

How to make hardware without losing your shirt

Ben Supper

Assuming that we want to make hardware:

- 1 Should we do it ?
- 2 How should we do it ?
- 3 Expensive lessons

Important, but out of scope:

**Dealing with a higher head-count
Logistics**

(consignment, distribution, load-in, reverse logistics ...)

Specific details about hardware design

Legal stuff and other hidden costs

(IP, certification, standards ...)

1

Should we do it ?

From [REDACTED] ★



Subject **Re:**

31/05/2019, 15:40

To Ben Supper ★

- doing another hardware product, is at this point, out of our possibilities
- we just lose money on it

JUST DON'T.

JUST DON'T.

Really!

The opportunity cost alone!

JUST DON'T.

**Please! There are other ways to
answer your questions!**

JUST DON'T.*



William Morris: *Hopes and Fears for Art* (1882)


Believe me if we want art to begin at home, as it must, we must clear our houses of troublesome superfluities that are for ever in our way: conventional comforts that are no real comforts, and do but make work for servants and doctors: if you want a golden rule that will fit everybody, this is it:

'Have nothing in your houses that you do not know to be useful, or believe to be beautiful.'

And if we apply that rule strictly, we shall in the first place show the builders and such-like servants of the public what we really want, we shall create a demand for real art, as the phrase goes; and in the second place, we shall surely have more money to pay for decent houses.

Perhaps it will not try your patience too much if I lay before you my idea of the fittings necessary to the sitting-room of a healthy person: a room, I mean, which he would not have to cook in much, or sleep in generally, or in which he would not have to do any very litter-making manual work.

Matt Watkinson: *The Grid* (2017)

	desirability	profitability	longevity
customer	 WANTS & NEEDS	 REVENUES	 CUSTOMER BASE
market	 RIVALRY	 BARGAINING POWER	 IMITABILITY
organisation	 OFFERINGS	 COSTS	 ADAPTABILITY

Book of Ecclesiastes (c.450-200 BCE)

CHAP. XI.

¹ Directions for charitie. 7 Death in life, 9 and the day of iudgement in the dayes of youth are to be thought on.

All thy bread [†] vpon the waters : for thou shalt find it after ^{*} many dayes.

[†] Heb. vpon the face of the waters.
^{*} Deut. 15.
10. Mat. 10
42. prou. 19
17.

² Giue a portion to seuen and also to eight : for thou knowest not what euill shall be vpon the earth.

³ If the clouds be full of raine, they emptie themselues vpon the earth : and if the tree fall toward the South, or toward the North, in the place where the tree falleth, there it shall be.

⁴ He that obserueth the wind, shall not sow : and hee that regardeth the clouds, shall not reape.

⁵ As thou knowest not what is the way of the spirit, nor how the bones doe growe in the wombe of her that is with child : euen so thou knowest not the workes of God who maketh all.

⁶ In the morning sowe thy seede, and in the euening withhold not thine hand : for thou knowest not whether [†] shall prosper, either this or that, or whether they both shall be alike good.

[†] Heb. shall be right.

⁷ Truly the light is sweet, and a pleasant thing is it for the eyes to behold the sunne.

⁸ But if a man liue many yeeres, and reioyce in them all ; yet let him re-



Philosophical digression: **What is success?**

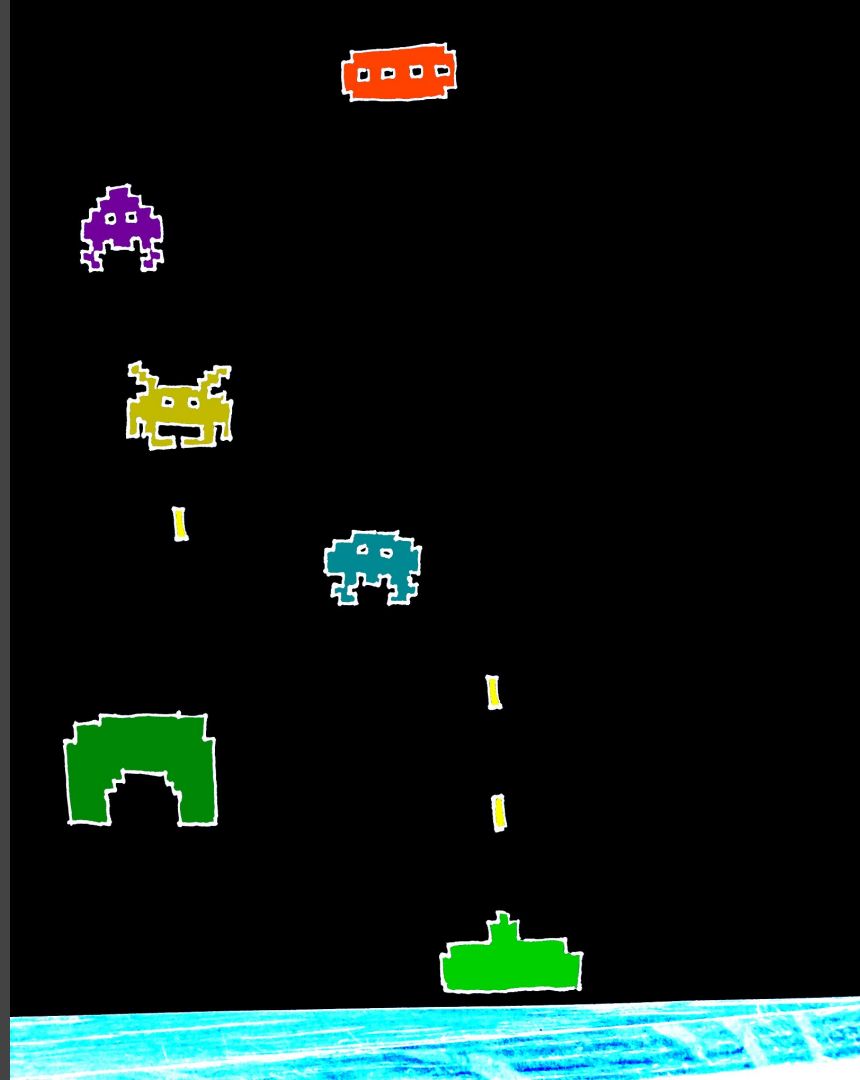


Predictions vs. Post-hoc
Financial vs. Intangible
Market vs. Organisation
Short-term vs. Strategic

