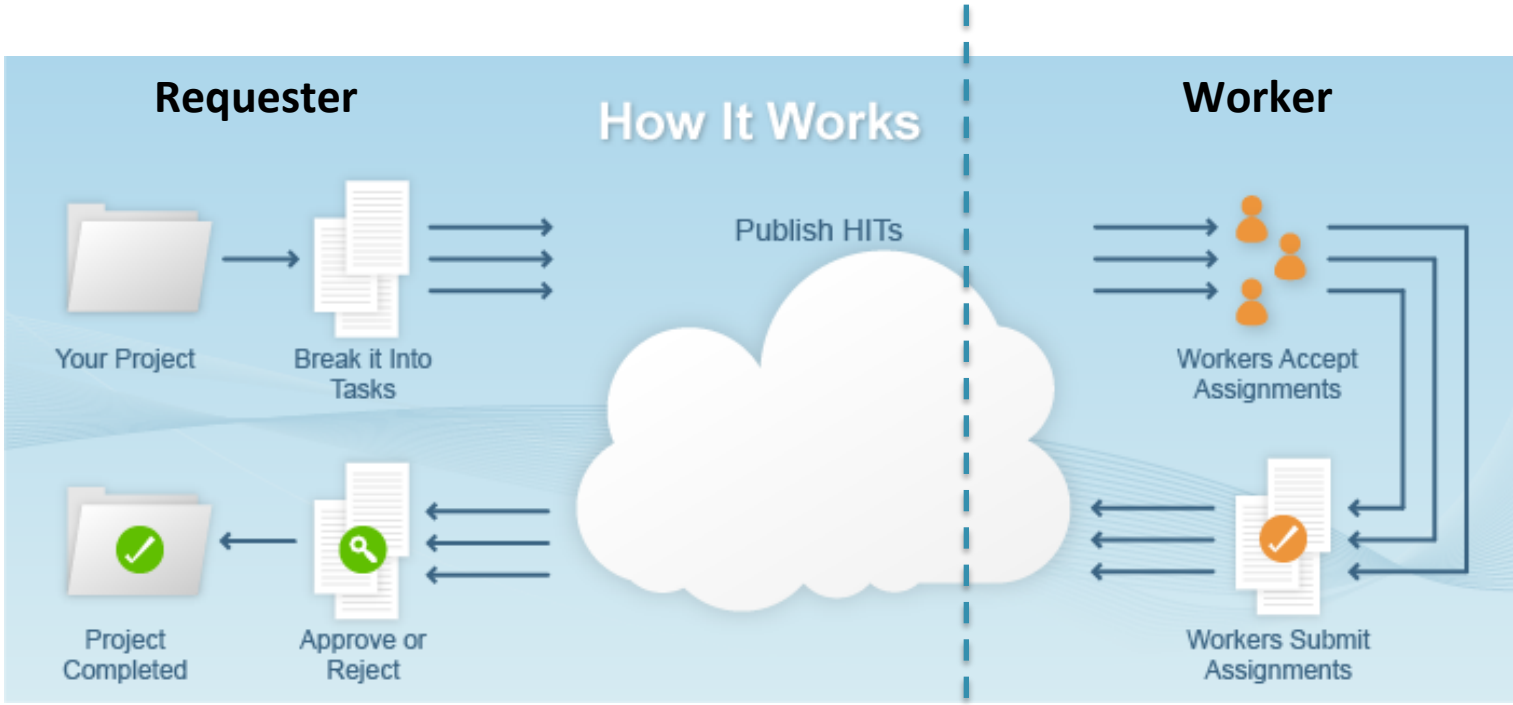
Amazon Mechanical Turk
Hands-on session

Maribel Acosta

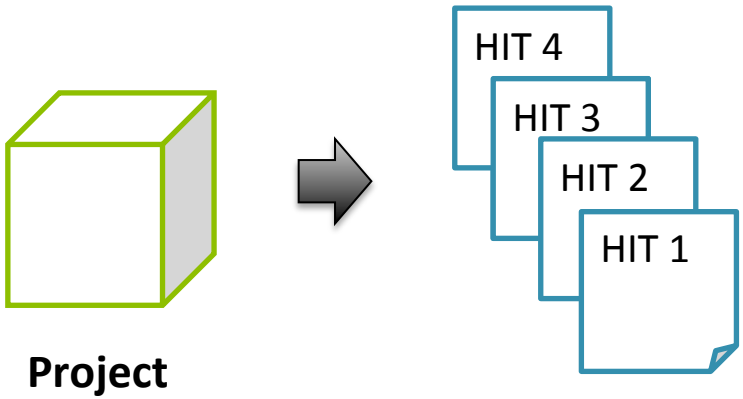
MTurk Basic Concepts (1)



Source: https://requester.mturk.com/tour/how_it_works

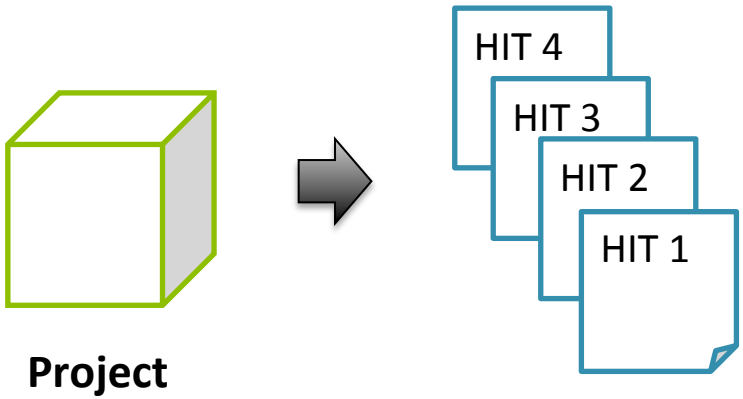
- **Requester:** creates and submits tasks to the platform.
- **Worker:** person who solves the tasks.
- **Human Intelligence Task (HIT):** work unit.

MTurk Basic Concepts (2)



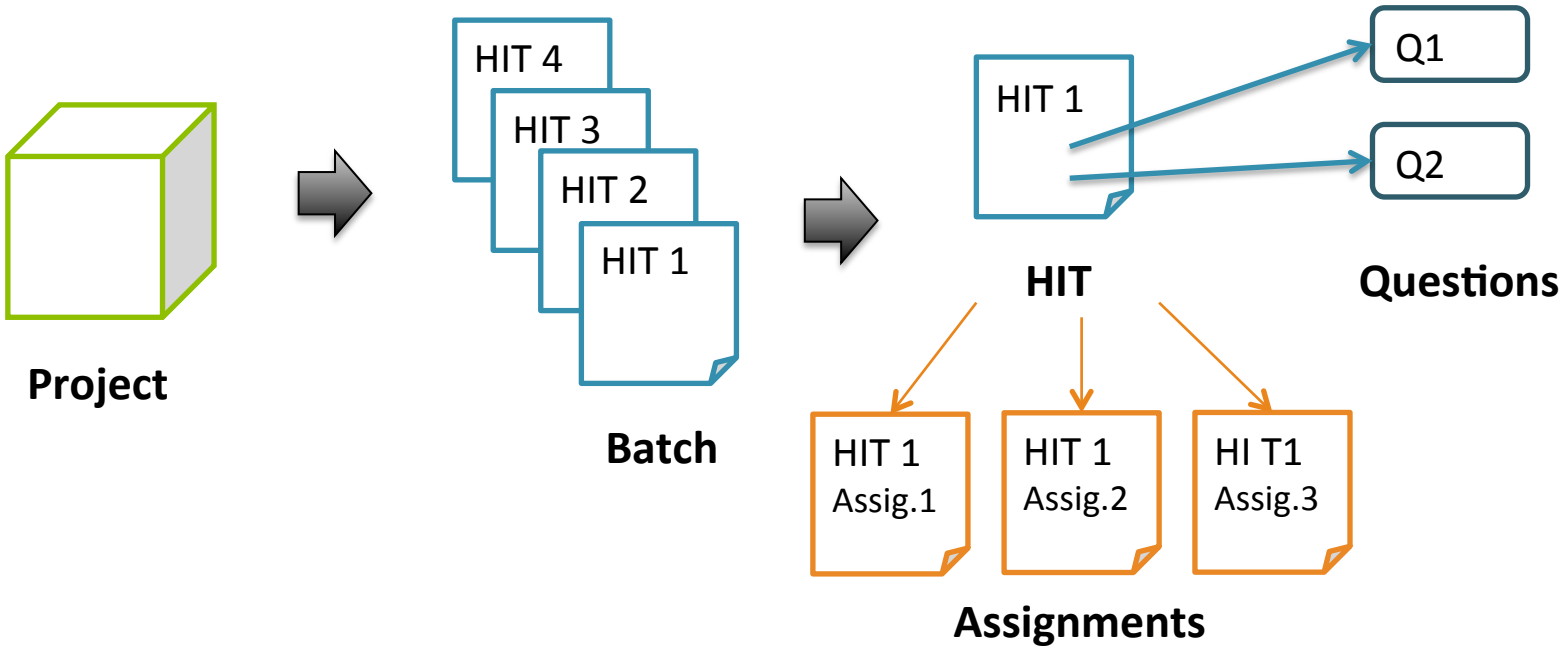
- **Project**: a graphical and functional template to create HITs
  - The elements that stay the same in every HIT are denominated **template**
  - The data that will vary from HIT to HIT are specified via **variables**
- NOTE: If no variables are specified in the project, we will create a single HIT
- **Variables:** allow creating several HITs in the project

MTurk Basic Concepts (3)



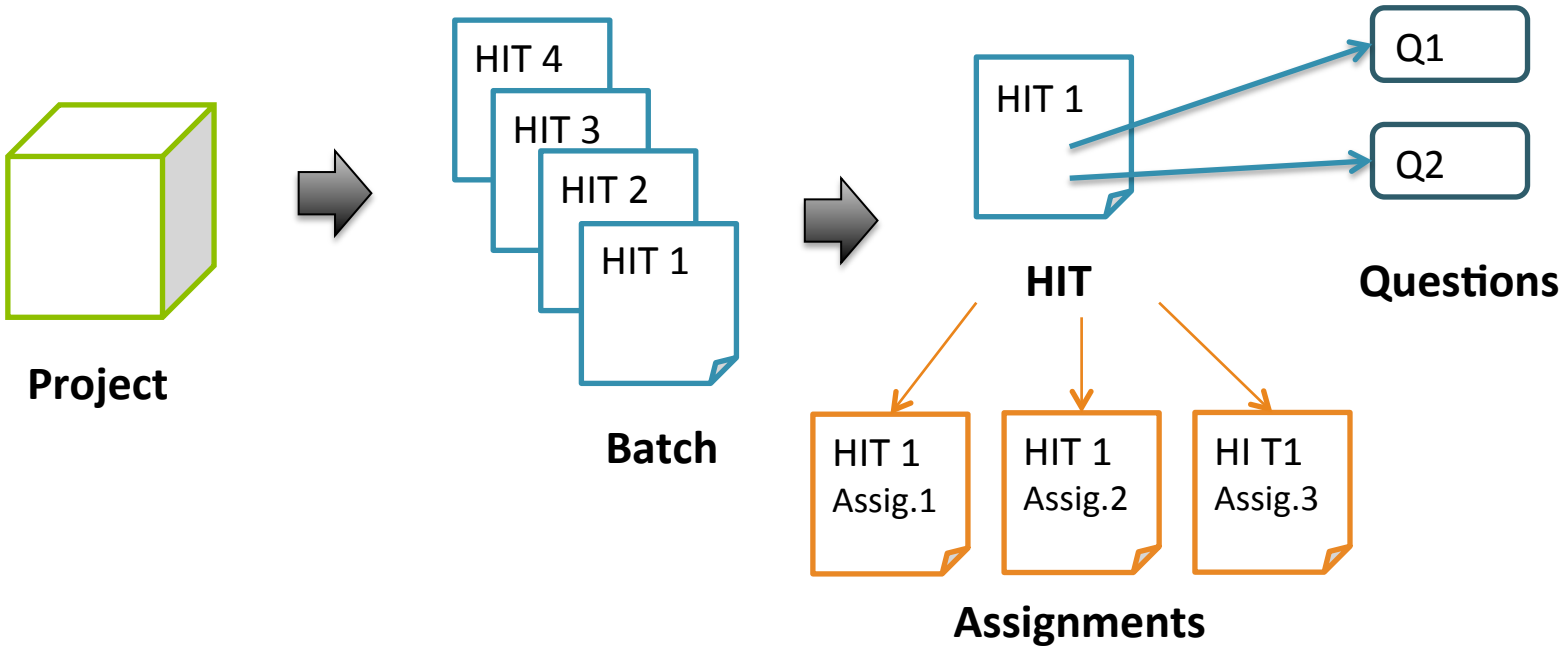
- **Batch:** Group of HITs created by instantiating the variable(s) of a project
- The values of the variables are specified in (CSV, TSV) files:
  - Each **column** corresponds to a variable
  - Each **row** is an instance -> HIT
  - Each file corresponds to a batch
- We can create **several batches** for the same project

