# Knowledge Base Book
## BMI Demo

| | |
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| File system: | |
| Template version: | 1.0 |

**Approved & Released:**

| Function | Name | Date (yyyy-mm-dd) | Signature |
|---|---|---|---|
| Project Manager | | | |
| Product Manager | | | |

# Table of Contents

# 1. About this Document

This document contains the full version of the developed knowledge base generated automatically from the binary knowledge base file. It specifies all parts of the knowledge relevant for the reasoning process.

The indented use of this document is primarily targeted to the review process of the knowledge base, i.e., manually reading, discussing, and verifying the developed knowledge. Additionally, the document can be used as a reference for deployed knowledge bases and for presentation and demonstration purposes.

## 1.1 Targeted users

This document is intended to be used during an expert review of the knowledge base or as an independent documentation media of the developed knowledge base. Thus, targeted users are domain specialists, knowledge engineers, project mangers, and developers.

## 1.2 Structure of the Document

The document is logically partitioned into distinct parts of the knowledge base:

- **Terminology:** Explaining all entities of the knowledge base, that are used as facts for the reasoning process. These include inputs to the systems, derived outputs, and intermediate derivations used for internal computations.
- **Derivation Knowledge:** The chapter references all knowledge elements included in the knowledge base that are used during the reasoning process. It presents rules for calculating intermediate derivations and final solutions, but also graphical models representing the guideline knowledge.
- **Unconsidered Knowledge:** In this chapter all remaining parts of the knowledge base are printed, that were not considered by an explicit section before. This chapter ensures that all entities of the knowledge base are printed in the document.

Entities of the terminology chapter are used in context in the following chapters, so this chapter is used as a defining reference.

## 1.3 Intended Use for Review

When using this document for review purposes it is recommended to print the document on paper. That way, handwritten notes and comments can be placed at the outer margins of each page, where extra space was left. For specific remarks on a single entity it is recommend to use the KEID of the knowledge element (knowledge element ID). The KEID is attached to each knowledge element starting with a character and is followed by a running number. KEIDs for rules start with "R" (e.g., R1,...,R210); nodes and edges of DiaFlux models have IDs starting with "N" and "E", respectively (e.g., N1, E42). Working with the KEID you can leave a precise link to the discussed part for others.

**Important Note:** The KEID (knowledge element ID) is only unique within this document. When using the KEID outside this document as a reference you have to attach the *document ID* and the *revision* of the document (see title page). In this document, the *document ID* and the *revision* is printed in the footer of every page. Alternatively, the *knowledge base creation date* and the *knowledge base book creation date* can be used (both printed on the title page).

Terminology objects, such as questions and solutions, are simply referenced by their name. It is important to notice, that a terminology object can be referenced by its name, since the

name has to be unique within the knowledge base. In consequence, the same name must not be used for a solution and for a question, for instance.

## 1.4 Abbreviations and Definitions

In the following, the important terms and concepts used throughout this document are explained.

| Abbr./Def. | Description |
|---|---|
| Abstraction | An abstraction is a special kind of question, for which values are not assigned by an external source (e.g., a user or a frame machine), but for which the values are derived by so-called abstraction knowledge. In d3web, values of abstractions can be derived by rules or DiaFlux models. Abstractions are commonly used to infer a higher-valued fact from a set of existing values; in turn derived abstractions are reused for further derivations. For instance, the value of the abstraction "body-mass-index" is inferred by values of the questions "height" and "weight" (sometimes also "sex"). |
| Abstraction tables | Many abstraction rules (see Abstraction) are defined as conjunctions of other findings. These conjunctions are printed in tables, where each line of an abstraction table corresponds to one rule. Each column of the rule (except the last column) corresponds to one conjunctive part of the rule condition, whereas the last column contains the action of the abstraction rule. |
| d3web | d3web is a Java implementation of problem-solving methods for diagnosis tasks. It provides an API, so that applications can use d3web as an embedded application. Besides the problem-solving methods, d3web also includes many additional APIs, e.g., for the persistence of knowledge bases (loading/saving). |
| Date question | A date value is assigned to the specific question, where only one date value can be assigned at the same time. The date value includes: Year, month, day, hours, minutes, seconds. |
| DiaFlux | DiaFlux is a knowledge representation language, that allows for the graphical definition of interview and derivation flows. That way, the interview logic of the system, as well as the derivation of findings and solutions can be modeled using DiaFlux. |
| Fact | A Fact is the actual assignment of a value to a question or a solution. Often, a fact is called a finding. |
| Finding | See "Fact". |
| Input | See "Question" |
| KEID (Knowledge Element ID) | A unique identifier of a single entity of the knowledge base, e.g., a question, a solution, or a rule. Please note, that KEIDs are only unique with respect to the *knowledge base book creation date* of the document. Outside this document, it is recommended to attach the *document ID* and the *revision* of the document to the KEID. |
| KBBCD (Knowledge Base Book Creation Date) | This date references to the creation of the knowledge base book, i.e., the time when the knowledge base book was generated from the binary knowledge base. |

