Software Measurement

Software Economics 2010

Outline

- Last week
  - Measures and metrics, what kinds of different metrics exist
- Today
  - Function point analysis + Home assignment
- Next week
  - Introduction of metrics in organizations
  - Application of metrics
- Fourth week
  - Presentation of group-work assignments

Agenda

1. Function point analysis

Function Point Analysis

- Function point is a measure of the amount of business functionality in a software application
  - The larger number of FP-s the more functionality
- Function Point Analysis is a method of using FP-s to break down applications into smaller components and measure their size

Function Point Analysis

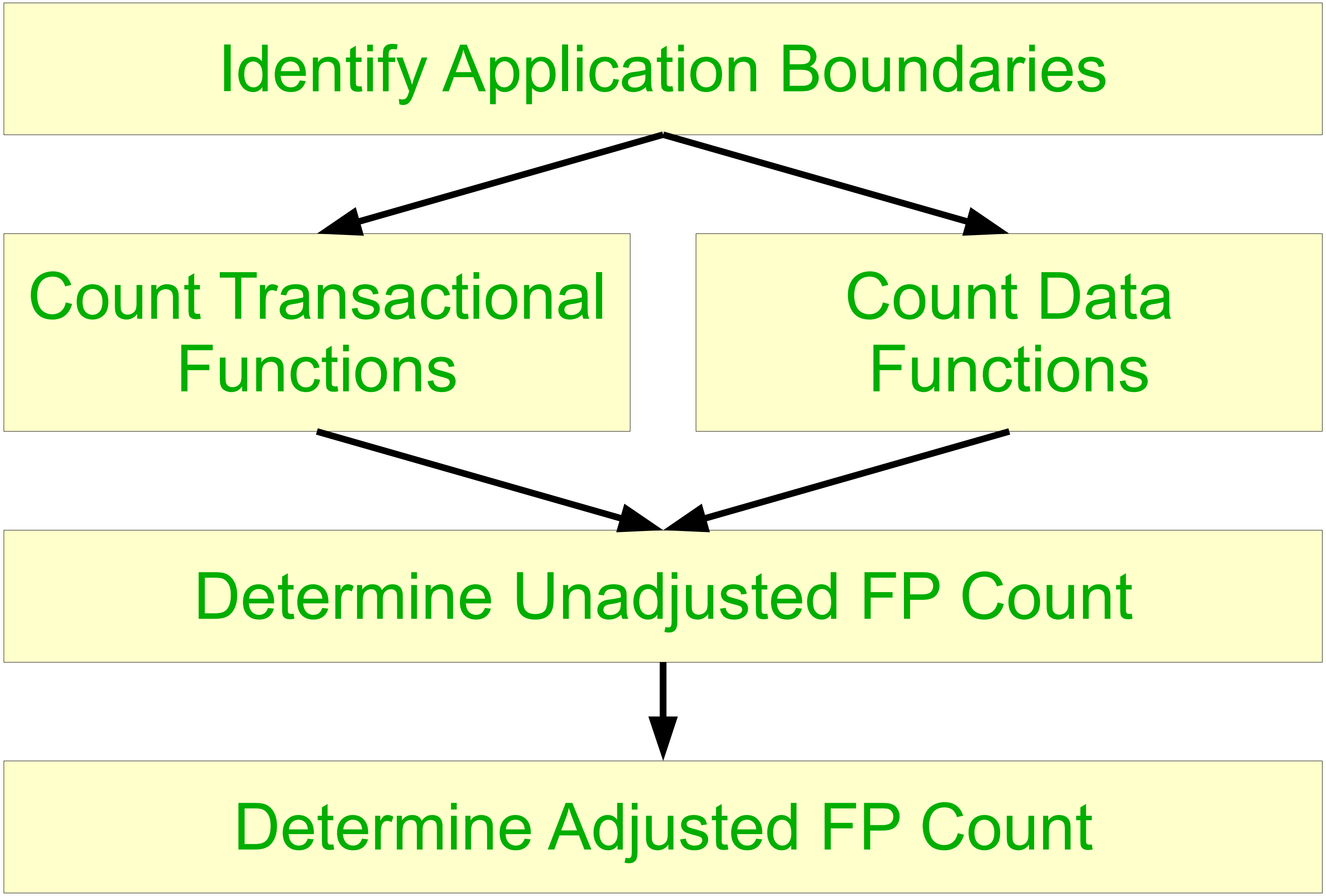
Performed from sophisticated user point of view!

Software Applications

- Interwoven set of defined elementary processes (=functions)

- Data in motion = Transactions
  - Moving data from application to outside or from outside to application
- Data at rest
  - Data storage

Function Points – Context



Identify Application Boundaries

Count Transactional Functions

Count Data Functions

Determine Unadjusted FP Count

Determine Adjusted FP Count

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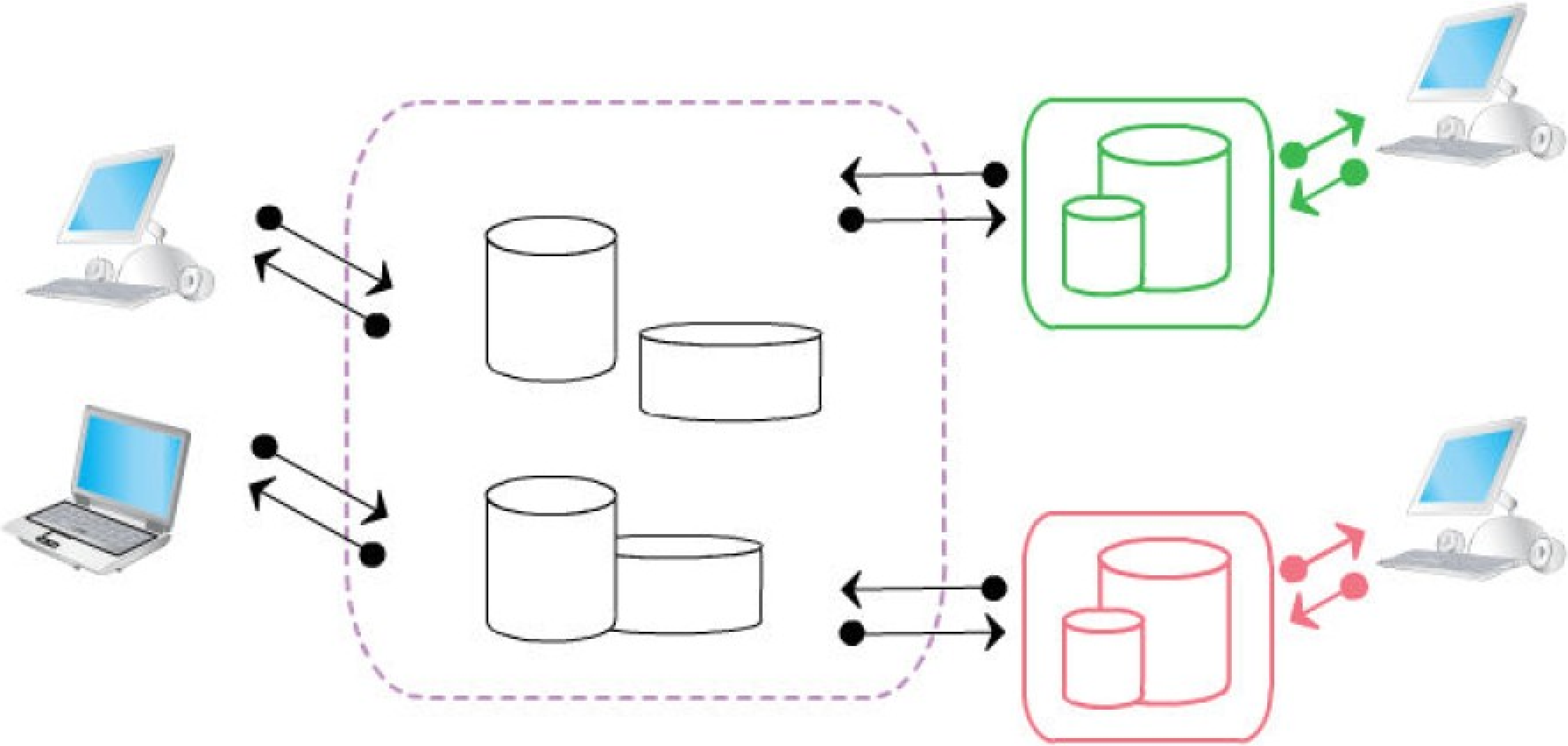
Function Points – Context

Identify Application Boundaries

Application Boundary

- Border between application being measured and external applications



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Exercise

- Assume we are building a web application that aggregates and shows stream of events in a team:
  - Anton fixed a bug
  - Mark added new task
  - Anton committed new code change
- Everybody can sign-up
- Create new streams
- Data is stored in database

What functionality is part of application?

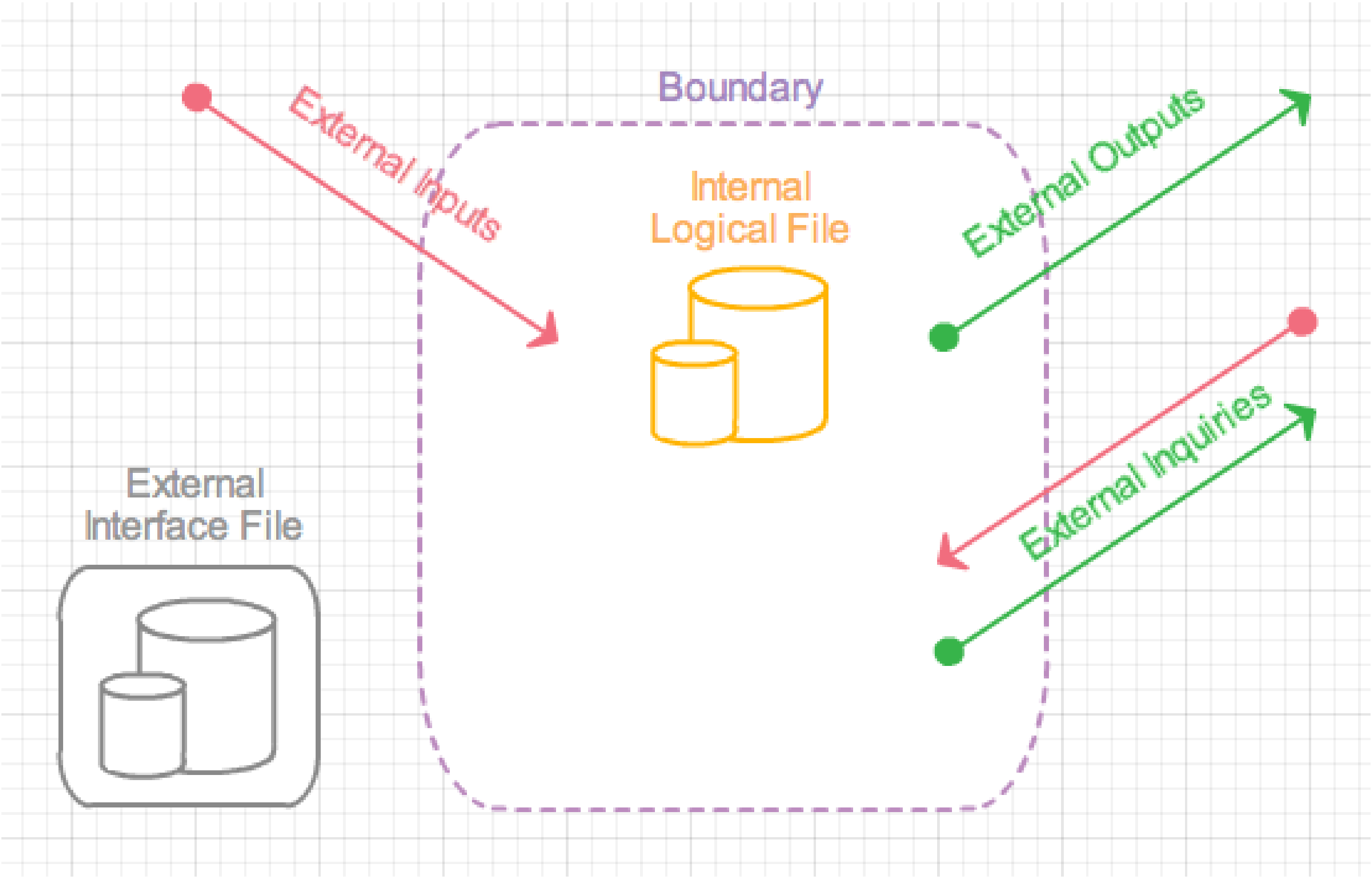
Exercise: Within Boundaries or Not?

- Authentication
- Configuration of connections to tools team is using (bug&task tracking, code management)
- Organization/optimization of database files
- Forwarding events to Twitter/Facebook
- Sending HTML/JS/CSS over HTTP to browser

Components

- Transactions
  - External Inputs (information input)
  - External Inquiries (no derived data, data retrieval):
  - External Outputs (derived data, algorithms):
- Data at rest
  - Internal Logical Files (maintained internally)
  - External Interfaces Files (maintained by external apps)

Components



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Components

- All components rated as Low, Average or High
  - Based on complexity
- Points are assigned based on the rating

How would you evaluate complexity of components?

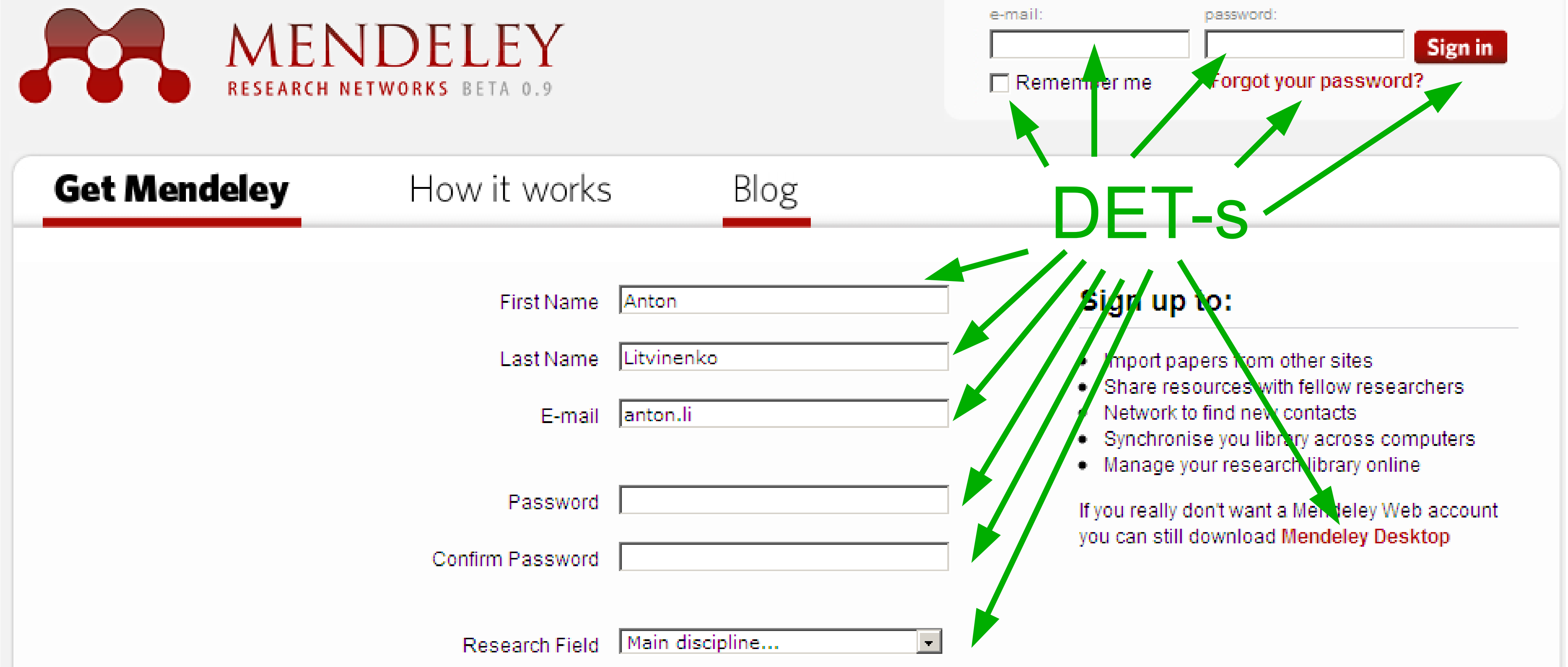
Break things up into even smaller pieces!

- Transaction
  - Dependent on data transferred
  - Dependent on data stored
- Data at rest
  - Dependent on data stored
  - Independent of data transferred

Smaller Pieces

- Data Element Type (DET)
  - Dynamic user recognizable fields
  - Controls (things that invoke actions)
  - Used to estimate complexity of both transactions and data
- Repeatable data element types → "Recursive DET"

Data Element Type – Examples



MENDELEY

RESEARCH NETWORKS BETA 0.9

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password:

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First Name	Anton
Last Name	Litvinenko
E-mail	anton.li
Password	
Confirm Password	
Research Field	Main discipline...

Sign up to:

- Import papers from other sites
- Share resources with fellow researchers
- Network to find new contacts
- Synchronise you library across computers
- Manage your research library online

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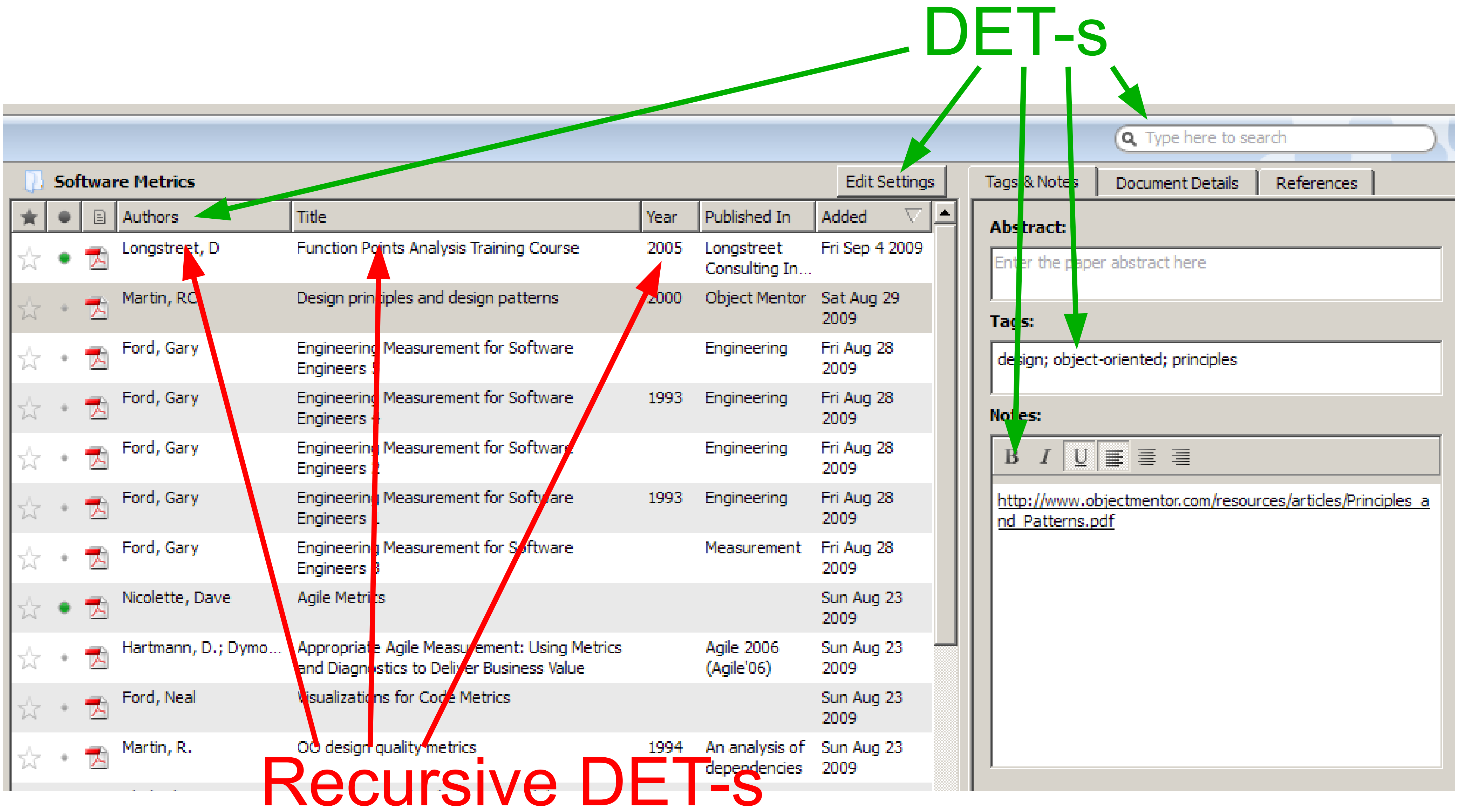
DET-s

Data Element Type – Examples



DET-s

Recursive DET-s

Software Metrics

★	●	🗎	Authors	Title	Year	Published In	Added
☆	●	🗎	Longstreet, D	Function Points Analysis Training Course	2005	Longstreet Consulting In...	Fri Sep 4 2009
☆	•	🗎	Martin, RC	Design principles and design patterns	2000	Object Mentor	Sat Aug 29 2009
☆	•	🗎	Ford, Gary	Engineering Measurement for Software Engineers 5		Engineering	Fri Aug 28 2009
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☆	•	🗎	Ford, Gary	Engineering Measurement for Software Engineers 3		Measurement	Fri Aug 28 2009
☆	●	🗎	Nicolette, Dave	Agile Metrics			Sun Aug 23 2009
☆	•	🗎	Hartmann, D.; Dymo...	Appropriate Agile Measurement: Using Metrics and Diagnostics to Deliver Business Value		Agile 2006 (Agile'06)	Sun Aug 23 2009
☆	•	🗎	Ford, Neal	Visualizations for Code Metrics			Sun Aug 23 2009
☆	•	🗎	Martin, R.	OO design quality metrics	1994	An analysis of dependencies	Sun Aug 23 2009

Abstract:

Enter the paper abstract here

Tags:

design; object-oriented; principles

Notes:

B I U

http://www.objectmentor.com/resources/articles/Principles_and_Patterns.pdf

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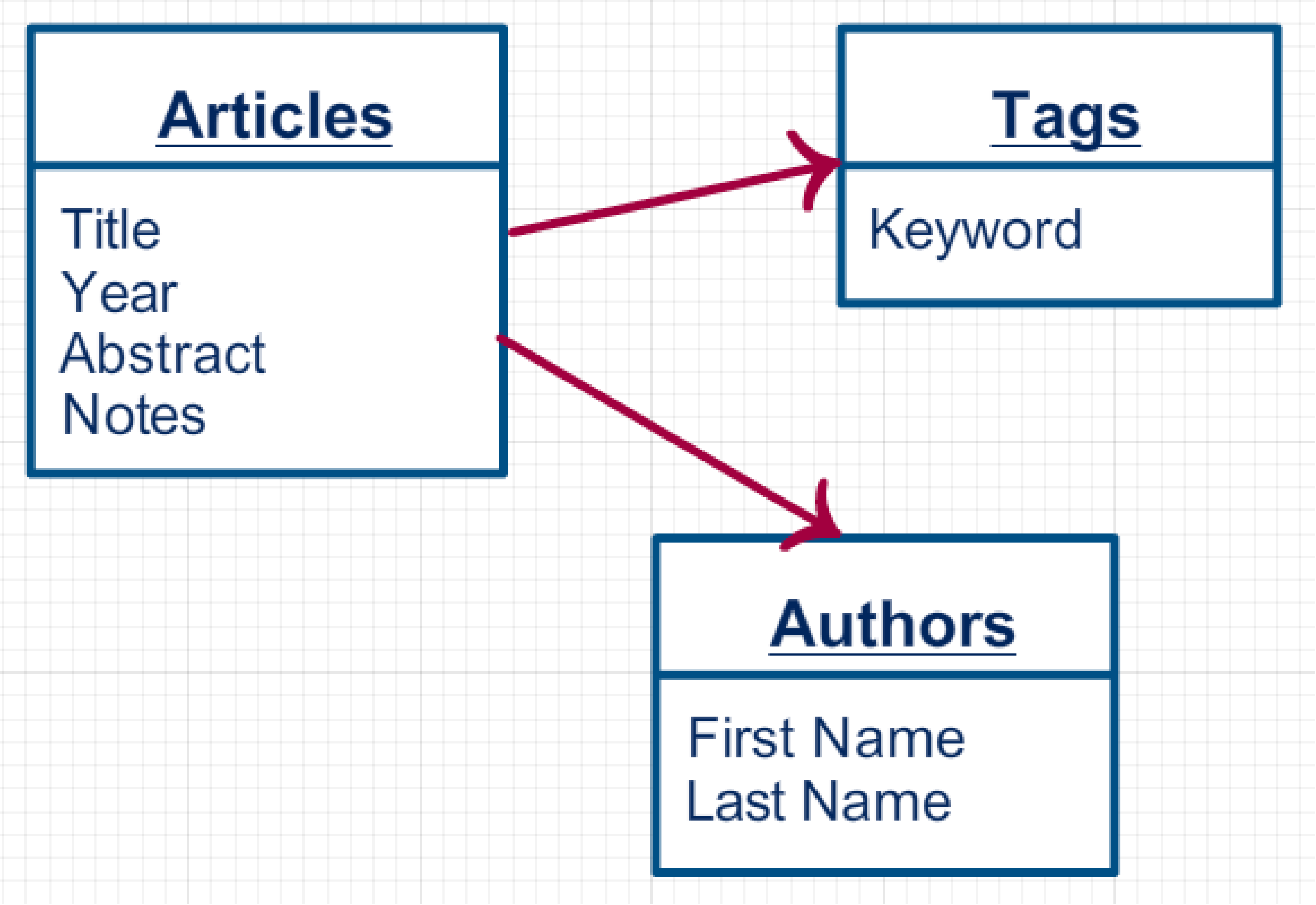
Data Element Type – Examples



