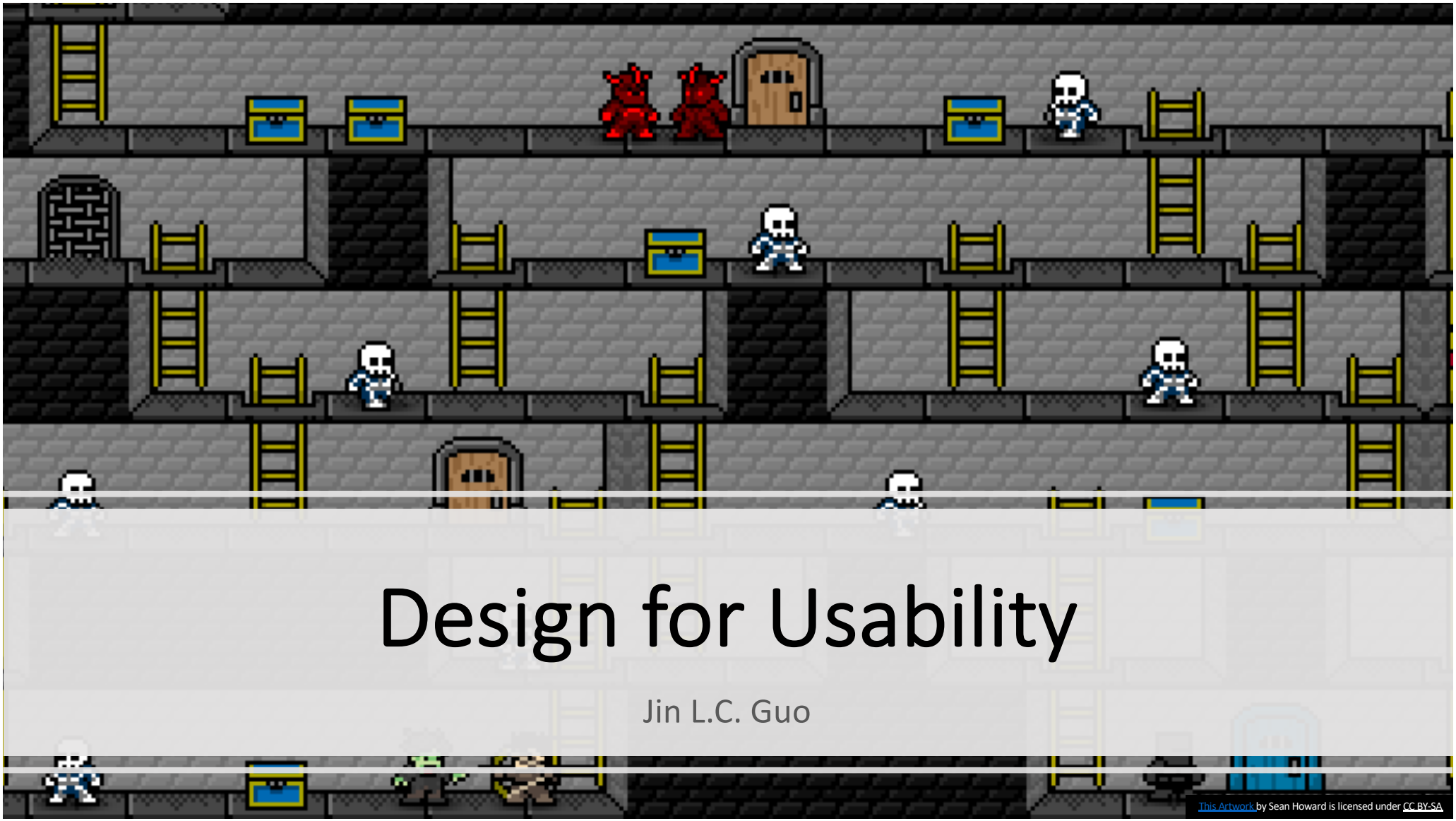

Design for Usability

Jin L.C. Guo

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