


Design Science Research: A Personal Journey

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Overview

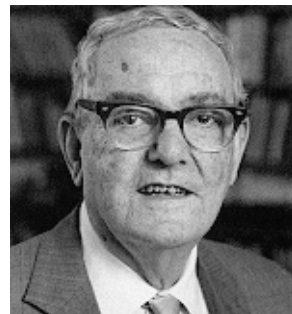
- What is Design Science Research?
- What activities are part of DSR?
- Activity 1: Problem Diagnosis
- Activity 2: Artefact Design
- Activity 3: Theory Building
- Activity 4: Evaluation
- How are DSR papers evaluated?

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WHAT IS DESIGN SCIENCE RESEARCH (DSR)?

The pioneers

- “Artificial or synthetic objects are the central objective of the activity and skill of Engineering”
- “The engineer, and more generally the designer, deals with how things should be: how they should be in order to achieve goals and functionalities ”



The Science of Artificial, H. Simon, 1969

DESIGN science vs. NATURAL science

- “Whereas natural science tries to understand reality, *design science* attempts to create things that serve human purposes.”
- “Its products are assessed against criteria of value or utility – *does it work? Is it an improvement?*”

March and Smith (1995)

Design science is ...

- ... the design and investigation of artifacts
 - in context



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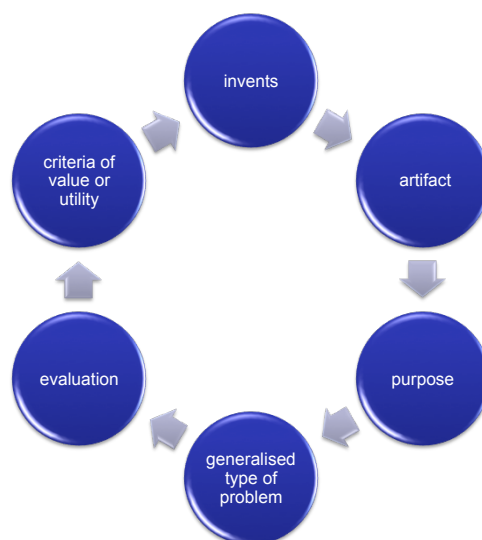
Design Science Research is ...

- Research that **invents**
 - Invention includes derivation, design, development, construction, prototyping, or other way of creating something new
- a new **purposeful artefact**
 - Purposeful Artefact (in IS) includes system, method, methodology, procedure, practice, or any other technology
- to address a **generalised type of problem**
 - Versus a situated, local problem
- and **evaluates** its utility for solving problems of that type”



(Venable and Baskerville, 2012)

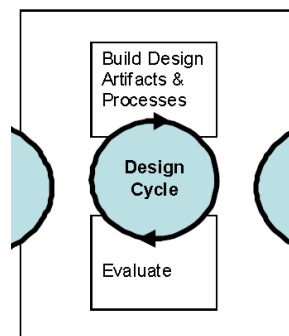
DSR key terms



WHAT ACTIVITIES ARE PART OF DSR?

Three-Cycle View of DSR - Hevner (2007)

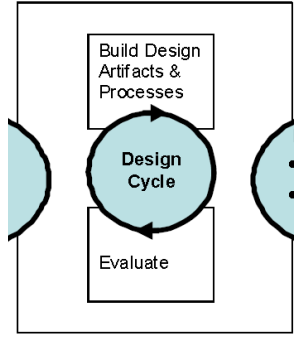
Design Science Research




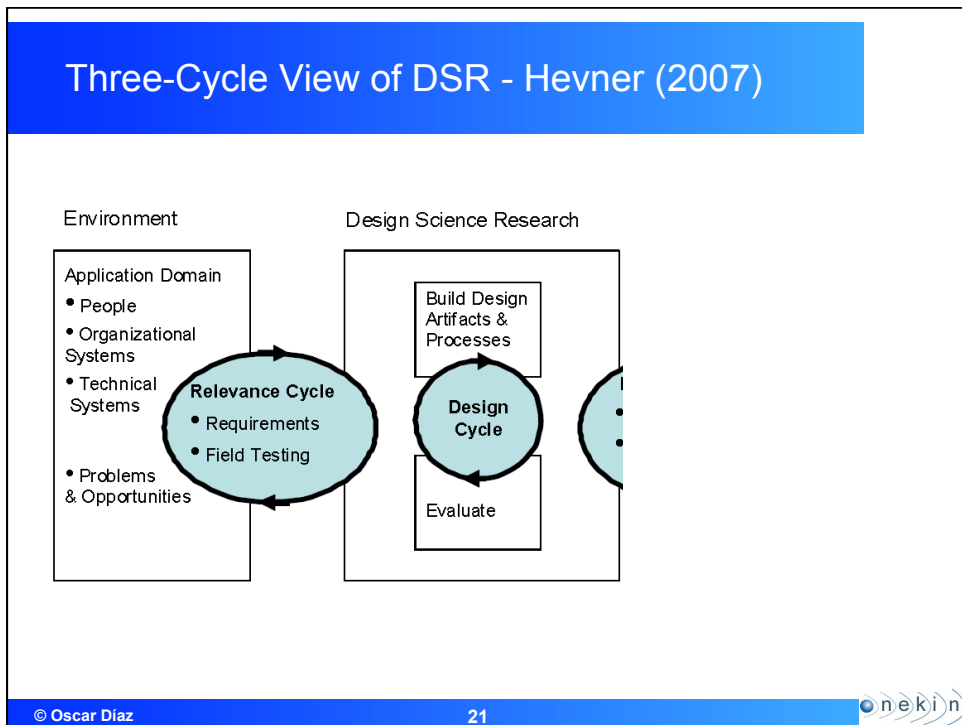
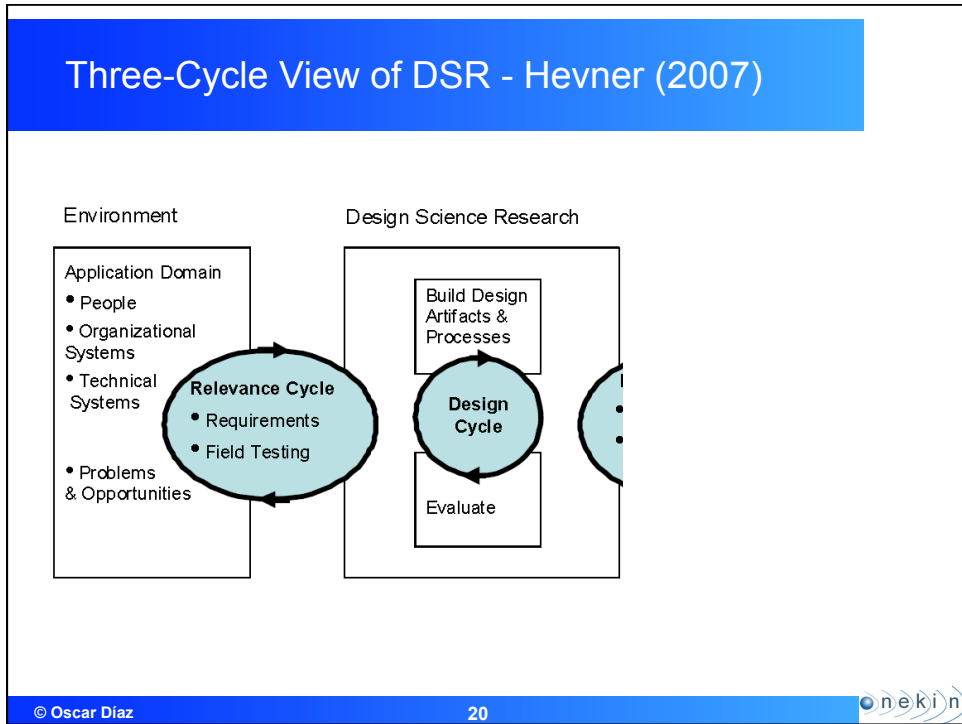
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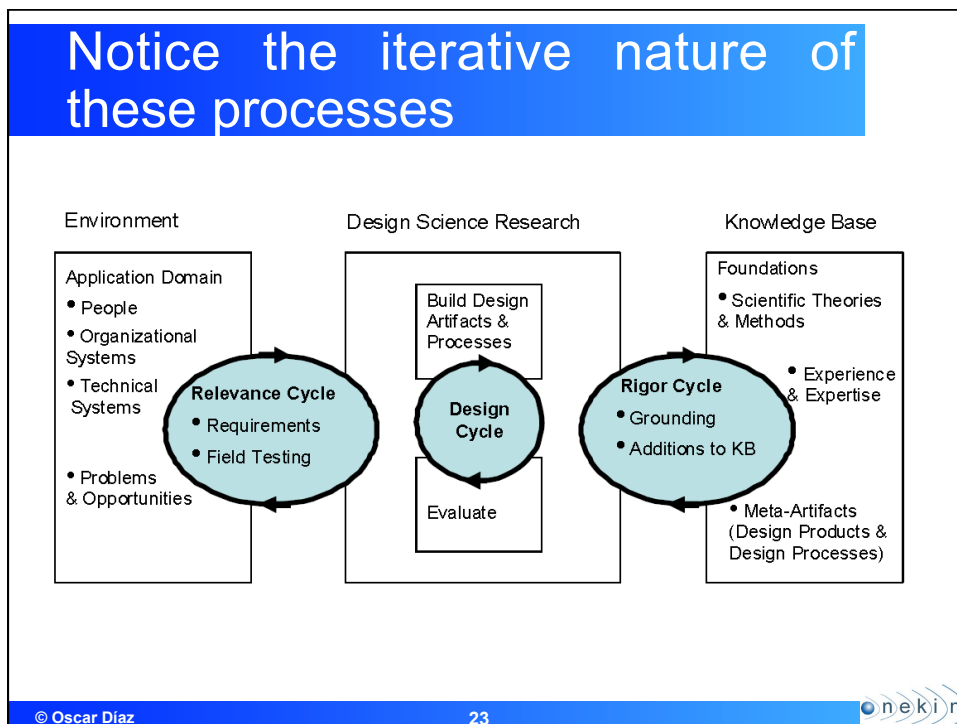
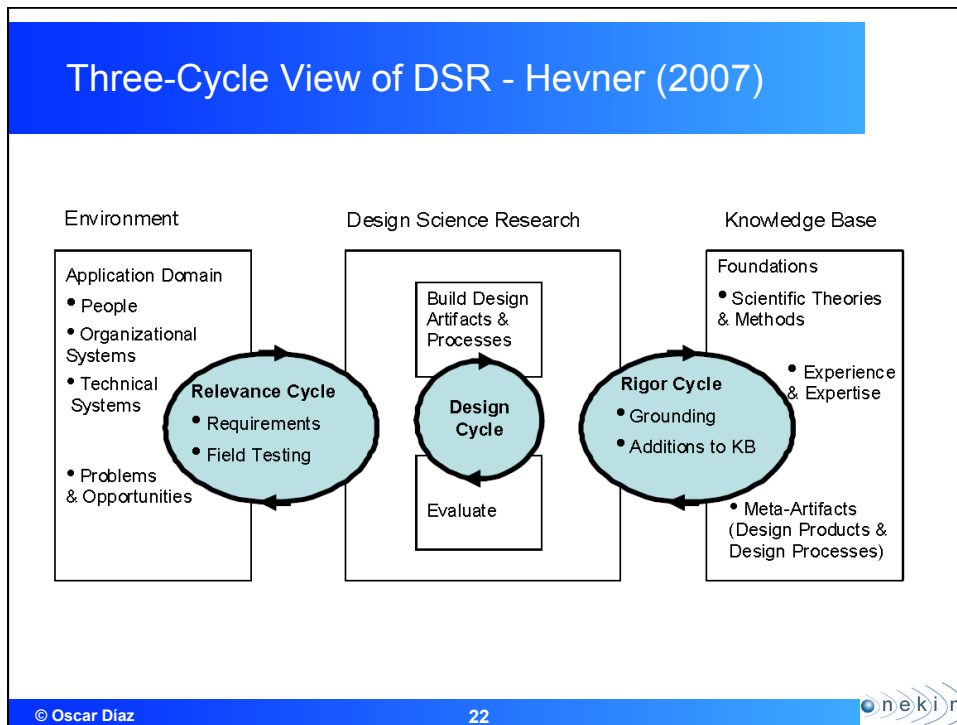
Three-Cycle View of DSR - Hevner (2007)

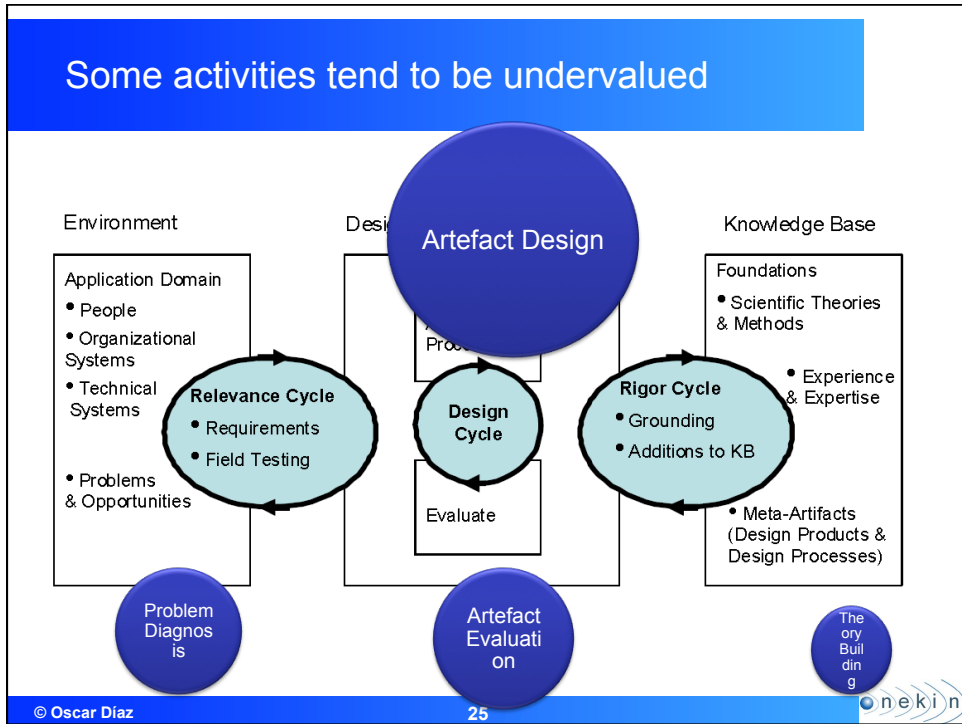
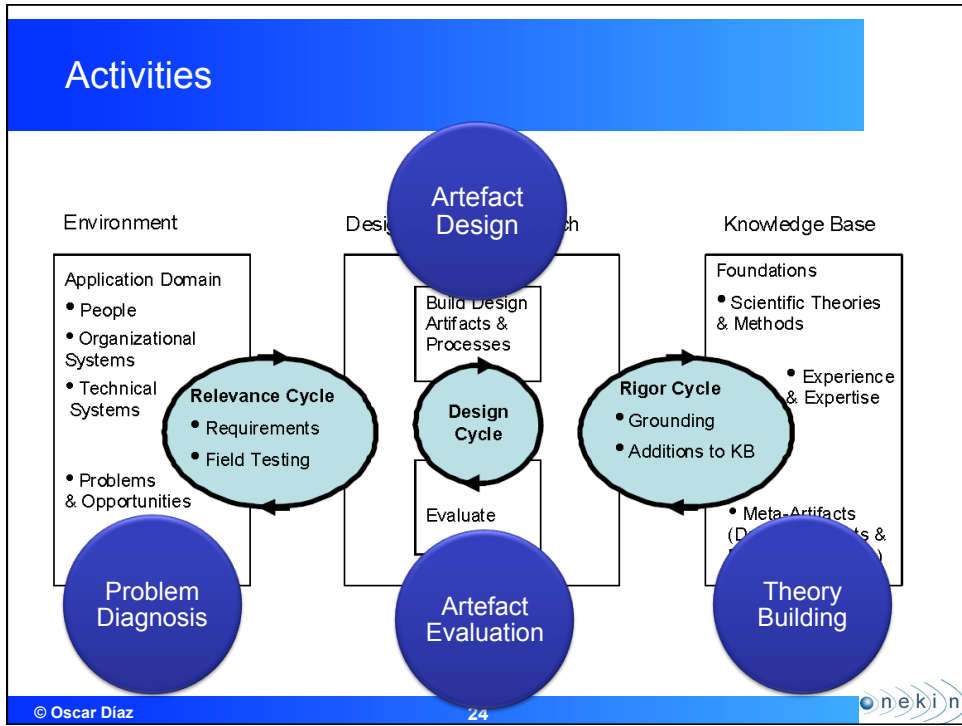
Design Science Research