Articles

Title
Year
Abstract
Notes

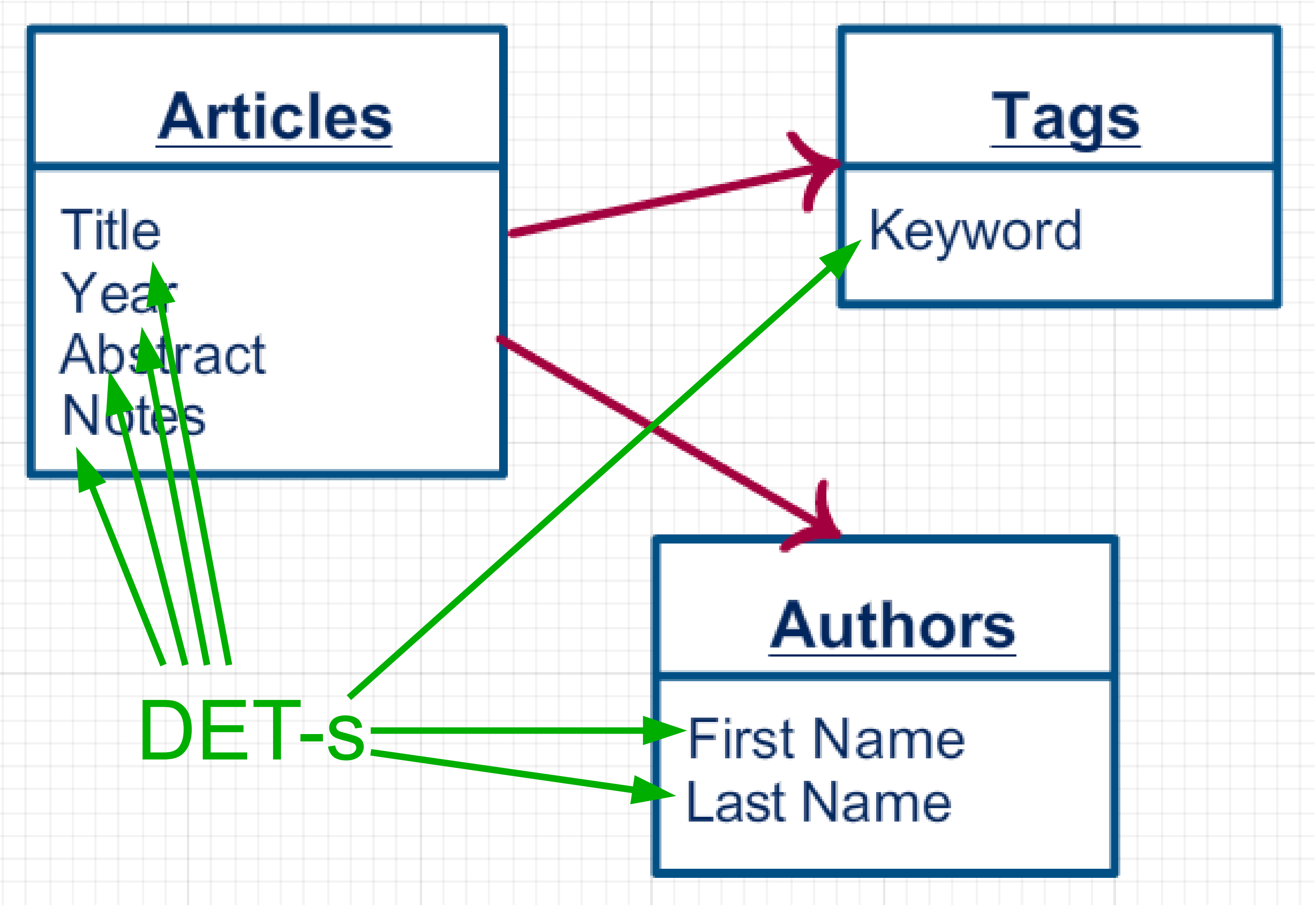
Tags

Keyword

Authors

First Name
Last Name

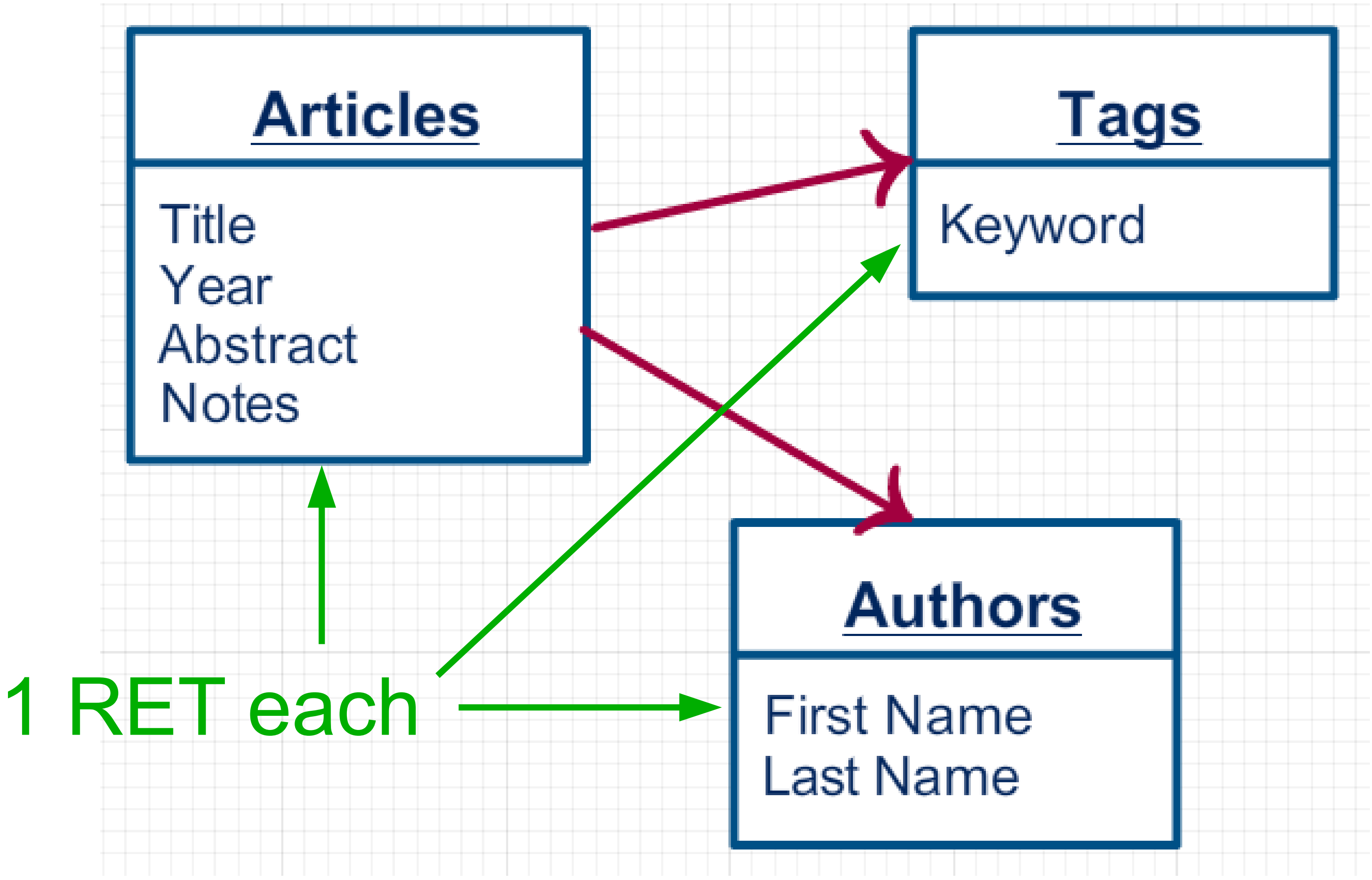
Data Element Type – Examples



Smaller Pieces

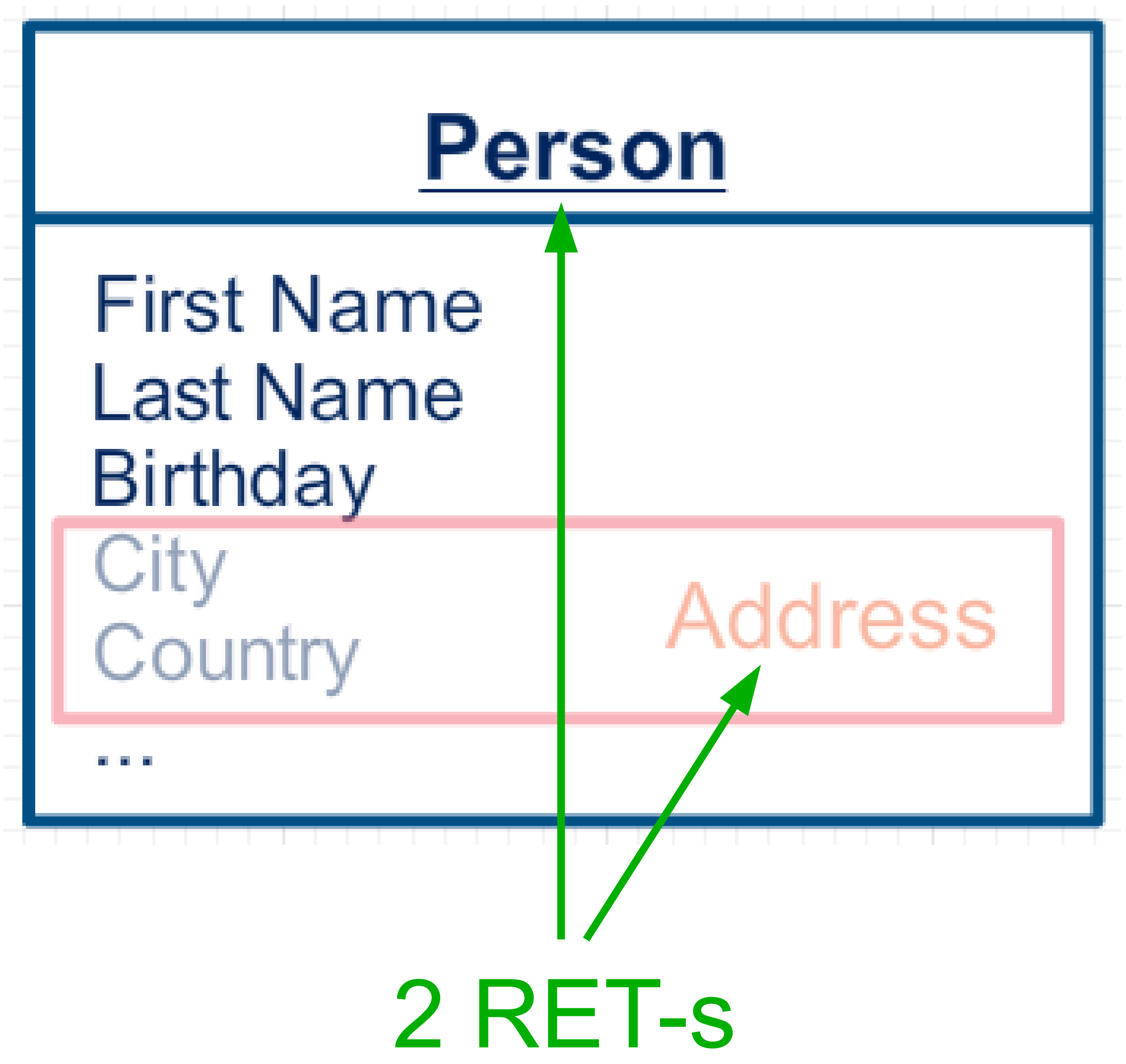
- Data Element Type (DET)
  - Dynamic user recognizable field
- Record Element Type (RET)
  - User recognizable subgroup of data elements in internal logical file or external interface file
  - For relational databases typically one Internal Logic File (table) = one Record Element Type

Record Element Type – Examples



1 RET each

Record Element Type – Examples



Person

First Name
Last Name
Birthday
City
Country
...

Address

2 RET-s

Record Element Type – Examples

Inheritance in object oriented development

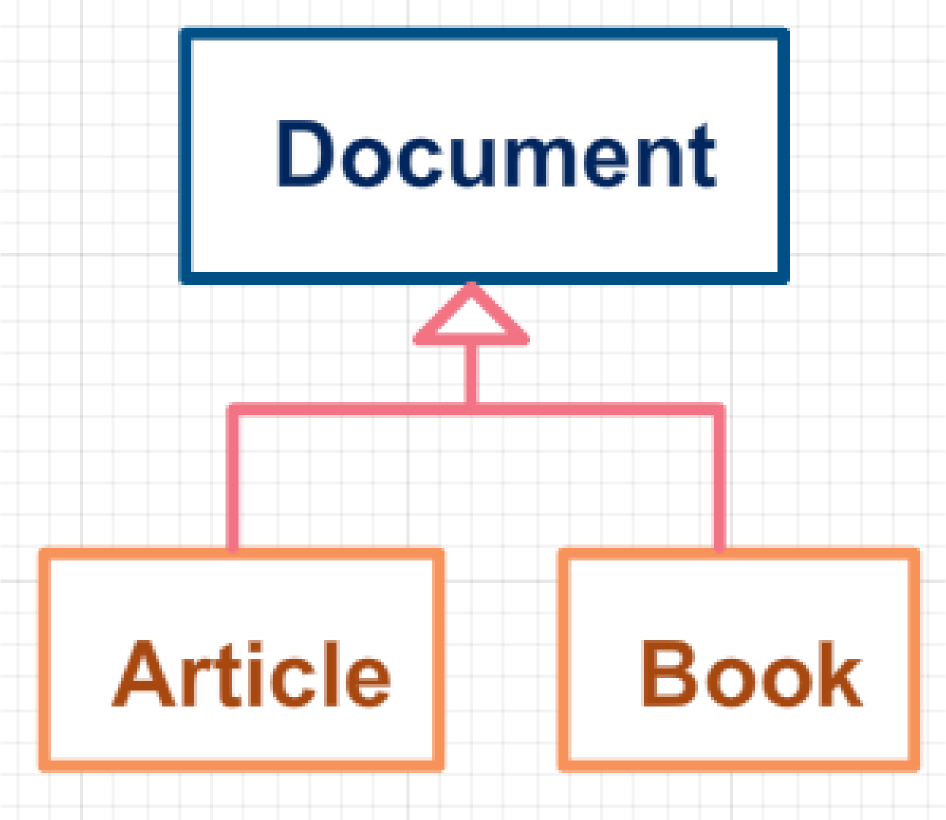
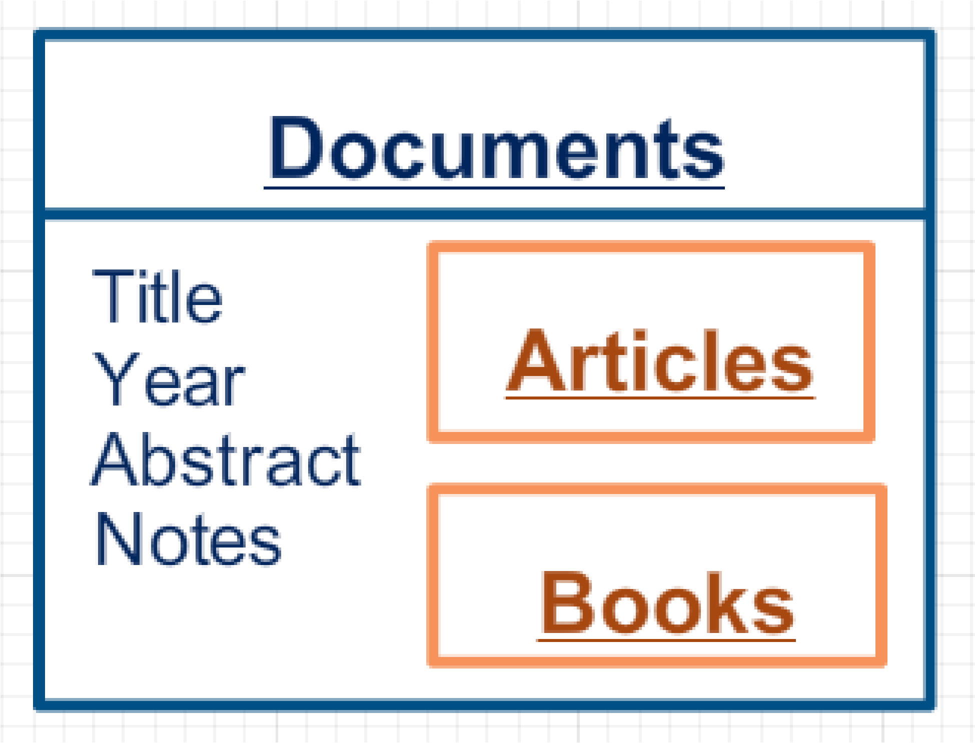
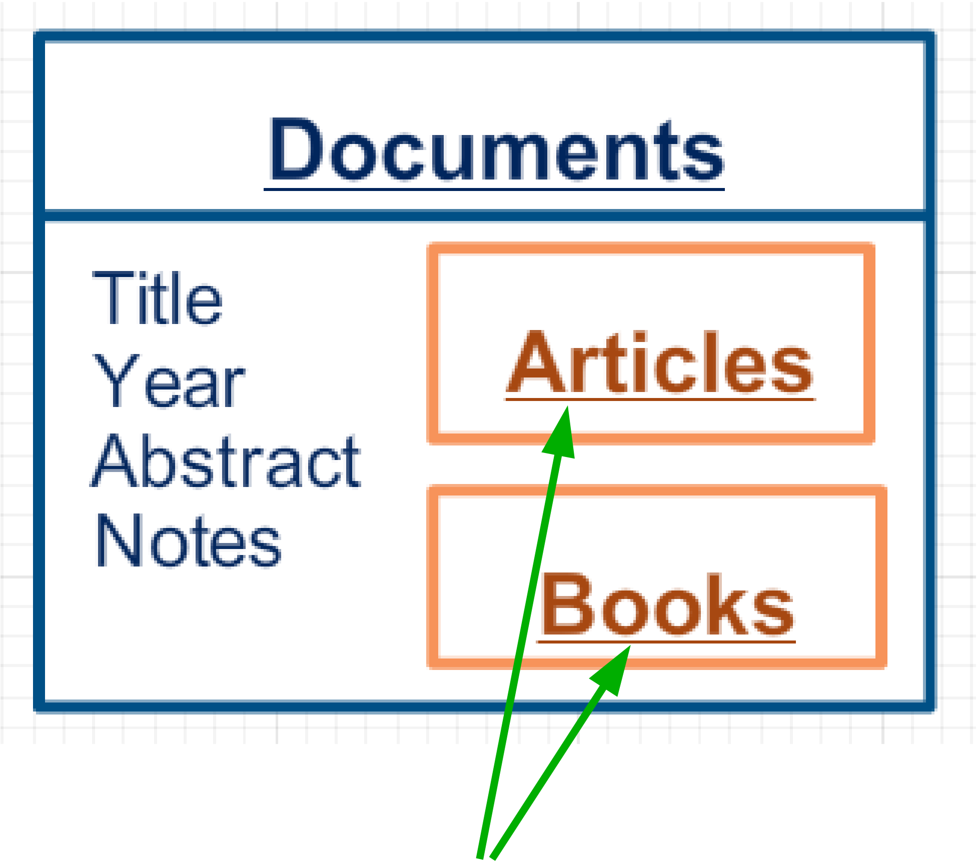


Table per object hierarchy in relational database



Record Element Type – Examples



Documents

Title
Year
Abstract
Notes

Articles

Books

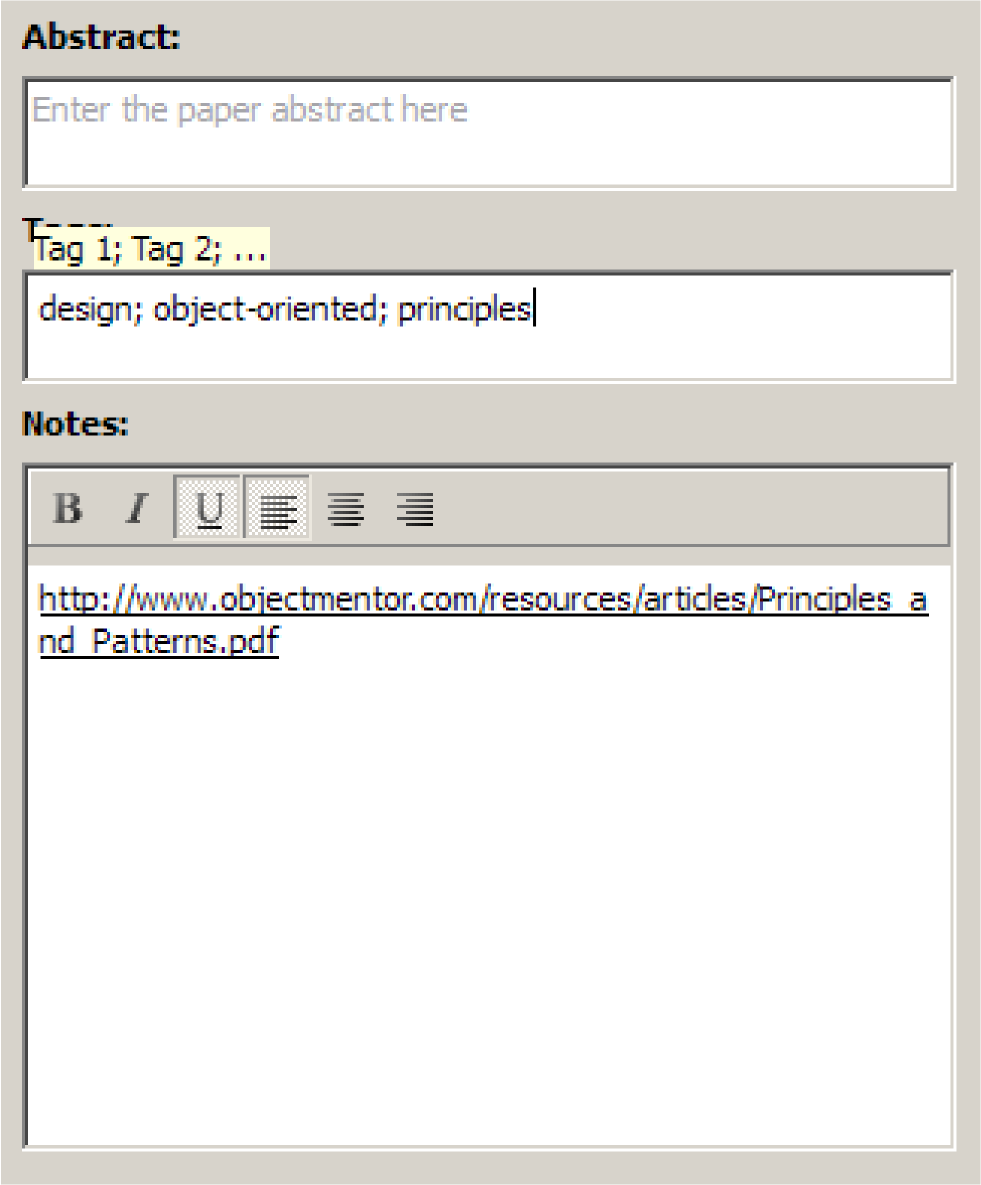
2 RET-s

Smaller Pieces

- Data Element Type (DET)
  - Dynamic user recognizable field
- Record Element Type (RET)
  - User recognizable subgroup of data elements in internal logical file or external interface file
- File Type Referenced (FTR)
  - File type referenced by transaction (internal logical file or external interface file)

