Intelligent Tagger for E-Learning

Ubayeed Syed

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Committee:

Dr.Susan Gauch (chair)

Dr.Costas Tsatsoulis

Dr.Arvin Agah

Presentation Outline

- Introduction
- Objective
- Technical Background
- Design Considerations
- Implementation
- Evaluation
- Conclusion and Future Work

Introduction ..

- Popularity of XML
  - Data storage, Information Exchange
  - Describe the data in a structured manner
  - Separation of content and presentation
  - Used in Educational Technology
- Basic issues in Education Technology
  - Produce and deliver quality of content
  - Mix and match content from other resources
  - Develop interchangeable content
  - Basic unit is called ‘Learning Object’
- Learning Objects
  - Entities used, re-used or referenced during technology supported learning

Introduction

- Intelligent Knowledge Management Environment *(IKME)*
  - Reusability & Extensibility.
  - Faster delivery of content.
  - Using XML as data format for publishing.

Objective

- System to Learn the users preferences from the users history
- Help decrease the effort required to create new Learning Objects.

Technical Background ..

- Reusable Learning Objects
  - Problems with traditional content development techniques.
  - Chunks of information.
  - Reusability.
  - Reduction of development time.

Technical Background ..

- Native XML databases
  - Databases designed specially to store *XML* documents.
  - Defines a (logical) model for an *XML* document and stores and retrieves documents according to that model.
  - Has an *XML* document as its fundamental unit of storage.
  - Provides support features commonly found in common RDBMS.

Technical Background

- XML-RPC
  - specification and set of implementations that allow remote procedure calls.
  - Uses HTTP as transport and XML as encoding.
  - Allows integration of disparate systems running in different environments.
  - Serializing & Un-Serializing of data (XML format).

Design Considerations

Process of Creating Learning Objects

- Initially Sample Template initialized with blank values.
- Sample template is loaded and displayed on the screen.
- Store the Learning Object into database.
- For each enumerated field determine the default values.
- Update Sample Template (XML file) with the default values of enumerated fields.

Design Considerations..

- Why eXist ?
  - Limitations of flat-file mechanism
    - Data is isolated and separated
    - file structure has to be defined
    - Incompatible file formats
    - Change in file structure may need a change in the code
    - wastage of space.

Design Considerations ..

- Limitations of Cookies
  - Can identify only the last preference of the user but not the longer user activity history trend.

Design Considerations ..

- Database approach chosen because
  - No wastage of space
  - No redundancy in storing and defining data
  - Flexibility to choose the history size
  - Documents are stored in chronological order, hence recent user activity can be known.

Design Considerations

- Determining the default value from the users history
  - From the Schema, identify the enumerated fields.
  - For each enumerated field, Query the eXist database for recent *N* Learning Objects.
  - Extract the enumerated field content from the results.
  - Choose the most common value as the default value.
  - Data structures used are one-dimensional arrays.

Implementation

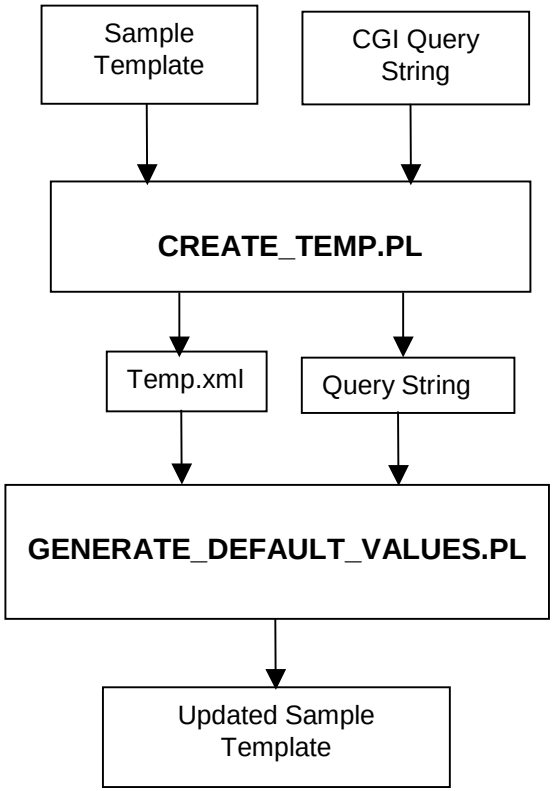
- Perl Version 5.0 and later
- Apache Web Server
- eXist V0.9 and later
- Additional Perl Modules
  - RPC::XML
  - RPC::XML::Client
  - XML::Twig
  - XML::Sablotron
  - Data::Dumper
  - CGI

Implementation ..

