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HOW-R-U?

Suite of e-coaches aimed to analyse human behaviour

Carlos Sánchez Páez Oresti Baños Legrán



17th July 2020

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- E-coaches suite as chatbots.
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- E-coaches suite as chatbots.
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- Data analysis.
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- Mental diseases are taboo.

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- Mental disorders are very common in our society.
- Doctors have high workloads.
- Mental diseases are taboo.
- No continuous traceability of patient's health status.

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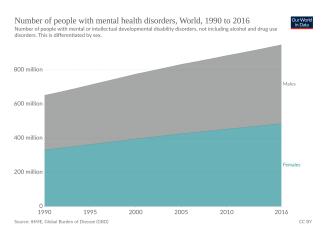


Figure: Number of people with mental health disorders

Reprinted from (Ritchie & Roser, 2018).

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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.

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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.
- Chatbots are becoming growingly becoming popular.

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- Technology is becoming increasingly integrated into our lives.
- Smartphones are used in a daily basis.
- Chatbots are becoming growingly becoming popular.
- In Spain there are 2 psychologist per 100.000 citizens (Vicente, 2019).



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- Conversational-agent-as-a-sensor that asks questions to patients.
- Questions will be defined by specialists.

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- Conversational-agent-as-a-sensor that asks questions to patients.
- Questions will be defined by specialists.
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- Questions will be defined by specialists.

- Graphical web interface for doctors.
- Flexible and scalable architecture to add functionality to the system.
- Architecture based on containers to host the different system modules.
- Implement a system that covers the previous goals.

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• Main goal:

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- Architecture based on containers to host the different system modules.
- Implement a system that covers the previous goals.
- Test a beta version of the system to retrieve target audience's feelings about it.

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Number of publications related to chatbots

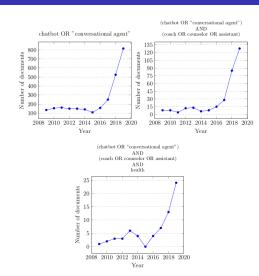


Figure: Search results of different queries performed in scopus.com.

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Conversational agent types

• Coaches: help users to get what they want.

Conversational agent types

- Coaches: help users to get what they want.
- Counselors: help users to identify and solve problems.

Communication formats

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Platform	Daily active users (billions)	Free API for chatbots
(Facebook Messenger, 2008)	1.66	✓
(Whatsapp, 2009)	1.5	X
(WeChat, 2011)	1.083	✓
(Telegram, 2013)	0.2	✓
(Kik, 2010)	0.015	✓
(Discord, 2015)	0.014	✓
(<i>Slack</i> , 2013)	0.012	✓
(Viber, 2010)	0.008	✓
(Line, 2012)	0.00723	✓

Table: Comparison between different chat applications (2019).

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 Facebook likes can be helpful to predict people's sensitive properties (Kosinski, Stillwell, & Graepel, 2013).

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- Facebook likes can be helpful to predict people's sensitive properties (Kosinski et al., 2013).
- Whatsapp's end-to-end encryption methods are not secure enough (Rastogi & Hendler, 2017).

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- Facebook likes can be helpful to predict people's sensitive properties (Kosinski et al., 2013).
- Whatsapp's end-to-end encryption methods are not secure enough (Rastogi & Hendler, 2017).
- Telegram provides more privacy protection (Sutikno et al., 2016).

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 - Ask questions to the patients.

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- Ask questions to the patients.
- Custom keyboard.

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- Must have requirements.
 - Ask questions to the patients.
 - Custom keyboard.
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- Must have requirements.
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Must have requirements.

- Ask questions to the patients.
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 - Questions and answers should be modifiable.

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 - Questions and answers should be modifiable.
 - Public questions.

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 - Questions and answers should be modifiable.
 - Public questions.
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 - Delete data from users.
 - View and modify profile data.

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 - View and modify profile data.
 - Assign questions to all patients.
 - Timezones support.
- Won't have requirements.

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- Could have requirements.
 - Numeric order of questions.
 - Custom questions frequency.
 - Other languages.
 - Password change.
 - Two factor authentication.
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- Could have requirements.
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Architecture

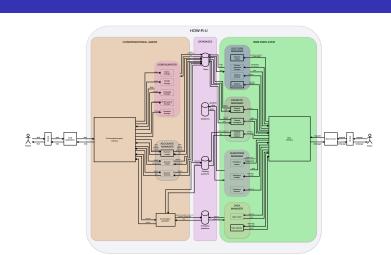


Figure: System architecture. Created using *diagrams.net* (*diagrams.net*, 2020).

Architecture

DATABASES CONVERSATIONAL AGENT CONFIGURATOR Name changer new configuration Gender changer ACK language Language changer profile picture Profile picture changer → Schedule changer Conversational gender Chat name, gender, ACCOUNTS agent language MANAGER language, schedule, schedule interface profile picture profile picture Pendina ACK Account creator questions ACK request patient id account data Account viewer patient data request request ACK Account remover -ACK patient id question response Conversation Answered patient id, question id generator questions doctor id, response question answer date ACK

Figure: System architecture (conversational agent and databases).

