EVOTION

BIG DATA SUPPORTING PUBLIC HEARING HEALTH POLICIES

USING BIG DATA ANALYTICS TO FORMULATE PUBLIC HEALTH POLICY FOR HEARING HEALTH

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https://bmjopen.bmj.com/content/8/2/e020978

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Outline

- The need for public health policy in hearing health
- Structure and functioning of EVOTION
- Development of computer language for Public Health Policy Decision Making Models (PHPDM)
- Examples of Models
- Text Mining
- Decision support system (DSS)
- Progress and future

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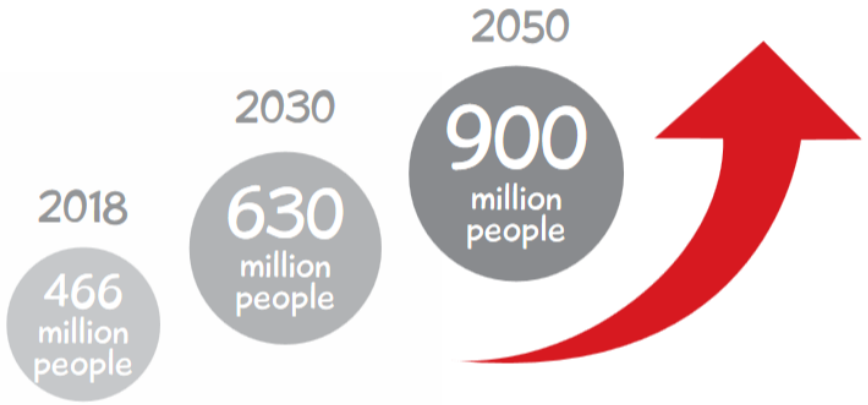
WHO: new estimates for disabling hearing loss

World Health Organization



	2018: All	Hearing loss 2018,		2050
World	7.63bn,	466m,	6.1%,	900m
High income countries	886m,	46m,	5.2%,	72m
EU population	513m,	27m,	5.3%	
Low income countries	6.74bn,	420m,	6.2%,	828m

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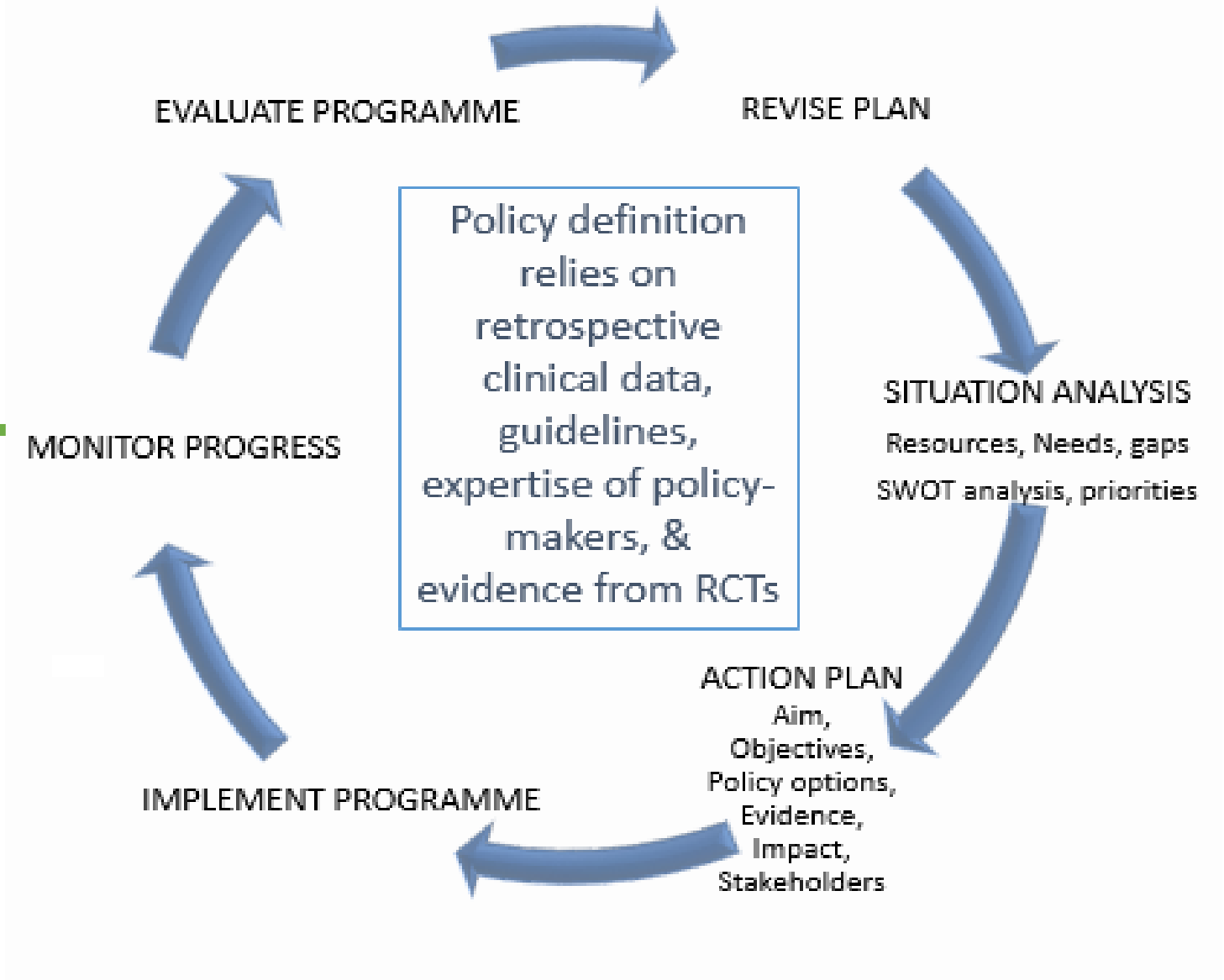
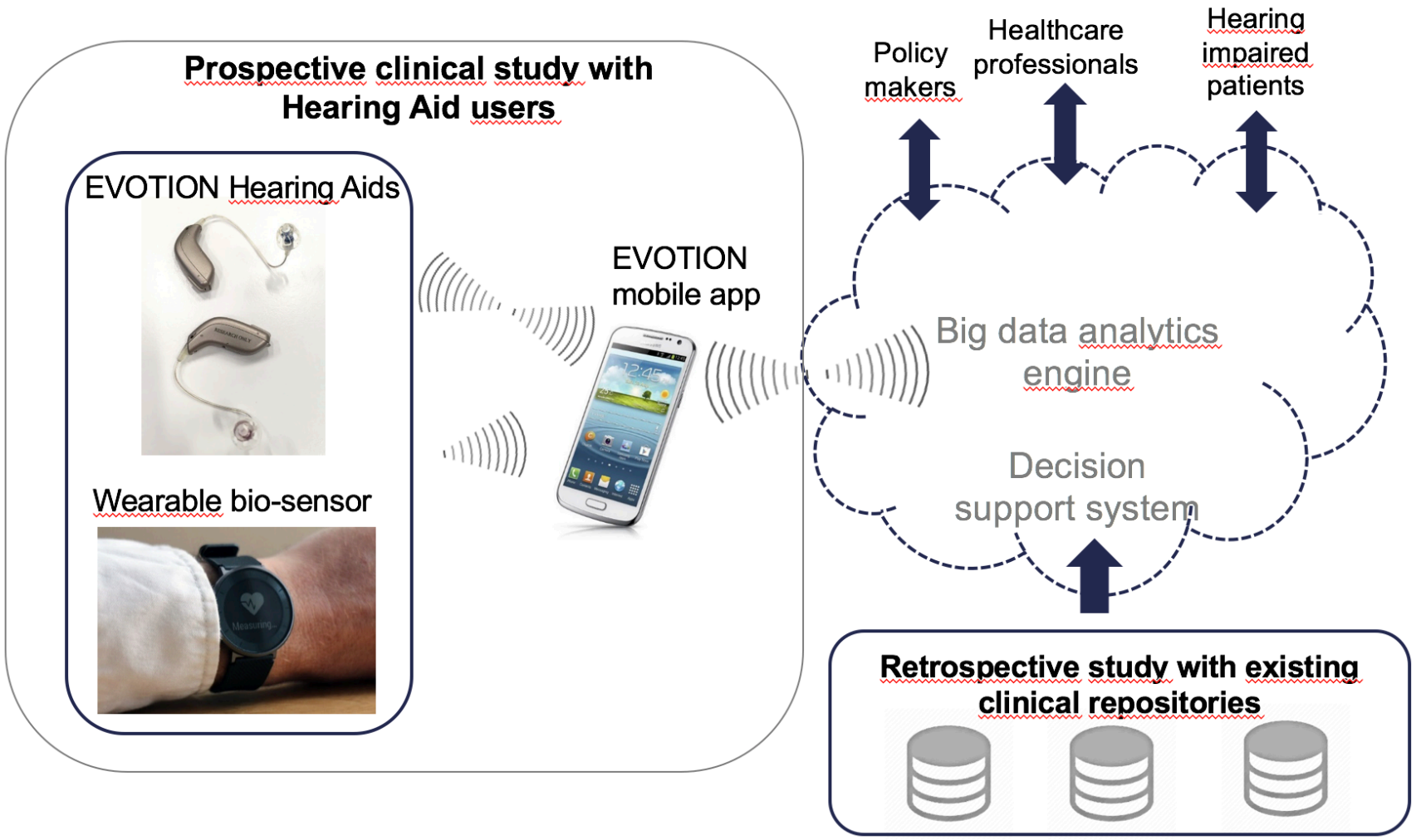
Rationale for public health policy decisions