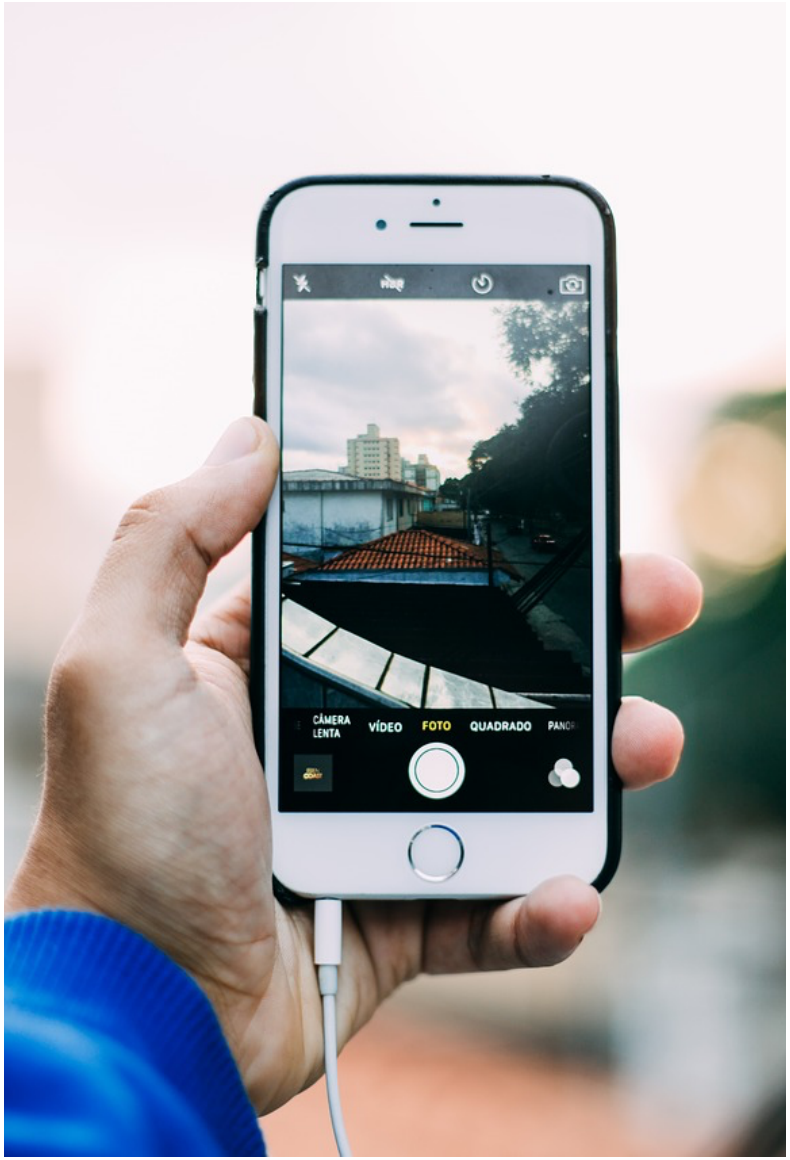
Usability

- **A Quality Attribute**

  How easy and pleasant user interfaces are to use.

