THE DEVELOPERS

Lucian Teodorescu

Software Engineers
vs Developers

14 June 2022, Cluj Innovation Park, www.the-developers.ro

TSM TODAY SOFTWARE MAGAZINE

Why I Hate Developers?

alternative title

LUCIAN RADU TEODORESCU

GARMIN

LucTeo

Software Engineering

Love Story

lucteo.ro/pres/2022-thedev

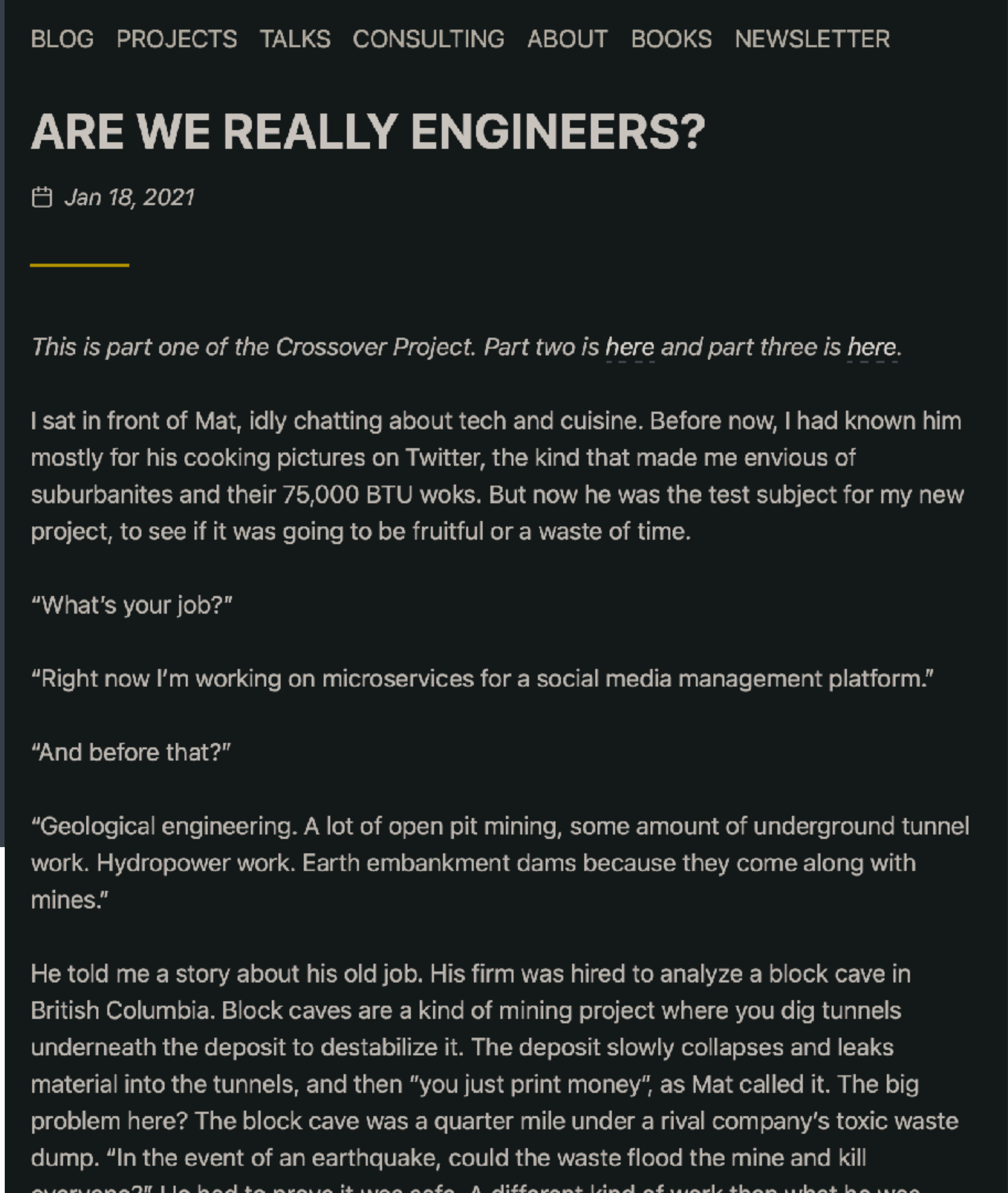
Software Engineering

1

Software Engineering

Hillel Wayne

https://hillelwayne.com/post/are-we-really-engineers/



ARE WE REALLY ENGINEERS?

Jan 18, 2021

This is part one of the Crossover Project. Part two is here and part three is here.

I sat in front of Mat, idly chatting about tech and cuisine. Before now, I had known him mostly for his cooking pictures on Twitter, the kind that made me envious of suburbanites and their 75,000 BTU woks. But now he was the test subject for my new project, to see if it was going to be fruitful or a waste of time.

“What’s your job?”

“Right now I’m working on microservices for a social media management platform.”

“And before that?”

“Geological engineering. A lot of open pit mining, some amount of underground tunnel work. Hydropower work. Earth embankment dams because they come along with mines.”

He told me a story about his old job. His firm was hired to analyze a block cave in British Columbia. Block caves are a kind of mining project where you dig tunnels underneath the deposit to destabilize it. The deposit slowly collapses and leaks material into the tunnels, and then “you just print money”, as Mat called it. The big problem here? The block cave was a quarter mile under a rival company’s toxic waste dump. “In the event of an earthquake, could the waste flood the mine and kill everyone?” He had to prove it was safe. A different kind of work than what he was