- Major sections:
  - Parse_Schema.pl
  - Create_Temp.pl
  - Generate_Default_Values.pl

Implementation ..

- System Design



Implementation ..

- System Inputs
  - *Sample Template file:*

    XML file, that has all the required fields for creating Learning Object.
  - *CGI Query String:*

    The array of attribute values obtained from the users Web Page as a cgi query string.

Implementation ..

- Example of Sample Template

```
<object>
  <metadata>
        <portionmark></portionmark>
        <environment></environment>
          ….
   </metadata>
   …….
   <tracking>    …….
   </tracking>   …….
</object>
```

Empty enumerated fields

Implementation ..

- System Output - *Updated Sample Template*
  - The Sample template now has default values assigned for each enumerated field.

Implementation ..

- Example of Updated Sample Template

```
<object>
   <metadata>
        <portionmark> T </portionmark>
        <environment> NBC </environment>
      ….
    </metadata>
 </object>
```

Updated enumerated fields

Implementation ..

- Intermediate Output - *Temp.xml*
  - Temporary XML file that has all the sub-fields of a highest level field in the XML Schema.
  - Its overwritten each time when user creates new Learning Object.

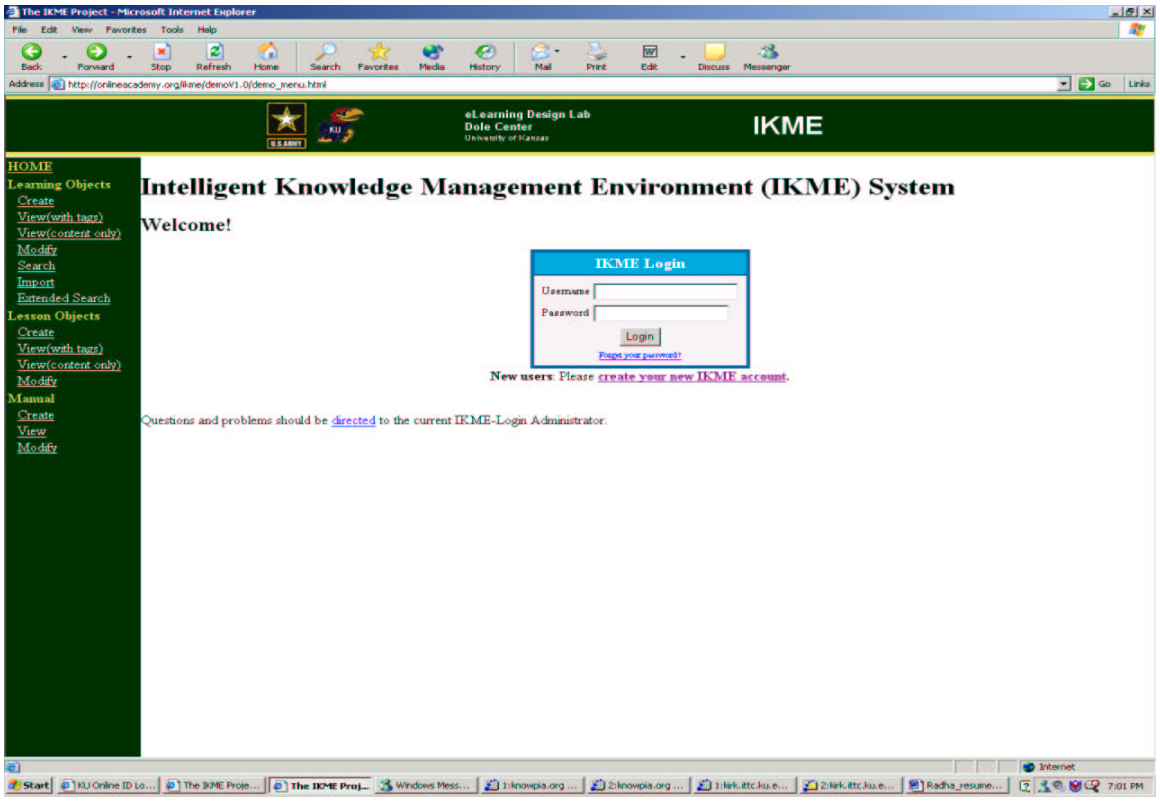
Implementation

- **Example of *Temp.xml:***

```
<metadata>
        <security>
            <classification> Confidential </classification>
            <portionmark/> T </portionmark>
        </security>
        ……….
        <description>
            <object_category> preparation </object_category>
            <object_type/>
              <proponent/>
              <vital_record/>
          </description>
        ……..
</metadata>
```