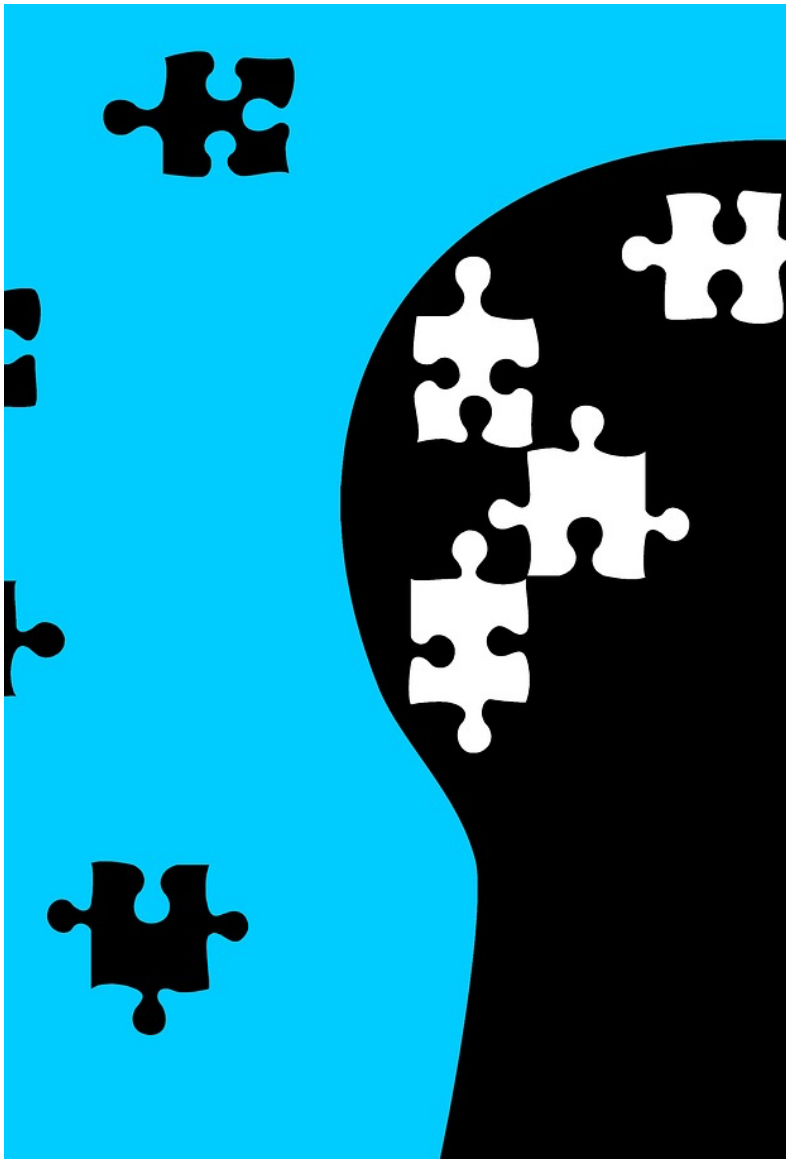
Usability

- **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?



Usability

- **Efficiency**: Once users have learned the design, how quickly can they perform tasks?



Usability

- **Memorability**: When users return to the design after a period of not using it, how easily can they re-establish proficiency?

Usability

- **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

Usability

- **Satisfaction**: How pleasant is it to use the design?

User Testing

- Find representative users
- Ask users to perform representative tasks
- **Observe**

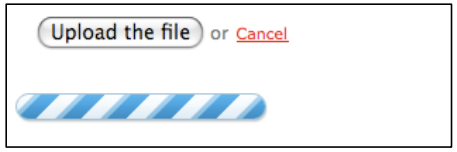
  what the users do;

  where they succeed;

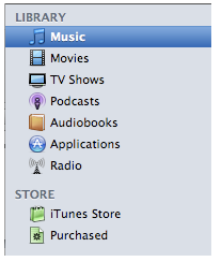
  and where they have difficulties with the user interface