File Type Referenced - Examples

- Edit article details
  - Abstract
  - Tags
  - Notes



Abstract:

Enter the paper abstract here

Tags:

Tag 1; Tag 2; ...

design; object-oriented; principles

Notes:

http://www.objectmentor.com/resources/articles/Principles_and_Patterns.pdf

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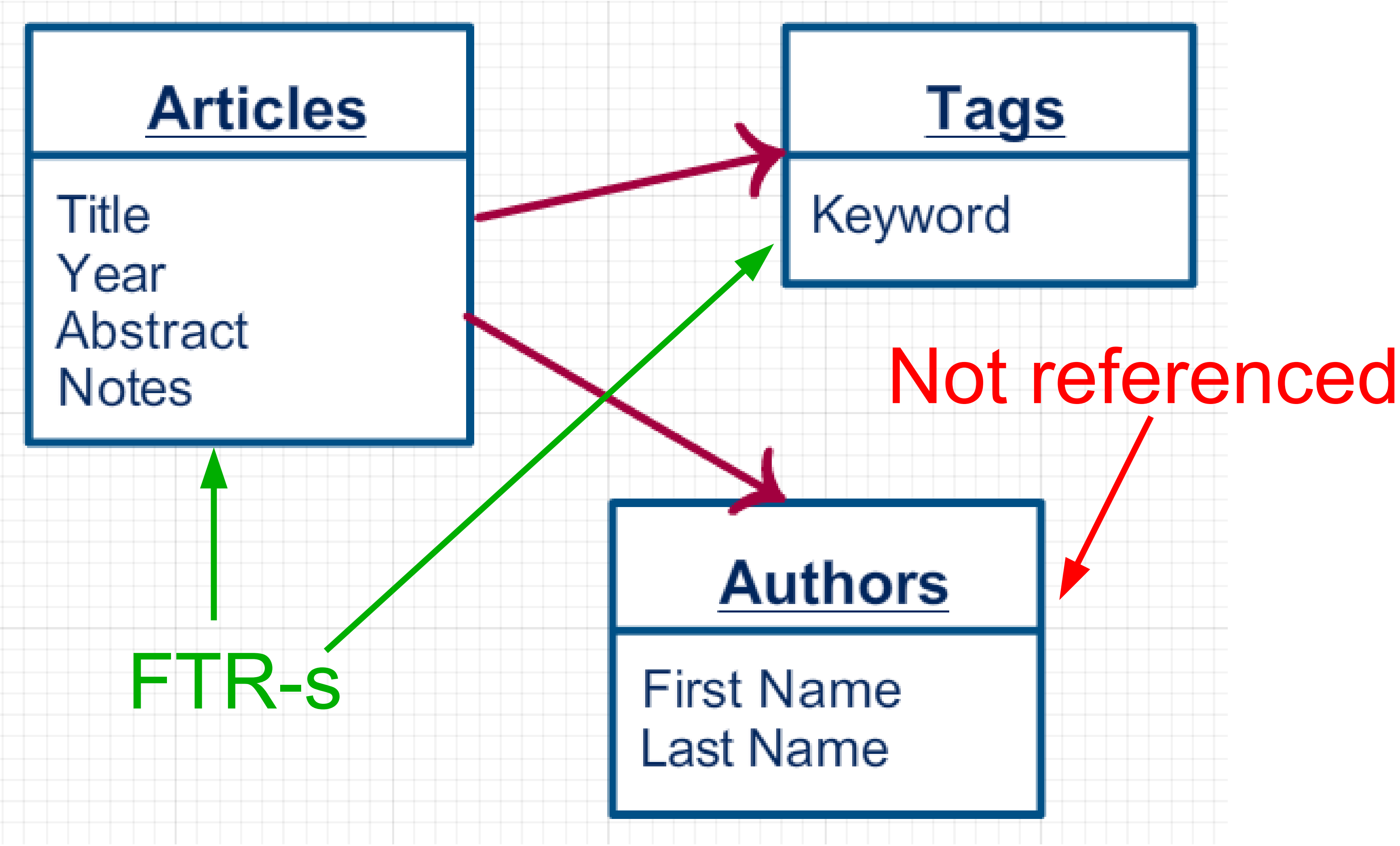
FTR-s For Edit Article Details



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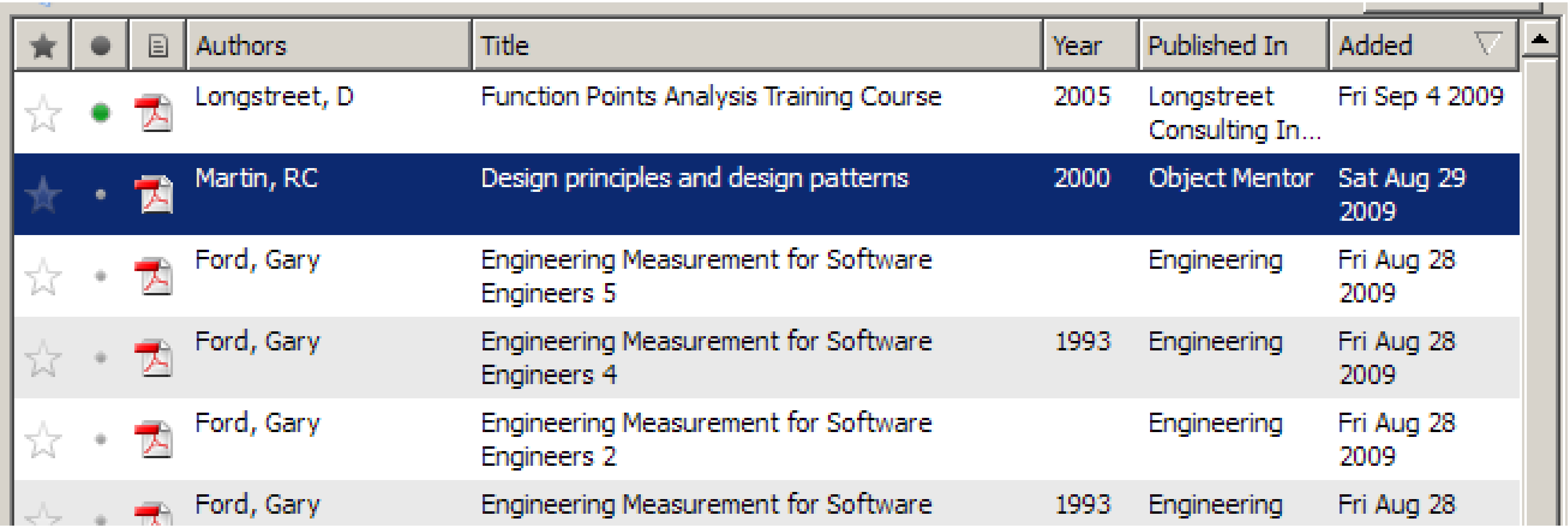
File Type Referenced Examples

- How many FTR-s for “List of Articles”?
  - Tables: Articles, Authors, Tags



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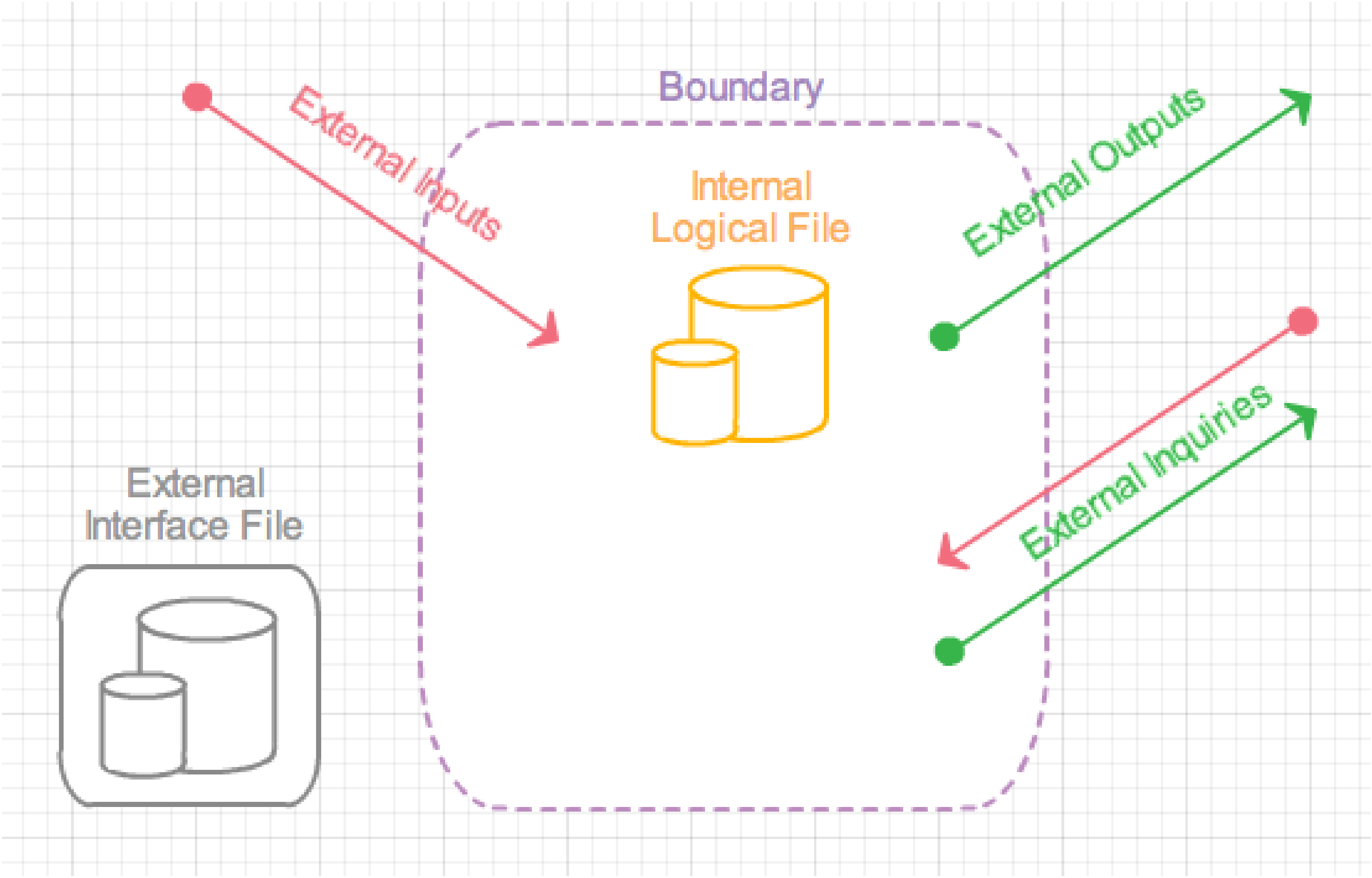
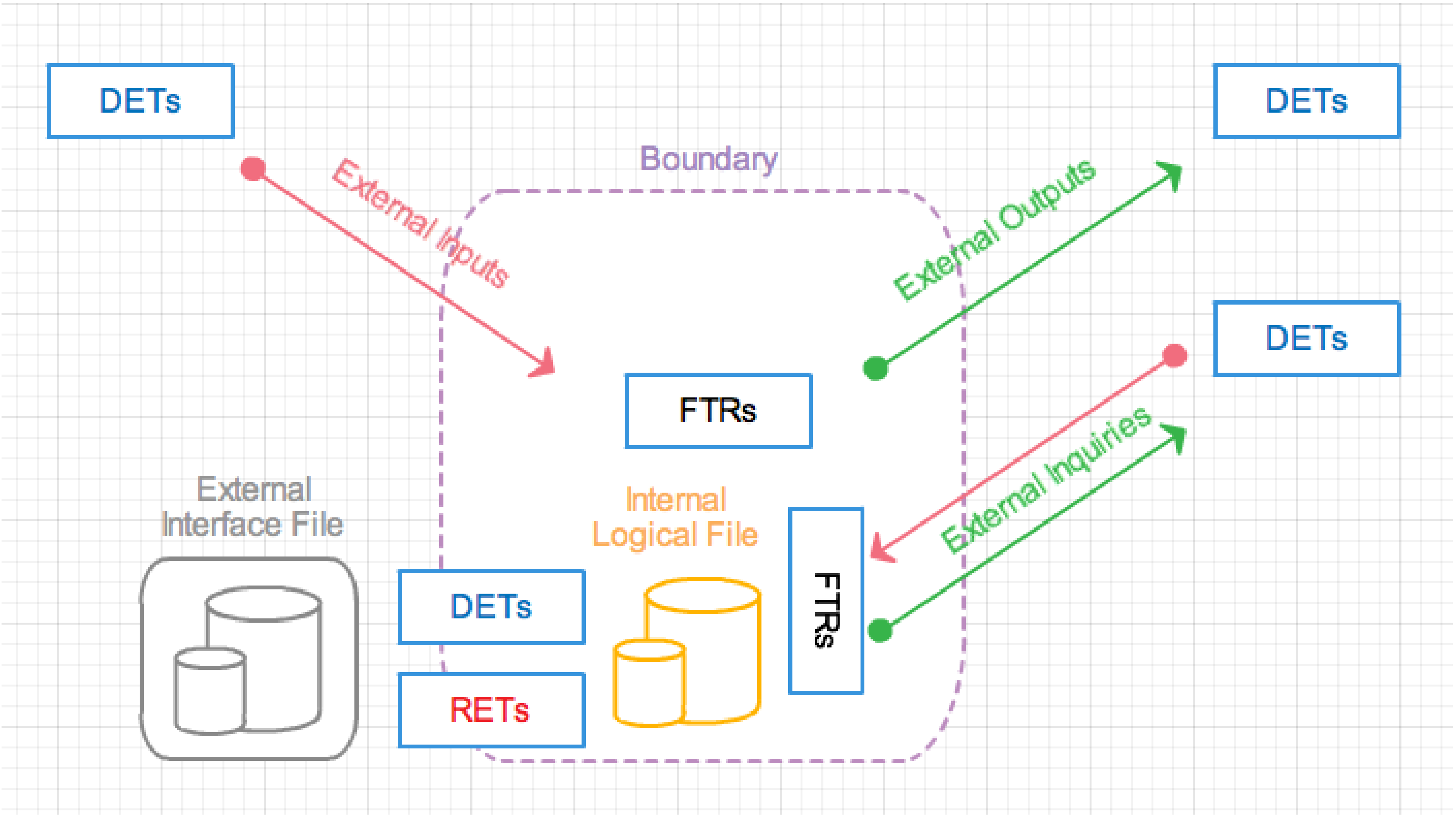
☆	•		Ford, Gary	Engineering Measurement for Software	1993	Engineering	Fri Aug 28

Components



Boundary
External Inputs
Internal Logical File
External Outputs
External Inquiries
External Interface File

Components and Elements



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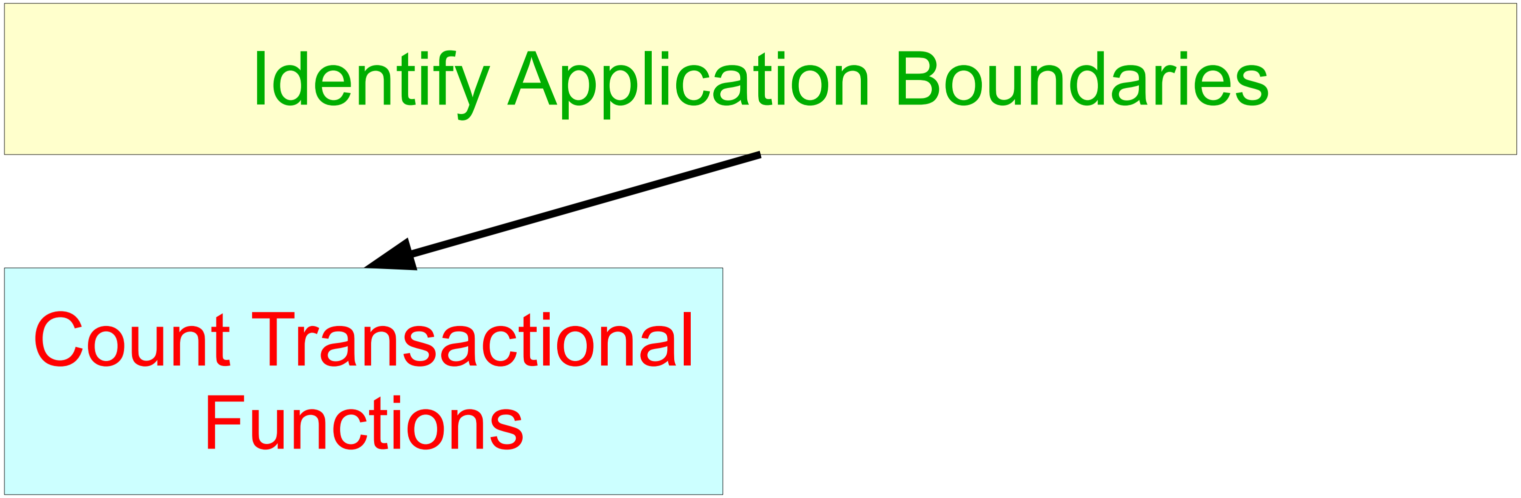
Function Points – Context



Identify Application Boundaries

Count Transactional Functions

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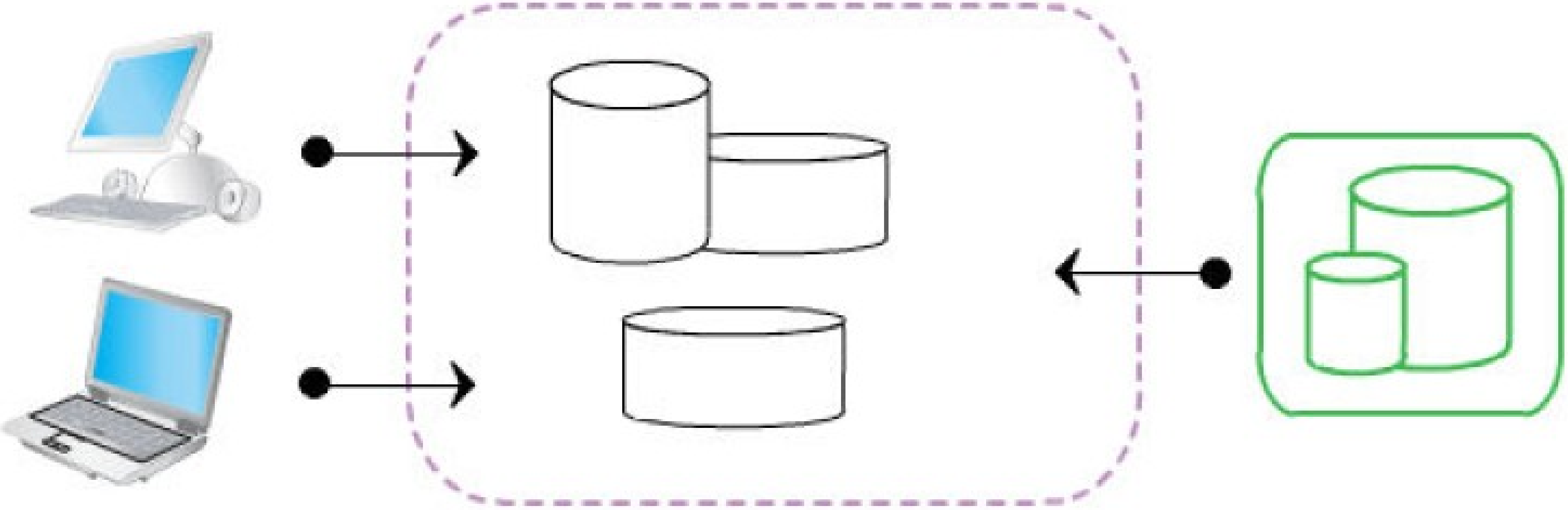
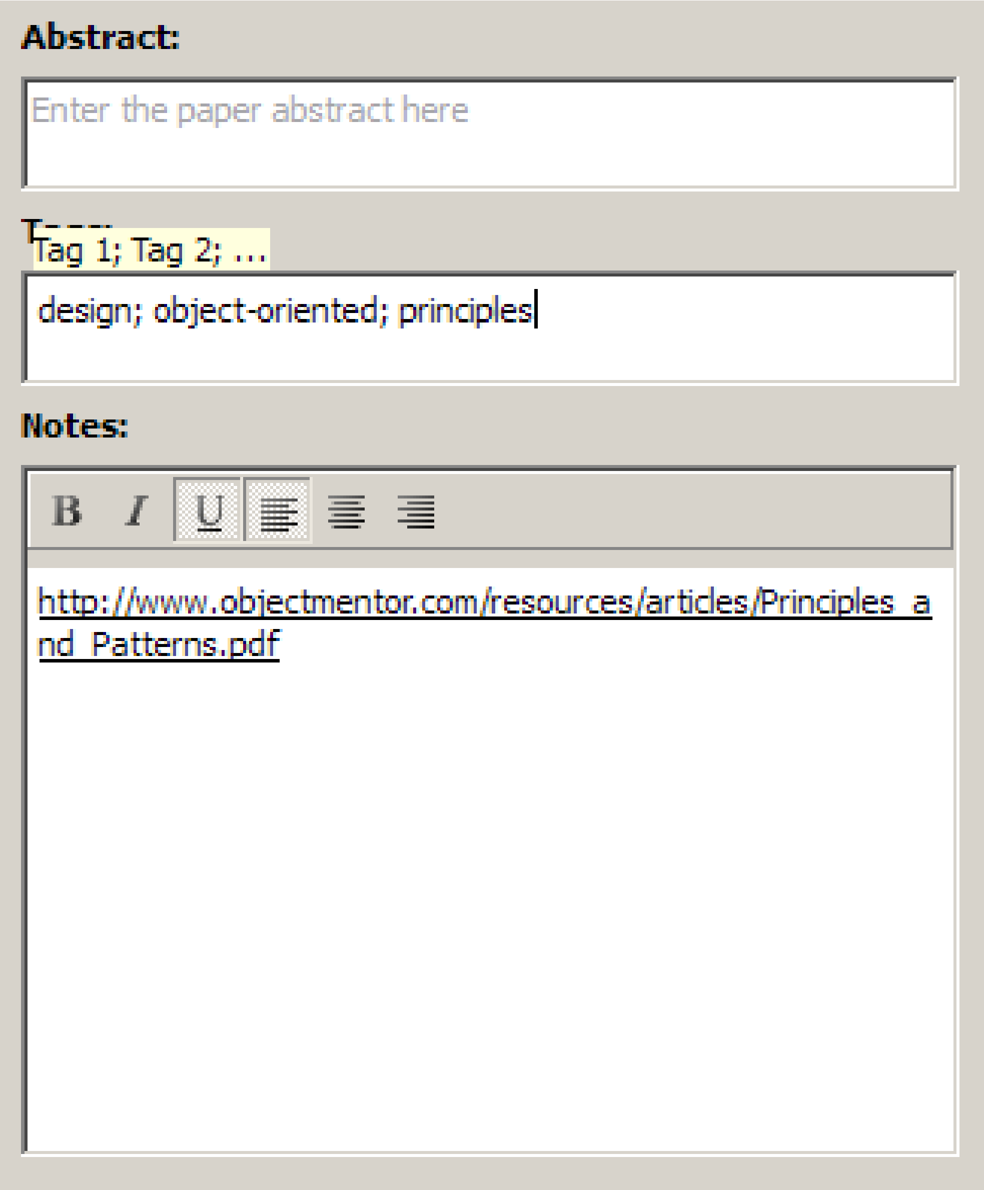
External Inputs

- Information flows into the application
  - Online, user inserted, from other application