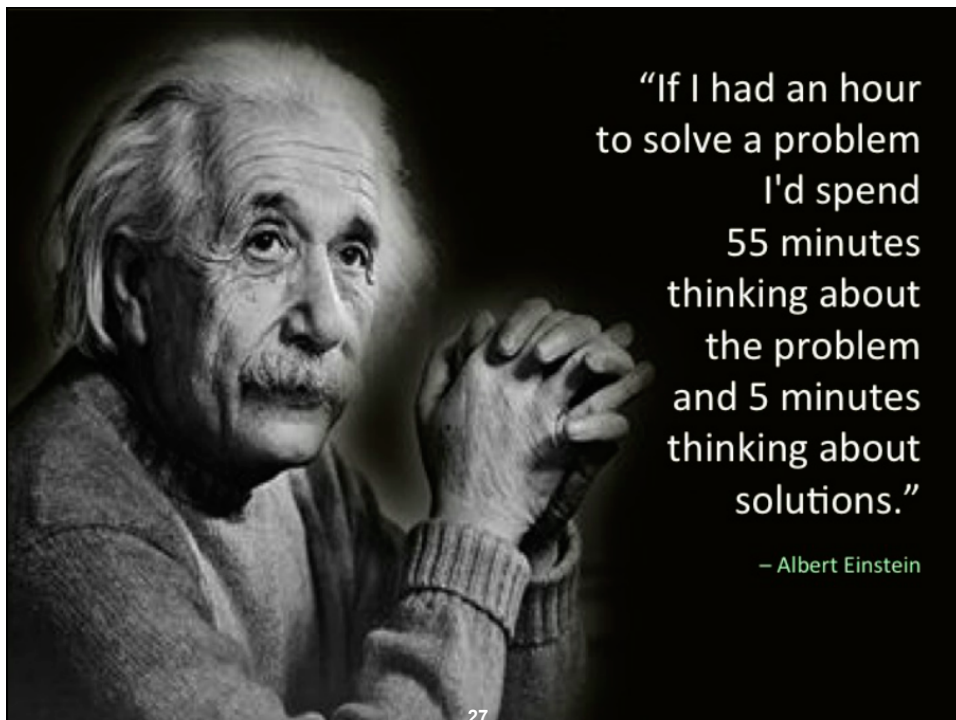
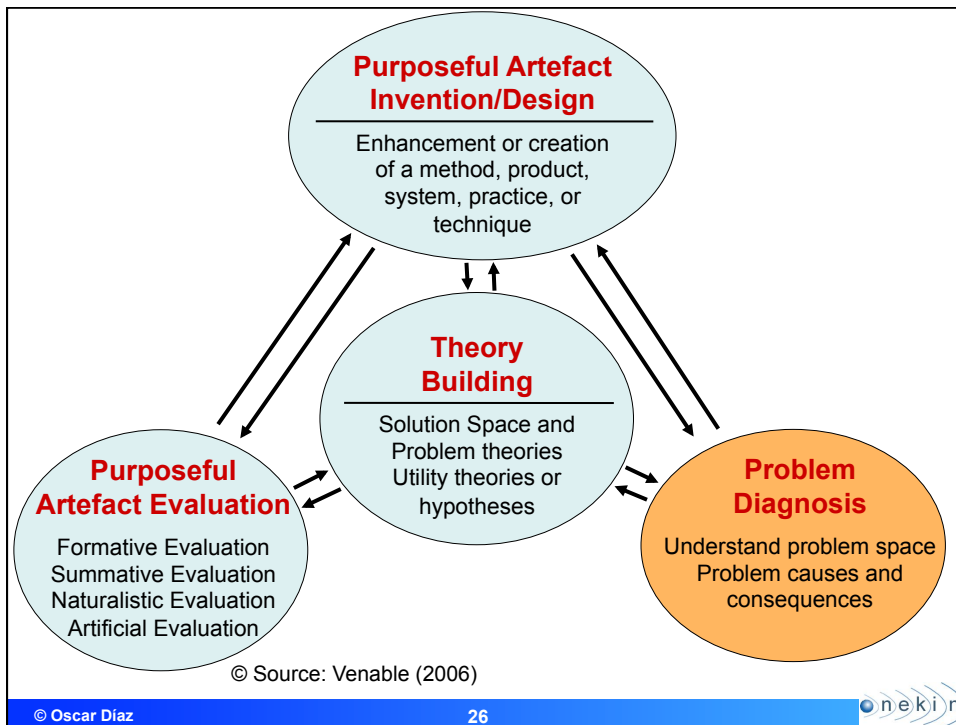


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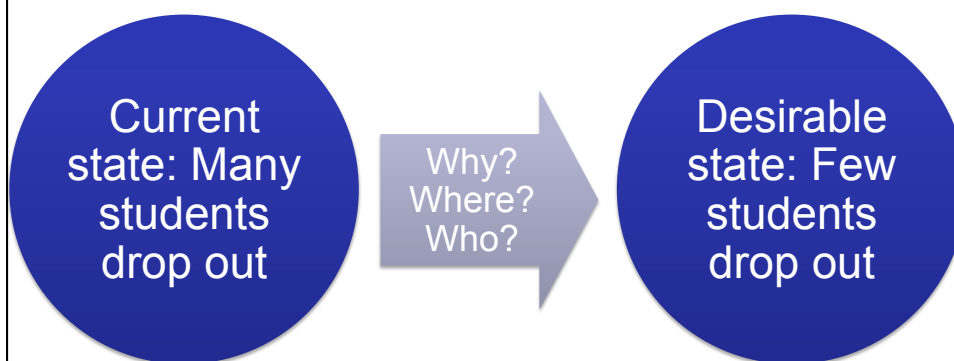


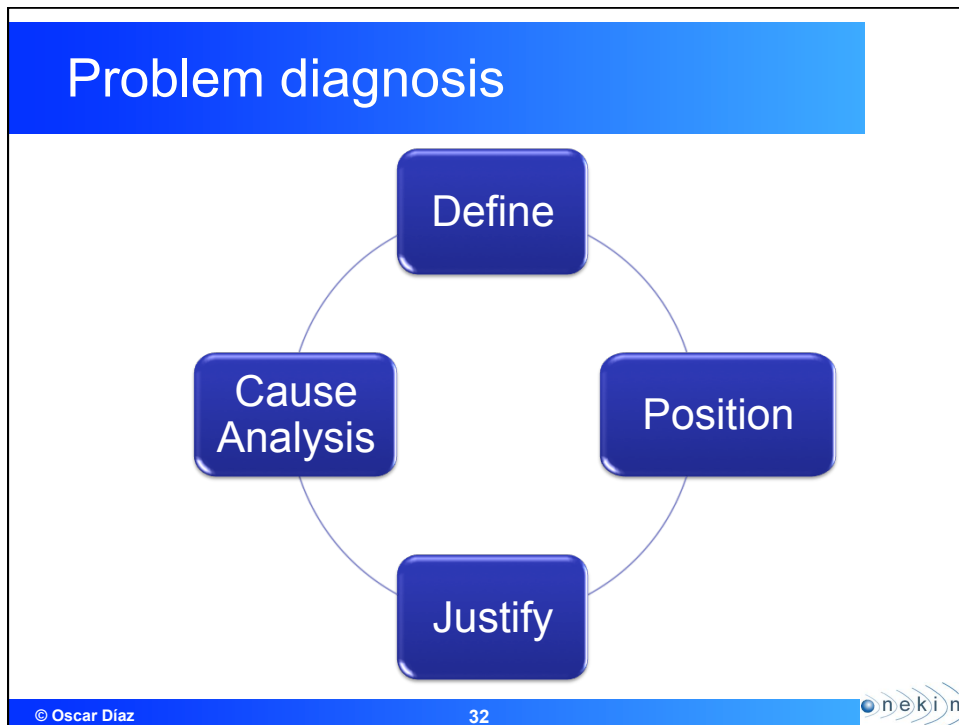


What is a problem?

- A problem is a gap between the current state and a desirable state
 - Current state: There are many adverse events
 - Desirable state: There are few adverse events
- Example:
 - Current state: Many students drop out
 - Desirable state: Few students drop out


Problem formulation





Define

- Problem Definition should be accurate
- Making a problem definition more precise means:
 - to make it **less ambiguous**
 - so that **different people** interpret and understand it in the same way
- Importance of a share terminology

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Fuzzy definition: “The medical treatments are not satisfactory”

- Make the problem definition more precise
- The medical treatments:
 - ...do not make the patients healthier
 - ...are very expensive
 - ...cause the patients a lot of pain
- We have a tendency to overclaim, partially due to no properly pinpointing the problem

Case study



Quora

Ask or Search Quora

Ask Question

Read

Reading Advice Robotics Academic Papers Academia Academic Research +4

I am a robotics PhD student and I have a hard time reading research papers. I am very slow at it and find the task kind of boring. Is there any way I can make paper reading fun and become faster at it?

Request

Follow

15

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Quora

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Research

Why is research so boring?

I'm a software engineer and to me, coding 5 hours straight is a normal thing. But when it comes to research, I can hardly continue reading a research paper for 5 minutes without being distracted.

What are your views on the topic and do you have any suggestions to stay connected?

Request

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RQ: Is on-line reading more efficient than paper-based reading?

- This question makes assumptions about the phenomena to be studied, and kinds of situation in which these phenomena occur.
- This question **only makes sense** if
 - we already know that some people (who?)
 - need to do reading (whatever that is?)
 - under some circumstances (which are?), and
 - efficiency (measured how?) is a relevant goal for these people (how would we know that?)

RQ as a problem: PhD students feel bored while reading



Quora Ask or Search Quora Ask Question Read

Reading Advice Robotics Academic Papers Academia Academic Research +4

I am a robotics PhD student and I have a hard time reading research papers. I am very slow at it and find the task kind of boring. Is there any way I can make paper reading fun and become faster at it?

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Research

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Request Follow 8 Comment Share Downvote

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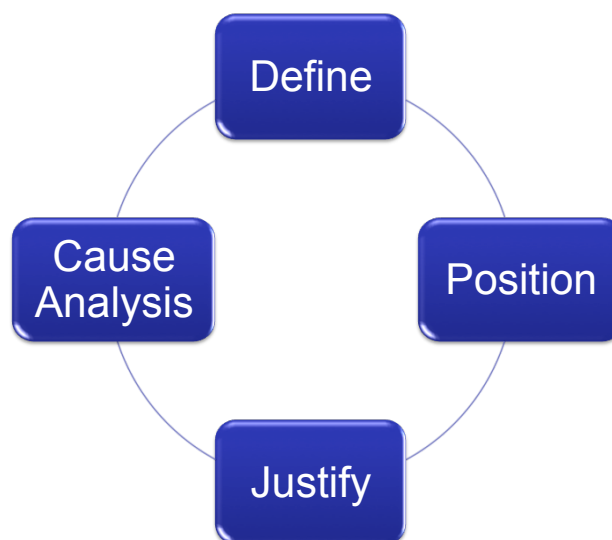
current state

desirable state

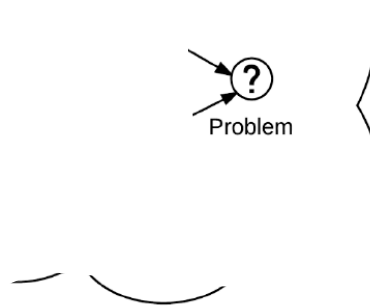
PhD students feel bored while reading

- What is meant by “PhD students”?
- Is “feeling bored” a problem for the stakeholders? To what degree?
- How is “feeling bored” measured?
- What is meant by “reading”?

Problem diagnosis



A problem does not exist in a vacuum



Position

- Ordinary Problem Solving is related to a particular, situated problem
 - Particular stakeholders

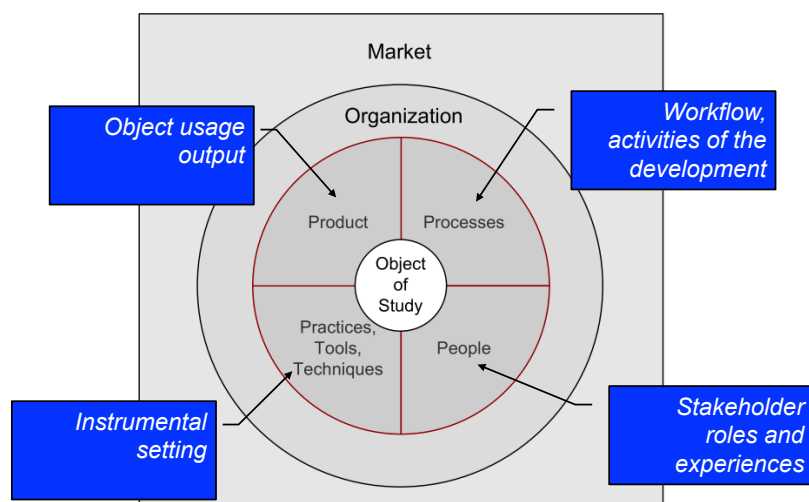
- Design Science Research should be related to
 - a **type** of problems
 - relevant to typical **classes** of stakeholders

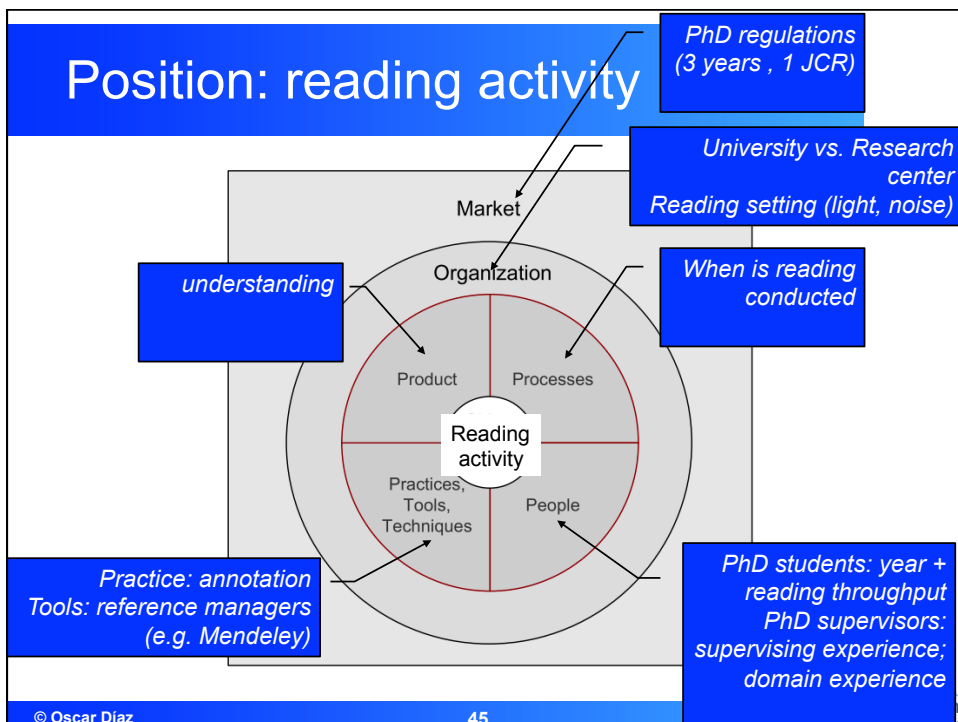
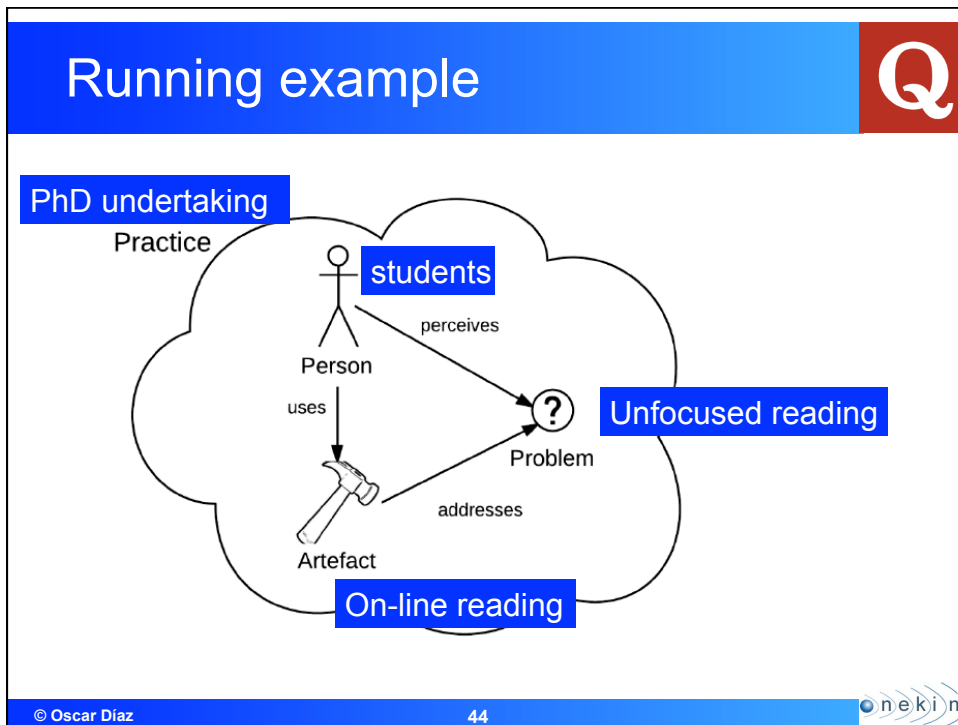
Position: the context

