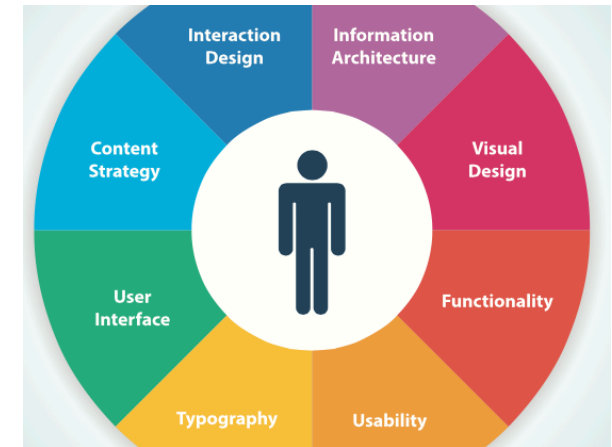

EVOLVING PATTERN LIBRARIES IN DISTRIBUTED EXPLORATIVE PROJECTS

Dr. René Reiners



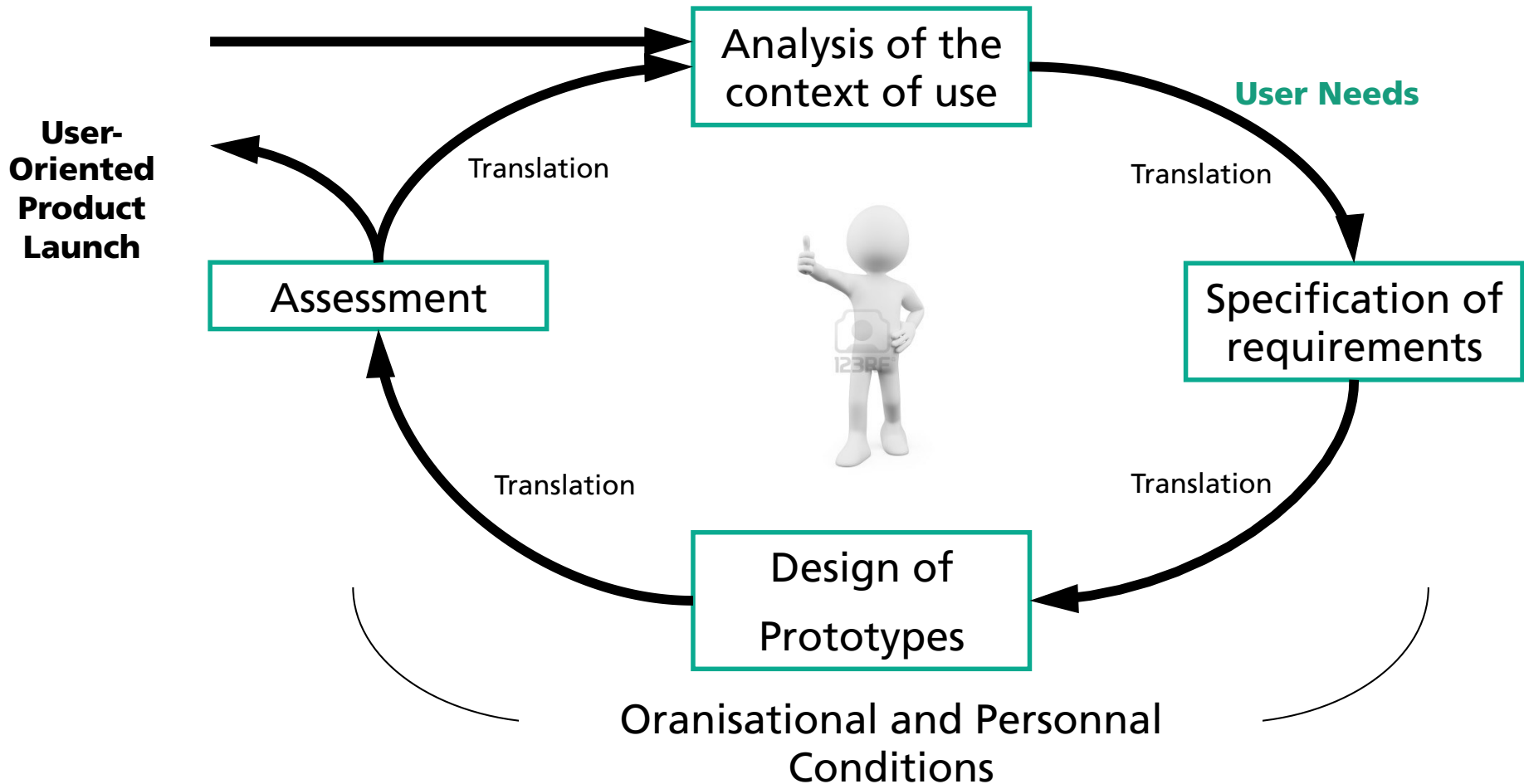
User-Centered Computing

Goal:

Optimizing usability and usefulness of IT in the interplay with organizational work practice, structures and processes.

How to? - Usability Engineering Process

ISO 9241-210



User Centred Ubiquitous Computing – Project Portfolio

■ Internet of Things and Services / Smart Cities

- Ebbits, BEMO-COFRA, **E3 Production**, **MAESTRI**, **ALMANAC**, **LinkSmart®**, **Industrial Data Space**



■ Energy Efficiency and Smart Environments:

