KDI
From Competence Queries to ER (a case study)

Fausto Giunchiglia and Mattia Fumagallli

University of Trento

Modeling recipes for online search

- by Usashi Chatterjee, Fausto Giunchiglia, Devika P. Madalli,Vincenzo Maltese.

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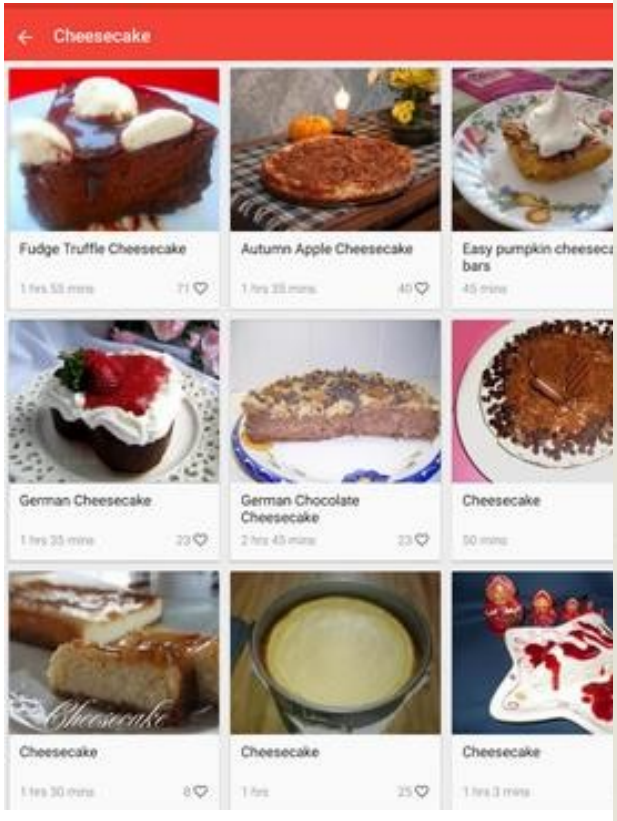
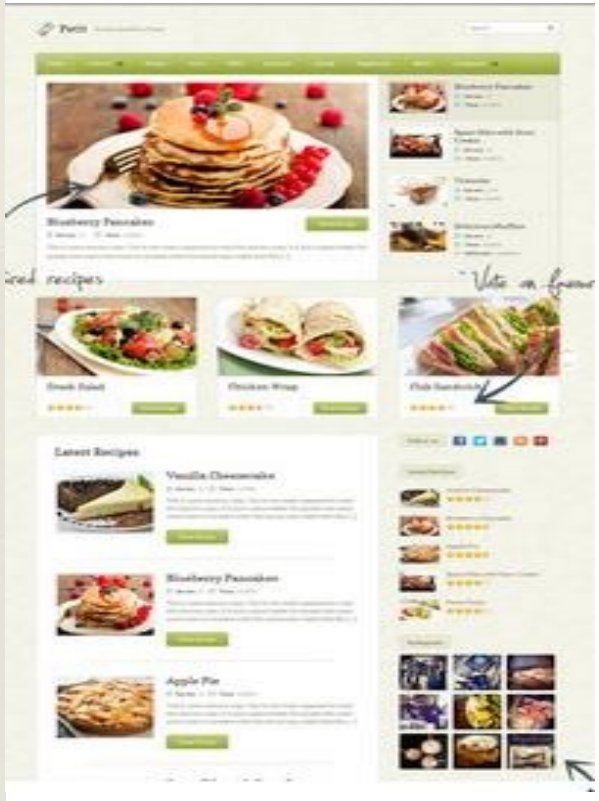
Heterogeneity in Recipes Websites