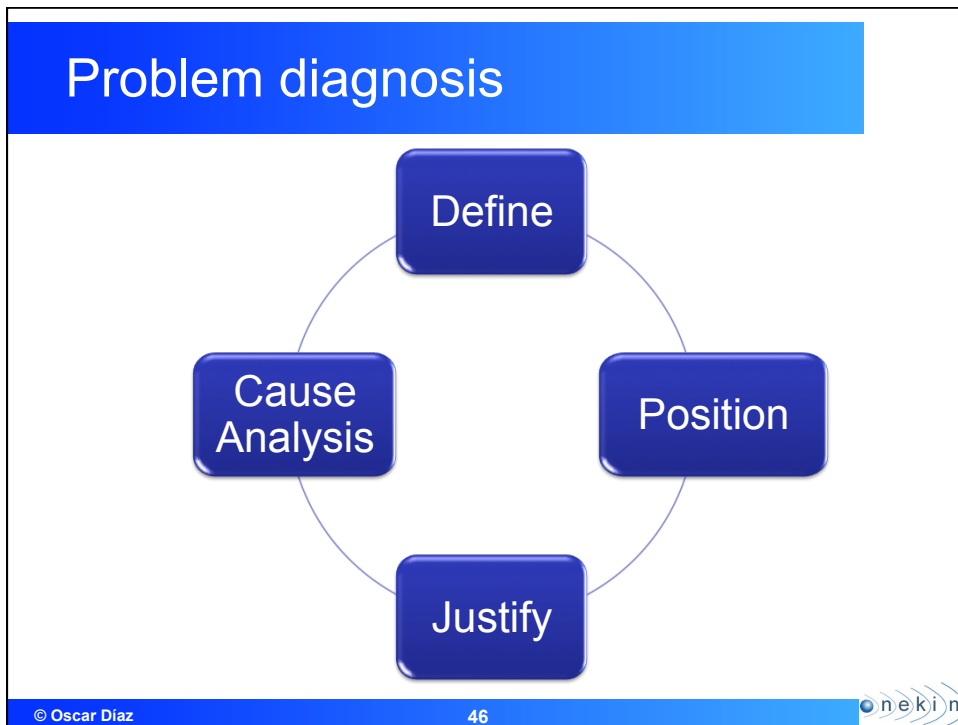
➤ To judge whether a specific solution can be successful it is necessary to describe the context as complete and accurate as possible for the considered “type of problems”

- In which practice does the problem appear?
- Who are the stakeholders of the practice?
- What is the environment of the practice?

Position: the context








Justify

➤ For a problem to be appropriate for DS it should be...

- significant for stakeholders
 - people are actually hurt by this problem
- of general interest, not only for one local practice
 - the problem happens in many places
- challenging
 - no-one has come up with a good solution

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Research significance

- How significant the problem is
 - number of instances of the type of problem x consequences of an instance

Judge the following problems based on significance, general interest, challenge and originality

- More and more bacteria are becoming multi-resistant
- In our department, some doctors are not very motivated
- Many people burn their tongue on hot food

Justify “unfocus reading”

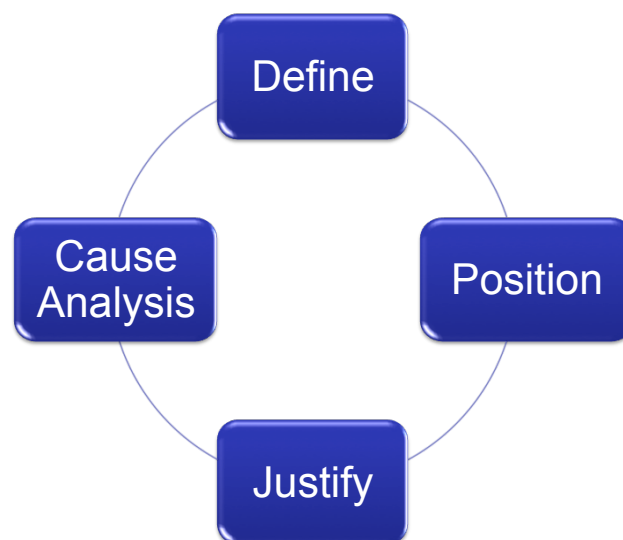


- Is this problem significant?
 - considerable time dedicated to reading papers
 - is time a problem? which are the stakeholders’s goals?

- Is this problem of general interest?
 - It happens not just for students in robotics

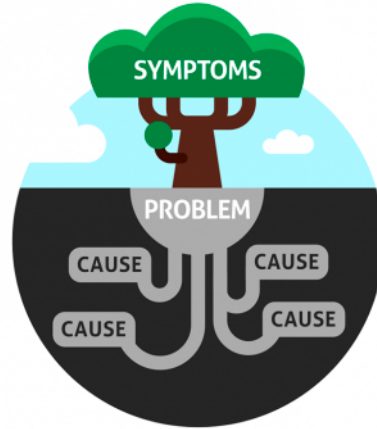
- Is this problem challenging?
 - not clear what the solution could be

Problem diagnosis

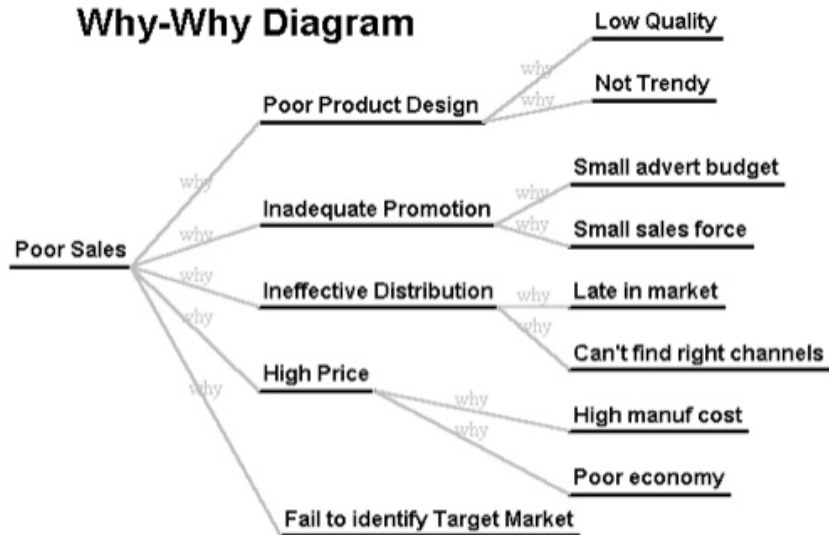


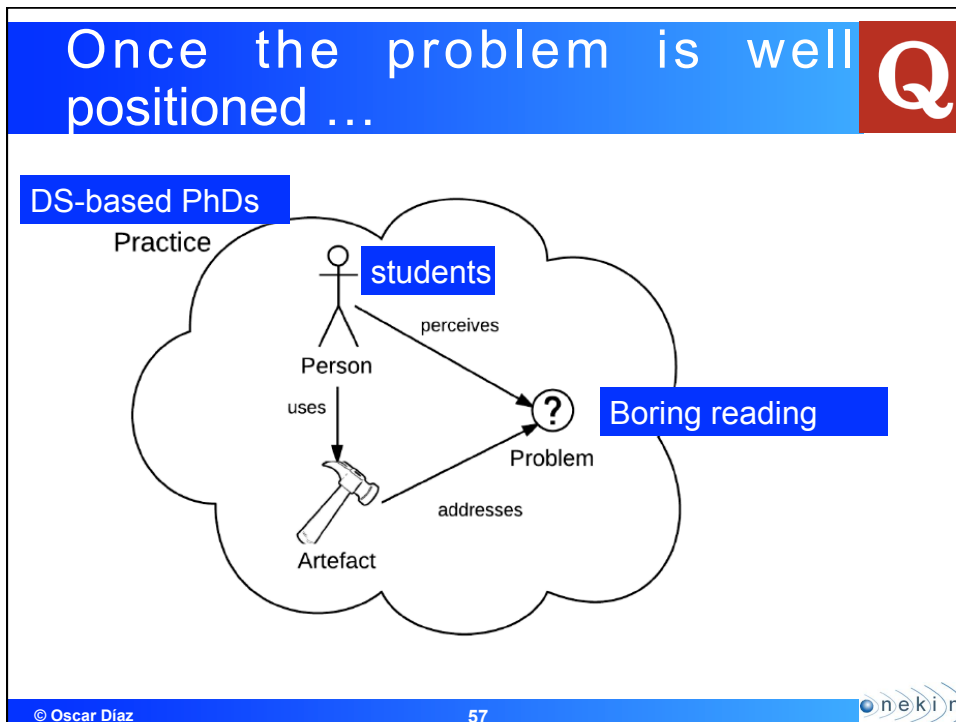
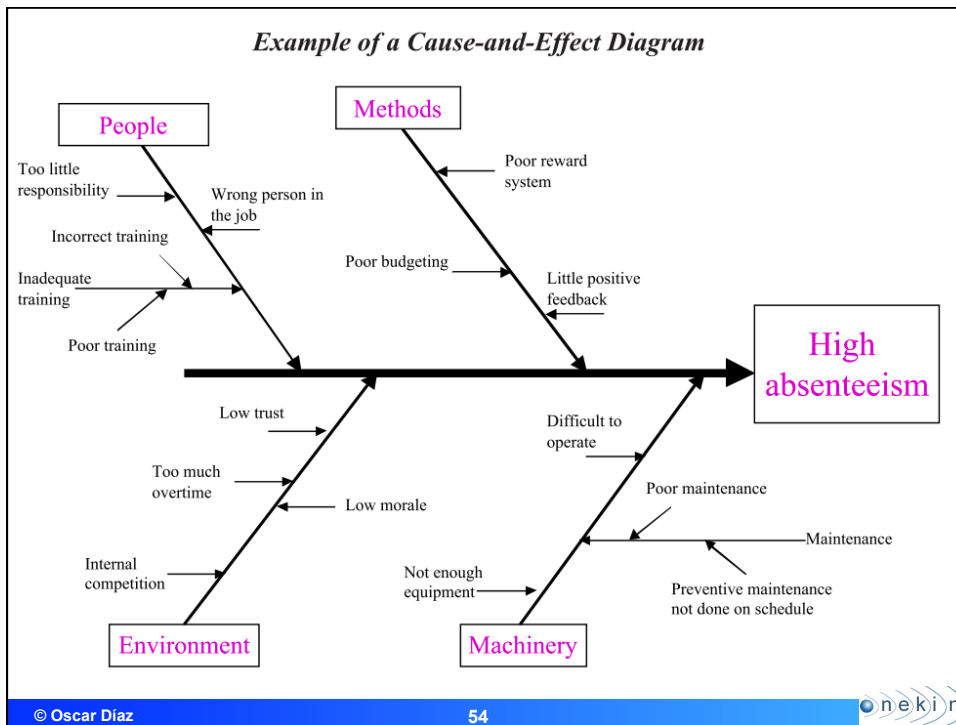
Finding Root Causes

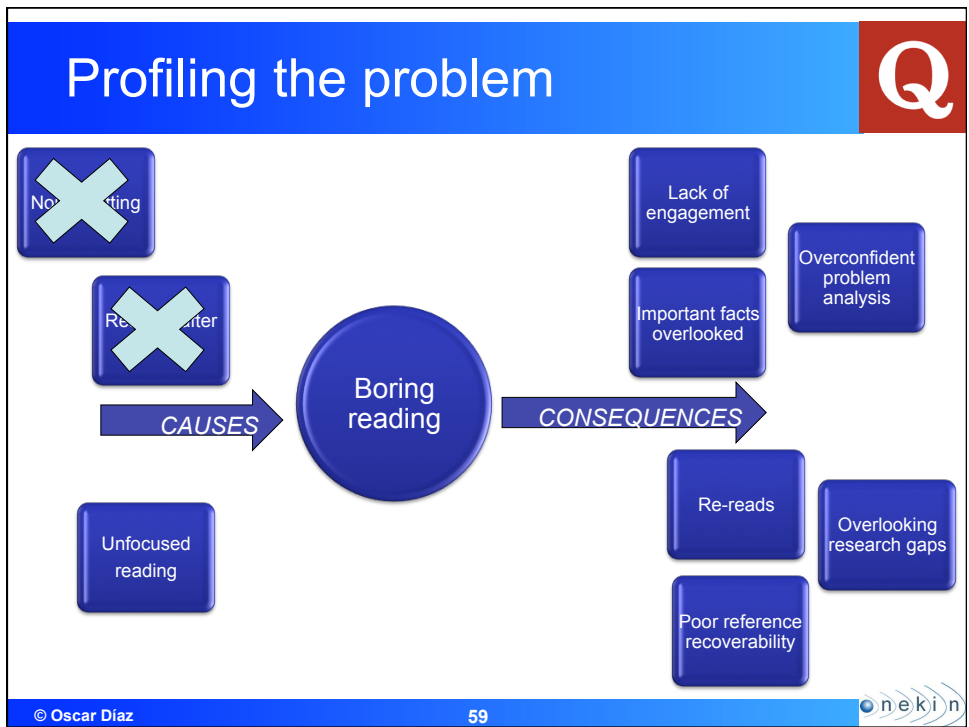
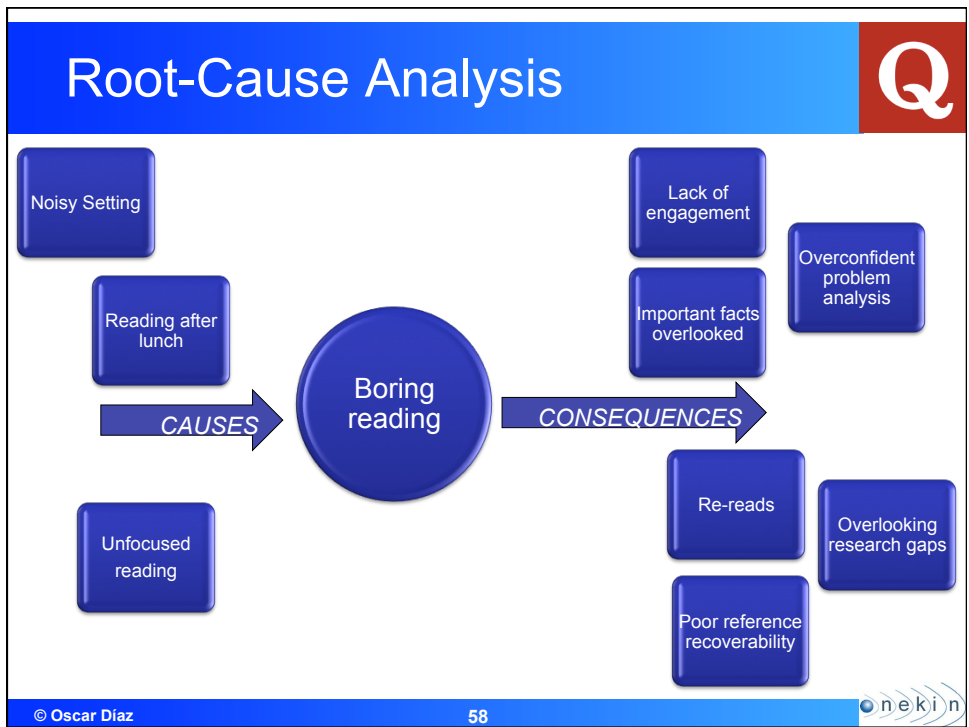
- Often, an initial problem cannot be addressed directly – but its underlying causes/ symptoms can
- Root-Cause Analysis (RCA) is about identifying, understanding and representing root causes of a problem