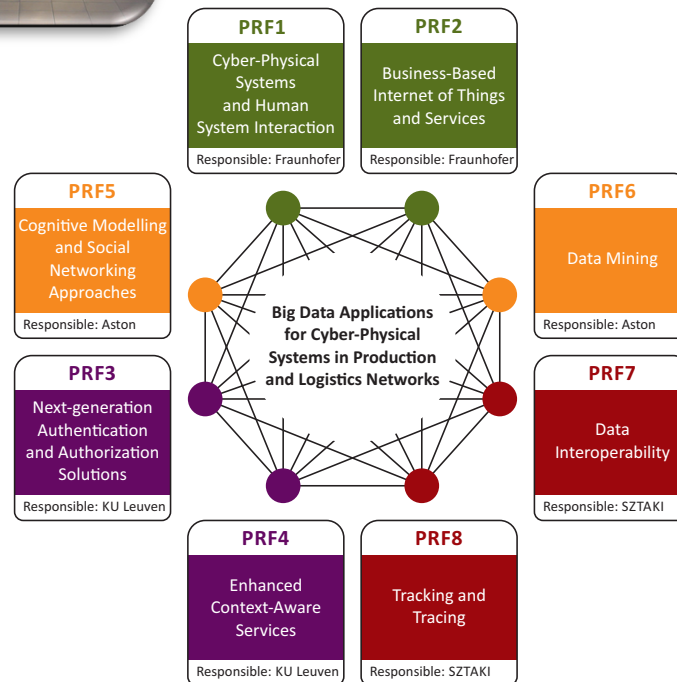
- Adapt4EE, SEAM4US, SEEMPubS, **DIMMER**, **IMPReSS**, **GreenCom**, **Flex4Grid**



■ Emergency Response / Healthcare, HCI and multimodal assistance

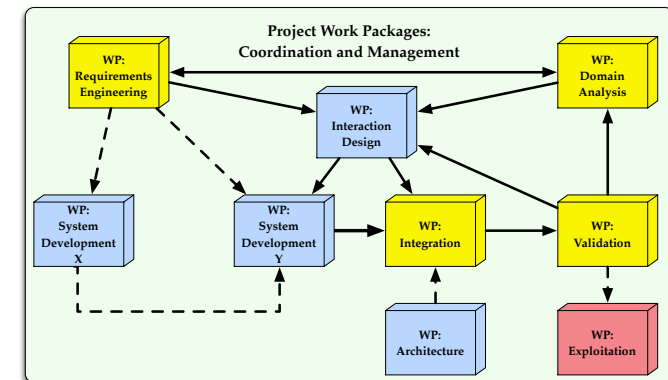
- BRIDGE, MICA, **AILB**, **PARADISE**, **SatisFactory**

User-Oriented Projects



Research Projects – Challenging Structures

- Various disciplines
- Different professional backgrounds
- Individual experience, methods and processes
- Complex communication
 - Different documentation formats and notations
 - Volatile knowledge
- Parallel activities need synchronization
- Staff changes
- Details about decisions are forgotten



Central Question and Aim

“How can we achieve that all project members benefit from gathered knowledge and made experience?”

- Creation of a common growing knowledge structure
 - Based on small chunks of knowledge
 - Created by all stakeholders
 - Iterative refinement
 - Understandable for every project member
- Approach: **Adapt the concept of design patterns**



Towards an Evolving Pattern Library



- Patterns are formulated *after* gathering experience
- **However:**
Knowledge needs to *evolve* in parallel to the project's achievements
- Research Questions:
 - What qualities are missing in currently existing pattern approaches?
 - How should a collaborative pattern formulation and maturation process be structured in order to reflect a pattern's development?
 - How can a pattern's formulation quality be ensured and validity be measured?
 - Which activities are performed by which roles?
 - How does the process remain easy to apply and to understand by the users?
 - What are accepted ways of showing progress and activity?

Pattern Formulation Approaches

- Exchange of Experience within Communities [*Borchers 2001, Graham 2003, van Duyne et al. 2007, Scott and Neil 2009, Tidwell 2011*]
- Online discussions within public and private libraries [*PatternTap LLC 2013, van Welie 2013, Yahoo! Inc. 2013*]
- Pattern formulation during engineering [*Grill and Blauhut 2008, de Rore 2009*]
- Active pattern mining workshops [*Iba and Isaku 2014*]
- Hypotheses supported by usability evaluations [*Kunert 2009*]
- From observations to best practices [*Leacock 2005, Averbakh et al. 2011*]



Summary of Discovered Problems

- Tedious pattern generation
- Closed author groups
- Lacking influence on pattern formulation
- Extensibility and actuality of patterns
- Lacking reuse of existing knowledge
- Non-transparent pattern derivation
- Long-term motivation and inclusion of stakeholders
- Lacking recommendation and guidance
- Missing knowledge about bad practices