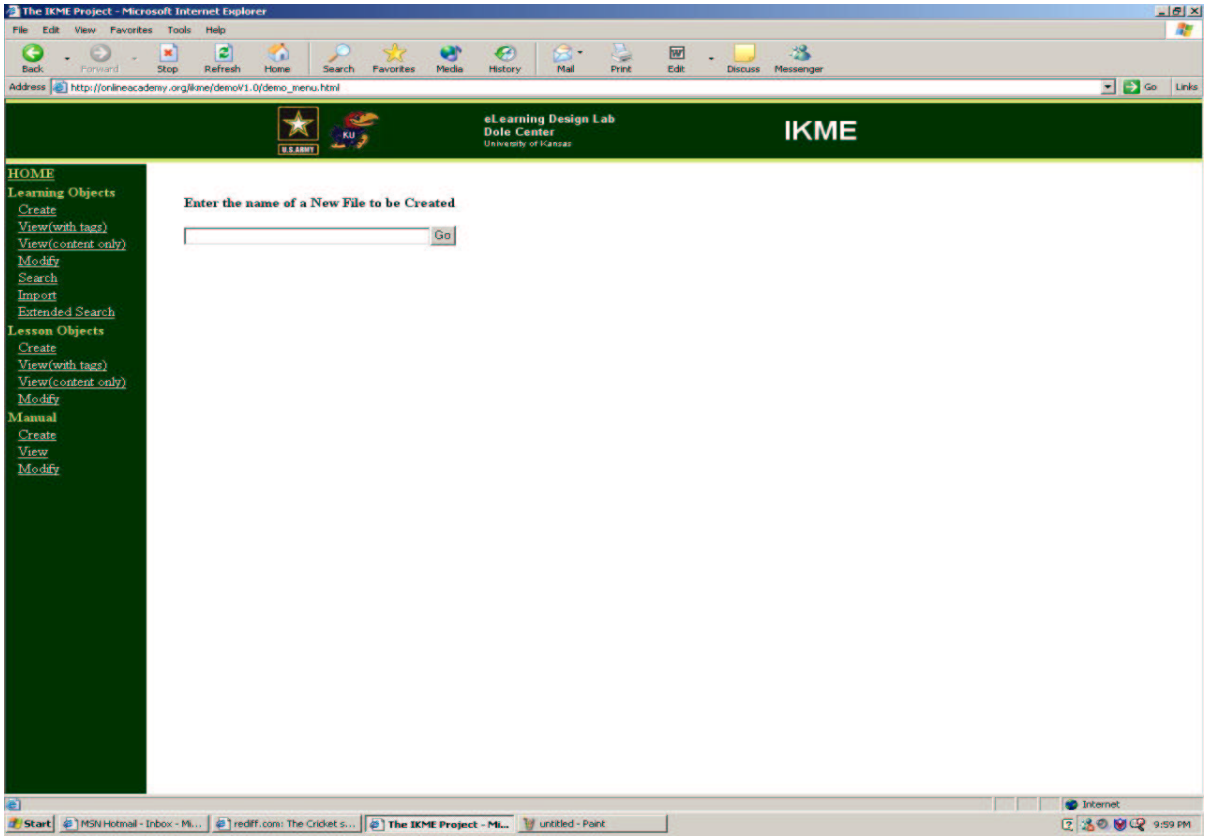
Evaluation

- Login Page - Restricts