**IT'S A BET,
SO SET A STAKE**

2

How should we do this ?





CUSTOMERS



COMPETITORS



VESTED INTERESTS



THE PHYSICAL WORLD



YOUR BUDGET

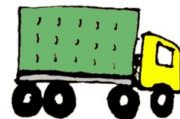


MANAGEMENT



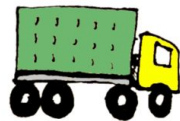
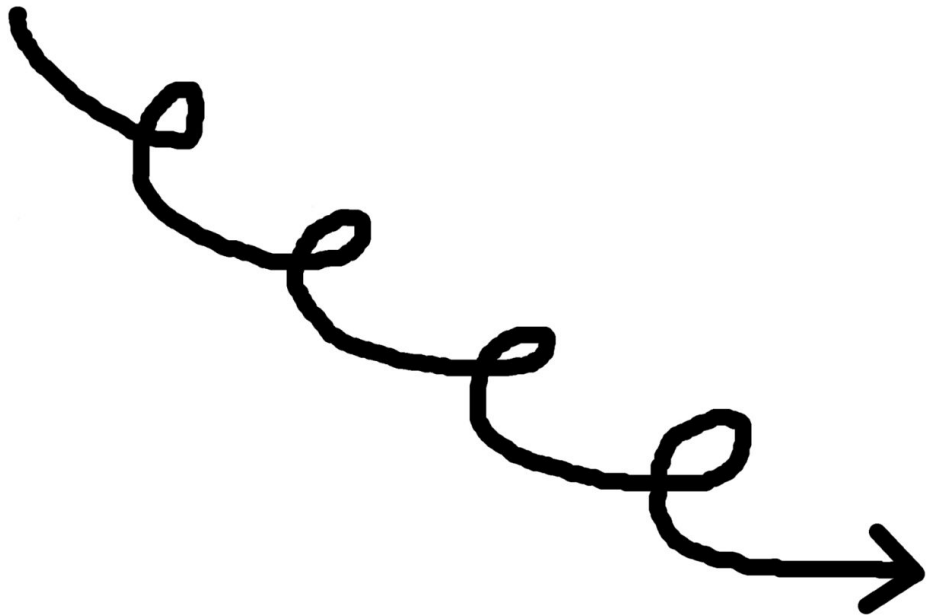
YOU & YOUR
TEAM