MTurk Basic Concepts (4)



- **HIT:** Work unit. The same HIT can be solved by 1 or more workers (assignments)
- **Assignment:** How many workers should solve one exact same HIT
- **Questions:** A single HIT may contain one or several questions

MTurk Basic Concepts (5)

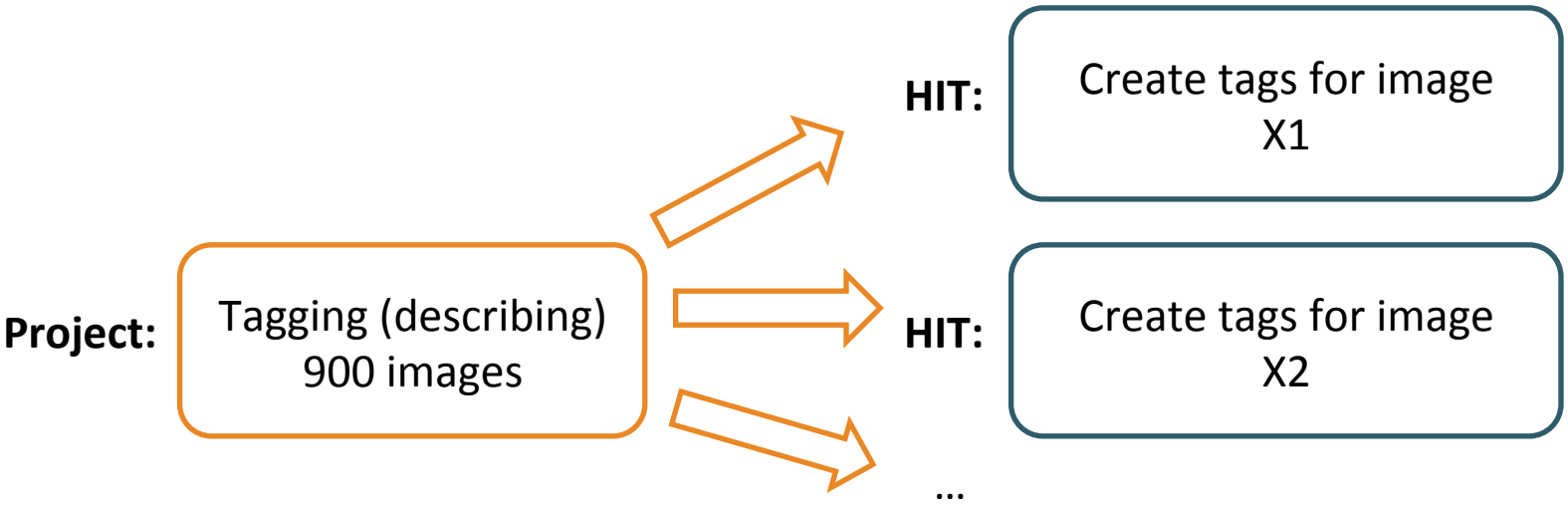


Total cost of the project = No. of HITs x No. of Assignments x (Reward per HIT + Fee)

MTurk Basic Concepts (6)

Example of Human Intelligence Tasks (HITs)

- Projects can be broken into smaller tasks called HITs
- A HIT represents a single work unit

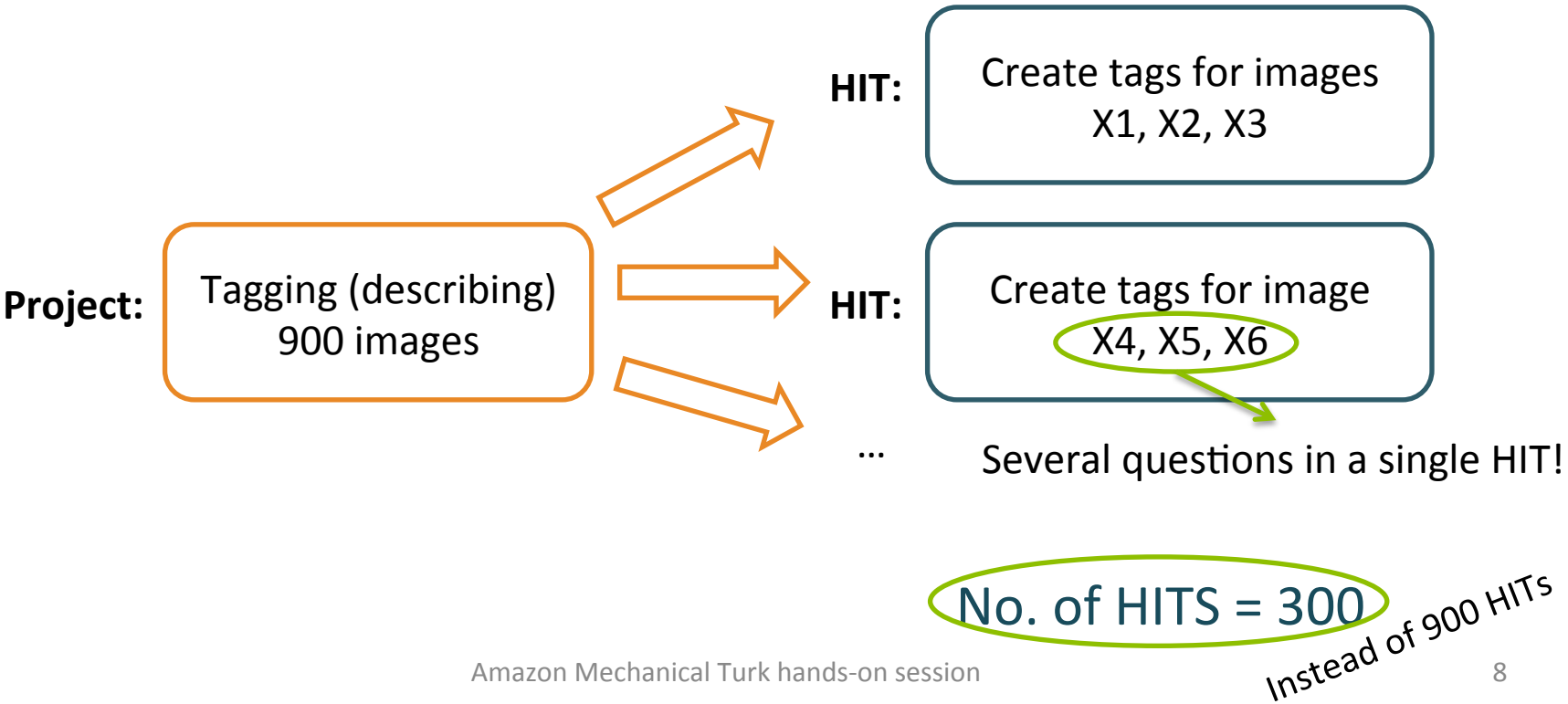


No. of HITS = 900

MTurk Basic Concepts (7)

Example of Human Intelligence Tasks (HITs)

- Projects can be broken into smaller tasks called HITs
- A HIT represents a single work unit

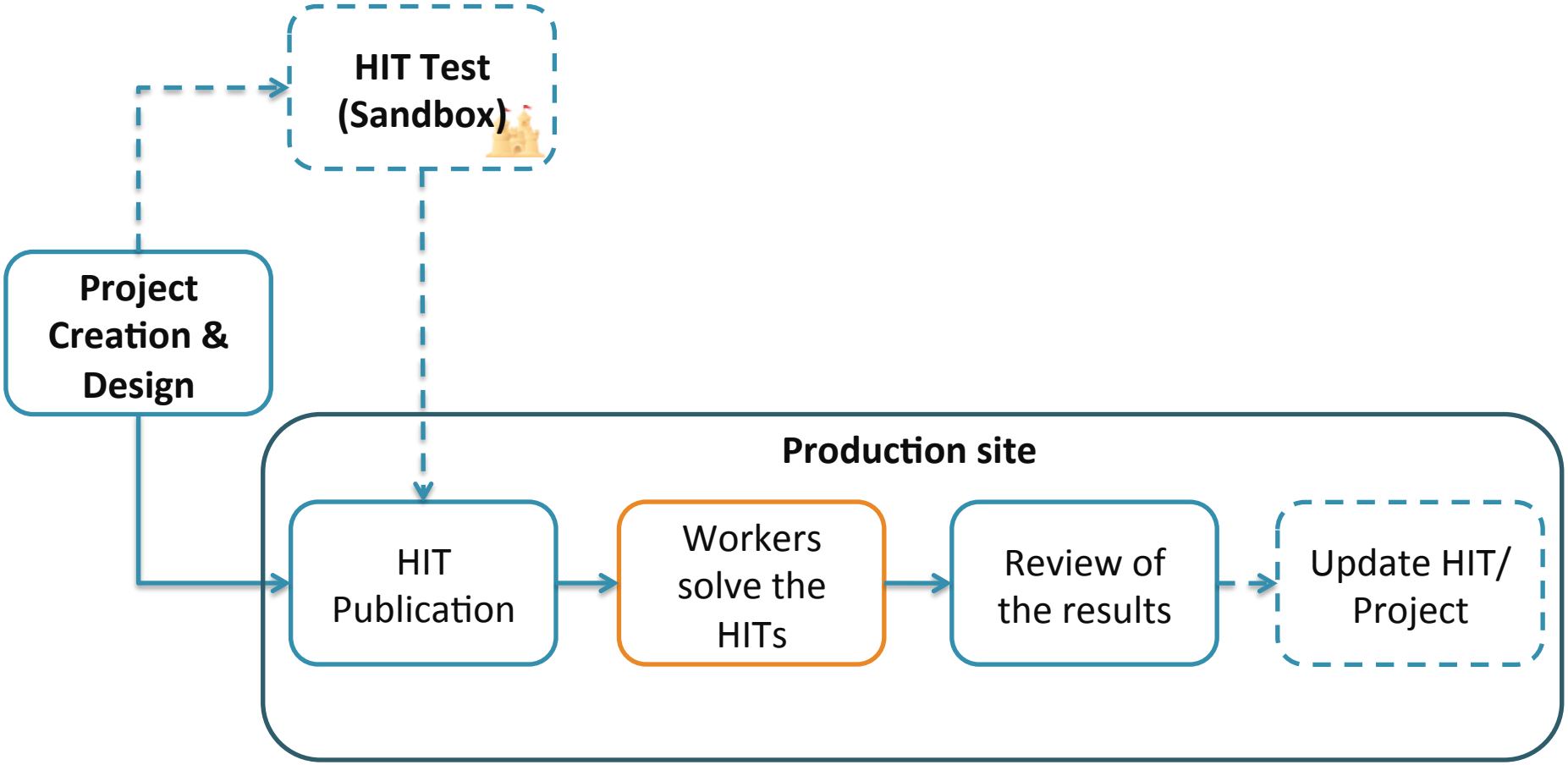


MTurk Basic Concepts (8)

