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How to make a startup business out of your research

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Outline

1. Key concepts / background
2. Business ideas and opportunities
   = How to come up with a business idea out of your research?
3. Idea validation & the Lean Startup
4. Business models
5. Task for next FAST meeting

Motivation

- Not all doctors are expected to become researchers; doctors are also trained for industry
- What do *you* want to do after your dissertation?
  - Researcher?
  - Work for a company, or other organization (e.g., public)?
  - Make your own company?
    - Startup, or maybe not
    - Maybe develop your own startup idea in an existing company?

→ During your dissertation, think about your outlook on research with this in mind

Motivation

- Even if you want to become a researcher, understanding **software business** (and the industry as such) is very beneficial as a researcher too
  - Identifying real business problems to solve → developing tools that answer industry needs
  - Being able to more easily talk to company people in their ”language” makes for easier collaboration
  - Also useful in funding applications…

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Key concepts / background

Software business (concept)

- Narrow view:
  - Selling/buying/developing software (products)
  - Offering software-related services (services)
- Broader view:
  - Offering/delivering value through software is software(-intensive) business
    - E.g., Uber is software business, Netflix is software business, etc.
    - MANY companies are now software-intensive in some way; digital transformation
      - Many develop software in-house too

Software business today

- Computational requirements and costs of making software have **plummeted** in the last 50 years
- Existing tools, services make software development and business easier than ever
  - Programming environments (IDEs), programming libraries
  - Endless learning and tutorial resources online
  - Cloud services
  - Now AI(?)

→ All you need is a laptop and a good idea now (sometimes...)

Startups

- Why “startup”, why not just company?
- Everyone has some intuitive idea of what is a “startup”
  - New company? Small? Innovative? Shoelace budget? etc.

Startups and software startups

- In SE and related computing disciplines like information systems (IS), the concept of "startup" dates back to 1994 when Carmel spoke of *"software package startups"* in their paper
- The main argument that drives all SE startup research is that startups are different from “normal” companies
  - *“software startups are quite distinct from traditional mature software companies, but also from micro-, small-, and medium-sized enterprises, introducing new challenges relevant for software engineering research”* (Unterkalmsteiner et al. 2016)

Carmel, E. (1994). Time-to-completion in software package startups. In Proceedings of the 27th Hawaii International Conference on System Sciences (HICSS), pp. 498–507. IEEE.
Unterkalmsteiner, M., et al. (2016) Software startups: a research agenda. E-Informatica Software Engineering Journal, 10(1), pp. 89–123. https://doi.org/105277/e-Inf160105

Software startup characteristics

- (1) highly reactive,
- (2) innovation,
- (3) uncertainty,
- (4) rapidly evolving,
- (5) time-pressure,
- (6) third party dependency,
- (7) small team,
- (8) one product,
- (9) low-experienced team,
- (10) new company,
- (11) flat organization,
- (12) highly risky,
- (13) not self-sustained,
- (14) lack of resources, and
- (15) little working history.

→ Disadvantage

Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., and Abrahamsson, P. (2014). Software Development in Startup Companies: a Systematic Mapping Study. Information and Software Technology, 56(10), pp. 1200-1218.

Software startups

- Past various characteristics, startup research generally quotes Blank (2013) for defining a startup as: **"*a temporary organization designed to search for a repeatable and scalable business model*"**

  → A startup either eventually becomes a "normal" company, or it fails somewhere along the way

    → A startup stops being a startup when it finds a repeatable and scalable business model?

  → Implies novelty in terms of business model; the average local pizzeria is just a small company because it just *executes an existing business model*

Blank, S. (2013a). Four Steps to Epiphany. K&S Ranch.
Blank, S. (2013b). Why the Lean Startup-Up Changes Everything. Harvard Business Review (May 2013).

Software startups

- A **software** startup is any startup that delivers, creates, or captures value through software
  - e.g., Uber was a software startup: its core value was delivered through a software platform
    - “Was” because now it is a mature company

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Business ideas and opportunities

Business ideas

- To make a business out of your research, you first need a business idea
- Yet ideas are only valuable if you…
  - (a) can validate that there's a market for your idea, and
  - (b) have the competencies to make it into a product or service
- (Business) opportunities = validated (business) ideas

How to find business opportunities?