risk



time

risk



time

risk



SPECIFY

REQUIREMENTS
DOCUMENT

BUILD

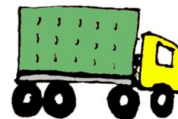
PROTOTYPE

TEST

FINISHED
PRODUCT

PRODUCE

SUPPORT



time

risk



SPECIFY

REQUIREMENTS
DOCUMENT

BUILD

VERSION 0.X

TEST

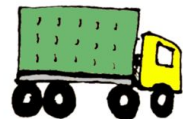
agile
loop

VERSION 1.X

RESPECIFY

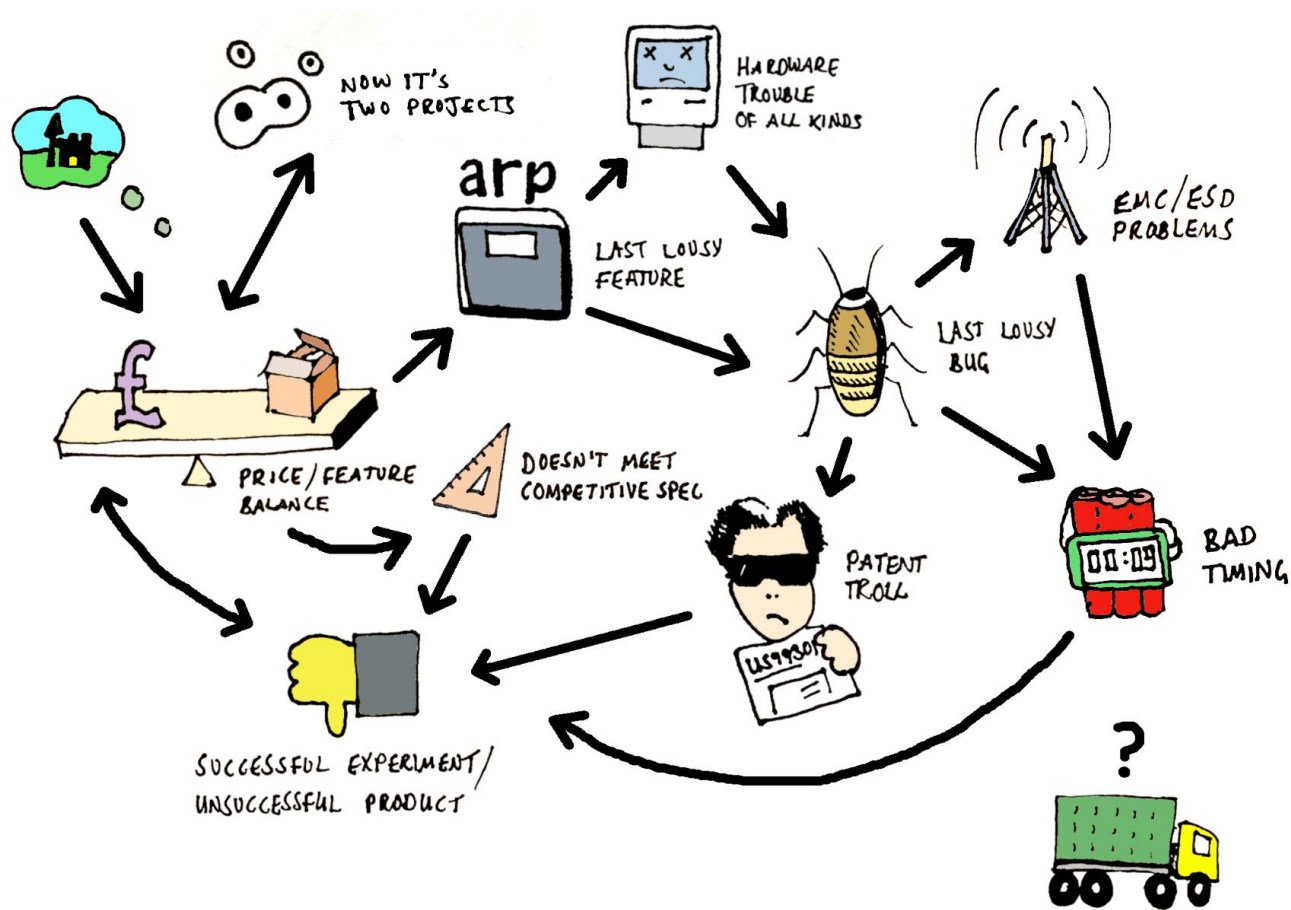
PRODUCE

SUPPORT



time

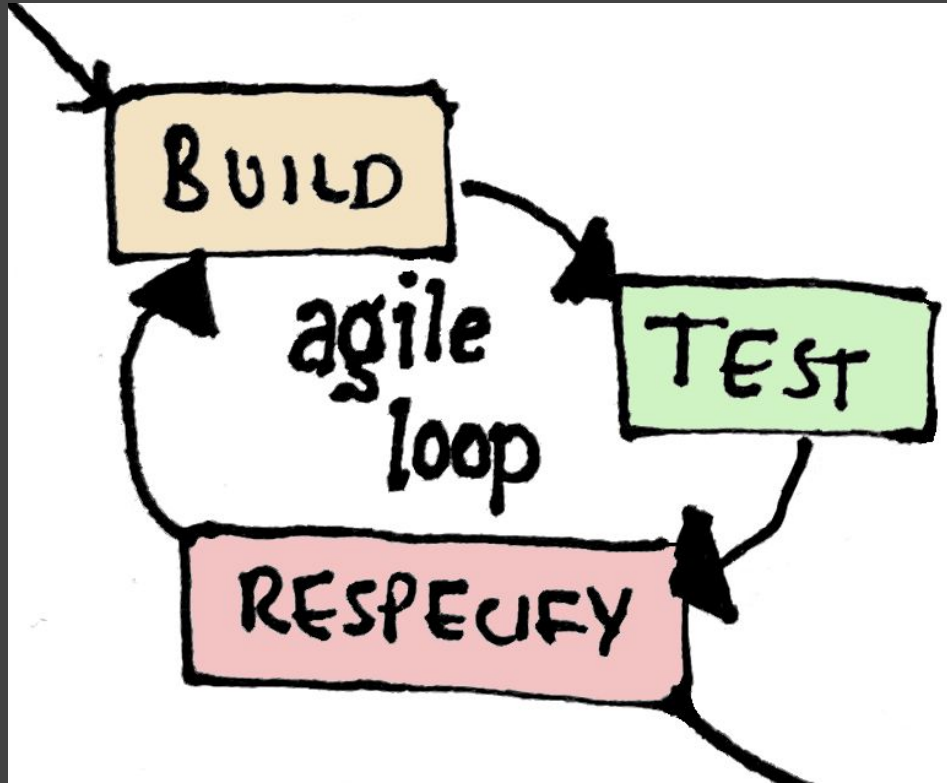
risk

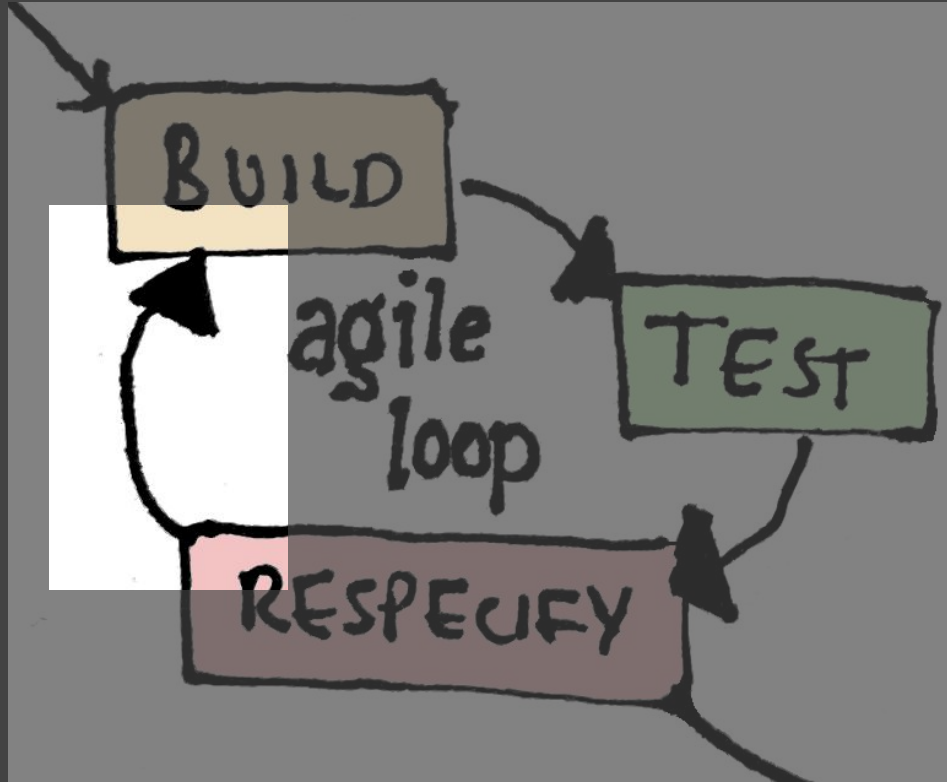


time

2

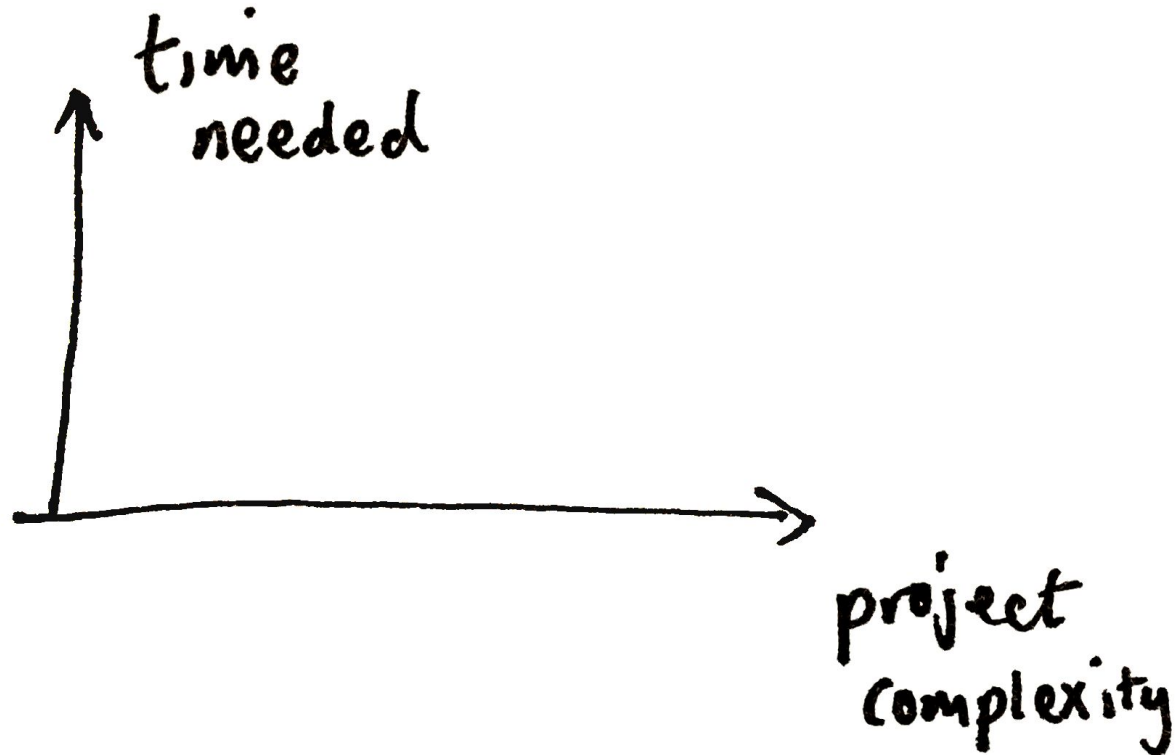
**No, really:
How should we do this ?**