Usability Heuristics for User Interface Design

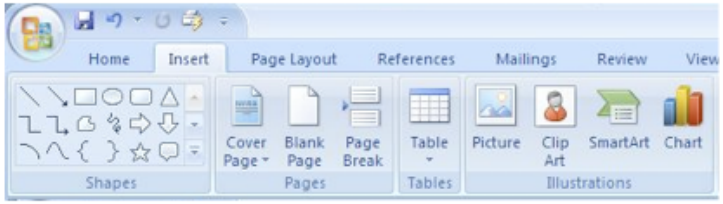
Visibility of system status



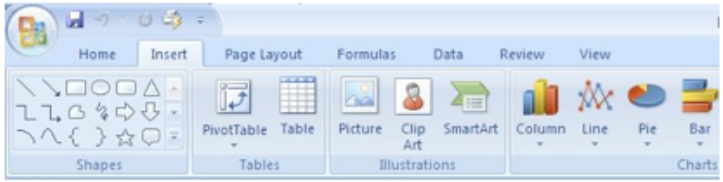
Match between system and the real world



User control and freedom



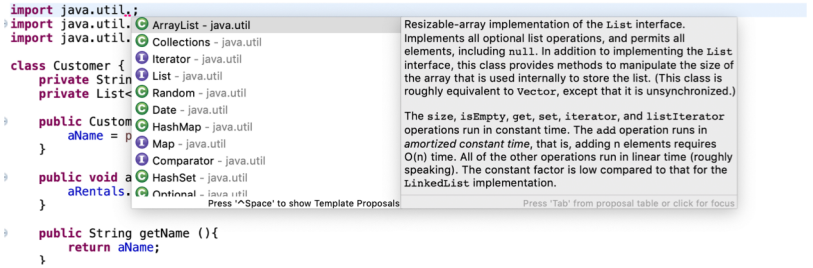
Consistency and standards



Usability Heuristics for User Interface Design

Error prevention

Recognition rather than recall



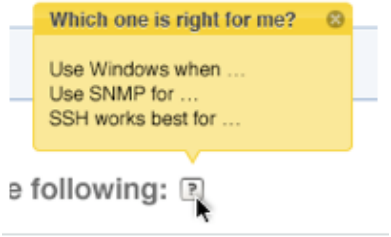
Flexibility and efficiency of use

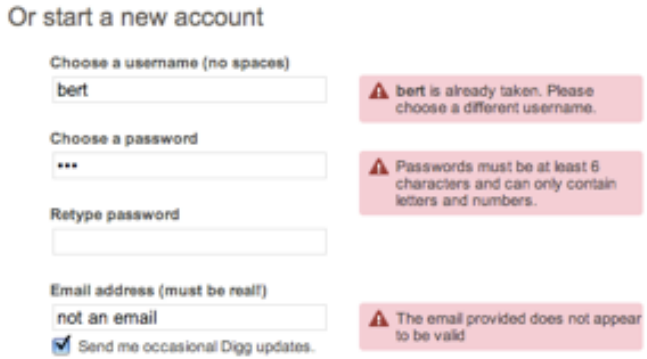
Usability Heuristics for User Interface Design

