
- 4) Attention and automated responses in older people – HCI design issues**
- 5) Memory and learning in older people and HCI design**
- 6) Intelligence in older people and HCI design**



| Characteristics of the Aged



Design Principles for the Aged

(Farage et al., 2012)

■ Age-related changes in vision

- ✓ Impaired near focus
- ✓ Reduce acuity
- ✓ Sensitivity to glare
- ✓ Brightness adaption
- ✓ Darkness adaptation
- ✓ Color perception
- ✓ Visual field narrowing



By Norwood (Charity) (Own work) [CC BY-SA 3.0 (<https://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

Design Principles for the Aged

(Farage et al., 2012)

■ Visual presentation guidelines

Variable	Accommodation Preference	Design and presentation choices
Font Type	Better	- Sans Serif: Arial, Helvetica, Century Gothic - Serif: Times, Bookman, Book Antigua
	Worse	<i>Script fonts are difficult to read</i> DECORATIVE FONTS ARE DIFFICULT TO READ
Font Size	Better	14pt - 20 pt
Font Case	Better	UPPERCASE DRAWS ATTENTION
	Worse	BUT SHOULD NOT BE USED FOR LONG BLOCKS OF TEXT

Design Principles for the Aged

(Farage et al., 2012)

- **Visual presentation guidelines**

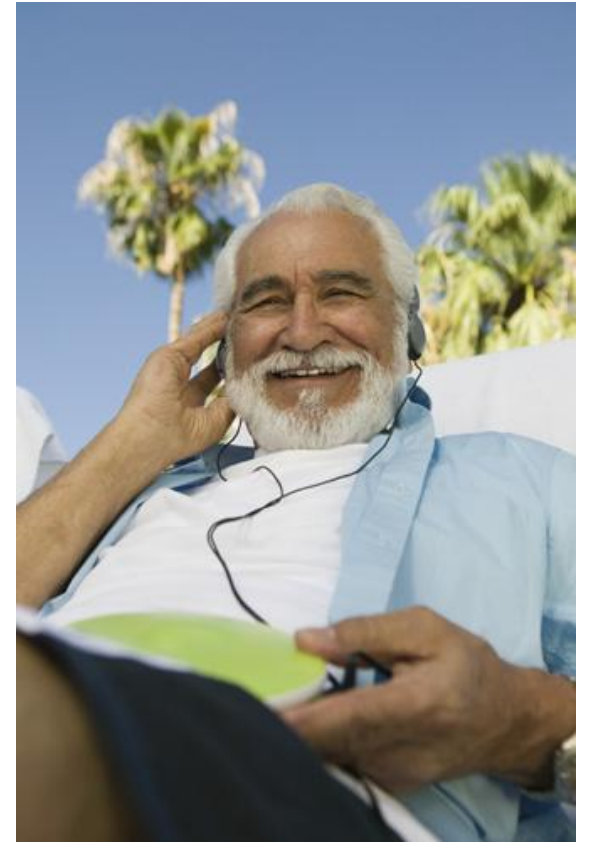
Variable	Accommodation Preference	Design and presentation choices
Contrast	Better	Black text on white background White text on black background
Color	Better	Warm Color
	Worse	Signaling information with Violet-Blue-Green (difficult to perceive)
Motion/3D	Worse	Rapidly changing, Flickering or moving stimuli

| Design Principles to the Aged

(Farage et al., 2012)

▪ Age-related changes in hearing

- ✓ Sound perception and speech recognition
 - Older adults use context cues to aid speech recognition
- ✓ Frequency (pitch) discrimination
 - Hissing or ringing in the ear
 - Words with high-pitched consonants(c, ch, f, s, sh, and z) more difficult to comprehend
- ✓ Identifying sound location
- ✓ Auditory attention



<image source>
<https://www.flickr.com/photos/67835627@N05/7301110114>

Design Principles for the Aged

(Farage et al., 2012)