access to DB



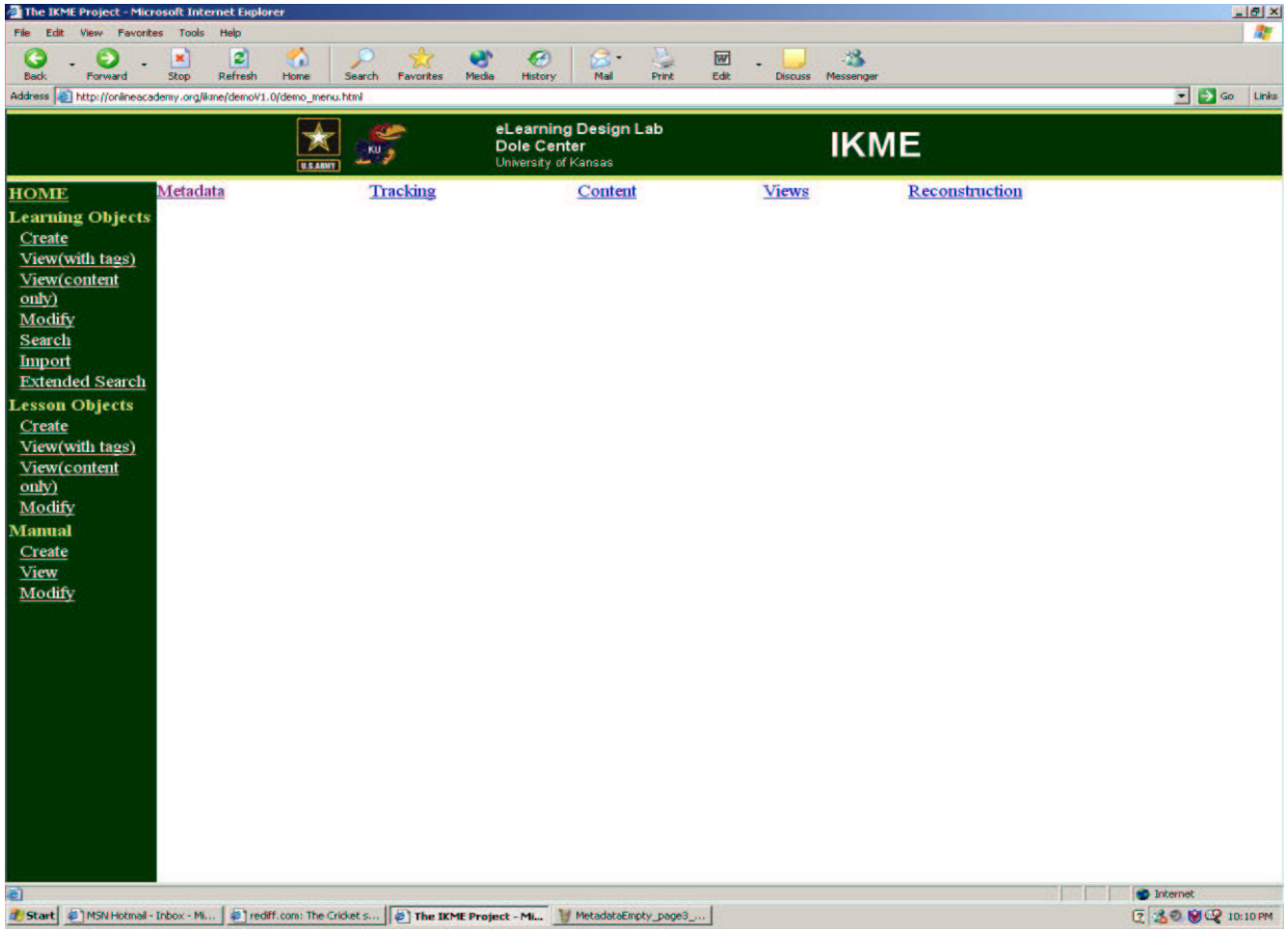
Evaluation ..

