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PassBot: A chatbot for providing information on *Getting a Greek Passport*

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Rationale

- Information on Public Services (aka PS descriptions) is often provided in eGovernment portals or PS e-catalogues (e.g. www.passport.gov.gr providing information about getting a Greek passport). These channels:
 - ✓ Use national standards or *ad hoc data models*
 - ✓ Often do not provide personalized information
 - ✓ Rarely use emerging technologies for providing personalized PS descriptions
- The EU has introduced Core Public Service Vocabulary (**CPSV**) to harmonize PS data models across EU
- **Chatbots** can facilitate human-machine communication to provide personalized PS information
- Despite the rapid growth in the use of chatbots, there are still no **chatbots for providing personalized PS information modeled using CPSV**



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- Research Objectives
- Background
- Results - Develop PassBot
- Usage Scenario
- Evaluation
- Conclusions and Future Work

Research Objectives

- The aim of this work is:
 - a) To investigate the use of chatbots in providing personalized information
 - b) To develop and evaluate a chatbot which:
 - ✓ Provides personalized information on PS “*Get a Greek Passport*”
 - ✓ Uses the CPSV model in a modified and extended version for the PS description



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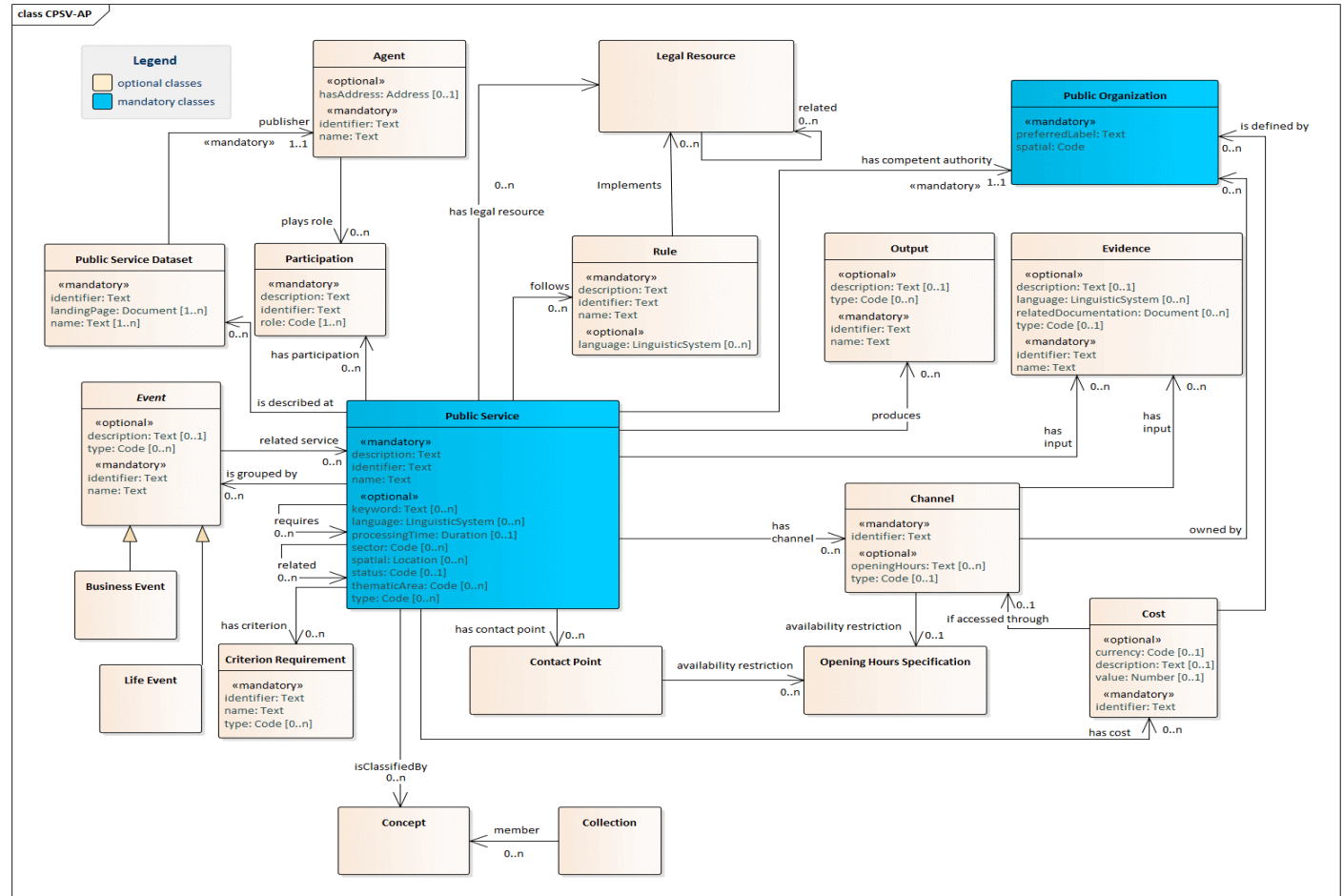
Background - Information phase of Public Services