▪ Auditory presentation guidelines

Variable	Accommodation Preference	Presentation choices
Sound Intensity	Better	<ul style="list-style-type: none">✓ Sound signals should be at least 60dB at the ear of the listener (<u>Conversational speech is 50dB</u>)✓ Allow for volume adjustments. Use simple instructions and controls with simple movement (e.g. back and forth along graduated level rather than tuning knob)
Auditory attention	Better	✓ Provide redundant cueing through cross-sensory channels (e.g. augment a sound signal [cell phone ring] with vibration; sound alarm with light)
	Worse	✓ Background noise or reverberation
Discrimination of sound cues	Better	✓ Maximize pitch, spectral or location differences of individual sound cues

| Design Principles for the Aged

(Farage et al., 2012)

▪ Accommodation guidelines for movement restriction

Variable	Accommodation Preference	Presentation choices
Slower movement and reflexes	Better	✓ Allow time for discrete tasks
	Worse	✓ Multiple rapid steps (e.g. adjust double-click speed of computer mouse, tracking speed on scroll ball)
Coordination and tremor	Better	✓ Simple task movements ✓ Large buttons
	Worse	✓ Failing to guard against accidental actuation of critical controls

| Design Principles for the Aged

(Farage et al., 2012)

▪ Age-related changes in memory and cognition

- ✓ Working memory
 - Negligible age differences for simple procedures
- ✓ Prospective memory – recalling future time-based tasks
- ✓ Semantic memory
 - Long-term repository of world knowledge
- ✓ Procedural memory – knowledge about how to do things
- ✓ Attention



<image source>
<http://www.freestockphotos.biz/stockphoto/17512>

Design Principles for the Aged

(Farage et al., 2012)

▪ Accommodation age-related cognitive changes

Variable	Accommodation Preference	Presentation choices
Working memory	Better	✓ Simple instructions - discrete short messages ✓ Label icons; pictorial info should be highly intuitive
	Worse	✓ Information overload
Procedural memory	Better	✓ Simple intuitive steps. Place in context. ✓ Minimize the number of steps ✓ Give feedback cues for correct action
	Worse	✓ Complex, multi-step process ✓ Procedures inconsistent with established practice
Attention	Better	✓ Simple displays. Short, discrete signals.
	Worse	✓ Avoid arrays of functions and displays

Customization for Universal Access

- Re-Definition of Disability and aged accessibility
- Mismatch between a given technology and needs, preferences of the user in context
- Temporary and aged disability
- Expansion of capabilities, devices, services
- Different devices and different interfaces, IoT
- Need high and low end user customization and refinements
- Use in different classrooms and lifelong learners