External Inputs – Examples



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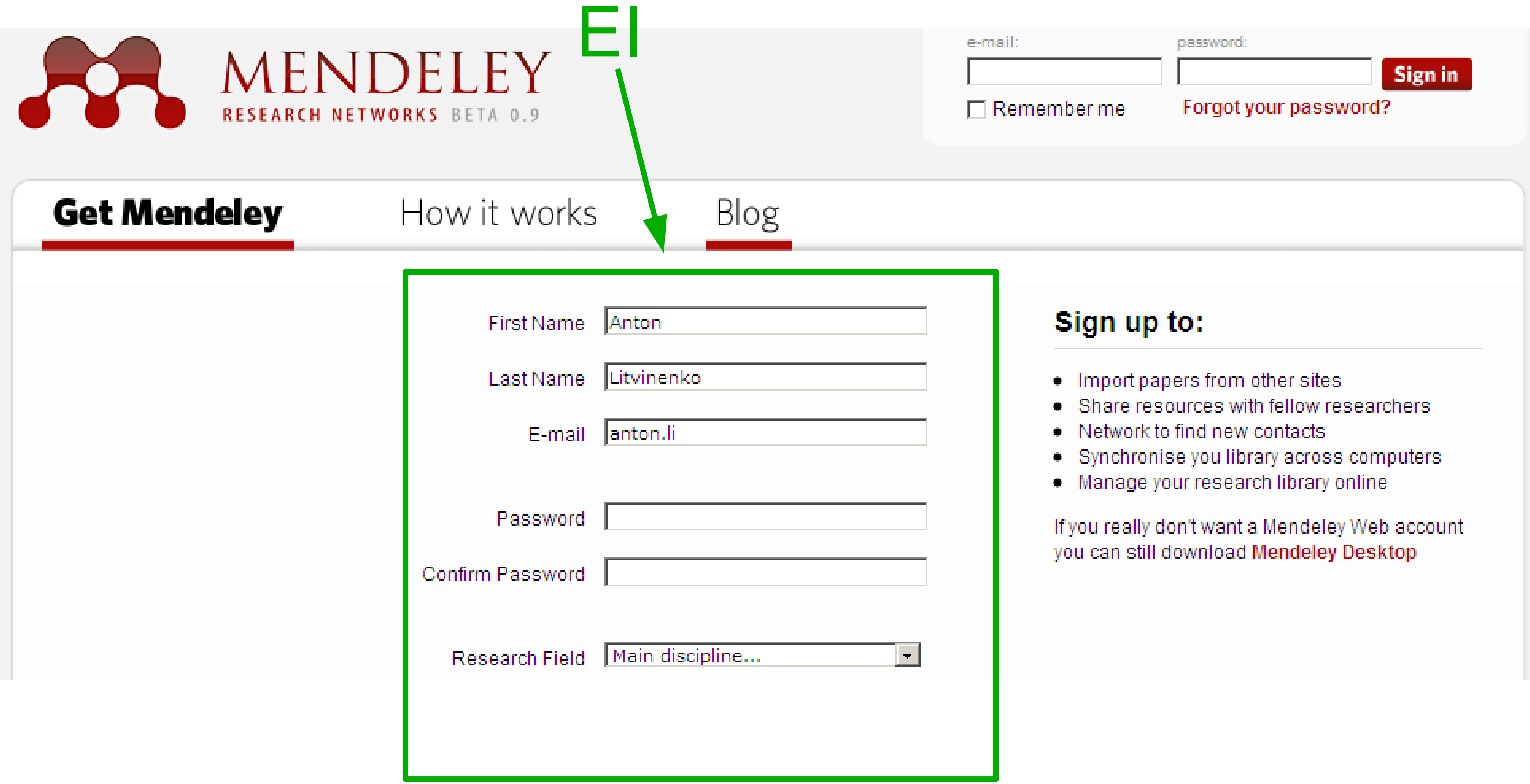
External Inputs – Examples



First Name	Anton
Last Name	Litvinenko
E-mail	anton.li
Password	
Confirm Password	
Research Field	Main discipline...

Sign up to:

- Import papers from other sites
- Share resources with fellow researchers
- Network to find new contacts
- Synchronise you library across computers
- Manage your research library online

If you really don't want a Mendeley Web account you can still download Mendeley Desktop

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External Inputs

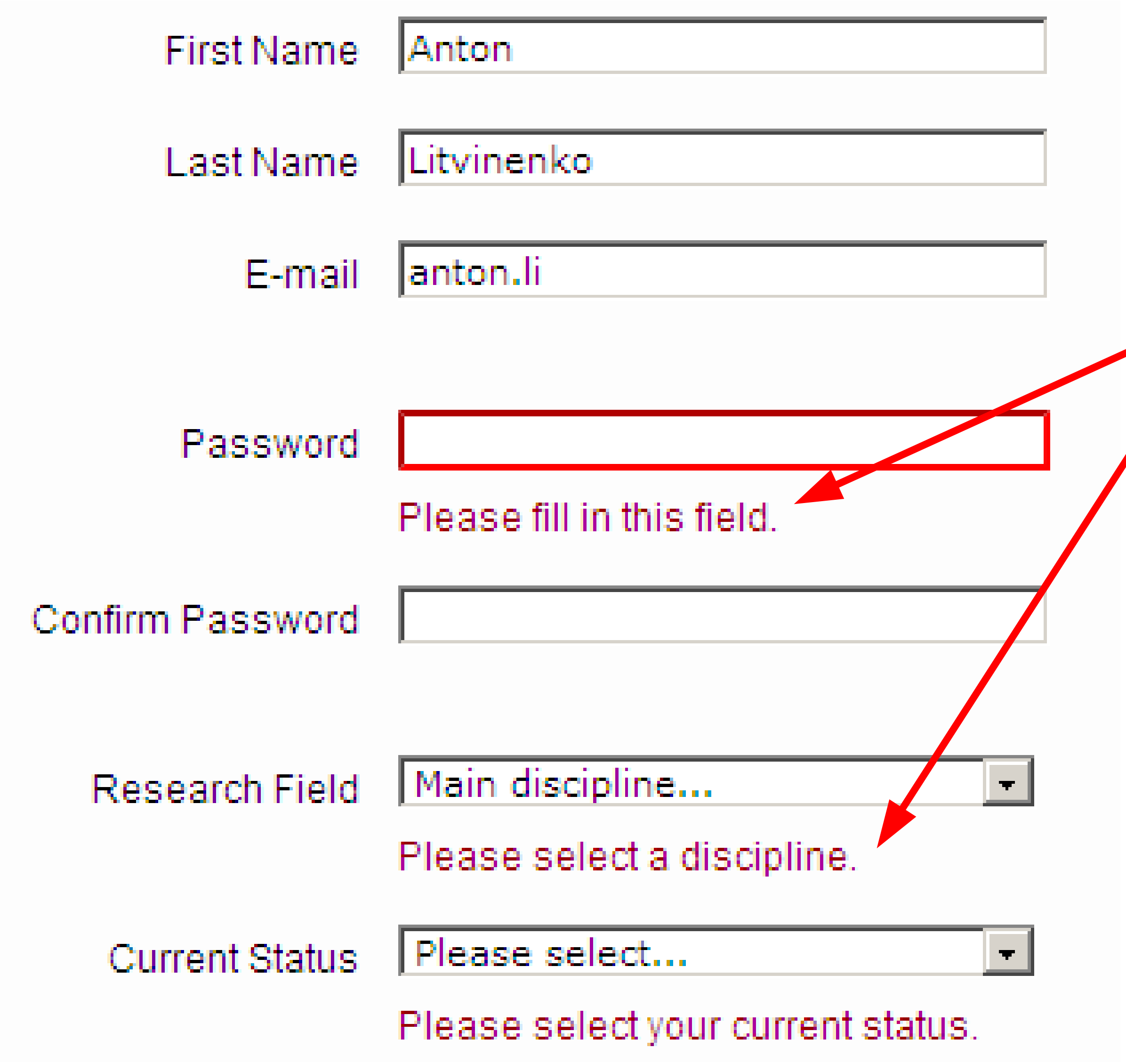
- Elementary process in which data or control information crosses the boundary from outside to inside
  - Data is **maintained** = added, changed or deleted
  - Application is controlled (manipulated, behavior is changed)
- Rated based upon Data Element Types and Files Type Referenced

External Inputs → Function Points

Files Referenced (FTR-s)	Data Elements (DET-s)		
	1 – 4	5 – 15	> 15
1	Low (3)	Low (3)	Average (4)
2	Low (3)	Average (4)	High (6)
> 2	Average (4)	High (6)	High (6)

- Low → 3 function points
- Average → 4 function points
- High → 6 function points

External Inputs – Examples



First Name	Anton
Last Name	Litvinenko
E-mail	anton.li
Password	
	Please fill in this field.
Confirm Password	
Research Field	Main discipline...
	Please select a discipline.
Current Status	Please select...
	Please select your current status.

- External Inputs include error messages!
- All errors messages are counted as 1 Dynamic Element Type

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External Inputs – Data Types

- Business data: customer name, number of credits for course, … → updates Internal Logical Files (ILF-s)
- Control data: printer port, number of copies, … → may or may not update ILF-s
- Rules data: number of days before registration closes, min amount eligible for free shipping → updates ILF-s

External Inputs

- Data element types for External Inputs
  - Fields, Controls, Messages (both error and confirmation)
  - Calculated values that are stored
- Cancel – not counted in EI
  - Data doesn't cross boundary – noting changed, edited or deleted
  - State or behavior of application is not changed

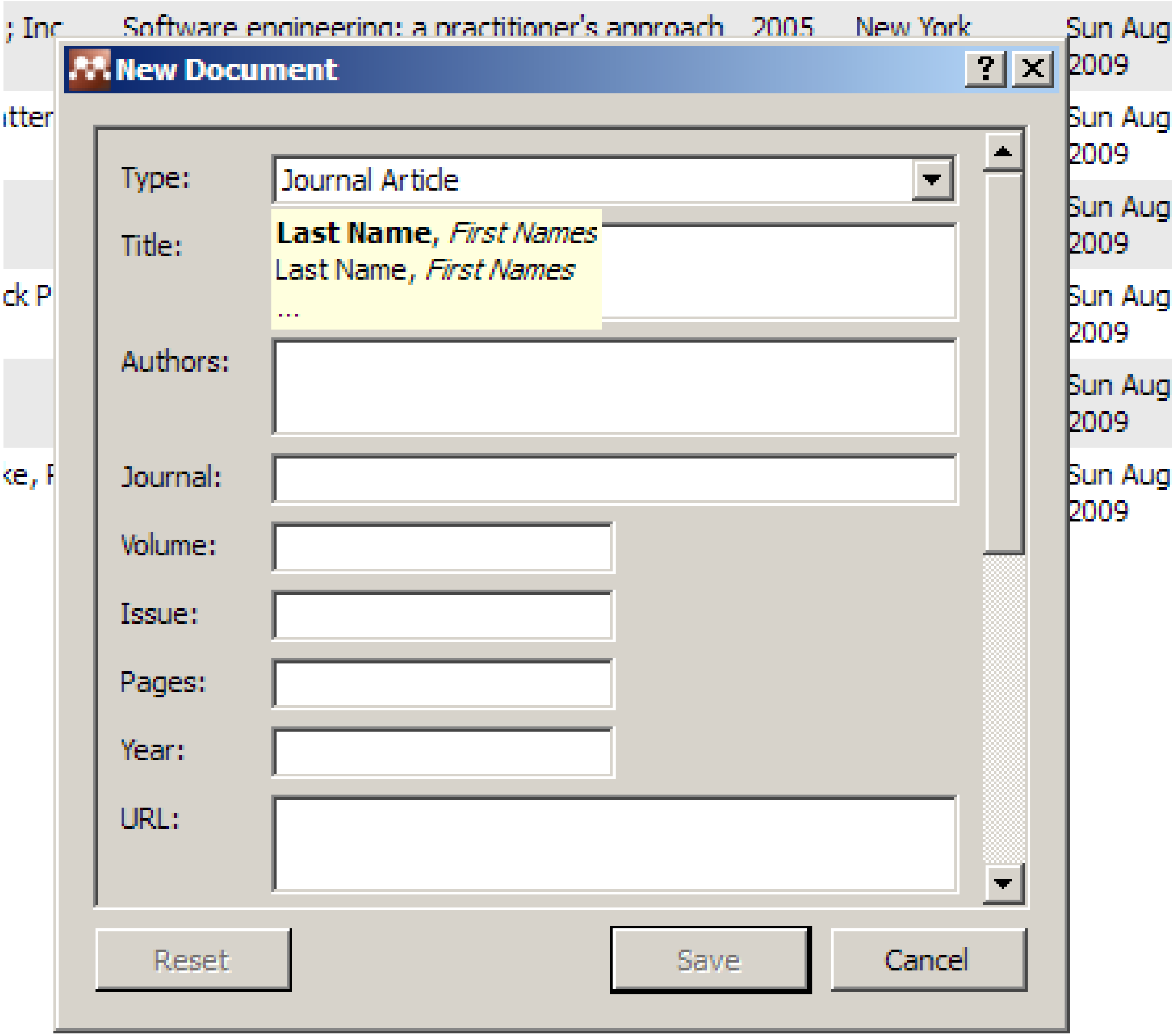
Invalid External Inputs

- Login screens
  - Should be counted as External Inquiry
- (Static) menus, link, navigational screens
  - Usability, not functionality

External Inputs – Identification Rules

- Data is received from outside the app boundary
- Maintains data in Internal Logical Files
- Process is self contained and leaves the application in consistent state
- Typical vocabulary
  - Add, Change, Delete, Modify, Remove, Edit, Enable, Save, Store, Submit, ...

Exercise – Rate External Input



; Inc Software engineering: a practitioner's approach 2005 New York Sun Aug 2009

itter Sun Aug 2009

Sun Aug 2009

ck P Sun Aug 2009

Sun Aug 2009

ke, F Sun Aug 2009

New Document

Type: Journal Article

Title:

Last Name, *First Names*
Last Name, *First Names*
...

Authors:

Journal:

Volume:

Issue:

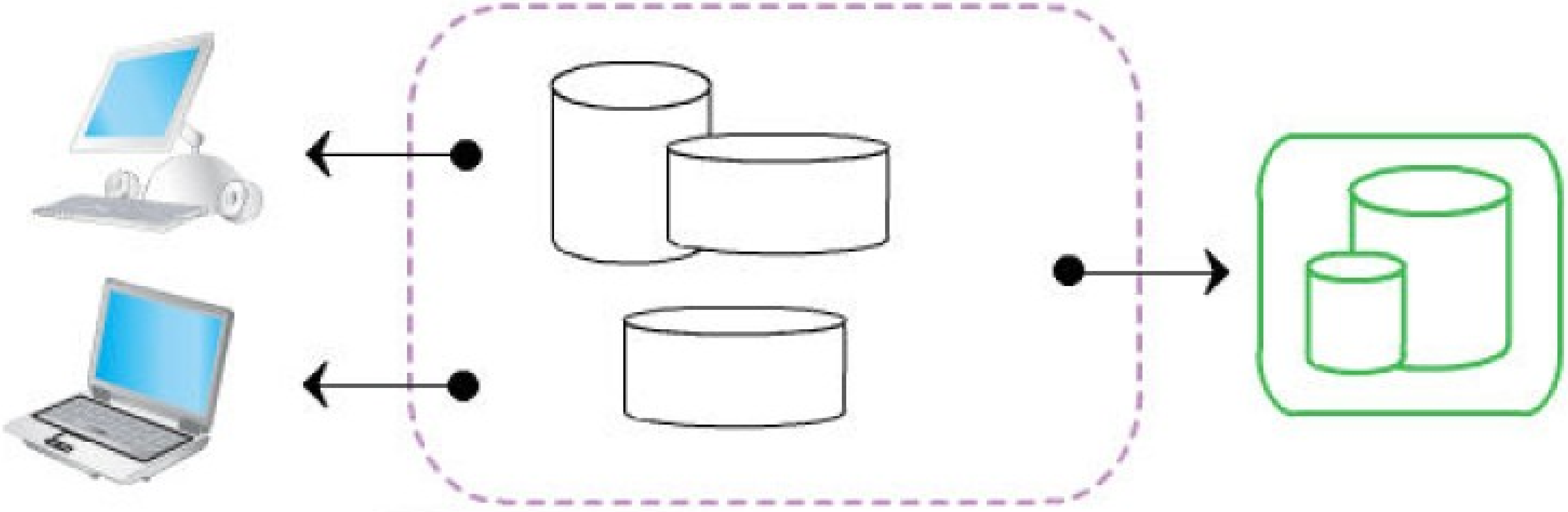
Pages:

Year:

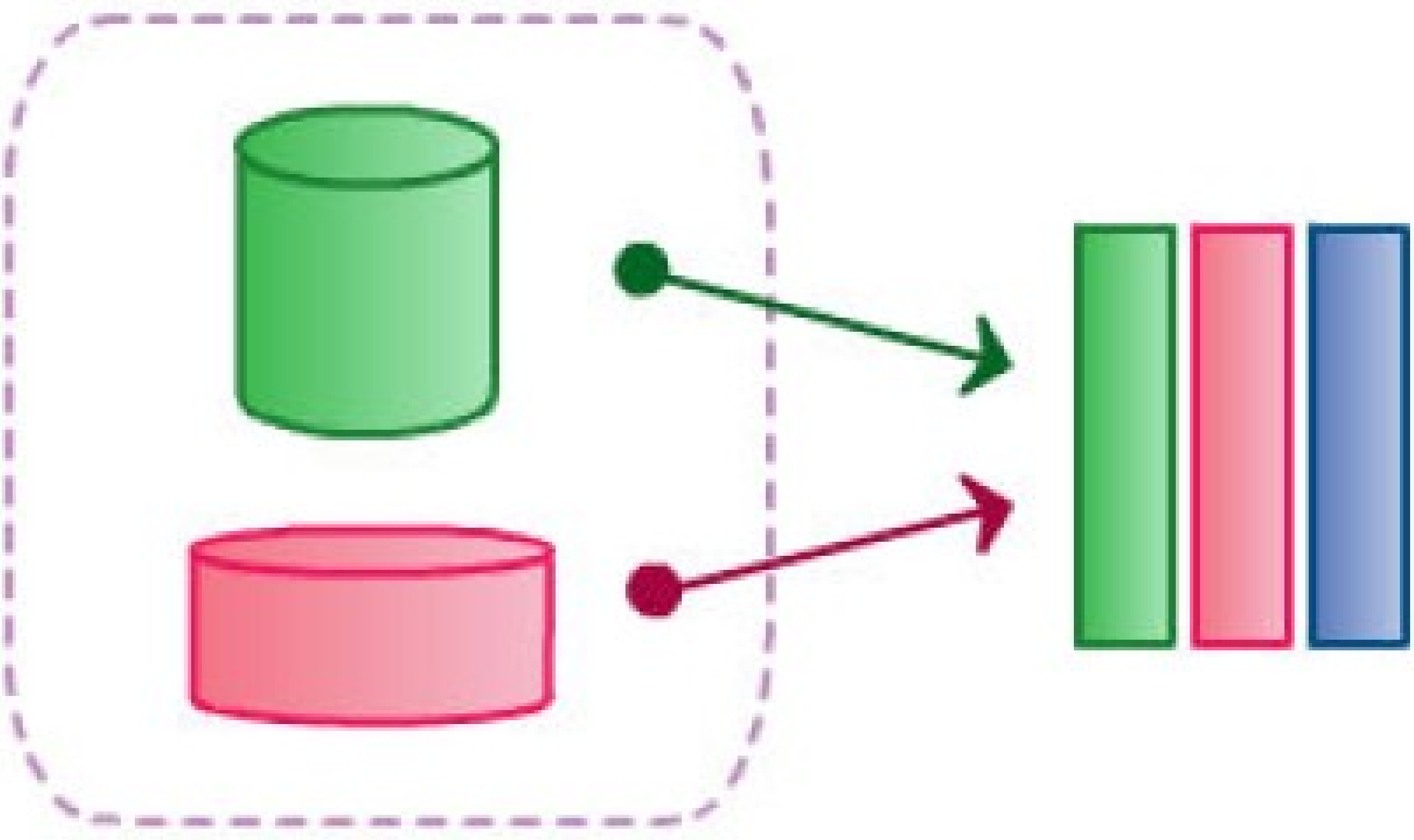
URL:

External Outputs

- Derived information flows from the application
  - Algorithms, calculations
  - Reports, graphs, charts

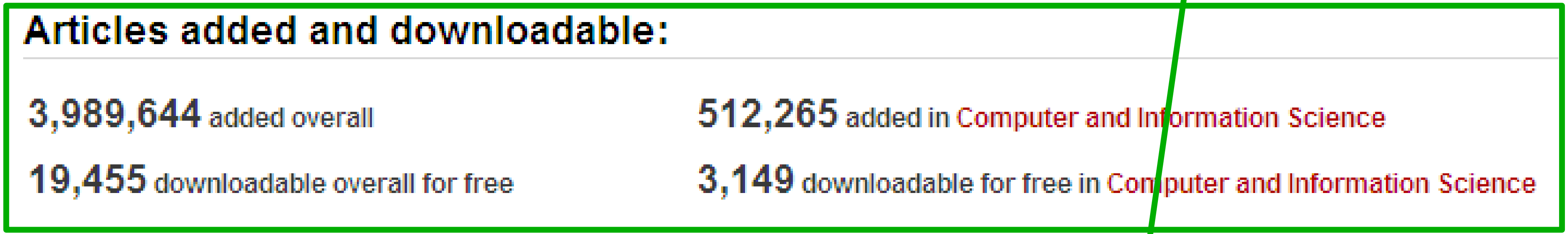


Derived Information



External Outputs – Examples

EO



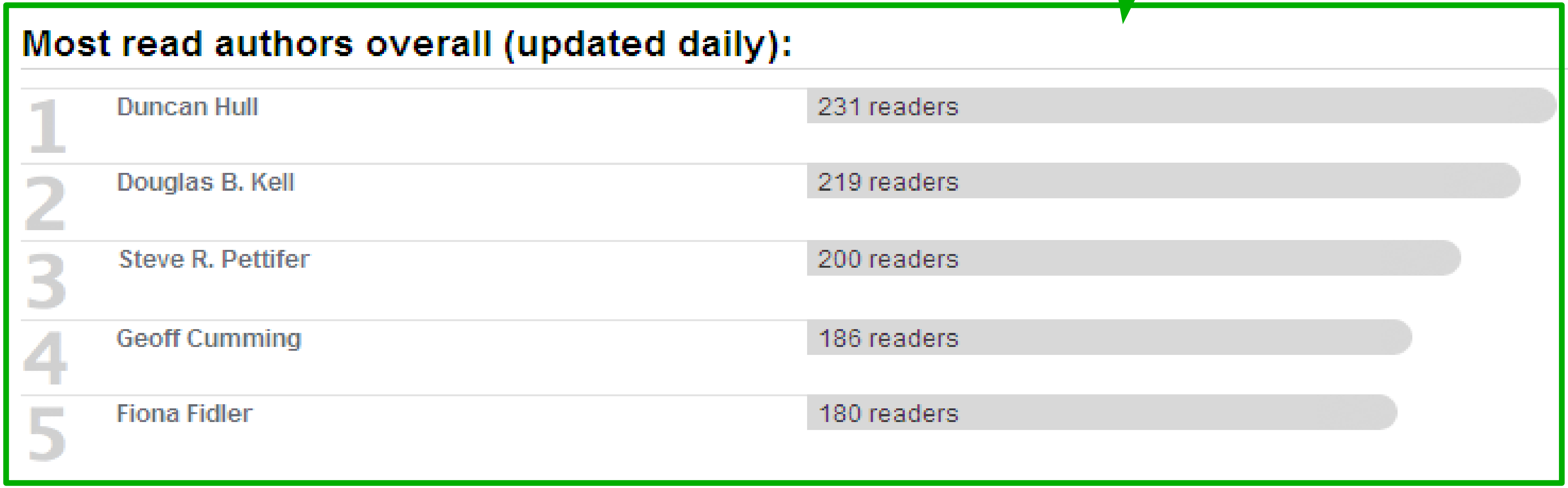
Articles added and downloadable:

3,989,644 added overall

512,265 added in Computer and Information Science

19,455 downloadable overall for free

3,149 downloadable for free in Computer and Information Science



Most read authors overall (updated daily):

1	Duncan Hull	231 readers
2	Douglas B. Kell	219 readers
3	Steve R. Pettifer	200 readers
4	Geoff Cumming	186 readers
5	Fiona Fidler	180 readers

External Output

- Elementary process in which derived data passes across the boundary from inside to outside
  - Based on internal logical files and/or external interface files
  - Data processed beyond direct retrieval and editing from internal logical files or external interface files
- Rated based upon Data Element Types and Files Type Referenced

External Outputs → Function Points

Files Referenced (FTR-s)	Data Elements (DET-s)		
	1 – 5	6 – 19	> 19
1	Low (4)	Low (4)	Average (5)
2 – 3	Low (4)	Average (5)	High (7)
> 3	Average (5)	High (7)	High (7)

- Low → 4 function points
- Average → 5 function points
- High → 7 function points

External Outputs

- Notification messages – result of processing = calculation
- Data element types for External Outputs
  - Error messages
  - Calculated values on reports
  - Values on reports retrieved from application
  - Recursive DET-s counted only once!
- External Outputs can have input side
  - Report configuration, ...