- Hearing loss is a huge and increasing problem in the world, including in high income countries.
- Public health methods are needed to address hearing loss on a large scale within countries.
- Good public health policy decisions are essential in order to develop and implement effective and cost-effective programmes.

CURRENT APPROACH TO POLICY MAKING



THE EVOTION APPROACH TO POLICY MAKING



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Public Health Policy Decision Making Models – (1) Language Objectives

To develop a high level computer language for specification of evidence-based Public Health Policy Decision Making Models

- based on big data analytics
- executable by the EVOTION platform.

The language would enable specification of:

- overall **goal** and **objectives** for the policy
- **possible interventions** to achieve the goals/objectives
- **evidence** needed for the interventions
- **validation** of the **evidence**
- **stakeholders** who consider evidence and decide on interventions
- **criteria** for making decisions on the basis of the evidence

Public Health Policy Decision Making Models –

(2) Examples of Goals and Objectives

Goal 1: Improve Hearing Aid usage

Objective 1: Average HA usage to be at least 50% of maximum time.

Objective 2: Average HA usage to increase by at least 30% of maximum time

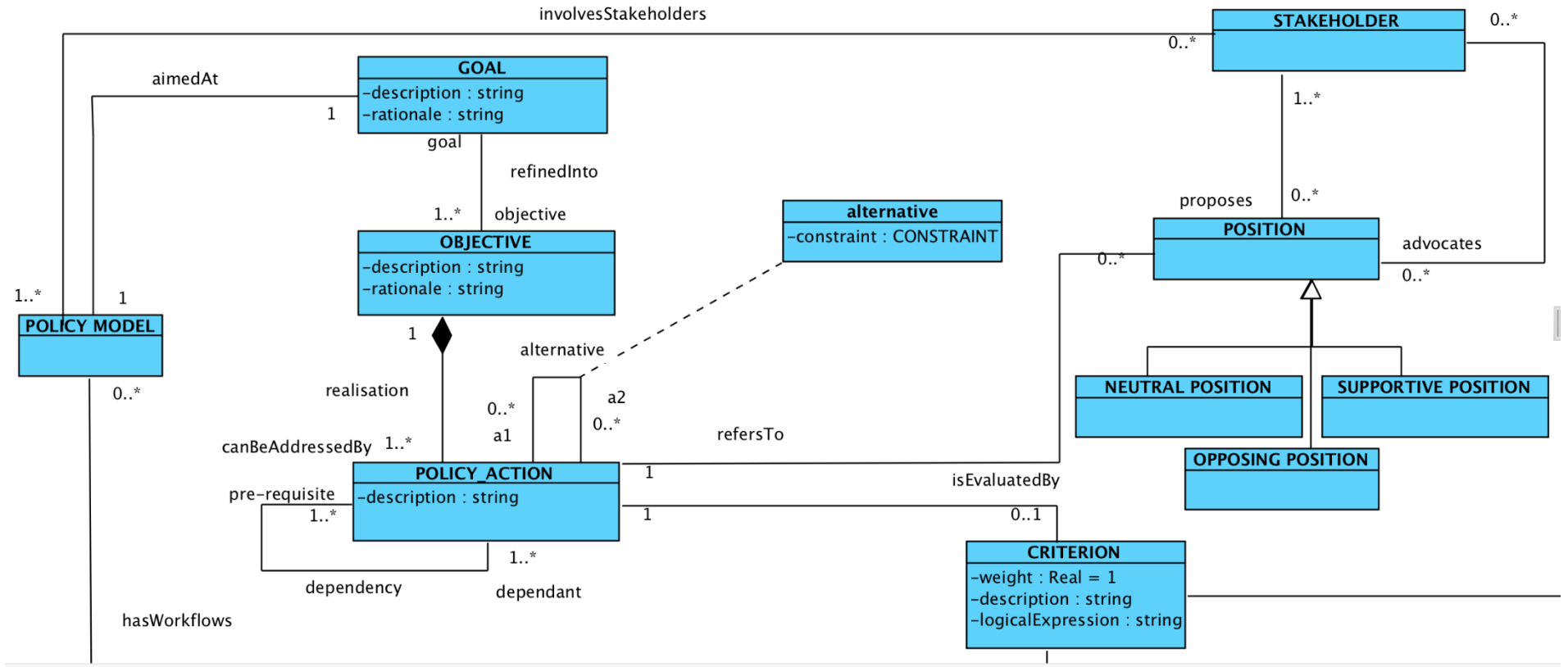
Objective 3: Satisfaction of HA users to increase by at least 20% of max value over 3 years

Goal 2: Stop Cognitive Decline

Objective 1: EVOTION cognitive tests to reach at least 80% of maximum.

Objective 2: Cognitive decline is stopped or made slower.

Module 1: Policy Making Process



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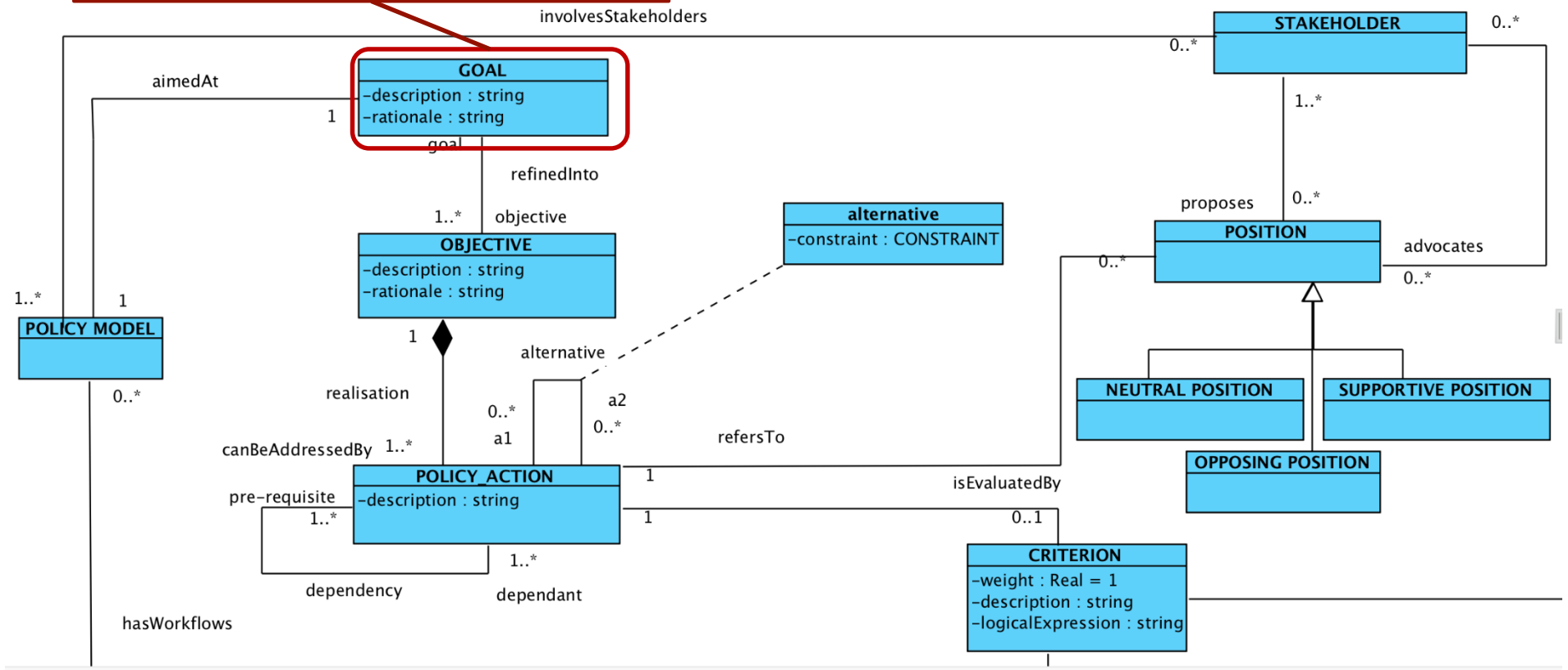
Module 1: Policy Making Process

What the policy is aimed at addressing (purpose) and why (rationale)