| GP11 Auto-Personalization Framework

Need not only Accessibility
but needs
Auto-personalized
Accessibility



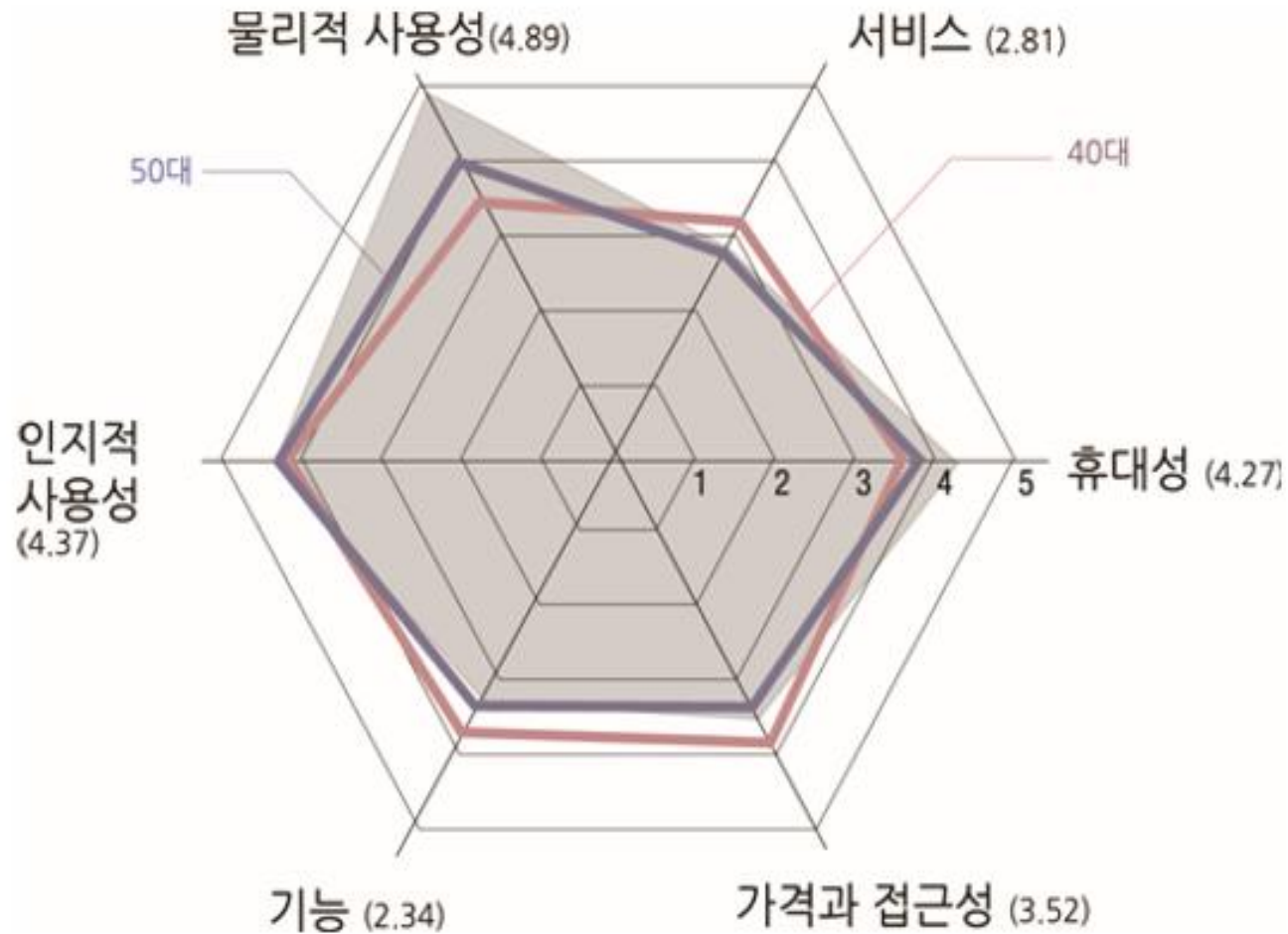
Video



Gregg Vanderheiden, University of Maryland

Theoretical Background on Accessibility

영어 내
한글
나타
애니메이



- 연령별 세대별 IT 사용 만족도 (이희명, 2013)

- ✓ 응답자의 나이에 상관없이 IT기기의 만족도에서 인지적 사용성과 물리적 사용성이 가장 중요한 요소로 나타남.

- ✓ 60대 이상의 경우 물리적 사용성이 인지적 사용성 보다 더 중요함.