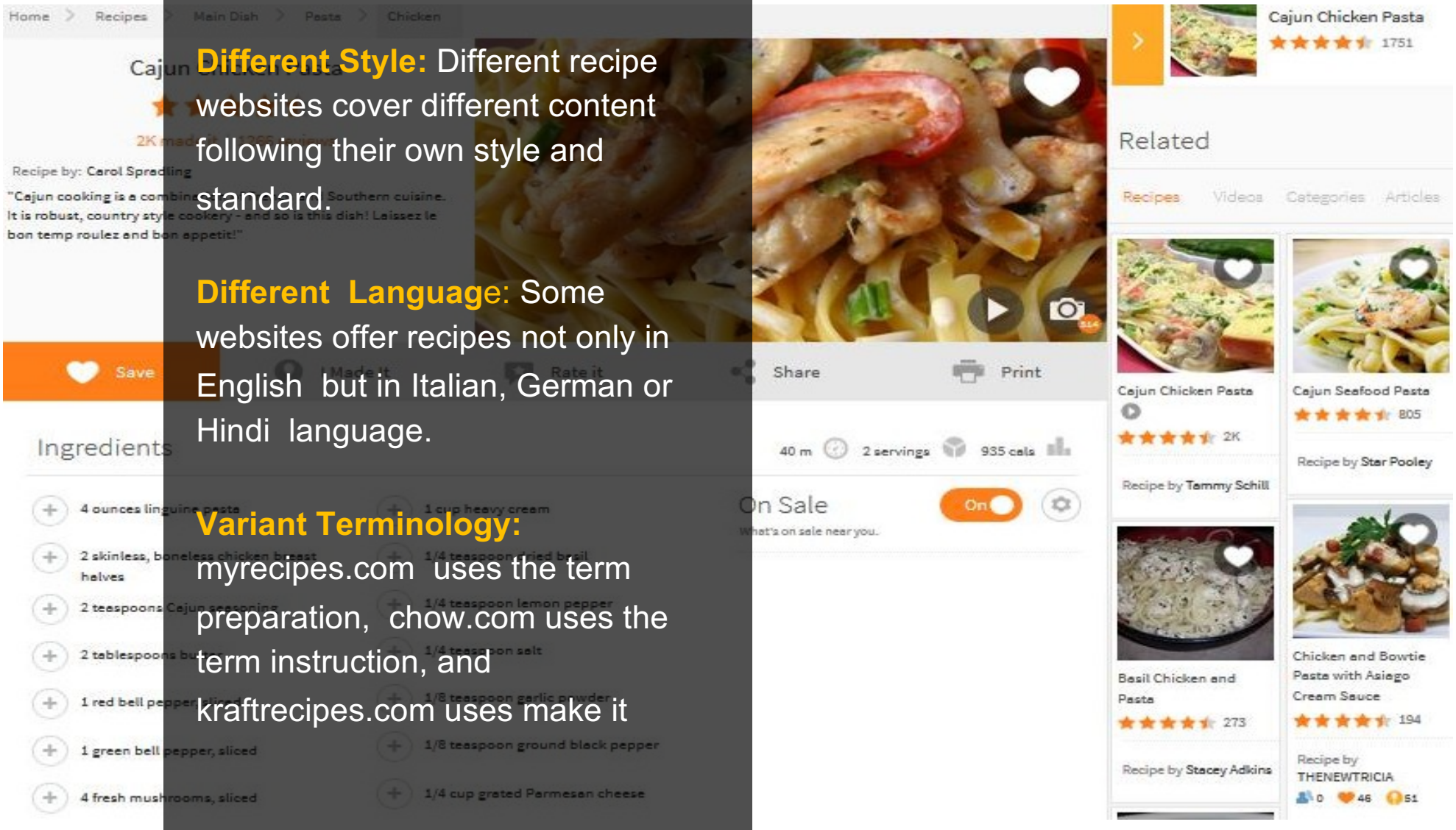
… informal, heterogenous, terminology, different schema…

Heterogeneity in Recipes Websites

Different Style: Different recipe websites cover different content following their own style and standard.

Different Language: Some websites offer recipes not only in English but in Italian, German or Hindi language.

Variant Terminology: myrecipes.com uses the term preparation, chow.com uses the term instruction, and kraftrecipes.com uses make it