When creating a project or individual HITs, the **HIT properties** must be specified:

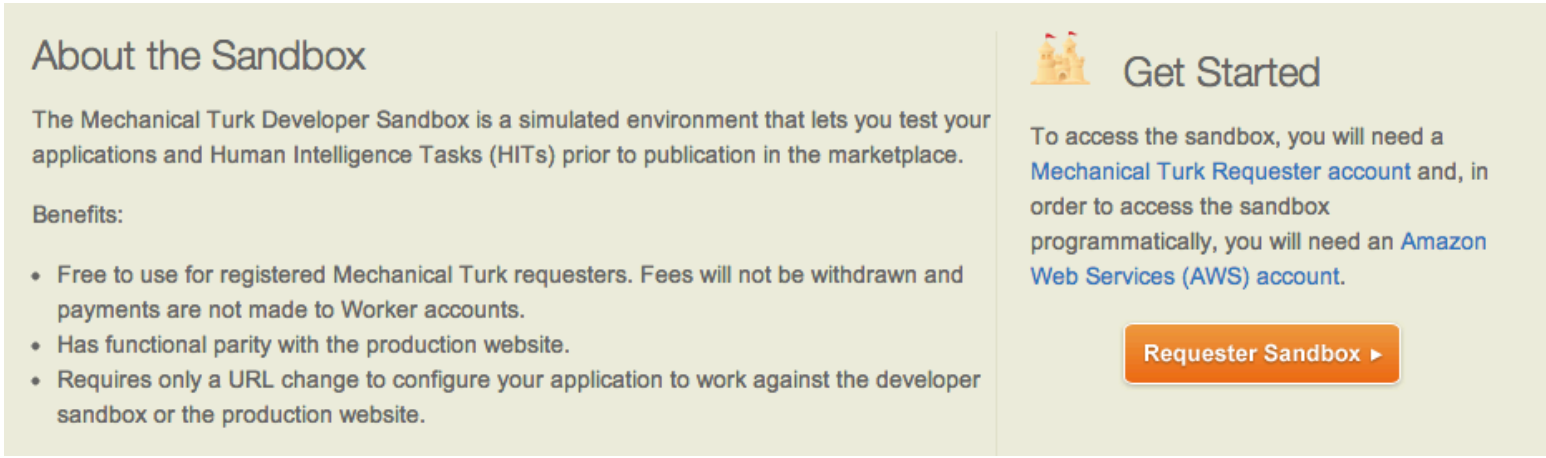
- General information: includes the title and description of the HIT, as well as keywords which are used by worker for searching HITs
- HIT duration time: time allotted to solve the HIT (before it is given to another worker)
- HIT life time: how long will the HIT be available on the platform
- # Assignments: number of different persons that will perform the exact same HIT
- Reward: payment for correctly solving each assignment

MTurk Workflow for Requesters



MTurk Sandbox

The Sandbox is a simulated MTurk environment to test HITs.



- Log in as **requester**: preview and test the interface of your HITs
  - https://requestersandbox.mturk.com
- Log in as **worker**: solve your own HITs to test their functionalities and result output
  - https://workersandbox.mturk.com
- **Best practice**: Always test your HITs (**as requester and worker**) before publishing them in the production site

Managing HITs in MTurk

There are three different mechanism to manage your HITs in MTurk:

MTURK WEB INTERFACE 

Hands On!

- **Project:** Crowdsourcing DBpedia triples to verify the links to external web pages

```
prefix dbpedia-ont:<http://dbpedia.org/ontology/>
prefix foaf:<http://xmlns.com/foaf/0.1/>
SELECT *
WHERE {
 ?s dbpedia-ont:wikiPageExternalLink ?o;
    foaf:name ?s_name;
    foaf:isPrimaryTopicOf ?s_wikipage .
} LIMIT 200
```

Triple to crowdsource

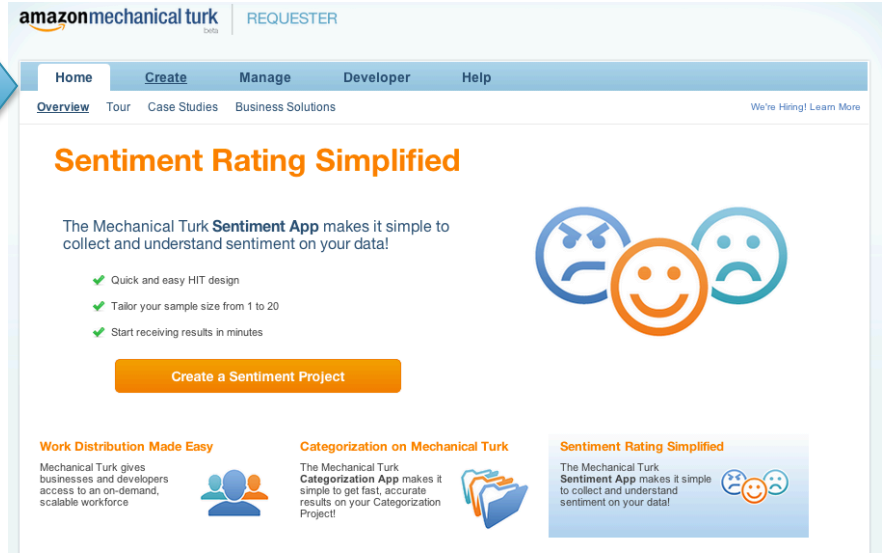
Triples to build the UI

MTurkDemo/data/sparql.csv

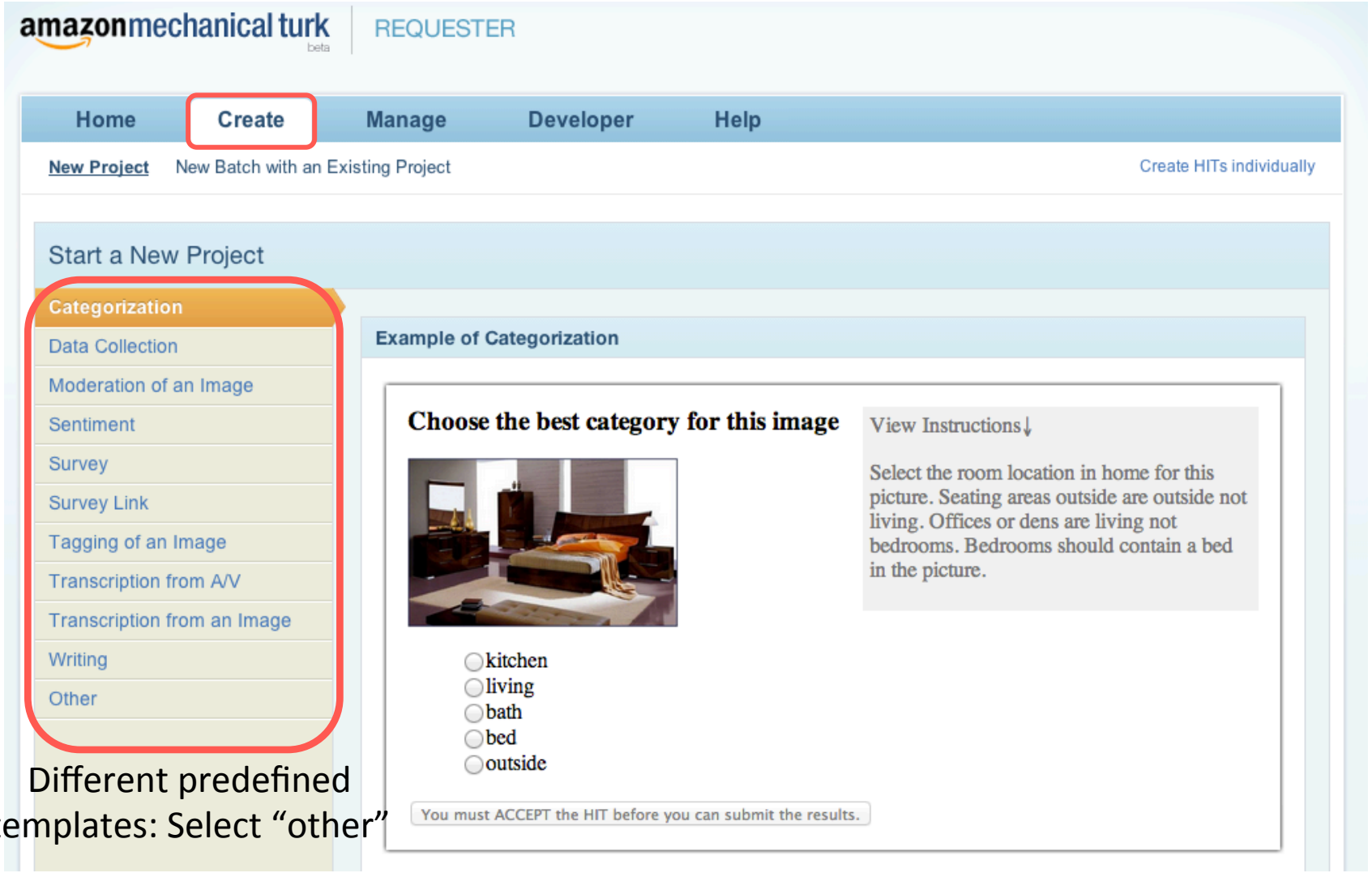
http://dbpedia.org/sparql

Hands On!