- Name the Learning Object



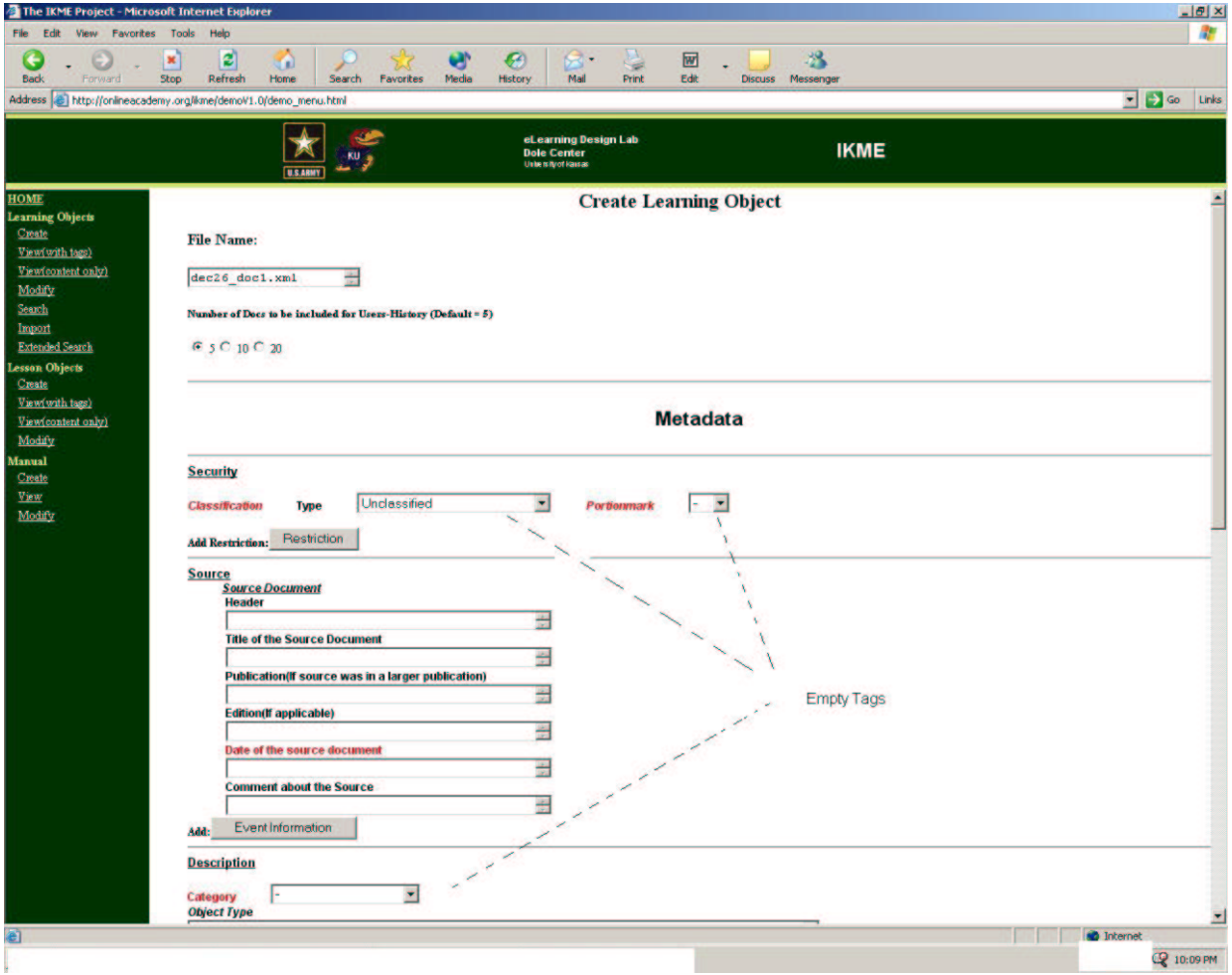
Evaluation ..