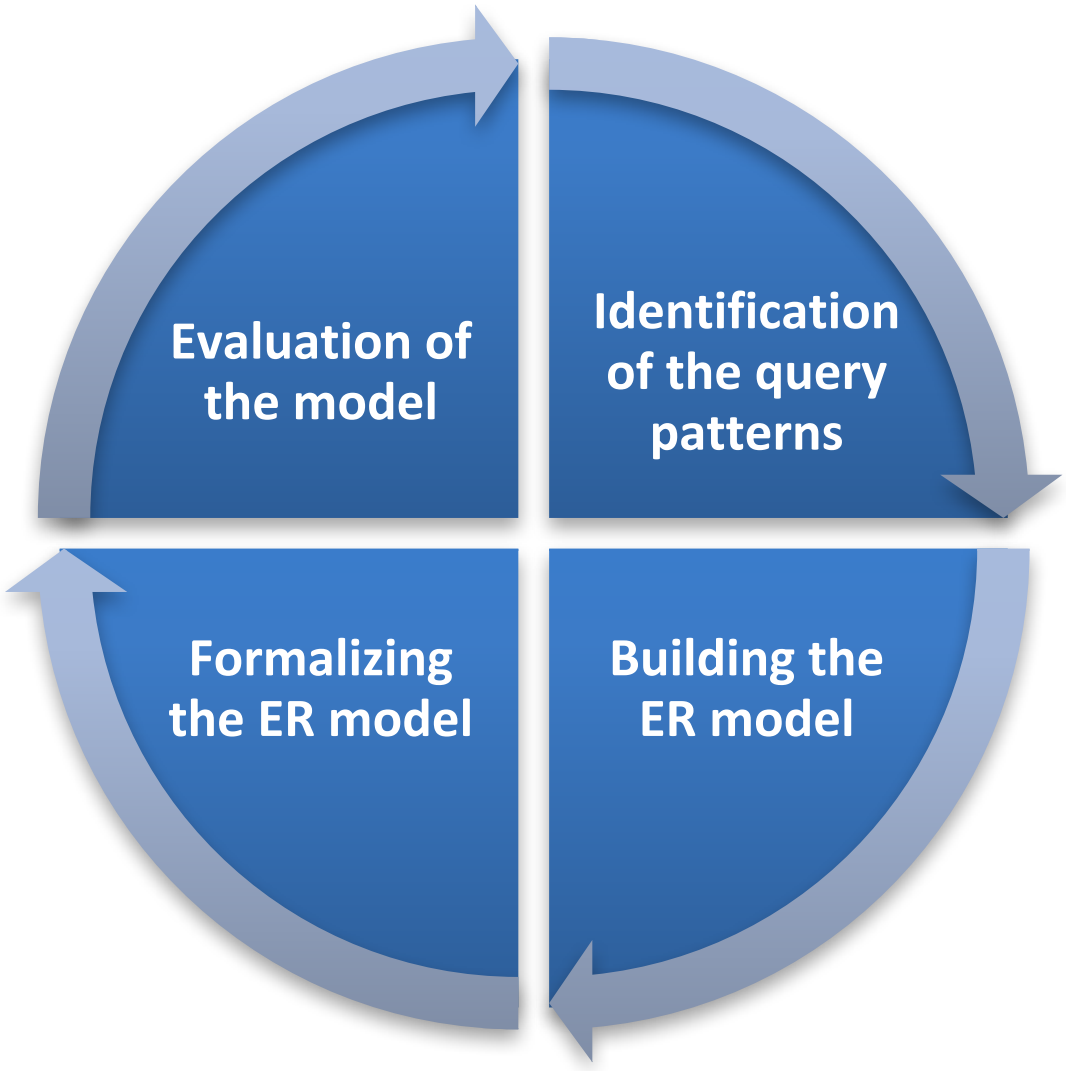


The proposed solution

1. Propose a formalized entity-relationship(ER) model.

2. Modelling methodology is based on competency questions.

The proposed solution – A Methodology



Step 1: Identification of the query patterns

- Competency queries are collected
  - *Give me a recipe to prepare roasted turkey for Thanksgiving celebration*
- The queries are grouped in distinct scenarios
  - *Give me a recipe to prepare roasted turkey for Thanksgiving celebration.*
  - *Give me a recipe of halal food prepared for Iftar party.*
  - *Give me breakfast recipes.*

Query Analysis

- Competency Question
  - *Give me a recipe to prepare roasted turkey for Thanksgiving celebration*
- Competency Question Analysis
  - Give me all Recipe for Dish X AND Event Y WHERE X.name= “roasted turkey” AND Y.name = “Thanksgiving” AND recipeIngredient = Z AND Z.type = “turkey” AND cookingMethod = “roasting”
- Identification Etypes and Properties
  - *Etypes: RECIPE, DISH, EVENT*
  - *Property: Dish.name, Event.name, recipeIngredient.type, Recipe.cookingMethod*

