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Representation in the Semantic Web of the Structure and Functions of a Police Department in Greece

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ABSTRACT: *In the Greek Public Administration and in particular in the Greek Police there is no tool – software that presents the tasks and structures of a Police service; so that the staff working there can be allocated according to their training. The resulting research question is 'Can an ontology be developed that presents the structure, tasks and alternate staff?'. In order to answer the above question, Greek legislation on the establishment and operation of the lower police services (Police Departments) was examined, as well as all legislation concerning the duties and training of police personnel. Finally, an ontology is created in OWL a semantic language syntax through the Protégé application*

KEYWORDS–*Ontology, Police Department, Semantic Web, Reasoning*

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I. INTRODUCTION

1.1 Literature Review

In the late 1960s and early 1970s the foundations were laid and the first attempts were made to design networks designed to represent knowledge about a place of knowledge or an object of knowledge. In these networks each node symbolizes a separate part of the issue under consideration, while the edges connecting the nodes are the relationships between them or properties [22].

Ontology is, according to Gruber [23], a formal and clear definition of a common and agreed conceptual formatting relating to a field of interest.

Ontology has:

- Class: These are concepts related to a particular field of knowledge and are usually structured in hierarchical form.
- Relationships: Determine the type of interaction between two concepts.
- Functions: a special relationship case in which the relationship element is (n) uniquely identified by the previous (n-1) element.
- Individuals: represent very specific elements.
- Axioms: represent sentences that always apply.

More and more state agencies internationally are trying to reflect their knowledge of their structure and tasks in the semantic web [1, 3, 4, 5]. The Semantic impression of the functions of a Public Service aims at the better distribution of its functions, but also at the most beneficial use of its staff [1, 2, 5, 6]. This can also allow citizens to have easy access to the necessary information on the tasks of each Public Service [1-6].

At the scientific and administrative level, much has been said about the development of ontologies on investigations into the solving of crimes carried out by the police [10-12]. There are fewer efforts being made to develop ontologies regarding the structure of police services and the functioning of police personnel [7-9].

1.2 Differentiation Points

This paper, drawing on the above principles, is original in the following manner:

1) First, they present all the tasks and structure of a police department.
2) Second, it categorizes department staff based on their training.
3) Thirdly, it presents the necessary equipment for each job.
4) Finally, the correlation of the above is presented and possible signs of weakness are examined.

II. THE PROPOSED METHODOLOGY

2.1 The Data

This study shows in the semantic web the operation of the Police Departments and the personnel with whom they are staffed under the Greek Legislation [13, 14, 15, 16, 17, 18, 19, 20 & 21].

Thus, the tasks – structure of a Greek Police Department are the following:

1) Internal Services: office of an officer of service, detention center, guard of the police building, secretariat, police control office, files classification office and administration.
2) External Services: police car patrol, police motorcycle patrol, foot patrol, transfer of prisoners to courts, transfer of prisoners to hospitals.

The staff of the Greek Police are allocated based on the tasks resulting from their training:

1) Senior Officers: graduates of the school of officer and the school of retraining of the Greek Police.
2) Junior Officers: graduates of the officers' school
3) Police Investigators: graduates of the police school in the capacity of police investigator.
4) Junior Police Personnel: graduates of the police school
5) Special Guards: graduates of the special guards' school.
6) Civilian Staff: Recruited on the basis of civil servants' criteria

The equipment used by police personnel varies according to their duties: computer; printer, set of seals; handcuffs; police baton; pistol; bulletproof vest; machine gun; car; motorcycle and radio.

2.2 The OWL Language, the Protégé Program and the HermiT Reasoner

OWL semantic language was used to display the data on the semantic tissue. OWL (Web Ontology Language) [24] OWL is a language for creating and editing ontologies; based on the RDF and RDF Scheme languages, but extends their syntax by proposing some new terms.

Protégé [25] is a free, open source software that uses the appropriate tools to create models based on knowledge applications with the help of ontologies. At its core, Protégé implements many structures and actions that support the creation, visualization and handling of ontologies in various forms of representation. Protégé can be customized to easily support the creation of knowledge standards and the input of data.

Reasoners are software that runs on ontologies and detects possible logical errors; examine whether the relationships within the ontology are consistent and at the same time check whether the affiliation relationships between classes and properties work correctly.

Reasoner HermiT [26] is used in this paper in version 1.4.3.456. It is an open source software which is available from LGPL.2.2 Participant (Subject) Characteristics

Appropriate identification of research participants is critical to the science and practice of psychology, particularly for generalizing the findings, making comparisons across replications, and using the evidence in research syntheses and secondary data analyses. If humans participated in the study, report the eligibility and exclusion criteria, including any restrictions based on demographic characteristics.