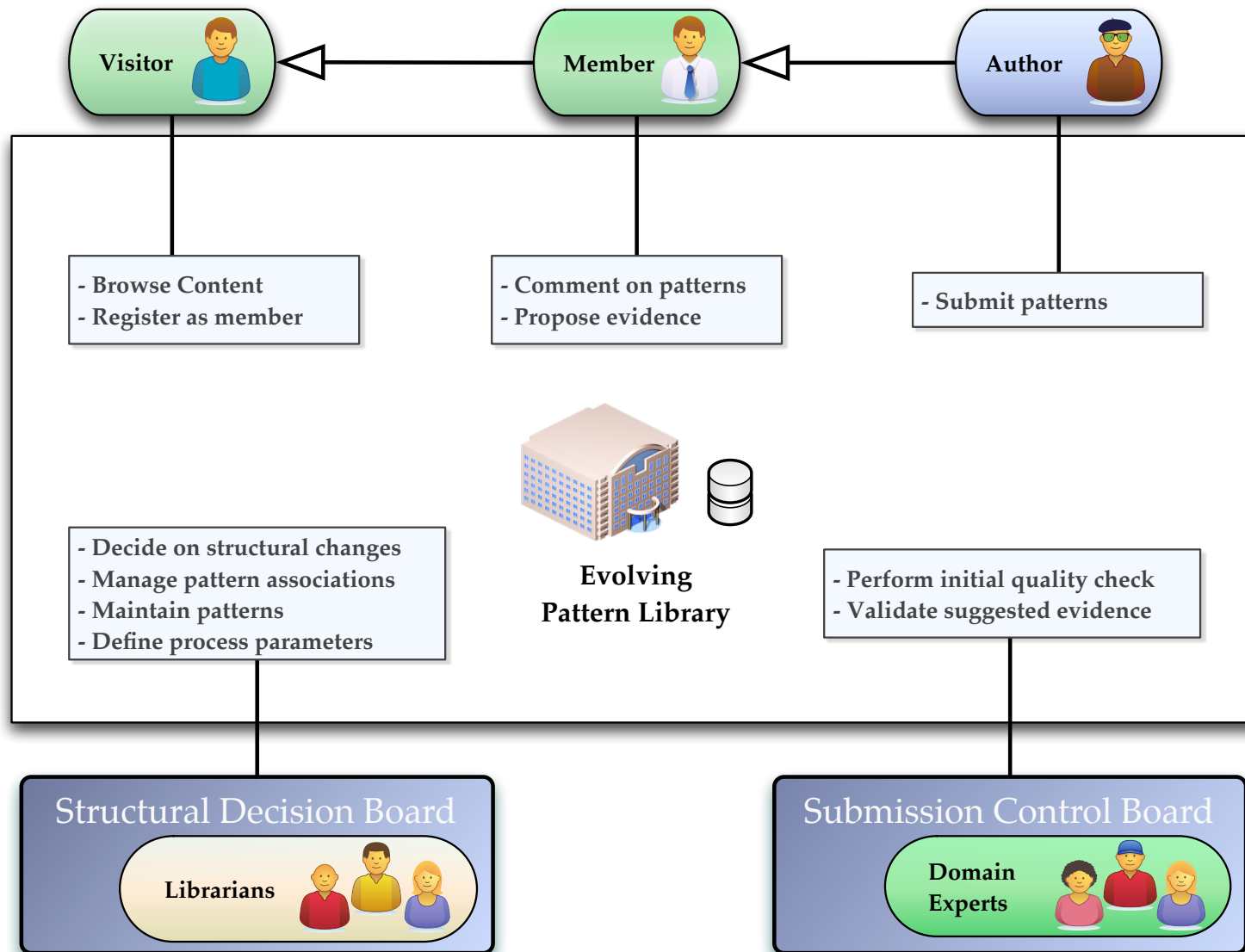


Requirements for a Collaborative Pattern Formulation and Maturation Process

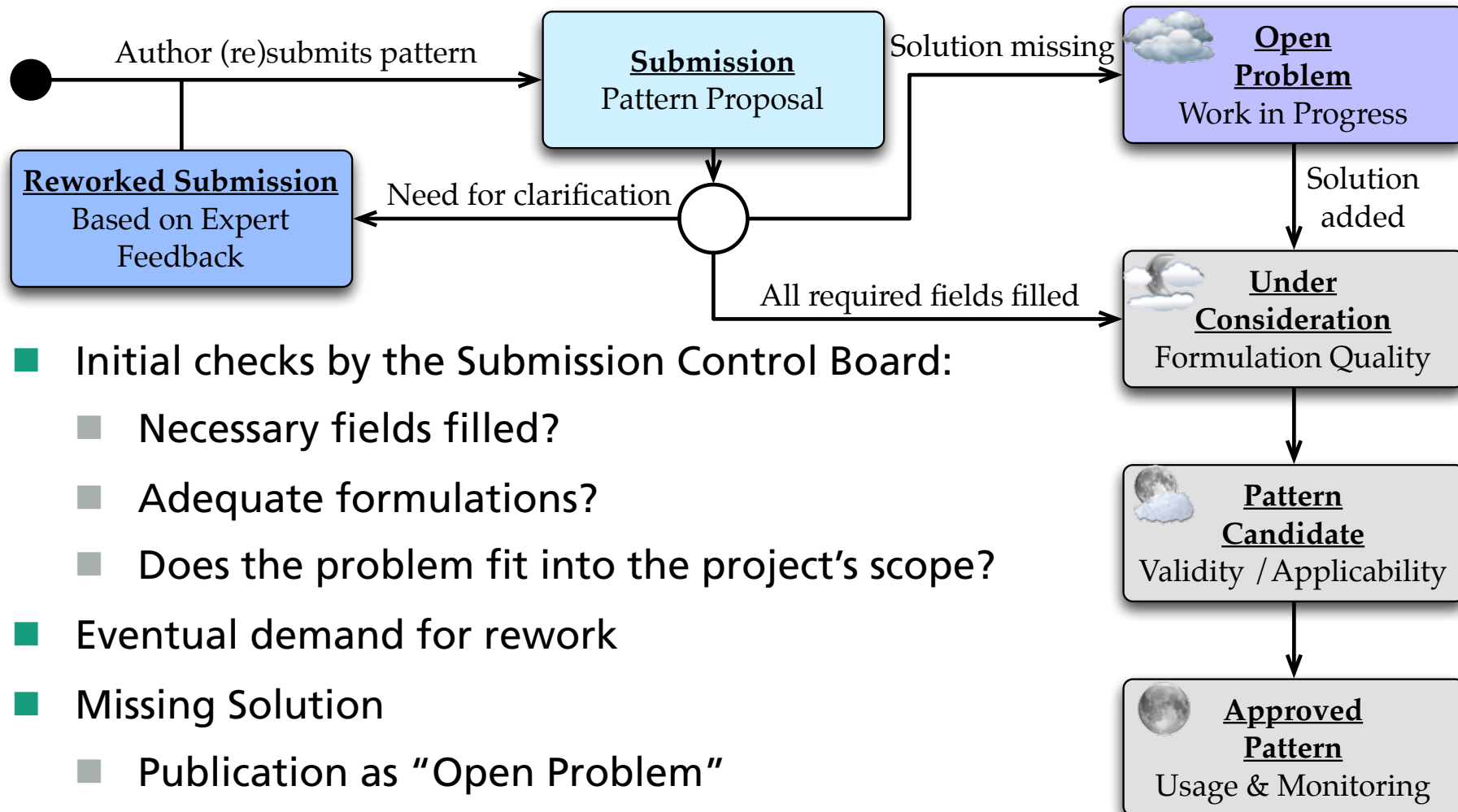
- Pattern discussion
- Maturity states
 - Formulation quality
 - Reliability
- Evolving pattern library structure
 - LoA: Standards, processes, guidelines, applied practices, realizations
 - Number, maturity and position of patterns
- Role model for contribution and library management
- Process and rules for formulation, maturation and validation
- Means for showing activity → Motivation