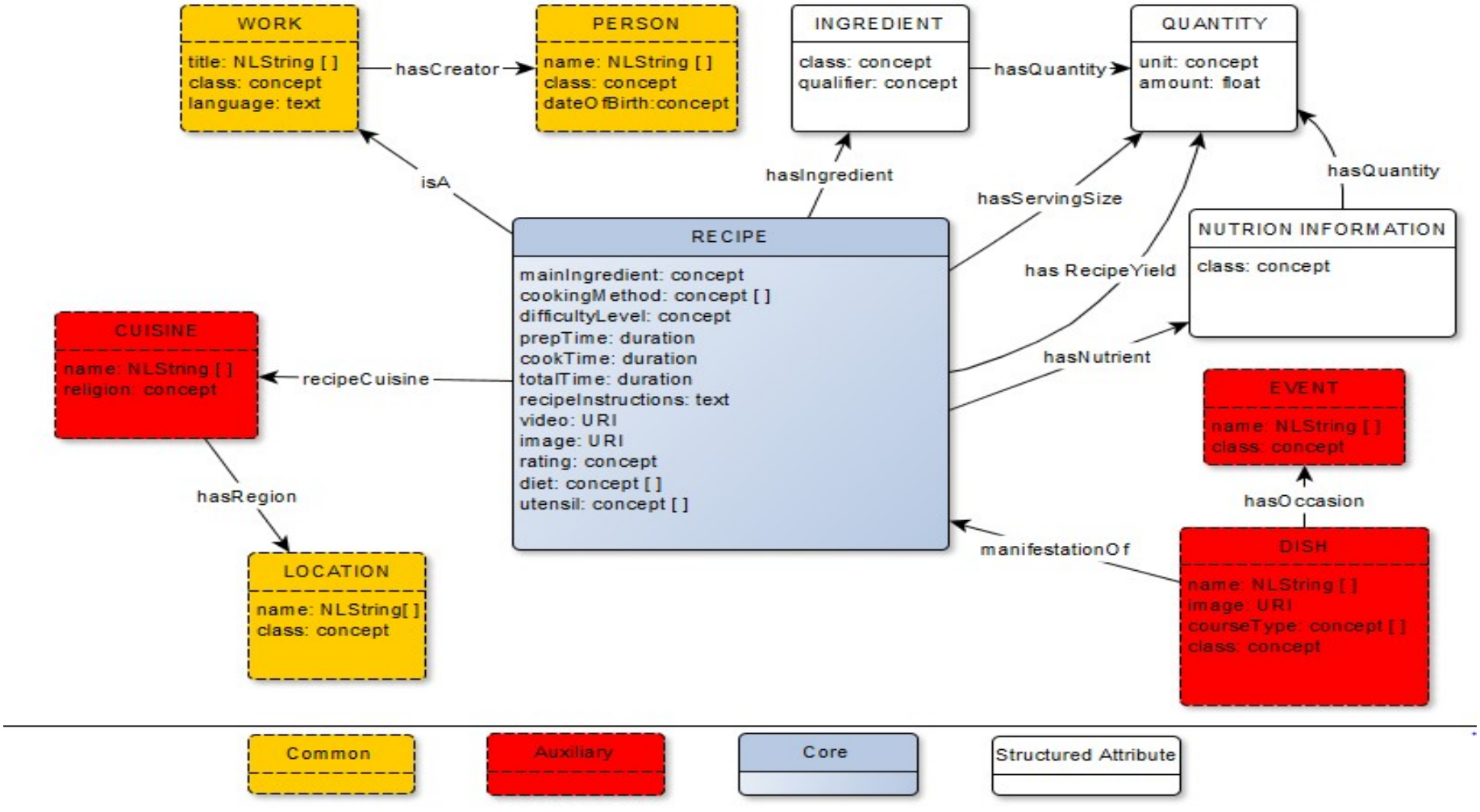
General Query Patterns

- Identification of the general query pattern
  - *Give me all **recipes R** which belong to **cuisine C** to prepare **dish D** appropriate for **event E***