2.3 Representation of Data

The data presented in section 2.1 were processed with the software in section 2.2 for the creation of the ontology of a Greek Police Department.

Ontology has Classes and sub-classes according to the following table:

Class	Sub-class	Sub-class
Police Tasks	Internal Services	
	External Services	
Staff	Senior Police Personnel	Senior Officers
		Junior Officers
	Junior Police Staff	Junior Police Personnel
		Police Investigators
		Special Guards
	Civilian Staff	
Equipment	Police Equipment	Radio
		Police Baton
		Pistol
		Machine Gun
		Handcuffs
		Bulletproof Vest
	Office Equipment	Set of Seals
		Printer

Class	Sub-class	Sub-class
		Computer
	Vehicles	Motorcycle
		Car

Ontology has Individuals: office of an officer of service; Detention Center; Guard of the Police Building; Secretariat; Police Control Office; Files Classification Office and Administration; Car Patrol; Motorcycle Patrol; Foot Patrol; Transfer of Prisoners to Courts; Transfer of Prisoners to Hospitals; Senior Officers; Junior Officers; Police Investigators; Junior Police Personnel; Special Guards; Civilian Staff; Computer; Printer; Set of Seals; Handcuffs; Police Baton; Pistol; Bulletproof Vest; Machine Gun; Car; Motorcycle and Radio.
Ontology has Object Properties (Relationships): has Head; has Personnel, has Equipment.

2.4 Visual Representation of Ontology
Below are presented a series of images that emerged from the visual representation of Ontology.
1) Representation of the whole of Ontology (image 1), based in online tool http://owlgred.lumii.lv/
2) Representation of all the personnel of a Police Department and the possession of weapons, regardless of the tasks in which he works (image 2).
3) Representation of the jobs that can be either a Police Investigator with higher education, or a Special Guard with a minimum training of 3-4 months (image 3).

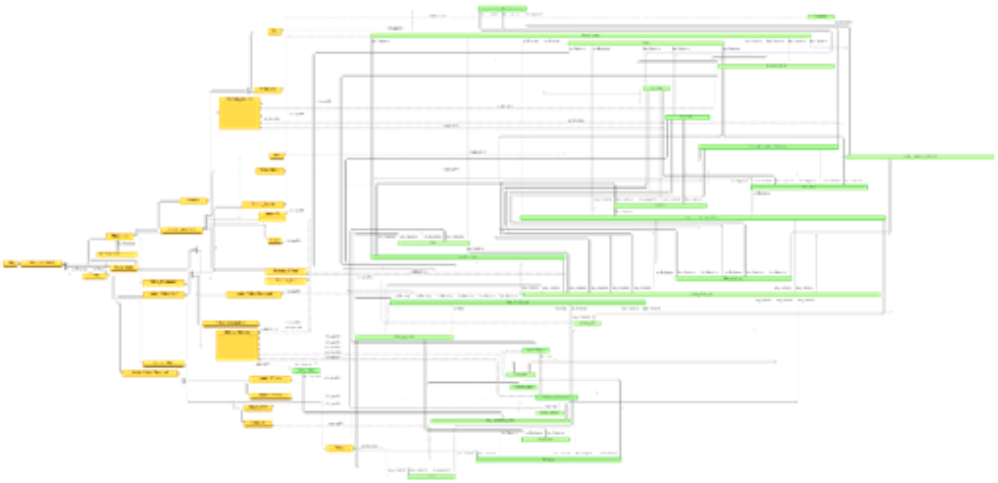

Image 1: *Representation of the whole of Ontology*

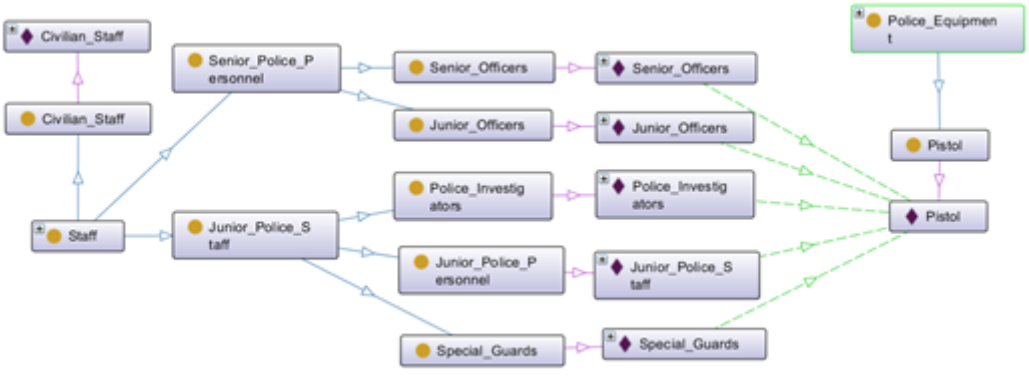

Image 2: *Representation of all the personnel of a Police Department and the possession of weapons, regardless of the tasks in which he works*