Architecture

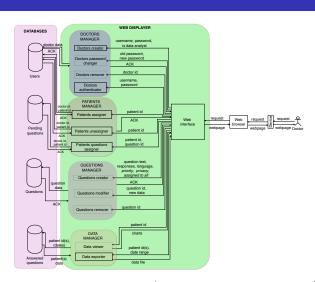


Figure: System architecture (web interface and databases).

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Implementation (databases)

```
ForeignKey (id)
                                                                       ForeignKey (id)
patient
                 ForeignKey (identifier)
                                                       pet/ent
                                                                       ForeignKey (identifier)
                  ForeignKey (id)
                                                       question
                                                                       ForeignKey (id)
                  ForeignKey (id)
answer_date
                 DateTimeField
                                                                            abstract
                      sponse (answeredouestion)
                                                                          nheritance
                                                                      ForeignKey (id)
                    ForeignKey (id)
                                                                     ForeignKey (identifier)
     order
                    IntegerField
                                                                     ForeignKey (id)
                    CharField
                    question (response)
                Question
                                                                    Patient
                       ForeignKey (id)
                                                                       Charfield
  assigned to all
                                                                                                      doctor (journalentry)
  frequency
                       Charfield
                                                         schedule
                                                                        DateTimeField
  language
                                                                       Charfield
                                                        language
                       IntegerField
                                                                       Charfield
  public
                       BooleanField
                                                        username
                                                                       Charfield
                       Charfield
                                                                 assigned_doctors (patient)
                                                          OneToOneField (id)
                                                         BroleanField
                                                            user (doctor)
```

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• Python 3.6.10 (Van Rossum & Drake, 2009)

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- Python 3.6.10 (Van Rossum & Drake, 2009)
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 - Start handler
 - Config handler.

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- Handlers.
 - Start handler
 - Config handler.
 - · Question handler.
- Jobs.

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- Handlers.
 - Start handler
 - Config handler.
 - · Question handler.
- Jobs.
 - PendingQuestionJob



Figure: Agent showing the welcome message and asking for language selection

```
Please specify the time when you would like to receive questions in
HH:MM format (24h)
You have been successfully registered into the system. 18:55
How do you feel today? 10:00
                                                                             0-2 hours
                                                                             2-4 hours
                                                                             4-6 hours
```

Figure: HOW-R-U converstional agent asking a question to a patient.

```
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• Django (*Django*, 2020) project.

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- Django (*Django*, 2020) project.
- Applications.
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 - Doctors manager.
 - Questions manager.
 - Patients manager.
 - Data viewer.

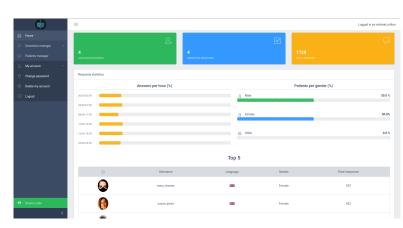
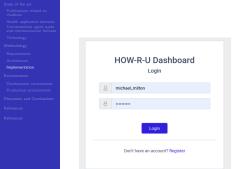


Figure: HOW-R-U homepage.



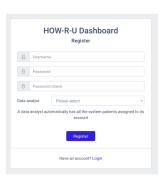


Figure: Doctors manager.

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	Question text (empty to get all questions)				Q, Search		
Question text	Possible responses	Assigned to all	Frequency	Priority	Creator	Language	Actions
Do you feel sad and cry easily?	Yes No	v	Daily	1	michael_milton (You)	88	
Have you felt insecure about yourself today?	Yes No	×	Daily	1	john_clive	88	☐ Add to My Question
How do you feel today?	Sad Tired Happy Very happy	v	Daily	1	michael_milton (You)	88	
How long have you slept today?	0-2 hours 2-4 hours 4-6 hours 6-8 hours More than 8 hours	~	Daily	1	michael_milton (You)	88	

Figure: Public questions page.

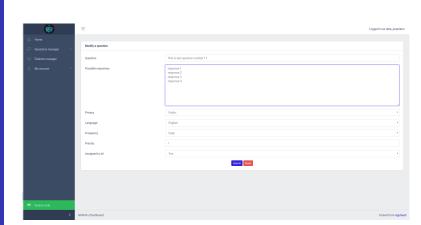


Figure: Questions creator and modifier.

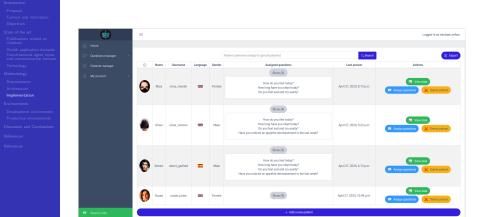


Figure: Patients manager.

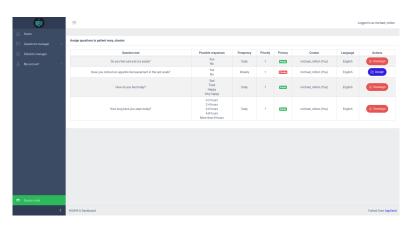


Figure: Patients manager assign questions page.