- Discovery theory (rooted in economics)

- Key assumption: opportunities pre-exist in stable markets → entrepreneurs discover
- Opportunities arise from changes in the external environment (market, industry, etc.)
- Opportunity recognition & risk assessment; alertness & awareness

- Creation theory (rooted in social constructivism)

- Key assumption: opportunities do not exist until they are created → entrepreneurs create
- Entrepreneurs are actors
- Opportunity creation & importance of unknown

What makes an opportunity?

- Creating significant **value** to a customer/end user
- Fixing an existing **problem** or **pain**
- Someone should be willing to **pay** for the solution → profitability
  - Relying on pure ad revenue is not good
- Have a clear **market** → needs clear target audience/users
- Fonuder/team has to have the competencies to make the idea into business

Starting points (your research)

Based on your research, you may have…

- Created a **potential product (tool)** → what problem does it solve/what value does it create?
- You have **identified a real problem to solve** → what solution (product/service) would solve it?
- You have a **novel technology** → what solution/product could be built from it?
- You have built **unique expertise** → how to sell it to someone as a service? Or what product could you build with it?
  - Consulting?

Starting points for ideas (external, generic)

- Studying potential customers
  - Analyzing online discussion where people discuss pains/needs related to something (e.g., subreddits for certain topics like pets), etc.
- Observing people and communities
  - Observing how staff works somewhere (e.g., hospitals, restaurants…)
- Knowledge of certain industries/businesses
  - B2B ideas can stem from founder expertise with certain work (e.g., focused on process improvement for certain business)
- Unexpected events (e.g., COVID)
- Other changes in external environment (e.g., aging population)
- Emerging industries and technologies (e.g., AI agents …)
- Own interests/hobbies (e.g., knowing what kind of video game is wanted)

Who is the customer?

On the very general level, consider the “type” of startup you might be founding:

- Business-to-Consumer (B2C)
- Business-to-Business (B2B)
- Business-to-Government (B2G)

→ Are you selling to individual consumers or organizations? **Who** are you creating value for / whose problem are you solving?

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Idea Validation & The Lean Startup

Idea validation

- (Business) opportunities = validated (business) ideas
- **Validation** means proving that your idea has a market
  - = someone is willing to pay for it

→ How to validate an idea?

The reality of ideas

- Up to 98 % of new product ideas overall fail[1]
- The majority of startups fails [2, 3, 4]
  - Depends on the source what % they say
- Validating your idea helps you “fail” faster → pivot so you don’t *actually* fail
  - One of the biggest mistakes is to have your product launch be the first time you reach out to (potential) customers

1 Mullins, J. W., & Komisar, R. (2009). Getting to plan B: Breaking through to a better business model. Harvard Business Press.
2 Crowne, M. (2002). Why software product startups fail and what to do about it. Evolution of software product development in startup companies. In IEEE International engineering management conference (Vol. 1, pp. 338-343). IEEE.
3 Blank, S. (2013). Four Steps to Epiphany. K&S Ranch.
4 Giardino, C., Wang, X., & Abrahamsson, P. (2014). Why early-stage software startups fail: a behavioral framework. In International conference of software business (pp. 27-41). Cham: Springer International Publishing.

Idea validation

- The practice of “idea validation” in startups is related to requirements engineering (RE) in conventional SE
- RE is built around the idea of eliciting requirements from a customer
  - A customer exists; we know who is the customer; customer can be involved in the project, etc.
- Startups are new organizations building their first product → no customers yet
  - Who is the customer? What should the product look like?
  - In this context, it’s more about “idea validation” than conventional RE

Kemell, K. K., Nguyen-Duc, A., Suoranta, M., & Abrahamsson, P. (2023). StartCards—A method for early-stage software startups. *Information and Software Technology*, *160*, 107224.