- Go to MTurk Sandbox as a **requester**:
  - https://requestersandbox.mturk.com/
- Click on **Sign In**
  - Email address
  - Password
- Now we are at “home”

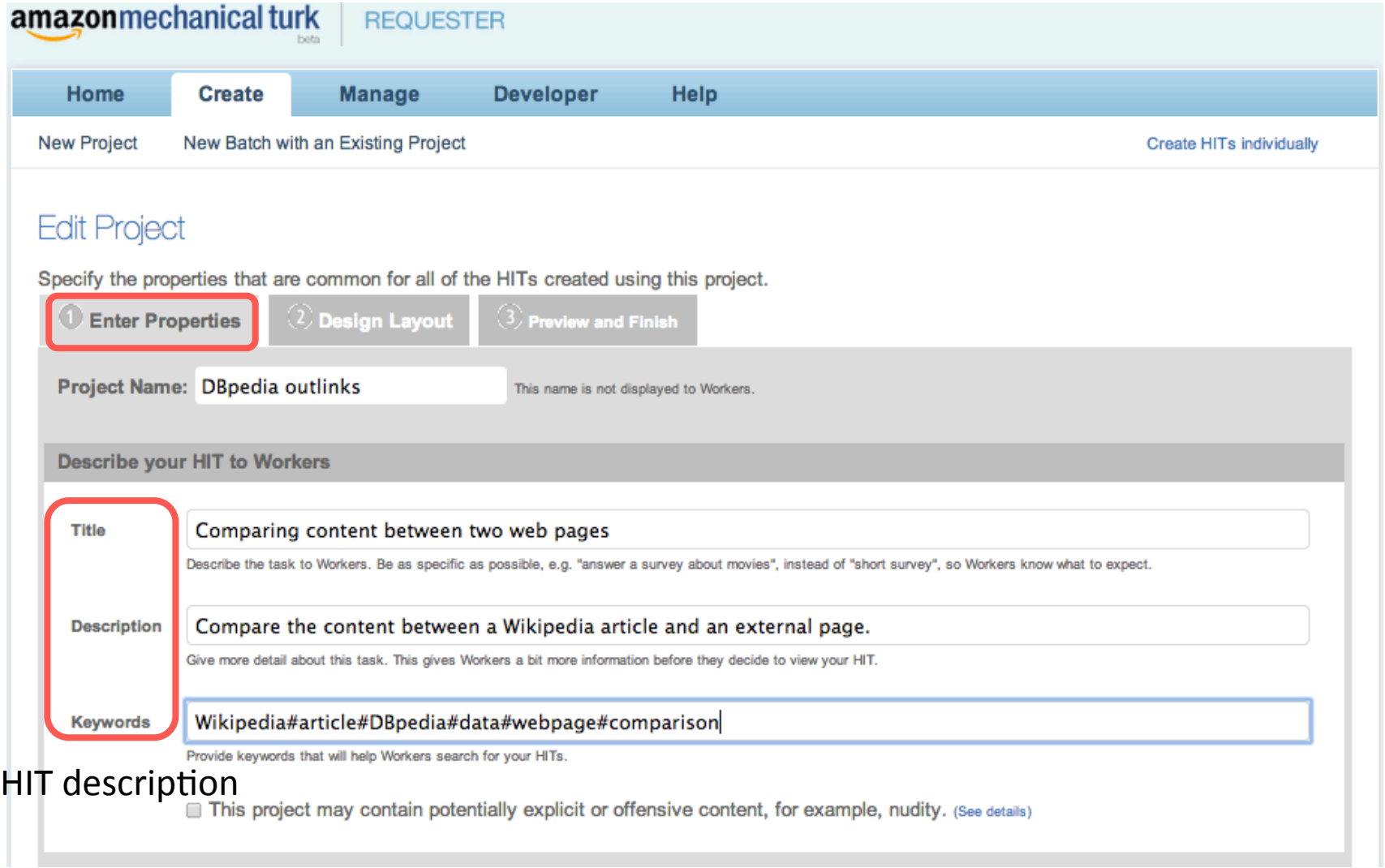


1. Creating a Project



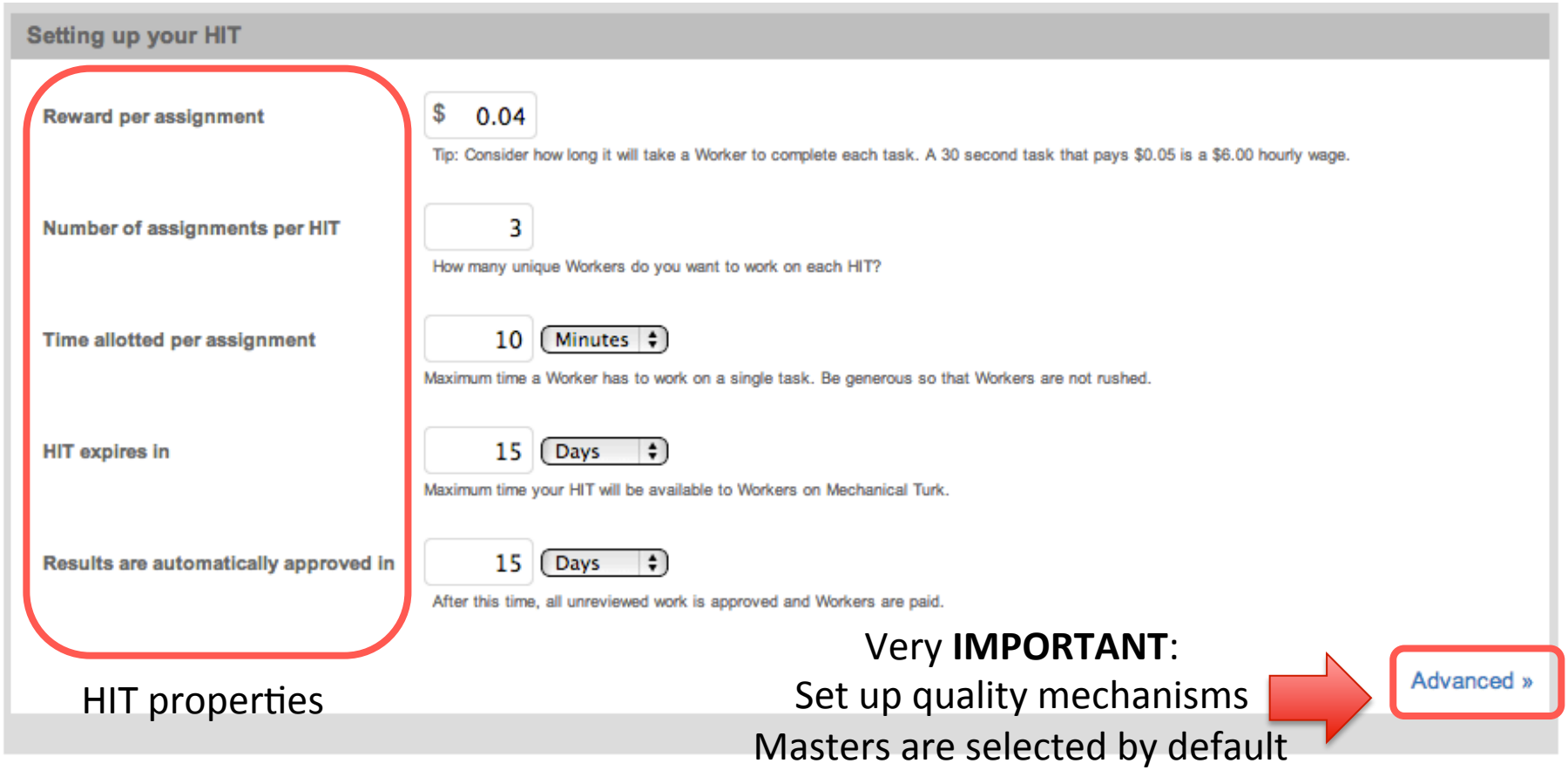
Different predefined templates: Select "other"

2. Setting up the HIT Properties (1)



HIT description

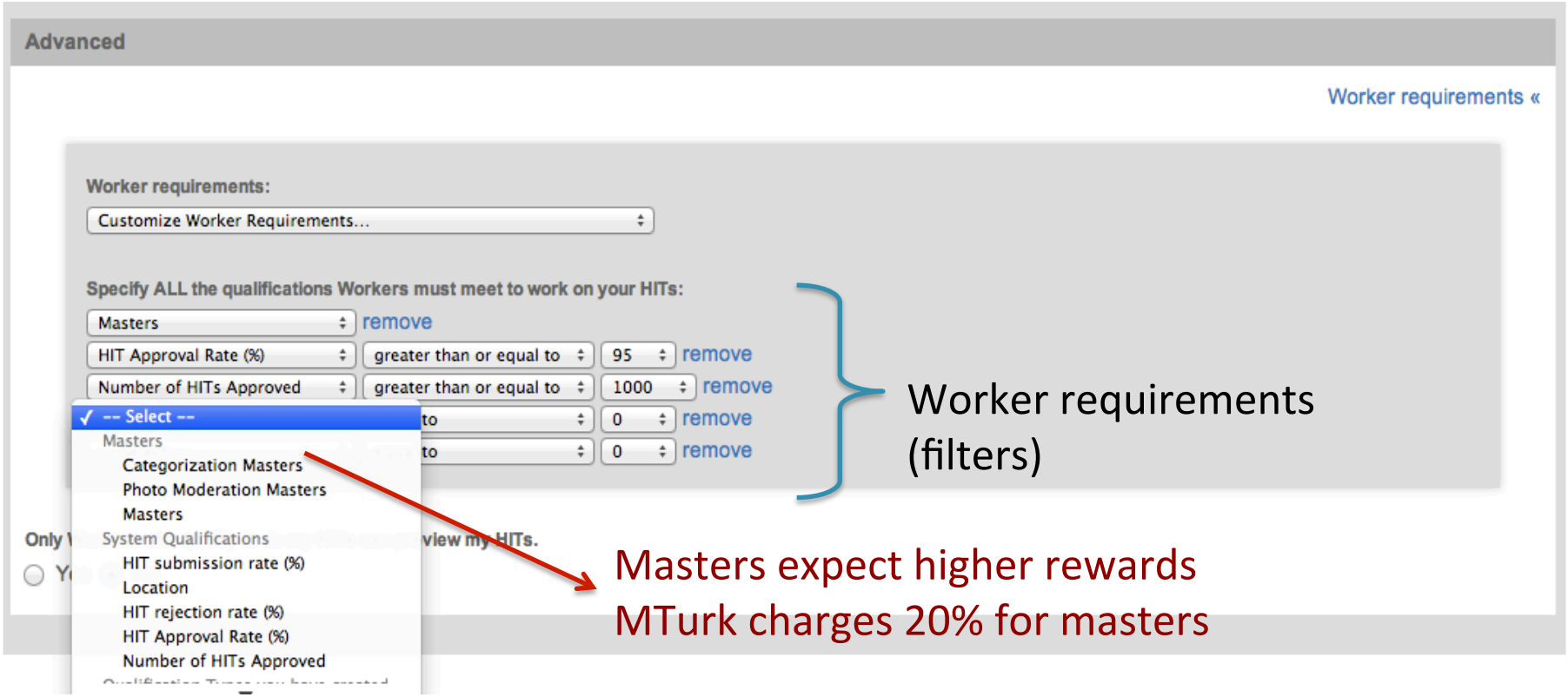
2. Setting up the HIT Properties (2)