Collaborative Pattern Formulation – Roles and Use Cases

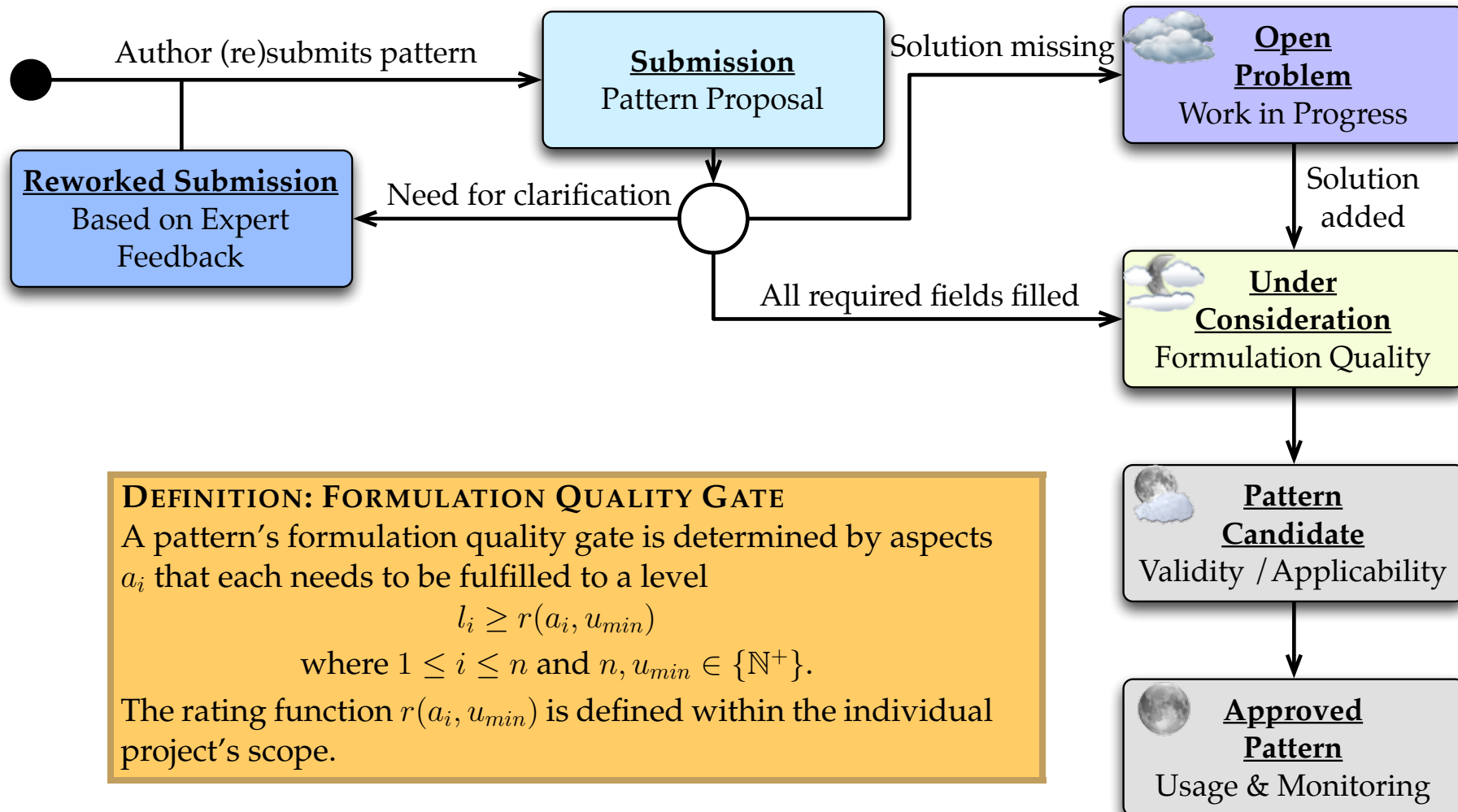


The Pattern Maturation Process - Submission



- Initial checks by the Submission Control Board:
 - Necessary fields filled?
 - Adequate formulations?
 - Does the problem fit into the project's scope?
- Eventual demand for rework
- Missing Solution
 - Publication as "Open Problem"
 - Documentation of ongoing work

The Pattern Maturation Process – Formulation Quality



DEFINITION: FORMULATION QUALITY GATE
 A pattern's formulation quality gate is determined by aspects a_i that each needs to be fulfilled to a level

$$l_i \geq r(a_i, u_{min})$$

where $1 \leq i \leq n$ and $n, u_{min} \in \{\mathbb{N}^+\}$.
 The rating function $r(a_i, u_{min})$ is defined within the individual project's scope.

A Pattern „Under Consideration“

Under Consideration
Active Influence on Logging

Pattern Origin : Adapted to Project

Hierarchy Level : Laws and Ethical Considerations

Pattern original author : Monika Büscher

Rating

Readability:

Understandability:

Appropriateness:

Rate Now!

Ratings submitted so far: 1
Ratings still needed: 1

Evidence

Supporting (0)

Add Supporting Evidence

Refuting (0)

Add Refuting Evidence

Pattern Context / Usage

Emergency responders already log key decisions and events. Technology is part of a transformation of logging capacity and practices.

Problem Summary

Technologies can log human activities and communications that are entered into systems directly or indirectly. However, technologically augmented logging is also part of a transformation of what logging means and what it is used for.


Problem Details and Forces

Logging can be great as it can save vital time, it can take work off people's shoulders, logs can be looked so no-one can change them, machines don't get tired logging, extensively logged real world events can be used for training. It can be used to apportion blame and punishment in retrospect, which, in turn can affect the way in which people carry out their work in the knowledge that everything will be logged.