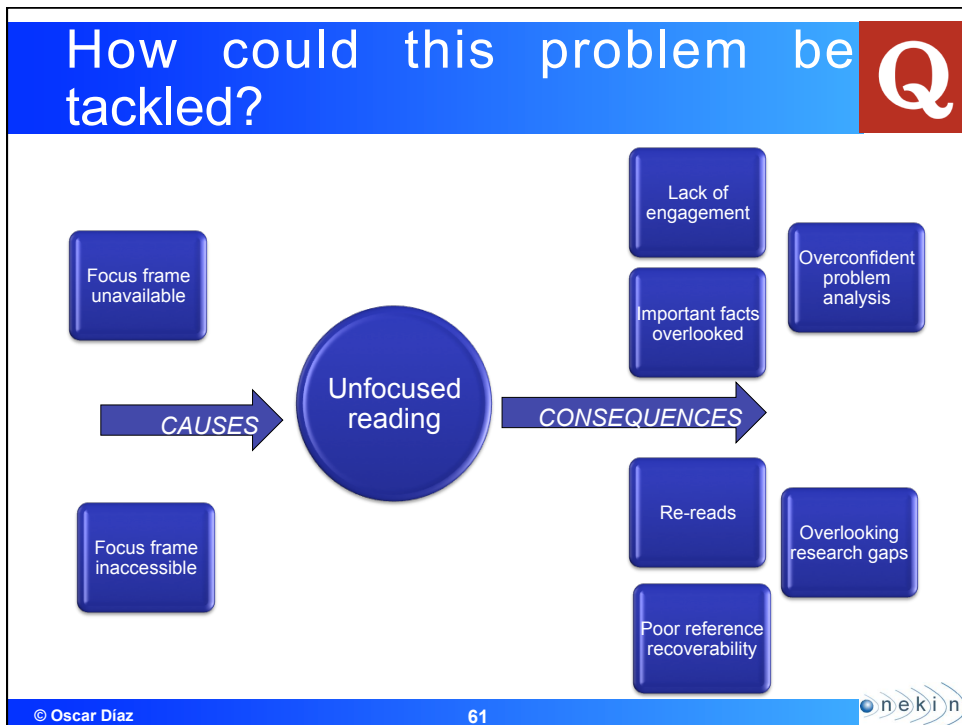
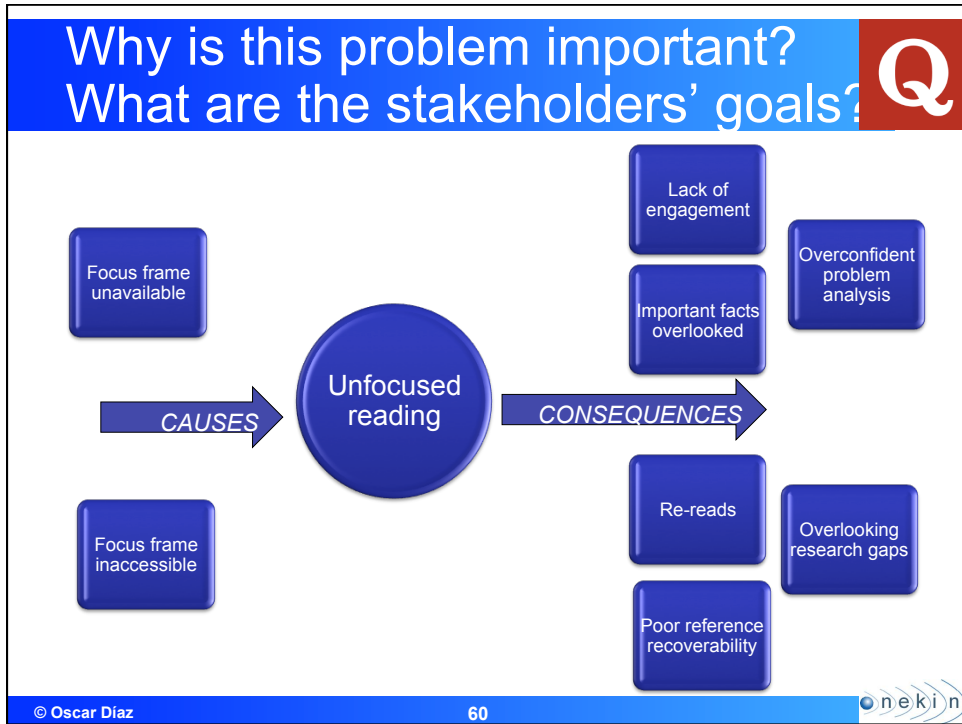


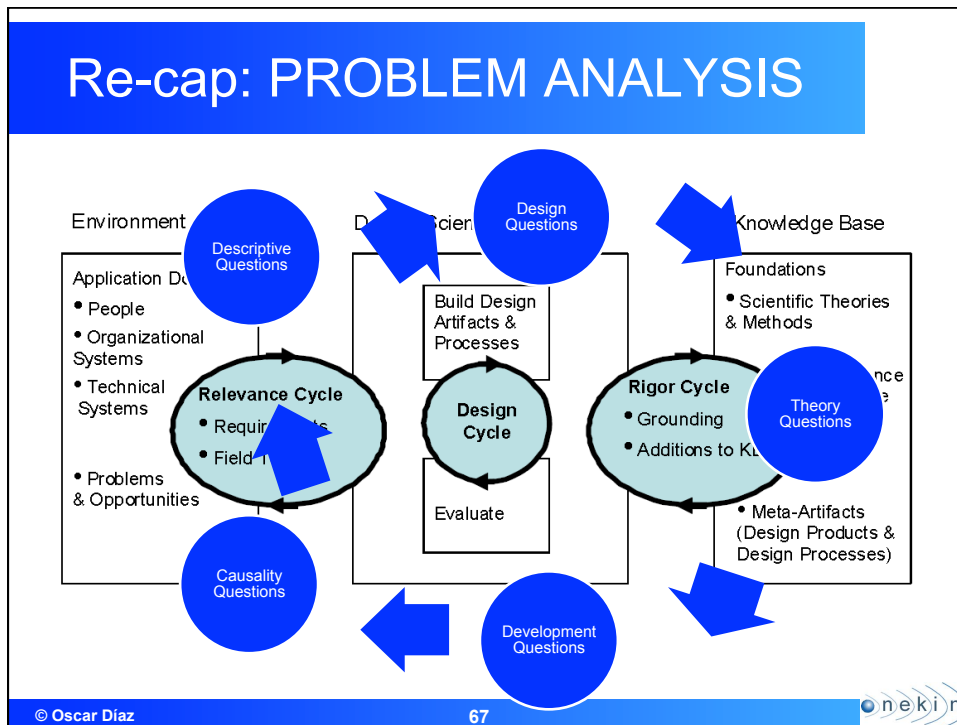
Why-Why Diagram









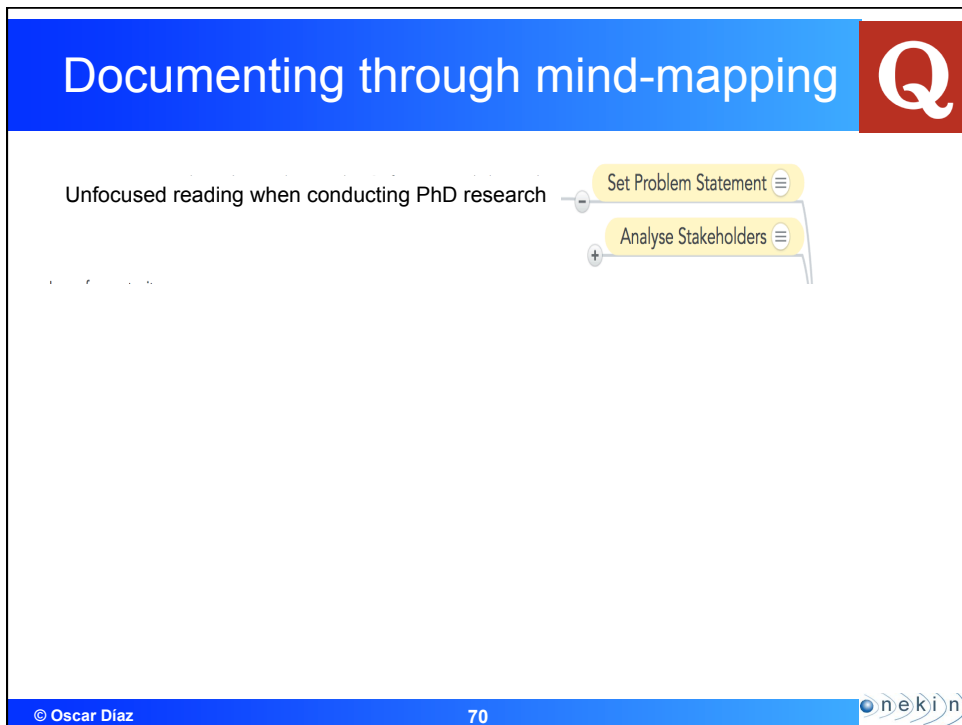
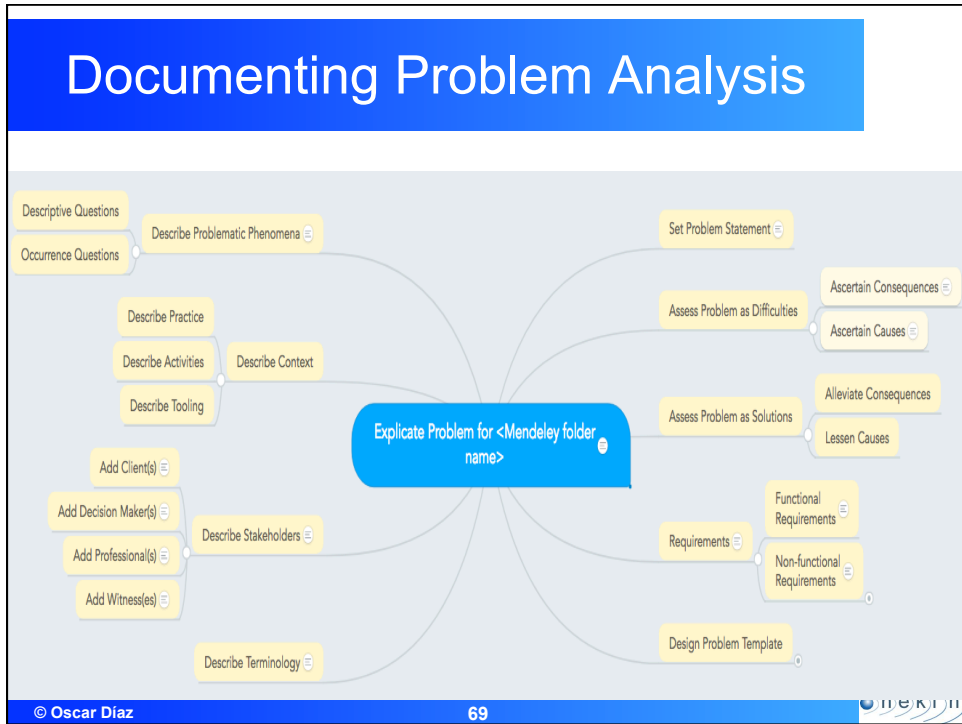


Problem Analysis needs to be documented

- it reveals gaps in existing knowledge
 - Most important to discover research opportunities

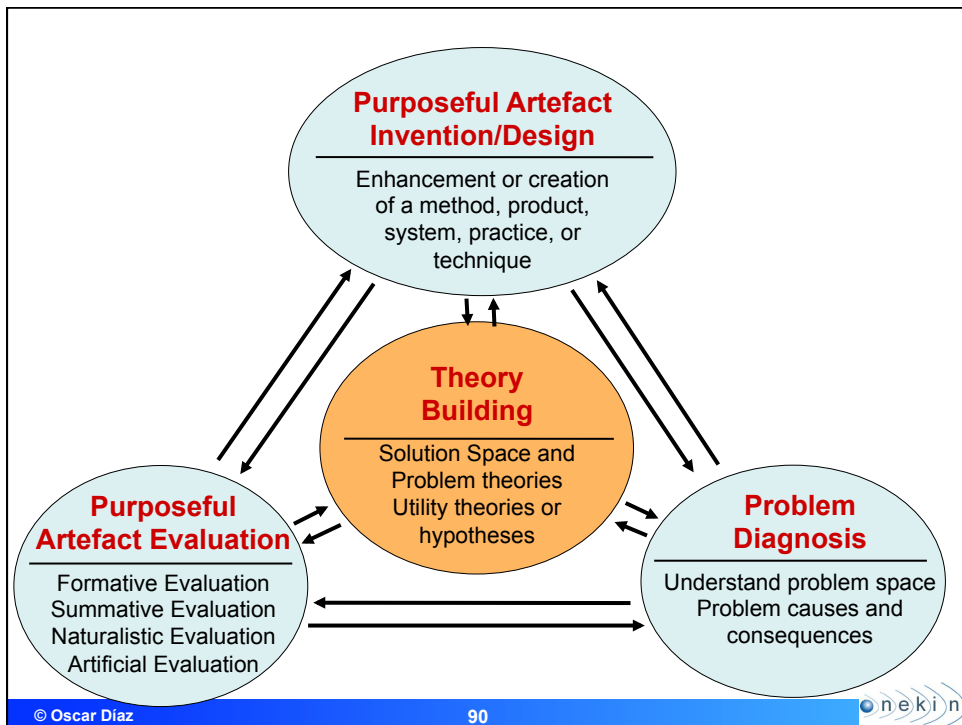
- it helps team members reach common understanding
 - Most important in a PhD setting

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Add references to back-up your analysis

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The importance of theories

- Theories provide the backbone to make sense of the accumulation of empirical results