- The provision of PS can be divided into two discrete phases, the information and the executive phase. The information phase (Why, What, Who, Where, When, How) is very important for:
 - ✓ Public Administration (PA) effectiveness
 - ✓ Citizens' / business' satisfaction
- Citizen/business individual profile is crucial since it affects the type of PS in need or its inputs
- Often disregarded by public authorities

Background - CPSV

- Core Public Service Application Profile (CPSV-AP) was developed in 2014:

- ✓ Main objective: the description of public services
- ✓ It exploits Linked Open Data (LOD) as an underpinning technology



Background - Chatbots



- Software systems that can interact with a user using natural language
 - They communicate through text or voice messages
 - They incorporate different forms of Artificial Intelligence (AI), like ML, NLP, NLU, and NLG
-
- Recently, chatbot applications have been used by the Public Sector for citizen inquiries and provision of PS information.



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Results - “Get a Greek Passport” Service Analysis

- **Public Service:** The PS under investigation is “Get a Greek passport”

Main categories based on the citizen's need to obtain a passport:

Issuance of a new passport

Passport renewal

Replacement of a valid passport

Issuance of a new passport due to theft or loss

Subcategories based on citizen’s age:

Adults

Minors under 12

Minors 12

Minors from 13 to 14

Minors over 14

Results - “Get a Greek Passport” Service Analysis

Additional, specialized categories:

Permanent resident of another country (besides Greece)

Completed military obligations (for males only)

Conviction by court order

Temporary ban on leaving the country

Unfulfilled technical requirements of the photo (due to health condition)

- Most of these cases can be combined, e.g. Passport renewal for an adult with permanent resident of another country and uncompleted military obligations.

Results - “Get a Greek Passport” Service Analysis

Depending on the above factors and the circumstances of the user, the following data emerge:



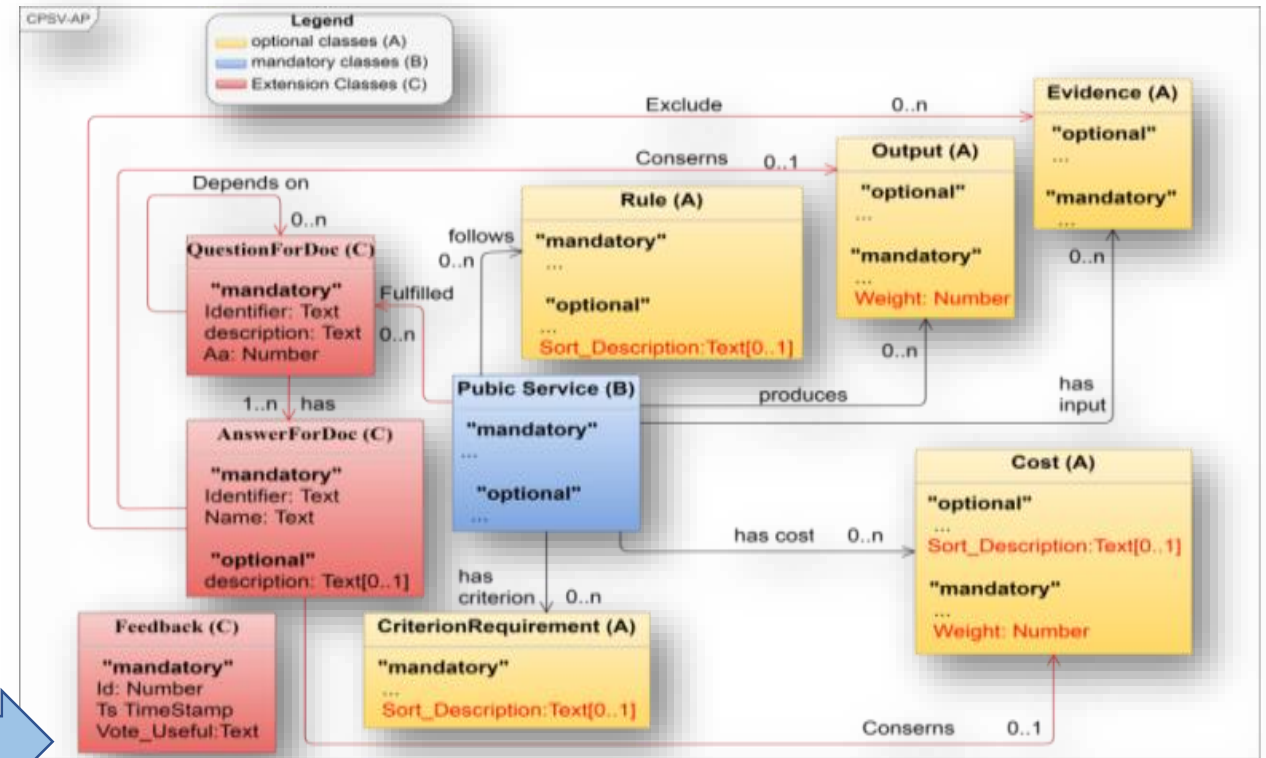
Evidences: 4 to 18 different input documents are needed for executing this PS (i.e. identification card, birth or marital status certificate, photographs adhering to specific technical requirements etc.)