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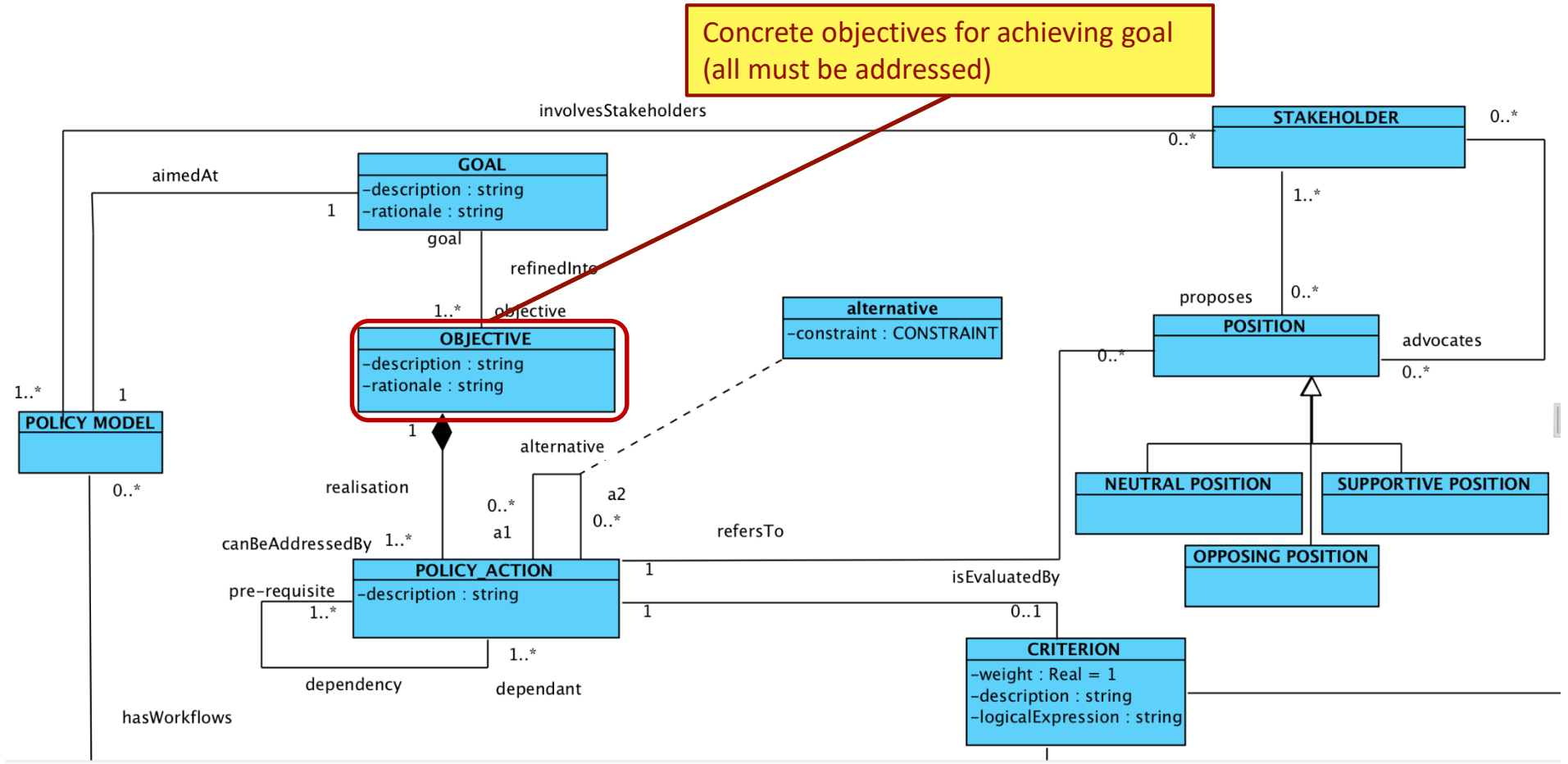
Module 1: Policy Making Process



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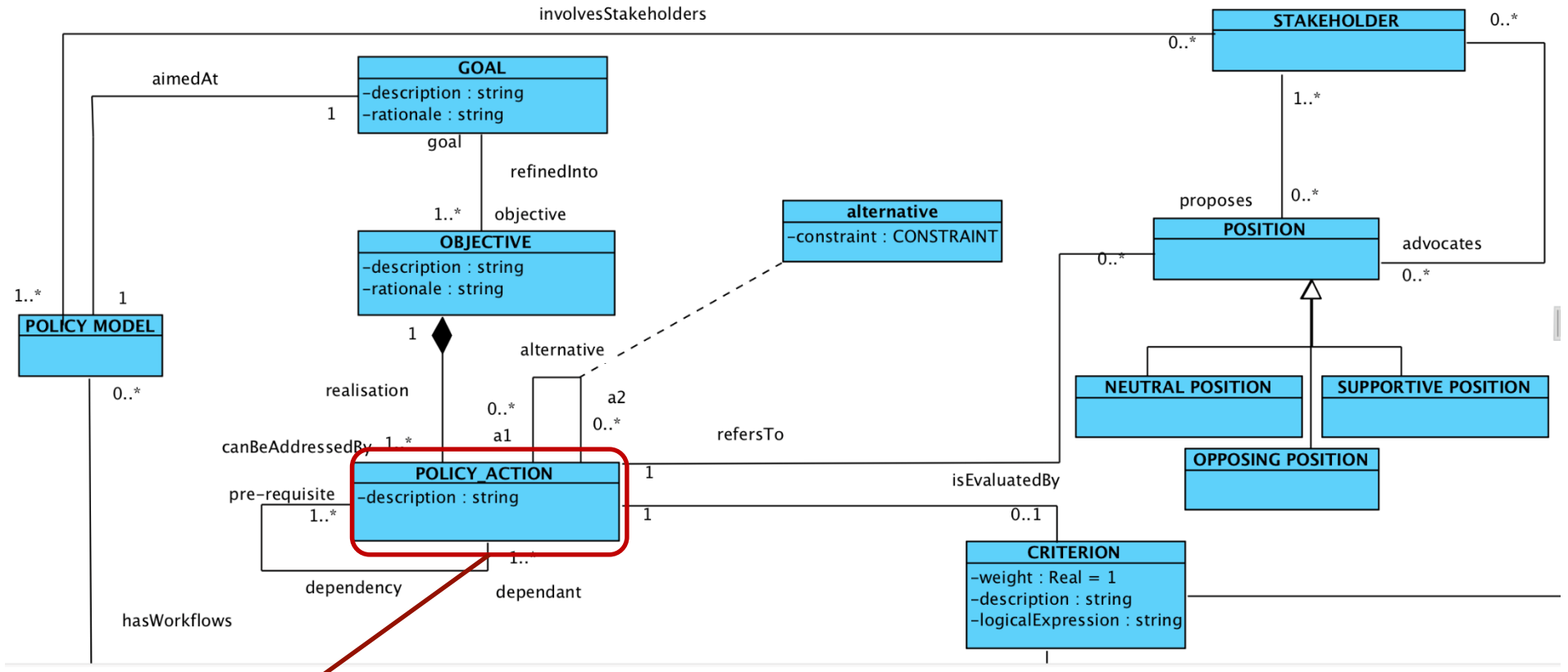
Module 1: Policy Making Process