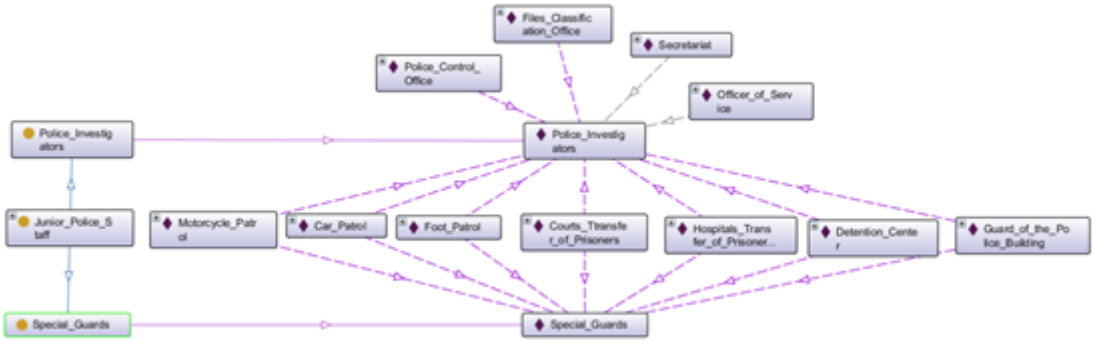

Image 3: *Representation of the jobs that can be either a Police Investigator with higher education, or a Special Guard with a minimum training of 3-4 months*

2.5 Examination of Ontology with Queries

As shown in section 2.4, it is particularly difficult to draw conclusions through the visual representation of such large, in scope and content, ontologies. That's why we're looking at some questions (Queries) below with which ontology is explored and through which we can draw useful conclusions about the allocation of the personnel of a Greek Police Department.

1) What duties are staffed by Police Investigators (Fig. 1)?
2) What duties are staffed by Junior Police Personnel (Fig. 2)?
3) What duties are staffed by Special Guards (Fig. 3)?
4) Which of the Police Department's personnel are armed regardless of their responsibilities (Fig. 4)?

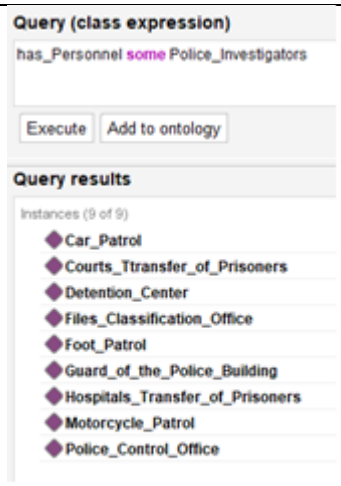

Fig 1

Fig. 2

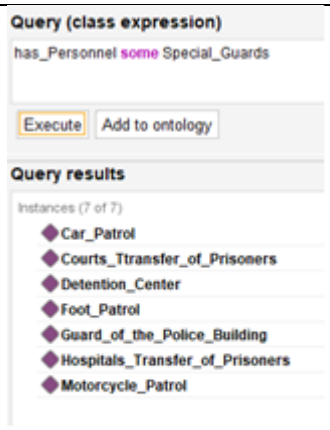

Fig. 3

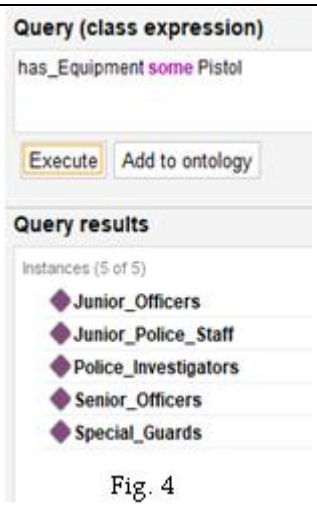

Fig. 4

III. CONCLUSION

Three extremely interesting conclusions have been drawn from the Queries referred to in paragraph 2.4:

1) Senior police staff in charge of investigative duties (Police Investigator) are used in the same jobs as the Special Guards and Junior Police Personnel who do not have training to conduct police investigations.
2) Special Guards with a minimum training of 3 to 4 months are used in tasks beyond the guarding of buildings or detention facilities.
3) All police personnel carry guns regardless of the needs of their jobs. This condition increases the chances of either misuse of the weaponry; an accident; or a loss of weaponry.