Idea validation

- Ideas should be validated with **data**
- Very early on, this can be secondary data
  - E.g., online discussion, news articles, company surveys, etc. that somehow support the overall problem being a real one
- As you progress, validation should pertain to your idea/product more directly

Lean startup vs. “stealth” mode

- Lean startup[1] is a methodology (approach?) that focuses on short development cycles and continuous idea validation → putting yourself and your idea out there
- If your idea is built around a technological innovation – that you are *sure* has a market – you may also consider “stealth mode”
  = keeping a low profile until you are ready to release the product/service
- For most ideas, idea validation is central → lean startup

1 Ries, E. (2011). The Lean Startup. USA, Crown Business.

Lean startup practices for validation

- Lean startup as a methodology stresses idea validation
- Various established practices focus on idea/solution validation
  - Idea validation early → later solution validation when you have a product
- The key practices are:
  - Minimum Viable Product (MVP)
  - Pivoting
  - The Build-Measure-Learn Loop

Ries, E. (2011). The Lean Startup. USA, Crown Business.

Minimum Viable Product (MVP)

- The idea of the MVP is to serve as a way of validating your idea
- MVP is intended to test one key assumption
- It's not about **launching** the product but **learning** (from data)
- An MVP is **not** just a prototype
  - But a prototype can be an MVP
- Literature[1] associates MVPs with "minimum set of features", "customer feedback", "minimum effort" and "early prototype"

1 V. Lenarduzzi and D. Taibi, "MVP Explained: A Systematic Mapping Study on the Definitions of Minimal Viable Product," 2016 42th Euromicro Conference on Software Engineering and Advanced Applications (SEAA), Limassol, Cyprus, 2016, pp. 112-119, doi: 10.1109/SEAA.2016.56.

Minimum Viable Product (MVP)

- What constitutes an MVP can vary greatly based on (1) your idea, (2) your current situation, (3) what you want to test …
- An MVP can be, e.g., …
  - A landing page → are you getting hits?
  - Explainer video / pitch video → is it getting views?
  - Crowdfunding campaign → do people like the idea enough to fund it?
  - A “Wizard of Oz” MVP
    - Simulate the product’s key functionalities manually → would people actually use/like it if you built the real thing?
  - A mockup or prototype
- A functional prototype is actually on the heavier end of MVPs! → less is enough early

Pivoting (or persevering)

- Pivoting means changing direction – of your business
- If data (e.g., collected with MVP) shows that your idea is not working → try to identify the problem(s) → pivot
- This does not going from software company to ice cream booth; it means changing *some* part of your idea strategically
  - e.g., YouTube was originally meant to be a video dating service
- Pivoting prevents you from truly *failing* as a business
- If data shows you are doing well → you can persevere, for now

Bajwa, S. S., Wang, X., Nguyen Duc, A., & Abrahamsson, P. (2017). “Failures” to be celebrated: an analysis of major pivots of software startups. Empirical Software Engineering, 22(5), 2373-2408.

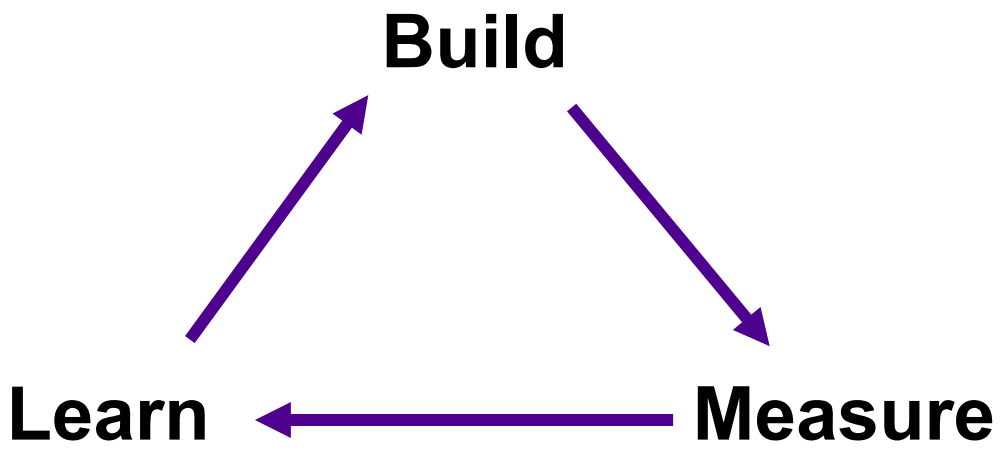
Types of pivots

- Examples of pivots from literature
  - Zoom-in pivot → single feature becomes the whole product
    - e.g., chat feature becomes chat app; Zoom-out pivot vice versa
  - Customer segment pivot → focus on different audience
    - e.g., professional --> amateur athletes
  - Customer need pivot → changing the core problem you are solving
    - After collecting data, you start understanding your customers' problems better
  - Value capture pivot or monetization/revenue pivot
    - Going free-to-use from paid model → in-app purchases
  - … etc.