Possible actions that may be taken to realise an objective; actions may be compatible or mutually disjoint (alternatives)

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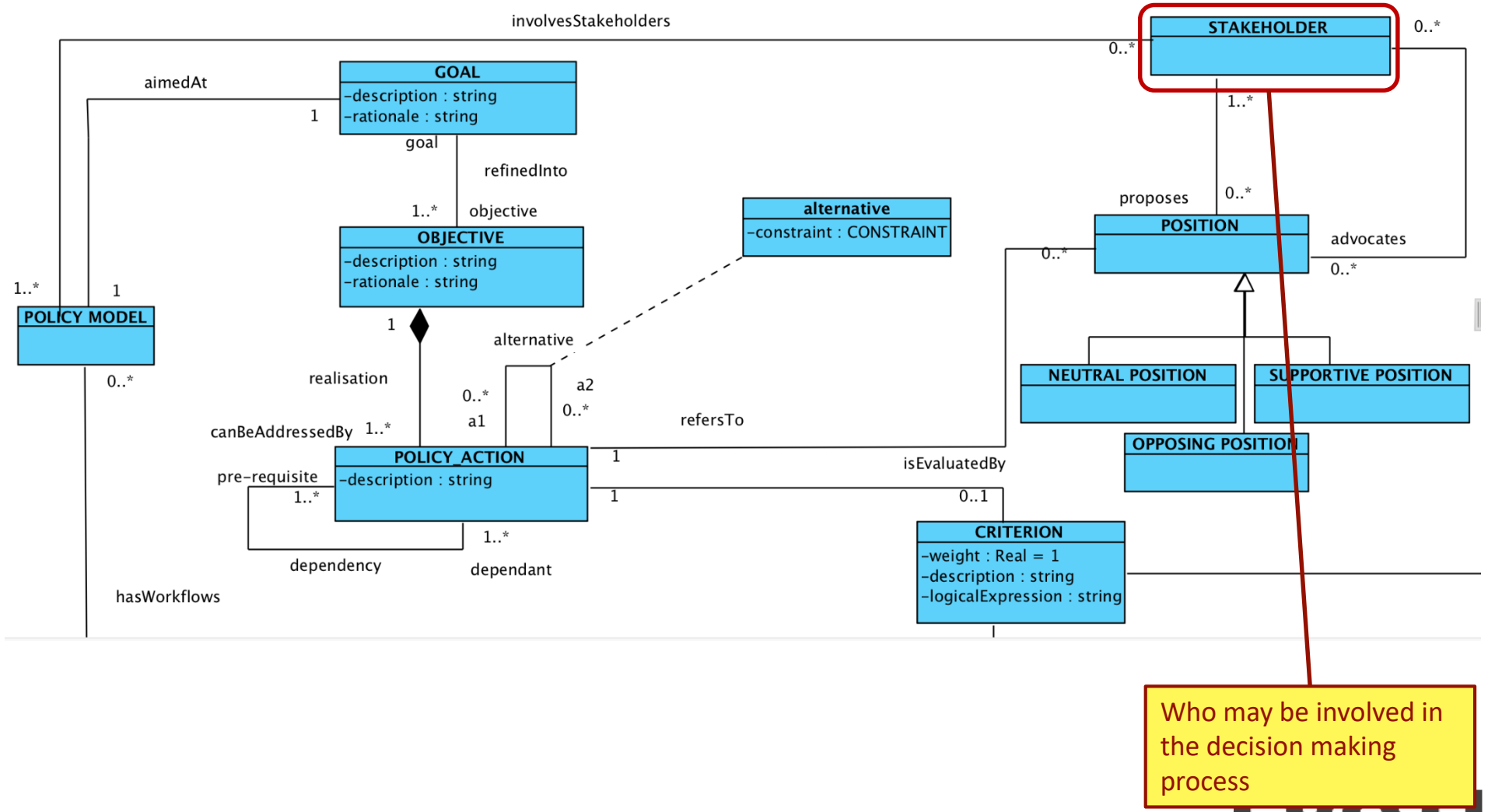