Mary Shaw

Progress Towards an Engineering Discipline of Software

engineering

creating cost-effective solutions

… to practical problems

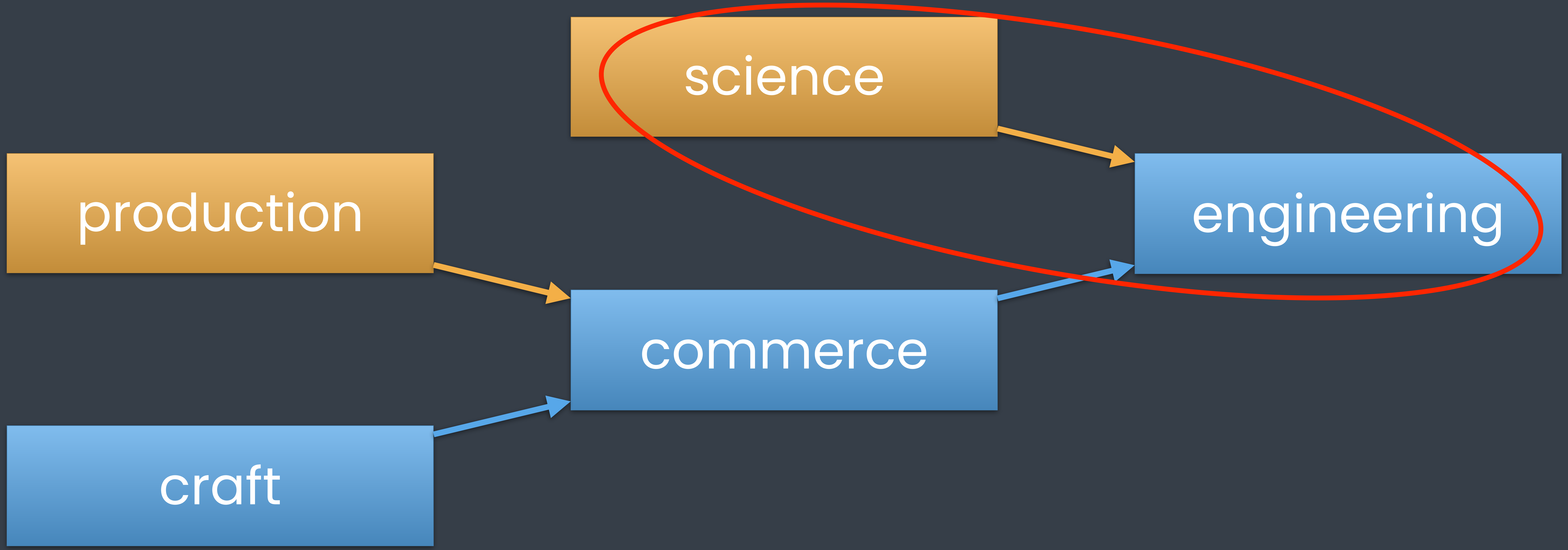
… by applying **scientific knowledge**

… building things

… in the service of mankind

engineering

enabled **ordinary people** to do things
that formerly required **virtuosos**



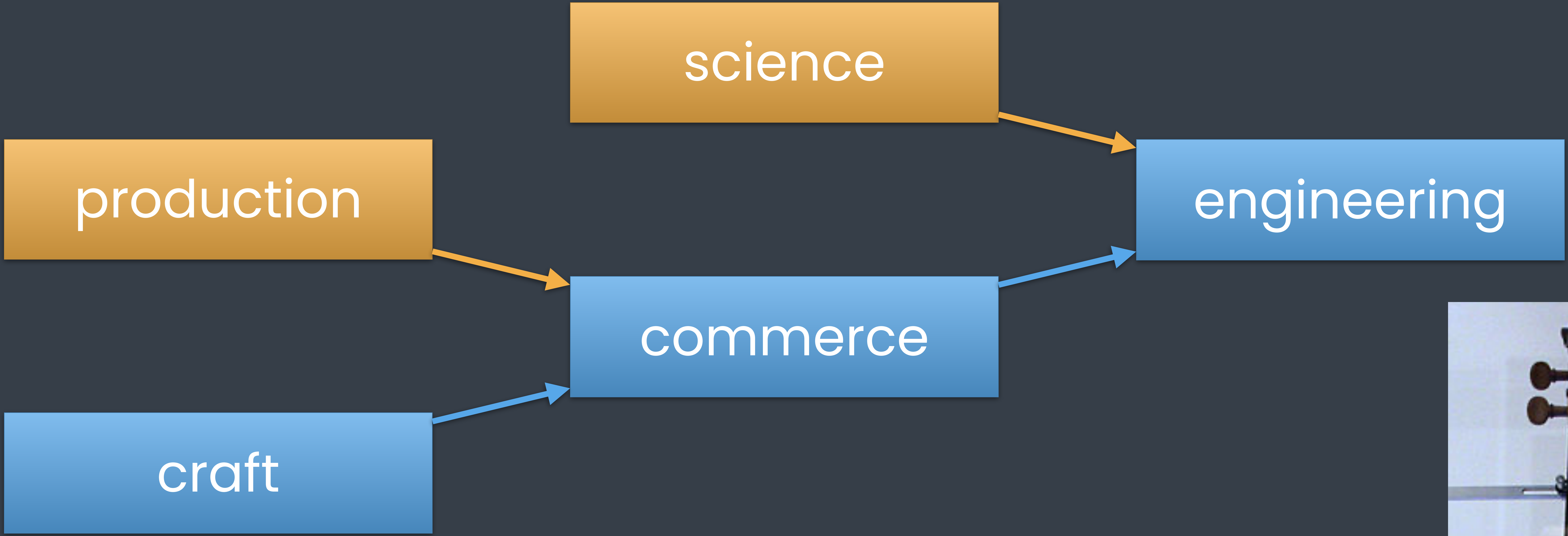
science

production

engineering

commerce

craft



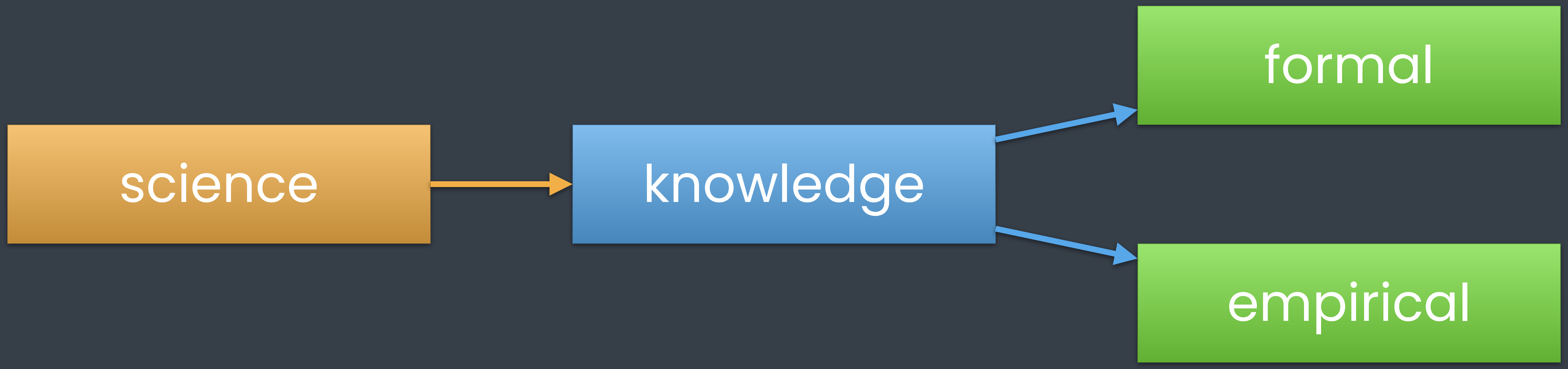
science

production

engineering

commerce

craft

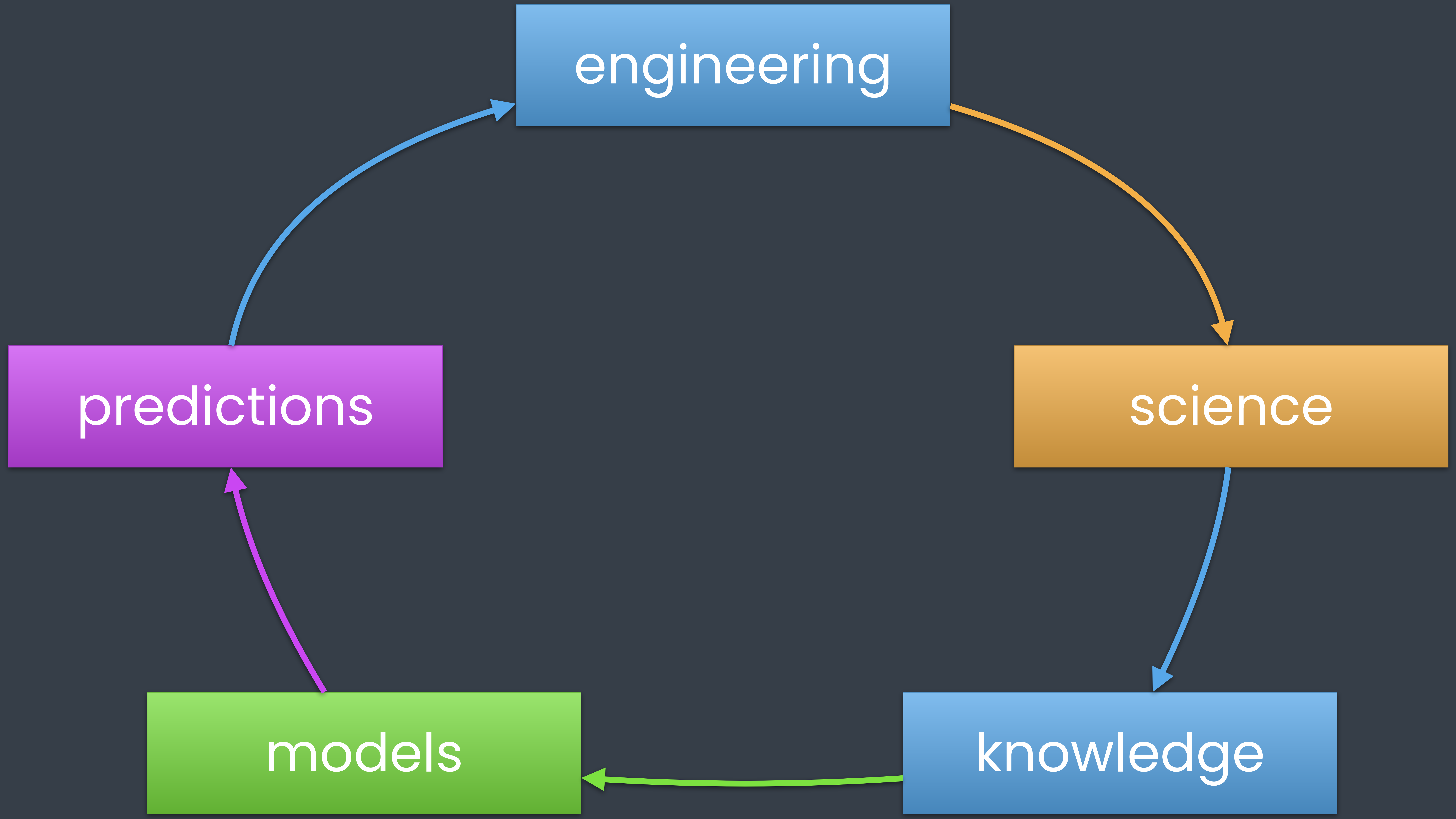


science

knowledge

formal

empirical



engineering

science

knowledge

models

predictions

predicting

quality

completion time

scope

knowledge

mostly empirical

scientific principles

assume that you are wrong

iteratively improve — limit the impact of mistakes

always measure

stop when “good enough”

moon landing

orbiting Earth
lunar orbit
lunar impact