Theoretical Background on Accessibility

영어 내용
한글
나타나
애니메이션

- **기술수용모델(TAM: Technology Acceptance Model, Davis, 1989)**

- 기술수용모델의 결정적 요인 2가지

- (1) **인지된 유용성(perceived usefulness)**

- 잠재적 이용자가 조직에서 특정 기술을 사용하면 업무성과가 향상될 것이라고 기대하는 정도

- (2) **인지된 사용 용이성(perceived ease of use)**

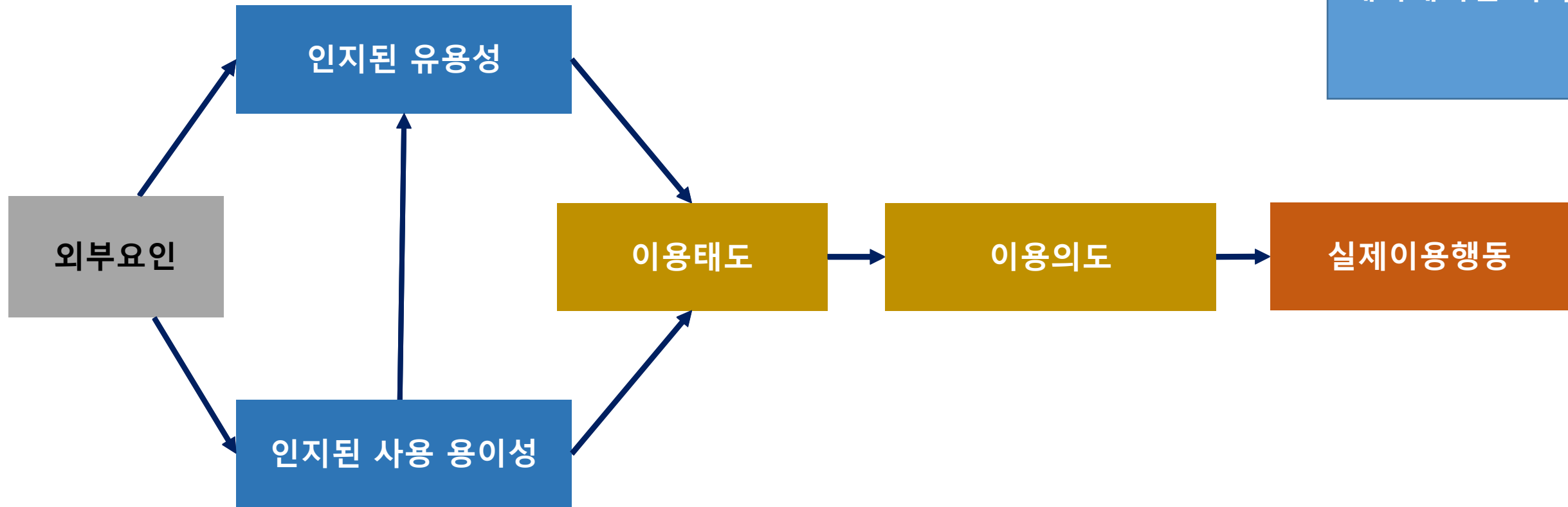
- 잠재적 이용자가 특정 기술을 노력 없이 사용할 수 있을 것으로 기대하는 정도

- **기술수용모델(TAM)의 의미**

- 기술은 사용하기 쉬울수록 유용하다고 인식되며, 유용하다고 인식될 수록 기술 사용에 대한 태도가 긍정적으로 형성되어 기술을 사용하고자 하는 의도가 증가함

Theoretical Background on Accessibility

- 기술수용모델(TAM: Technology Acceptance Model)



영어 내용 이후에
한글 내용이
나타나도록
애니메이션 처리 함

(Davis, 1989)