| Abbr./Def. | Description |
|---|---|
| KBCD (Knowledge Base Creation Date) | This date references to the creation of the binary d3web file containing the knowledge base. Usually, the value of KBCD is set when exporting the knowledge base from KnowWE to a d3web file. |
| KnowWE | KnowWE (Knowledge Wiki Environment), as a development environment for building knowledge bases, includes d3web and offers various editors to develop d3web knowledge bases. KnowWE runs as a JSP-server application on all systems with Java 6 or greater installed. |
| MC question (multiple-choice) | A symbolic value range is assigned to the specific question, where only one or more values of the range can be assigned at the same time. |
| Num question (numeric) | A numerical value range is assigned to the specific question, where only one numeric value can be assigned at the same time. The numeric value is represented as floating point data (Implementers note: Java instance of Double). It is possible to define a range of valid values for a numeric question, as well as a unit information (a String). |
| OC question (one-choice) | A symbolic value range is assigned to the specific question, where only one value out of the range can be assigned at the same time. |
| Question | The terminology of d3web distinguishes questions and solutions. Facts, collected from the user and derived for internal reasoning, are represented as questions. Sometimes, questions are also used to represent computed outputs of the system, for instance, changed parameter settings for a machine. A *type* is always assigned to a question. Possible types are one-choice (OC), multiple-choice (MC), numeric (num), text, and date. Please note, that over time multiple values can be assigned to a question, where each value has a distinct time stamp. |
| Questionnaire | A collection of questions can be grouped by a questionnaire. Usually, questionnaires pack coherent questions into one bag and thus help to structure the set of available questions. |
| Solution | The terminology of d3web distinguishes questions and solutions. Solutions represent possible outputs of the system. Exactly one value of the following is assigned to a solution at the same time: ESTABLISHED (clearly derived), SUGGESTED (possible but not clear), UNCLEAR (default), and EXCLUDED (clearly not a possible output). |
| Text question | An arbitrary text string can assigned to the specific question, where only one string value can be assigned at the same time. |

# 2. Terminology

## 2.1 Inputs

### 2.1.1 Input Hierarchy

Q000

- Q1: Startquestionaire

### 2.1.2 Detailed Structure

The names of the sections correspond to the names of the questionnaires, where the particular questions are located. Each questionnaire table prints all included questions.

**Note:** Abstractions are marked with an appended 'a' in the terminology tables. Terminology objects with additional properties are marked with an appended 'p'. The additional properties can be found at the end of the current table.

#### 2.1.2.1 Startquestionaire

| Question | Type | Unit | Range |
|---|---|---|---|
| Height | Num | m | 0.1 - 3 |
| Weight | Num | kg | 1 - 300 |
| bmi [a] | Num | n/a | n/a |

#### 2.1.2.2 Questions without Questionnaires

| Question | Type | Unit | Range |
|---|---|---|---|
| now [p] | Date | n/a | n/a |
| start [p] | Date | n/a | n/a |