- Highest level fields of Learning Object



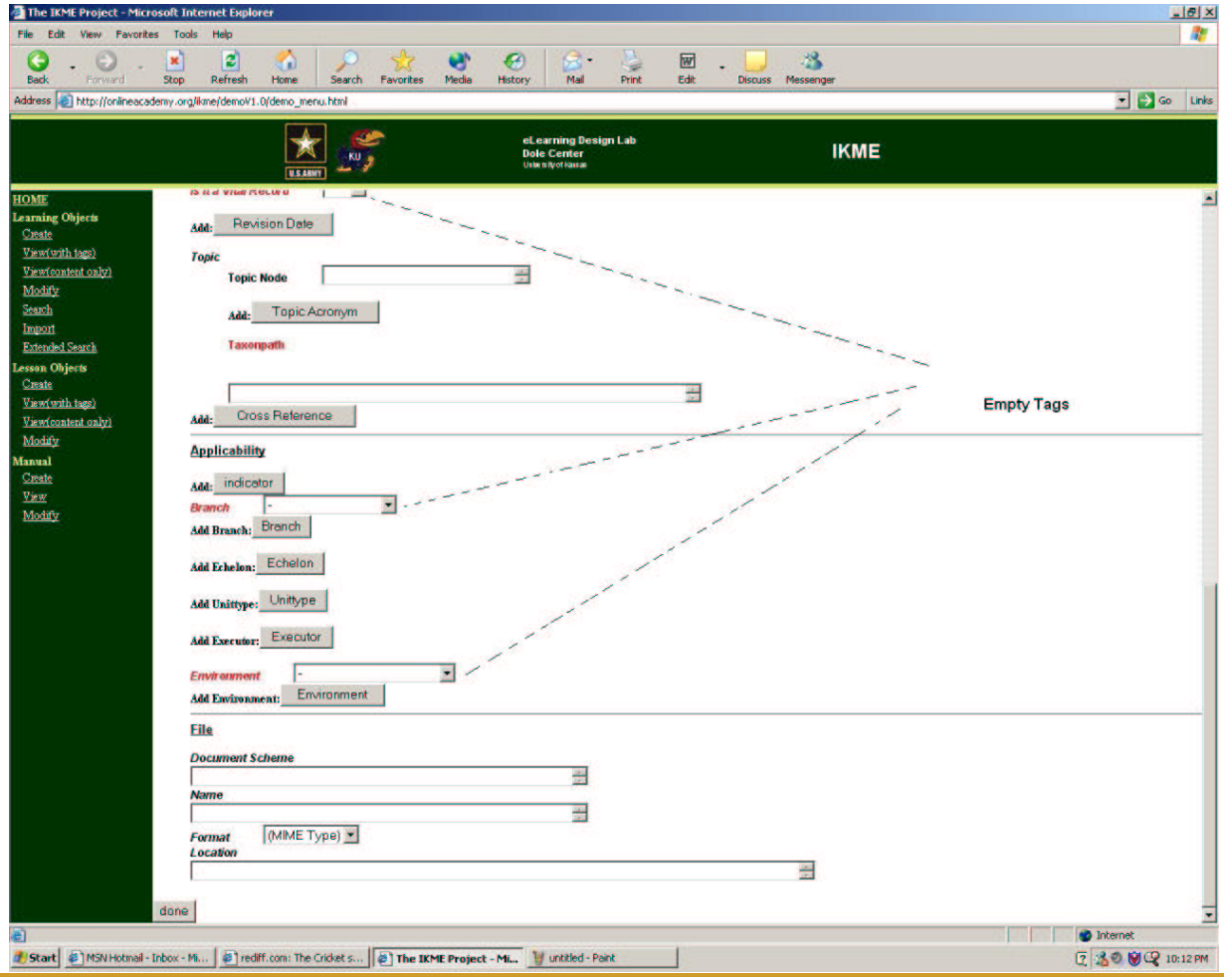
Evaluation ..