Duration: the passport duration, i.e. the output of the PS, can be 5 years, 3 years, 13 months, 8 months, 3 months, and the same duration as that replaced in case of passport replacement

Cost: depends on the passport duration (i.e. 84.40 Euros, 73.60 Euros, 68.80 Euros, 63.40 Euros or 58 Euros)

Results - CPSV-AP model extension

- The existing structure of the CPSV-AP model cannot accommodate the underlying complexity of the PS “Get a Greek Passport”
- The CPSV-AP model was, accordingly, extended based on two key features:
 - ✓ The use of a Q&A dialogue to obtain the required information by users, and
 - ✓ The gradual exclusion of the documents that are NOT required for their case, based on their answers



Part of the overall CPSV-AP UML diagram. New classes, their relations and the corresponding properties, in red.

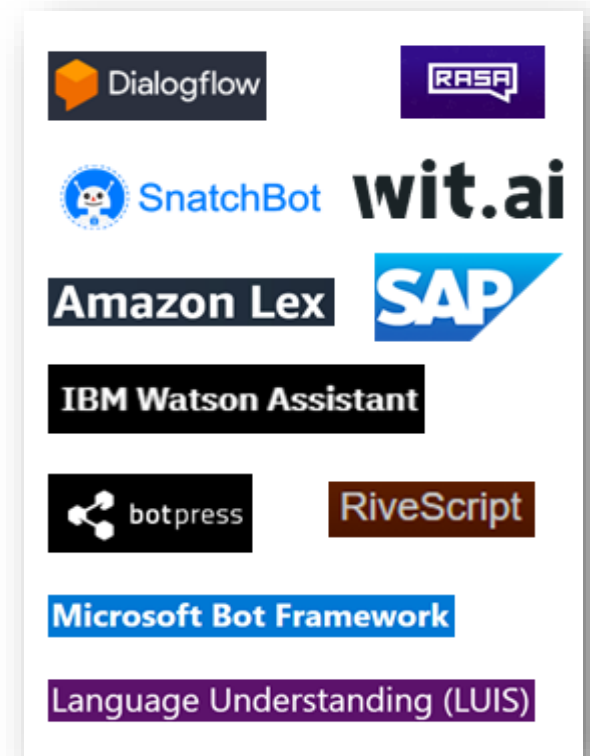
Results - Chatbot development tool selection

Development tools community: Frameworks, Platforms, Open Sources tools.