Invalid External Outputs

- Error message, confirmation message
  - Parts of External Outputs or other transactions
- Reports without derived data
  - External Inquiries

External Outputs – Identification Rules

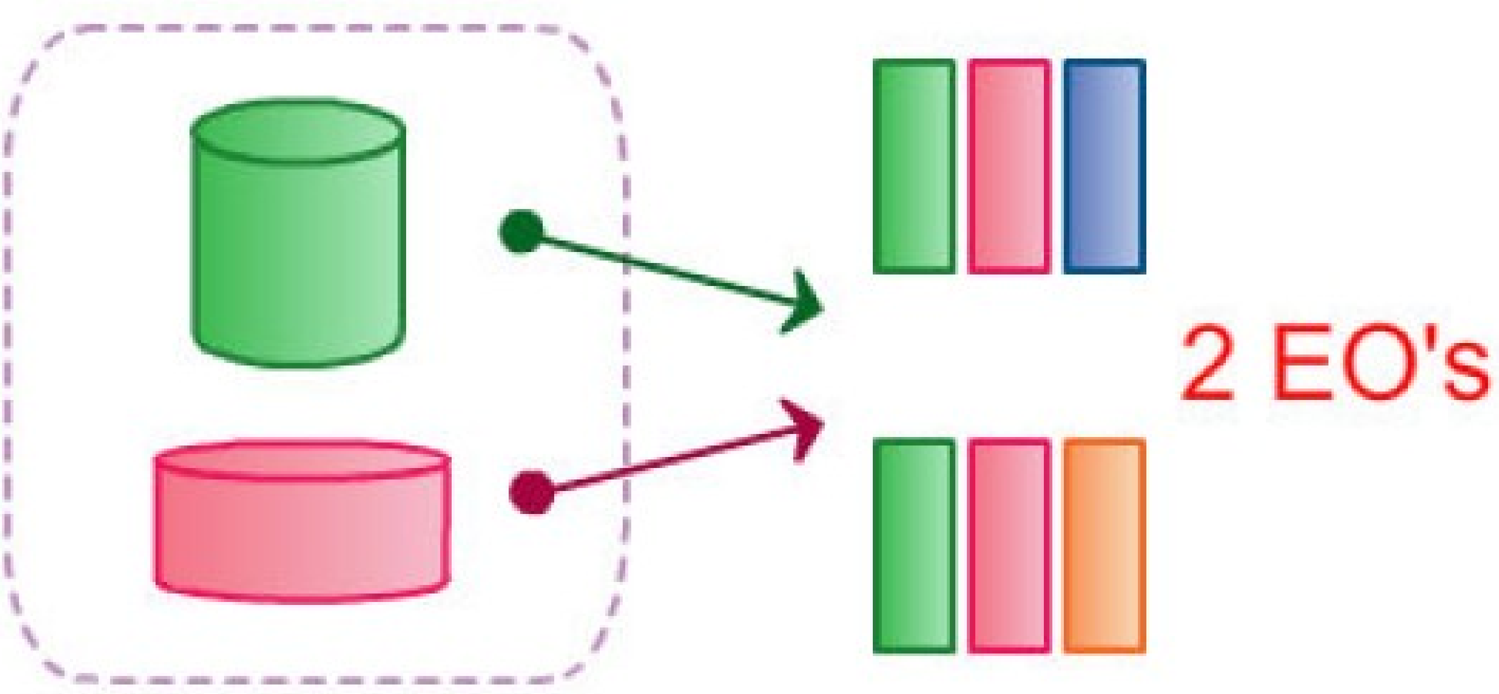
- Data is sent from the app boundary to outside
- Process is self contained and leaves the application in consistent state
- Typical vocabulary
  - Browse, Display, Query, Report, View, Select, Request, Retrieve, Aggregate, Calculate

External Outputs – Identification Rules

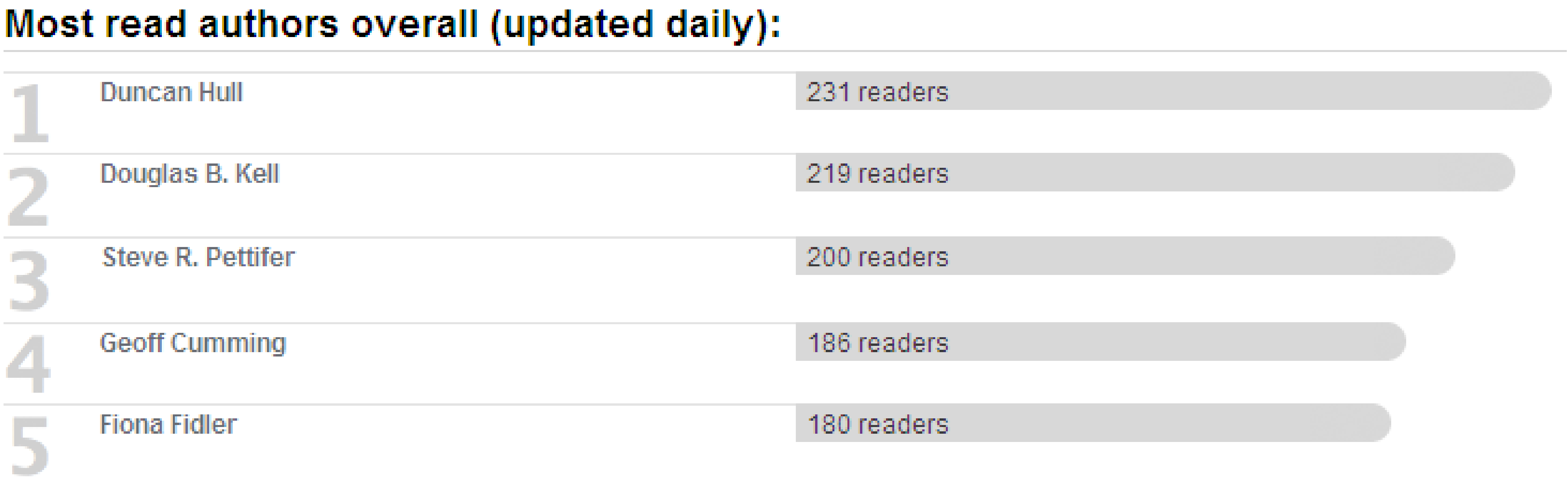
- Data ordering produces the same external output → counted only once!

External Outputs – Identification Rules

- Different derived data from the same data → different external outputs!



Exercise – Rate External Output



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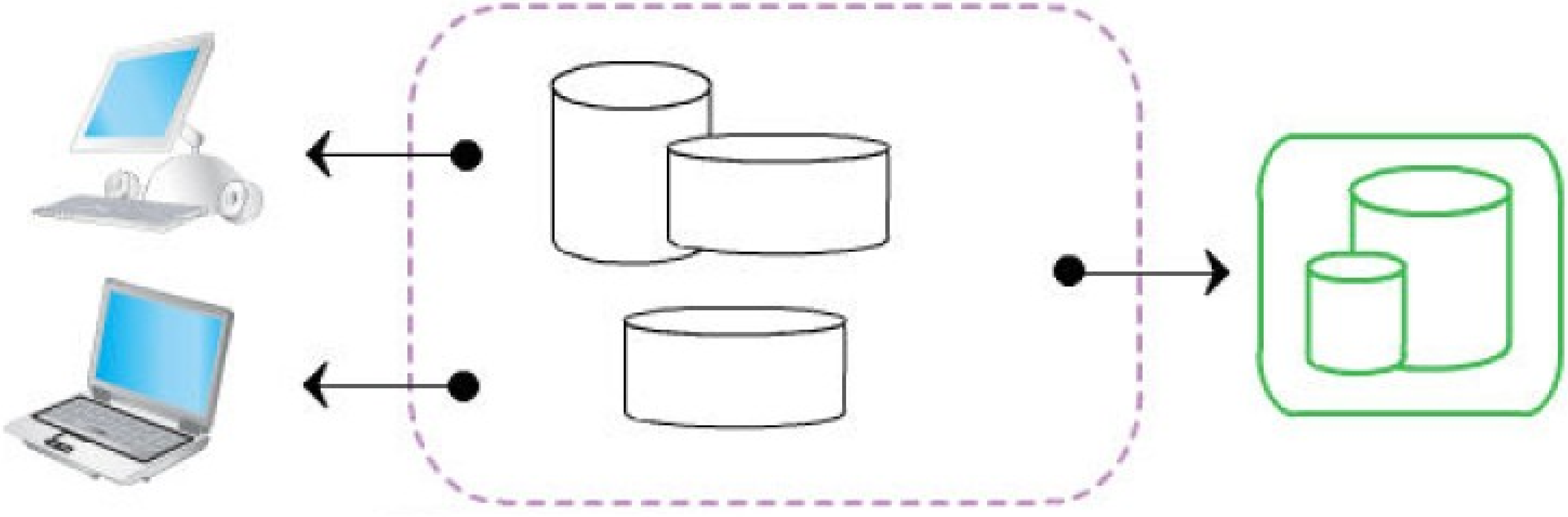
5	Fiona Fidler	180 readers

External Inquiries

- Information flows from the application
  - Existing, already stored data
  - Input side and output side
  - Reports, graphs, charts,



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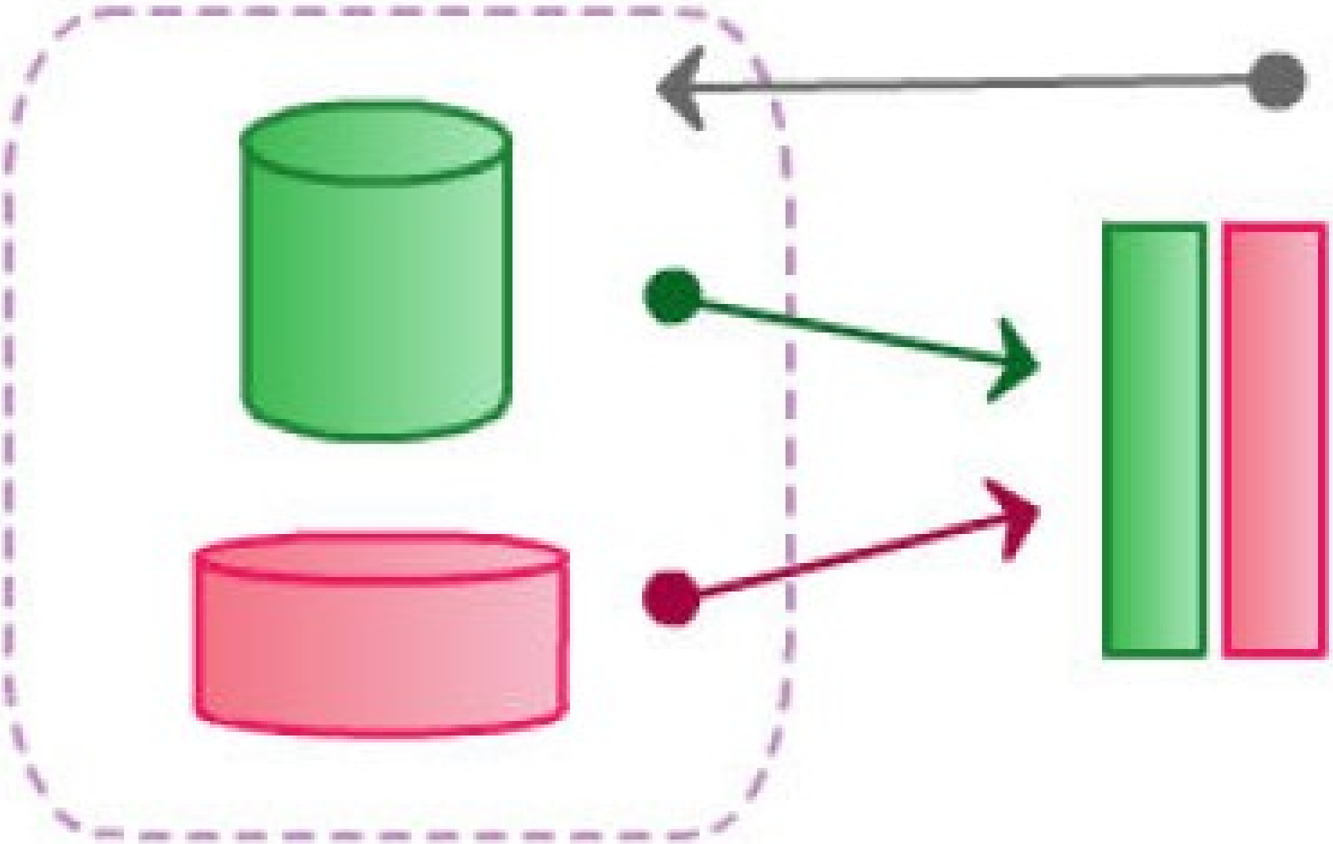
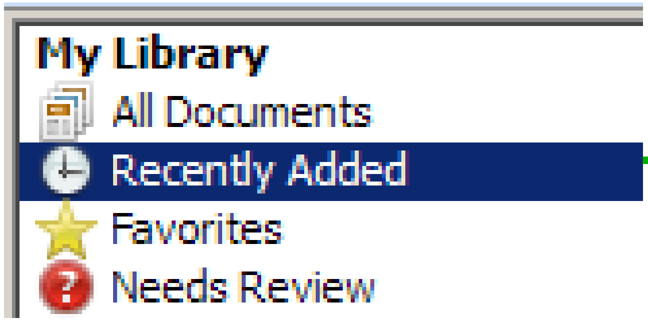
External Inquiries

- Existing data + Input and output sides

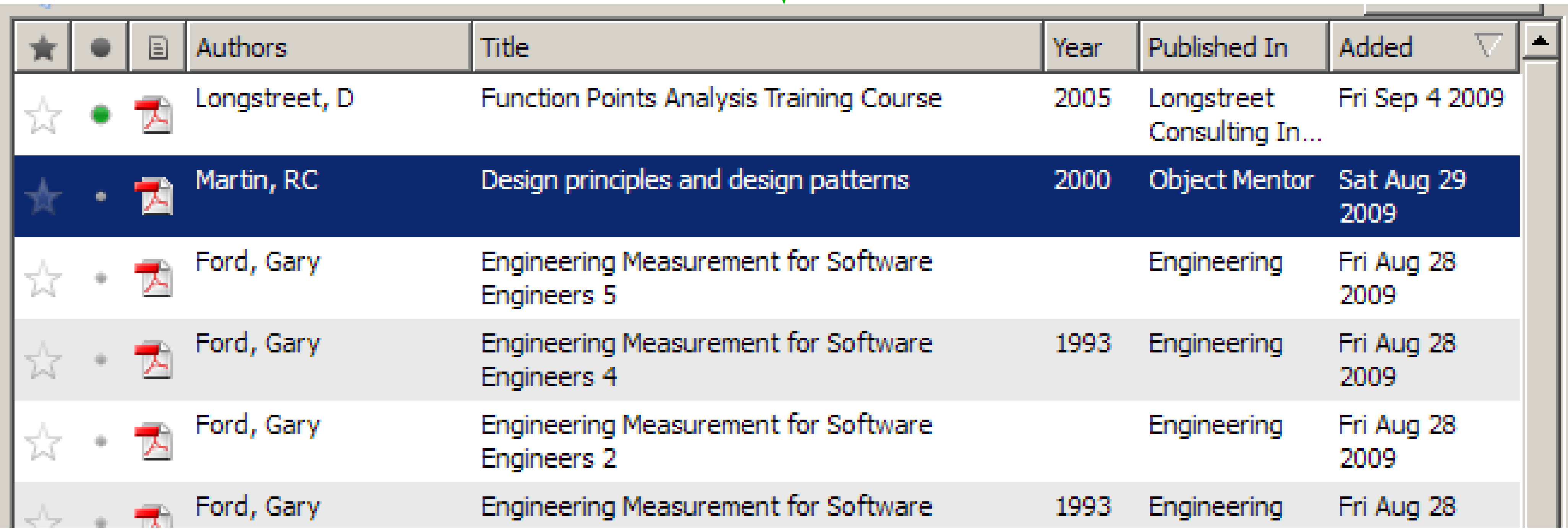


External Inquiries – Examples



My Library
- All Documents
- Recently Added
- Favorites
- Needs Review

1 EI



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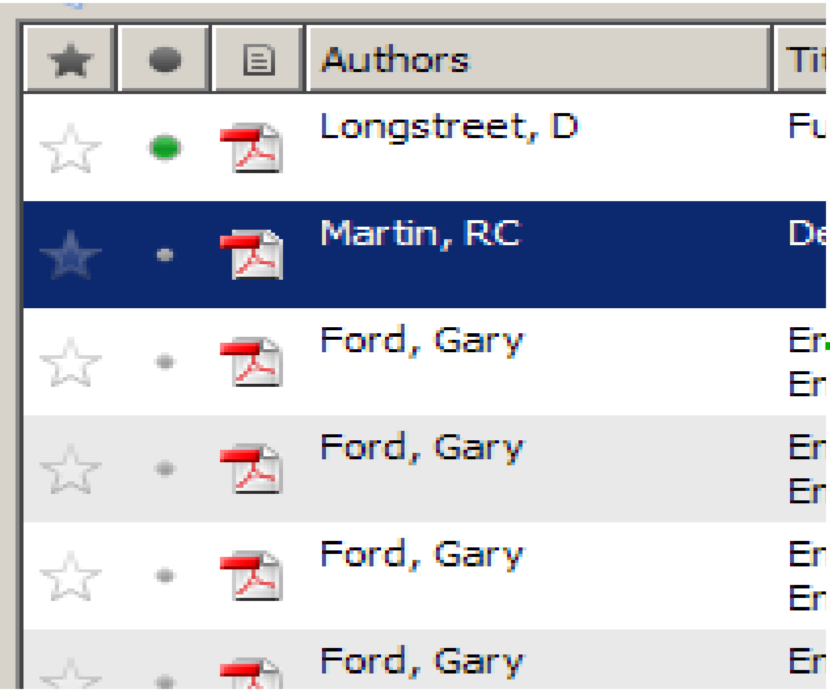
☆	•		Ford, Gary	Engineering Measurement for Software Engineers 2		Engineering	Fri Aug 28 2009
☆	•		Ford, Gary	Engineering Measurement for Software	1993	Engineering	Fri Aug 28

External Inquiry – Examples



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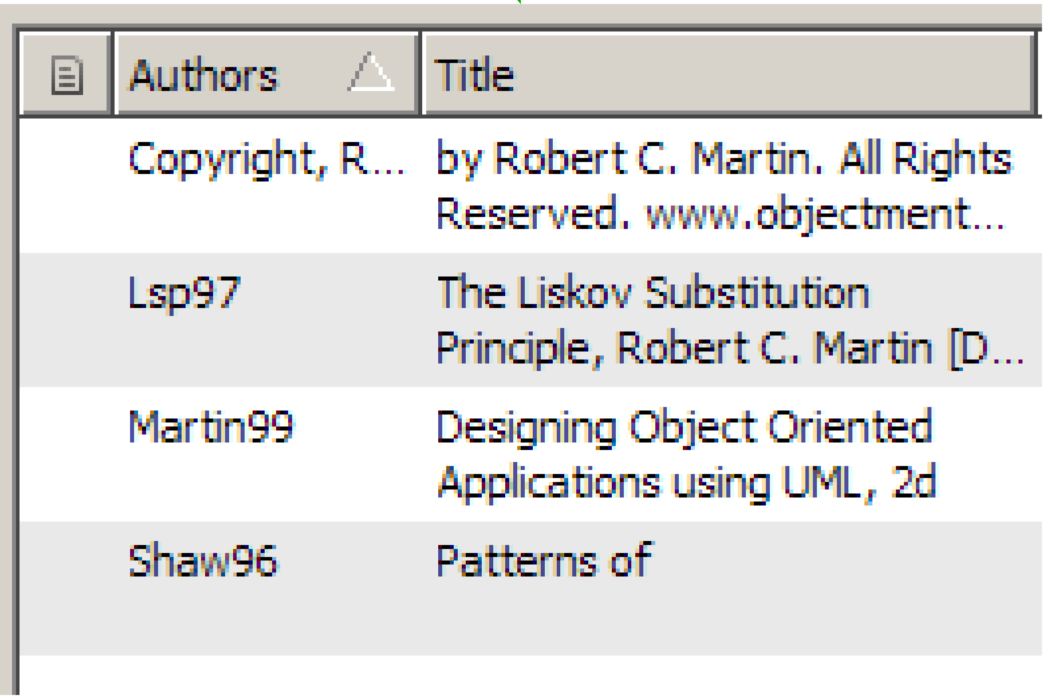
1 EI



▤	Authors △	Title
	Copyright, R...	by Robert C. Martin. All Rights Reserved. www.objectment...
	Lsp97	The Liskov Substitution Principle, Robert C. Martin [D...
	Martin99	Designing Object Oriented Applications using UML, 2d
	Shaw96	Patterns of

External Inquiries

- Elementary process with both input and output components that result in data retrieval from one or more internal logical files and/or external interface files
  - Does not maintain any internal logical files
  - Does not contain derived information
- Rated based upon Data Element Types and Files Type Referenced

External Inquiries → Function Points

Files Referenced (FTR-s)	Data Elements (DET-s)		
	1 – 5	6 – 19	> 19
1	Low (3)	Low (3)	Average (4)
2 – 3	Low (3)	Average (4)	High (6)
> 3	Average (4)	High (6)	High (6)

- Low → 3 function points
- Average → 4 function points
- High → 6 function points

External Inquiries – Examples

- Input: customer name in the search field
- Output: list of customers by name

- Input: click on the document title
- Output: document details

External Inquiries – Data Types

- Pagination: NEXT and BACK buttons – recursive information, counted as the same function
- Messages are DET-s!
  - “*searching*”+data+”*not found*” = 3 DET-s

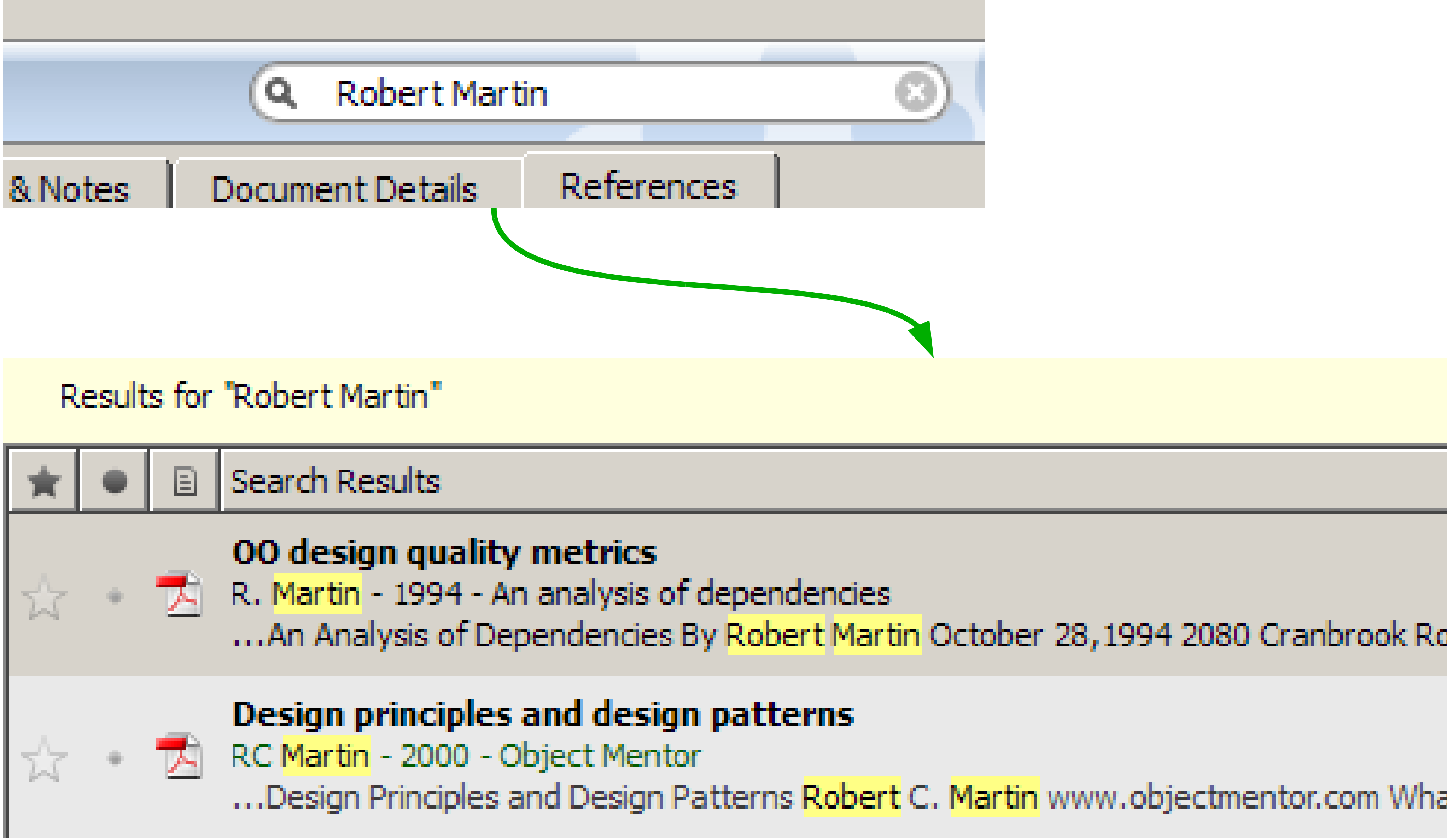
Invalid External Inquiries

- Error message, confirmation message
  - Parts of External Inquiries or other transactions
- Screens with derived data
  - External Outputs

External Inquiries – Identification Rules

- Request enters the boundaries, result exits the boundaries
- Data retrieval, no derived data
- Input and Output together form an elementary process
- Data is not maintained (but can be updated)
- Typical vocabulary
  - Browse, Display, Fetch, Find, List, Drop-down, Select, View, Query, Report, ...