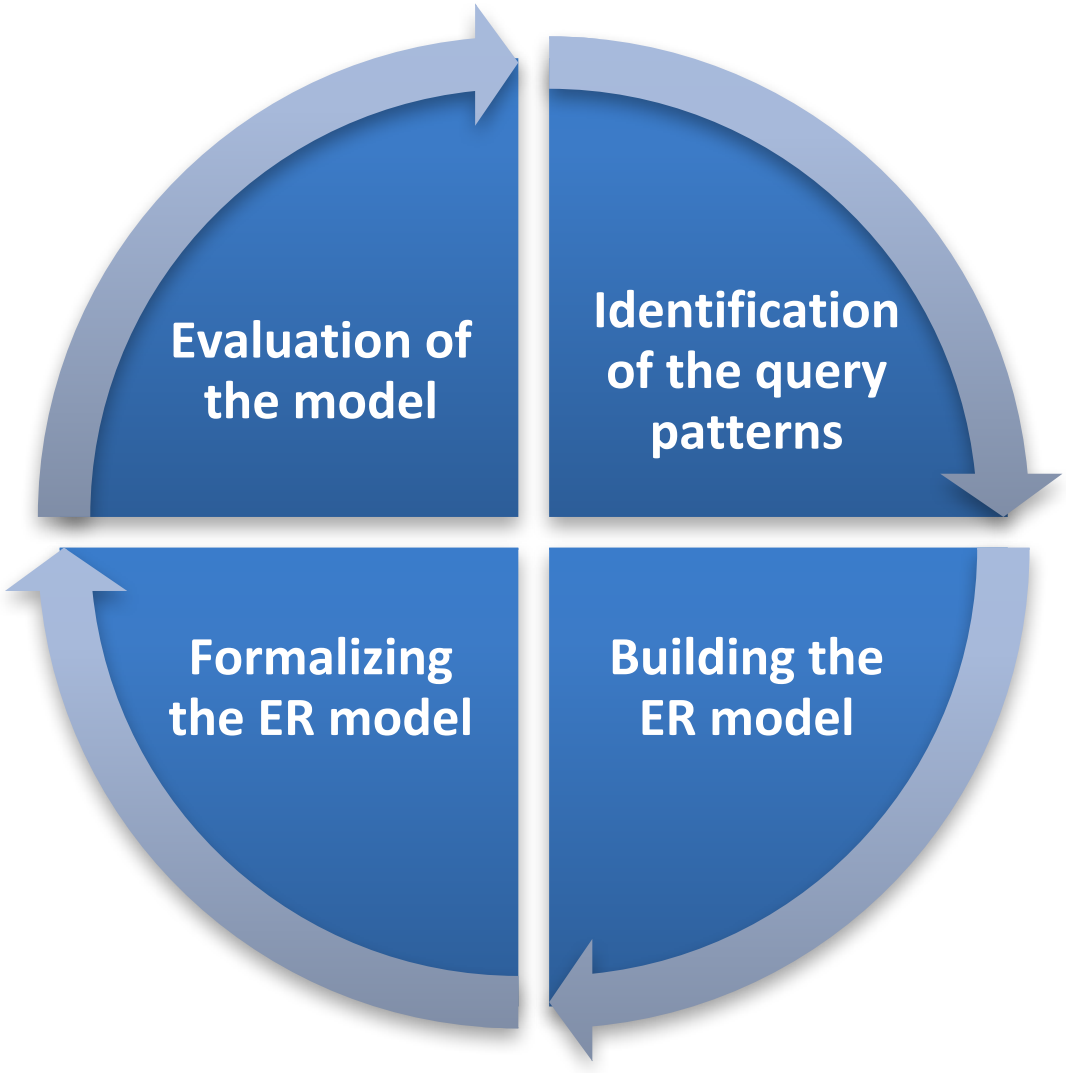
Step 2: Building the recipe model

- Common entity types
  - *Those that can be (re-)used across domains*
- Core entity types
  - *Are those returned by the queries*
- Auxiliary entity types
  - *are those that in the general pattern determine how to filter results*