Solution Summary

There are no 'solutions' - there are lots of ways of managing both positive and negative consequences. For example by installing forgetting, by logging things without identifying persons, by allowing people to turn logging off or erasing their logs.

Solution Illustration



Solution Details and Consequences

All of these designs would, in turn, generate positive and negative consequences.

Related Patterns

None.

Open Problem
Under Consideration
Pattern Candidate
Approved Pattern

Add Comment

Isn't this necessary like for example black boxes on planes? 14.08.2013 08:23:40 (by Uwe Kirschenmann)

I understand this pattern that there are pros (technology can log very efficiently / "it can take work off people's shoulders" / etc.) and cons (logging can effect the way people work if they know everything they do is logged) of logging. So the pattern focuses tradeoffs between logging and no logging.
What I want to mention is:
1.) I agree that logging has direct impact to technology and systems design. Nevertheless I think that the concept of logging itself should be a pattern on a higher layer. I am not familiar with law and regulations in the field of emergency response but I will give an example from the domain of ERP systems: Logging on business transaction level is regulated by law because a ERP system has to be revision-safe. So perhaps there are also such forces in the field of emergency response that directly lead to a "Logging Pattern" in the layer "Processes and Concepts" or "Domain Practices" which is derived from a pattern in the "Laws and Regulations". Then the "Log-don't log" pattern could be logically derived from those patterns and would therefore be much better placed in the whole domain context of emergency response.
2.) Also if there are no such higher level concepts and regulations in the domain of emergency response like mentioned in 1 I still can extract more than one pattern from the problem description: a) logging can be done quite efficiently by technology, so design applications for logging and take off that work from human shoulders b) there is a need for logging at all c) we can extract data for training purposes using some logging mechanisms
3.) As I can use some sentences from the problem description very easily to formulate solutions I wonder if the problem section isn't describing solutions but rather than problem(s).
Nevertheless I think this pattern opens up a couple of new pattern ideas so this pattern repo is quite the best place to formulate those ideas. 09.08.2013 10:40:47 (by Michael Falkenthal)

I would like to suggest some smaller changes:
1. Maybe, the title could be shortened to something like: "Log or Don't Log" or "Human-Managed Log" since otherwise, the pattern name itself is a little too long to be remembered easily.
2. The solution part says that there are no solutions. However, I think that the examples presented are solutions that could be applied. Maybe they could be listed or a little further described in the section about solution details and consequences when applying them.
3. The Problem Summary could be split up into the central message. The rest of the section could be moved to the problem details. This would improve readability and support a first quick look through the pattern before reading on.
What does the author think about that? :) 24.07.2013 06:06:57 (by Anonymized User)

Under Consideration

Pattern Origin : Adapted to Project

Hierarchy Level : Laws and Ethical Considerations

Pattern original author : Monika Büscher

Rating

Readability:

Understandability:

Appropriateness:

Rate Now!

Ratings submitted so far: 1
Ratings still needed: 1

Evidence

Supporting (0)

Add Supporting Evidence

Refuting (0)