Exercise – Rate External Inquiry



Results for "Robert Martin"

OO design quality metrics
R. Martin - 1994 - An analysis of dependencies
…An Analysis of Dependencies By Robert Martin October 28, 1994 2080 Cranbrook Ro

Design principles and design patterns
RC Martin - 2000 - Object Mentor
…Design Principles and Design Patterns Robert C. Martin www.objectmentor.com Wha

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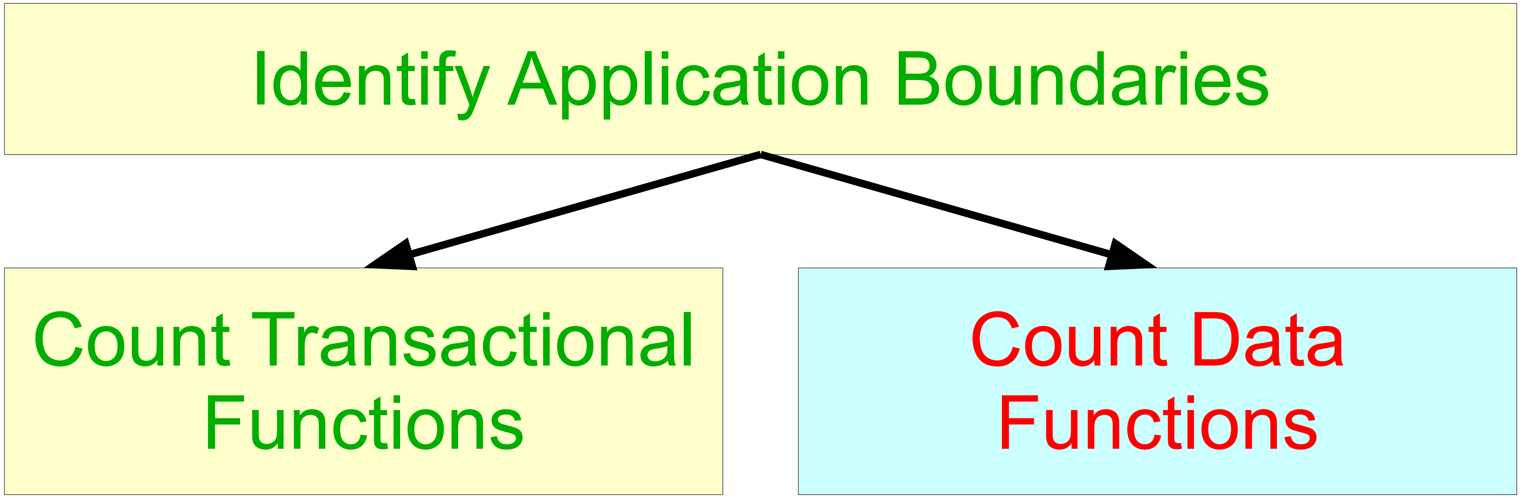
Transactional Components Trivia

- For which components is true:
  - DET-s are retrieved from FTR-s
  - Updates ILF
  - Maintains ILF
  - Contains derived data
  - Info from outside to inside
  - Never contains derived data
  - Info from inside to outside
  - At least on FTR is referenced

Function Points – Context



Identify Application Boundaries

Count Transactional Functions

Count Data Functions

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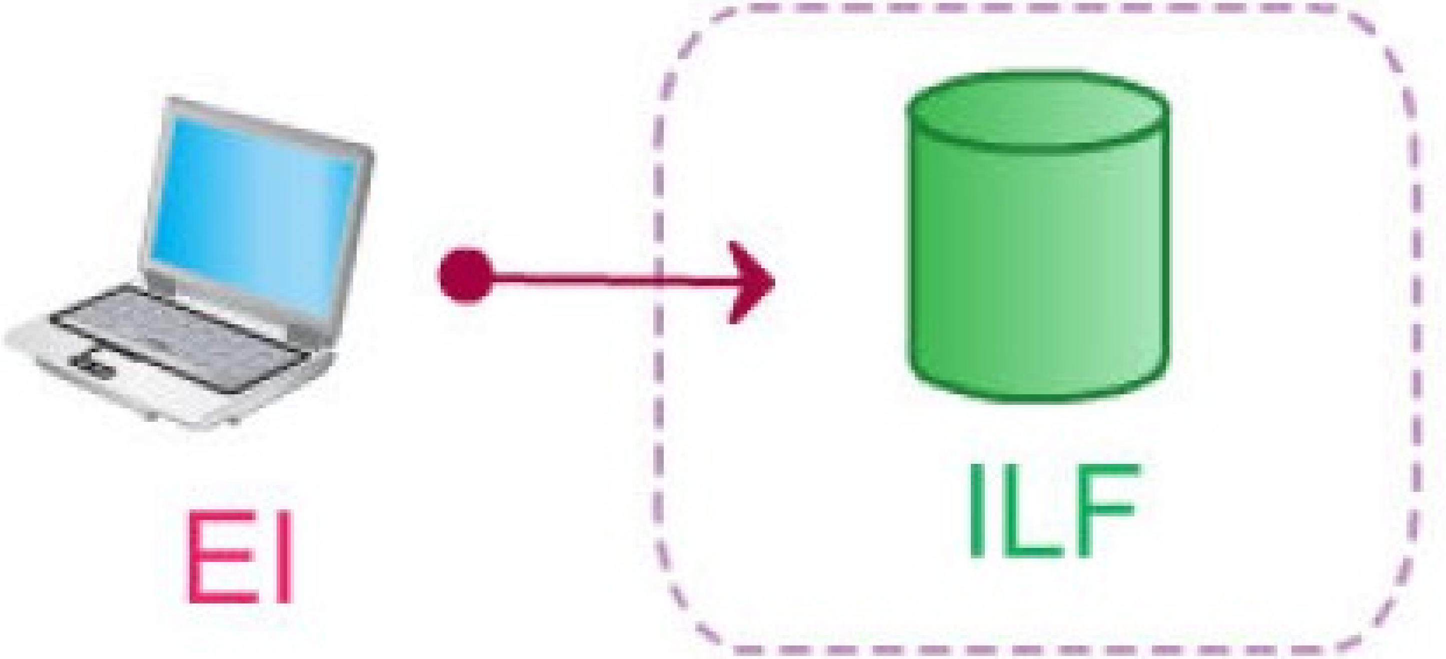
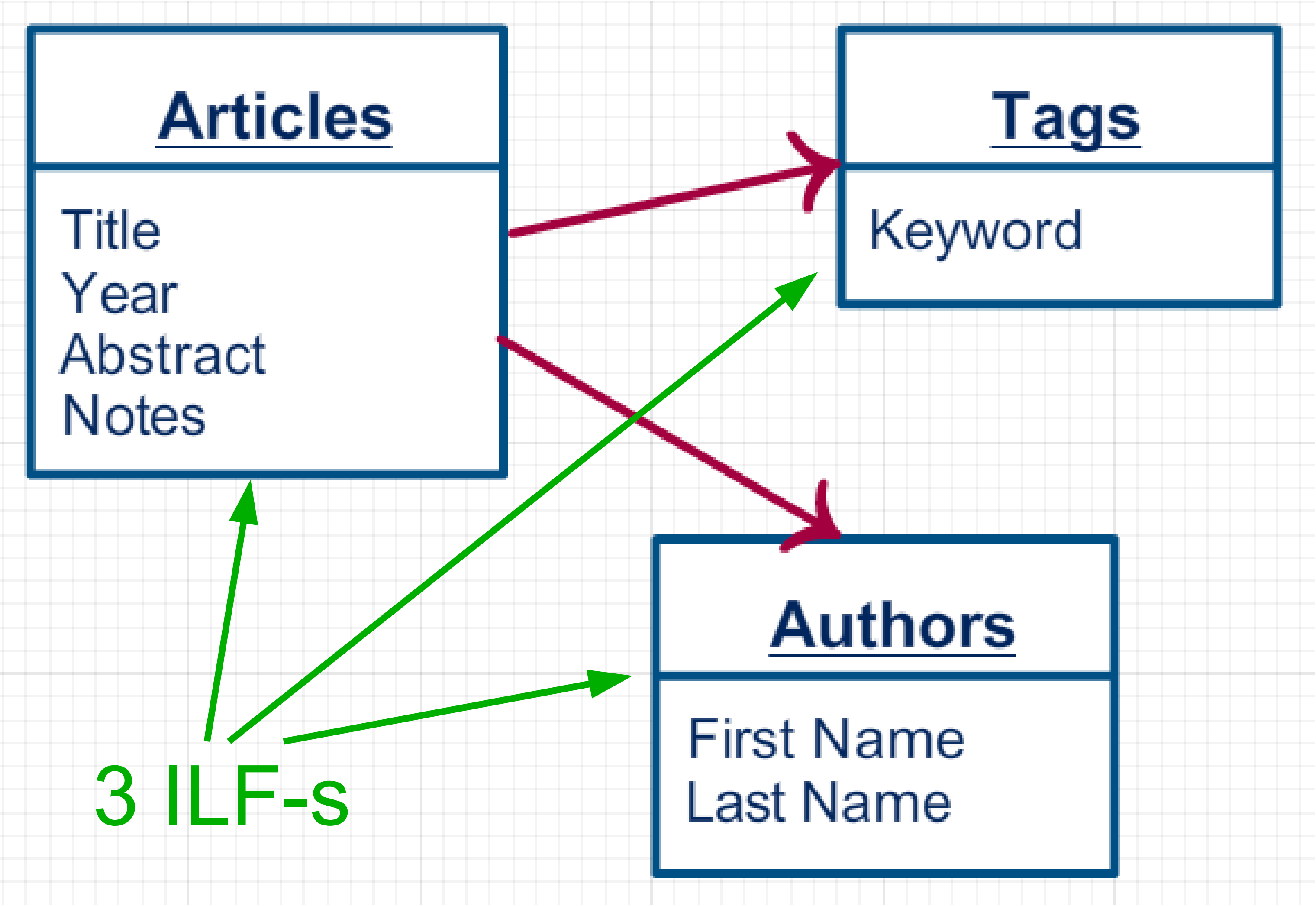
Internal Logical Files

- Data that resides within app. boundaries
  - Business data, control data, rules based data



Internal Logical Files – Examples



Internal Logical Files – Data Types

- Business data: course name, address, student
- Control data: printer port, copies, database url
- Rules based data: registration criteria, grading scheme

Internal Logical Files – Examples

- Application configuration stored on hard drive
  - If maintained through the application
- Log files

Internal Logical Files

- Group of logically related data residing entirely within application boundary
  - Maintained by External Inputs
  - Has at least one Record Element Type
- Rated based upon Data Element Types and Record Element Types

Internal Logical Files → FP-s

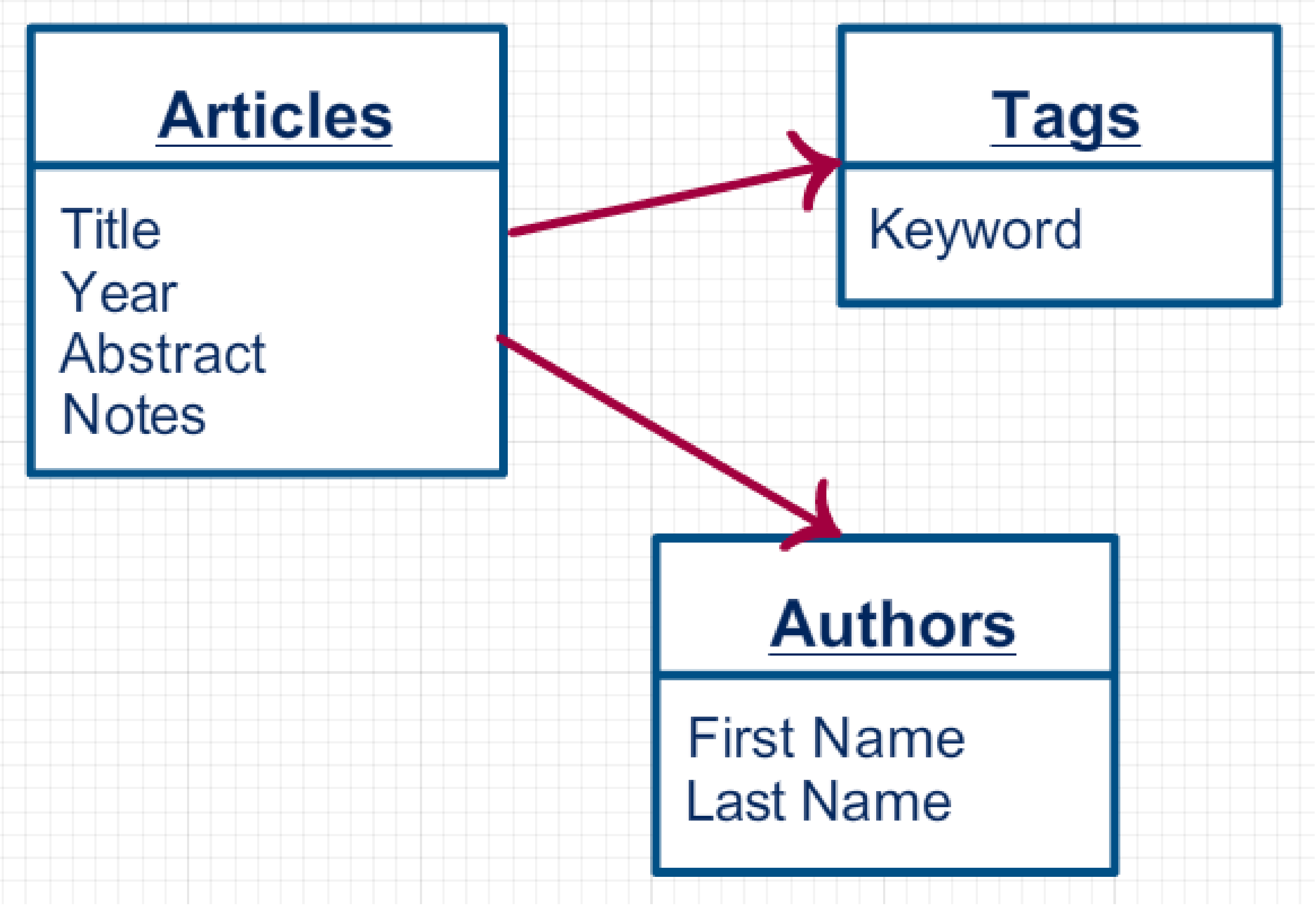
Record Elements (RET-s)	Data Elements (DET-s)		
	1 – 19	20 – 50	> 50
1	Low (7)	Low (7)	Average (10)
2 – 5	Low (7)	Average (10)	High (15)
> 5	Average (10)	High (15)	High (15)

- Low → 7 function points
- Average → 10 function points
- High → 15 function points

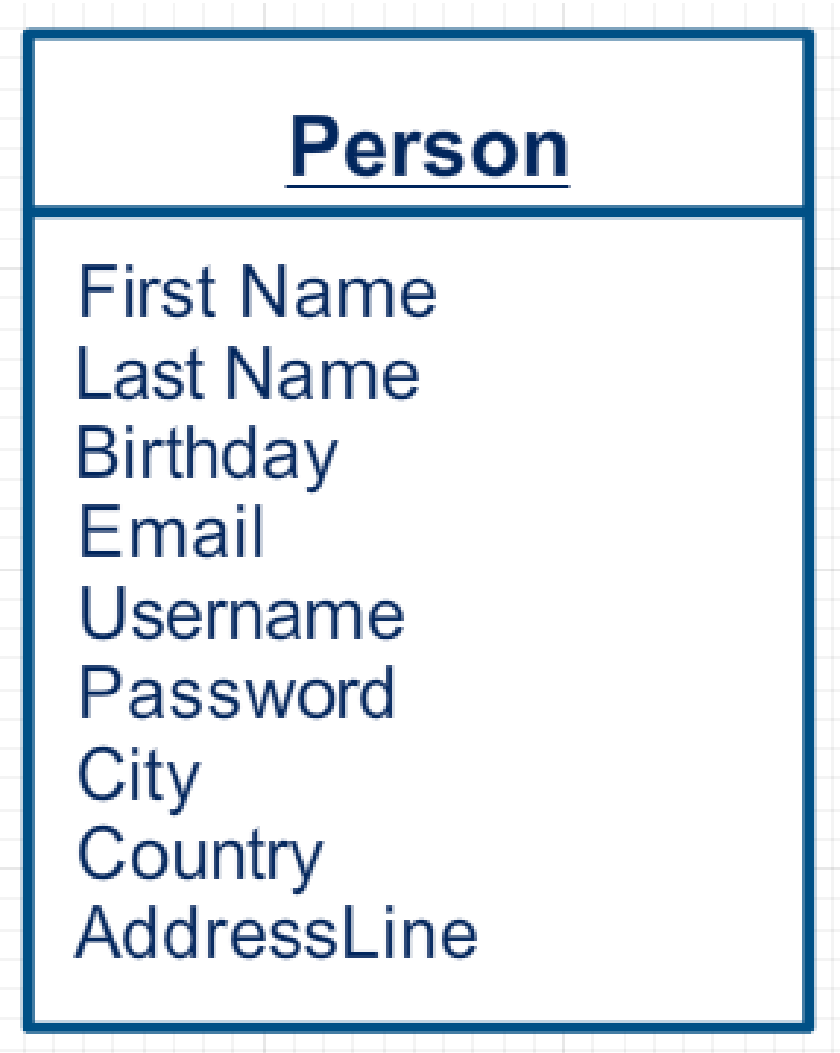
Internal Logical Files – Identification Rules

- User identifiable logical grouping
- Data is maintained within application boundaries
- Data is modified via one or more External Inputs

Exercise – Rate ILF-s



Exercise – Rate ILF

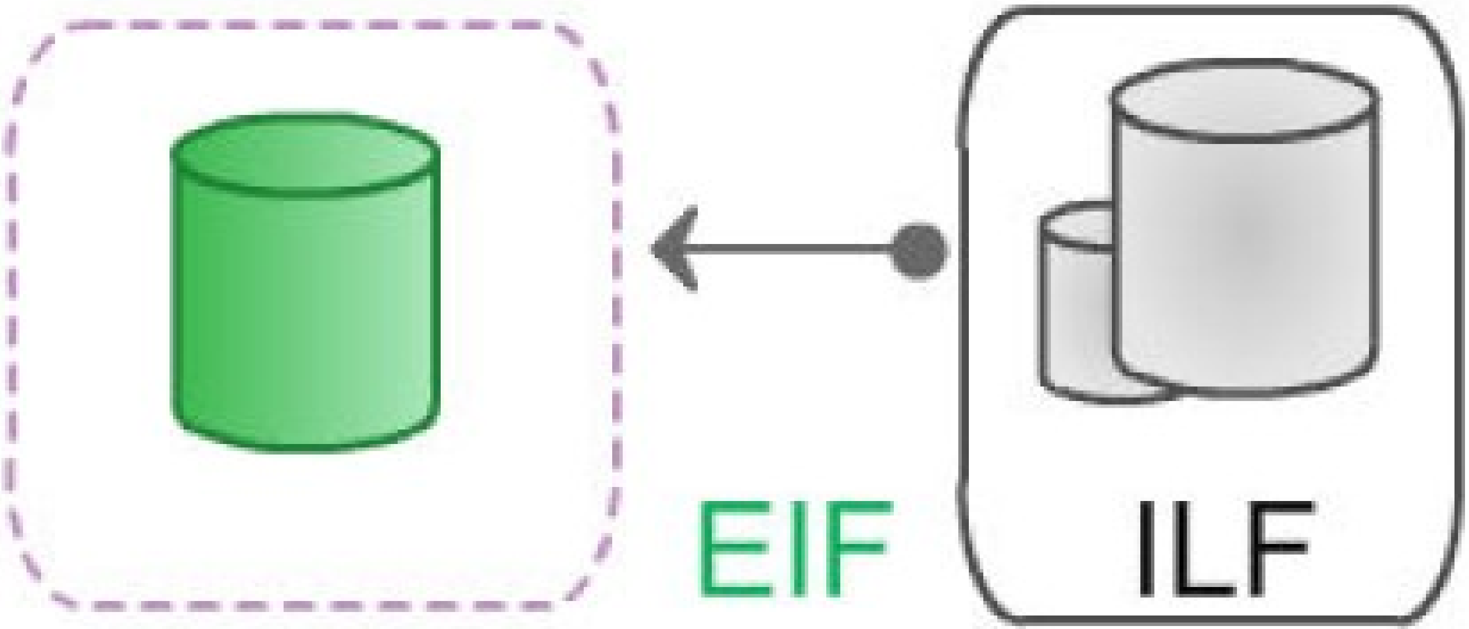


Person

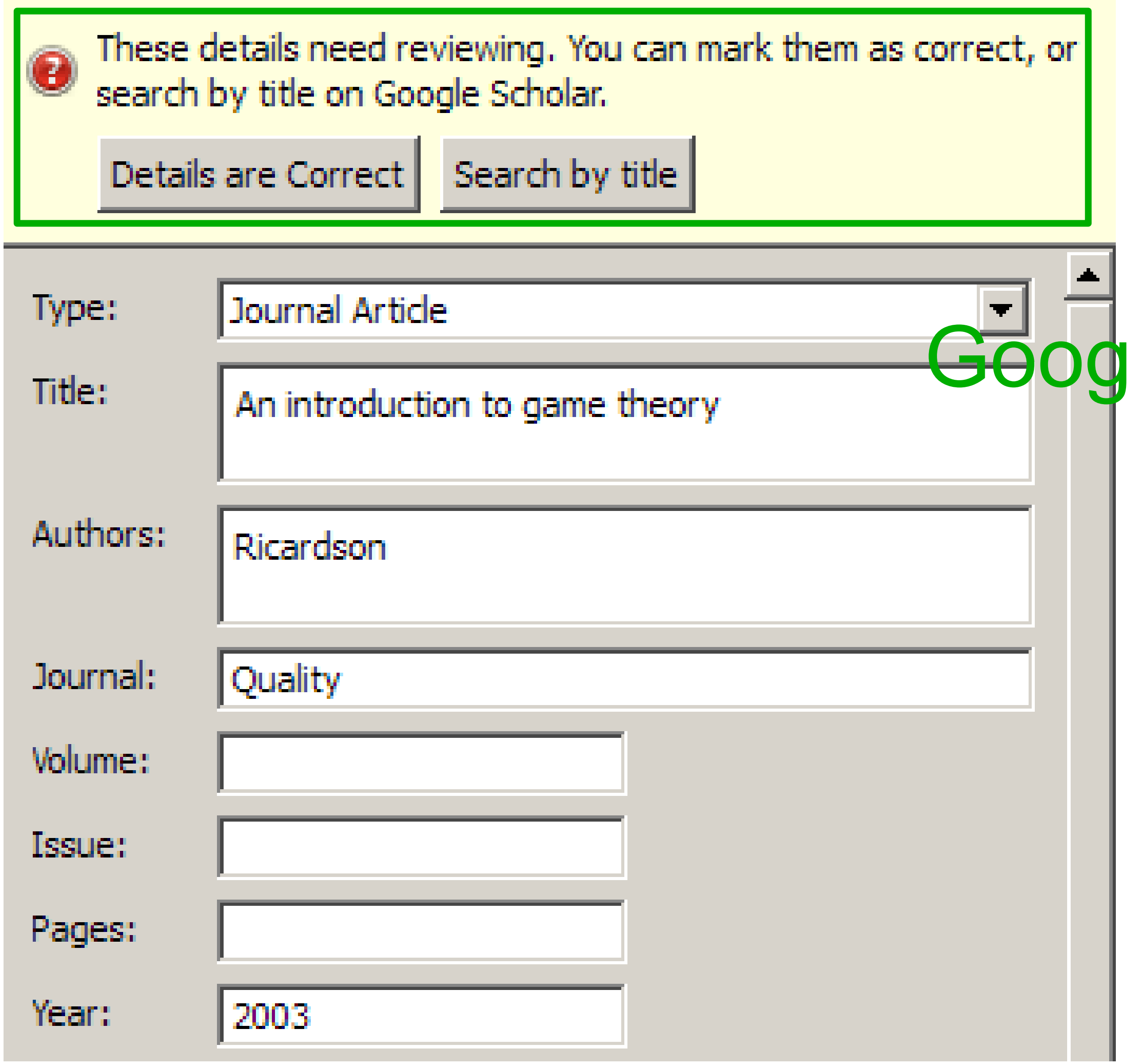
First Name
Last Name
Birthday
Email
Username
Password
City
Country
AddressLine

External Interface Files

- Data that resides outside app. boundary
  - Internal data of other application



External Interface Files – Examples



These details need reviewing. You can mark them as correct, or search by title on Google Scholar.