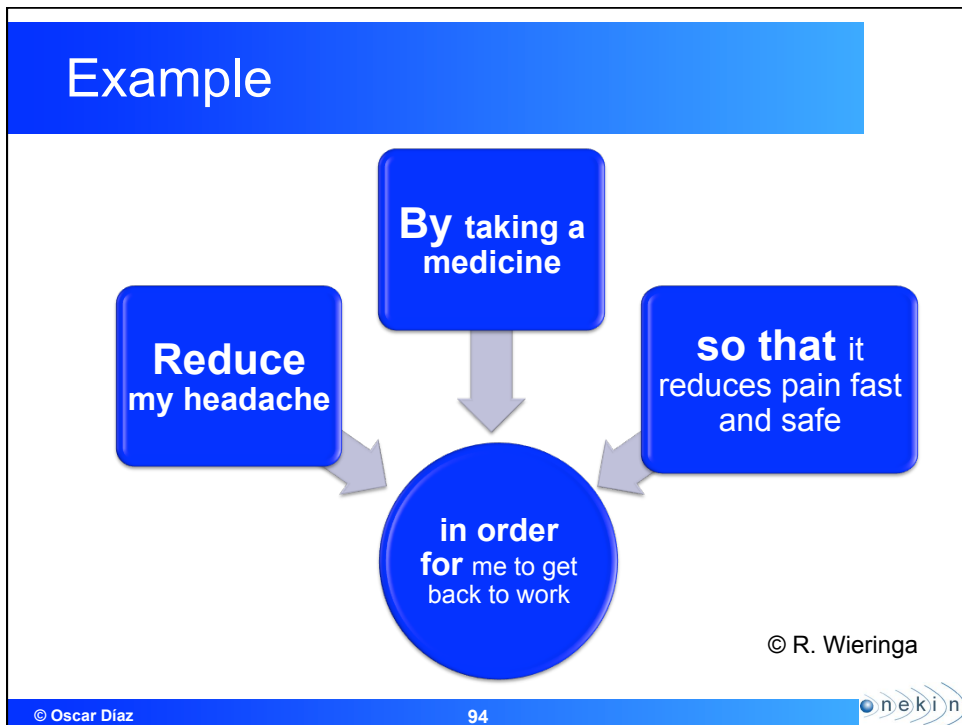
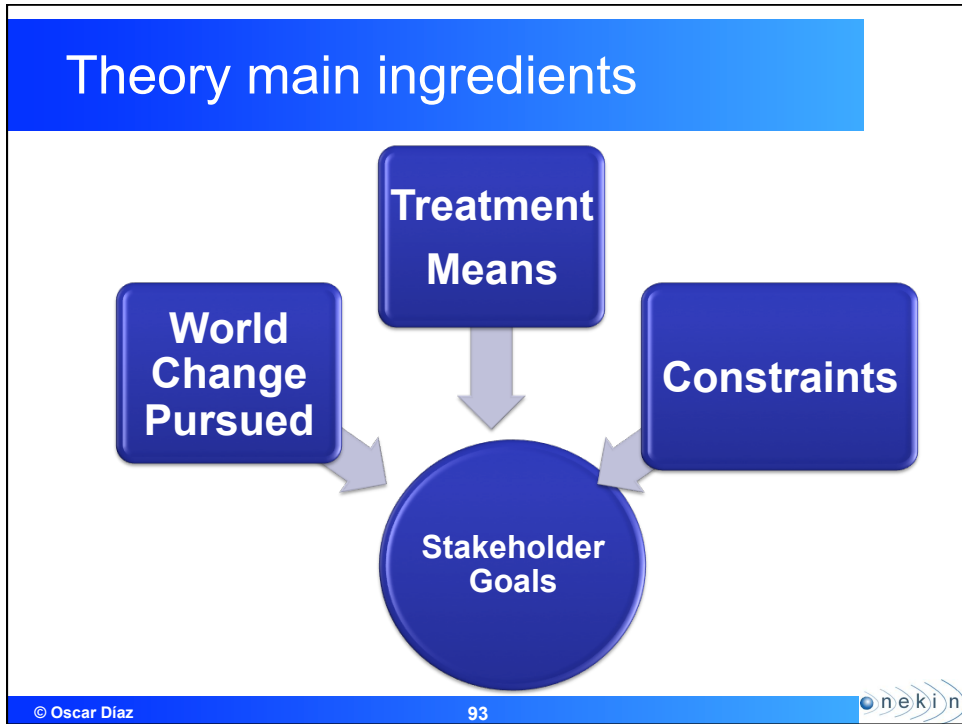
- By defining the key terms, the results of empirical studies can be compared
 - An individual study can never offer conclusive results.
 - Each study adds more evidence for or against the propositions of the theory

The importance of theories (cont.)

- Software Engineering researchers have traditionally been very poor at making theories explicit (Jørgensen and Sjøberg, 2004).

- Many of the empirical studies conducted over the past few decades fail to relate the collected data to an underlying theory.

- The net result is that results are hard to interpret, and studies cannot be compared.



Practical problems

- A “problem” is a difference between the way stakeholders experience the world and the way they would like to experience it

- The **answer** to a practical problem
 - It is not true or false but it is useful or useless
 - It is judged by criteria that have been identified by **problem analysis**
 - These criteria operationalize the usefulness of a solution: The better a solution satisfies these criteria, the more useful the solution is.

Knowledge Problems vs. Practical problems

Knowledge problems	Practical problems
Find truth	Do something useful
Avoid interference with the world	Interfere with the world
Goal is knowledge	Goal is change in the world
Any change in the world is a side-effect (to be minimized)	Any knowledge gained is a side-effect (to be cherished)
Ethical rules not applied to the answer (unpleasant, revolting and offensive truths are still truths)	Ethical rules are applied to the answer (If you change the world you are accountable for what you do)

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Moving from knowledge questions to design questions

Improve
focus reading
during PhD

by ...
???

that
satisfies ??

in order to
improve re-
call of
research
articles

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Moving from the problem space to the solution space

The problem space
(problem understandings
including parts,
causes,
and consequences)

John R. Venable: Using Coloured Cognitive Mapping (CCM) for Design Science Research.
 DESRIST 2014: 345-359

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The solution space

The solution space refers to opportunities to alleviate consequences or lessen causes

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Utility Theories in IS DSR (Venable 2006)

The solution space
(solution means/approach including key components and relationships)

The problem space
(problem understandings including parts, causes, and consequences)

Utility theories w.r.t. effectiveness, efficiency, efficacy in solving problems

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Design Theory

- A design theory should only recommend or suggest a possible action (from among many possible actions).
 - Needs to be clear and precise = **actionable**
 - Needs to be testable, verifiable and/or **refutable**

© J. Venable

Which “action” are you going to address?



Action: Alleviating a consequence

Q

Design Question:

- How to engage students in reading (e.g. gamification)?

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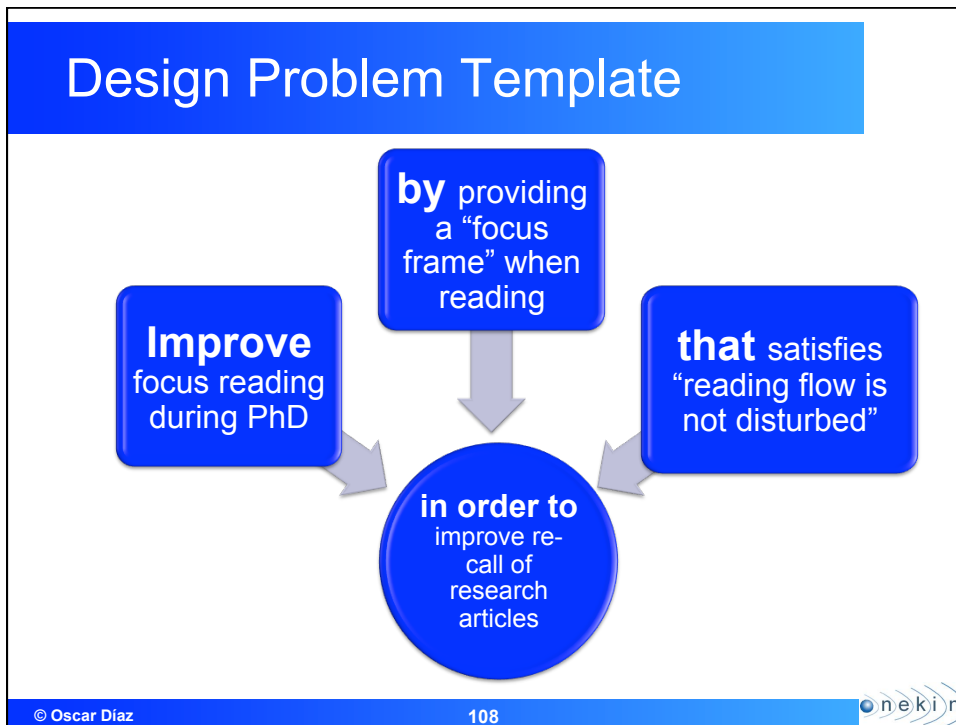
Action: Lessen a cause

Q

Design Question:

- How to make “focus frame” accessible when reading?

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But ... what is a “focus frame”?

Q

Science Home News Journals Topics Careers

SHARE **How do you approach reading a paper?**

121K

I start by reading the abstract. Then, I skim the introduction and flip through the article to look at the figures. I try to identify the most prominent one or two figures, and I really make sure I understand what's going on in the conclusion/summary. Only when I have done that will I go back into the technical details they might have.

...s candidate in astronomy at Wesleyan University in Middletown, Connecticut

... reading the abstract and conclusions. The conclusions help me understand if the abstract has been reached, and if the described work can be of interest for my own work. I look at plots/figures, as they help me get a first impression of a paper. Then I usually read the entire article from beginning to end, going through the sections in the order they appear so that I can follow the flow of work that the authors want to communicate.

If you want to make it a productive exercise, you need to have a clear idea of which kind of information you need to get in the first place, and then focus on that aspect. It could be to compare your results with the ones presented by the authors, put your own analysis into context, or extend it using the newly published data. Citation lists can help you decide why the paper may be most relevant to you by giving you a first impression of how colleagues that do similar research as you do may have used the paper.


- Cecilia Tubiana, scientist at the Max Planck Institute for Solar System Research in Göttingen, Germany

If I'm aiming to just get the main points, I'll read the abstract, hop to the figures, and scan the discussion for important points. I think the figures are the most important part of the paper, because the abstract and body of the paper can be manipulated and shaped to tell a compelling story. Then anything I'm unclear about, I head to the methodology.

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What are you reading for?


- Scanning for evidences about ...
 - ...the importance of your problem
 - ... the roots of your problem
 - ... those who address similar problems

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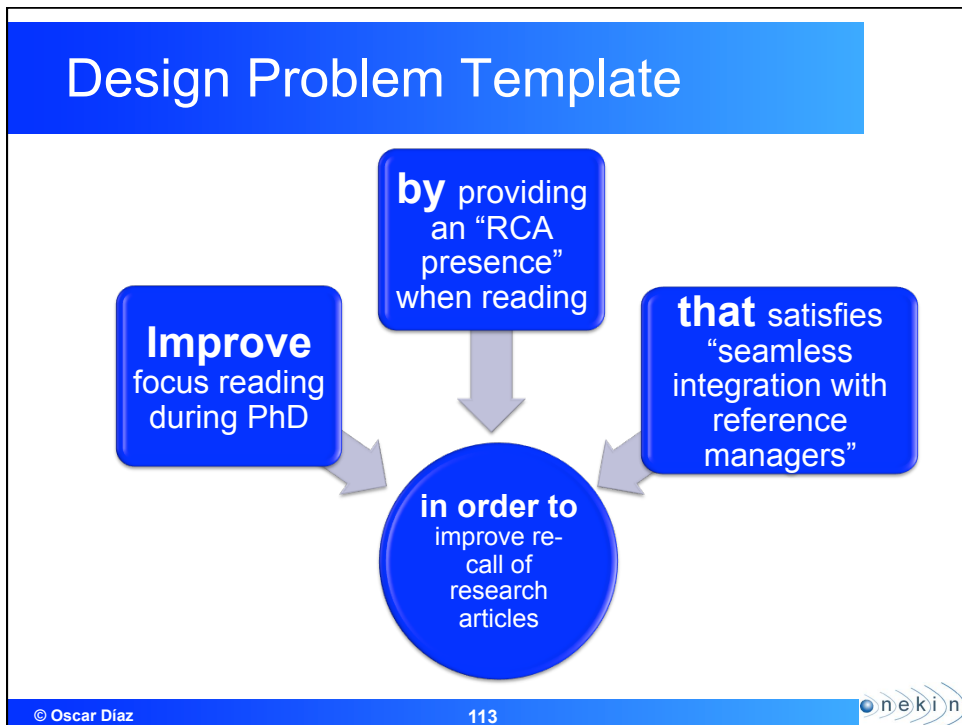
What are you reading for?

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 - ...the importance of your problem
 - ... the roots of your problem
 - ... those who address similar problems

Focus frame = RCA

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The image shows a screenshot of a ScienceDirect article page. A thought bubble in the top left corner contains a flowchart with steps: 'Set Problem Statement', 'Analyze Stakeholders', 'Assess Problem as Difficulties', 'Explore Problem', 'Assess Problem as Solutions', 'Learn Causes', and 'Achieve Consequences'. Below the bubble is a man in a blue shirt thinking. The article text includes a 'SHARE' section with social media icons and two quotes: one from Gary McDowell about checking references and another from Lina A. Colucci about using Excel to summarize research teams.



You don't need to generate your own theory


- You can contribute to existing theories by
 - refuting
 - supporting
 - elaborating
 - appropriating
- someone else's

		Artifact		
		Identify	Appropriate	Generate
Kernel theory	Unknown /Unavailable			
	Appropriate			
	Generate			

Mandviwalla, M. (2015). **Table 1: DSR projects**
 Generating and justifying design theory. *Journal of the Association for Information Systems*, 16(5), 314–344.


		Artifact		
		Identify	Appropriate	Generate
Kernel theory	Unknown /Unavailable	Type I <i>Exploratory research to identify what is important about an artifact</i> (e.g., ethnographic study on how firms use Facebook)	Type IV <i>Apply interesting artifacts to specific problems and look for explanations later</i> (e.g., apply consumer social media inside a business)	Type VII <i>Invent new artifacts and look for explanations later</i> (e.g., invent a new kind of group support system)
	Appropriate	Type II <i>Formal evaluation of artifacts using specific theories</i> (e.g., apply cognitive learning theories to evaluate the ease of use of Windows 8)	Type V <i>Investigate the appropriation of specific artifacts and associated explanations</i> (e.g., customize social media to higher education and explain using cognitive learning theory)	Type VIII <i>Create artifacts that apply specific theories</i> (e.g., create a new kind of social networking platform by applying and adapting social capital theory)
	Generate	Type III <i>Develop concepts to explain specific artifacts</i> (e.g., explain the impact of blogging on politics)	Type VI <i>Adapt artifacts and create explanations</i> (e.g., propose how social media can be appropriated to higher education; propose concepts to explain use)	Type IX <i>Create new artifacts and explanations</i> (e.g., propose a new system for academic peer review; propose new concepts to explain the process changes)