- Metadata and its sub-fields



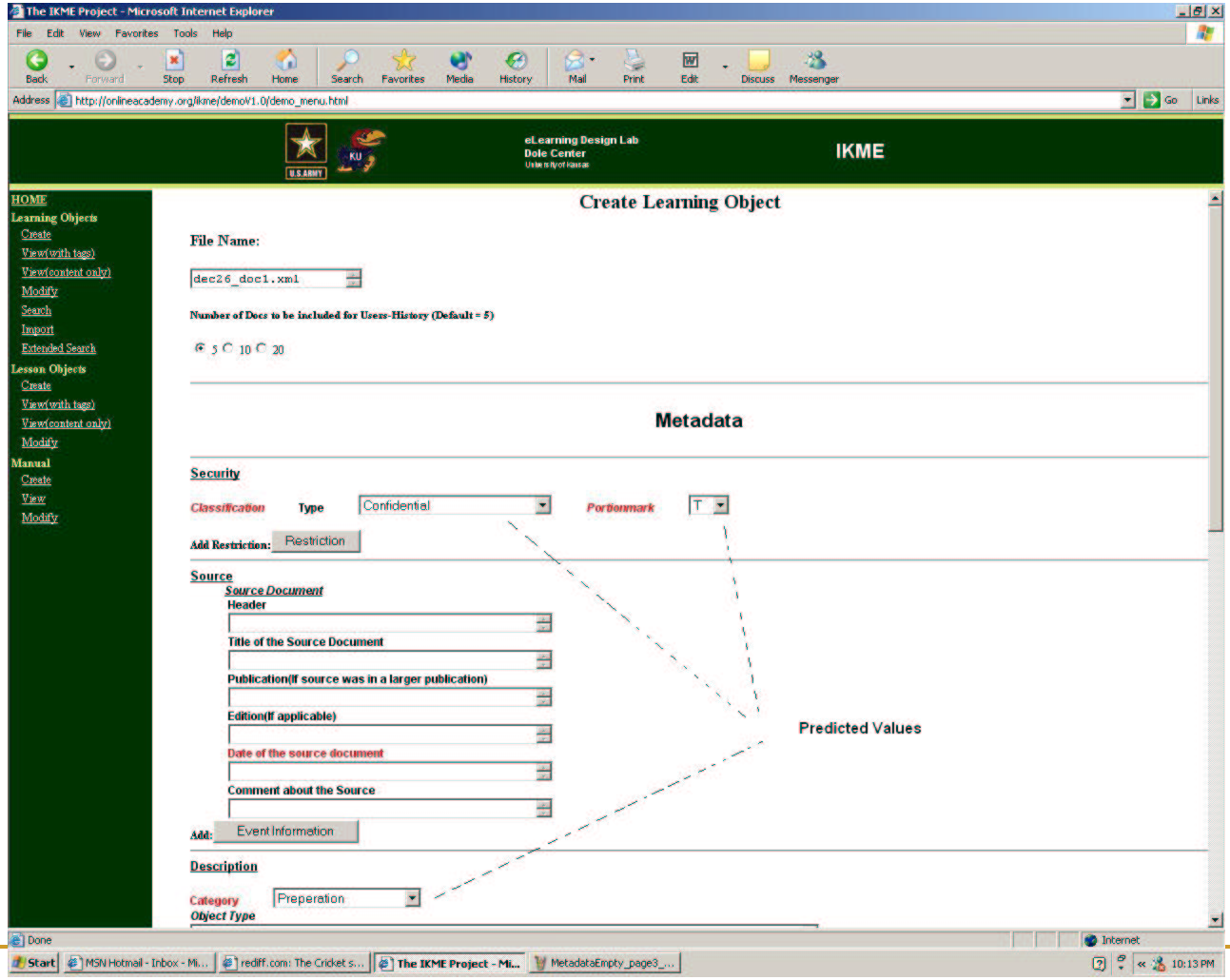
Evaluation ..