Bajwa, S. S., Wang, X., Nguyen Duc, A., & Abrahamsson, P. (2017). "Failures" to be celebrated: an analysis of major pivots of software startups. Empirical Software Engineering, 22(5), 2373-2408.

The Build-Measure-Learn (BML) Loop

- The idea of the BML loop is continued, validated learning
- **Build** MVP → use MVP to **measure** something → **learn** from data
  - → build new MVP based on what you learned …
- Pivot or persevere as seems appropriate based on the data



Ries, E. (2011). The Lean Startup. USA, Crown Business.

Why idea validation?

- It is common to fall in love with your own idea
  - You are likely doing something you are passionate about → that is what you *want* to do → easy to just keep developing the idea as is
- **You** like your idea, but does anyone else?
- The worst-case scenario = you spend years developing a product that no one will buy/use
  - Changes to your idea/product, are easier/cheaper to make the earlier you make them

→ Collect *some* kind of data; reach out to people/your target customers and talk to them; build MVPs …

Final notes about idea validation

- If you ask someone, face-to-face, what they think of your product, while being clearly excited about it → they will hesitate to tell to your face that they think it sucks :-)…
  - This also goes for asking people if they would pay for your hypothetical product when it's ready
- Don't think you know better than the users when it comes to **problems**
  - If customers don't like some thing about your product, they just don't → try to understand why
  - However, they might not know best how to *fix* the problem!

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Business models

Business models

- Describes the business of a company – i.e., how it makes money
  - “A way of doing business”
  - Typically includes specific elements like customers (segments groups), value proposition, etc.
- Helps conceptualize an idea into a hypothetical business → how does your idea / opportunity actually translate into a business?

Essential elements of a business model

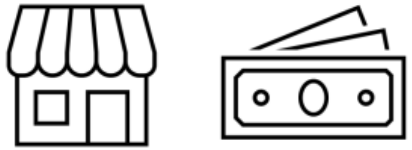
1

"what does the **customer** get?"

(value creation process)

2

"how do we get the **money**?"



(converting the market opportunities into revenue)

Business Model Canvas (BMC)

- Based on the doctoral dissertation of Alexander Osterwalder, BMC is now a very common way to describe a business
- 1-page/sheet with 9 boxes to fill → each box is 1 element of the business model
  - (1) Value propositions → what is the key value you deliver / problem you solve?
  - (2) Customer segments → value for whom / whose problem?
  - (3) Customer relationships → what are they like; how are they created / maintained?
  - (4) Channels → how do you reach the customers?
  - (5) Key activities → what is required to produce value? Production / problem solving …
  - (6) Key resources → physical / human / intellectual / financial …
  - (7) Key partners → partners / suppliers / their role …
  - (8) Cost structure → what costs are there in doing this business?
  - (9) Revenue streams → where does the money come from?

The Business Model Ontology: A Proposition in a Design Science Approach (University of Lausanne, 2004)
Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons.

The Business Model Canvas

Designed for:	Designed by:	Date:	Version:

Key Partners

Who are our Key Partners?
Who are our key suppliers?
Which Key Resources are we acquiring from partners?
Which Key Activities do partners perform?

MOTIVATIONS FOR PARTNERSHIPS
Optimization and economy
Reduction of risk and uncertainty
Acquisition of particular resources and activities

Key Activities

What Key Activities do our Value Propositions require?
Our Distribution Channels?
Customer Relationships?
Revenue streams?

CATERGORIES
Production
Problem Solving
Platform/Network

Key Resources

What Key Resources do our Value Propositions require?
Our Distribution Channels? Customer Relationships?
Revenue Streams?