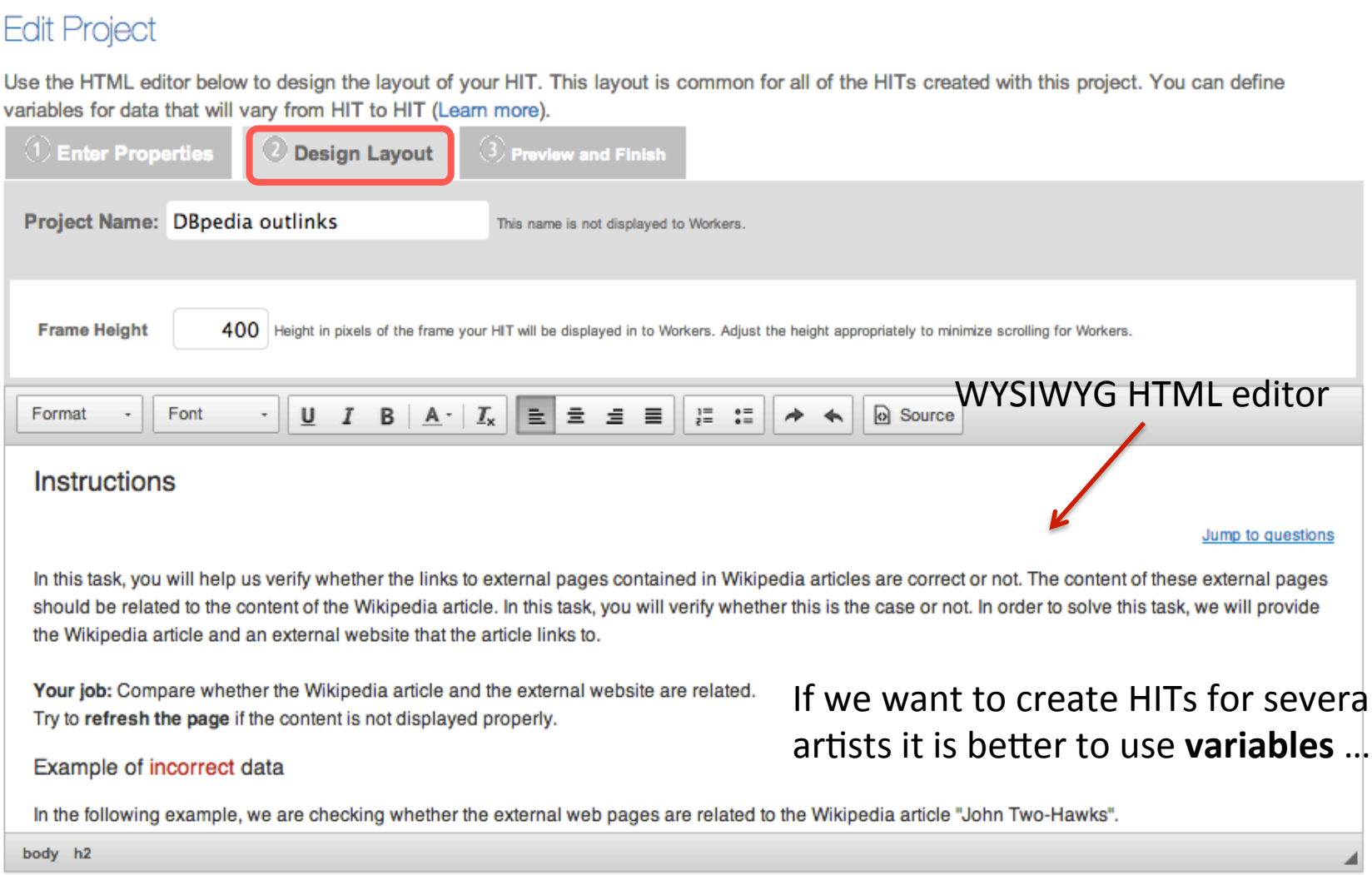
HIT properties

Very **IMPORTANT**:
Set up quality mechanisms
Masters are selected by default

3. Selecting Qualifications

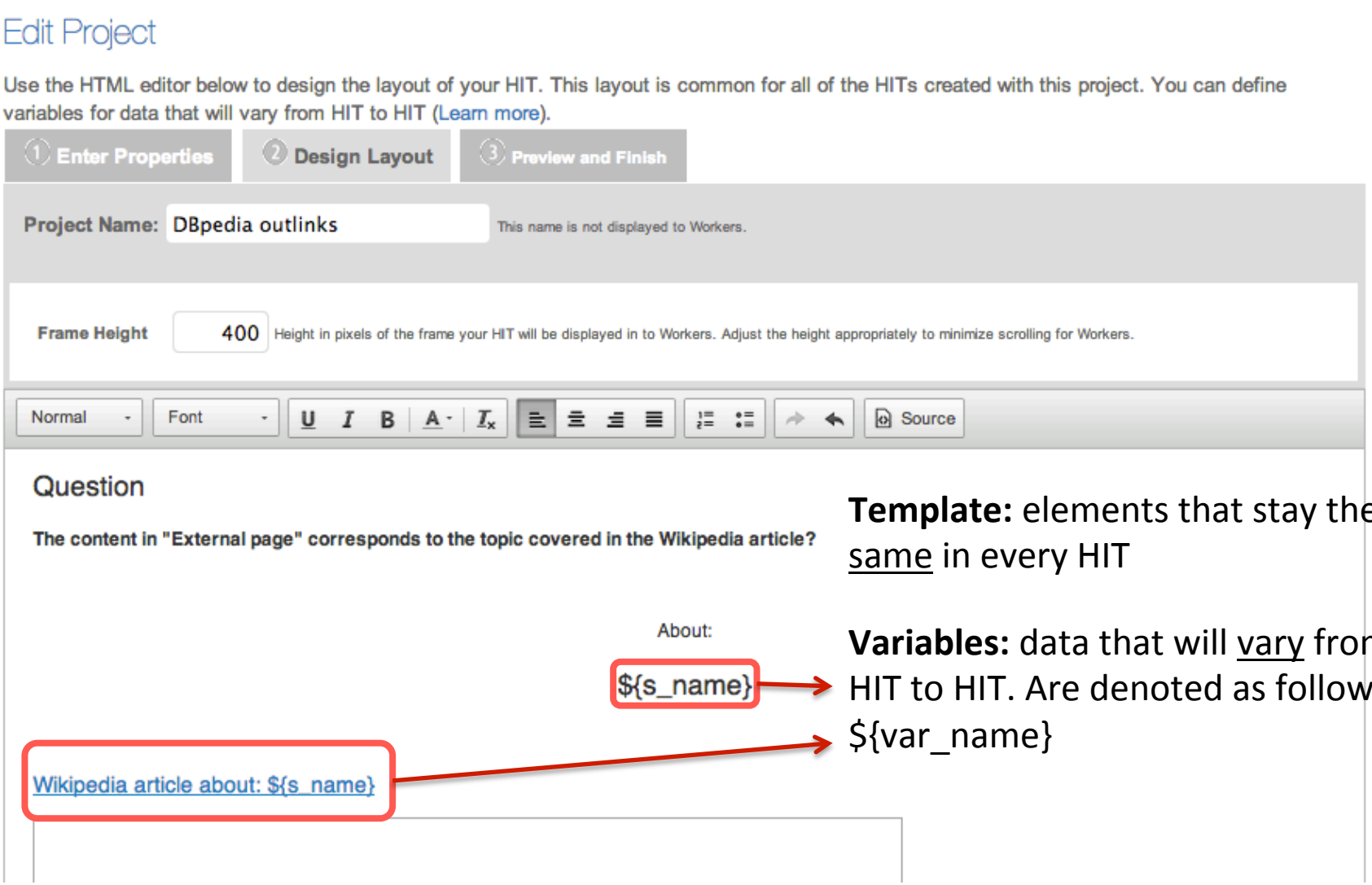


4. Defining the Task



If we want to create HITs for several artists it is better to use **variables** …

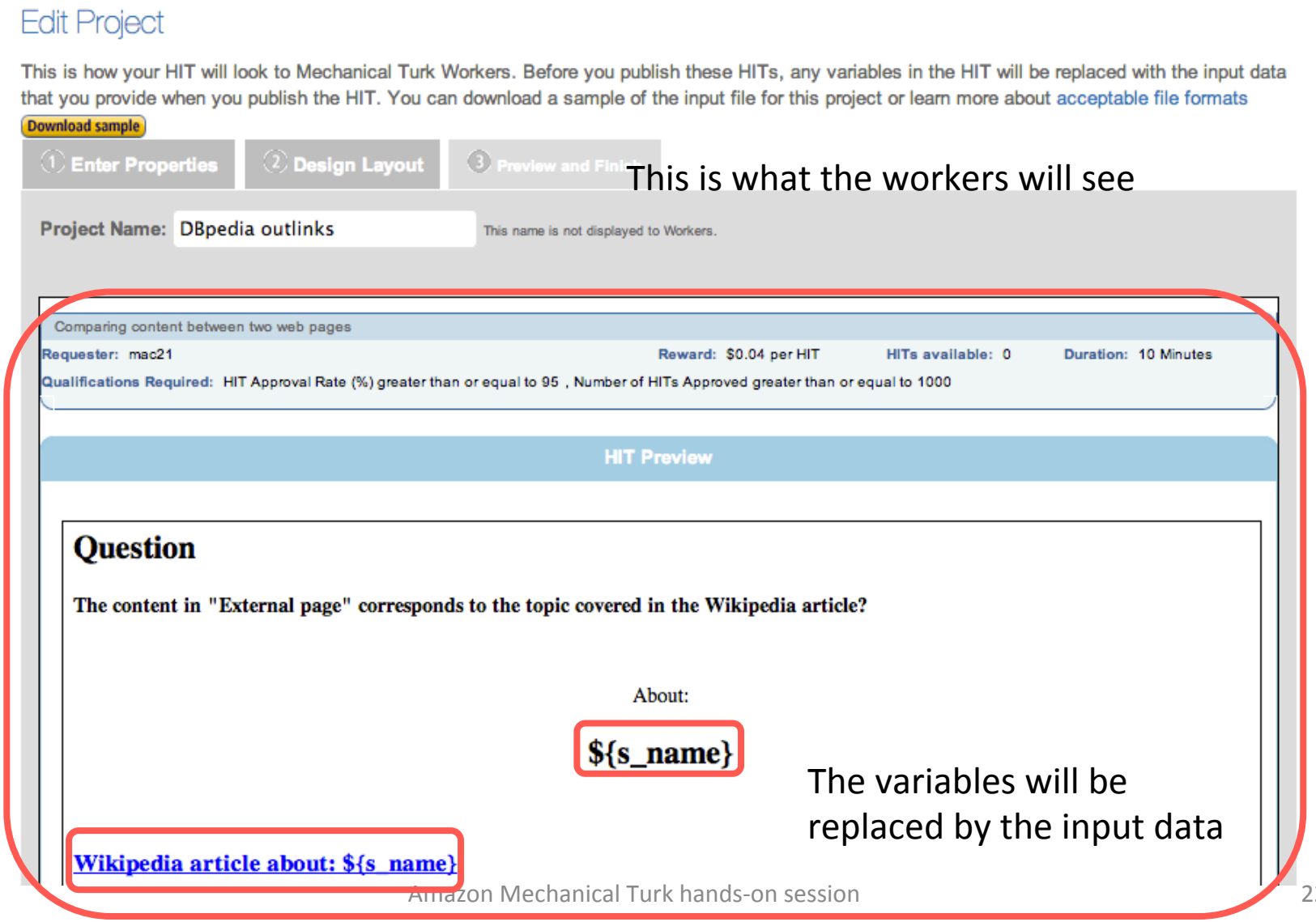
4. Defining the Task (with Variables)



Template: elements that stay the same in every HIT

Variables: data that will vary from HIT to HIT. Are denoted as follows: ${var_name}

