In this chapter we are suggesting three possible ontologies which are compatible with our data.

The first ontology has been taken from [www.schema.org](http://www.schema.org). We think that it is a little bit too complicated considered our data structure.

<rdf:RDF

xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"

xmlns:xsd="http://www.w3.org/2001/XMLSchema#"

xmlns:scm="https://schema.org/">

<rdf:Description rdf:id="18">

<rdf:type rdf:resource="https://schema.org/Thing"/>

<scm:hasCreativeWork rdf:resource="#17"/>

<scm:description>This classic banana bread recipe</scm:description>

<scm:name>Mom's World Famous Banana Bread</scm:name>

</rdf:Description>

<rdf:Description rdf:id="17">

<rdf:type rdf:resource="https://schema.org/CreativeWork"/>

<scm:hasHowTo rdf:resource="#0"/>

<scm:hasAuthor rdf:resource="#19"/>

</rdf:Description>

<rdf:Description rdf:id="19">

<rdf:type rdf:resource="https://schema.org/Person"/>

<scm:author>John Smith</scm:author>

</rdf:Description>

<rdf:Description rdf:id="0">

<rdf:type rdf:resource="https://schema.org/HowTo"/>

<scm:hasRecipe rdf:resource="#1"/>

<scm:estimatedCost>20 USD</scm:estimatedCost>

<scm:hasPerformTime rdf:resource="#14"/>

<scm:hasPrepTime rdf:resource="#15"/>

<scm:step>Mix in the ingredients in a bowl.</scm:step>

<scm:supply>sugar</scm:supply>

<scm:tool>oven</scm:tool>

<scm:hasTotalTime rdf:resource="#16"/>

<scm:yield>1 loaf</scm:yield>

</rdf:Description>

<rdf:Description rdf:id="1">

<rdf:type rdf:resource="https://schema.org/Recipe"/>

<scm:hasCookTime rdf:resource="#2"/>

<scm:cookingMethod>Frying</scm:cookingMethod>

<scm:hasNutrition rdf:resource="#3"/>

<scm:recipeCategory>appetizer</scm:recipeCategory>

<scm:recipeCuisine>Italian</scm:recipeCuisine>

<scm:recipeIngredient>3/4 cup of sugar</scm:recipeIngredient>

<scm:recipeInstructions>Preheat the oven to 350 degrees. Mix in the ingredients in a bowl.</scm:recipeInstructions>

<scm:recipeYield>1 loaf</scm:recipeYield>

<scm:isSuitableForDiet rdf:resource="#13"/>

</rdf:Description>

<rdf:Description rdf:id="2">

<rdf:type rdf:resource="https://schema.org/Duration"/>

<scm:cookTime>PT1H</scm:cookTime>

</rdf:Description>

<rdf:Description rdf:id="14">

<rdf:type rdf:resource="https://schema.org/Duration"/>

<scm:performTime>PT2H</scm:performTime>

</rdf:Description>

<rdf:Description rdf:id="15">

<rdf:type rdf:resource="https://schema.org/Duration"/>

<scm:prepTime>PT30M</scm:prepTime>

</rdf:Description>

<rdf:Description rdf:id="16">

<rdf:type rdf:resource="https://schema.org/Duration"/>

<scm:totalTime>PT3H</scm:totalTime>

</rdf:Description>

<rdf:Description rdf:id="3">

<rdf:type rdf:resource="https://schema.org/NutritionInformation"/>

<scm:hasCalories rdf:resource="#4"/>

<scm:hasFatContent rdf:resource="#5"/>

<scm:hasSaturatedFatContent rdf:resource="#6"/>

<scm:hasCarbohydrateContent rdf:resource="#7"/>

<scm:hasFiberContent rdf:resource="#8"/>

<scm:hasSugarContent rdf:resource="#9"/>

<scm:hasProteinContent rdf:resource="#10"/>

<scm:hasSodiumContent rdf:resource="#11"/>

<scm:hasCholesterolContent rdf:resource="#12"/>

</rdf:Description>

<rdf:Description rdf:id="4">

<rdf:type rdf:resource="https://schema.org/Energy"/>

<scm:energy>240 calories</scm:energy>

</rdf:Description>

<rdf:Description rdf:id="5">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:fatContent>9 grams</scm:fatContent>

</rdf:Description>

<rdf:Description rdf:id="6">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:saturatedFatContent>92 grams</scm:saturatedFatContent>

</rdf:Description>

<rdf:Description rdf:id="7">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:carbohydrateContent>39 grams</scm:carbohydrateContent>

</rdf:Description>

<rdf:Description rdf:id="8">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:fiberContent>8 grams</scm:fiberContent>

</rdf:Description>

<rdf:Description rdf:id="9">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:sugarContent>34 grams</scm:sugarContent>

</rdf:Description>

<rdf:Description rdf:id="10">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:proteinContent>18 grams</scm:proteinContent>

</rdf:Description>

<rdf:Description rdf:id="11">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:sodiumContent>25 grams</scm:sodiumContent>

</rdf:Description>

<rdf:Description rdf:id="12">

<rdf:type rdf:resource="https://schema.org/Mass"/>

<scm:cholesterolContent>75 grams</scm:cholesterolContent>

</rdf:Description>

<rdf:Description rdf:id="13">

<rdf:type rdf:resource="https://schema.org/RestrictedDiet"/>

<scm:suitableForDiet>http://schema.org/LowFatDiet</scm:suitableForDiet>

</rdf:Description>

</rdf:RDF>

As can be seen schema.org is suggesting a lot of information and structure for NutritionalInformation releated to calories, fat, sugar, protein and so on. The same thing happened to preparation, cooking, perform and total time.

