

# Adaptive Internet Delivered Psychological Treatment Systems: Key Questions



Suresh Kumar Mukhiya

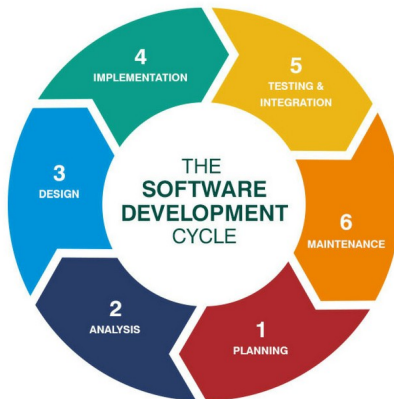
✉ skmu@hvl.no

## **Supervisors:**

Prof. Yngve Lamo & Assoc. Prof. Violet Ka I Pun & Assoc. Prof. Fazle Rabbi

December 11, 2019

# System development process



Synotive

- Analysis phase: Software Requirement Engineering
- Role: Requirement Elicitation Engineers

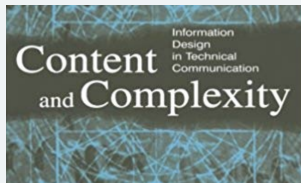
# What do you want to adapt?

Too many possibilities to adapt. What do we want to adapt?

# What can be adapted? 1/3



Content Presentation



Content Complexity

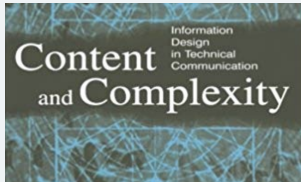


*Recommendation*

# What can be adapted? 2/3



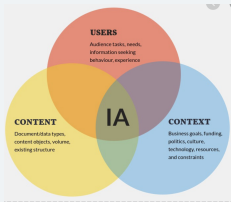
Content Presentation



Content Complexity



Recommendation



Information Architecture



User interface



Reports

# What can be adapted? 3/3



Feedback



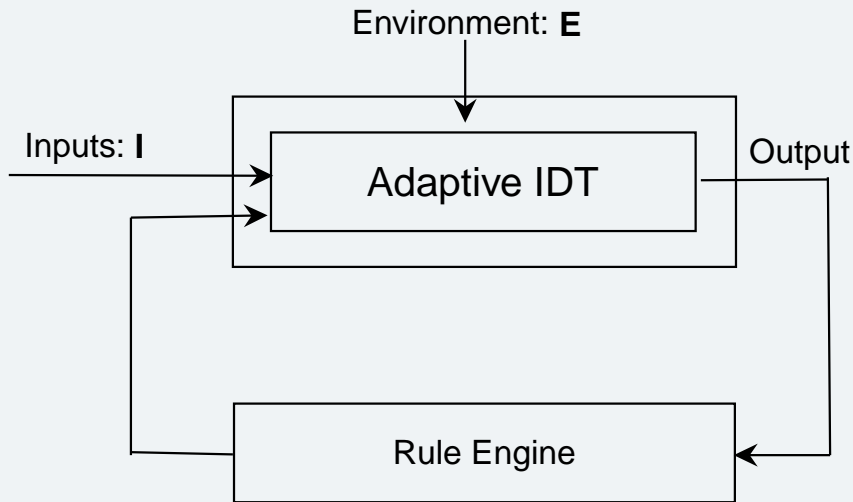
Notifications/Alerts

- Based on findings from the review paper, the definition of adaptation is confined to personalization of feedback and notifications.

# How can we adapt?

Several ways to adapt. How do you want to adapt?

# Strategies for adaptation: Rule Based adaptation





Which psychometric test do you use for Depression?

# PHQ-9 for Depression

## PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

Over the last 2 weeks, how often have you been  
bothered by any of the following problems?  
(use ~✓~ to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

# PHQ-9 for Depression - Dimensions

## PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

Over the last 2 weeks, how often have you been bothered by any of the following problems?  
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day	
1. Little interest or pleasure in doing things	0	1	2	3	Less pleasure
2. Feeling down, depressed, or hopeless	0	1	2	3	Hopeless
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3	Trouble Sleeping
4. Feeling tired or having little energy	0	1	2	3	Little Energy
5. Poor appetite or overeating	0	1	2	3	Appetite issue
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3	Family Issues
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3	Concentration
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3	Speaking issue