- Recommendations of the EU report “ISA2 - Architecture for public service chatbots”
- The selected tool had to meet the following requirements:
 - ✓ Support the Greek language
 - ✓ Support rapid app development
 - ✓ Be free and
 - ✓ Be open-source
- 10 development tools were tested.
- The "Rasa open source framework" was chosen as the most appropriate tool:



- ✓ Meets all four selection criteria and seemed flexible and friendly
- ✓ It integrates modern AI technologies such as NLP-NLU-ML
- ✓ Has the active support from a large community of developers

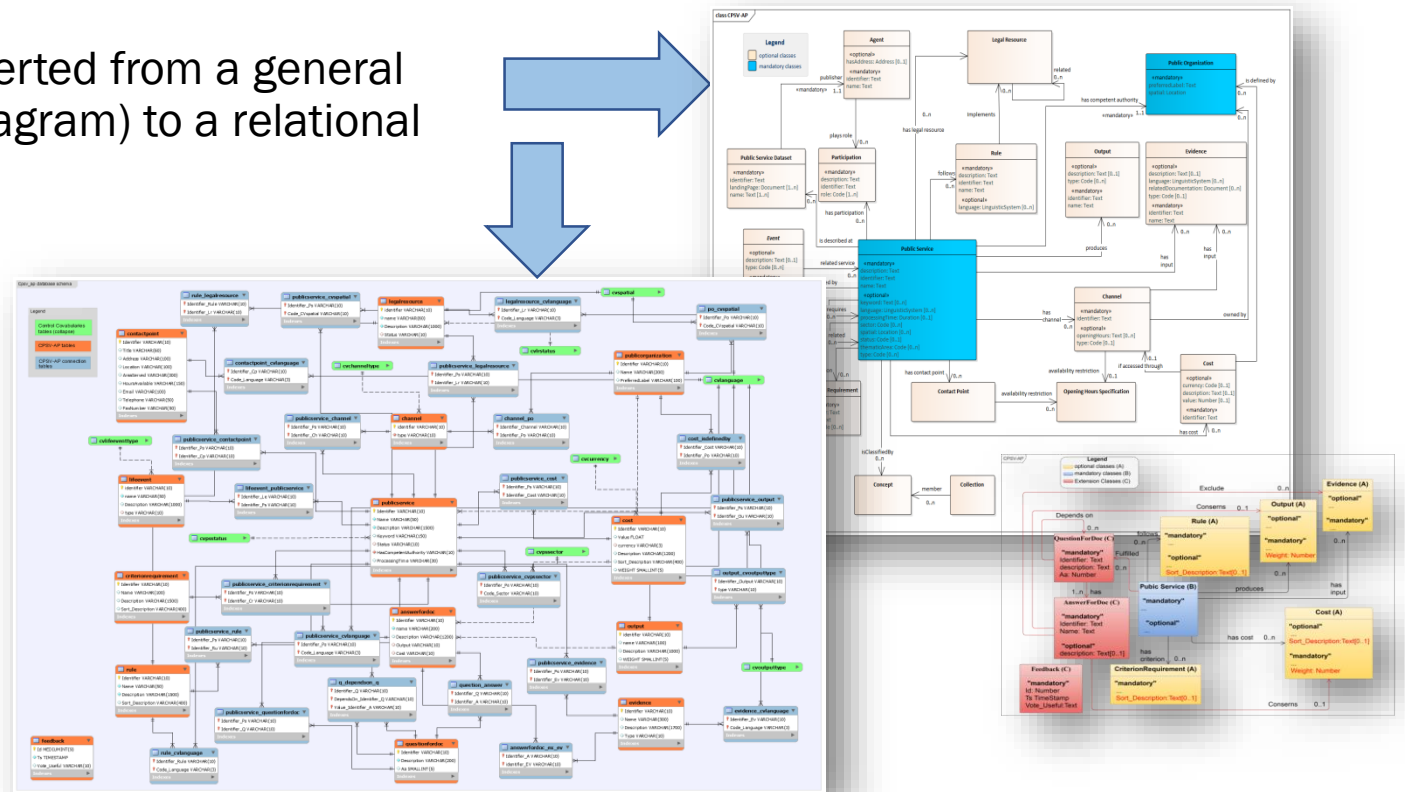


Results – PassBot Development



- A relational data repository managed by MySQL (RDBMS) was created to host the PS “*Get a Greek Passport*” description, based on the extended CPSV-AP model.

