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OF ENGINEERING**

The Innovator's Mindset

**David Lefer,
NYU Tandon School of Engineering**

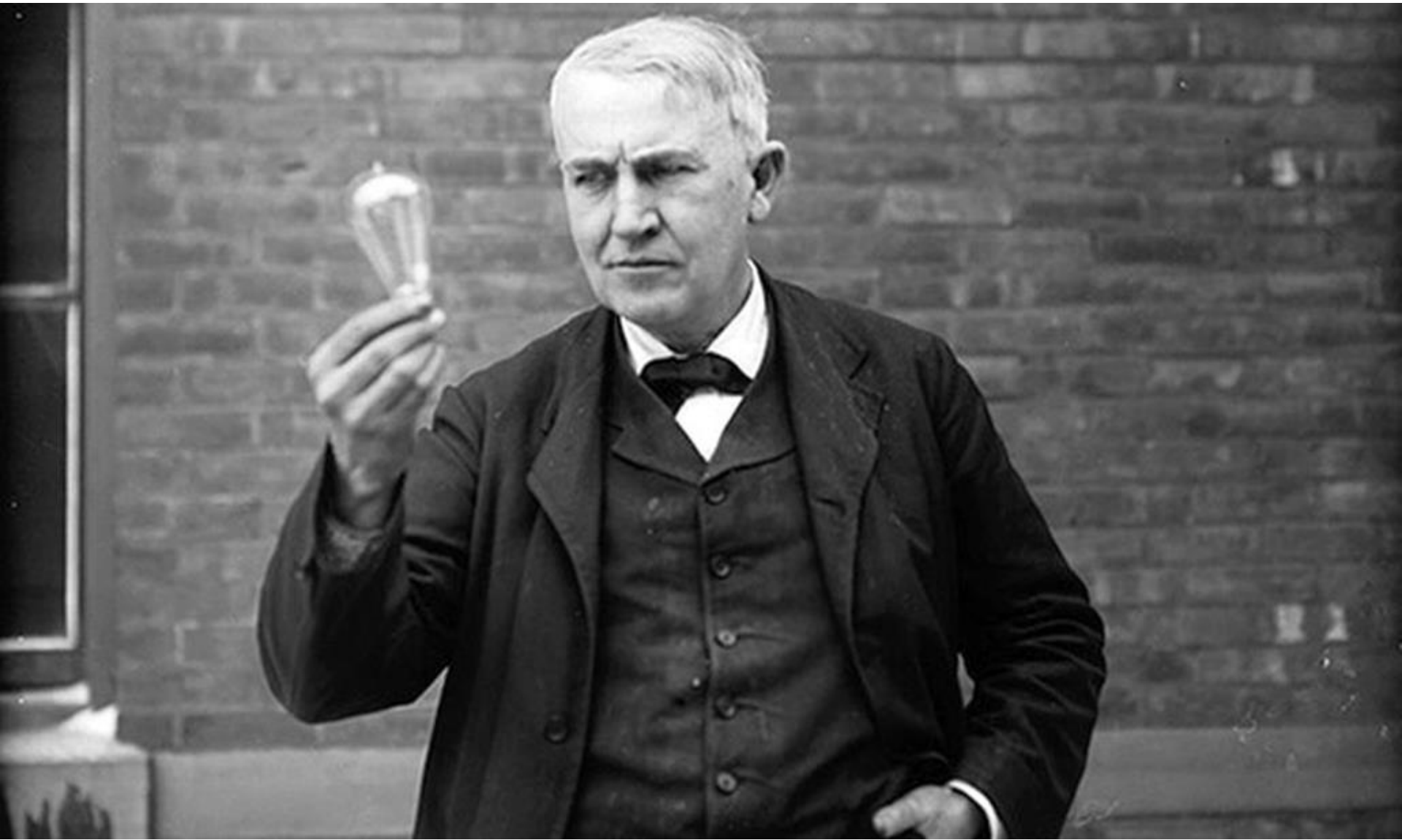


INNOVATION



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POP QUIZ



The Edison test for college graduates:

What city in the US is noted for its laundry-machine making?

Newton, Iowa



The Edison test for college graduates:

Who was Leonidas?

Spartan general who fought
Persians



The Edison test for college graduates:

Who invented the logarithm?

John Napier



The Edison test for college graduates:

Where is Magdalena Bay?

Baja California



The Edison test for college graduates:

What is the first line of
Virgil's Aeneid?