# PHQ-9 for Depression - Dimensions - Modules - Labeling

## PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

Over the last 2 weeks, how often have you been bothered by any of the following problems?  
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day		
1. Little interest or pleasure in doing things	0	1	2	3	Less pleasure	M1
2. Feeling down, depressed, or hopeless	0	1	2	3	Hopeless	M2
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3	Trouble Sleeping	M3
4. Feeling tired or having little energy	0	1	2	3	Little Energy	M4
5. Poor appetite or overeating	0	1	2	3	Appetite issue	M5
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3	Family Issues	M6
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3	Concentration	M7
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3	Speaking issue	M8
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3	Suicidal Thoughts	M9

# PHQ-9 for Depression - 1D adaptation

## PHQ-9 measure variable

Speaking issue

Select the required conditions for triggering alert.

## Conditions

equals to (=)

## Enter value





3

Select a number between 0 to 3

## Modules to activate

- ☐ Less pleasure
- ☐ Hopeless
- ☐ Trouble Sleeping
- ☐ Little energy
- ☐ Appetite issue
- ☐ Family issues
- ☐ Concentration
- ☒ Speaking issue
- ☐ Suicidal Thoughts

# PHQ-9 for Depression - 1D adaptation - rule table

0 of 3 Selected:  Mark As |  Export |  Delete Table Settings 

<input type="checkbox"/>		Date Submitted	PHQ-9 measure variable	Conditions	Enter value	Modules to activate
<input type="checkbox"/>	☆	2019-12-10 10:19:21	Family issues	equals to (=)	2	Less pleasure Family issues Speaking issue
<input type="checkbox"/>	☆	2019-12-10 10:18:30	Trouble Sleeping	is greater than ( > )	1	Less pleasure Trouble Sleeping
<input type="checkbox"/>	☆	2019-12-10 10:17:25	Speaking issue	equals to (=)	3	Speaking issue

Rows per Page: 25 ▾ Showing 1-3 out of 3 << < 1 > >>

# PHQ-9 for Depression - 2D adaptation

PHQ-9 measures

Less pleasure



Conditions

Equals to ( = )



Select Value

Select a value (0-3)

**AND**

User Activity

Last logged in



Conditions

Equals to ( = )



Select Value in Hour

Select a value (0 +)

**THEN**

Create Alert

Email



Time

HH:MM:SS



Select Email Templater

Template 1



# Anxiety - 2D adaptation - role

Select Psychometric Score

GAD (GAD7.)



Conditions

Equals to ( = )



Select Value

21

**AND**

User Activity

Last logged in



Conditions

Equals to ( = )



Select Value in Hour

72 hours ago

**OR**

Goals

User goal



Conditions

Equals to ( = )



Select goal

decrease anxiety

**THEN**

Create Alert

Email



Select Role

Therapist



Select Email Templater

Template Alert The.





# Conditions and constraints

- **Time:** When to trigger adaptation?
- **Role:** For whom are we adapting? Admin/Patients/Therapists
- **Profiling:** User preferences, past history, user goals
- others ...

# Strategies for adaptation: Goal driven adaptation

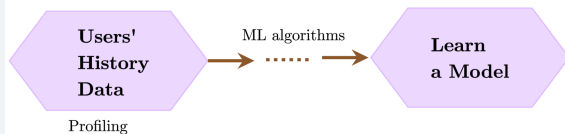
- Two types of goals are managed - *patient goals, therapists or providers goals.*
- Goal driven adaptation involves *goal management, change management and control.*
- System changes the behavior of the system to maximize goal achievement.