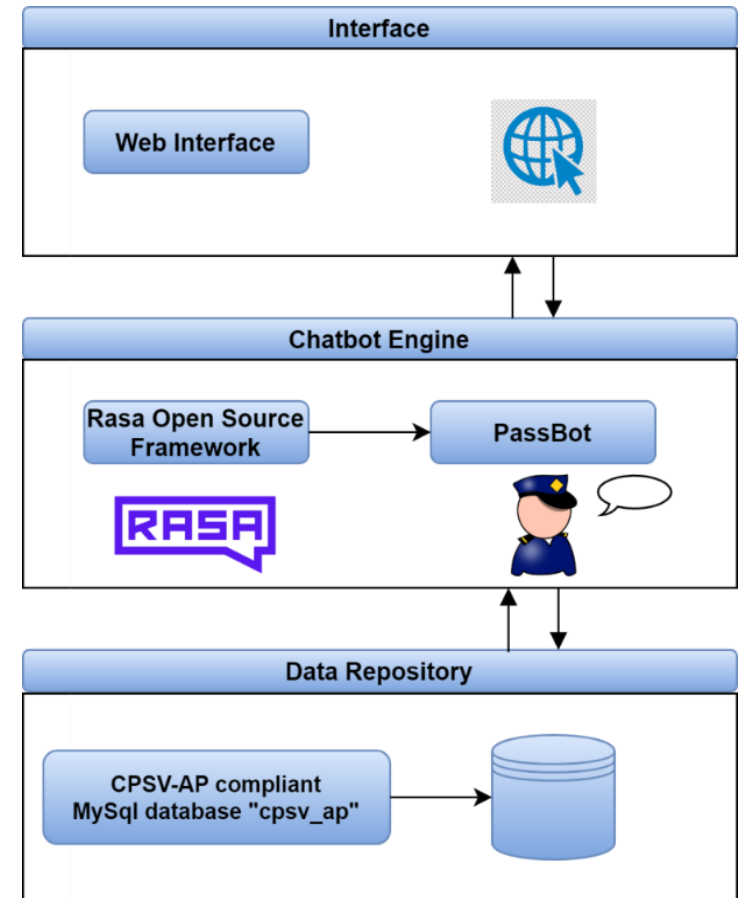
- The extended CPSV-AP model was converted from a general conceptual design model (UML class diagram) to a relational model (Entity-Relationship diagram)
- All model classes and correlations were converted into 48 relational tables of a central database.
- The Q&A dialogue was coded into a total of twelve questions. Nine to twelve questions are used.



Results – PassBot Development

Overall system architecture

- 3 basic levels:
 - ✓ Web interface
 - ✓ Chatbot engine, responsible for sorting and processing the input data
 - ✓ Relational data repository which hosts the PS “*Get a Greek Passport*” description, based on the extended CPSV-AP model



Results – PassBot Development

System implementation

- System files formatting
- “Actions” classes
- Chatbot features
- E-mail
- Integration into a simple html website



System files formatting

- Intents and entities
- Small talks, greetings, thanks and feedback coverage
- Appropriate training data (NLU)
- Stories (51)

Results – PassBot Development

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Action sample – “Issuing procedure”

```
253 class ActionDPassportIssueProcedure(Action):
254 # Διαδικασία έκδοσης διαβατηρίου
255 # Ανάρτηση και εμφάνιση Sort_Description (Description για email) από table
"rule" για PS = "Ps0001" και rule.name = 'PASSPORT ISSUE PROCEDURE'.
256 def name(self):
257 return "action_db_passport_issue_procedure"
258
259 def run(self, dispatcher, tracker, domain):
260 db = mysql.connector.connect(**config)
261
262 cursor = db.cursor()
263
264 q = "select rule.description, rule.sort_description from publicservice_rule
as ps_rule, rule where ps_rule.identifier_ps = '{}' and
ps_rule.identifier_ru = rule.identifier and rule.name = 'PASSPORT ISSUE
PROCEDURE'".format(IDENTIFIER_PS_PASSPORT)
264
265 email_results = ''
266
267
268 try:
269 cursor.execute(q)
270 results = cursor.fetchall()
271 i = 0
272 for row in results:
273 i+=1
274 descr = row[0]
275 sort_descr = row[1]
276 if i == 1:
277 response = """"Η διαδικασία που ακολουθείται από την υποβολή των
δικαιολογητικών μέχρι και την παραλαβή του νέου διαβατηρίου
είναι η εξής : """"
278 dispatcher.utter_message(response)
279 email_results = Response
280 dispatcher.utter_message(format(sort_descr))
281 email_results = email_results + "\n\n" + format(descr)
282
283 if not results:
284 dispatcher.utter_message("Αυπάμα... Δεν βρέθηκαν τα στοιχεία...")
285
286 except:
287 dispatcher.utter_message("Ούπς... @ Δεν μπόρεσα να ανακτήσω στοιχεία...")
288
289 db.close()
290
291 # Ερώτηση για αποστολή mail, εφόσον εμφανίστηκαν στοιχεία
292 if not email_results:
293 dispatcher.utter_message(template="utter_anything_else")
294
295 else:
296 message = "Θα ήθελες να σου στείλω με ✉ email τις πληροφορίες
εμπλουτισμένες;"
297 buttons = [{"title": BUTTON_YES,
298 'payload': '/afirm'},
299 {'title': BUTTON_NO,
300 'payload': '/deny'}]
301 dispatcher.utter_message(message, buttons=buttons)
302
303 return [SlotSet("email", None), SlotSet("info_for_email", email_results),
SlotSet("subject_for_email", email_subject)]
```