Aesthetic and minimalist design

Help users recognize, diagnose, and recover from errors

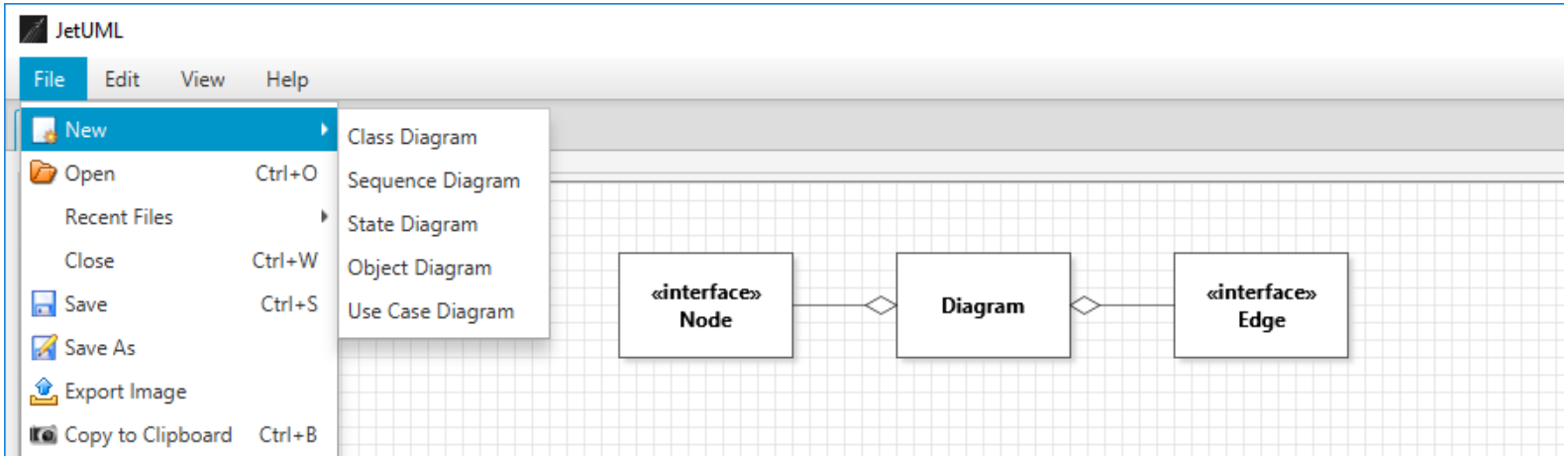
Help and documentation





Case Study - JetUML

- Evaluate JetUML tool using the Usability Heuristics.
- Finish the activity form.



Why API Usability

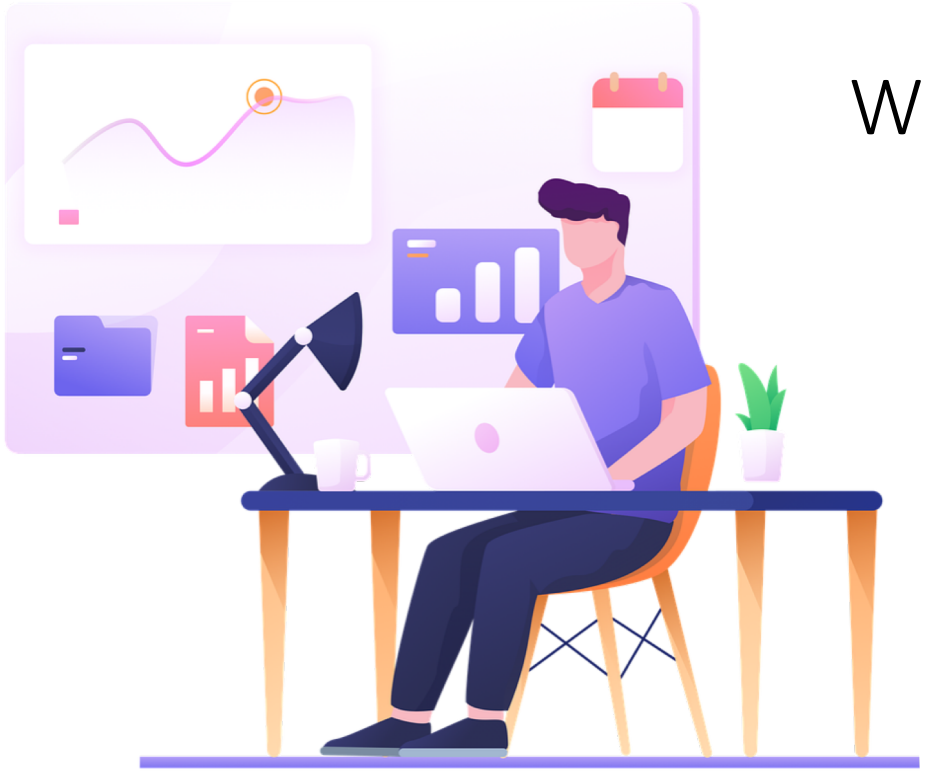
- APIs provide a mechanism for code reuse.
- Nearly every line of code most programmers write will use API calls.
- API for accessing system resources
- API for Web services

Why API Usability

- APIs are difficult to use.

  Causes includes the semantic design of the API, the level of abstraction, the quality of the documentation, error handling, and unclear preconditions and dependencies

  Resulting bugs and/or significant security problems.



Why API Usability

- “Programmers Are Users Too”
- Developer Experience Matters

API users were between 2.4 and 11.2 times faster when a method was on the expected class, rather than on a different class.