lunar landing
human lunar landing

I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth

John F. Kennedy

@LucT3o

however

Mark Seemann, Where’s the science?

https://blog.ploeh.dk/2020/05/25/wheres-the-science/

Hillel Wayne, Intro to Empirical Software Engineering

https://www.youtube.com/watch?v=WELBnE33dpY

Sw Eng vs Developers

2

name

discipline: Software Engineering

Software Engineers → like other engineers

Developers → like Real estate developers?

approach

Software Engineers	**Developers**
use scientific methods	ad-hoc methods
structured	unstructured
predictable results	unpredictable results

use of knowledge

Software Engineers	Developers
contextualized prior knowledge	magic art?

iterations

Software Engineers

improve knowledge
steps towards vision

Developers

finish “disconnected” features
altering vision

building good software

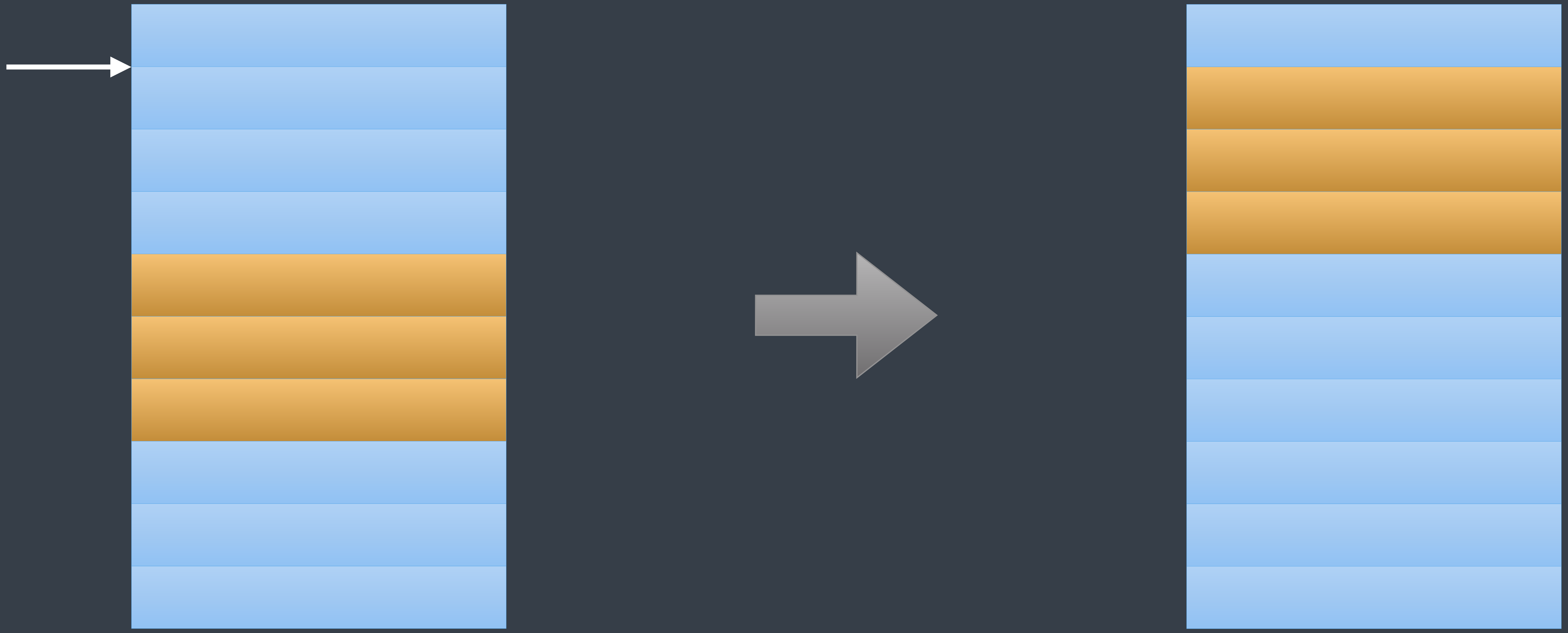
Software Engineers	Developers
ordinary people	virtuosos