Theoretical Background on Accessibility

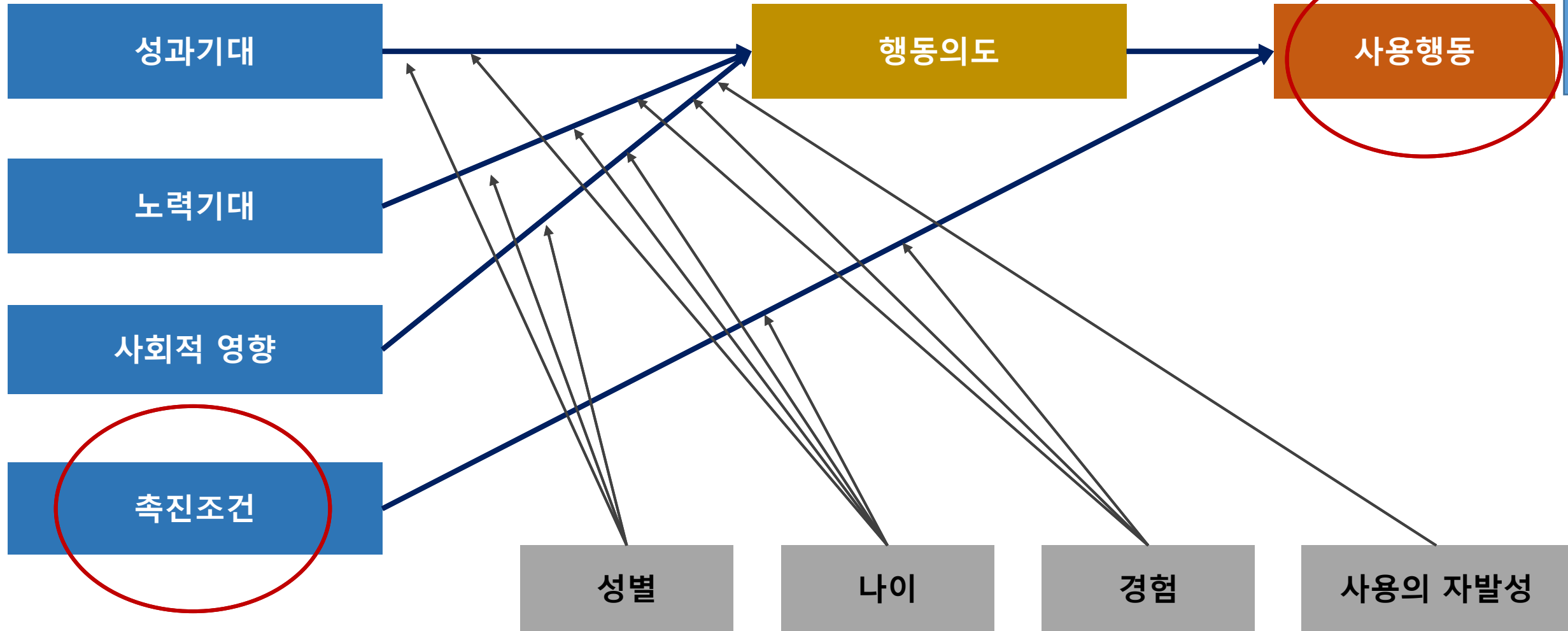
통합기술수용모델(UTAUT: Unified Theory of Acceptance and Use of Technology, Venkatesh, Morris, Davis, & Davis, 2003)

- ✓ TAM이 변수들 간 설명력 미흡하다는 지적(Venkatesh et al., 2003)
- ✓ 사용자의 기술 수용을 8가지 기존의 이론들을 통합하여 높은 설명력을 갖춘 새로운 모델 제시
 - TRA
 - TAM
 - Motivation Model
 - Theory of Planned Behavior
 - Innovation Diffusion
 - Social Cognitive Theory
 - Combined TAM AND TPB(C-TAM-TPB)
- ✓ 사용자 기술수용 영향 변수: 성과기대, 노력기대, 사회적 영향, 실제 행위에 영향을 미치는 촉진조건
- ✓ 조절효과를 줄 수 있는 통제 변수: 성별, 나이, 경험, 사용의 자발성

장현용, 고준 (2017)

Theoretical Background on Accessibility

- 통합기술수용모델(UTAUT: Unified Theory of Acceptance and Use of Technology)