Add Refuting Evidence

Open Problem
Under Consideration
Pattern Candidate
Approved Pattern

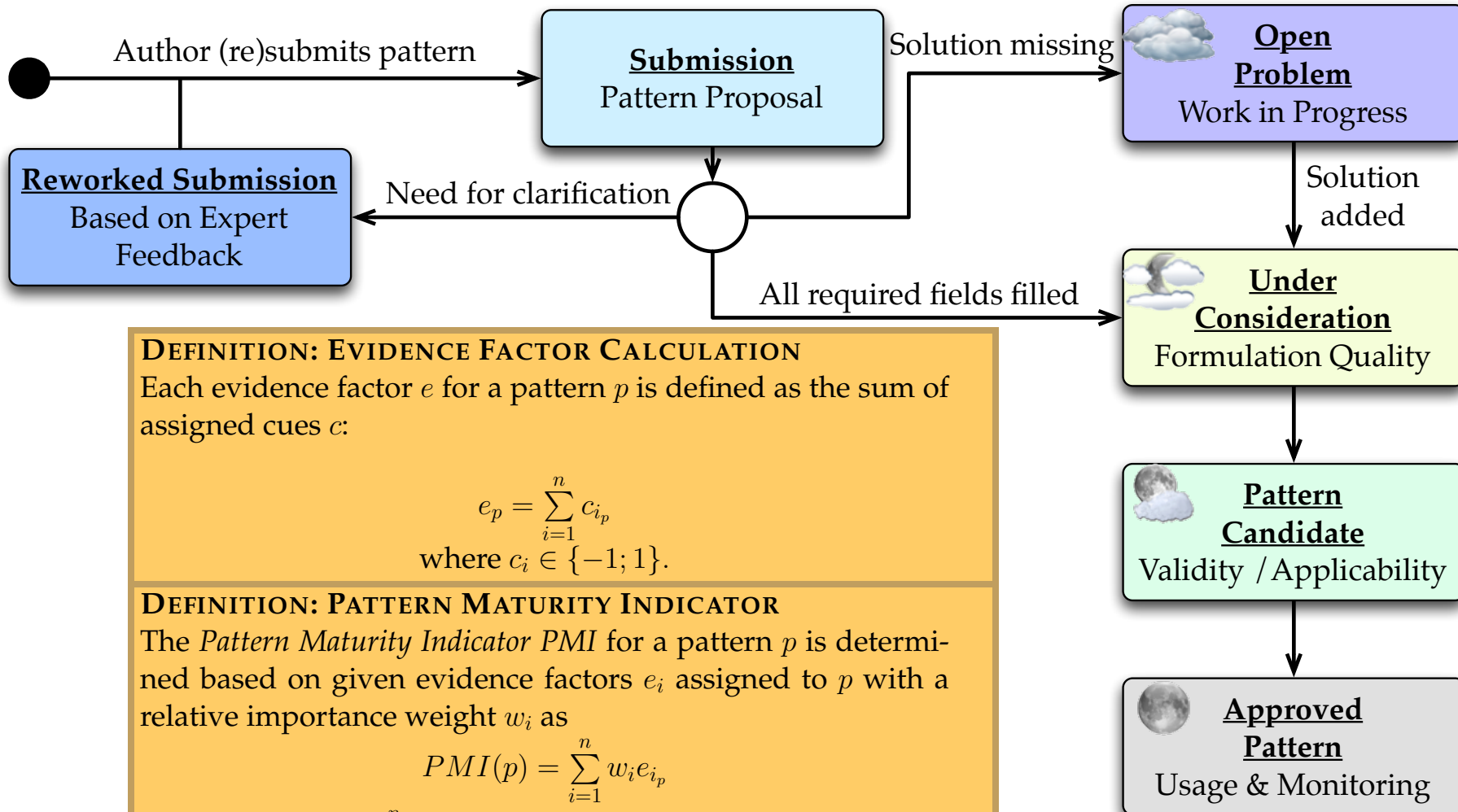
Add Comment

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What does the author think about that? :) 24.07.2013 06:06:57 (by Anonymized User)

The Pattern Maturation Process – Validity



DEFINITION: EVIDENCE FACTOR CALCULATION
 Each evidence factor e for a pattern p is defined as the sum of assigned cues c :

$$e_p = \sum_{i=1}^n c_{i_p}$$

where $c_i \in \{-1; 1\}$.

DEFINITION: PATTERN MATURITY INDICATOR
 The *Pattern Maturity Indicator PMI* for a pattern p is determined based on given evidence factors e_i assigned to p with a relative importance weight w_i as

$$PMI(p) = \sum_{i=1}^n w_i e_{i_p}$$

where $\sum_{i=1}^n w_i = 1, w_i \in \{\mathbb{R} \mid 0 \leq w_i \leq 1\}$.

A „Pattern Candidate“

Pattern Candidate

Pattern Origin :
Project-External

Hierarchy Level :
General Processes and Concepts

Pattern original author :
Aslak Wegner Eide

Rating

Readability: ★★★★★

Understandability: ★★★★★

Appropriateness: ★★★★★

[Rate Now!](#)

Ratings submitted so far: 2

Evidence

Supporting (1)

- Research-Based Guidelines for Warning Design and Evaluation (Wolgateira, M. S., Conzola, V. C., and Smith-Jackson, T. L.).

[Add Supporting Evidence](#)

Refuting (0)

[Add Refuting Evidence](#)

Risk Colors

Pattern Context / Usage

The pattern is relevant for systems that intend to support risk analysis/assessment during emergency response, and particularly in situations with a high number of risks.

Problem Summary

When dealing with risk analysis/assessment, users need an efficient way of separating more critical risks from less critical risks.

Solution Summary

Colorize risk objects (e.g. risk icons on a map, risk items in a list) differently depending on the risk level they represent. Color the most critical risk objects red, less critical risk objects yellow, and the least critical risk objects green.

Colorized Item in a list:

- Risk 1
- Risk 2
- Risk 3
- Risk 4

Colorized icons on a map:

Related Patterns

- Triage
- Up-To-Date Vital Values

Discussion

Open Problem

Under Consideration

Pattern Candidate

Approved Pattern

+ Add Comment

Pattern Candidate

Pattern Origin :
Project-External

Hierarchy Level :
General Processes and Concepts

Pattern original author :
Aslak Wegner Eide

Rating

Readability: ★★★★★

Understandability: ★★★★★

Appropriateness: ★★★★★

[Rate Now!](#)

Ratings submitted so far: 2

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Supporting (1)

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[Add Supporting Evidence](#)

Refuting (0)

[Add Refuting Evidence](#)