Software Engineers

3

Engineering the Code

1. UI rearrange



dev

```
// Next, check if the panel has moved to the other side of another panel.
for (size_t i = 0; i < expanded_panels_.size(); ++i) {
  Panel *panel = expanded_panels_[i].get();
  if (center_x <= panel->cur_panel_center() ||
      i == expanded_panels_.size() - 1) {
    if (panel != fixed_panel) {
      // If it has, then we reorder the panels.
      ref_ptr<Panel> ref = expanded_panels_[fixed_index];
      expanded_panels_.erase(expanded_panels_.begin() + fixed_index);
      if (i < expanded_panels_.size()) {
        expanded_panels_.insert(expanded_panels_.begin() + i, ref);
      } else {
        expanded_panels_.push_back(ref);
      }
    }
    break;
  }
}
...
```

sw eng

```cpp
// Next, check if the panel has moved to the left side of another panel.
auto f = begin(expanded_panels_) + fixed_index;
auto p = lower_bound(begin(expanded_panels_), f, center_x,
    [](const ref_ptr<Panel> &e, int x) { return e->cur_panel_center() < x; });
// If it has, then we reorder the panels.
rotate(p, f, f + 1);
```

sw eng

```
template <typename It> // I models RandomAccessIterator
auto slide(It first, It last, It pos) -> pair<It, It>
{
    if (pos < first) return { pos, rotate(pos, first, last) };
    if (last < pos) return { rotate(first, last, pos), pos };
    return { first, last };
}
```

more info

Sean Parent — C++ Seasoning, Going Native 2013

https://www.youtube.com/watch?v=W2tWOdzgXHA

2. computing mean, median

mean = average of the data values

median = middle number in the ordered set of data

naïve implementation

```cpp
float mean(float arr[], int n) {
  float sum = 0;
  for (int i = 0; i < n; i++)
    sum += arr[i];

  return sum / n;
}

float median(float arr[], int n) {
  // sort the array
  std::sort(arr, arr + n);
  if (n % 2 == 0)
    return (arr[n / 2 - 1] + arr[n / 2]) / 2;
  return arr[n / 2];
}
```

using STL algorithms

```cpp
float mean(float arr[], int n) {
  return std::reduce(arr, arr + n) / n;
}

float mean_par(float arr[], int n) {
  return std::reduce(std::execution::par, arr, arr + n) / n;
}
```

using STL algorithms

```
float median(float arr[], int n) {
  // partially sort the array
  auto mid = n / 2;
  std::nth_element(arr, arr + mid, arr + n);
  if (n % 2 == 1)
    return arr[mid];
  else {
    auto prev = *std::max_element(arr, arr + mid);
    return std::midpoint(prev, arr[mid])
  }
}
```

percentile calculation

```
float percentile(float arr[], int n, int rank = 90) {
  auto t = static_cast<float>(rank) / 100.0f * (n - 1);
  auto idx_down = static_cast<int>(t);
  std::nth_element(arr, arr + idx_down, arr + n);
  auto lower = arr[idx_down];
  if (idx_down < n - 1) {
    auto upper = *std::min_element(arr + idx_down + 1, arr + n);
    return std::lerp(lower, upper, t - float(idx_down));
  } else
    return lower;
}
```