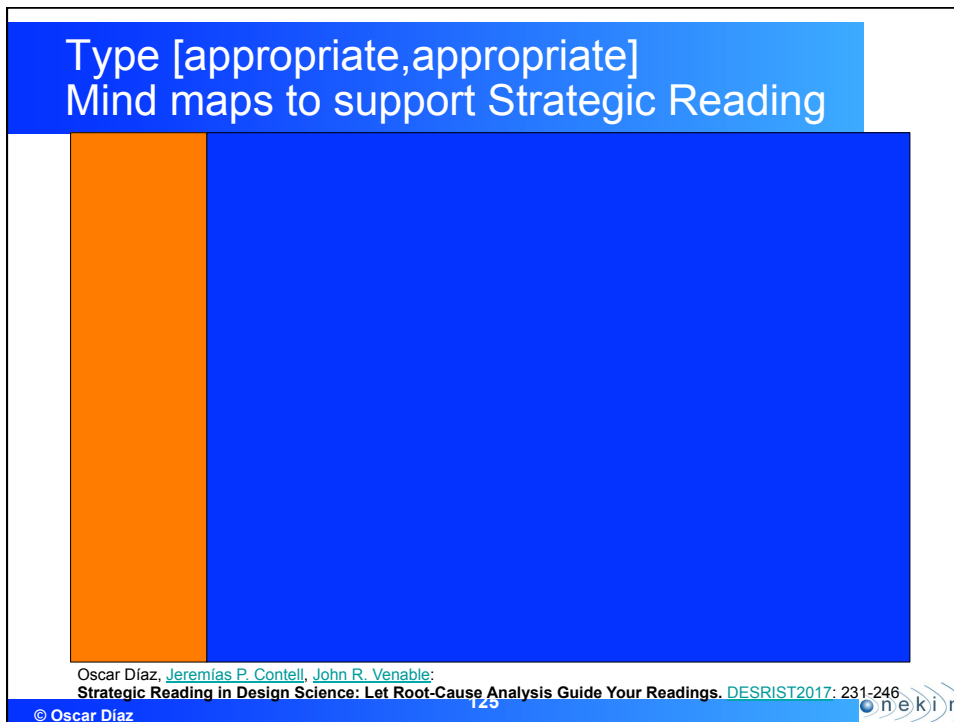
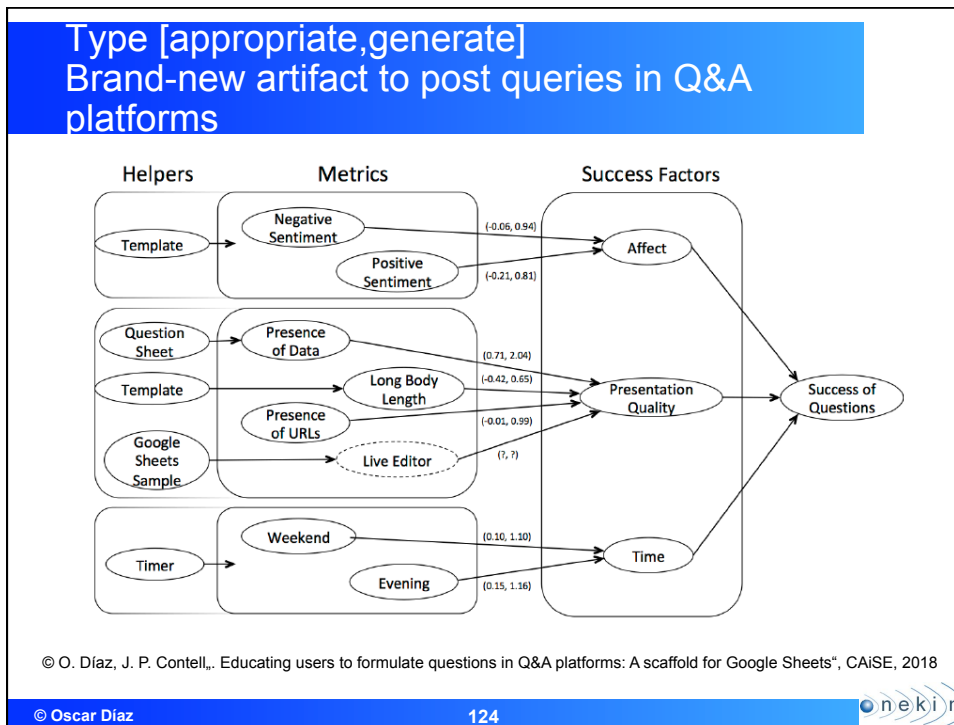
Mandviwalla, M. (2015). **Table 1: DSR projects**
 Generating and justifying design theory. *Journal of the Association for Information Systems*, 16(5), 314–344.

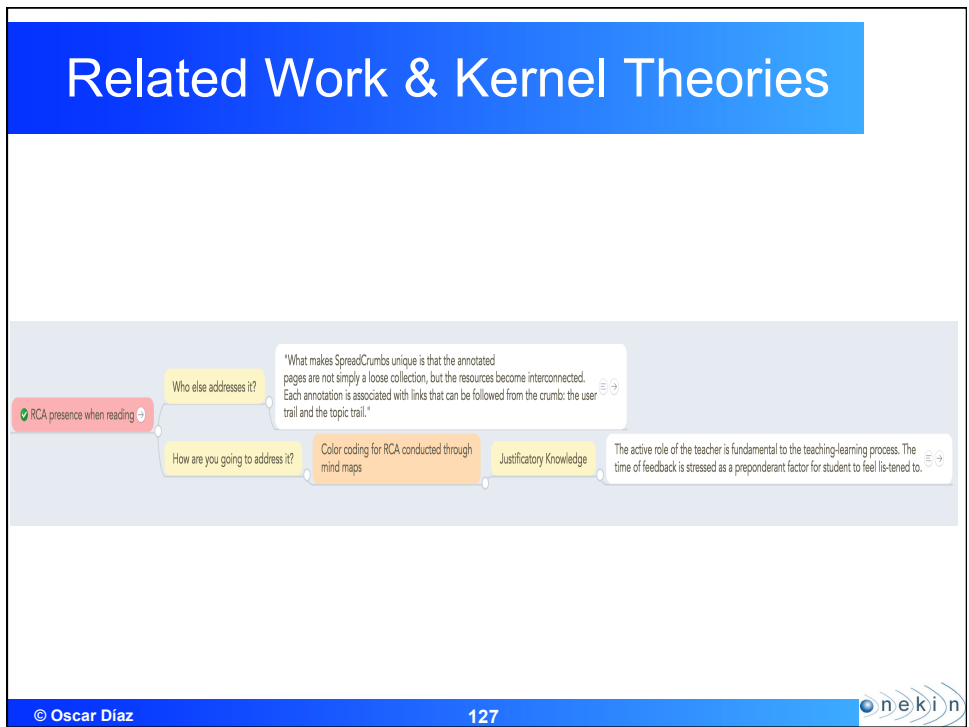
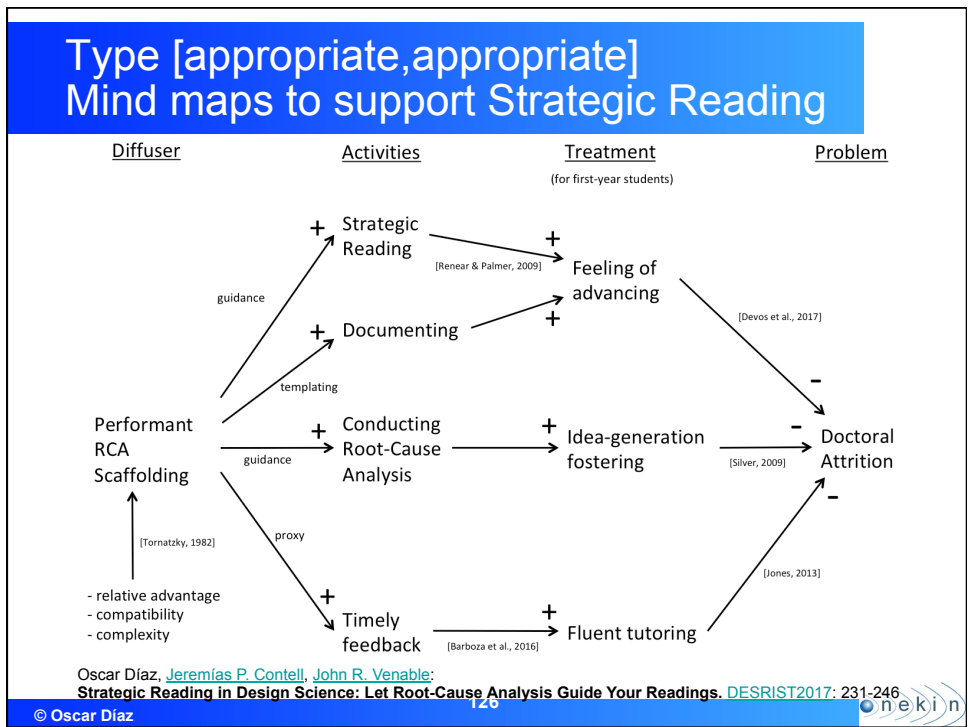
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Type [appropriate,generate]
 Brand-new artifact to post queries in Q&A platforms


© O. Díaz, J. P. Contell,, Educating users to formulate questions in Q&A platforms: A scaffold for Google Sheets[®], CAISE, 2018

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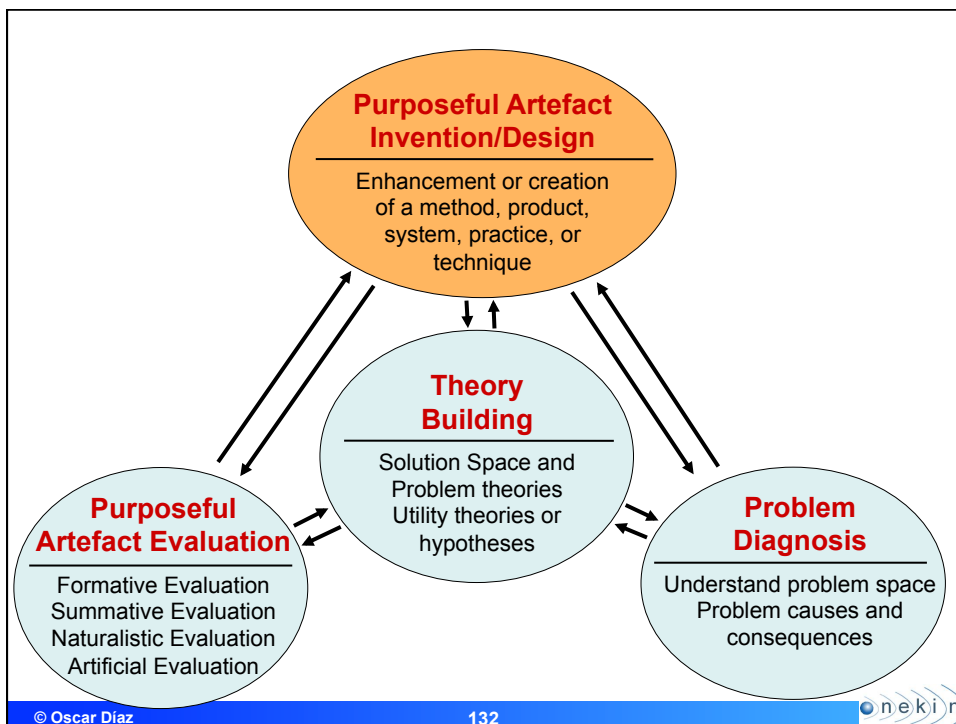


Demo time



D Scaffolding

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What is an artifact?

Design Artifacts	Description
Constructs	The conceptual vocabulary of a domain
Models	Sets of propositions or statements expressing relationships between constructs
Methods	Sets of steps used to perform tasks (how-to knowledge)
Instantiations	Situated implementations in certain environments that do or do not operationalized constructs, models or methods.

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From the insight

Science Home News Journals Topics Careers

SHARE

I also check if there are references that I may be interested in. Sometimes I am curious to see who in the field has—or more likely has not—been referenced, to see whether the authors are choosing to ignore certain aspects of the research. I often find that the supplementary figures actually offer the most curious and interesting results, especially if the results relate to parts of the field that the authors did not reference or if they are unclear or unhelpful to their interpretation of the overall story.

- **Gary McDowell**, postdoctoral fellow in developmental biology at Tufts University in Medford, Massachusetts, and visiting scholar at Boston College

When reading papers, it helps me to have a writing task so that I am being an active reader instead of letting my eyes glaze over mountains of text only to forget everything I just read. So for example, when I read for background information, I will save informative sentences from each article about a specific topic in a Word document. I'll write comments along the way about new ideas I got or questions I need to explore further. **Then, in the future, I'll only need to read this document instead of re-reading all the individual papers.**

Likewise, when I want to figure out how to conduct a particular experiment, I create a handy table in Excel summarizing how a variety of research teams went about doing a particular experiment.

- **Lina A. Colucci**, doctoral candidate at the Harvard-MIT Health Sciences and Technology program

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Building the artefact Q

- RCA-frame presence can be obtained through (functional requirements):
 - Ticking off RCA concerns
 - Annotate bibliography along RCA concerns
 - Frame annotations as part of RCA

- ... provided (non-functional requirements)
 - reading/RCA flows are not disturbed

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onekin

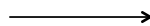
Building the artefact.



- Now, we need to focus on concrete realizations
- Where is reading conducted?
 - E.g. Mendeley
- Where is RCA conducted?
 - E.g. MindMeister

How to support meta-requirements for Mendeley-MindMeister?

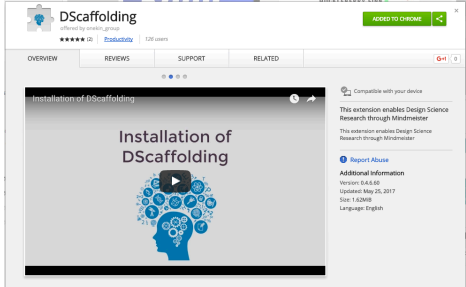
Functional requirements
<i>Identify RCA concerns</i>
<i>Annotate resources along RCA concerns (the concern flow)</i>
<i>Frame annotations as part of RCA (the annotation flow)</i>




How to support meta-requirements for Mendeley-MindMeister?

Functional requirements
<i>Identify RCA concerns</i>
<i>Annotate resources along RCA concerns (the concern flow)</i>
<i>Frame annotations as part of RCA (the annotation flow)</i>


→



DScaffolding: a freely available Chrome's extension

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MR1: IDENTIFY READING PURPOSES


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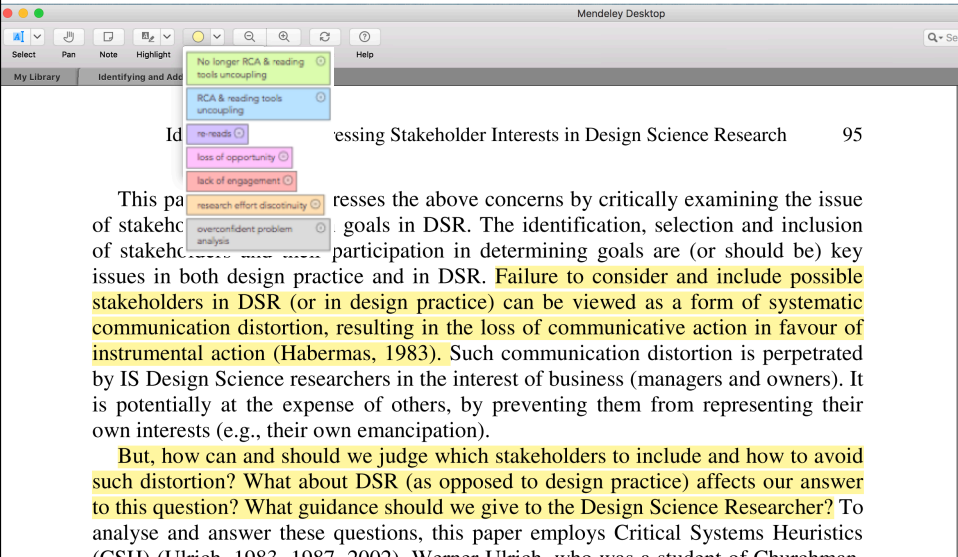
MR1 realization in DScaffolding

- Reading purposes are ticked off through a special node: “Supporting Evidences?”
 - Akin to mind mapping practices
- Adding “Supporting Evidences?” as a child turns the parent into a “reading purpose”
 - This causes the node’s background colour to change

MR2: ANNOTATE RESOURCES ACCORDING TO CURRENT RCA CONCERNS

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Mendeley's highlight palette to be derived from MindMeister



Id... essing Stakeholder Interests in Design Science Research 95

This pa... resses the above concerns by critically examining the issue of stakeh... goals in DSR. The identification, selection and inclusion of stakeh... participation in determining goals are (or should be) key issues in both design practice and in DSR. Failure to consider and include possible stakeholders in DSR (or in design practice) can be viewed as a form of systematic communication distortion, resulting in the loss of communicative action in favour of instrumental action (Habermas, 1983). Such communication distortion is perpetrated by IS Design Science researchers in the interest of business (managers and owners). It is potentially at the expense of others, by preventing them from representing their own interests (e.g., their own emancipation).

But, how can and should we judge which stakeholders to include and how to avoid such distortion? What about DSR (as opposed to design practice) affects our answer to this question? What guidance should we give to the Design Science Researcher? To analyse and answer these questions, this paper employs Critical Systems Heuristics (CSH) (Ulrich, 1983, 1987, 2002). Werner Ulrich, who was a student of Churchman

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Unfortunately, Mendeley's palette can not be configured (pending request)

The screenshot shows the Mendeley Desktop interface. A document titled "Addressing Stakeholder Interests in Design Science Research" is open. The text contains several highlighted sections. A palette of colors is visible, but it is not fully configurable. The palette includes colors like yellow, green, blue, purple, pink, red, orange, and grey, but it lacks the ability to create custom colors or adjust existing ones.

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MR2 realization in DScaffolding

➤ Placing MindMeister-generated cheat-sheet by Mendeley

The screenshot shows the Mendeley Desktop interface. A document titled "Addressing Stakeholder Interests in Design Science Research" is open. The text contains several highlighted sections. A palette of colors is visible, but it is not fully configurable. The palette includes colors like yellow, green, blue, purple, pink, red, orange, and grey, but it lacks the ability to create custom colors or adjust existing ones.

