



CS 428

“The Five Orders of
Ignorance” (Armour)

WINTER 2020

BRUCE F. WEBSTER

The true nature of software

- ▶ Software is a knowledge-storage medium
- ▶ Developing software is a knowledge-acquiring activity
- ▶ We seldom have perfect knowledge ahead of time
 - ▶ If we do, then why are we doing this? The problem has already been solved.
- ▶ Therefore, software development is an inherently inefficient exploration and discovery process
 - ▶ We determine what works
 - ▶ We determine what does not work (for this particular system)
- ▶ Observations and experiences?

What can happen along the way

- ▶ The problem of late discovery
 - ▶ Blind alleys, significant backtracking
 - ▶ Webster: [Do not Defer the Difficult in IT Projects](#) (2013)
- ▶ Two kinds of knowledge
 - ▶ Again, what doesn't work and what does
 - ▶ Sometimes, what doesn't work is just as valuable, but is often discarded
- ▶ "Corrupted" knowledge
 - ▶ The code often contains artifacts or remnants of our knowledge exploration during development – these may be misleading or obscuring
- ▶ Observations/experiences?

What the discovery process looks like

4

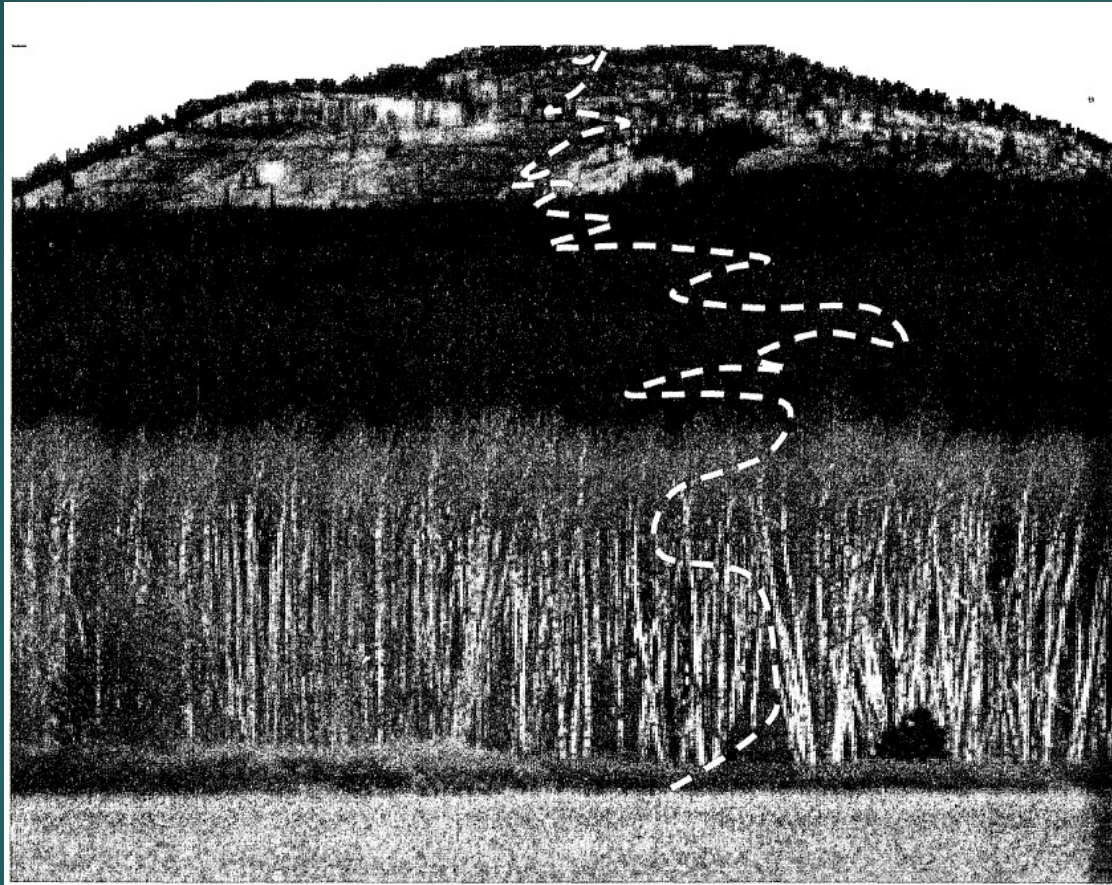


Exhibit 6. A path through the woods.

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MONDAYS, 2:00 - 4:30 PM
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What the discovery process yields