Step 2: Building the recipe model

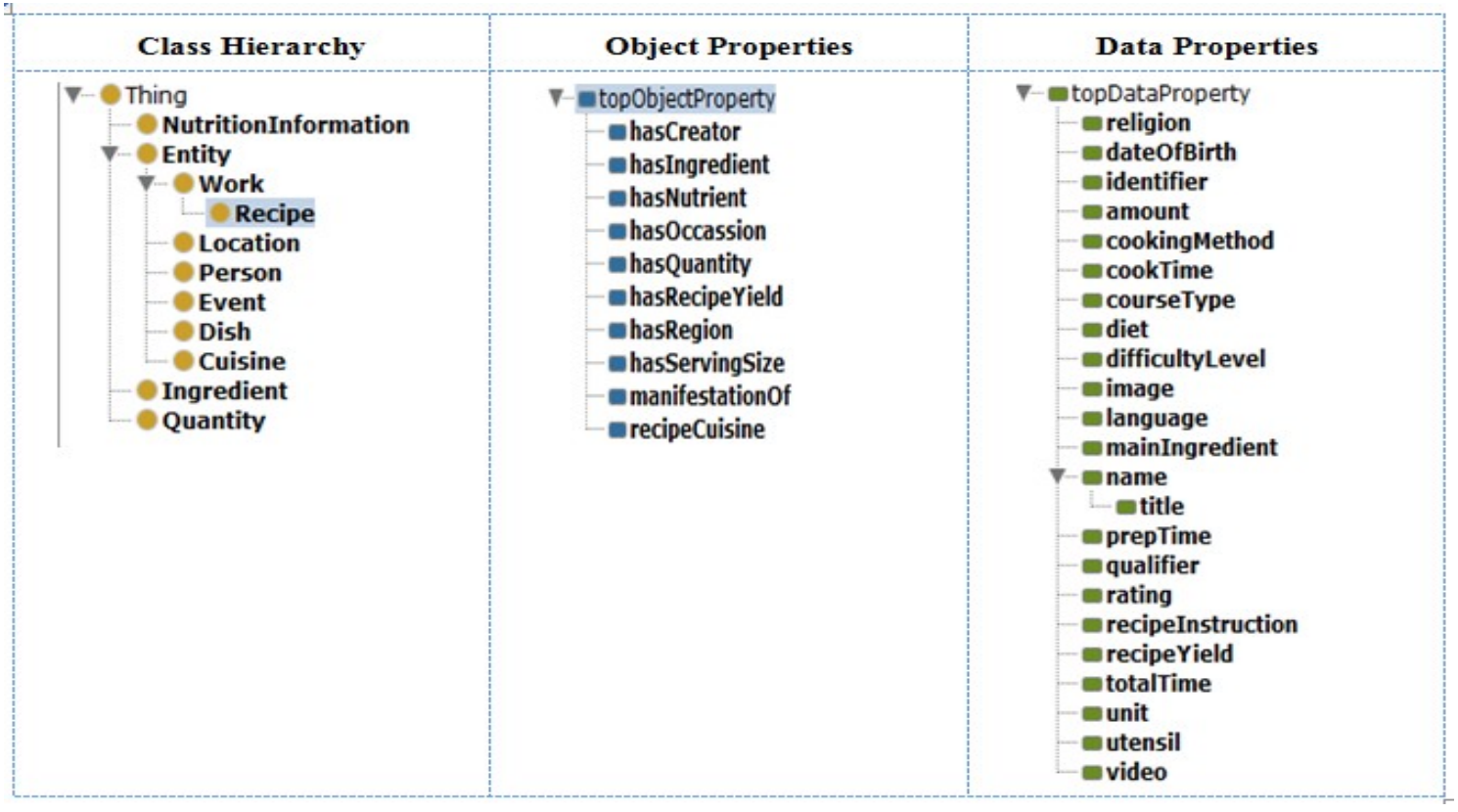


The proposed solution – A Methodology



Step 3: Formalization

- RDF as formal language
- Protégé standard free open source ontology editor



Step 4: Evaluation of the Model

- Syntactic correctness and consistency
- Completeness and conciseness
- Empirical adequacy of the developed model

Step 5: Terminology comparison (example)

eatingwell.com	Recipe model
Ingredients	INGREDIENT type qualifier unit amount
Preparation	recipeInstructions
Nutrition	NUTRITION INFORMATION type unit amount
Makes	SERVING SIZE unit amount
Active Time	prepTime
Total Time	totalTime
Health & Diet Considerations	Diet
Meal/Course	EVENT Type
Type of Dish	DISH courseType
Preparation/Technique	cookingMethod

Schema.org ,BBC Food Ontology vs. Recipe Model Findings:

- ***Incompleteness of properties***

Properties such as Recipe Creator and Recipe Rating is absent.

- ***Lack of Types***

Schema.org and BBC Food Ontology does not associate recipes to specific event.

- ***Underspecified properties***

Properties in Schema.org as plain text poses serious limitations to queries.

- ***Lack of Structure***

Schema.org defines ingredient as text prevents it to answer queries related to quantities and qualifiers for ingredients.

Highlights of the Proposed Model

- ***Addressed the diversity problem in websites***
  Definition of a formal ER model captures the fundamental queries to be offered

- ***The model is grounded in Library Science theories on creative works.***
  Clear distinction between Recipe and Dish

- ***Overcomes the limitations of existing models***
  Schema.org and BBC food ontology