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MR3: INCORPORATE ANNOTATIONS AS PART OF RCA DIAGRAMS

Annotation nodes are automatically created by DScaffolding



Annotation nodes are automatically created by DScaffolding

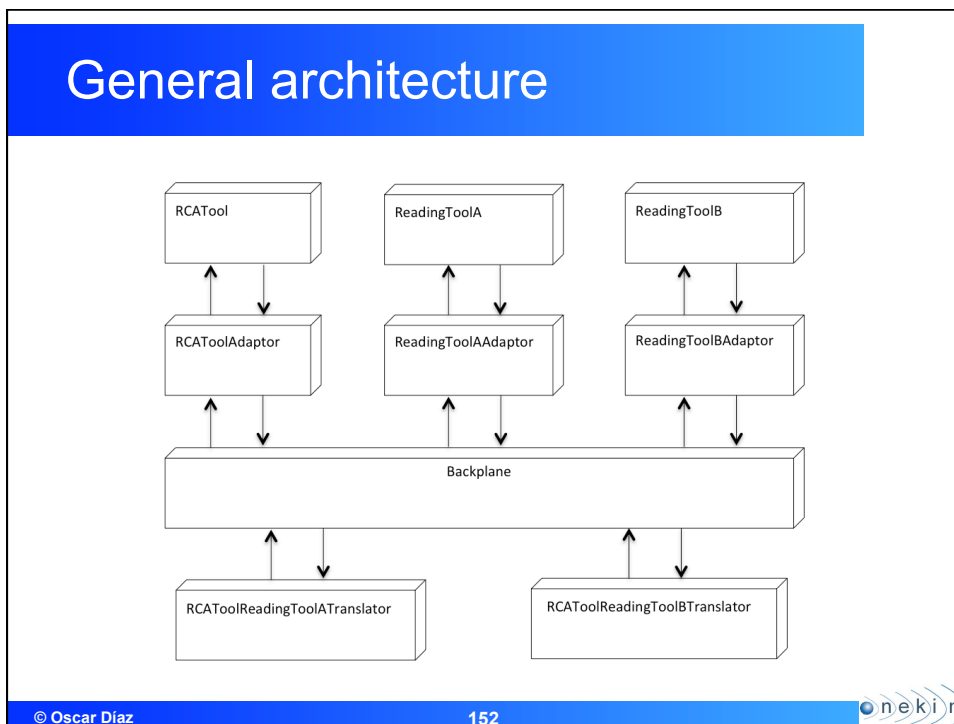
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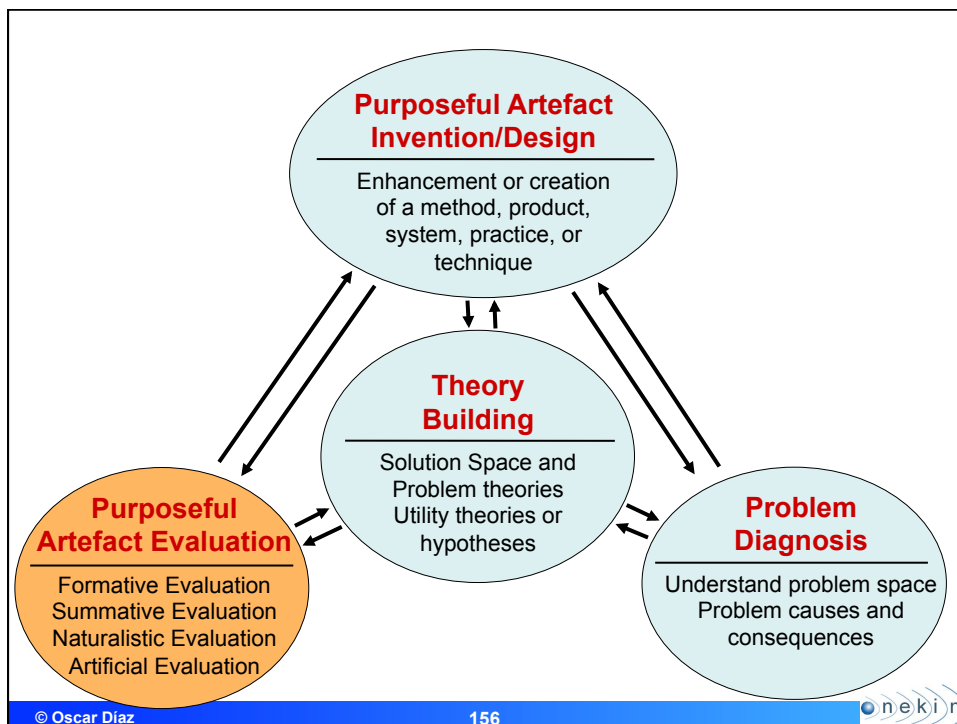
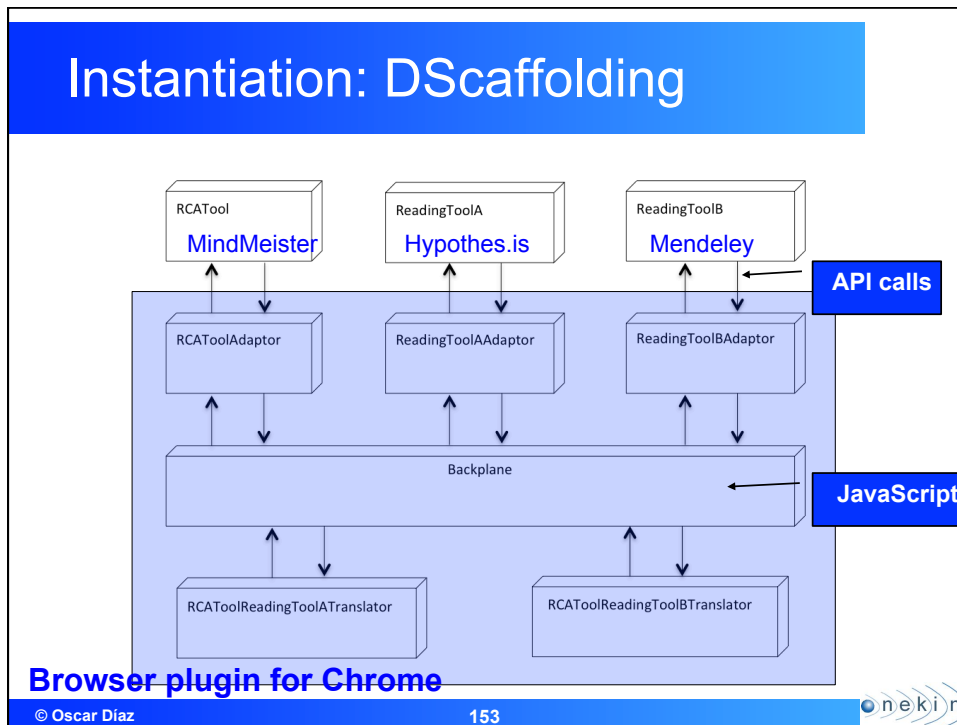
MR3 realization in DScaffolding

- DScaffolding monitors Mendeley folders
- On entering a mind map, DScaffolding creates “**annotation nodes**” out of annotations in the namesake Mendeley folder

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Functional Meta-requirements	DScaffolding Features
<i>MR1: Identify RCA concerns</i>	<i>"Supporting Evidences?"</i> node
	<i>"Who else addresses it?"</i> node
<i>MR2: Annotate resources according to current RCA concerns (the purpose pipe)</i>	Concern cheat sheet
	Right mouse context menu for concerns
<i>MR3: Incorporate annotations as part of RCA (the annotation pipe)</i>	<i>"Annotation"</i> node
	Background colour & icons used to capture <i>"the quality of the annotation"</i>
	Tracking of annotation repositories

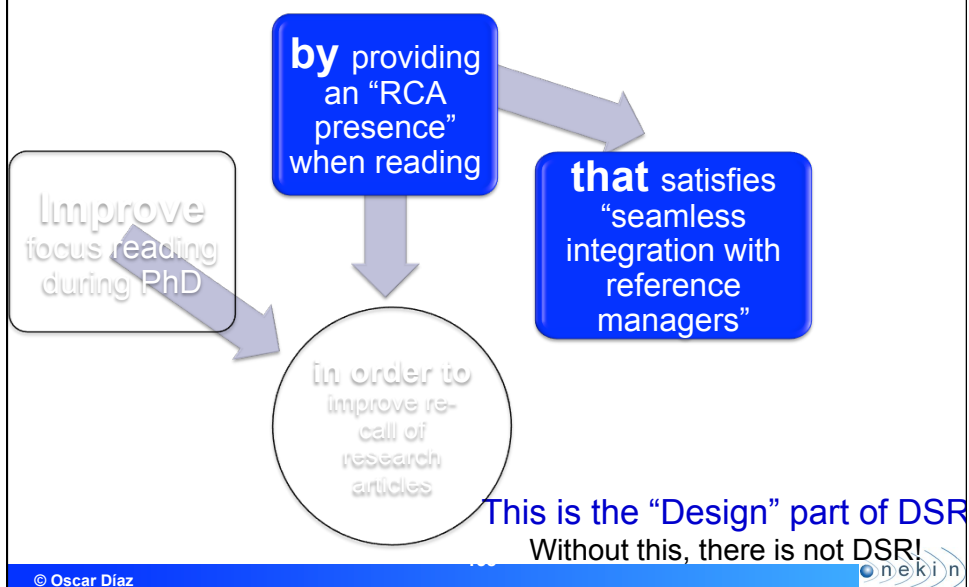




Evaluation

- Even once built, a purposeful artefact is still only **hypothesised** to be useful to address problems unless it is evaluated
- Need to provide evidence that:
 - The artefact works
 - **The artefact has utility for its purpose**
 - Use of the artefact solves the problem and/or provides the benefit or improvement expected
 - The design theory is correct

DESIGN science: building the artefact



design SCIENCE: evaluating the artifact

Improve focus reading during PhD

by providing an “RCA presence” when reading

that satisfies “seamless integration with reference managers”

in order to improve re-call of research articles

This is the “Science” part of DSR
Without this, there is not DSF

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Remember: the ultimate goal is to prove our theory

Improve focus reading during PhD

by providing an “RCA presence” when reading

that satisfies “seamless integration with reference managers”

in order to improve re-call of research articles

- DScaffolding is “just” the means to prove this theory!
- Knowledge & understanding of a problema and its solution comes from the construction and evaluation of artefacts

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What is meant by “providing an RCA presence when reading”? Q

Providing an RCA-presence

When on-line “PhD reading”

Focus frame inaccessible/inexistent

will prevent

Unfocus reading

↓

Functional requirements
<i>Identify RCA concerns</i>
<i>Annotate resources along RCA concerns (the concern flow)</i>
<i>Frame annotations as part of RCA (the annotation flow)</i>

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How have these requirements been realized for your platform? Q


Functional requirements	Realization
<i>Identify RCA concerns</i>	<i>Supporting Evidences? node</i> <i>Who else addresses it? node</i>
<i>Annotate resources along RCA concerns (the concern flow)</i>	concern cheat sheet right mouse context menu for concerns
<i>Frame annotations as part of RCA (the annotation flow)</i>	<i>“Annotation” node.</i> Background color & icons used to capture “the quality of the annotation” Tracking of annotation repositories

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Functional requirements	Realization
<i>Identify RCA concerns</i>	<i>Supporting Evidences?</i> node
	<i>Who else addresses it?</i> node
<i>Annotate resources along RCA concerns</i> <i>(the concern flow)</i>	concern cheat sheet
	right mouse context menu for concerns
<i>Frame annotations as part of RCA</i> <i>(the annotation flow)</i>	"Annotation" node.
	Background color & icons used to capture "the quality of the annotation"
	Tracking of annotation repositories

➤ Was the "Supporting Evidences" node effective on identifying RCA concerns? (functional)


- without disrupting the RCA flow (non-functional)

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Functional requirements	Realization
<i>Identify RCA concerns</i>	<i>Supporting Evidences?</i> node
	<i>Who else addresses it?</i> node
<i>Annotate resources along RCA concerns</i> <i>(the concern flow)</i>	concern cheat sheet
	right mouse context menu for concerns
<i>Frame annotations as part of RCA</i> <i>(the annotation flow)</i>	"Annotation" node.
	Background color & icons used to capture "the quality of the annotation"
	Tracking of annotation repositories

➤ Was the cheat-sheet effective on annotating papers along RCA concerns? (functional)

– without disrupting the reading flow (non-functional)

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If so, where requirement fulfilment enough to achieve the "world change": focused reading?

- Did the "RCA presence" help me to keep focus while reading in Mendeley?

- How to measure focus?
 - Was there an increase in the number of color-coded annotations?
 - Was there a consistent use of annotations along the paper?
 - Did annotation take place in a coherent time frame?

If so, we have a theory!

1. Did "realization" meet "requirements"?
2. If so, where requirement fulfilment enough to achieve the goal: focused reading?

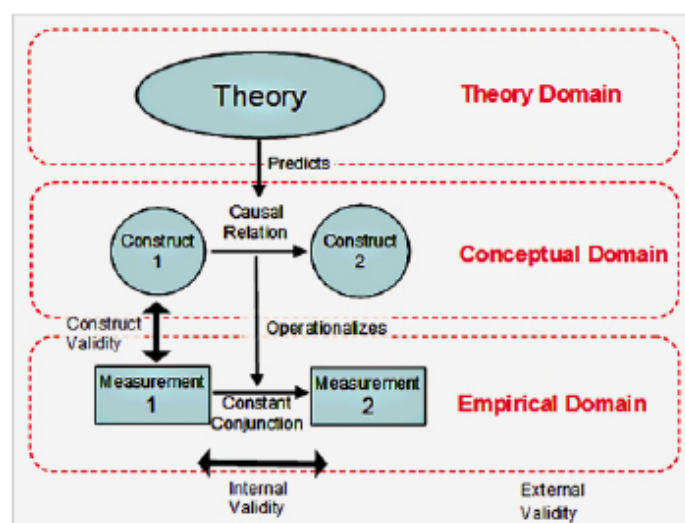
3. If so, we have a theory!
 - Our Design Theory states that RCA might provide main drivers of attention when reading.

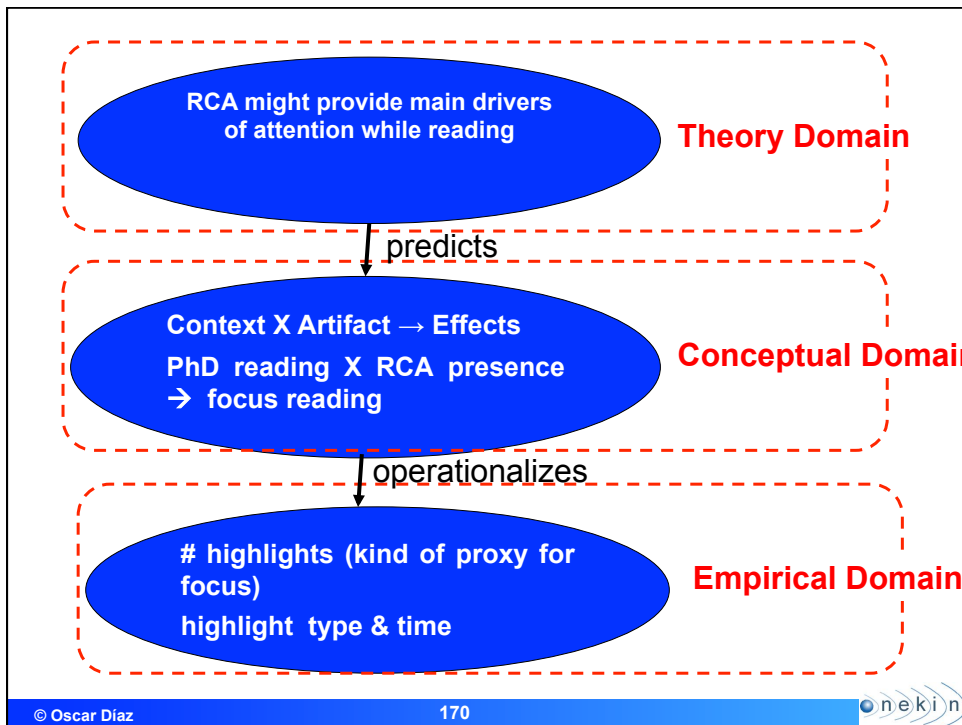
- Notice: DScaffolding is "just" the means to validate this theory

Empirical validity

- For empirical work to be acceptable as a contribution to scientific knowledge, readers need to be convinced that the conclusions drawn from an empirical study are **valid**.
- **Validity**: the degree of support for a conclusion of a fallible inference

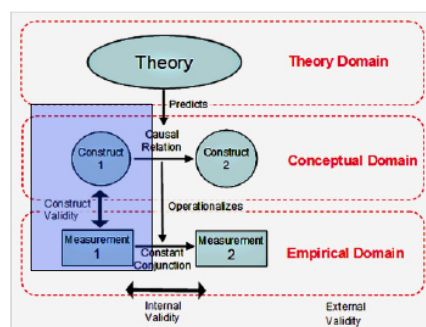
Empirical validity. Setting





Construct Validity

- The amount of correspondence between
 - an unobservable concept &
 - measurable indicators of that concept's properties.