It is understood that it is extremely useful to develop such ontologies concerning the representation in the semantic web of public service structures and the tasks of their staff. In addition, we see that the ontology of a police department can reveal important security issues such as the use of personnel with lack of training in complex tasks and the general weaponry of personnel regardless of the needs of their job.

REFERENCES

[1]. GOUDOS, Sotirios K., et al. Public administration domain ontology for a semantic web services EGovernment framework. In: IEEE International Conference on Services Computing (SCC 2007). IEEE, 2007. p. 270-277.
[2]. SAVVAS, Ioannis; BASSILIADES, Nick. A process-oriented ontology-based knowledge management system for facilitating operational procedures in public administration. Expert Systems with Applications, 2009, 36.3: 4467-4478.
[3]. RAADSCHELDERS, Jos CN. The future of the study of public administration: Embedding research object and methodology in epistemology and ontology. Public Administration Review, 2011, 71.6: 916-924.
[4]. WANG, Xia, et al. WSMO-PA: formal specification of public administration service model on semantic web service ontology. In: 2007 40th Annual Hawaii International Conference on System Sciences (HICSS'07). IEEE, 2007. p. 96-96.
[5]. BRUSA, Graciela; LAURA CALIUSCO, M.; CHIOTTI, Omar. Towards ontological engineering: a process for building a domain ontology from scratch in public administration. Expert Systems, 2008, 25.5: 484-503.
[6]. STOUT, Margaret. Competing ontologies: A primer for public administration. Public Administration Review, 2012, 72.3: 388-398.
[7]. XIE, Neng-fu; WANG, Wen-sheng. Ontology and acquiring of agriculture knowledge. Agriculture Network Information, 2007, 8: 13-14.
[8]. JUNG, Hoill; CHUNG, Kyungyong. Ontology-driven slope modeling for disaster management service. Cluster Computing, 2015, 18.2: 677-692.
[9]. ROBINSON, Howard. The ontology of the mental. In: The Oxford Handbook of Metaphysics. 2003.
[10]. MASSUMI, Brian. The political ontology of threat. The affect theory reader, 2010, 52-70.
[11]. LAWSON, Celeste. Situating policing in a late modern society: the ontology of police identity. The police journal, 2014, 87.4: 270-276.
[12]. ONNOOM, Boonyarin, et al. An ontology design for recommendation filling-in for a crime scene investigation report of the forensic science police center 4 thailand. In: Advanced Approaches to Intelligent Information and Database Systems. Springer, Cham, 2014. p. 139-147.
[13]. Presidential Decree 141/1991, Government Gazette 58 v A', 'Responsibilities of institutions and staff of the Ministry of Public Order and Issues of Organization of Services'.
[14]. Presidential Decree 178/2014, Government Gazette 281 v A', 'Organization of Greek Police Services'.
[15]. Presidential Decree 585/85 "Regulation for the Training of Personnel of the Ministry of Class"
[16]. Presidential Decree 319/95 "Organization of the Hellenic Police Officers' School"
[17]. Presidential Decree 352/95 "Organization of the School of Police Officers"
[18]. Presidential Decree 190/96 "Organization of the School of Education and Training"
[19]. Ministerial Decision 7002/12/1-2009 Special Guards Training"
[20]. Ministerial Decision 6999/3/5-2009 "Additional training of Special Guards and Border Guards joining police personnel"

[21]. Presidential Decree 14/2001 "Organization of Hellenic Police Services"
[22]. BERNERS-LEE, Tim; HENDLER, James. Publishing on the semantic web. Nature, 2001, 410.6832: 1023-1024.
[23]. GRUBER, Thomas R. A translation approach to portable ontology specifications. Knowledge acquisition, 1993, 5.2: 199-220.
[24]. OWL Working Group. W3 Semantic Web. https://www.w3.org/OWL/.
[25]. Gonçalves, Rafael, και συν. Protege. https://protege.stanford.edu.
[26]. Knowledge Representation and Reasoning Group. HermiT OWL Reasoner. http://www.hermit-reasoner.com

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