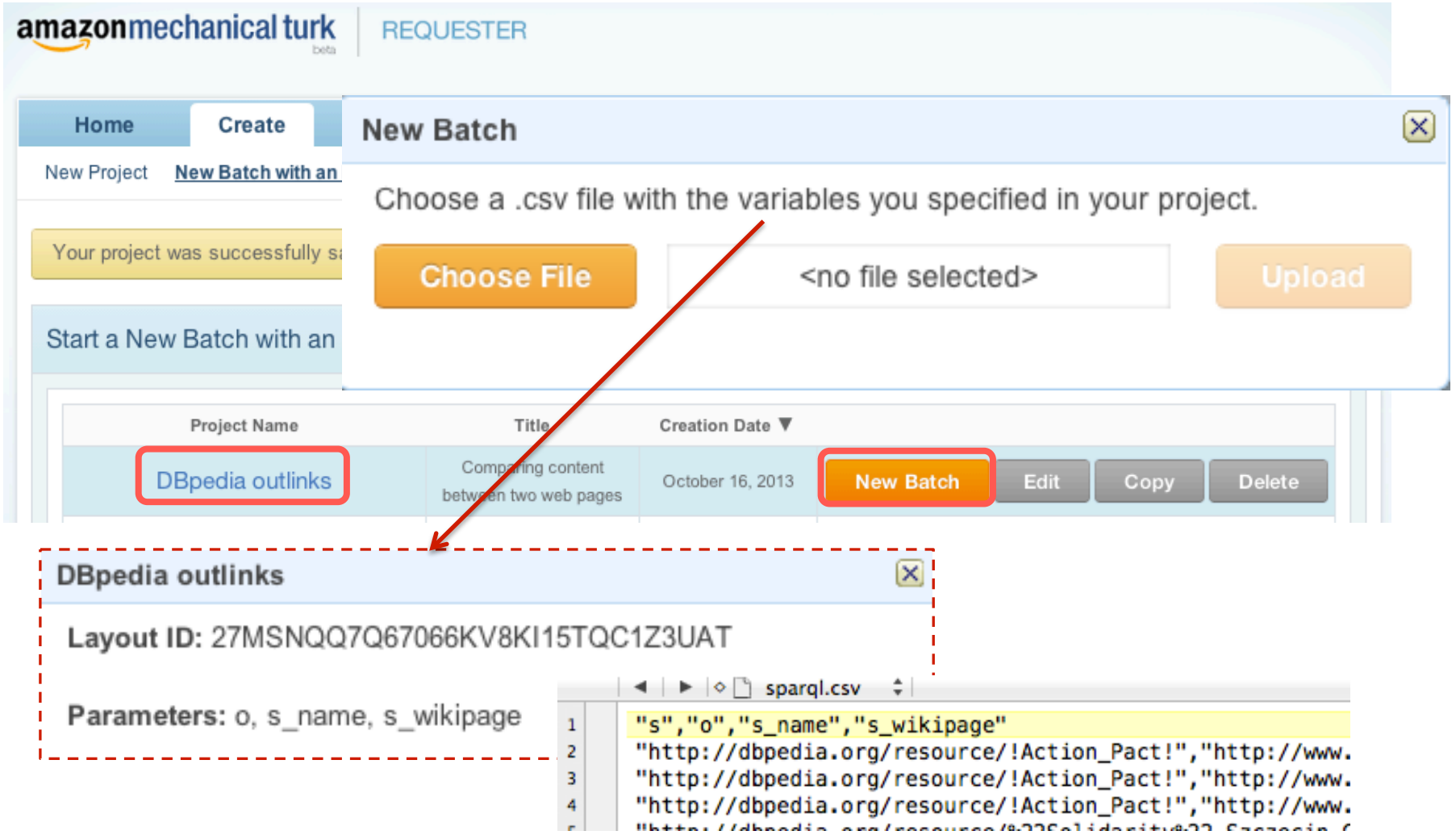
5. Previewing the Template



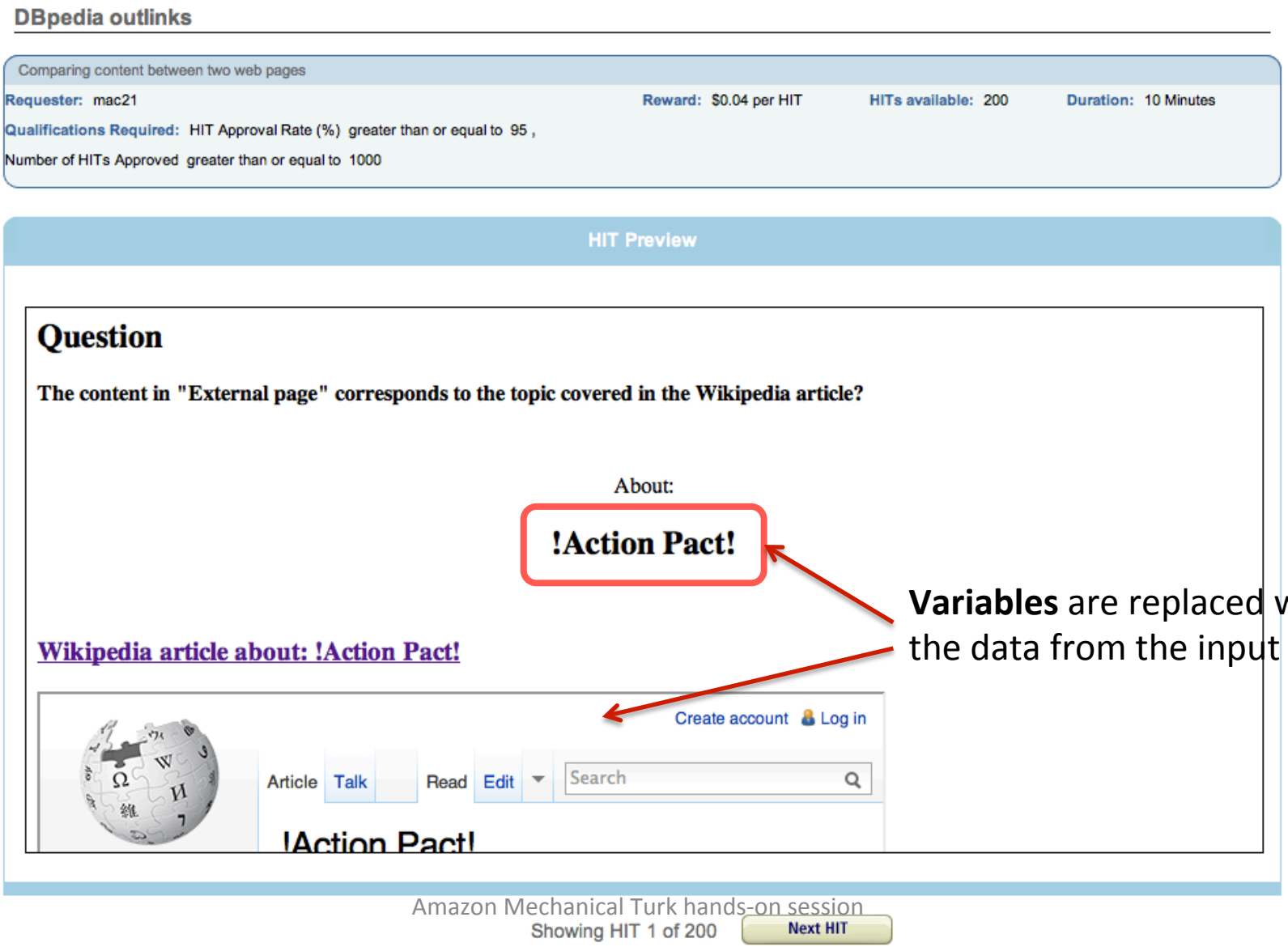
This is what the workers will see

The variables will be replaced by the input data

6. Creating Batches

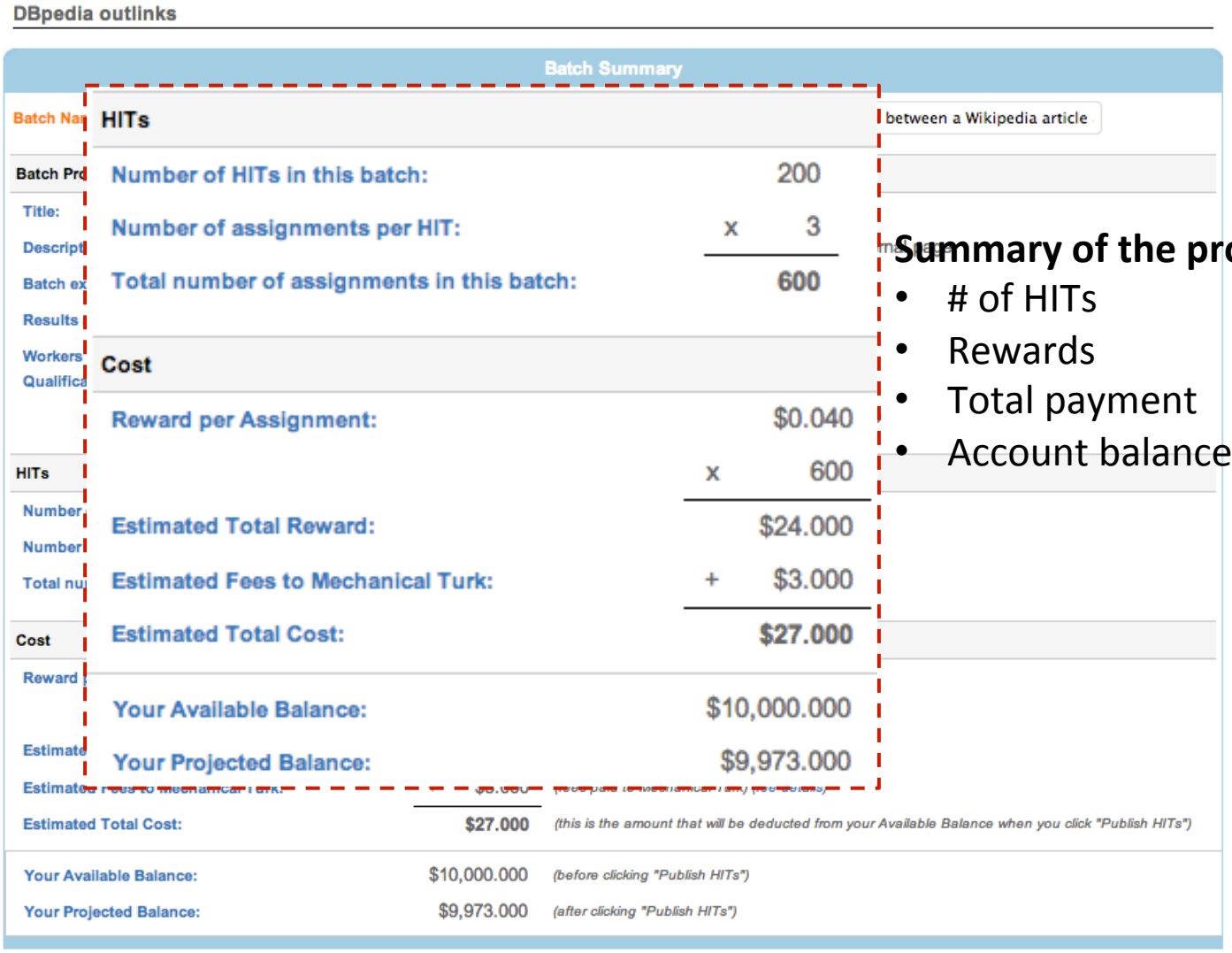


7. Previewing the HITs



Variables are replaced with the data from the input file

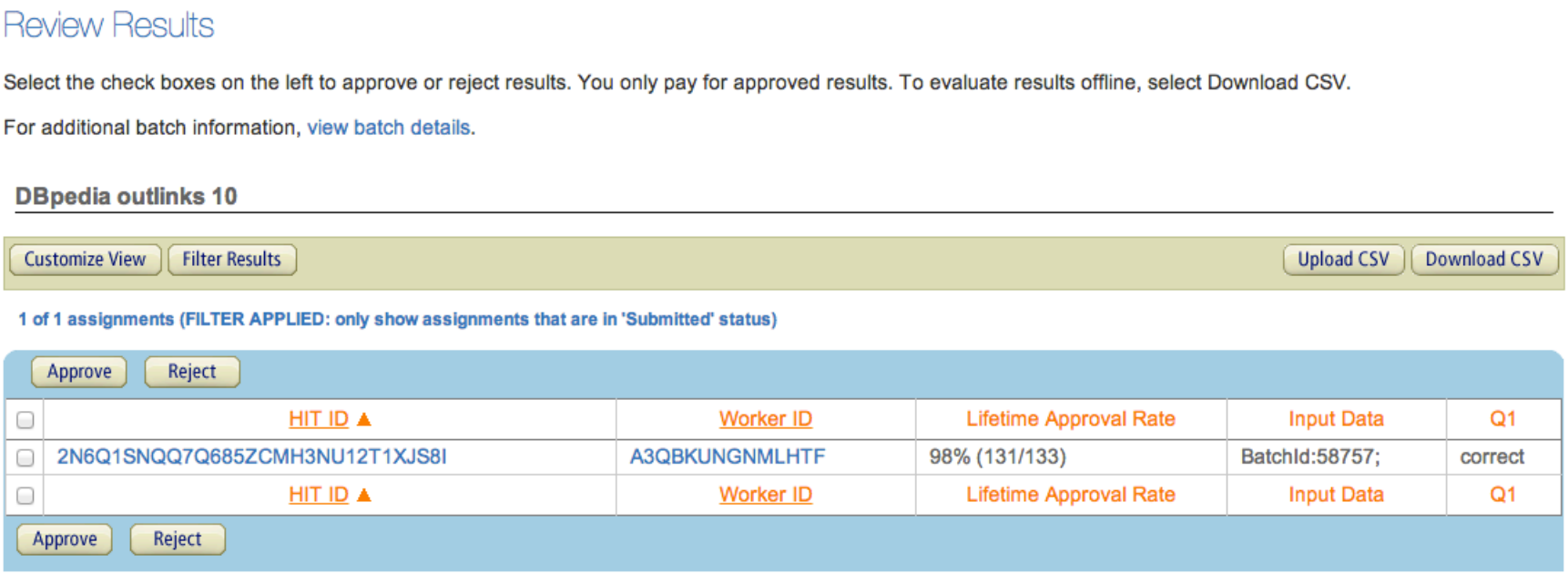
8. Publishing the HITs



Summary of the project:

- # of HITs
- Rewards
- Total payment
- Account balance

9. Retrieving the Results



Review Results

Select the check boxes on the left to approve or reject results. You only pay for approved results. To evaluate results offline, select Download CSV.

For additional batch information, view batch details.

DBpedia outlinks 10

Customize View | Filter Results | Upload CSV | Download CSV

1 of 1 assignments (FILTER APPLIED: only show assignments that are in 'Submitted' status)

Approve | Reject

	HIT ID ▲	Worker ID	Lifetime Approval Rate	Input Data	Q1
☐	2N6Q1SNQQ7Q685ZCMH3NU12T1XJS8I	A3QBKUNGNMLHTF	98% (131/133)	BatchId:58757;	correct
☐	HIT ID ▲	Worker ID	Lifetime Approval Rate	Input Data	Q1

Approve | Reject

MTURK COMMAND LINE TOOLS 

List of Commands

[HITs]

```
Make template
Load HITs
Delete HITs
Update HITs
Extend HITs
```

[Results]

```
Get result
Approve/reject work
Review results
Generate result summary
Grant bonus
Block/unblock worker
```

[Qualification types]

```
Create qualification type
Update qualification type
Get qualification results
Evaluate qualification request
Approve/reject qualification request
Revoke qualifications
Update qualification score
```

[Account]

```
Reset account
Get balance
```

Creating HITs with CLT

1. Configuring the connection to the platform
2. Setting up the HIT properties
3. Defining the task
4. Creating the batch
5. Publishing the HITs
6. Retrieving the results

1. Configuring the connection to the platform

- Configure the `./bin/mturk.properties` file

- Add the keys to access your MTurk account

```
# Information to access the MTurk account.
access_key=
secret_key=
```

- Specify the service to use (Sandbox or production site)

```
# If you want to use the Sandbox use the following service_url
service_url=https://mechanicalturk.sandbox.amazonaws.com/?Service=AWSMechanicalTurkRequester

# If you want to use the Sandbox use the following service_url
#service_url=https://mechanicalturk.amazonaws.com/?Service=AWSMechanicalTurkRequester
```

2. Setting up the HIT Properties

- Create a HIT properties file `myhits.properties`

```
####################################
## Basic HIT Properties
####################################

title: Comparing content between two pages
description: Compare the content between a Wikipedia article and an external page.
reward:0.04
assignments:3
annotation:Wikipedia#article#DBpedia#data#errors

####################################
## HIT Timing Properties
####################################

# this Assignment Duration value is calculated based on the number questions.
assignmentduration:900

# this HIT Lifetime value is 60*60*24*15 = 15 days
hitlifetime:1296000

# this Auto Approval period is 60*60*24*15 = 15 days
autoapprovaldelay:1296000

####################################
## Qualification Properties
####################################

# Qualifications can be defined in the properties file instead of in code.
# You can add multiple qualifications for this HIT by simply increasing the # suffix.
# i.e. qualification.2: XXXXX
#      qualification.comparator.2:greaterthan

# this is a built-in qualification -- user must have an approval rate of 25% or greater
qualification.1:00000000000000000L0
qualification.comparator.1:greaterthan
qualification.value.1:50
qualification.private.1:false
```

3. Defining the Task (1)

- Create a template file `myhits.question`

Data structure

Instructions

```
<?xml version="1.0" encoding="UTF-8"?>
<QuestionForm
xmlns="http://mechanicalturk.amazonaws.com/AWSMechanicalTurkDataSchemas/2005-10-01/
QuestionForm.xsd">
  <Overview>
    <FormattedContent><![CDATA[
    <h2>Instructions</h2>