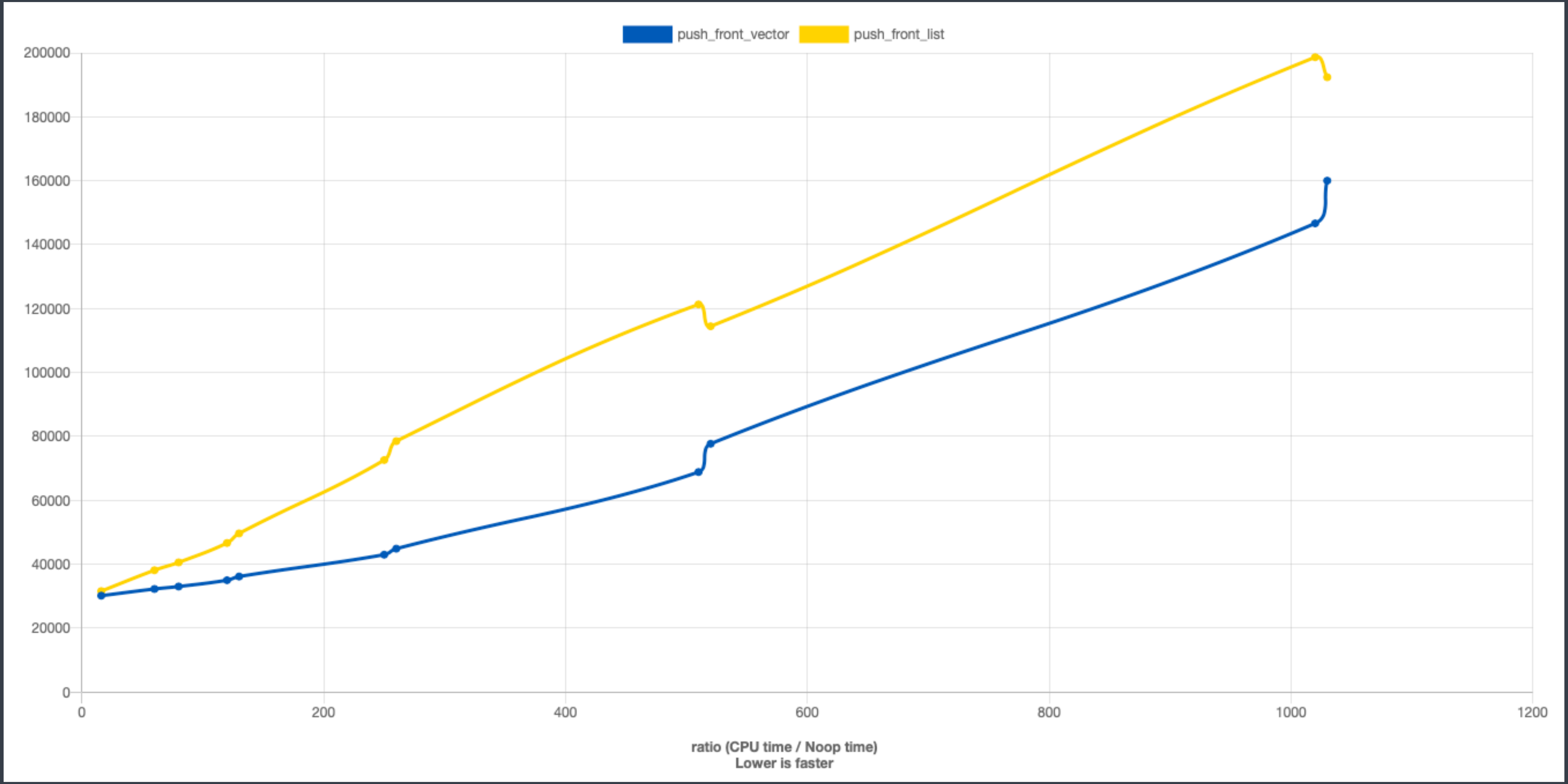
3. choosing containers

insert *N* elements in the front of a container

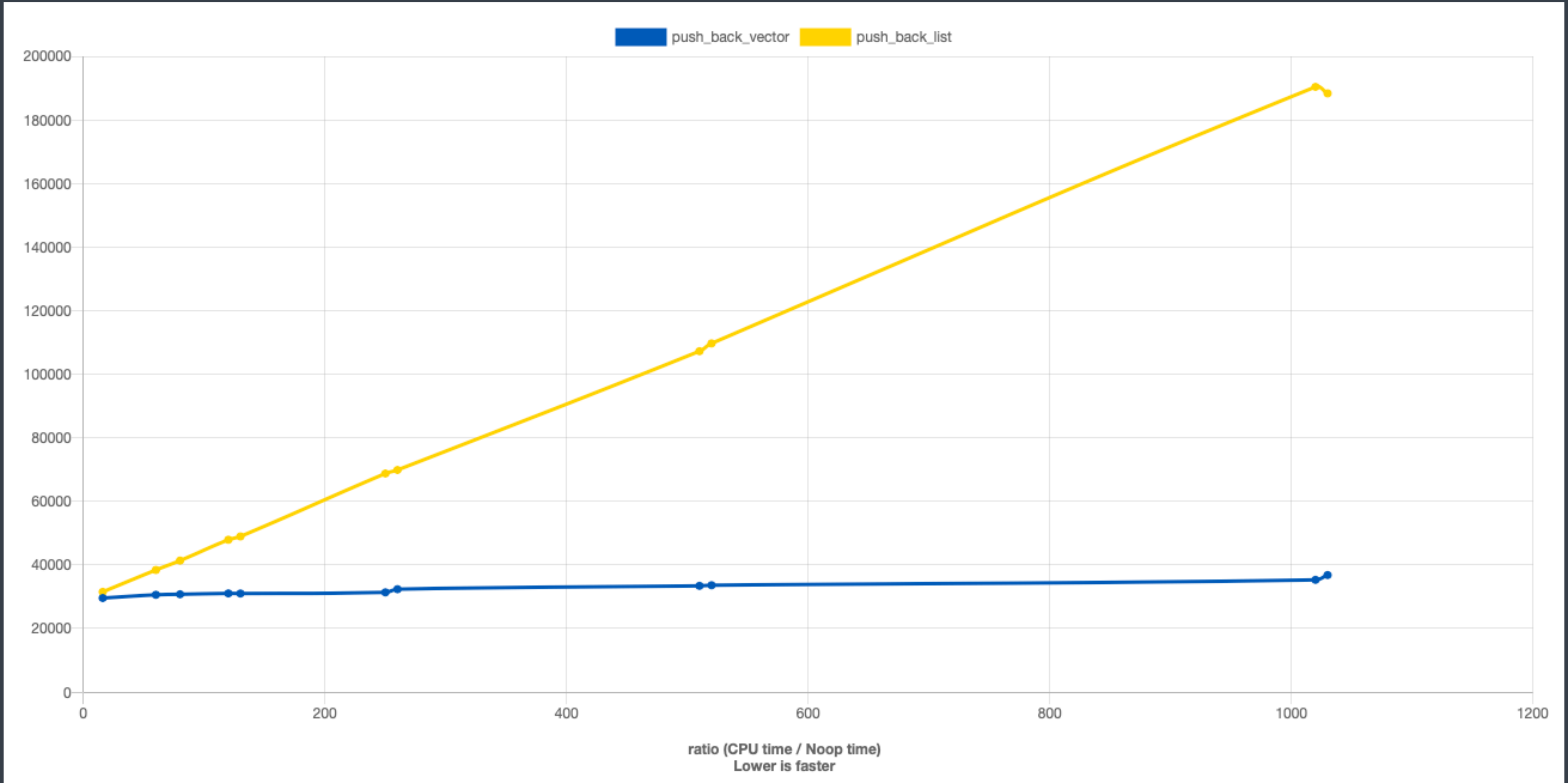
insert front, vector & list

```
// Alternative 1: std::vector, O(N)
std::vector<int> c;
for ( int i=0; i<N; i++ )
    c.insert(c.begin(), i);


// Alternative 2: std::list, O(1)
std::list<int> c;
for ( int i=0; i<N; i++ )
  c.push_front(i);
```


push_front_vector
push_front_list
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
0
200
400
600
800
1000
1200
ratio (CPU time / Noop time)
Lower is faster