##### Additional Properties

now: history = false

start: history = false

# 2.2 Messages

## 2.2.1 Messages Hierarchy

P000

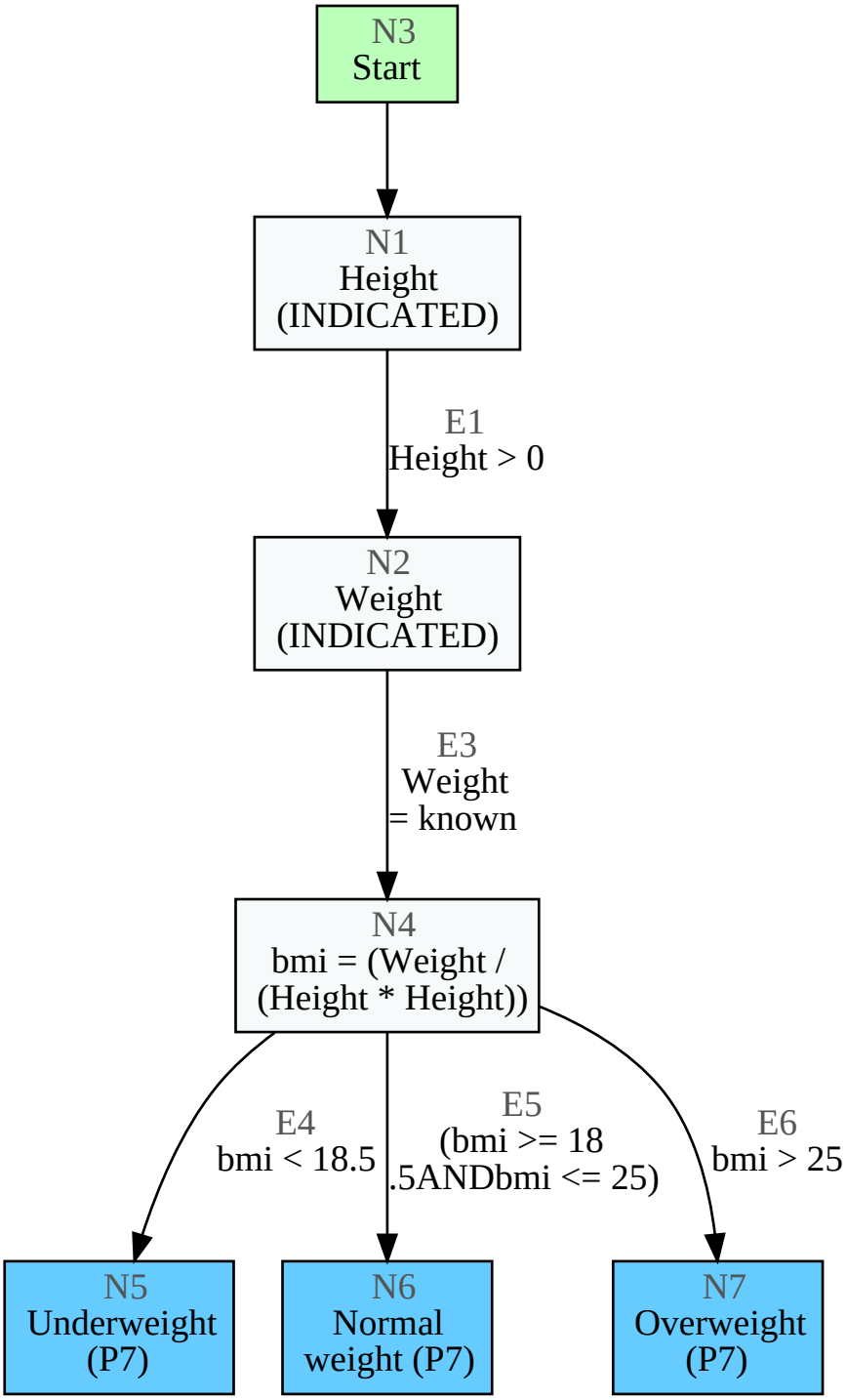
- P1: Weight Assessment
  - P2: Underweight
  - P3: Normal weight
  - P4: Overweight
  - P5: Heavy overweight

# 3. Derivation Knowledge

## 3.1 DiaFlux Models

1. Main (autostart)

### 3.1.1 Main (autostart)



# 4. Knowledge Base Configuration

The following modules of d3web and KnowWE were used to develop the knowledge base presented in this document:

- C1: d3web-CostBenefit
- C2: d3web-DiaFlux
- C3: d3web-Plugin-TimeDB
- C4: d3web-XCL

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