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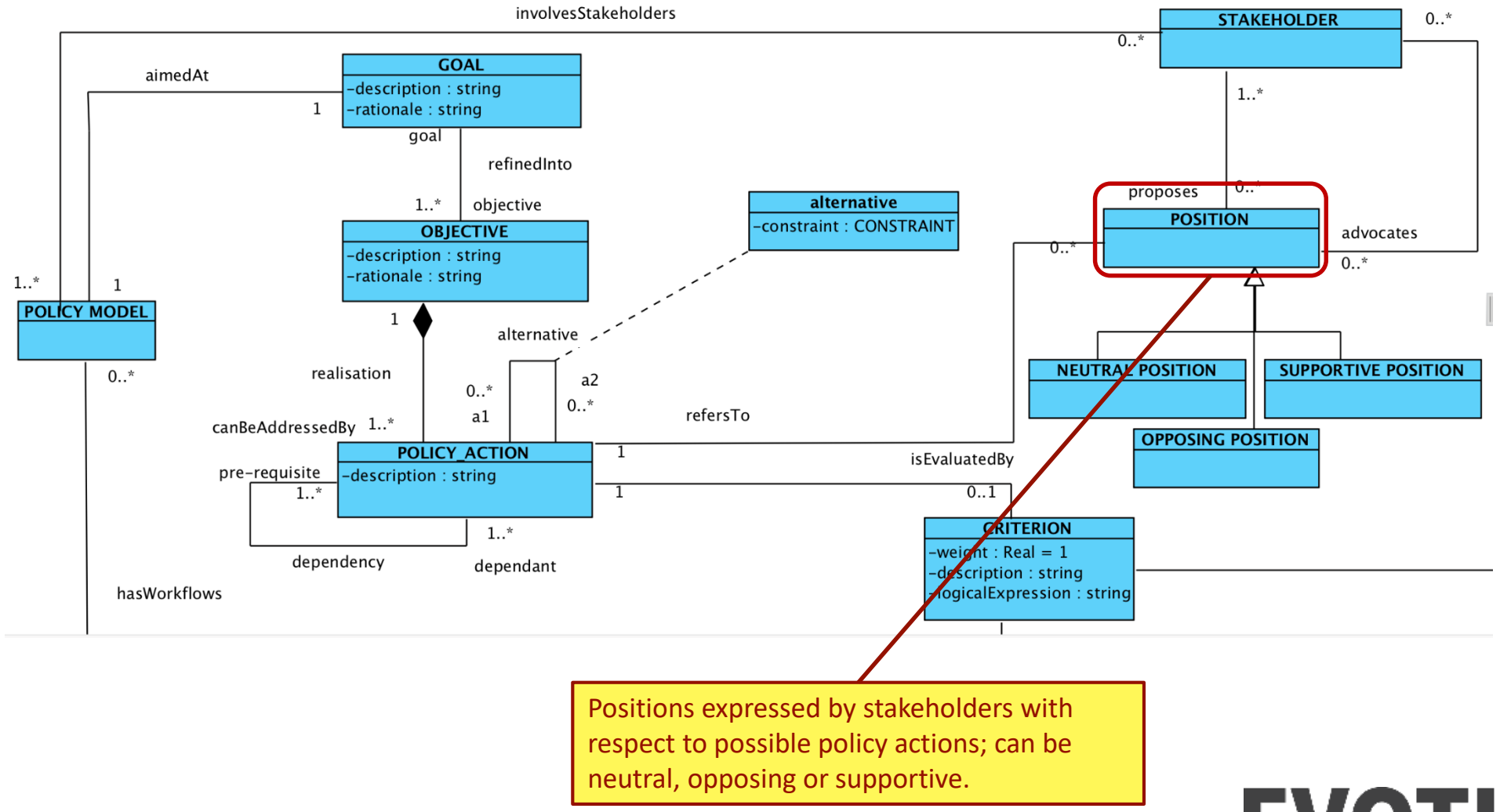

Positions expressed by stakeholders with respect to possible policy actions; can be neutral, opposing or supportive.

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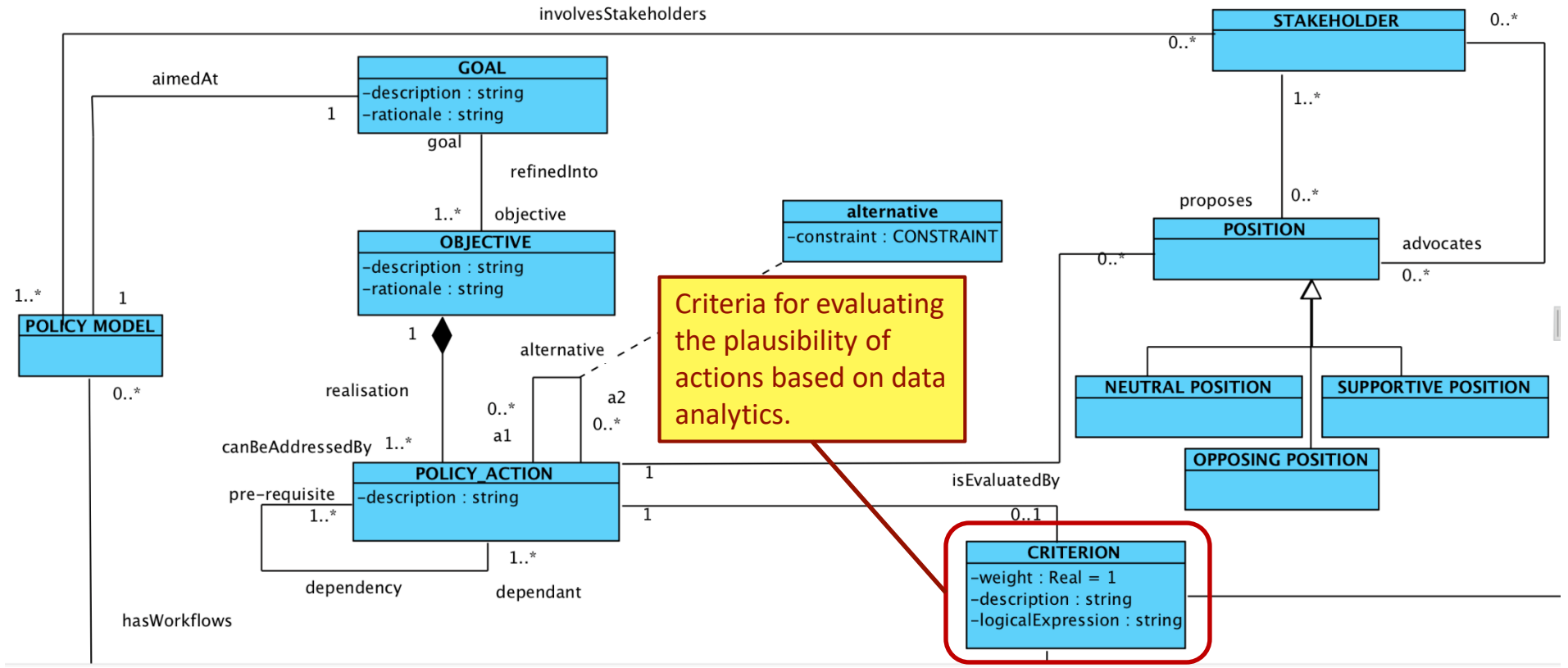
Module 1: Policy Making Process