The second ontology proposed is our modeling based on our structure data.

<rdf:RDF

xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"

xmlns:xsd="http://www.w3.org/2001/XMLSchema#"

xmlns:rcp="http://our/Recipe" >

<rdf:Description rdf:id="1">

<rdf:type rdf:resource="http://our/Recipe"/>

<rcp:name>Mom's World Famous Banana Bread</rcp:name>

<rcp:description>This classic banana bread recipe</rcp:description>

<rcp:hasNutrition rdf:resource="#3"/>

<rcp:recipeCuisine>Italian</rcp:recipeCuisine>

<rcp:hasRecipeIngredient rdf:resource="#12"/>

<rcp:recipeInstructions>Preheat the oven to 350 degrees. Mix in the ingredients in a bowl.</rcp:recipeInstructions>

<rcp:recipeServing>4 people</rcp:recipeServing>

<rcp:recipeCost>20</rcp:recipeCost>

</rdf:Description>

<rdf:Description rdf:id="3">

<rdf:type rdf:resource="https://our/NutritionInformation"/>

<rcp:calories>240</rcp:calories>

<rcp:fatContent>12</rcp:fatContent>

<rcp:saturatedFatContent>3</rcp:saturatedFatContent>

<rcp:carbohydrateContent>125</rcp:carbohydrateContent>

<rcp:fiberContent>18</rcp:fiberContent>

<rcp:sugarContent>38</rcp:sugarContent>

<rcp:proteinContent>22</rcp:proteinContent>

<rcp:sodiumContent>32</rcp:sodiumContent>

</rdf:Description>

<rdf:Description rdf:id="12">

<rdf:type rdf:resource="https://our/RecipeIngredient"/>

<rcp:ingredientQuantity>1 1/5</rcp:ingredientQuantity>

<rcp:ingredientUnit>l</rcp:ingredientUnit>

<rcp:ingredientName>milk</rcp:ingredientName>

</rdf:Description>

</rdf:RDF>

Here we have simplified the NutritionalInformation part and we have extended the recipeIngredient field, splitting it into ingredientQuantity, ingredientUnit and ingredientName. It is possible since we have splitted the ingredient information taken via scaping using regex.

The third ontology proposed is an hybrid ontology created by mixing the previous two ontologies.

This ontology uses our simplification discussed above and adds some field from schema.org like:

* cookTime
* cookingMethod
* recipeCategory
* isSuitableForDiet

Furthermore a new field author has been added.

<rdf:RDF

xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"

xmlns:xsd="http://www.w3.org/2001/XMLSchema#"

xmlns:scm="https://schema.org/"

xmlns:rcp="http://our/Recipe" >

<rdf:Description rdf:id="1">

<rdf:type rdf:resource="http://our/Recipe"/>

<rcp:name>Mom's World Famous Banana Bread</rcp:name>

<rcp:description>This classic banana bread recipe</rcp:description>

<rcp:hasNutrition rdf:resource="#3"/>

<rcp:recipeCuisine>Italian</rcp:recipeCuisine>

<rcp:hasRecipeIngredient rdf:resource="#4"/>

<rcp:recipeInstructions>Preheat the oven to 350 degrees. Mix in the ingredients in a bowl.</rcp:recipeInstructions>

<rcp:recipeServing>4 people</rcp:recipeServing>

<rcp:recipeCost>20</rcp:recipeCost>

<rcp:author>John Smith</rcp:author>

<scm:hasCookTime rdf:resource="#2"/>

<scm:cookingMethod>Frying</scm:cookingMethod>

<scm:recipeCategory>appetizer</scm:recipeCategory>

<scm:isSuitableForDiet rdf:resource="#5"/>

</rdf:Description>

<rdf:Description rdf:id="2">

<rdf:type rdf:resource="https://schema.org/Duration"/>

<scm:cookTime>PT1H</scm:cookTime>

</rdf:Description>

<rdf:Description rdf:id="3">

<rdf:type rdf:resource="https://our/NutritionInformation"/>

<rcp:calories>240</rcp:calories>

<rcp:fatContent>12</rcp:fatContent>

<rcp:saturatedFatContent>3</rcp:saturatedFatContent>

<rcp:carbohydrateContent>125</rcp:carbohydrateContent>

<rcp:fiberContent>18</rcp:fiberContent>

<rcp:sugarContent>38</rcp:sugarContent>

<rcp:proteinContent>22</rcp:proteinContent>

<rcp:sodiumContent>32</rcp:sodiumContent>

</rdf:Description>

<rdf:Description rdf:id="4">

<rdf:type rdf:resource="https://our/RecipeIngredient"/>

<rcp:ingredientQuantity>1 1/5</rcp:ingredientQuantity>

<rcp:ingredientUnit>l</rcp:ingredientUnit>

<rcp:ingredientName>milk</rcp:ingredientName>

</rdf:Description>

<rdf:Description rdf:id="5">

<rdf:type rdf:resource="https://schema.org/RestrictedDiet"/>

<scm:suitableForDiet>http://schema.org/LowFatDiet</scm:suitableForDiet>

</rdf:Description>

</rdf:RDF>