- Metadata and its sub-fields



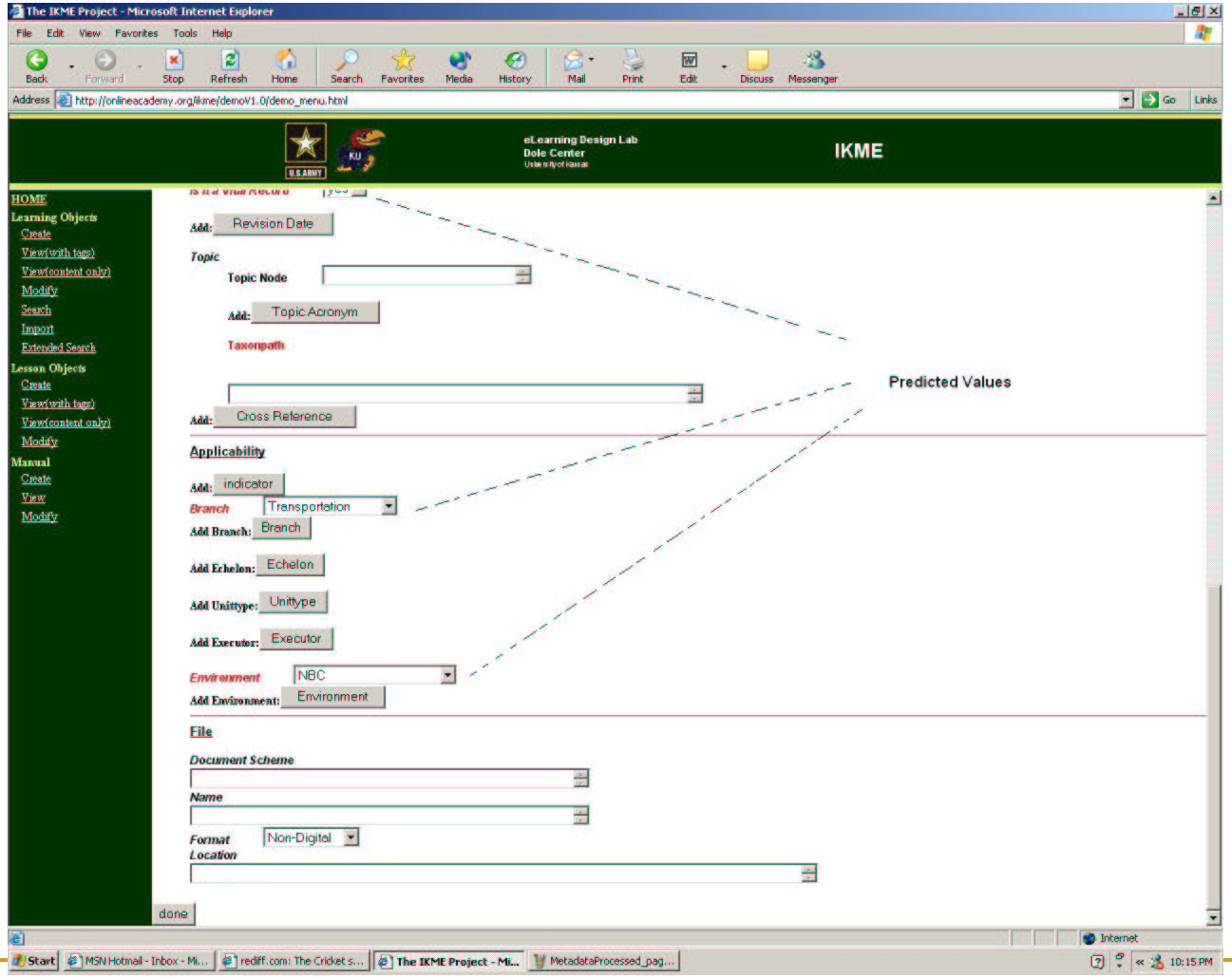
Evaluation ..

- Metadata – next logins, enumerated fields with default values



Evaluation

- Metadata – next logins, enumerated fields with default values



Benefits and Costs

- Benefits
  - Nothing has to be put on clients machine, user can thus work from any machine.
  - No redundancy in storing and defining data.
  - User has the flexibility to choose the total Learning Objects for his history.

Benefits and Costs continued

- Costs
  - User must login each time.
  - Cost involved in accessing and updating the database.

    - Database has to be queried M times, M = Size of history.

Future work

- Extend the functionality of login system to support multiple users with individual logins.
- Also, learn the preferences on optional enumerated fields.
- Investigate the size of history to get best default values.
- Investigate the methods of weighting recent values higher than older values.

Questions ?