Stylos, J. and Myers., B.A. The implications of method placement on API learnability. FSE 2008. ACM

API Designers in the Field

- In a recent study, only four of 24 professional API designers have learned anything about API design in school

- API designers must have a strong understanding of software engineering, but also have the ability and personal drive to stay focused on their user's perspective as their primary goal

Murphy, L., Kery, M.B., Alliyu, O., Macvean, A. and Myers, B.A., 2018, October. API Designers in the Field: Design Practices and Challenges for Creating Usable APIs. *VL/HCC 2018*. IEEE.

User Centered Methods during API Design

Usability Studies

Design Reviews

Heuristic Evaluations

Visibility of system status

It should be easy for the API user to check the state (such as whether a file is open or not), and mismatches between the state and operations should provide appropriate feedback (such as writing to a closed file should result in a helpful error message);

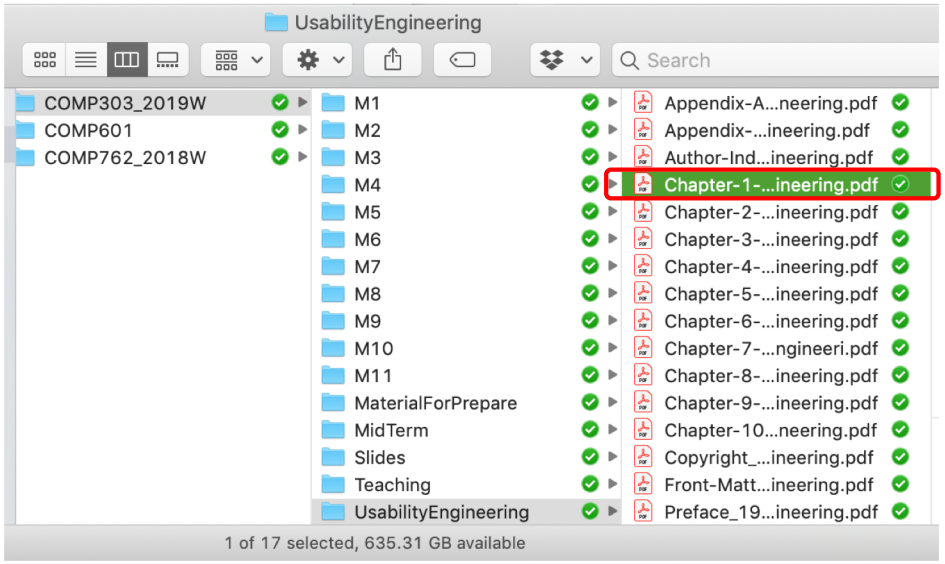
Match between system and the real world

Names given to methods and the organization of methods into classes should match the API users' expectations.

Match between system and the real world

java.io

public class **File** extends Object implements Serializable, Comparable<File>



An abstract representation of file and directory pathnames. User interfaces and operating systems use system-dependent *pathname strings* to name files and directories. This class presents an abstract, system-independent view of hierarchical pathnames.

User control and freedom

API users should be able to abort or reset operations and easily get the API back to a normal state

Consistency and standards

All parts of the design should be consistent throughout the API.

Consistency and standards

javax.xml.stream

interface **XMLStreamWriter**

The XMLStreamWriter interface specifies how to write XML.

void **writeEmptyElement**(String namespaceURI, String localName)
throws XMLStreamException