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Chatbot (**Pass**port+Chat**Bot**) features

- Goal-oriented chatbot
- Responds and recognizes the Greek language
- Scripted and conversational chatbot
- Retrieval-based model
- No Security policies



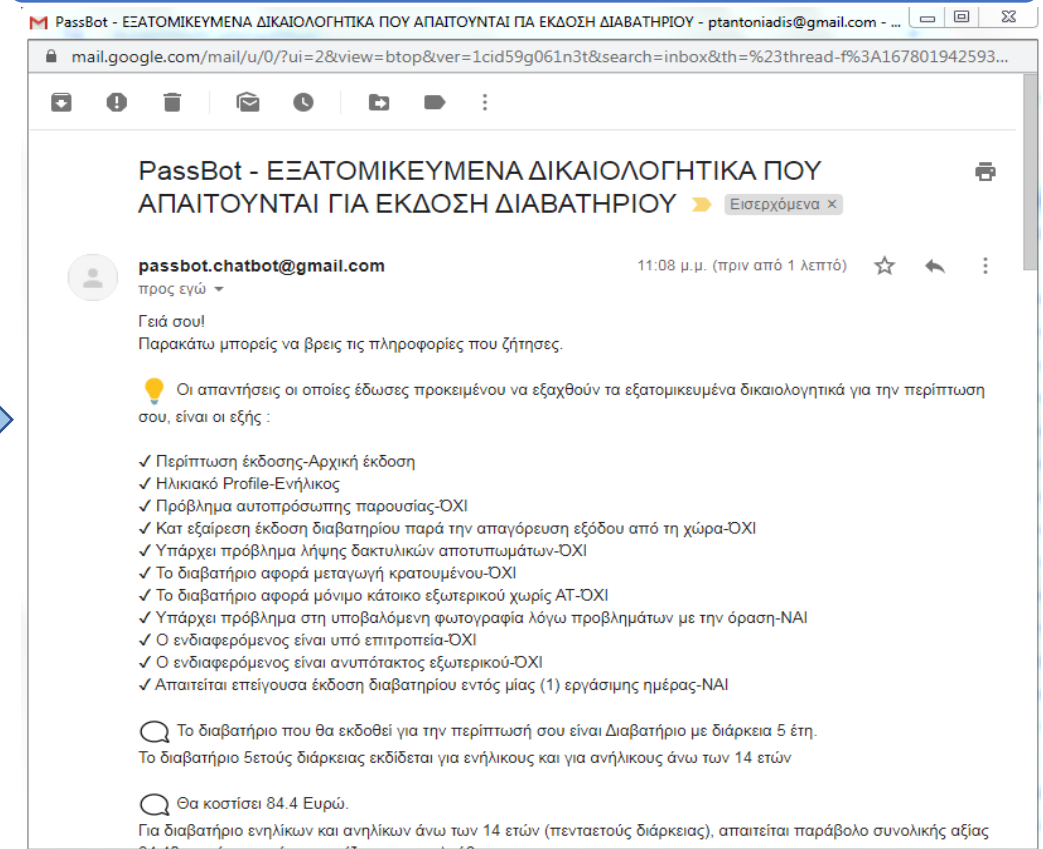
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Passbot E-mail



Results – PassBot Development

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Passbot Chatbot

ΕΛΛΗΝΙΚΟ ΑΝΟΙΚΤΟ ΠΑΝΕΠΙΣΤΗΜΙΟ - Μεταπτυχιακή Εξειδίκευση στα Πληροφοριακά Συστήματα - ΠΛΣ
Διπλωματική εργασία ΑΝΤΩΝΙΑΔΗ ΠΑΝΤΕΛΗ "Ανάπτυξη chatbot για την έκδοση διαβατηρίου"
Επιβλέπων καθηγητής: ΕΥΘΥΜΙΟΣ ΤΑΜΠΟΥΡΗΣ - Καθηγητής τμήματος εφαρμοσμένης πληροφορικής του ΠΑ.ΜΑΚ.