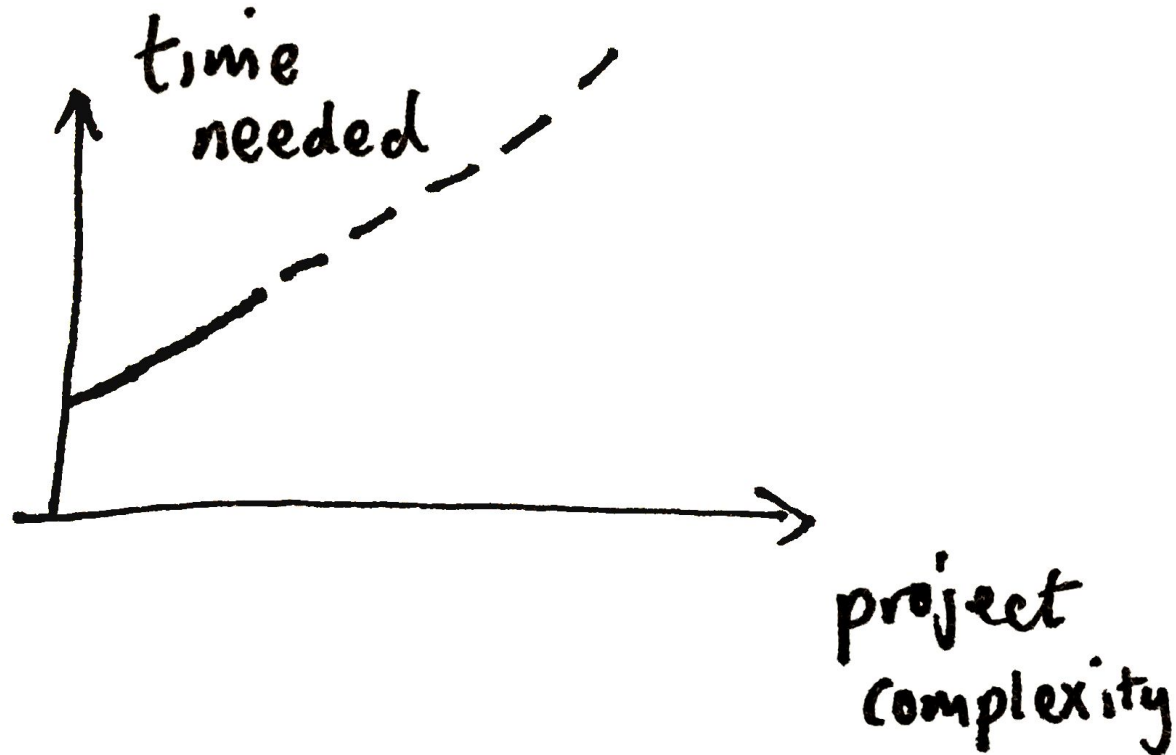


**LET IT TAKE
TWO YEARS.**

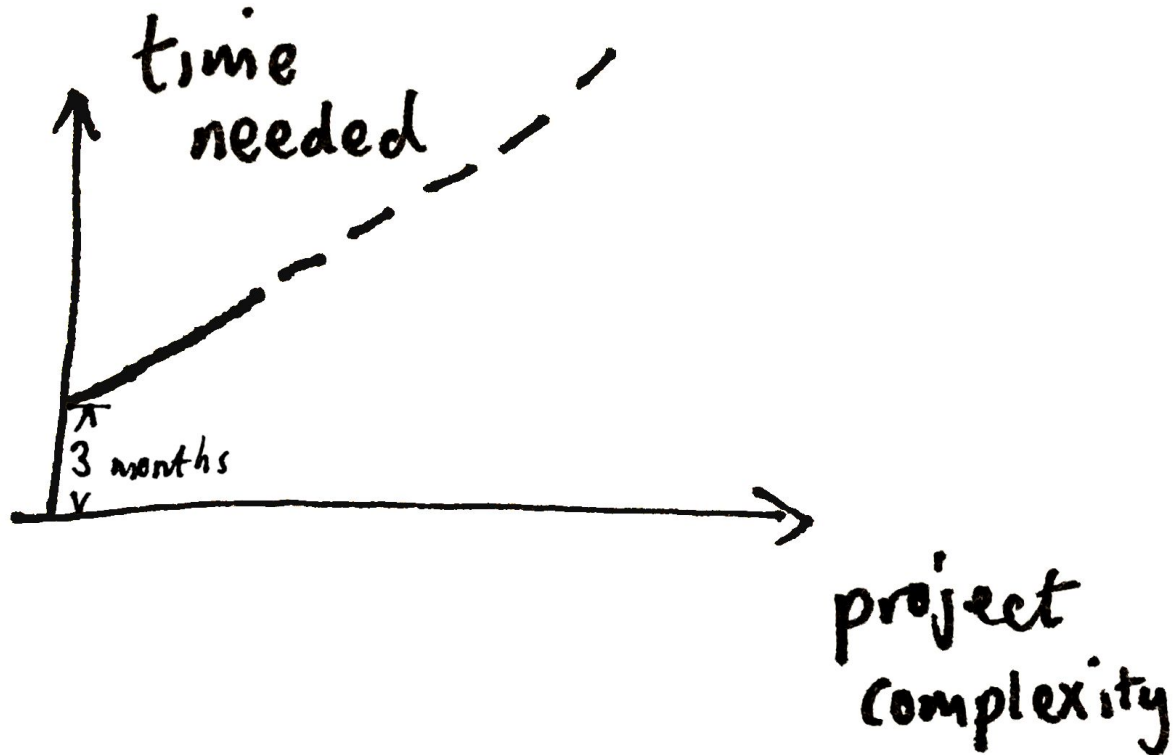
HODDER'S LAW



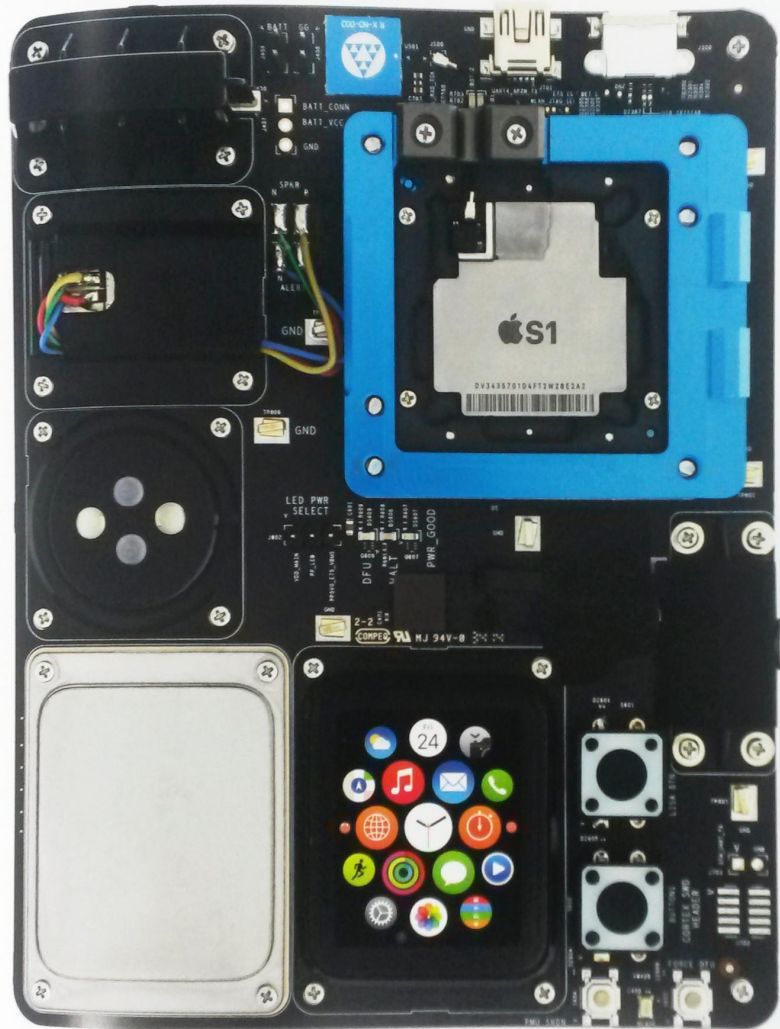
HODDER'S LAW



HODDER'S LAW



**REMOVE
DEPENDENCIES
ON MECHANICAL
DESIGN.**





Ender 3 Pro



Ender 3 Pro 3D Printer

£ 158.00 GBP ~~£179.00 GBP~~