Related Patterns

- Triage
- Up-To-Date Vital Values

Discussion

Open Problem

Under Consideration

Pattern Candidate

Approved Pattern

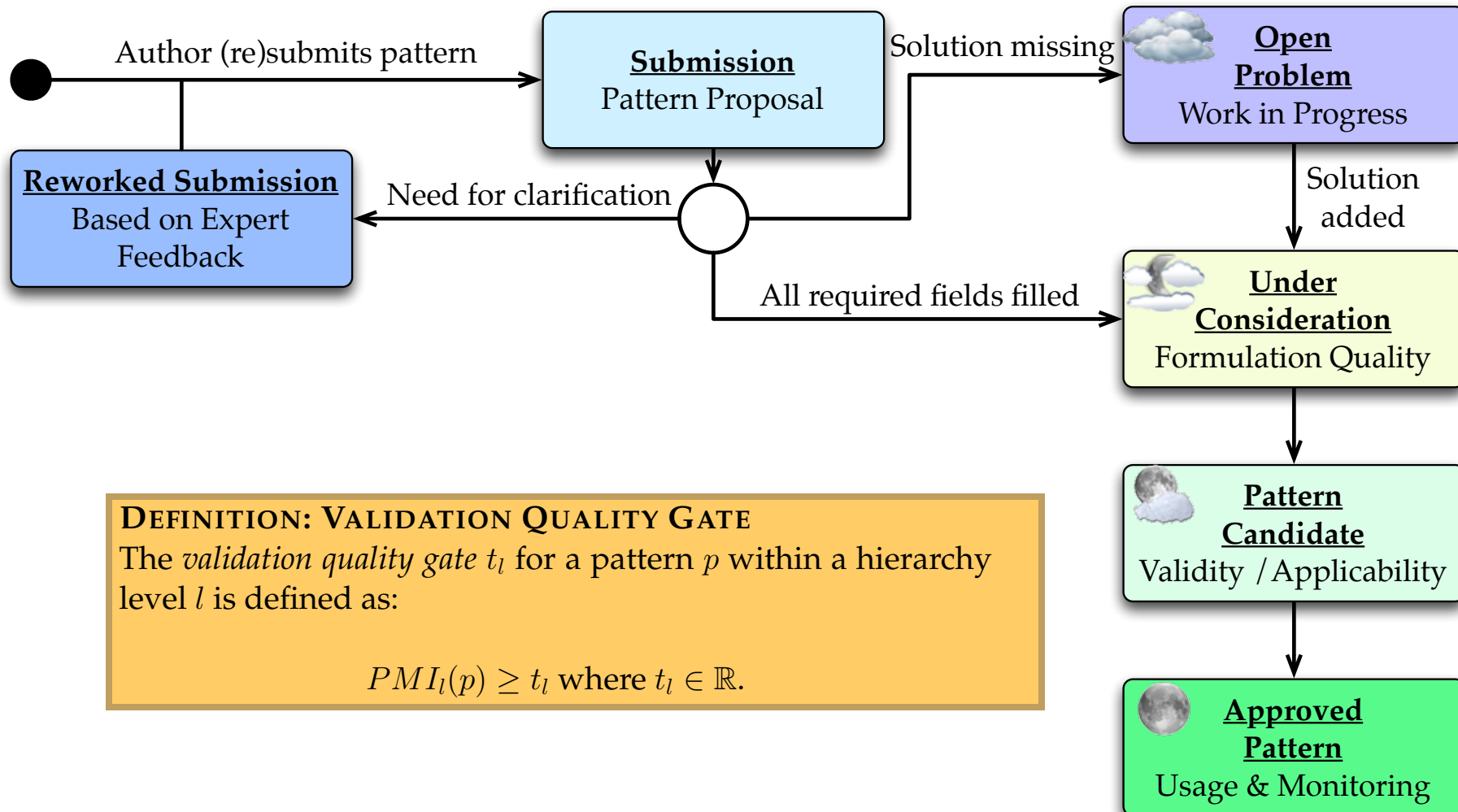
+ Add Comment

René Reiners

16

Fraunhofer
FIT

The Pattern Maturation Process - Approval



DEFINITION: VALIDATION QUALITY GATE
 The *validation quality gate* t_l for a pattern p within a hierarchy level l is defined as:

$$PMI_l(p) \geq t_l \text{ where } t_l \in \mathbb{R}.$$

An „Approved Pattern“

Approved Pattern

Pattern Origin :
Derived from Project

Hierarchy Level :
User Interface Design

Pattern original author :
Daniela Pohl

Created on :
Wednesday, 16 November 2011

Modified By :

Rating

Readability:
★★★★★

Understandability:
★★★★★

Appropriateness:
★★★★★

[Rate Now!](#)

Ratings submitted so far: 2

Evidence

Supporting (3)

- Designing an Emergency Medical Information System for the Early Stages of Disasters in Developing Countries.
- ARTEMIS: A Vision for Remote Triage and Emergency Management Information Integration. Dartmouth University. Nov. 2003.
- Electronic Triage Tag and Opportunistic Networks in Disasters.

[Add Supporting Evidence](#)

Refuting (0)

[Add Refuting Evidence](#)

Body Injury Visualization

Pattern Context / Usage

Especially during the search and rescue operation, the visualization is used to capture the wounds of patients. It can be also used to capture the injuries and transmit them to the hospital for further medical care treatment.

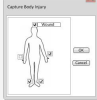
Problem Summary

The user needs to capture the injury of a patient. The capturing of the injury can be done to organize/structure the triage process or to transmit the information to the hospital to allow a better patient-centered care.

Solution Summary

Therefore, show illustrations of the human body according to which injuries can be indicated.

Solution Illustration



Solution Details and Consequences

Capturing body injuries or wounds are very common in literature, especially in triage. This facilitates a good overview of what are the important aspects to focus on when medical treatment is needed. It should give the possibility to label, locate and describe the wounds of a person. Different UI Components (like textfields, checkboxes, buttons or graphics) can be used.

Related Patterns

None.

Discussion

Open Problem
Under Consideration
Pattern Candidate
Approved Pattern

[Add Comment](#)

This is a very clear description. 14.08.2013 08:28:20 (by Uwe Kirchenmann)

Approved Pattern

Pattern Origin :
Derived from Project

Hierarchy Level :
User Interface Design

Pattern original author :
Daniela Pohl

Rating

Readability:
★★★★★

Understandability:
★★★★★

Appropriateness:
★★★★★

[Rate Now!](#)

Ratings submitted so far: 2

Evidence

Supporting (3)

- Designing an Emergency Medical Information System for the Early Stages of Disasters in Developing Countries.
- ARTEMIS: A Vision for Remote Triage and Emergency Management Information Integration. Dartmouth University. Nov. 2003.
- Electronic Triage Tag and Opportunistic Networks in Disasters.

[Add Supporting Evidence](#)

Refuting (0)

[Add Refuting Evidence](#)

Discussion

Open Problem

Under Consideration

Pattern Candidate

Approved Pattern

This item should obviously be related to other triage patterns 31.07.2013 12:03:40 (by Ragnhild Halvorsrud)

The text is a bit shallow, e.g. it is not clear who the "user" is, who should capture the injuries. That could be a problem if a non-professional should capture injuries because he just doesn't have the knowledge. On the other hand, a professional might lose important time with capturing injuries. That said, I think the pattern could need some supporting evidence, a problem description and for sure some illustrations. 23.07.2013 07:26:15 (by Marco Jahn)