TYPES OF RESOURCES
Physical
Intellectual (brand patents, copyrights, data)
Human
Financial

Value Propositions

What value do we deliver to the customer?
Which one of our customer's problems are we helping to solve?
What bundles of products and services are we offering to each Customer Segment?
Which customer needs are we satisfying?

CHARACTERISTICS
Newness
Performance
Customization
"Getting the Job Done"
Design
Brand/Status
Price
Cost Reduction
Risk Reduction
Accessibility
Convenience/Usability

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?
Which ones have we established?
How are they integrated with the rest of our business model?
How costly are they?

EXAMPLES
Personal assistance
Dedicated Personal Assistance
Self-Service
Automated Services
Communities
Co-creation

Channels

Through which Channels do our Customer Segments want to be reached?
How are we reaching them now?
How are our Channels integrated?
Which ones work best?
Which ones are most cost-efficient?
How are we integrating them with customer routines?

CHANNEL PHASES
1. *Awareness*
   How do we raise awareness about our company's products and services?
2. *Evaluation*
   How do we help customers evaluate our organization's Value Proposition?
3. *Purchase*
   How do we allow customers to purchase specific products and services?
4. *Delivery*
   How do we deliver a Value Proposition to customers?
5. *After sales*
   How do we provide post-purchase customer support?

Customer Segments

For whom are we creating value?
Who are our most important customers?

Mass Market
Niche Market
Segmented
Diversified
Multi-sided Platform

Cost Structure

What are the most important costs inherent in our business model?
Which Key Resources are most expensive?
Which Key Activities are most expensive?

IS YOUR BUSINESS MORE
Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing)
Value Driven (focused on value creation, premium value proposition)

SAMPLE CHARACTERISTICS
Fixed Costs (salaries, rents, utilities)
Variable costs
Economies of scale
Economies of scope

Revenue Streams

For what value are our customers really willing to pay?
For what do they currently pay?
How are they currently paying?
How would they prefer to pay?
How much does each Revenue Stream contribute to overall revenues?

TYPES
Asset sale
Usage fee
Subscription Fees
Lending/Renting/Leasing
Licensing
Brokerage fees
Advertising

FIXED PRICING
List Price
Product feature dependent
Customer segment dependent
Volume dependent

DYNAMIC PRICING
Negotiation (bargaining)
Yield Management
Real-time-Market

Image source: Strategyzer AG / Alex Osterwalder — Business Model Canvas. Licensed under CC BY-SA 3.0. Image via Wikimedia Commons.

Potential business model mistakes

- Typical mistakes can be, e.g.,
  - Too narrow approach (excluding potential customer groups)
  - Too broad approach (trying to serve *everyone*)
  - Fixation on a specific product/service
    - When the problem might be better addressed by another
  - Failing to *update* the business model as you progress
- Box filling exercise vs. interactions & coherence between the elements