★★★★★ 10 reviews

Ship From

United Kingdom

China(Shipping&Tax-Free)

Option/Type

Ender 3 Pro

Ender 3Pro+Tempered Glass Kits

Shipping

United Kingdom



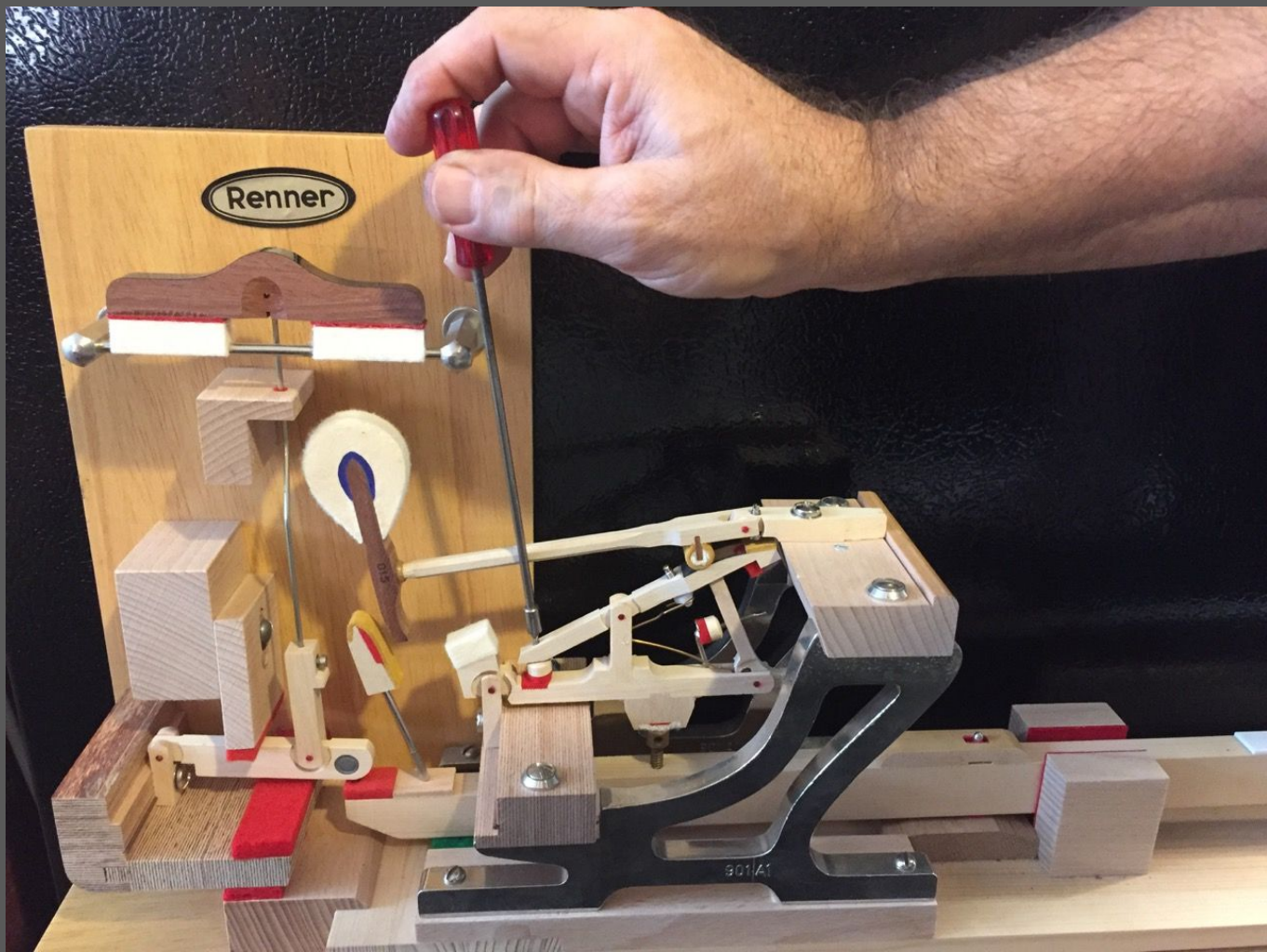
It is expected to arrive within 3~5 Working days and will cost £ 0.00 GBP to ship