ς και το Chatbot της διπλωματικής εργασίας φιλοξενούνται σε Server του τμήματος Εφαρμοσμένης Πληροφορικής του Πανεπιστημίου Μακεδονίας, που παραχωρήθηκε ειλ

Δήλωση αποποίησης ευθύνης και απορρήτου



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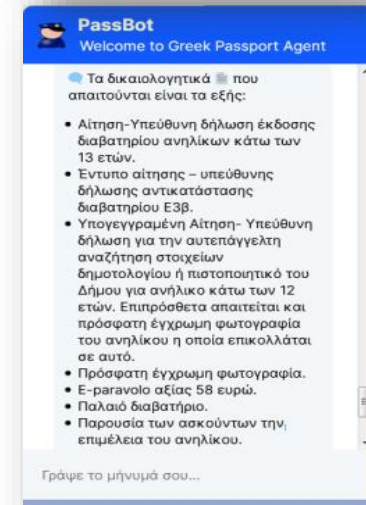
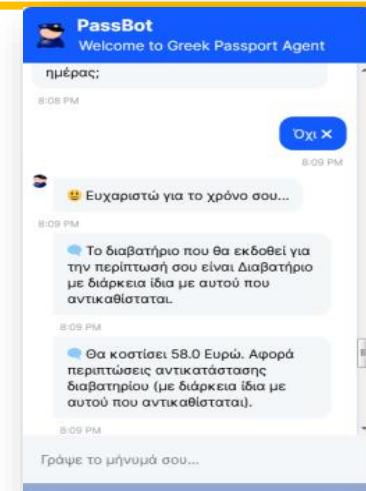
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Usage Scenario

- A citizen wishes to replace the passport of his son as he found out that it has been destroyed.
- The child is 10 years old and there are no other circumstances (health, urgency, etc.) affecting the issuance of the passport
- The Chatbot, after dialogue with the citizen through 9 questions, explains and provides the duration of the new passport, the corresponding cost and the following supporting documents required



- The passport that will be issued for your case is a Passport with the same duration as the one that is being replaced.
- It will cost 58.0 Euros. It concerns cases of passport replacement.
- The supporting documents required are the following:
 - ✓ Application-Responsible declaration for issuing a passport for minors under 13 years old.
 - ✓ Application form - responsible declaration of passport replacement E3b.
 - ✓ Signed Application - Responsible statement for the ex-officio search of municipal records or a certificate of the Municipality for a minor under 12 years old. In addition, a recent color photograph of the minor is required and affixed to it.
 - ✓ Recent color photography.
 - ✓ Administrative Fee (e-paravolo) 58 euros.
 - ✓ Old passport.
 - ✓ Presence of the juvenile custodians.





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Evaluations

- A TAM (Technology Acceptance Model) based questionnaire, consisting of 20 questions, was customized to evaluate Passbot.
- The answers were a 7-point scale from strong agreement to strong disagreement.
- The questionnaire was implemented using Google forms.
- The participants in the evaluation were 53 students.
- Overall, 47 users (89%) believes that the use of Passbot is easy. 29 users (62%) agree completely, 12 users (26%) almost completely and nobody disagrees.
- Generally, users believe that the Passbot is useful (47 users).
- 22% of the users believe that the chatbot should be trained more to recognize more users' questions, while some people suggest adding more options. Also, some users identified failures in the user's free questions.



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Conclusions and Future Work

- The goal of providing personalized information to the citizen is technically achievable
- Benefits to the citizen (personalized, fast and accurate information, saving time and money) and the PAs (modernization)
- Various technical challenges remain to be addressed towards the production of the ideal result (short descriptions, FAQ, Greek language)
- Future work includes a thorough examination of the use of a relational database for CPSV-AP model and enhancing CPSV model to incorporate machine-readable rules. For the chatbot development it is considered necessary to create an API interface and an interconnected network of Goal-oriented chatbots, which will provide information for different PSs.
- Citizens' acceptance as well as potential benefits and challenges for PAs must be more thoroughly investigated



Thank you for your attention! Questions?

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