    In this task, you will help us verify whether the links to external pages contained
    in Wikipedia articles are correct or not. The content of these external pages should
    be related to the content of the Wikipedia article. In this task, you will verify
    whether this is the case or not. In order to solve this task, we will provide the
    Wikipedia article and an external website that the article links to.<br />
    <br />
    <b>Your job:</b> Compare whether the Wikipedia article and the external website are
related.<br />
    Try to <b>refresh the page</b> if the content is not displayed properly.
    <br />

    <h3>Example of <font color="#C92020">incorrect</font> data</h3>

    <p>In the following example, we are checking whether the external web pages are
    related to the Wikipedia article &quot;John Two-Hawks&quot;.<br />
    The following link shows a website not related to &quot;John Two-Hawks&quot;.</p>

    About: <h2>John Two-Hawks</h2>
    <br />
    <b>External page:</b><a href="http://www.cedarlakedvd.com"
target="_blank">http://www.cedarlakedvd.com</a>

    <iframe height="200" src="http://www.cedarlakedvd.com" width="620">Preview not
    available. Please go to http://www.cedarlakedvd.com.</iframe><br />
```

`FormattedContent` allows for using HTML tags

3. Defining the Task (2)

- Create a template file `myhits.question`


```
<Question>
  <QuestionIdentifier>1</QuestionIdentifier>
  <QuestionContent>
  <FormattedContent><![CDATA[
  <p><b>The content in &quot;External page&quot; corresponds to the topic covered in
  the Wikipedia article?</b></p>

  About: <b>${s_name}</b>

  <h3><a href="${s_wikipage}" target="_blank">Wikipedia article about:
${s_name}</a></h3>

  <p><iframe height="300" src="${s_wikipage}" width="620">Preview not available.
     Please go to ${s_wikipage}</iframe></p>

  <h3><a href="${o}" target="_blank">External page: ${o}</a></h3>

  <p><iframe height="300" src="${o}" width="620">Preview not available.
     Please go to ${o}</iframe></p>

  <p>Your answer:</p>
  ]]></FormattedContent>
  </QuestionContent>
  <AnswerSpecification>
    <SelectionAnswer>
      <MinSelectionCount>1</MinSelectionCount>
      <MaxSelectionCount>1</MaxSelectionCount>
      <StyleSuggestion>radiobutton</StyleSuggestion>
      <Selections>
        <Selection>
          <SelectionIdentifier>Correct</SelectionIdentifier>
          <Text>Correct</Text>
        </Selection>
        <Selection>
          <SelectionIdentifier>Incorrect</SelectionIdentifier>
          <Text>Incorrect</Text>
        </Selection>
```

3. Defining the Task (3)

Question data structures

`[QuestionForm]`

Describes one or more questions for a HIT, or for a Qualification test.

Elements: `QuestionIdentifier, DisplayName, IsRequired, QuestionContent, AnswerSpecification`

`[ExternalQuestion]`

Displays a web page from your website in a frame.

Elements: `ExternalURL, FrameHeight`

`[HTMLQuestion]`

Describes the HIT with HTML code, without running an external website.

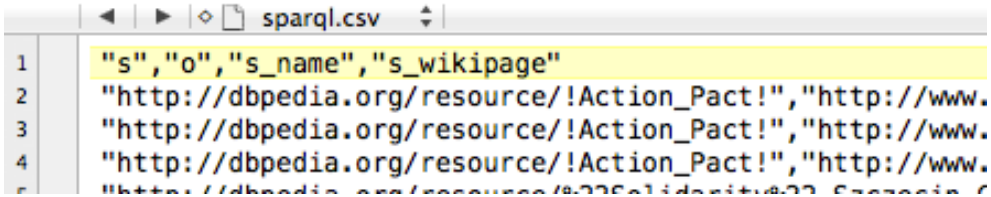
Elements: `HTMLContent, FrameHeight`

`[HITLayout]`

Reusable template to provide HITs. It is created by creating a project on the website (MTutk Web Interface).

4. Creating a Batch

- Create an input file `myhits.input`:
  - Use **tab** as separator (very sensitive)
  - First row corresponds to the variables used in the task template. In this example: `${o}`, `${s_name}` and `${s_wikipage}`



  - Each line contains the input data to generate the tasks

5. Publishing the HITs

- Run the `loadHits` command. In the example:

```
./loadHITs.sh  -label PATH/MTurkDemo/cmd/myhits
               -input PATH/MTurkDemo/cmd/myhits.input
               -question PATH/MTurkDemo/cmd//myhits.question
               -properties PATH/MTurkDemo/cmd/myhits.properties
```

- The following output files are generated:
  - Success file: Contains identifiers to the HIT that were created. This information is used to retrieve the results of these HITs.
  - Failure file: Contains the rows of the input files that could not be published in the platform.