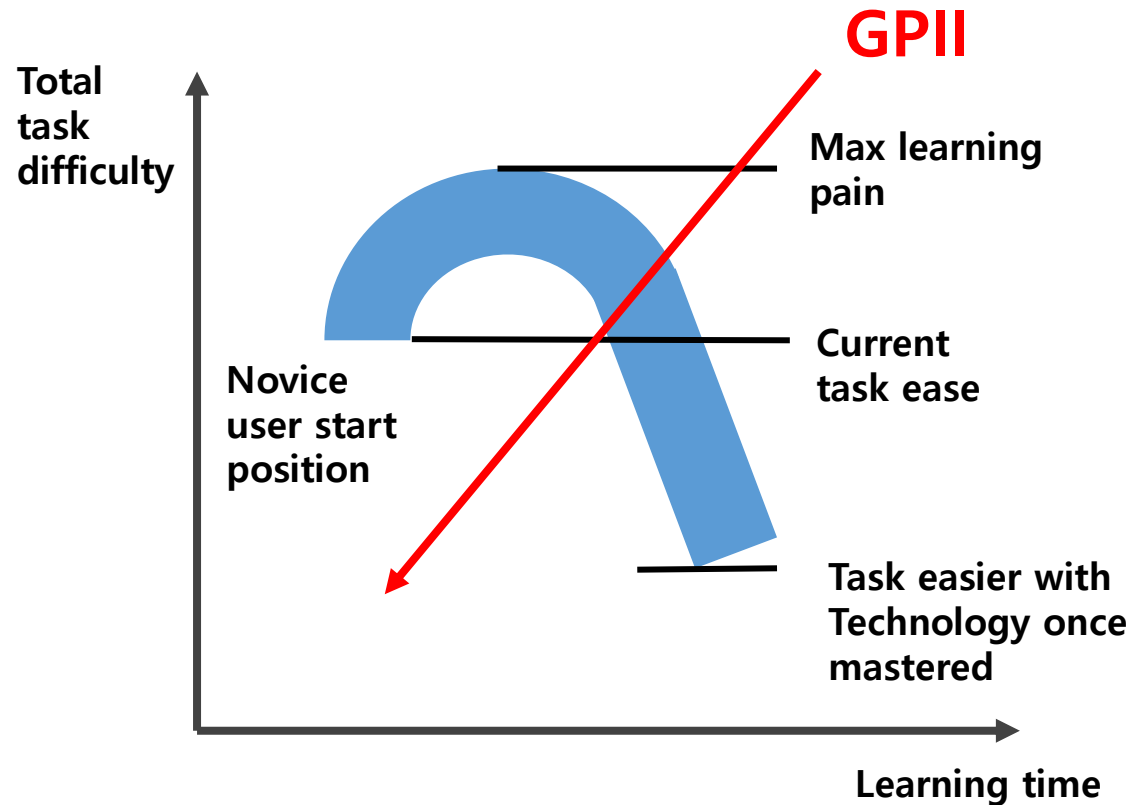


Theoretical Background on Accessibility

- **STAM model (Senior Technology Acceptance and Adoption Model, Renaud & van Biljon, 2008)**
 - 1) **Objectification phase**: the user forms an intention to use the system based on the user context, including social influences and the perceived usefulness.
 - 2) **Incorporation phase**: the user starts with an experimentation and exploration process. This experimentation gives the user an idea of the usefulness of the system, and if positive, the usefulness is confirmed, leading to actual use
 - 3) **Acceptance**
- ✓ Facilitating conditions influence the experimentation, exploration as well as actual use.
- ✓ In the incorporation phase, ease of learning and use is a component that influences both experimentation and exploration, and actual use, while the experimentation gives feedback to the user on how easy the use of a system actually is.
- ✓ Consider not only perception of ease of use but also experiences in using the system

Theoretical Background on Accessibility

- Abstracted Model of Learning Difficulty Perception for Novice Users of Digital Technology (Barnard, et al., 2013)



Once the older adults use devices adopting GPII, total task difficulty and learning time can be reduced.

| Conclusion: New Perspectives on Accessibility

When are assistance and support required?