Type:	Journal Article
Title:	An introduction to game theory
Authors:	Ricardson
Journal:	Quality
Volume:	
Issue:	
Pages:	
Year:	2003

Google Scholar is EIF

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External Interface Files

- Group of logically related data residing entirely outside application boundary
  - Maintained by another application
  - Data is retrieved during External Output or External Inquiry
- Rated based upon Data Element Types and Record Element Types

External Interface Files → FP-s

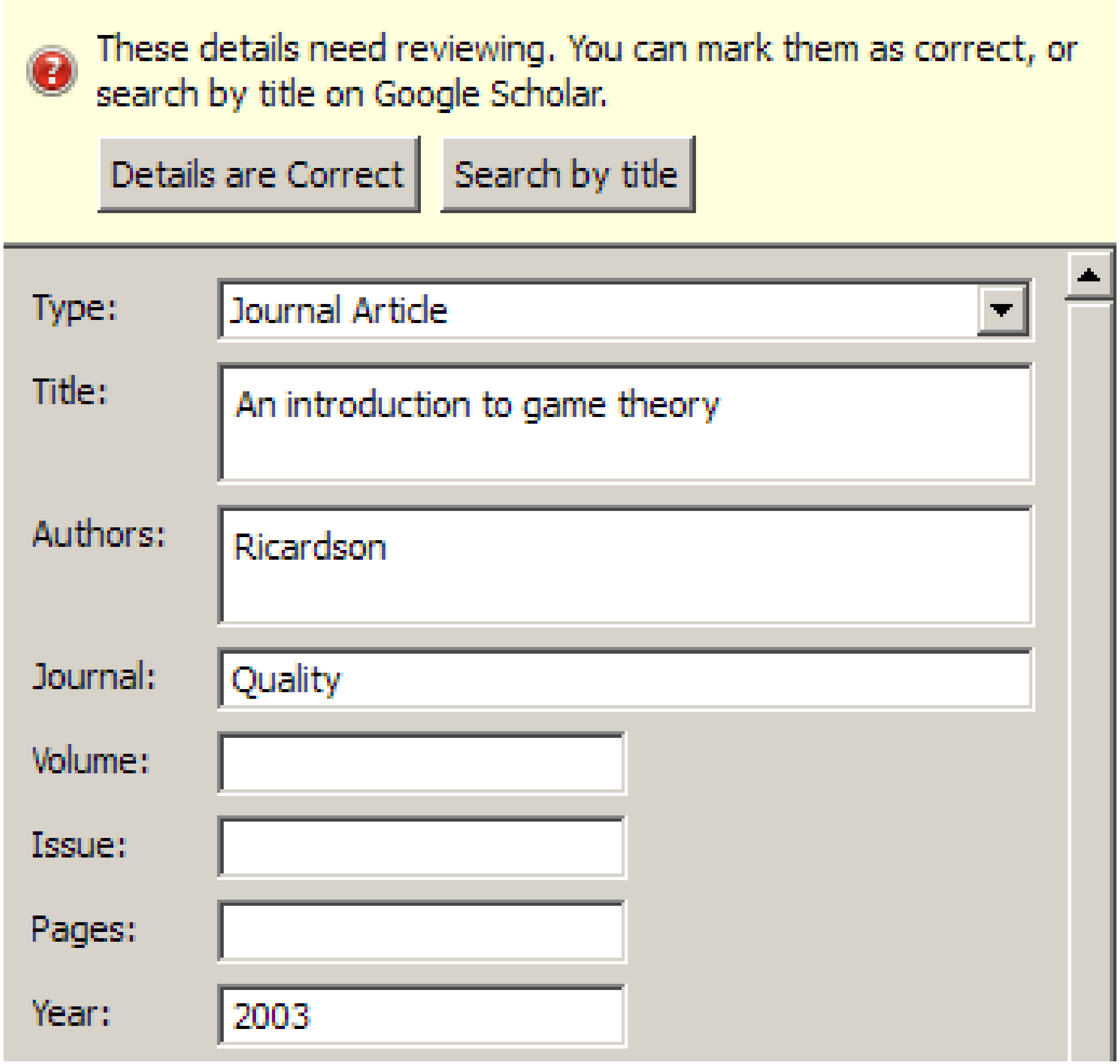
Record Elements (RET-s)	Data Elements (DET-s)		
	1 – 19	20 – 50	> 50
1	Low (5)	Low (5)	Average (7)
2 – 5	Low (5)	Average (7)	High (10)
> 5	Average (7)	High (10)	High (10)

- Low → 5 function points
- Average → 7 function points
- High → 10 function points

External Interface Files – Identification Rules

- User identifiable logical grouping of information
- Data external to application

Exercise – Rate EIF



These details need reviewing. You can mark them as correct, or search by title on Google Scholar.

Type:	Journal Article
Title:	An introduction to game theory
Authors:	Ricardson
Journal:	Quality
Volume:	
Issue:	
Pages:	
Year:	2003

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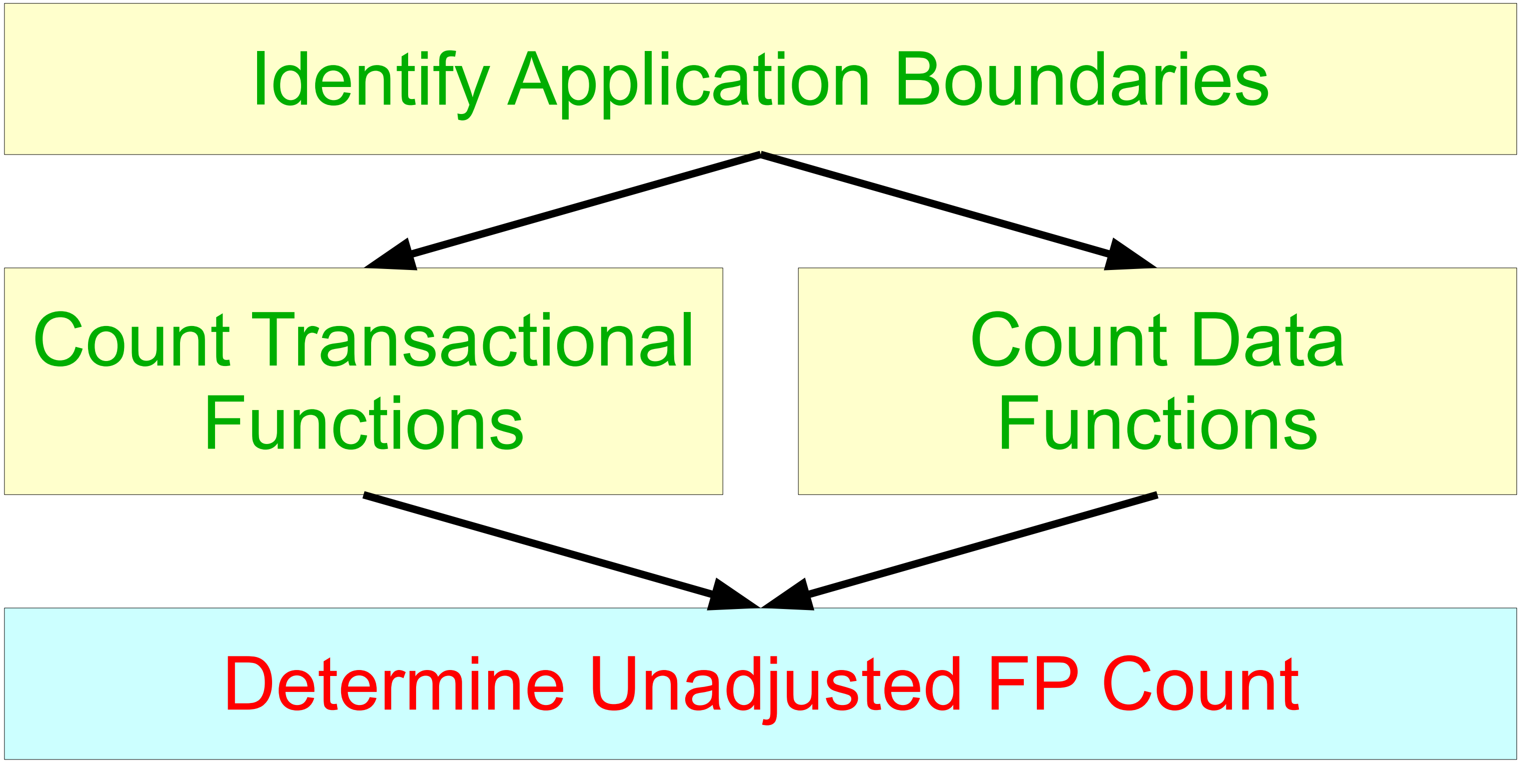
Function Points – Context



Identify Application Boundaries

Count Transactional Functions

Count Data Functions

Determine Unadjusted FP Count

What important aspect is missing in order to start using FPA right now?

General System Characteristics

- Rate the general functionality of the application
- Things that influence application as a whole (= non-functional requirements)
  - Context of operation
  - Performance
  - Reliability
- 14 Characteristics → For each rate “how much it influences the application”
  - 0 – 5

1. Data Communications

- How many communication facilities are there?

0. Batch processing or standalone computer
1. Batch processing w/ remote data entry or printing
2. Batch w/ remote data entry and printing
3. Online data collection or front-end to a batch process or query system
4. More than a front-end but supports only one communication protocol
5. More than a front-end and supports more than one com. protocol

1. Data Communications - Example

- Application that allows querying via internet and local access → 3 pt
- Application that allows updating ILF-s via internet and local access → 5 pt

2. Distributed Data Processing

- How are distributed data and processing functions handled

0. Application doesn't aid data transfer or processing between components
1. Data prepared for end-user processing on another component (e.g. store results in DBMS)
2. Data prepared for transfer, transferred and processed on another component
3. Distributed processing and transfer are online in one direction
4. Distributed processing – online in both directions
5. Dynamically performed on most appropriate component

3. Performance

- Requirements of response time or throughput

0. No special requirements
1. Stated and reviewed but no special actions
2. Critical during peak hours
3. Critical during business hours
4. Stringent requirements drive performance analysis in the design phase
5. Stringent requirements drive usage of analysis tools during various phases (design, development, etc)

4. Heavily Used Configuration

- Usage of existing hardware to run application

0. No operational restrictions
1. Restrictions exist, but no special effort required to meet them
2. Some security or timing considerations required
3. Processor requirements for specific piece of app.
4. Special constraints on application in the central processor
5. In addition, special constraints on application in distributed components

5. Transaction Rate

- Frequency of transaction execution

0. No peak period anticipated
1. Peak period (monthly, quarterly, etc) is anticipated
2. Weekly peak period
3. Daily peak period
4. Requirements or SLA drive performance analysis in the design phase
5. Requirements or SLA drive usage of performance analysis tools in various phases (design, development, installation, etc)

6. Online Data Entry

- How much information is entered online

    0.All transactions processed in batch mode

    1.1% – 7% of transactions are interactive data entry

    2.8% – 15%

    3.16% – 23%

    4.24% – 30%

    5.More than 30%

7. End-user Efficiency

- Was application designed for end-user efficiency?

- Navigational aids
- Menus
- Online help
- Scrolling
- Mouse interface
- Pop-up windows
- Cursor selection of screen data

- Bilingual support (4x)
- Multilingual (6x)
- Remote printing
- Preassigned function keys
- Highlighting, color underlining, ..
- AND MORE ...

7. End-user Efficiency

- Was application designed for end-user efficiency?

0. None of the above
1. 1 – 3 of the above
2. 4 – 5 of the above
3. More than 6, but no specific requirements stated
4. More than 6 and requirements require special design tasks
5. More than 6 and requirements require usage of special tools to demonstrate achievement

8. Online Update

- Number of ILF-s updated online

0. None
1. 1 – 3 control files, volume of updating is low, recovery is easy
2. 4 or more control files, …
3. Online update of major ILF-s is included
4. Protection against data loss is required and to be designed and implemented
5. High volumes of updates, highly automated recovery procedures, cost considerations

9. Complex Processing

- Requirements of logical or mathematical processing (each selected → +1 point)
  - Sensitive control (special audit processing) and/or app specific security processing
  - Extensive logical processing
  - Extensive mathematical processing
  - Exception processing resulting in incomplete transactions that must be redone (e.g. ATM-s)
  - Complex processing to handle multiple input/output possibilities (e.g. multimedia, device independence)

10. Reusability

- Application and code designed and developed to be usable in **<u>other</u>** applications

0. No reusable code
1. Reusable code used within the application
2. <10% of app considered more than one user's needs
3. >10% of app considered …
4. Packaged and documented for reuse, customizable at source code level
5. Package and documented for reuse, customizable by parameter maintenance

11. Installation Ease

- Difficulty of conversion and installation

0. No special considerations stated, no special setup is required for installation
1. No special considerations stated, but special setup is required
2. Requirements stated, but impact of conversion is not important, installation and conversion guides tested and provided
3. Requirements stated and impact is important
4. #2 + Automated conversion and installation
5. #3 + Automated conversion and installation

12. Operational Ease

- Effectiveness and automation of start-up, back-up and recovery procedures, min. manual activities

0. No special considerations, only normal back-up procedures stated

1-4. Each selection from below → +1 point:
   - Effective procedures with operator intervention
   - Effective procedures without intervention (+2)
   - Minimization of tape mounts needs
   - Minimization of paper handling needs

5. No operator intervention required besides start-up and shut-down. Automatic error recovery

13. Multiple Sites

- Support of installation and usage at multiple sites for multiple organizations

0.No requirements of more than one user/site

1.Identical hardware and software environment

2.Similar hardware and software environment

3.Different hardware and software environments

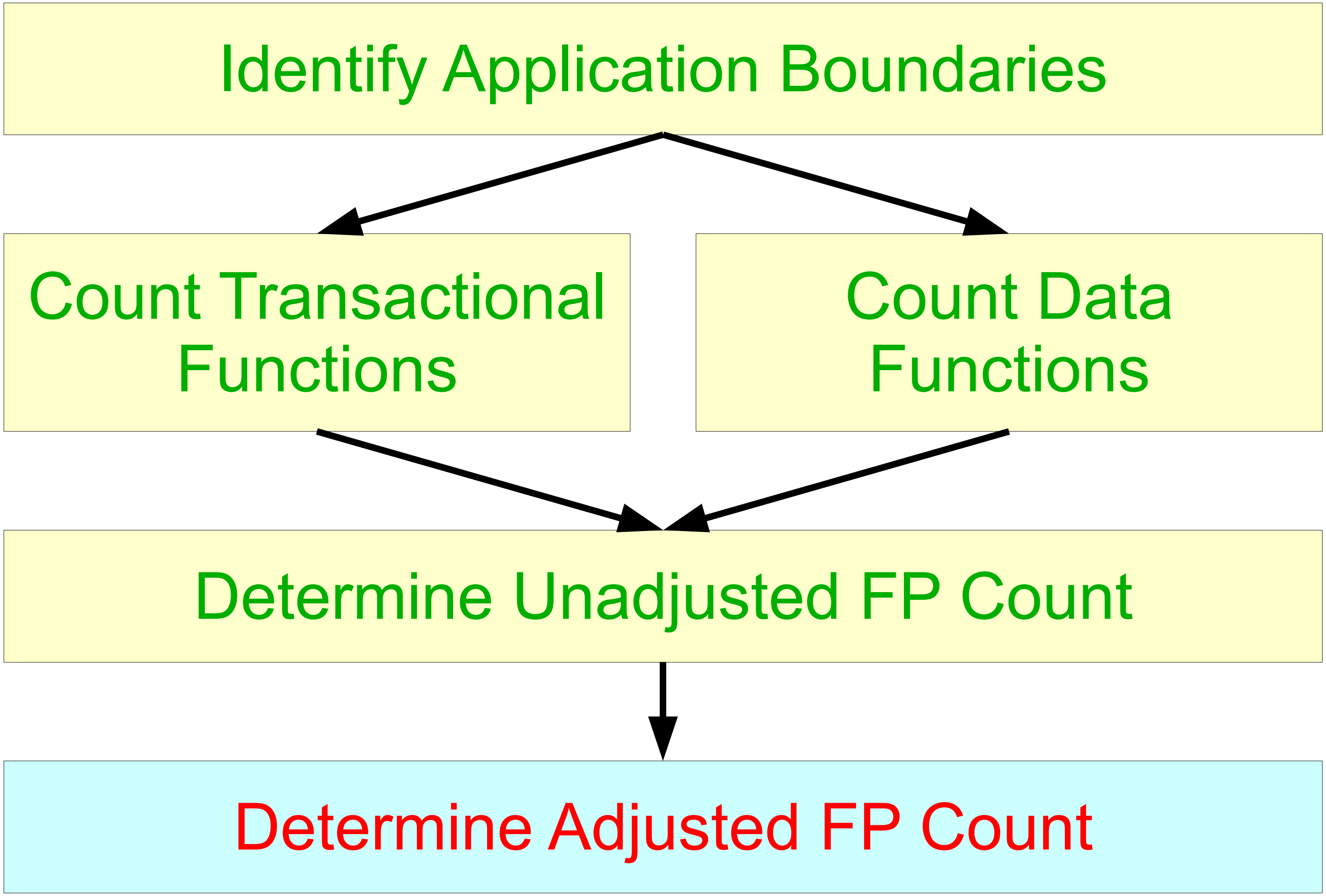
– Docs and support plan provided and tested + #1 or #2

– Docs and support plan provided and tested + #3

14. Facilitate Change

- Requirements of change facilitation in biz. data (sum points)
  - Flexible query and report facility with simple requests (for 1 ILF) – 1pt
  - Query and report with average complexity requests (for >1 ILF) – 2pts
  - Query and report with complex requests (combinations of ILF-s) – 3pts
  - Online interactive processes for biz. control data, but changes take effect next business day – 1pt
  - Online interactive processes for biz. control data, and changes take effect immediately – 2pts

Function Points – Context


Identify Application Boundaries
Count Transactional Functions
Count Data Functions
Determine Unadjusted FP Count
Determine Adjusted FP Count

Value Adjustment Factor

$$\mathtt{VAF = 0.65 + 0.01\ x\ Sum(GSC_i)}$$

Function Points Count

`FP = UFP * VAF`

- UFP – Unadjusted function points
- VAF – Value adjustment factors

Different Types of Projects

- Development project
  - Data migration, initial installation → assisting functionality
- Enhancement project
  - New functionality, modification and deletion of existing functionality, changes in global system characteristics
- Size of the existing/modified application
  - Several enhancements, “current size”

Development Project

DFP = (UFP + CFP) * VAF

- UFP – Unadjusted function points
- CFP – Conversion function points
  - Data conversion, initial installation, doesn't exist after application is up and running
- VAF – Value adjustment factor

Enhancement Project

EFP = (ADD + CHGA + CFP) * VAFA + DEL * VAFB

- ADD – Added unadjusted function points
- CHGA – Modified unadjusted function points
  - Counted AFTER modifications
- CFP – Conversion function points
- VAFA – Value adjustment factor AFTER project
- DEL – Deleted unadjusted function points
- VAFB – Value adjustment factor BEFORE project

Size After Enhancement Project

```
AFP = [(UFPB + ADD + CHGA)
  - (CHGB + DEL)] * VAFA
```

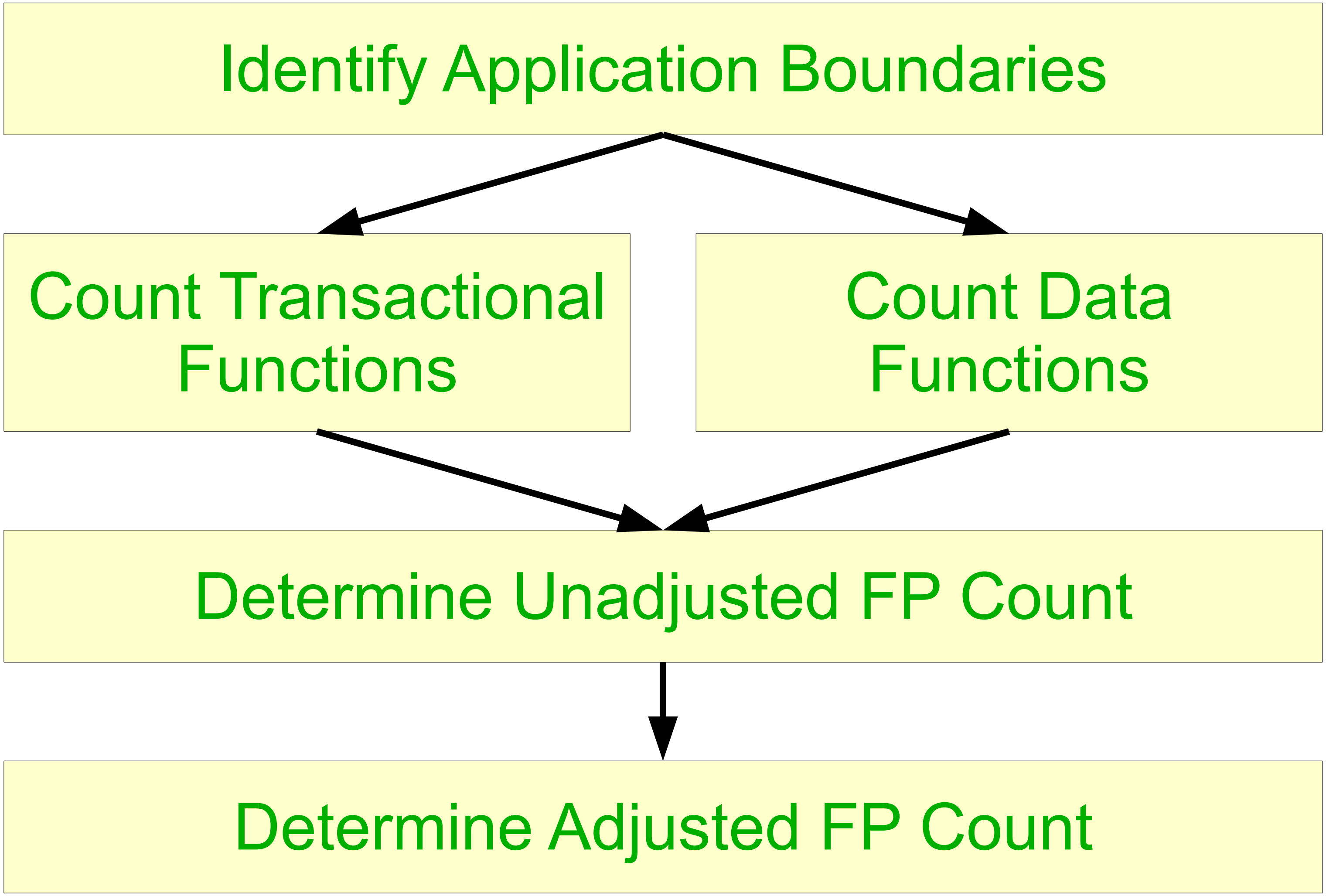
- UFPB – Unadjusted FP-s before enhancement
- ADD – Added unadjusted function points
- CHGA – Modified unadjusted FP-s “AFTER”
- CHGB – Modified unadjusted FP-s “BEFORE”
- DEL – Deleted unadjusted function points
- VAFA – Value adjustment factor AFTER project

Current Application Size

AFP = ADD * VAF

- ADD – Unadjusted FP-s for functionality currently installed
  - Parts of application may have been deleted, modified etc
- VAF – Value adjustment factor

Function Points – Context


Identify Application Boundaries

Count Transactional Functions

Count Data Functions

Determine Unadjusted FP Count

Determine Adjusted FP Count

Home Assignment

- Group assignment
- Select software or software project
  - At least 5 transaction components
- Perform function point analysis
- Important dates:
  - 26. Sept 00:00 → submit reports
  - 28. Sept → present your work

Report Expectations

- Application overview
- State all assumptions (e.g. data model, ...)
- Clearly stated boundaries
  - what's inside, what's not
- For each component:
  - justify its type
  - list DETs, RETs, FTRs
- GSC → for each justify value
- Be laconic → keep it short
- English!