6. Retrieving and Reviewing the Results

- The results are retrieved with the `getResults` command. In the example:

```
./getResults.sh -successfile PATH/MTurkDemo/cmd/myhits.success
                -output PATH/MTurkDemo/cmd/myhits.results
```

Success file containing the identifiers of the HITs created with `loadHITs`

- The output file contains a column named "`reject`" which should be marked in case the assignment should be rejected.

- To approve/reject HITs execute the `reviewResults` command. In the example:

```
./reviewResults.sh -resultsfile PATH/MTurkDemo/cmd/myhits.results
```

MTURK API

Select a Programming Language

http://aws.amazon.com/code/SDKs/695

http://aws.amazon.com/code/SDKs/922

http://aws.amazon.com/code/SDKs/793

http://aws.amazon.com/code/SDKs/923

Java API:
1. Pre-requisites

- Download the MTurk SDK for Java
  - http://sourceforge.net/projects/mturksdk-java/files/latest/download
- Include all the `*.jar` files from the `/lib` and `/lib/build` in your classpath
- Set up the `mturk.properties` file
- Include the following classes:
  - `com.amazonaws.mturk.service.axis.RequesterService:` Establishes the connection to the platform
  - `com.amazonaws.mturk.util.ClientConfig:` Connection specifications (path to the mturk.properties files)
  - `com.amazonaws.mturk.service.exception.ServiceException:` Handles the exceptions when contacting the platform
  - `com.amazonaws.mturk.requester.HIT:` Class for HIT management.

Java API:
2. Setting up the connection

- Create a `RequestServiceObject`
- Specify the configurations with a `PropertiesClientConfig` object. This class has two different constructors with the following arguments:
  - No arguments: the configuration is set up using the methods `setAccessKeyId`, `setSecretAccessKey`, `setServiceURL`.
  - String specifying the path to the property file mturk.properties

```
service = new RequesterService(
              new PropertiesClientConfig("./mturk.properties"));
```

Java API:
3. Creating HITs (1)

There are different ways to create HITs using the Java API:

1. Reading certain information about the HITs from **CSV files** (properties, question, input) – same files used in the CLT example.

2. Specifying certain the information about the HITs using **Java objects**
   - This method is more suitable –specially for the input specification– when consuming data directly from other applications, for example, the results of a SPARQL query.

3. Combining 1. and 2.

Java API:
3. Creating HITs (2)

1. Reading from CSV Files

```
// Locations of files containing HIT information.
String inputFile = "./src/site_category/site_category.input”;
String propertiesFile =  "./src/site_category/site_category.properties";
String questionFile =  "./src/site_category/site_category.question";
...

// Reading the information from each file.
HITDataInput input = new HITDataCSVReader(inputFile);
HITProperties props = new HITProperties(propertiesFile);
HITQuestion question = new HITQuestion(questionFile);

// Specification of output files.
HITDataOutput success = new HITDataCSVWriter(inputFile + ".success");
HITDataOutput failure = new HITDataCSVWriter(inputFile + ".failure");

// The method service.createHITs publishes the HITs in the platform.
HIT[] hits = service.createHITs(input, props, question, success, failure);
```

Creates bulk of HITs

Java API:
3. Creating HITs (3)

2. Creating Java Objects

```
// Specification of a question (String). It could be any form of Mturk questions:
// QuestionForm, ExternalQuestion, HTMLQuestion or even a simple question
// created with RequesterService.getBasicFreeTextQuestion("question here")
String question = "<HTMLQuestion xmlns=...>...</HTMLQuestion>";

// Specification of the properties.
String title = "Information about artists.";
String description = "Help us to select the most representative picture of an artist.";
double reward = 0.04;
int assignments = 3;

// The method createHIT creates and publishes a single HIT using default values
// for the HIT properties not specified in the parameters.
// There are two createHIT methods with different arguments.
HIT hit = service.createHIT(title, description, reward, question, assignments);

// We need to keep track of success/failure while publishing the HIT.
// Print in success file: hit.getHITId() + "\t" + hit.getHITTypeId();
```

Create an individual HIT

Java API:
3. Creating HITs (4)

3. Combining 1. and 2.

```
// Specification of a question (String). It could be any form of Mturk questions:
// QuestionForm, ExternalQuestion, HTMLQuestion or even a simple question
// created with RequesterService.getBasicFreeTextQuestion("question here")
String question = "<HTMLQuestion xmlns=...>...</HTMLQuestion>";

// Reading the specification of the properties from a file.
String propertiesFile =  "./src/site_category/site_category.properties";
HITProperties props = new HITProperties(propertiesFile);

// The method createHIT creates and publishes a single HIT using default values
// for the HIT properties not specified in the parameters.
// There are two createHIT methods with different arguments.
HIT hit = service.createHIT(
            props.getTitle(),
            props.getDescription(),
            props.getRewardAmount(),
            question,
            props.getMaxAssignments());
...
```

Java API:
4. Retrieving the Results

```
// Read from the success file the id of the HITs which were effectively published.
// Each row of the success file is as follows: HITid \t HITTypeID.
String successFile = "./src/site_category/site_category.success”;
HITDataInput success = new HITDataCSVReader(successFile);

// Read each line of the success file to get the hitId.
for (int i = 1; i < success.getNumRows(); i++) {

    // Retrieve the information of submitted (completed) assignments for the HIT.
    Assignment[] a = service.getAllSubmittedAssignmentsForHIT(success.getRowValues(i)[0]);

   // Iterate over each assignment to get the answer.
   for (Assignment assignment : a) {
        // Print the results and the id of the assignment in the .results file.
        // The results of each assignment are stored in assignment.getAnswer();
        // The API offers methods to parse the XML answer.
    }
}
```

Java API:
5. Approving/Rejecting a Work

```
// Read from the output file the assignements to accept/reject.
String resultsFile = "./src/site_category/site_category.results”;
HITDataInput results = new HITDataCSVReader(resultsFile);

// Read each line of the results file.
for (int i = 1; i < results.getNumRows(); i++) {
    Map<String,String> row = results.getRowAsMap(i);
    String reject = (String)row.get("reject");

   // If the column reject is not marked -> accept assignment.
   // Otherwise -> reject assignment and submit a new (available) assignment.
   if (reject.equals("")) {
        service.approveAssignment(row.get("assignmentid"), "Thank you");
    } else {
        service.rejectAssignment(row.get("assignmentid"), ”Sorry”);
        HIT hit = service.getHIT(row.get("hitid"));
        service.extendHIT(row.get("hitid"), hit.getNumberOfAssignmentsPending()+1, (long)3600.00);
    }
}
```

Choosing the Right Tool

Tool Comparison Table



	Web Interface	Command Line Tools	API
Creating and managing your work			
Start with our sample HTML templates	✔		
Create HITs visually with an HTML editor	✔		
Create and manage your HITs in batches	✔	✔	
Support tab-delimited input files	✔	✔	
Manage HITs created via the CLT or API		✔	✔
Define HITs in XML		✔	✔
Host HITs on your own server		✔	✔
Can be integrated into back-end systems			✔
Create notifications indicating when HITs are updated			✔

Source: https://requestersandbox.mturk.com/tour/choose_the_right_tool

SUMMARY

Project/HIT Creation & Design (1)

- The requester is able to create **projects** or **individual HITs**

- Then, the **HIT properties** must be specified:
  - General information: includes the title and description of the HIT, as well as keywords which are used by worker for searching HITs.
  - HIT duration time: time allotted to solve the HIT (before it is given to another worker).
  - HIT life time: how long will the HIT be available on the platform.
  - # Assignments: number of different persons that will perform the same HIT.
  - Reward: payment for correctly solving each assignment.

Project/HIT Creation & Design (2)

- Selection of **MTurk quality control** mechanisms:

Worker requirements

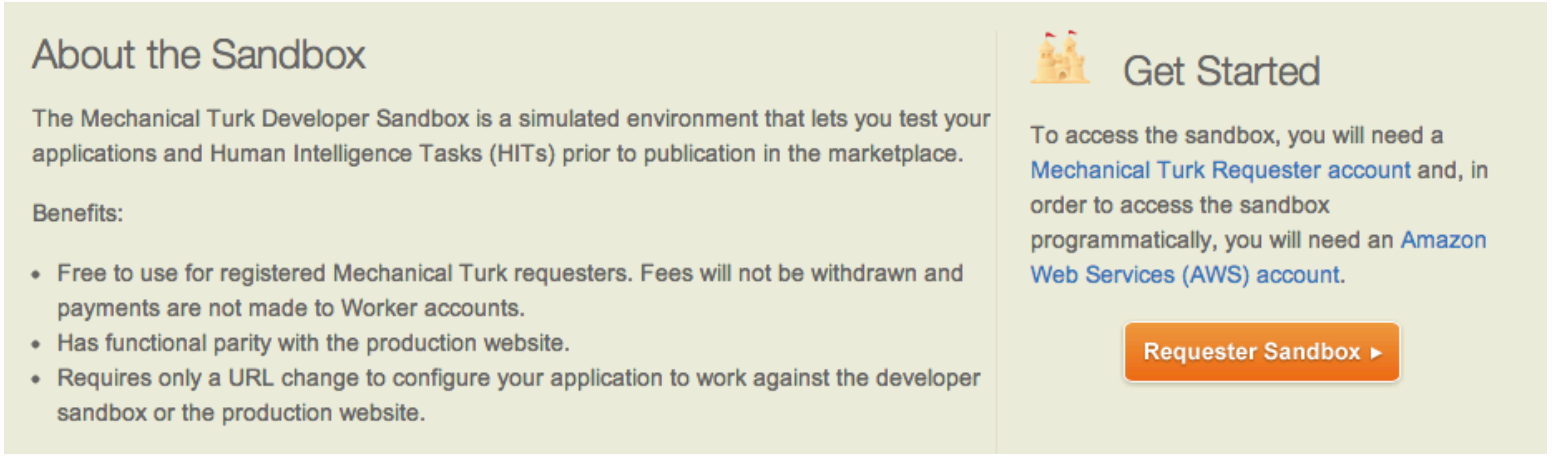
- **High quality workers**
  - Masters
  - Photo moderation masters
  - Categorization masters

  Masters expect higher rewards
  MTurk charges 20% for masters
- **System qualifications**
  - Location by country
  - HIT submission rate (%)
  - HIT approval/rejection rate (%)
  - (Absolute) Number of HITs approved
- **Qualification types**
  - Simply granted or attributed via customized tests

- These filters are automatically performed by the platform

HIT Test

- **Best practice**: Always test your HITs before publishing them
  1. Perform **technical tests** (both as requester and worker) in the MTurk Sandbox environment.



Source: https://requester.mturk.com/developer/sandbox

  2. Publish a small subset of tasks in the production site to test **usability** and **responsiveness**.

Run live HITs

- **HIT publication:**
  - Make the HITs available to the workers
- **Review of the results:**
  - Monitor the submitted assignments constantly
  - Download the results
  - Accept/reject assignments
  - Block spammers (optional)
- **Update HIT/Project:**
  - Extend/expire HITs or modify other HIT properties
  - Add additional assignments

References

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- MTurk Java API
  http://people.csail.mit.edu/glittle/MTurkJavaAPI/