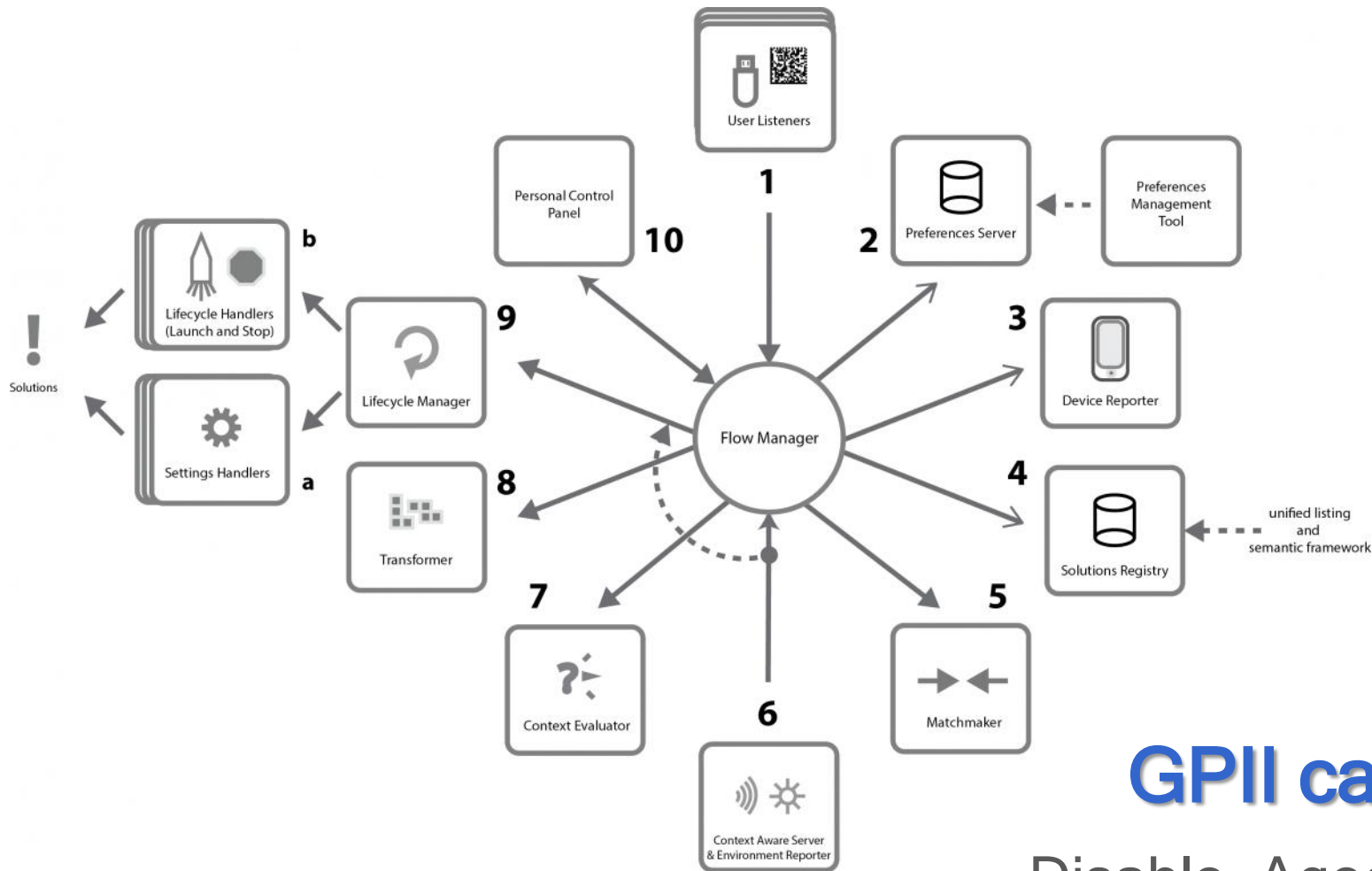
The need for assistance and support can fluctuate, depending on environmental factors, the stage of life, the underlying health conditions, and the level of individual functioning.

The need for assistance and support changes through stages of the lifecycle. Formal support may include:

- **Childhood** – respite care, special needs assistance in education;
- **Adulthood** – advocacy services, residential support, or personal assistance in the workplace;
- **Old age** – day centers, home-help services, assisted living arrangements, nursing homes, and palliative care.

WHO. (2011). World Report on Disability. P.42

GPII Auto-Personalization Accessibility



GPII can improve access for all

- Disable, Aged, Digital Literacy, Preferences, and more diverse needs of users

Thank you

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Jiyeon Lee

Hanyang University



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