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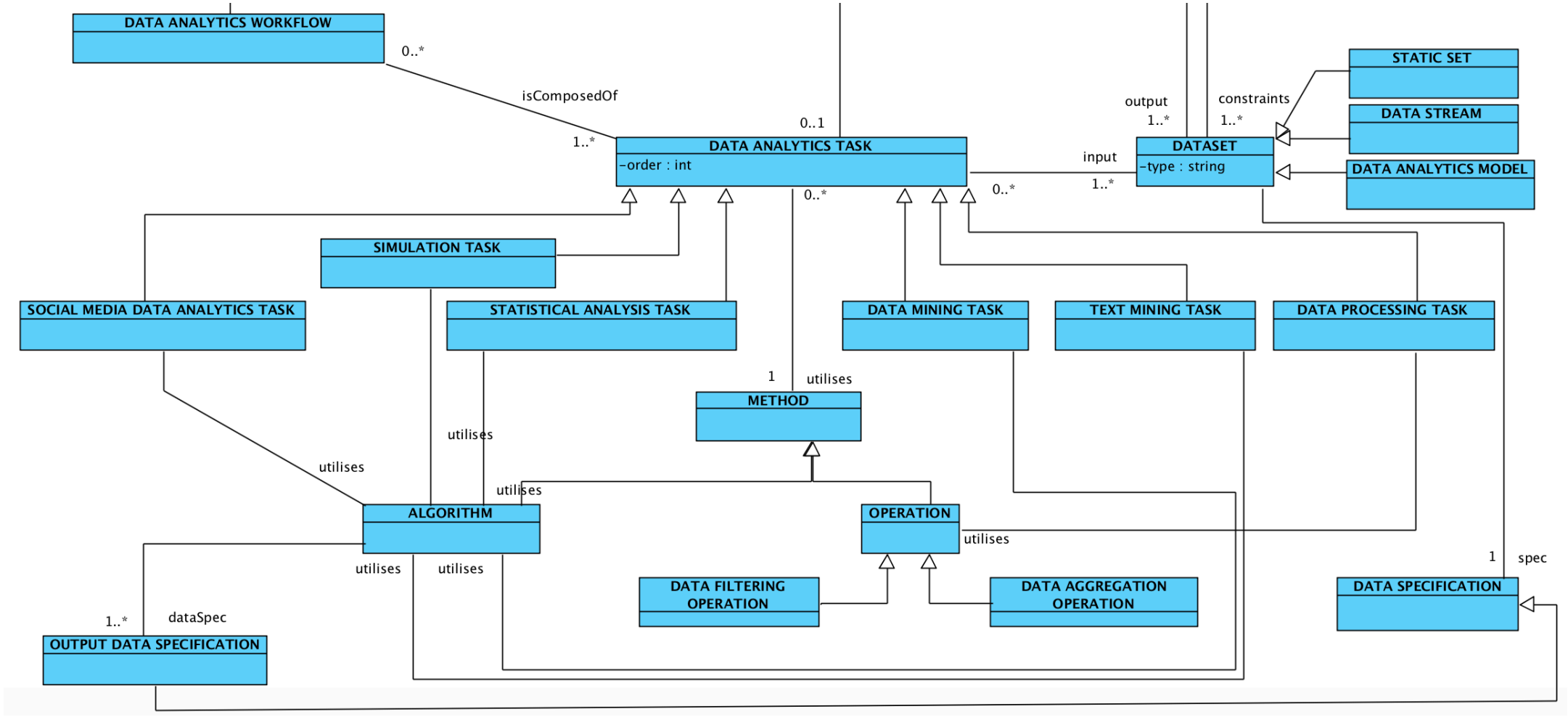
Module 2: Data Analytics and Evidence



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Public Health Policy Decision Making Models –

(2) Examples of Actions for Models

Goal 1: Improve Hearing Aid usage

- Enhance clinical practice to monitor influences on HA use, and user reported benefit
- Improve HA users awareness and motivation to increase their HA use

Goal 2: Stop Cognitive Decline

(targeted at HA users with low or deteriorating scores on cognitive tests)

- Referrals for clinician assessment and patient recommendations for improving cognitive skills
- Social campaigns to increase patient awareness and inform them of remedies
- Provision of games apps to improve cognitive skills; app links sent to mobiles for downloading

Big Data Analytics-Text Mining interaction and decision making for PHP

(S) Superset (BDA+TM) clusters

e.g. HA usage is affected by {education, cognitive scores, outdoor activities, gender, satisfaction}

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Reasoning for applying Text Mining to Big Data Analytics (BDA) for Decision Making

- Currently, almost no work on PHP modelling for HL.
- Literature review by text mining may indicate where to look (most significant factors)
- BDA use this info and other factors to build an updated situation.
- Decision Support System (DSS) uses BDA computations on top of text-mining to suggest PHP decisions.
- THUS - BDA should be part of all policy making procedures

Text Mining Component

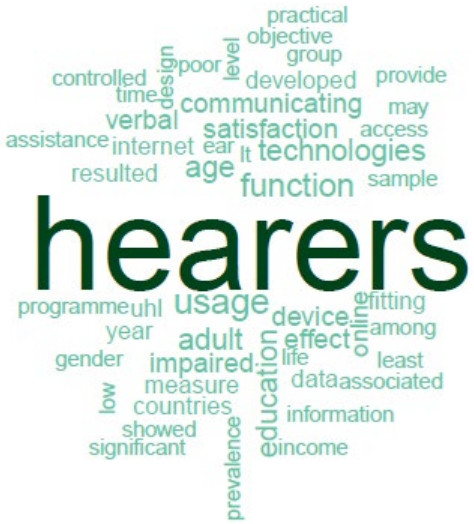
From previous example (PHPDM1), a trifold input may be given to the TM component (part of the DSS) for:

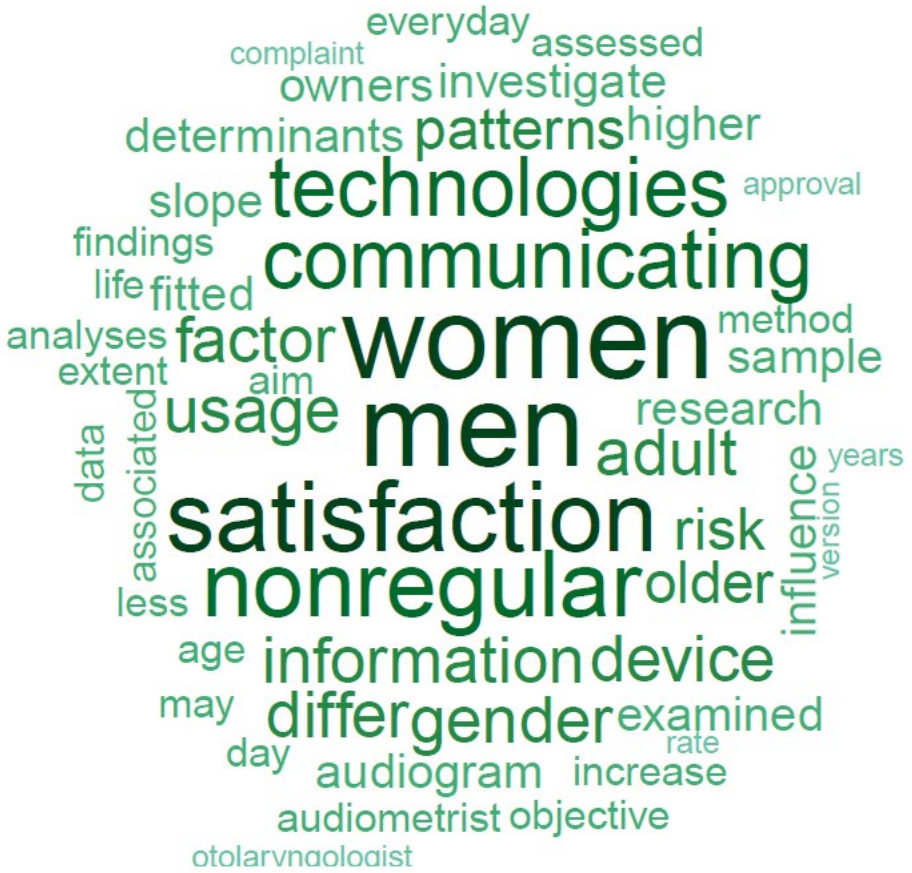
- hearing aid usage AND education
- hearing aid usage AND activities
- hearing aid usage AND cognitive function

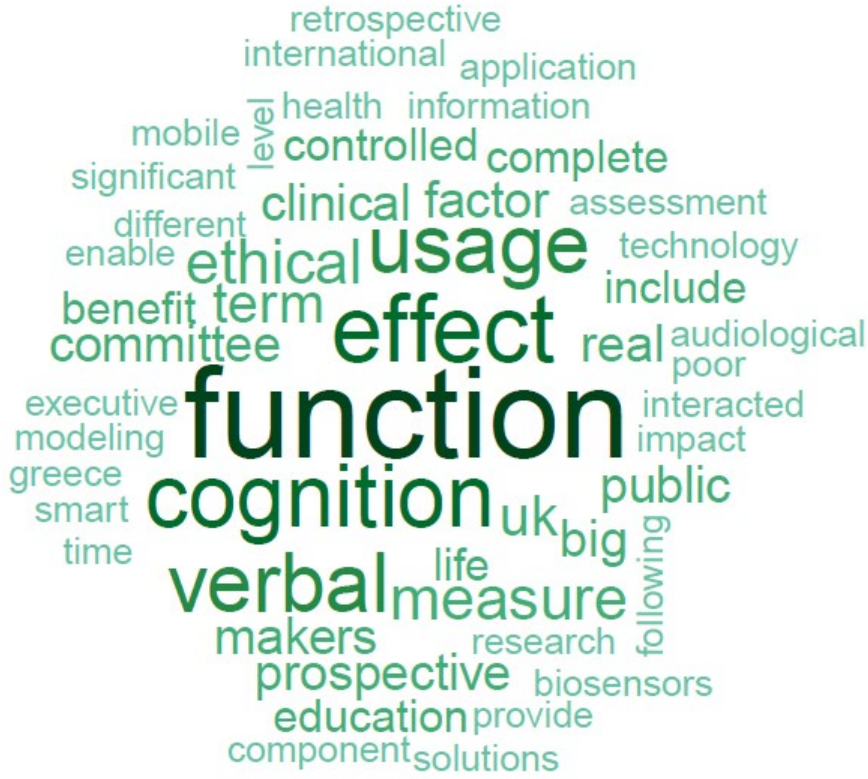
with STOPWORD-LISTS updated based on clinicians' and PHP actors' input

Text Mining Wordclouds

The Text Mining Component produces the following results shown in wordcloud format (extracted to a pdf report and an json file)







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Text Mining Wordclouds

The visual representation of the TM analysis results, allows a Public Health Policy Makers to identify literature-related parameters, thus enabling them to modify (if they select so) the parameters of the model.

Key-elements identified

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Key EVOTION progress so far and next step

Developed these platform components:

-collection of USAGE DATA from HAs & health records from clinical databases;

-BIG DATA ANALYTICS ENGINE to analyze the collected data;

-public health POLICY SPECIFICATION LANGUAGE for modeling public hearing health policies;

-DECISION SUPPORT SYSTEM to support public hearing health policy-making

-custom WEB INTERFACE for clinical partners to connect to the above platform.

Set up – encryption/pseudo-identifiers to preserve privacy and security.

Started -- collection of real time usage data.

Next step -- Custom web interface for policy partners to connect to the platform

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Future use of health data for policies

- Future health care will connect data from end-users, Health Care Providers, and policy makers to monitor, revise, and formulate new health policies.

- By end of project, the EVOTION platform will enable public health policy makers to analyze data from many end-users, compare with literature, and develop and implement public health policies.

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In summary, EVOTION aims to

- build the evidence base for
  - the formulation of public health policies related to the prevention, early diagnosis, long-term treatment and rehabilitation of HL,
  - the detection and prevention of cognitive decline and the socioeconomic inclusion of individuals with HL.
- enable and support a more holistic management of HL at the population level.

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Thank You for listening

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