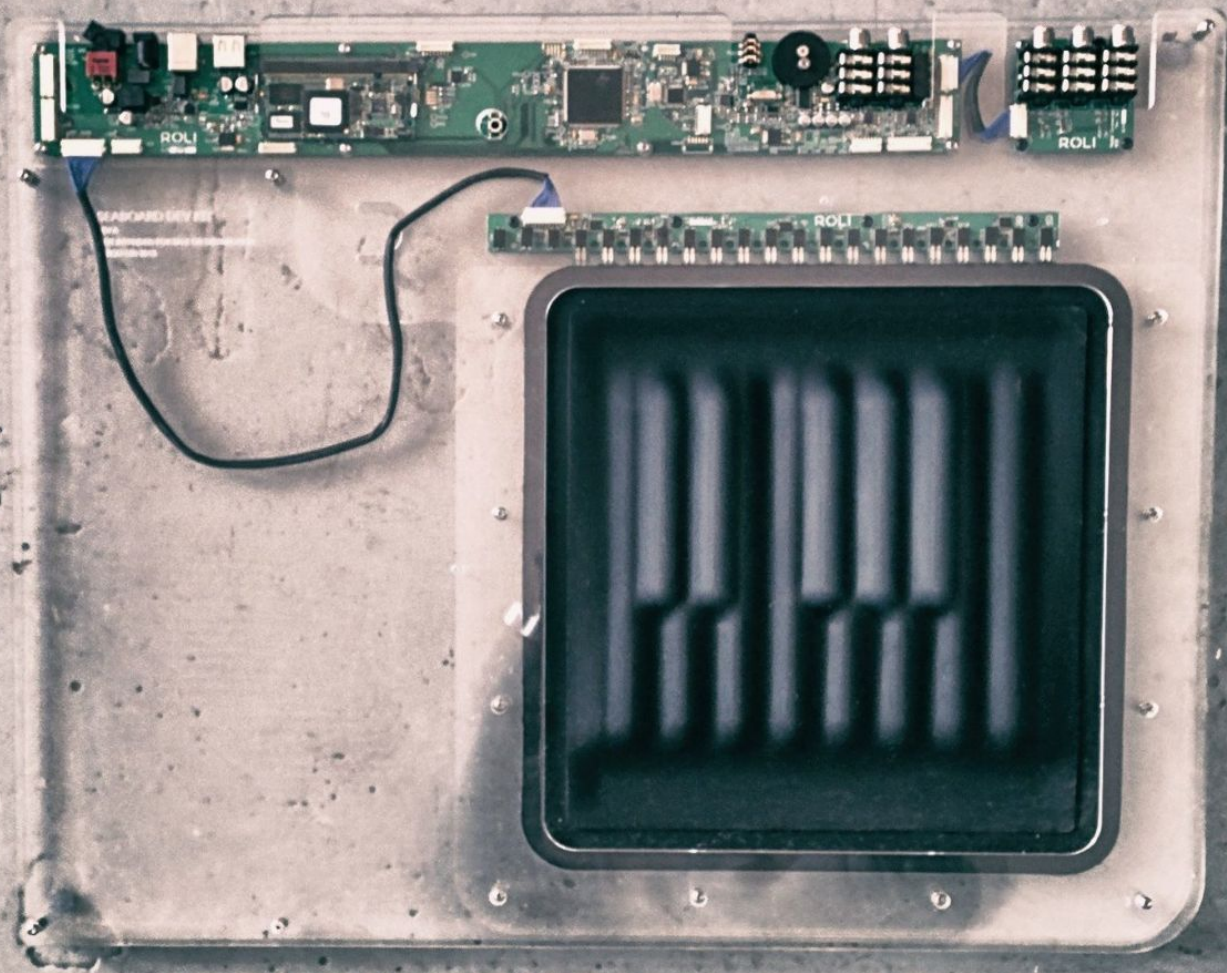
Bundles

+ 10KG PLA Filament

+ Ender/CR Touch kit

REDUCE!
... SIZE



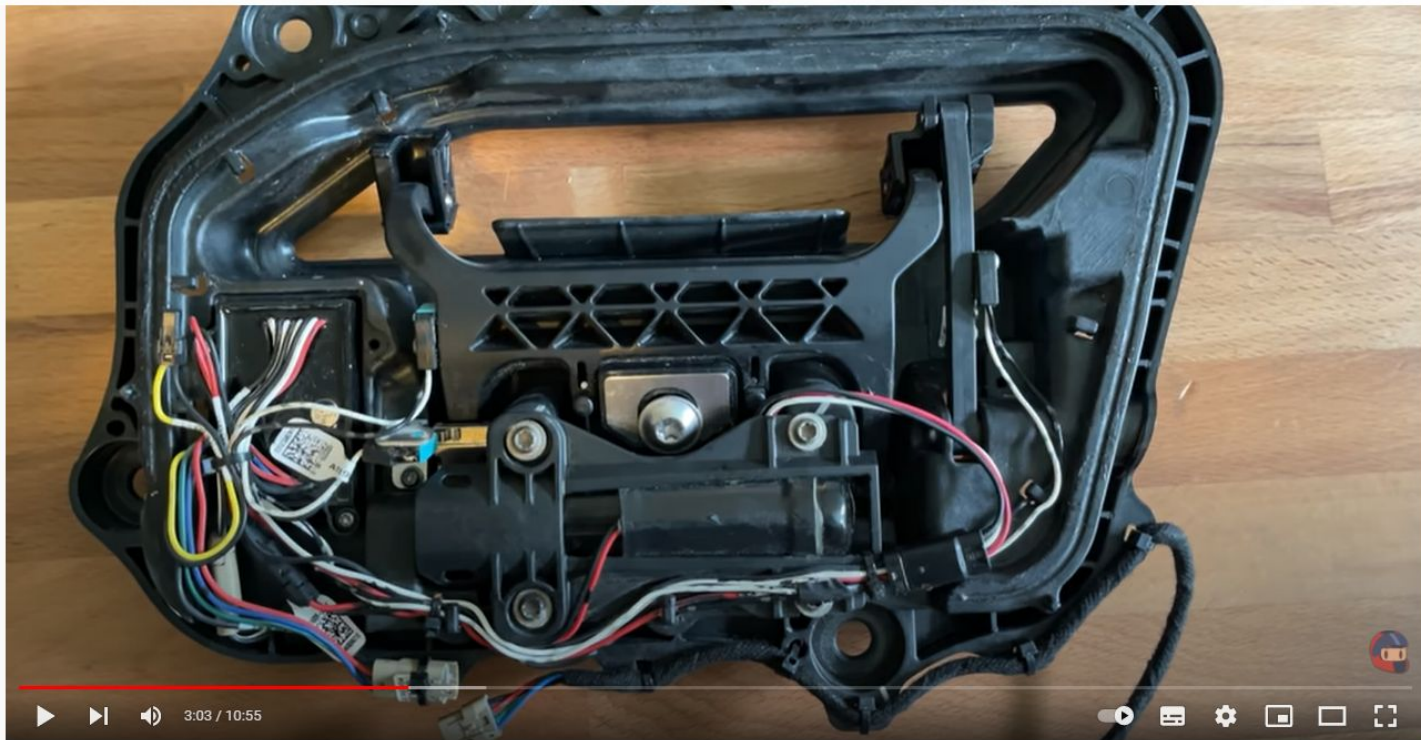


REDUCE!

... COMPLEXITY

Complexity reduction

- 1 Isolate risky or hard elements.
Refine them separately to iterate faster.**
- 2 Pare features mercilessly.
Distil your product.**
- 3 Design in dialogue with engineers.
Save time and cost; make better things.**



Tesla Is Lightyears Ahead Of... Tesla

724,472 views • 2 Sept 2021

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Novation and Serato have provided exclusive footage to Create Digital Music of stress tests of the touch strip for their new Twitch DJ/live controller.

Life Is Too Short to RTFM: How Users Relate to Documentation and Excess Features in Consumer Products

ALETHEA L. BLACKLER, RAFAEL GOMEZ, VESNA POPOVIC AND M. HELEN THOMPSON

School of Design, Queensland University of Technology, 2, George St, Brisbane, Qld, 4001, Australia.

*Corresponding author: a.blackler@qut.edu.au

This paper addresses two common problems that users of various products and interfaces encounter—over-featured interfaces and product documentation. Over-featured interfaces are seen as a problem as they can confuse and over-complicate everyday interactions. Researchers also often claim that users do not read product documentation, although they are often exhorted to 'RTFM' (read the field manual). We conducted two sets of studies with users which looked at the issues of both manuals and excess features with common domestic and personal products. The quantitative set was a series of questionnaires administered to 170 people over 7 years. The qualitative set consisted of two 6-month longitudinal studies based on diaries and interviews with a total of 15 participants. We found that manuals are not read by the majority of people, and most do not use all the features