```
Select patients to export
                                               susan iones
                                               robert_garfield
                                               oliver_morton
                                               mary_chester
                                               04/01/2020
Start date
                                             Please enter a valid date
                                               mm/dd/yyyy
End date
                                              June 2020 *
                                                                    \uparrow \downarrow
                                                                                 Submit Reset
                                                    8 9 10 11 12 13
```

5 6 7 8 9 10 11 Today

Figure: Export page

Patient username	Question	Answer	Date
robert_garfield	How do you feel today?	Tired	2020-04-01 04:12:20
robert_garfield	How do you feel today?	Sad	2020-04-02 05:24:20
robert_garfield	How long have you slept today?	0-2 hours	2020-04-01 12:56:20
robert_garfield	How long have you slept today?	4-6 hours	2020-04-02 11:28:20
robert_garfield	Do you feel sad and cry easily?	Yes	2020-04-01 14:22:21
robert_garfield	Do you feel sad and cry easily?	No	2020-04-02 06:31:21
oliver_morton	How do you feel today?	Very happy	2020-04-01 01:45:19
oliver_morton	How do you feel today?	Нарру	2020-04-02 02:59:19
oliver_morton	How long have you slept today?	More than 8 hours	2020-04-01 20:51:20
oliver_morton	How long have you slept today?	2-4 hours	2020-04-01 22:24:20
oliver_morton	Do you feel sad and cry easily?	No	2020-04-01 07:47:20
oliver_morton	Do you feel sad and cry easily?	Yes	2020-04-02 17:26:20
oliver_morton	Have you noticed an appetite decreasement in the last week?	Yes	2020-04-01 21:41:20
oliver_morton	Have you noticed an appetite decreasement in the last week?	Yes	2020-04-08 21:09:20

Table: Example data generated with the *Export* feature.



Figure: View data page.

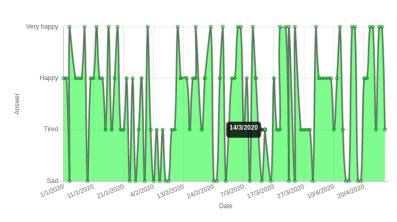


Figure: View data page (line chart).

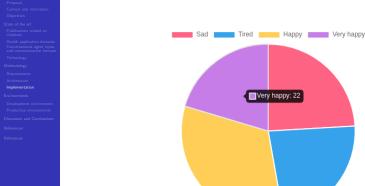


Figure: View data page (pie chart).

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Development environment

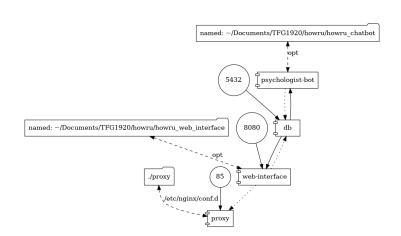


Figure: Docker-compose file schema. Generated by (PSIH, 2016).

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Production scalable environment

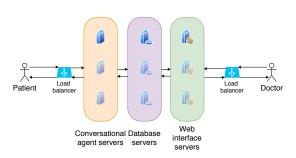


Figure: Scalable environment architecture diagram. Created using diagrams.net (diagrams.net, 2020).

Production non-scalable environment

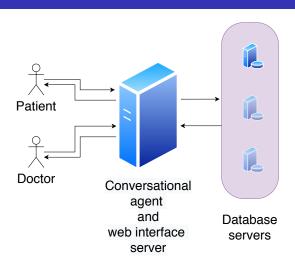


Figure: Non-scalable environment architecture diagram. Created using *diagrams.net* (*diagrams.net*, 2020).



Production one-instance environment

```
Patient

Doctor

HOW-R-U server
```

Figure: One-instance environment architecture diagram. Created using *diagrams.net* (*diagrams.net*, 2020).

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STRENGTHS

- 1. Different scenarios.
- 2. Multiple e-coaches.
- 3. Intuitive interface.
- 4. No extra software for patients.

OPPORTUNITIES

- 1. COVID-19 data analysis.
- 2. Telegram ensures privacy.

WEAKNESSES

- 1. Telegram is not used by the majority of people.
- System deployment requires knowledge on computer science.

HREATS

- 1. Eld ople may not know how to use Telegram.
- If patients do not have Telegram installed, they could install a specific app instead of Telegram.
- 3. Not all patients have smartphones.

Figure: HOW-R-U SWOT analysis. Based on http://www.mostlycolor.ch/2015/07/swot-matrices-in-latex.html.



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• Main goal: Conversational-agent-as-a-sensor that asks questions defined by specialists to patients.

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- Main goal: Conversational-agent-as-a-sensor that asks questions defined by specialists to patients. ✓
- Secondary goals.

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- Main goal: Conversational-agent-as-a-sensor that asks questions defined by specialists to patients. <
- Secondary goals.
 - Graphical web interface for doctors.

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- Secondary goals.
 - Graphical web interface for doctors.
 - Flexible and scalable architecture to add functionality to the system.

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 - Flexible and scalable architecture to add functionality to the system.
 - Architecture based on containers to host the different system modules.

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 - Architecture based on containers to host the different system modules.
 - Implement a system that covers the previous goals.

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