push_back results



@LucT3o

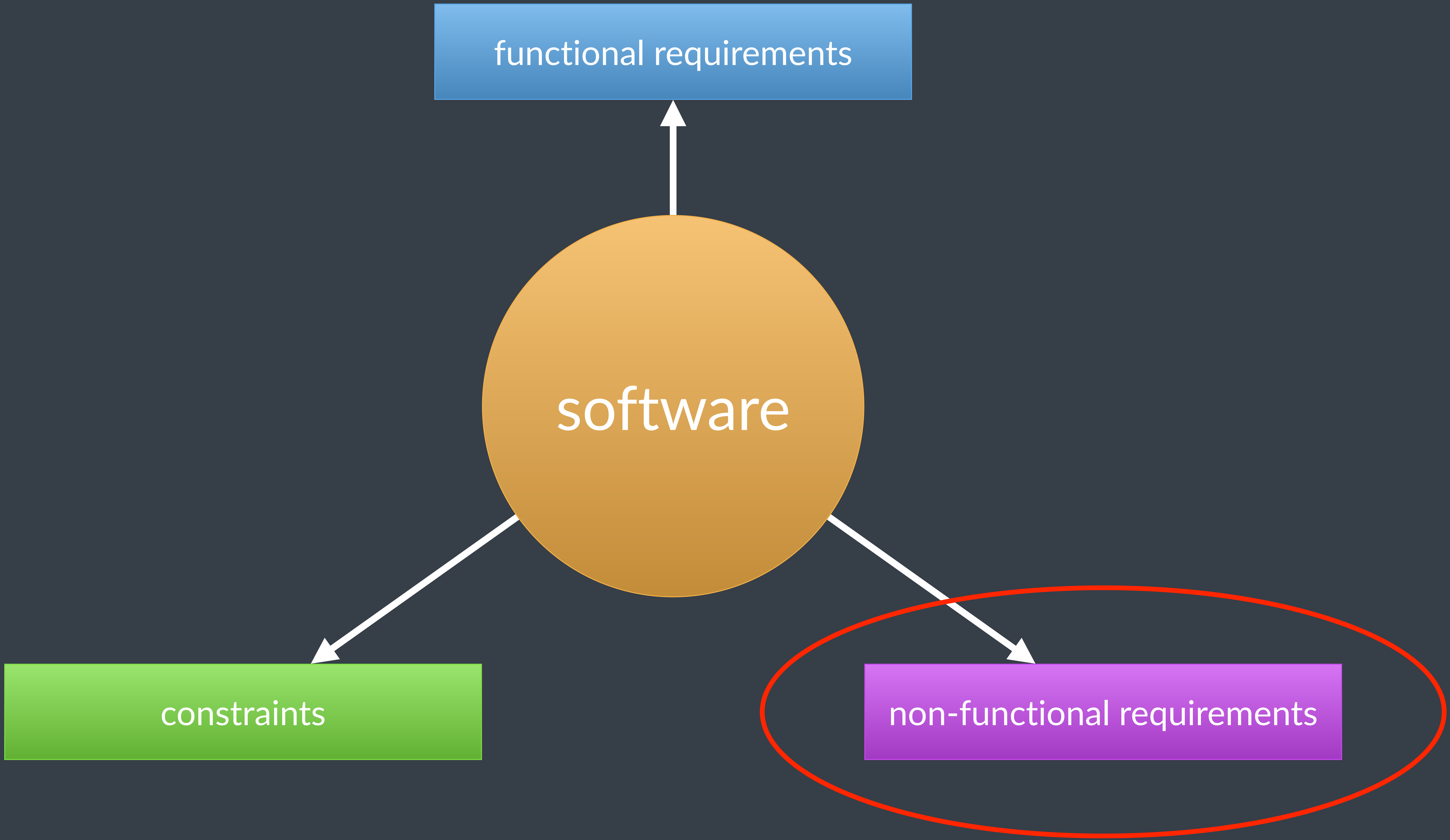
bottom line

know your algorithms
know your data structures

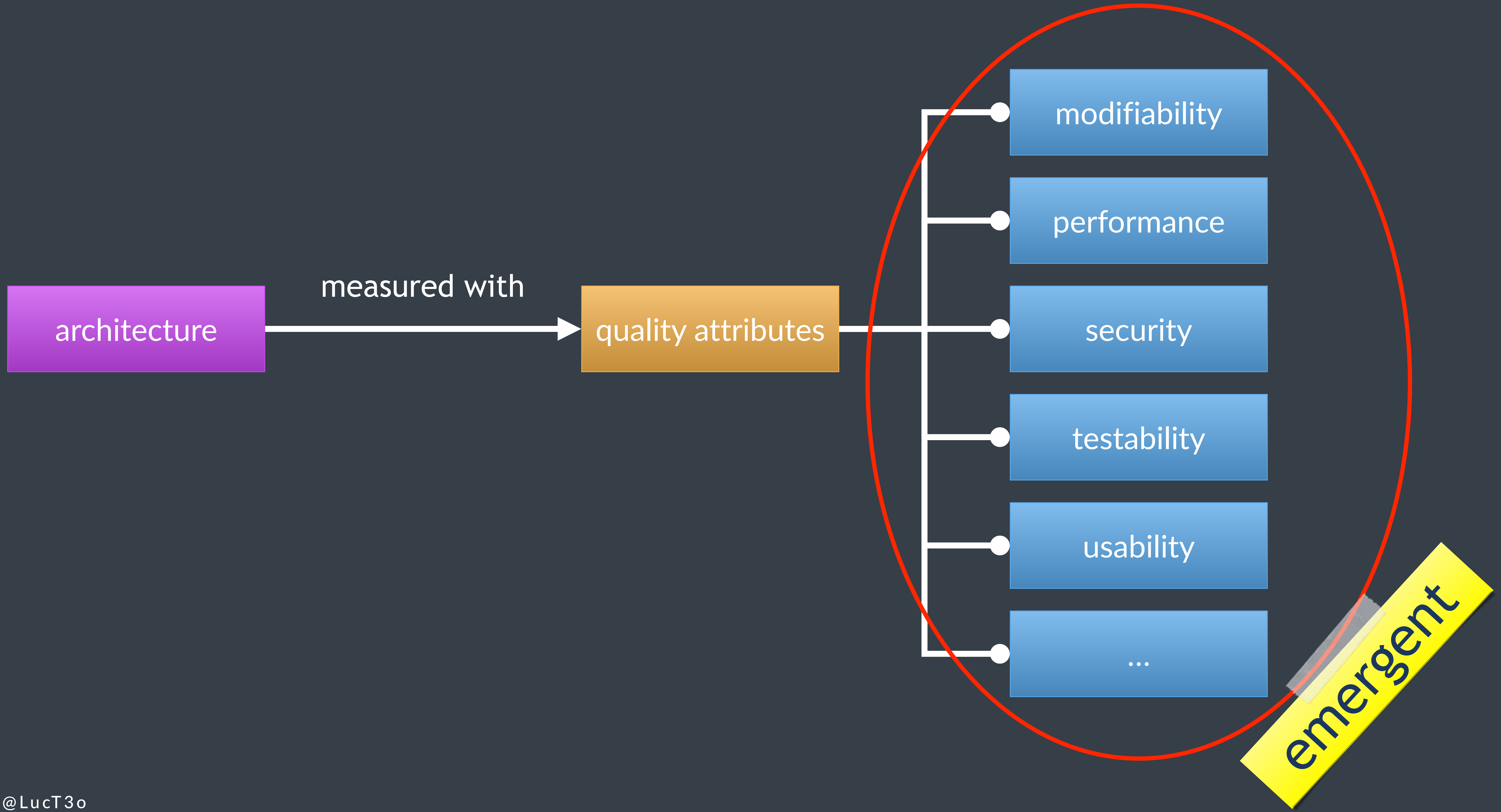
perform experiments

4

Engineering the Architecture



functional requirements
software
constraints
non-functional requirements


architecture
measured with
quality attributes
modifiability
performance
security
testability
usability
...
emergent