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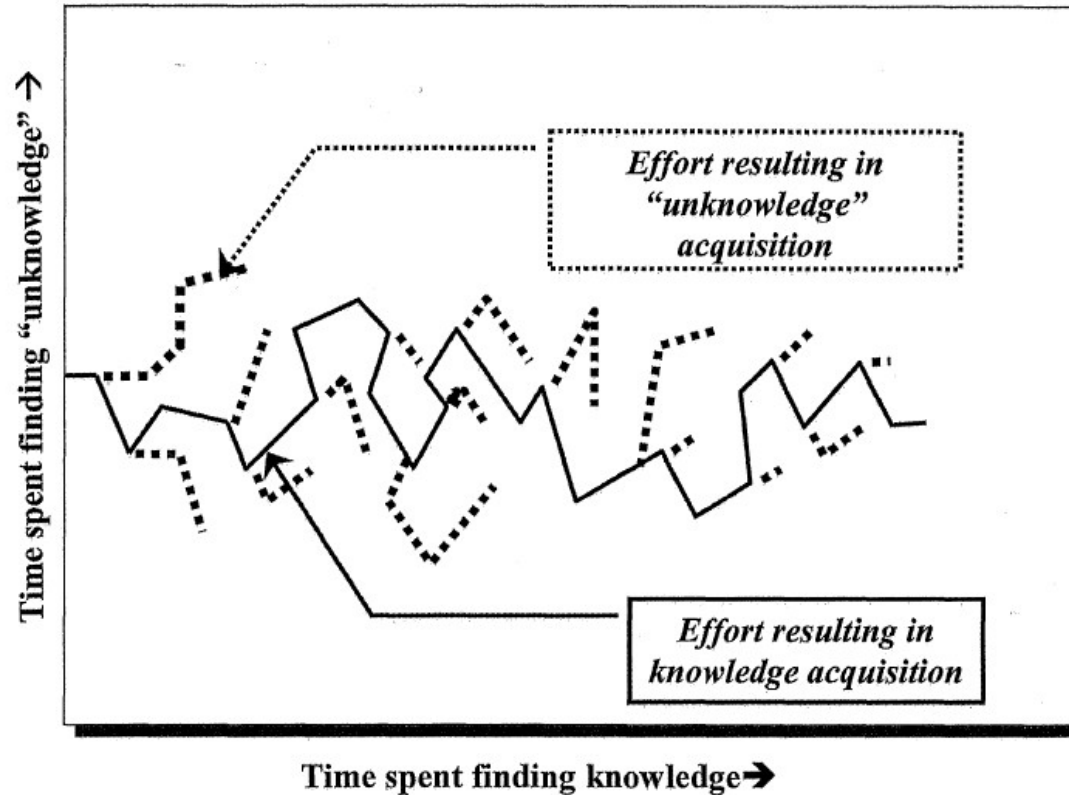


Exhibit 4. Hacking project: Full build.

The five orders of ignorance

- ▶ Zeroth Order: Lack of Ignorance
 - ▶ I know something, I know that I know it, and I can demonstrate I know it
- ▶ First Order: Lack of Knowledge
 - ▶ I don't know something, and I know I don't know it
- ▶ Second Order: Lack of Awareness
 - ▶ I don't know something, and I don't know that I don't know it
- ▶ Third Order: Lack of Process
 - ▶ I lack a process by which I can discover that I don't know that I don't know something
- ▶ Fourth Order: Meta Ignorance
 - ▶ I don't know about the Five Orders of Ignorance

Applied to software development

- ▶ 0th Order: I know how to complete the system
- ▶ 1st Order: I know what I need to know to complete the system
- ▶ 2nd Order: I don't know yet what I will need to know to complete the system
- ▶ 3rd Order: I don't know how to discover what I need to know to complete the system
- ▶ 4th Order: I have no clue about any of the issues above

Order of Ignorance Cycles

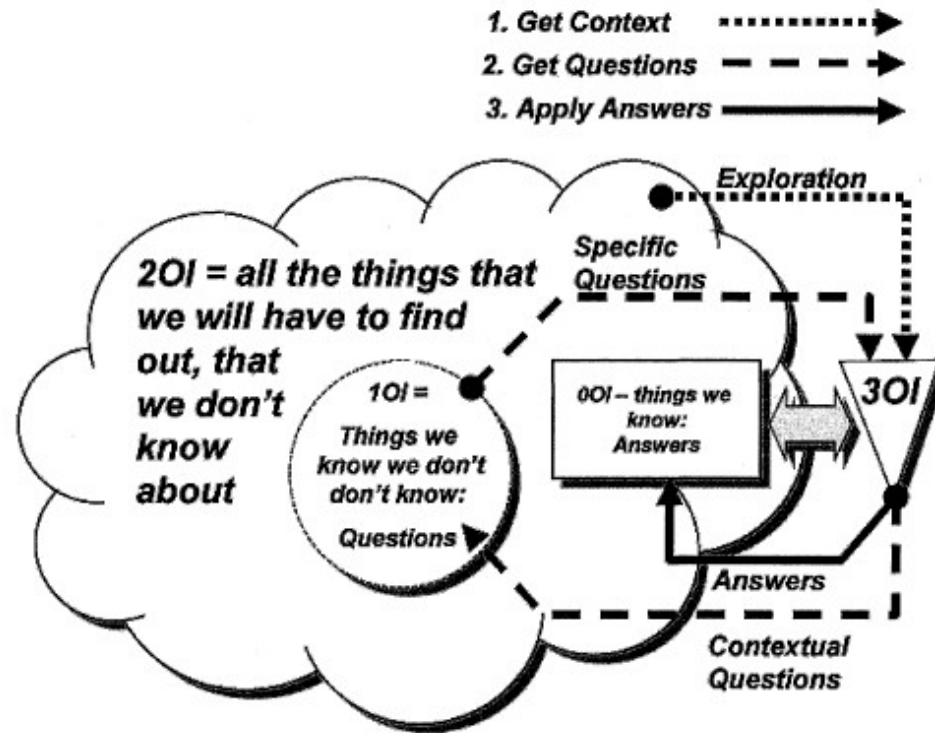


Exhibit 8. Order of Ignorance cycles.

Nature of the process

- ▶ To identify whether there are areas where we have ignorance (need to acquire knowledge)
- ▶ To identify what questions we would need to ask to resolve ignorance in these areas
- ▶ To obtain the answers to these questions in a form that we can usefully integrate into the system
- ▶ Key problems
 - ▶ Acquiring knowledge also illuminates more areas of lack of knowledge
 - ▶ Humans have not found a way to empirically measure knowledge
 - ▶ The critical measure of knowledge in software is that of the knowledge *not* in the software
- ▶ Observations/thoughts?