Presentation Expectations

- 10 mins
- 3 most interesting/complex components
- 3 GSC-s
- Total number of points
- English!

Assignment – Project Examples

- Projects in English
  - http://www.cs.gordon.edu/courses/cs211/AddressBookExample/
  - http://courses.cs.ut.ee/2009/tvp/Teams/MK
- Projects in Estonian
  - http://courses.cs.ut.ee/2009/tvp/Teams/SK1
  - http://courses.cs.ut.ee/2009/tvp/Teams/SK2
  - http://courses.cs.ut.ee/2008/tvp/Teams/EM1
  - http://courses.cs.ut.ee/2009/tvp/Teams/PP2

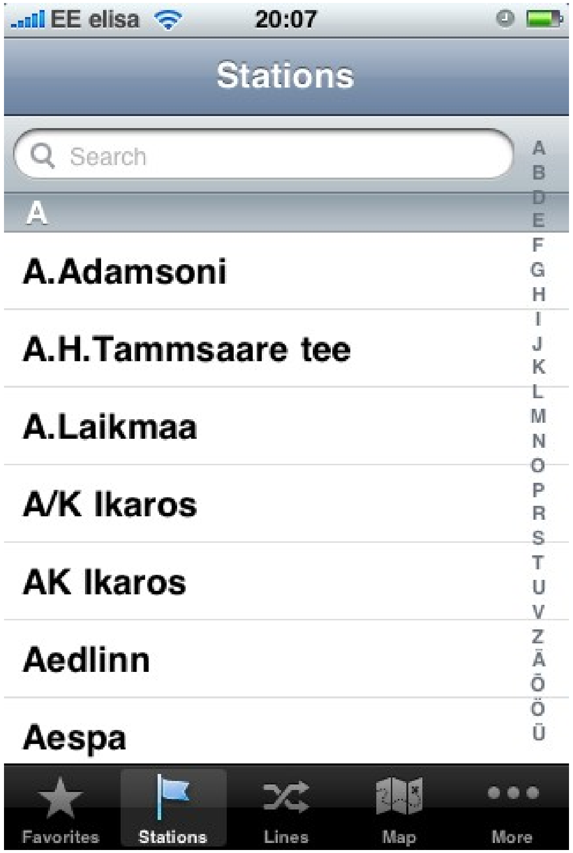
Case Study

- Let's analyze something
  - iRoute – iPhone App
  - Twitter web client
  - ...

iRoute: Tallinn, Estonia

- Created by Vitaly Virulaine
- Public transportation info
  - List of stations
  - Bus, trolleybus, tram lines
  - Timetable
  - Favorites
  - Map with stations
  - Search

iRoute: Tallinn, Estonia



A

A.Adamsoni

A.H.Tammsaare tee

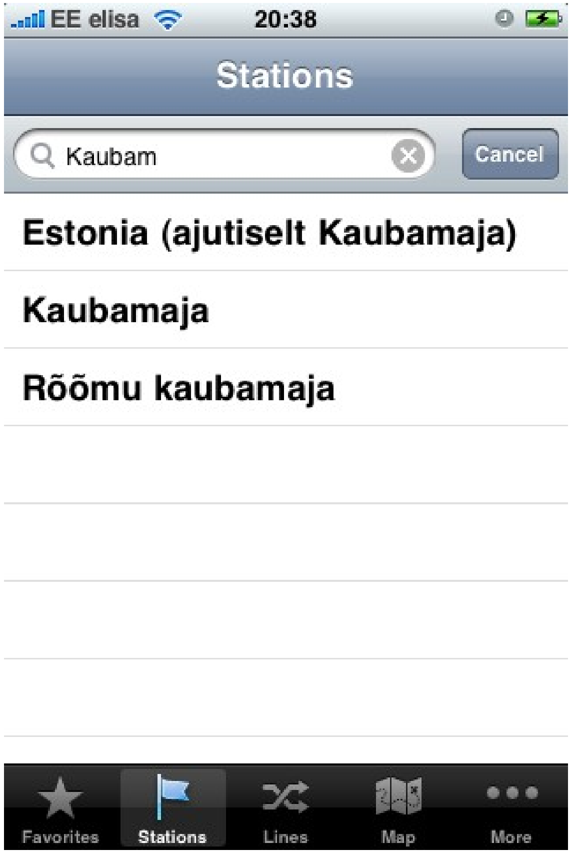
A.Laikmaa

A/K Ikaros

AK Ikaros

Aedlinn

Aespa



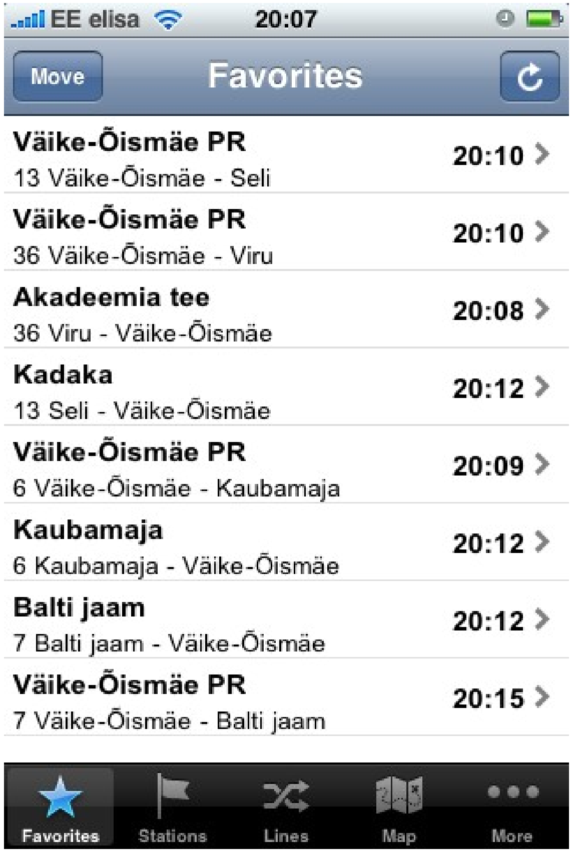
Kaubam

Estonia (ajutiselt Kaubamaja)

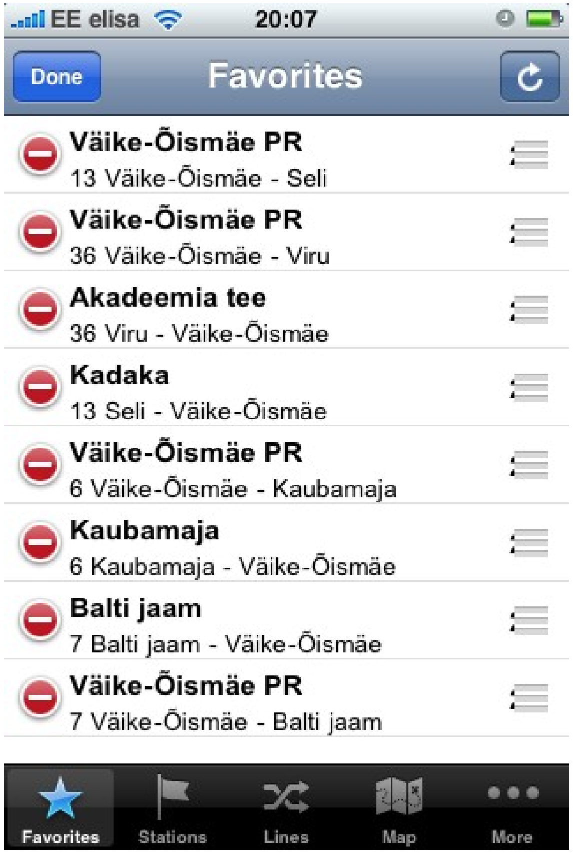
Kaubamaja

Rõõmu kaubamaja

iRoute: Tallinn, Estonia



Väike-Õismäe PR 13 Väike-Õismäe - Seli	20:10
Väike-Õismäe PR 36 Väike-Õismäe - Viru	20:10
Akadeemia tee 36 Viru - Väike-Õismäe	20:08
Kadaka 13 Seli - Väike-Õismäe	20:12
Väike-Õismäe PR 6 Väike-Õismäe - Kaubamaja	20:09
Kaubamaja 6 Kaubamaja - Väike-Õismäe	20:12
Balti jaam 7 Balti jaam - Väike-Õismäe	20:12
Väike-Õismäe PR 7 Väike-Õismäe - Balti jaam	20:15



Väike-Õismäe PR
13 Väike-Õismäe - Seli

Väike-Õismäe PR
36 Väike-Õismäe - Viru

Akadeemia tee
36 Viru - Väike-Õismäe

Kadaka
13 Seli - Väike-Õismäe

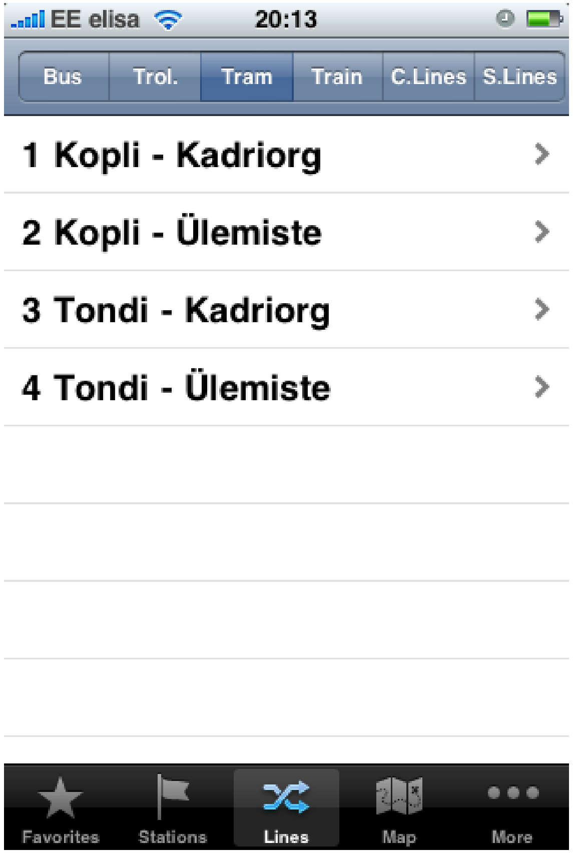
Väike-Õismäe PR
6 Väike-Õismäe - Kaubamaja

Kaubamaja
6 Kaubamaja - Väike-Õismäe

Balti jaam
7 Balti jaam - Väike-Õismäe

Väike-Õismäe PR
7 Väike-Õismäe - Balti jaam

iRoute: Tallinn, Estonia

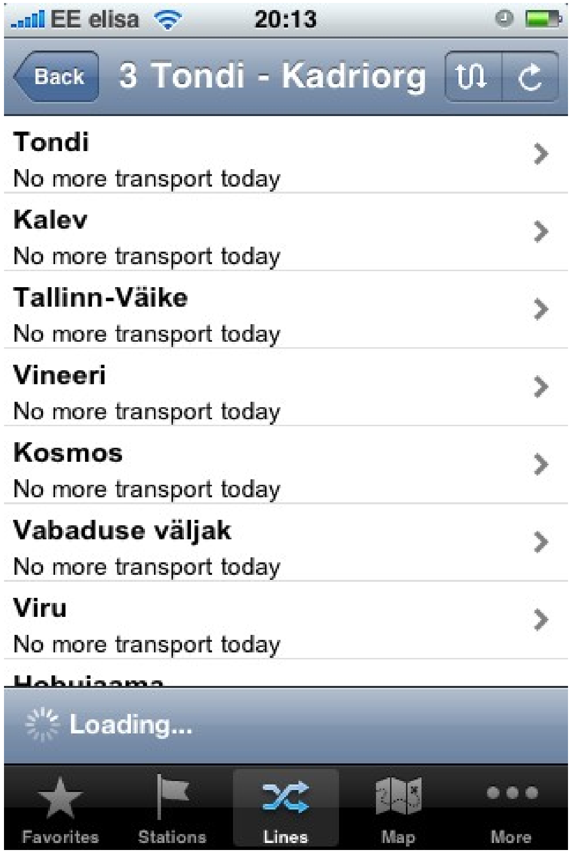


1 Kopli - Kadriorg

2 Kopli - Ülemiste

3 Tondi - Kadriorg

4 Tondi - Ülemiste



Tondi
No more transport today

Kalev
No more transport today

Tallinn-Väike
No more transport today

Vineeri
No more transport today

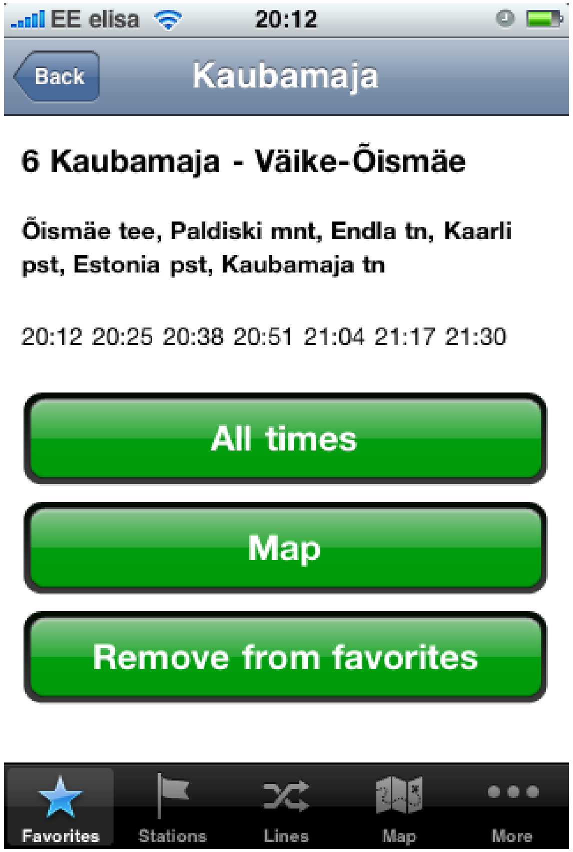
Kosmos
No more transport today

Vabaduse väljak
No more transport today

Viru
No more transport today

Hobujaama

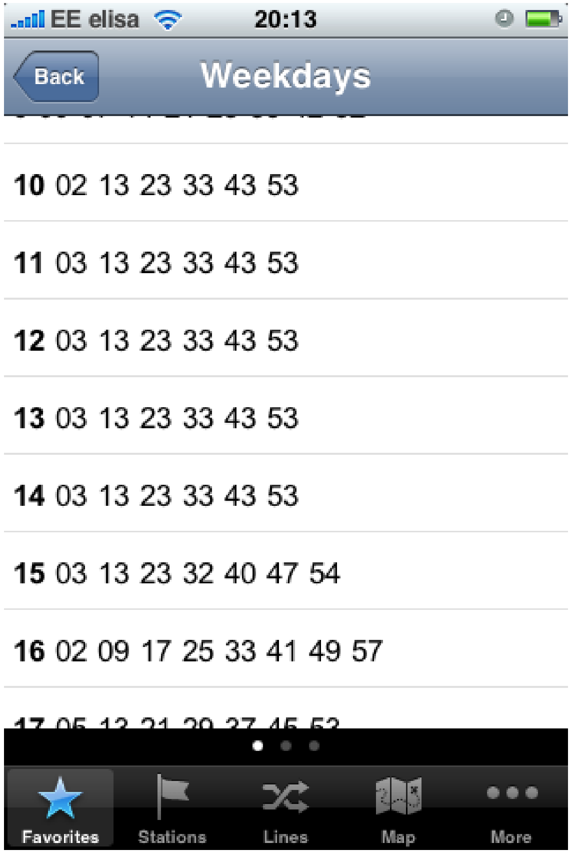
iRoute: Tallinn, Estonia



6 Kaubamaja - Väike-Õismäe

Õismäe tee, Paldiski mnt, Endla tn, Kaarli pst, Estonia pst, Kaubamaja tn

20:12 20:25 20:38 20:51 21:04 21:17 21:30



10 02 13 23 33 43 53

11 03 13 23 33 43 53

12 03 13 23 33 43 53

13 03 13 23 33 43 53

14 03 13 23 33 43 53

15 03 13 23 32 40 47 54

16 02 09 17 25 33 41 49 57

17 05 13 21 29 37 45 53

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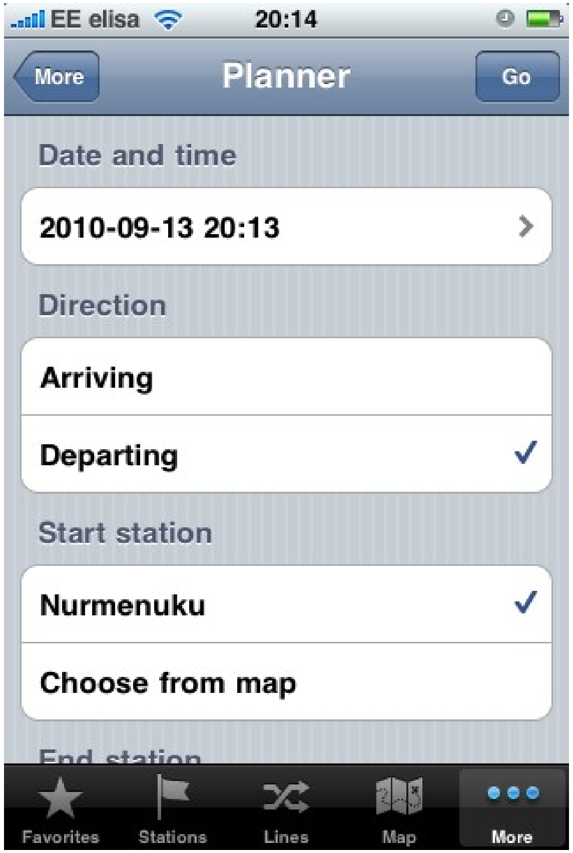
iRoute: Tallinn, Estonia



Date and time

2010-09-13 20:13 ›

Direction

Arriving

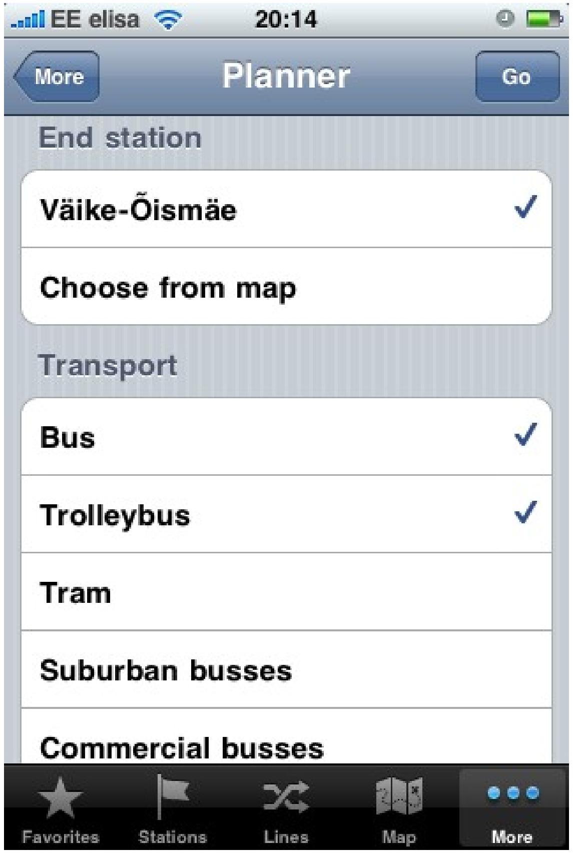
Departing ✓

Start station

Nurmenuku ✓

Choose from map

End station



End station

Väike-Õismäe ✓

Choose from map

Transport

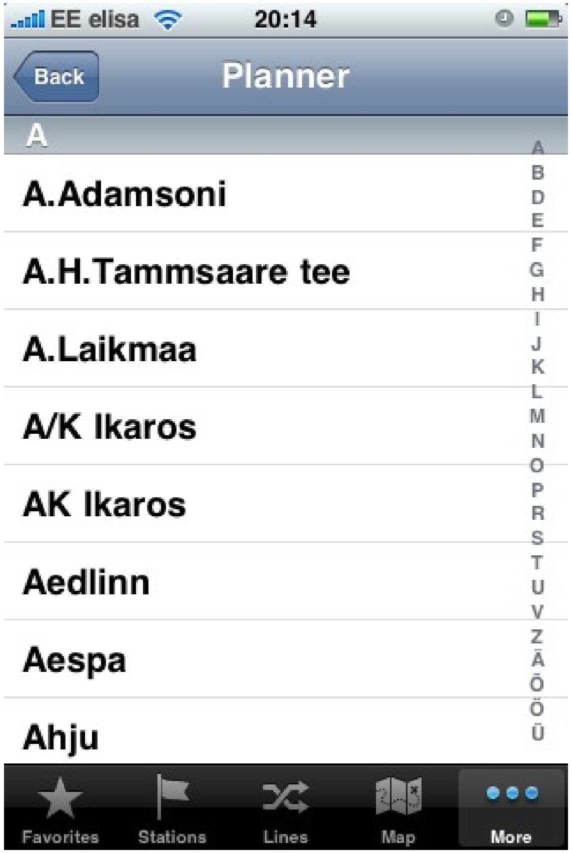
Bus ✓

Trolleybus ✓

Tram

Suburban busses

Commercial busses



A

A.Adamsoni

A.H.Tammsaare tee

A.Laikmaa

A/K Ikaros

AK Ikaros

Aedlinn

Aespa

Ahju

References

- D. Longstreet, Function Points Analysis Training Course
    - http://bit.ly/G6WIx

Home Assignment

Function Point Analysis of Software Projects

Home Reading #1

David Longstreet
“Function Point Manual”

Home Reading #2

Linda Westfall
“12 Steps to Useful Software Metrics”

http://www.westfallteam.com/Papers/12_steps_paper.pdf

Skype Public Chat:
http://bit.ly/tu-se-2010-chat

E-mail:
anton.litvinenko@programeter.com

Thank you for your time and attention!

See you in two weeks!

Next week: Mark Kofman