Writes an empty element tag to the output

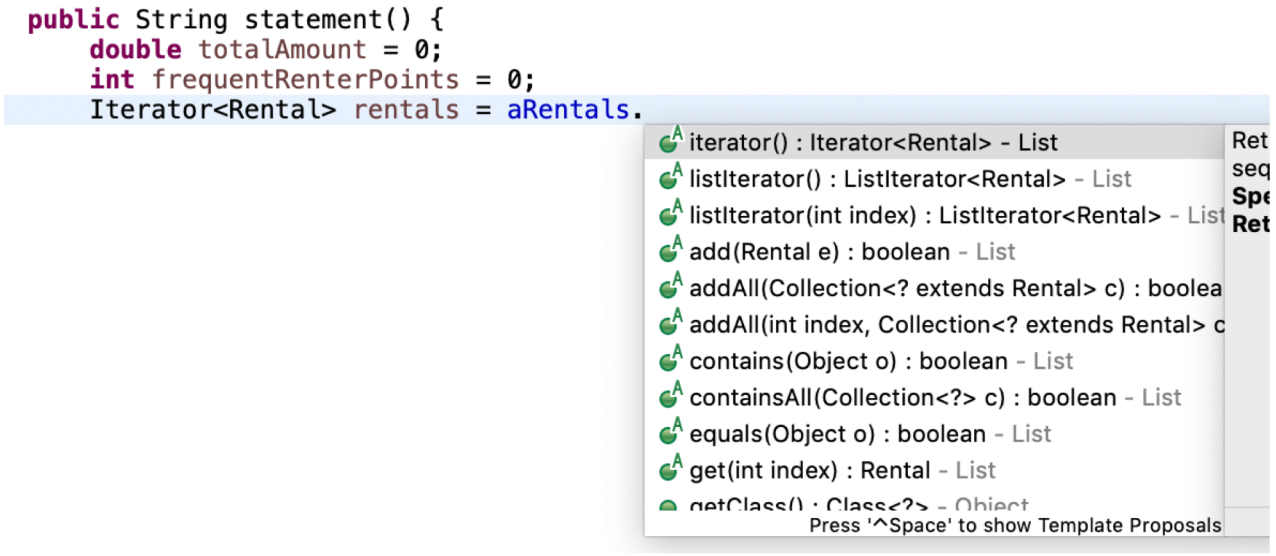
void **writeEmptyElement**(String prefix, String localName, String namespaceURI)
throws XMLStreamException

Error Prevention

The API should guide the user into using the API correctly, including having defaults that do the right thing.

Recognition rather than recall

Make the names clear and understandable, enabling users to recognize which element they want.



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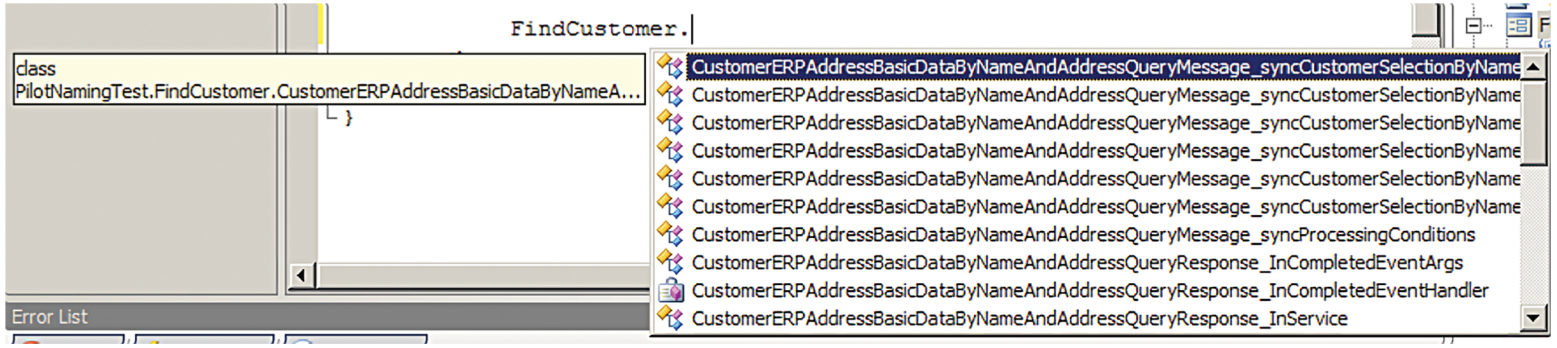

Myers, B.A. and Stylos, J., 2016. Improving API usability. *Communications of the ACM*, *59*(6), pp.62-69.

More heuristics

Flexibility and efficiency of use

Aesthetic and minimalist design

Help users recognize, diagnose, and recover from errors

Help and documentation

Final words

- Usability is a key quality attribute of API and should be evaluated as other quality attributes.
- When designers decide usability must be compromised in favor of other goals, this decision will be made knowingly, and appropriate mitigations will be put in place.