# Adaptation through predictive algorithms

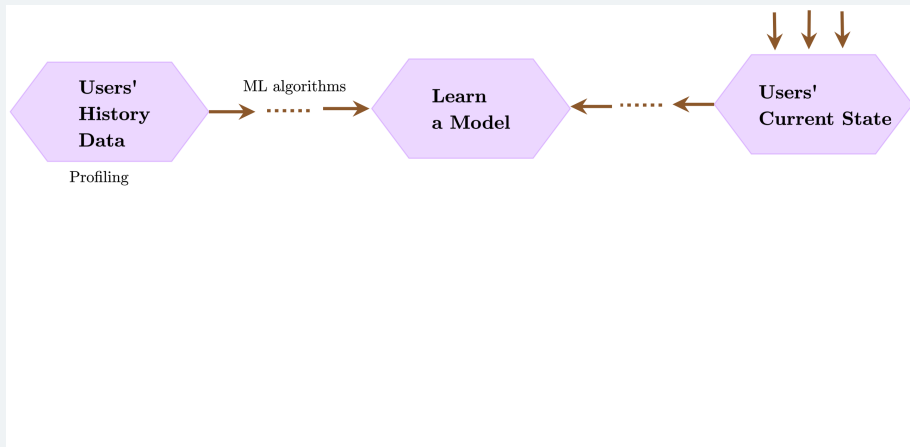


**Users'  
History  
Data**

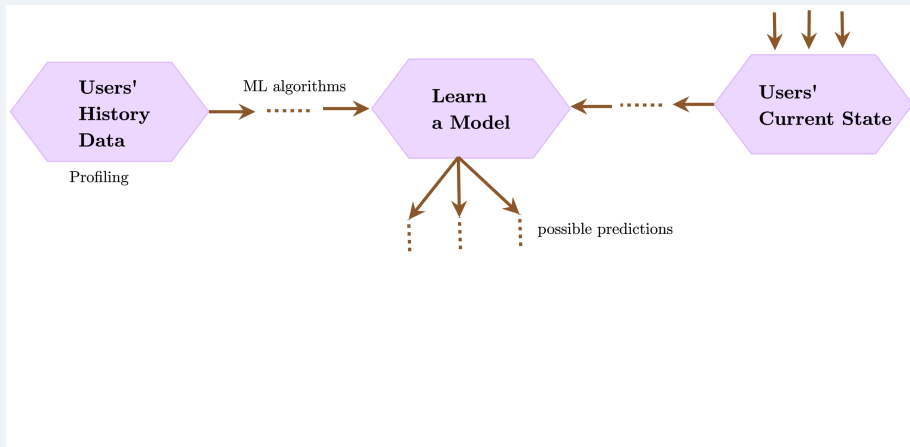
# Adaptation through predictive algorithms



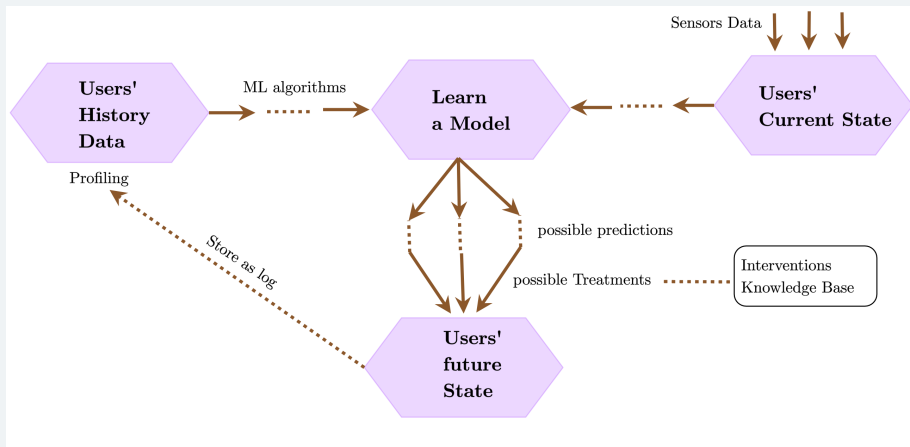
# Adaptation through predictive algorithms



# Adaptation through predictive algorithms



# Adaptation through predictive algorithms



## SRS Template

Table of Contents

Revision History

### 1. Introduction

1.1 Purpose

1.2 Document Conventions

1.3 Intended Audience and Reading Suggestions

1.4 Project Scope

1.5 References

### 2. Overall Description

2.1 Product Perspective

2.2 Product Features

2.3 User Classes and Characteristics

2.4 Operating Environment

2.5 Design and Implementation Constraints

2.6 User Documentation

2.7 Assumptions and Dependencies

### 3. System Features

3.1 System Feature 1

3.2 System Feature 2 (and so on)

### 4. External Interface Requirements

4.1 User Interfaces

4.2 Hardware Interfaces

4.3 Software Interfaces

4.4 Communications Interfaces

### 5. Other Nonfunctional Requirements

5.1 Performance Requirements

5.2 Safety Requirements

5.3 Security Requirements

5.4 Software Quality Attributes

### 6. Other Requirements

Appendix A: Glossary

Appendix B: Analysis Models

Appendix C: Issues List



# Take aways

In order to transform your vision into prototype, a developer needs to clear about:

- What do you want to adapt?
- How do you want to adapt?
- And when do you want to trigger adaptation?
- Which one is good adaptation algorithm? No free lunch theorem.

# Thanks!