Discussion

Open Problem

Under Consideration

Pattern Candidate

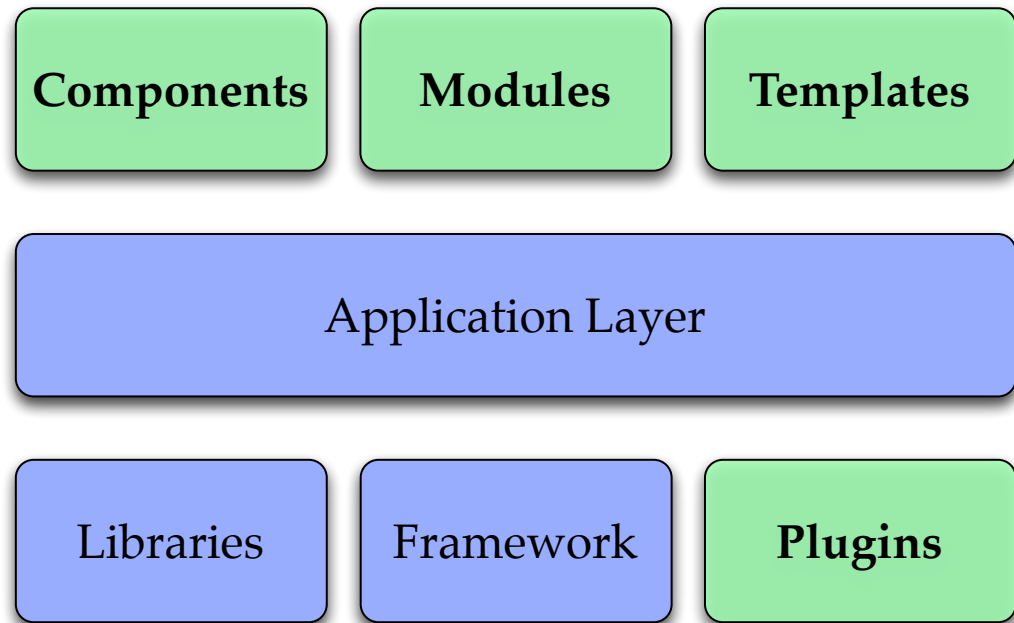
Approved Pattern

[Add Comment](#)

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Pattern Library Prototype – Extending the Joomla! CMS

- Pattern library as component
- Widgets as modules
 - Announcements
 - Activity stream
 - Call for ratings and evidence
 - Incomplete patterns
 - Hall of fame
 - Who is online?
- Visualization as DAG and detail view
- Rule engine as plugin

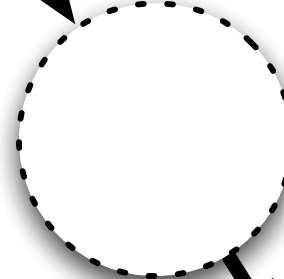


Structure: Pattern Organization as DAG

General Processes and Concepts



Domain Practices



Application Concepts



Screenshot of the BRIDGE DPL

Welcome to the BRIDGE Pattern Library

Home **Browse Library** Submit A New Pattern About Us

Login and Take Part

User Name

Password

Forgot your password? [Log in](#)
Forgot your username?

Activity Stream

Activities during the last 100 days:

Still Incomplete Patterns

- Up-To-Date Vital Values
- Easy Handover
- Medical Questionnaire
- Live Video from Incident
- Safety-Critical Information Display
- Resource Type Visualization
- Vital Sign Monitoring
- Delegating Commands
- Keep It Light!
- Comms Break Down First
- Not Yet Another Device!
- eTriage Colors and Icons
- Relevant Information

Hall of Fame

Submits

- Anonymized Contributor (8)
- Marc Jentsch (7)
- Erion Elmasllari (6)
- Aslak Wegner Elde (5)
- René Reiners (5)
- Monika Büscher (4)
- Daniela Pohl (4)
- Amro Al-Akkad (2)
- Sebastian Deneff (2)
- Mark Vinkovits (1)
- Sebastian Kayser (1)
- Ragnhild Halvorsrud (1)

Comments

- René Reiners (10)
- Erion Elmasllari (7)
- Ragnhild Halvorsrud (7)
- Marco Jahn (5)
- Jonathan Simon (4)
- Uwe Kirschenmann (4)
- Michael Falkenthal (3)
- Monika Büscher (2)
- Alexander Boden (2)
- Mark Vinkovits (2)
- Amro Al-Akkad (2)

Votes

- Erion Elmasllari (15)
- Philip Schell (13)
- Marco Jahn (7)
- Uwe Kirschenmann (7)
- Sebastian Kayser (6)

Newsticker

Announcement:
Site remains open for contributions!

Please Rate:

- Seamful Integration
- Pocket-Switched-Network
- Vital Sign Monitoring
- Simplified Information Gat...
- Separated Components
- Resource Overview

Evidence Needed:

- Negotiate Availability
- Handy Multi Tools
- Show Map Details
- Improve Quality Instead of...
- Separated Components
- Risk Colors

Laws and Ethical Considerations

- Design for Privacy
- Active Influence o...

General Processes and Concepts

- Simplified Information...
- Firm Rules and Protoco...
- Improve Quality Ins...
- Attribute-Based Domai...
- Delegating Commands
- Evolutionary Developmen...
- Monitoring is not Supe...
- Risk Colors

Domain Practices

- Rigid Structure
- Separated Components
- Negotiate Availabilit...
- Medical Questionnai...
- Triage

Application Concepts

- Handy Multi Tools
- Relevant Information
- Live Video from Incide...
- Up-To-Date Vital Value...
- eTriage Colors and ...
- Resource Type Visual...
- Safety-Critical In...

User Interface Design

- Resource Overview
- Cluster Map Icons
- POIs in Maps
- Vital Sign Monitoring
- Body Injury Visualizati...
- Show Map Details
- High Visibility ...

Contribution Summary

I

Pattern Maturation Process

- Distributed, asynchronous and incremental pattern formulation
- Collaborative review and feedback
- Formulation quality criteria and validity measures
- Dynamic structure
- Participation of *all* project members
- Rules and roles

II

Pattern Library Prototype

- CMS extension
- Low learning curve
- Means for browsing, contributing and providing feedback
- Visualization of structure and activity
- Embedded into project context
- Flexible rule engine
- Exchangeable L&F

III

Project-Related Case Study

- EPL concept accepted and understood
- Benefits of usage
- Suited as tool within project work
- Reflection of current R&D activities
- Reflects domain knowledge
- Learning aspects
- Seeding for future contributions

Outlook

- Discussed concepts (not yet validated)
 - Extended relations (OR, AND, XOR)
 - Pattern sequences
 - Traceability and history

- Future Work
 - Common authorship and identification of experts [*Prause 2013*]
 - Incentives and motivation [*Prause et al. 2010*]
 - Transfer to different project scales and types