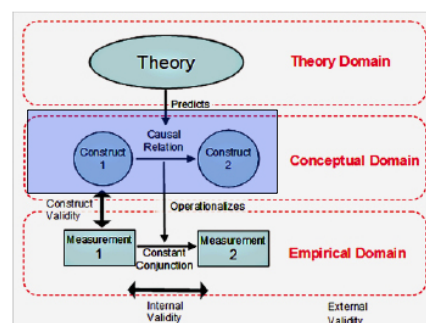


Construct Validity. Focus Reading

- Construct: Highlighting as an manifestation of focus reading
 - Measures:
 - Was there an increase in the number of colored annotation used?
 - Was there a consistent use of annotations along the paper?
 - Did annotation take place in a coherent time frame?
- Threats:
 - Do you agree highlighting implies focus?

Internal Validity

- The degree of support for the claim that a relation between two variables is causal
- There should not exist alternative explanations for the relationships identified between our research model constructs

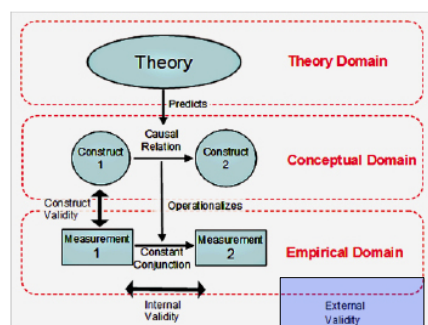


Internal Validity Focus Reading

- PhD research X RCA presence → focus while reading
- Was participation somehow being influenced by the novelty of the approach (confounding variable)?
- Are participants in the experiment representative of the target audience?

External validity

- It tackles the representativeness of the study, and the ability to **generalize** the conclusions beyond the scope of the study itself.



External validity Focus Reading

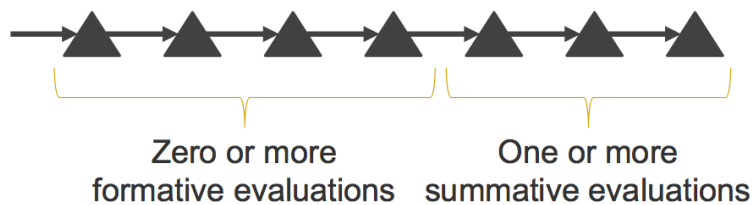
- Generalize the audience:
 - PhD students → senior researchers
 - Web research → SE research

- Generalize the documents being read
 - research papers → tabloids

- Generalized the tooling
 - Mendeley → Zotero

When to conduct evaluation: Formative & Summative Evaluation

- Formative Evaluation – Helps identify areas of needed improvement during development
- Summative Evaluation – Evaluates the “final” artefact



Notation: \longrightarrow = Design/Construct \blacktriangle = Evaluation episode

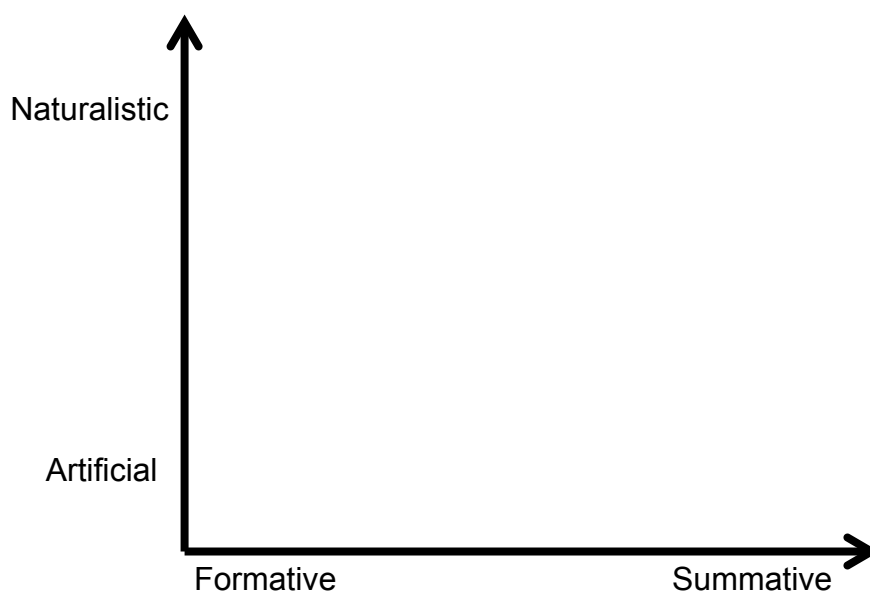
How to conduct evaluation: Naturalistic & Artificial Evaluation

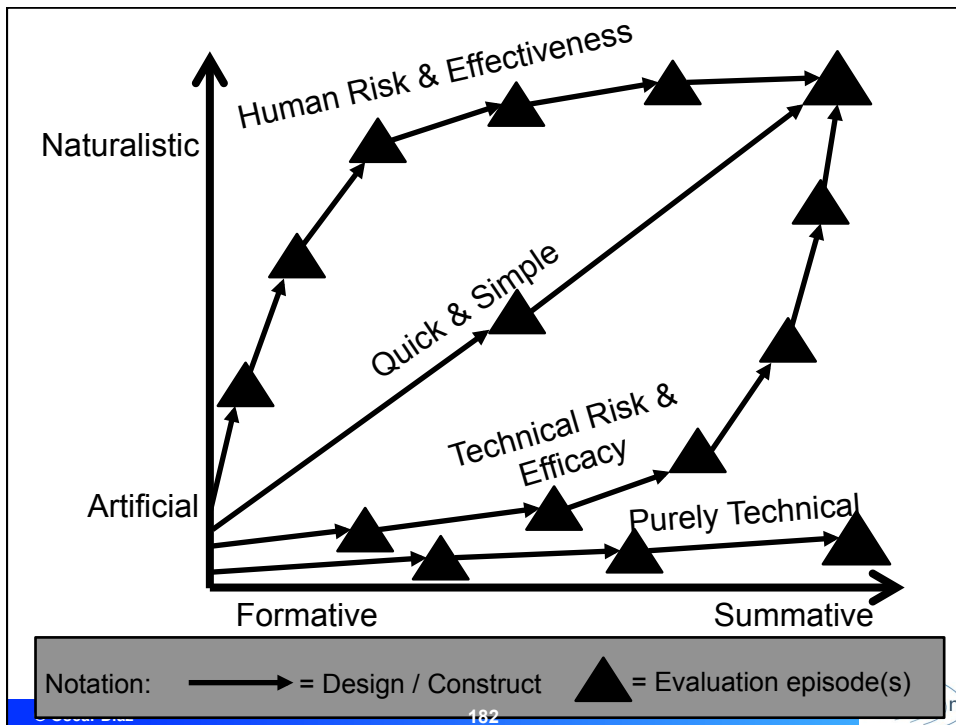
➤ Naturalistic Evaluation

- Good for evaluating **effectiveness** of a purposeful artefact, especially a socio-technical artefact, in real use
- More or less satisfies three realities: **real users, real system, real problem**

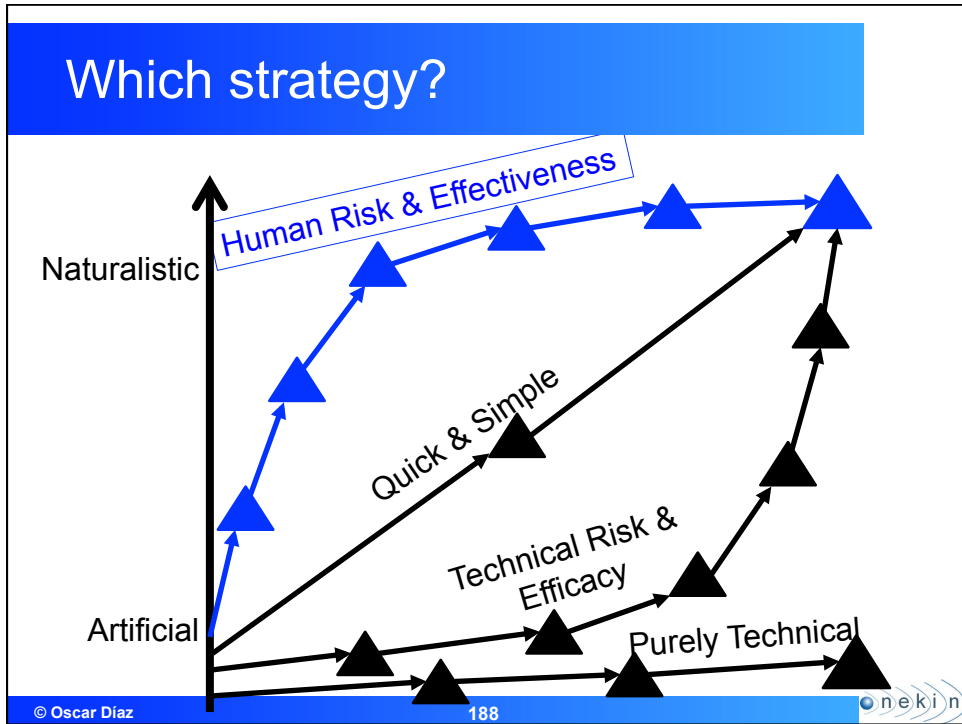
➤ Artificial Evaluation

- Good for evaluating the **efficacy** of a purposeful artefact, controlling for confounding variables and determining that the artefact (not something else) causes the desired effect



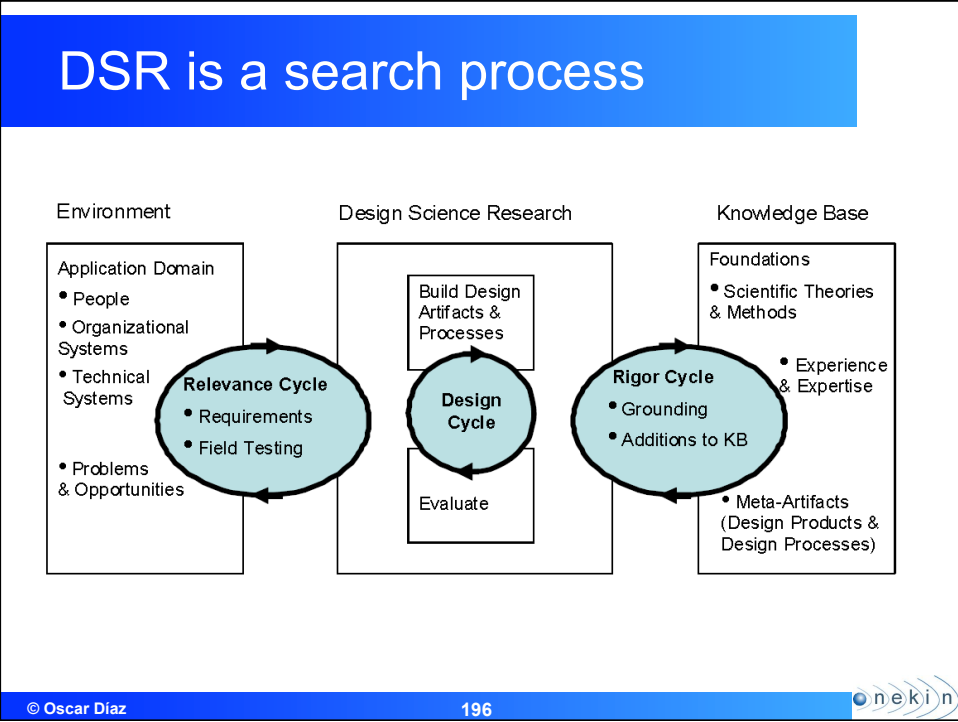
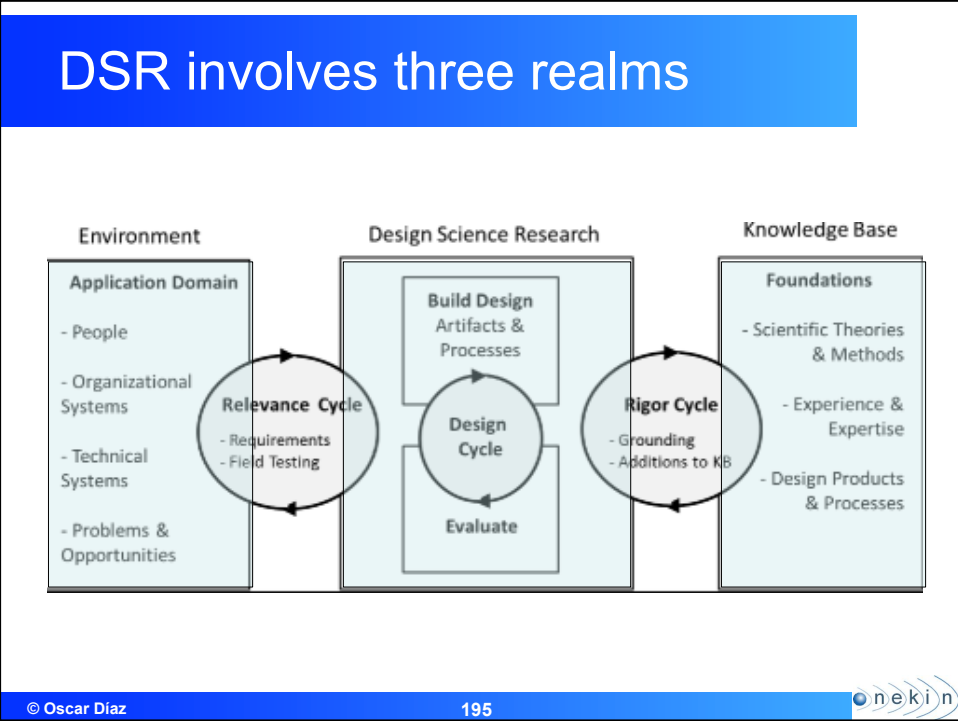


The slide features a blue header with the text 'EVALUATING DSCAFFOLDING' in white. To the right of the header is a blue icon of a human head profile with various gears and symbols inside, representing cognitive processes. At the bottom left, it says '© Oscar Díaz' and '187'. At the bottom right is the 'nekin' logo.



CONCLUSIONS

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Evaluation criteria for research papers

Evaluation object	Relevant evaluation questions
1. Design of an artefact	Produce the research an it-artefact, that includes a construct, a model or an instantiation.
2. Problem relevance	Is the research problem and objective of the it-artefact important? Is the it-artefact or solution relevant business problem?
3. Design evaluation	Could the results be verified? Are the evaluation method rigorous and well-defined? Is the utility, quality and efficacy rigorously demonstrated?
4. Research contribution	Is there a contribution? Is it significant? Is the contribution timely interest?
5. Research rigor	Are the results correct? Are the all technical detail correct? Are they sensible?
6. Design as a search process	Are the researchers utilized available means? Do the results satisfy laws on the problem environment?
7. Communication of research	Are the appropriate conclusions drawn from the results? Can the paper be understand? Is it clearly written? Is the results presented effectively both to the technology-oriented and management oriented audiences?

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