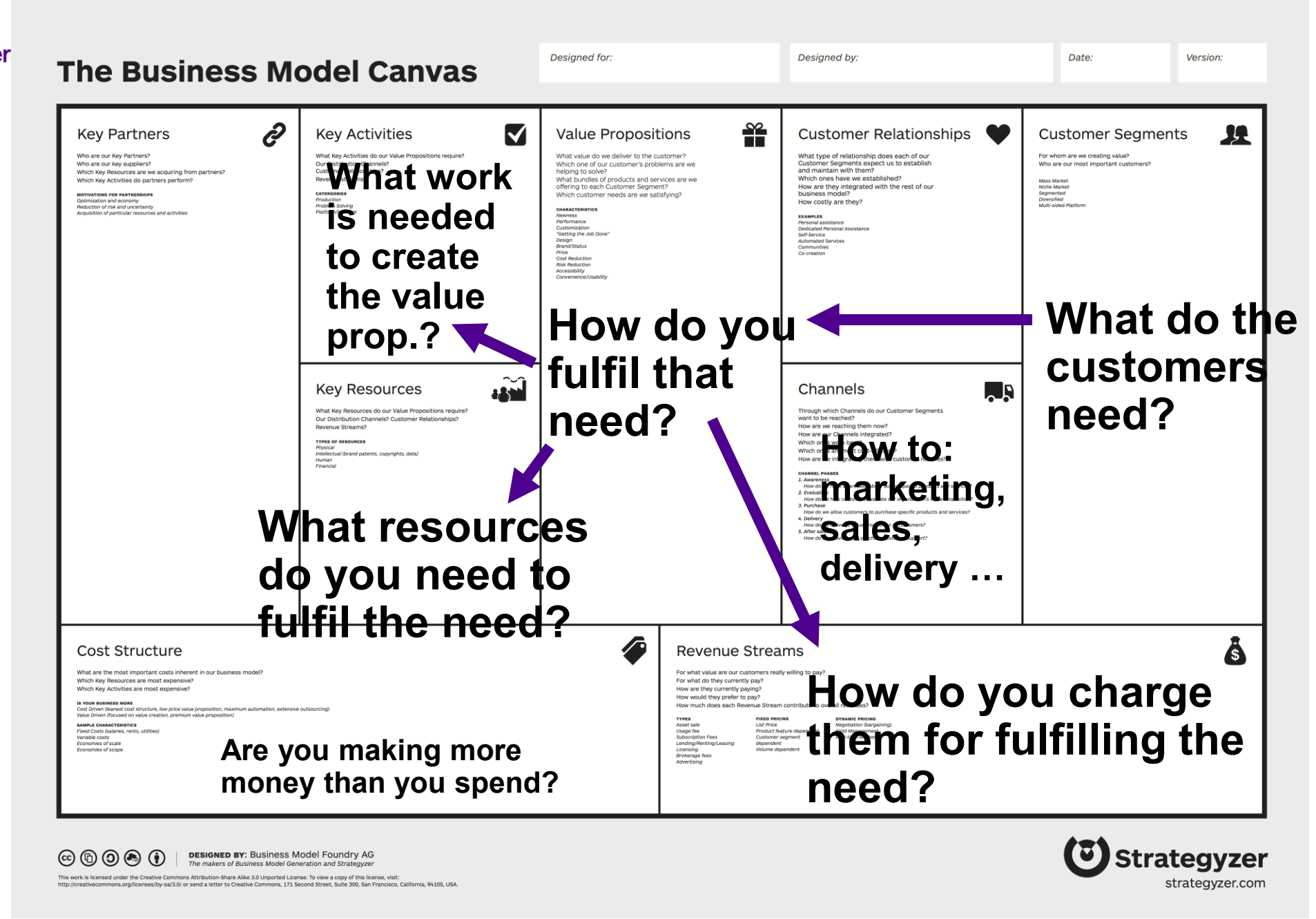


Image source: Strategyzer AG / Alex Osterwalder — Business Model Canvas. Licensed under CC BY-SA 3.0. Image via Wikimedia Commons.

Startup vs. “normal” company

- Startups *search* for new & scalable business models
- Implies some innovation in business model!
  + scalability is typical for software business (excl. e.g., usual consulting)

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“Homework” / Tasks for next FAST

Task 1 – Business Model Canvas

1. Sketch a business idea based on your research
2. Fill out a Business Model Canvas based on the idea
   - You can find this in many places online

→ Fill the BMC for next FAST meeting and take it with you

Obstacles?

- While filling the canvas, think about what you would **need** to make a business out of your research (or other idea) → what is missing?
- Consider, e.g., …
  - Funding → Would you need some funding from an external source? How much & what for?
  - Team → Do you need other people? To make things faster (person hours/months), or people with specific skills to make the idea happen?
  - Other resources → Hardware? Physical facilities?
  - What else could prevent you from doing this? Think for next FAST
- No formal deliverable; just food for thought for you

University support (OPTIONAL)

- **IF** you are already excited about potentially trying to make a startup *(or just a company)* out of your research, consider looking into how your home university supports this
- Finnish universities support entrepreneurship in different ways
  - Includes courses, coaching, funding, accelerator programs, etc.
- Keywords to look out for: Research-to-Business (R2B), spinout
- Also Intellectual Property Rights

Closing thoughts: team?

- Could you make a business alone?
- If not, who could you work with? What skills should they have?

→ Maybe there are some like-minded students here at FAST…