dynamics

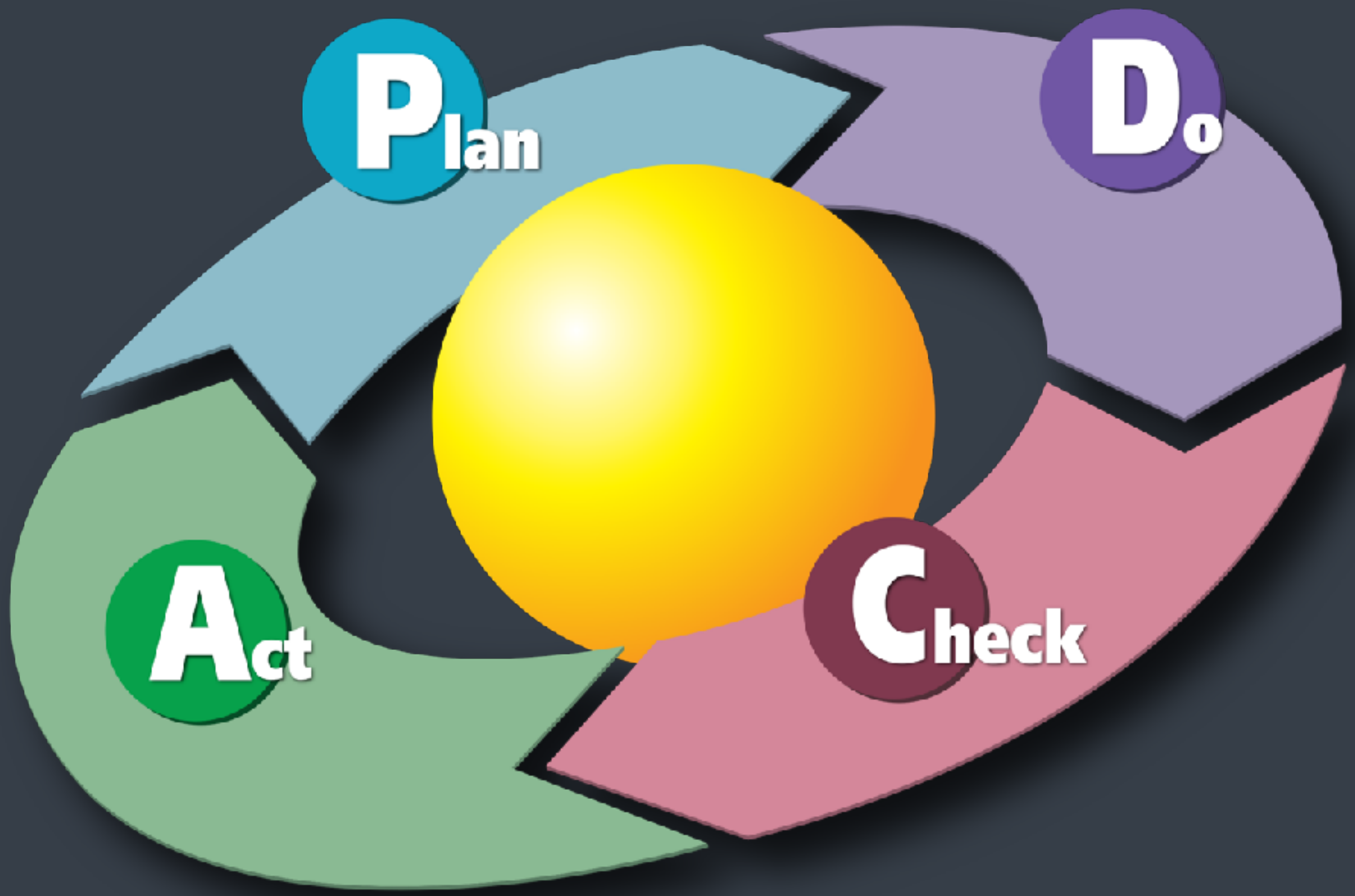
features	incrementally added
quality attributes	always changing