of the products that they own and use regularly. Men are more likely to do both than women, and younger people are less likely to use manuals than middle-aged and older ones. More educated people are also less likely to read manuals. Over-featuring and being forced to consult manuals also appears to cause negative emotional experiences. Implications of these findings are discussed.

RESEARCH HIGHLIGHTS

- Two sets of studies investigating use of manuals and excess interface features. One longitudinal qualitative. People claim to read the manual and use all of the features of the products only 25% of the time. Men are significantly more likely to read manuals and use all the features of the products than women.

REDUCE!

... QUANTITY

1 **Decide on your questions**

utility / beauty / marketability / practicability /
what's the least we can get away with doing?

2 **'Build 3' sprints**

(at least two sprints, and probably in-house; cross the valley of despair)

3 **'Build 30' sprints**

(using the correct supply chain, having learned about manufacturability)

4 **'Build 300'**



Philosophical digression:

Notes on building 3 units



3

Expensive lessons

**FIND YOUR
PEOPLE.**



Four questions when visiting a manufacturer

- 1 Is there anything in this project you haven't done before?
- 2 (if no) Will your entire life revolve around getting my project right?
- 3 (if no) Do my trousers have really deep pockets?
- 4 (if no) Does this fire escape lead to the car park?



Philosophical digression: **Power**

BE LUCKY.



Philosophical digression:
You can be lucky.

- 1 JUST DON'T ***
- 2 IT'S A BET, SO SET A STAKE**
- 3 LET IT TAKE TWO YEARS**
- 4 REMOVE DEPENDENCIES**
- 5 REDUCE, REDUCE, REDUCE**
- 6 FIND YOUR PEOPLE**
- 7 BE LUCKY**

ben@supperware.net

```
static const String Thanks { "Thanks to Anita for the T-shirt" }  
  
// user-generated content goes here
```