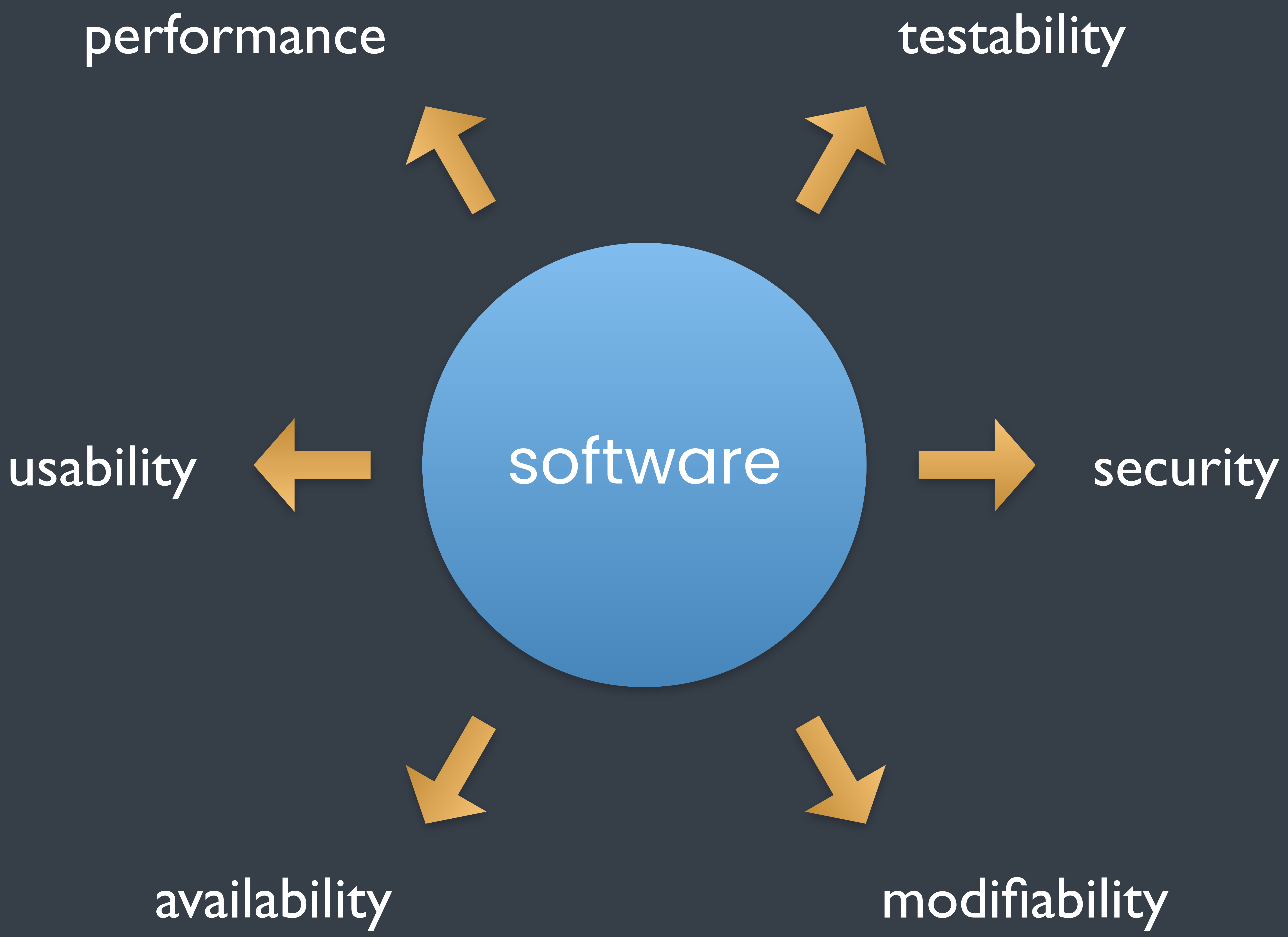
Architecture is always in flux

engineering architecture

set goals for quality attributes
constantly measure important QAs
dedicate work for improving QAs when needed

engineering architecture





performance
testability
usability
software
security
availability
modifiability

Engineering the Processes

5

main **problems**

software design is unpredictable

QAs can be fragile

waterfall

big design upfront

no iterations

results often misaligned with the goals

common agile

small sprints
deliver functionality in each iteration
upfront design is innexistent

both are wrong

controlled iterative

learn through iterations

measure, measure, measure

constantly improve design

reduce risks

engineering

initial guesses are wrong

improved with each iteration

empirical approach

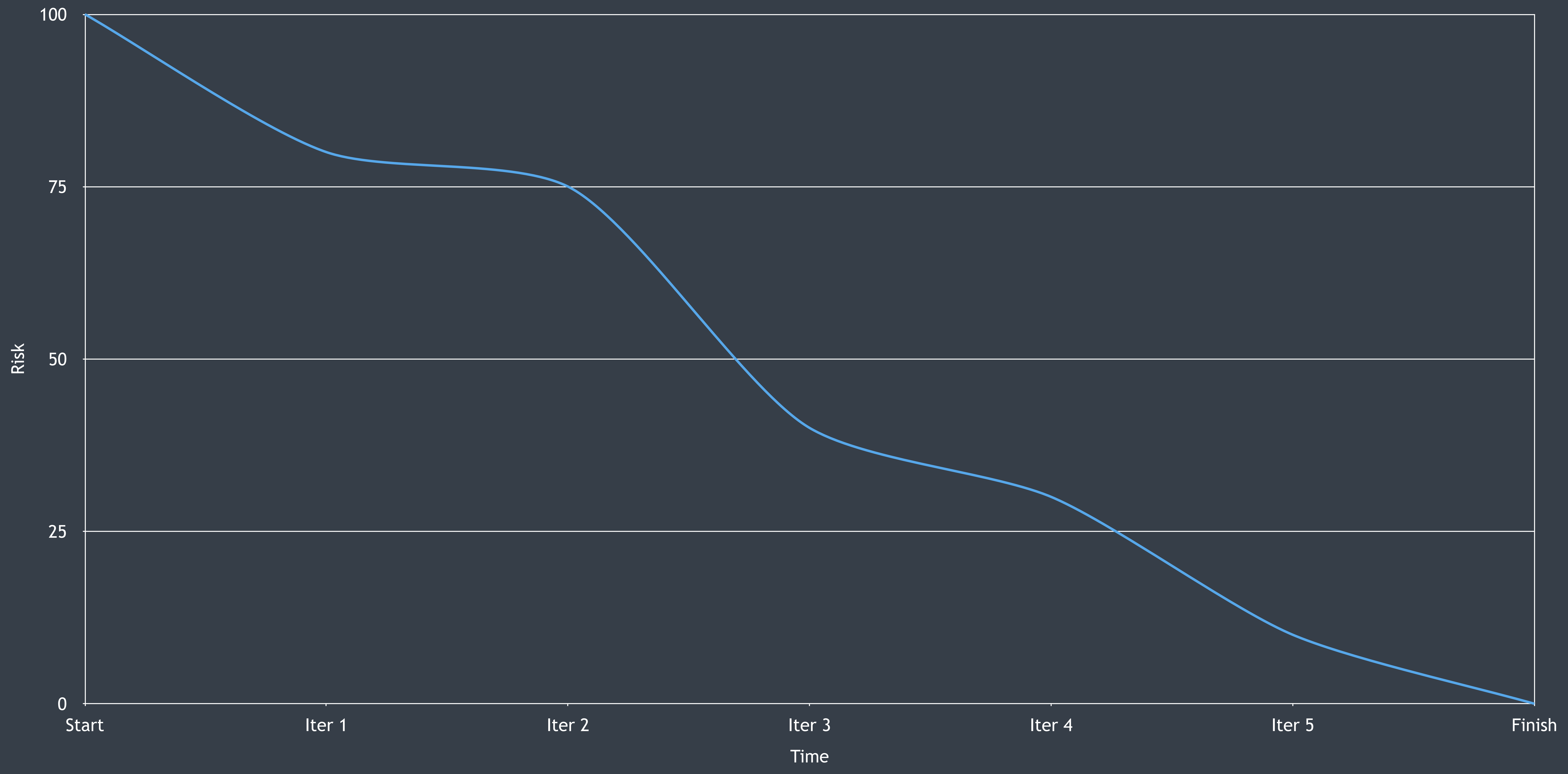
another take: **risks**

initial state	high risk
project completed	zero risk

process goal

iteratively decrease risk

ideal project



tips

constantly identify risks

mitigate risks asap

spend design time around risks

prototype around risks

no risk == success

Conclusions

6

engineering

know what engineering is

knowledge → software

use engineering

in code

for architecture

with the processes

software engineer

developer

Love It

Thank You

@LucT3o

lucteo.ro