Arma virumque cano

Partial credit: Of arms and the
man I sing...



The Edison test for college graduates:

What is the weight of air in a room 10 x 20 x 30?

0.075 pounds per cubic foot
times 6000 cubic feet = 450
pounds



The Edison test for college graduates:

Where is Korea?





The Edison test for college graduates:

Who composed *Il Travatore*?

Giuseppe Verdi



The Edison test for college graduates:

What voltage is used in streetcars?

625 volts



The Edison test for college graduates:

What are the main ingredients
of a Martini cocktail?

Gin and dry vermouth



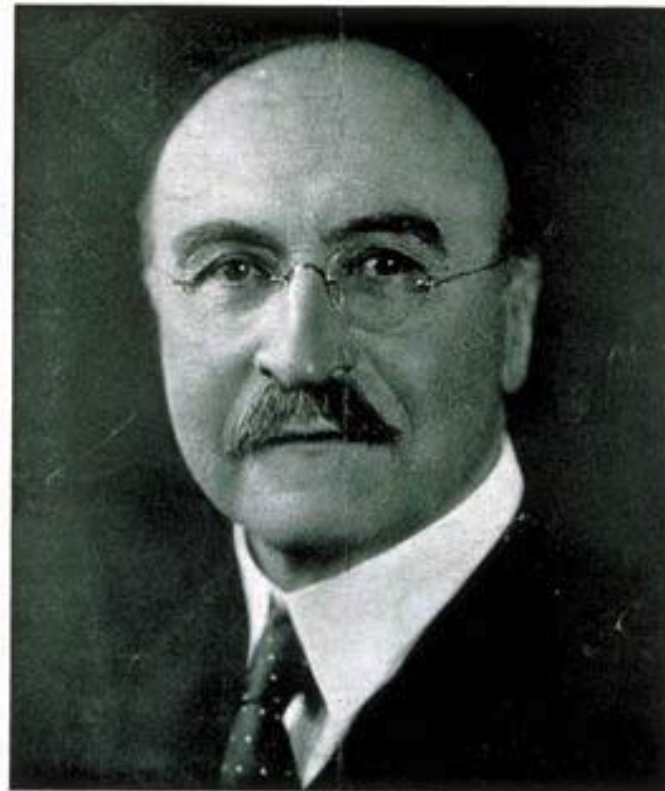
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FIFTEEN CENTS

TIME

The Weekly News-Magazine



VOL. IV NO. 12

DR. LEO H. BAEKELAND
"It will not burn. It will not melt."
(See Page 25)

SEPTEMBER 22, 1924

Leo Baekeland



Steve Jobs

Bill Gates



Gary Kildall





\$20 MILLION LAWSUIT:

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Tech

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Posted 3/2/2005 3:31 PM

Programmer sues author over role in Microsoft history

SEATTLE (AP) — The programmer generally credited with building the basis for Microsoft's landmark computer operation system has sued an author who alleges the software was simply a "rip-off" of another man's work.

Tim Paterson, who created the software later known as DOS and sold it to Microsoft, filed a defamation lawsuit Monday against



- Tech Products
- [Products home](#)
- [Talking Tech](#)
- [Edward C. Baig](#)
- [Kim Komando](#)
- Ask Kim



Corporate innovation:

84% of global executives reported that innovation was extremely important to their growth strategies.

--McKinsey & Co.



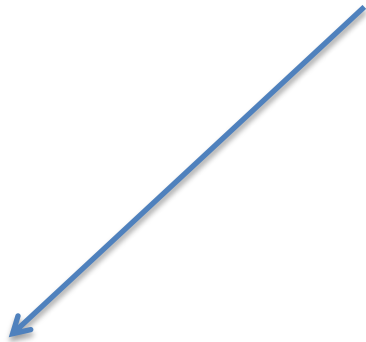
Corporate innovation:

94% were dissatisfied with their organizations' innovation performance.

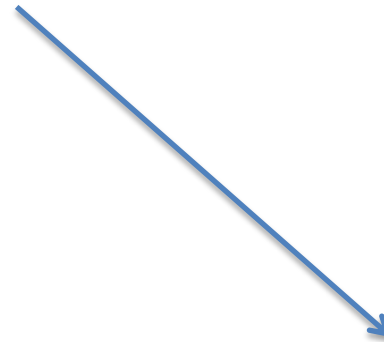
--McKinsey & Co.



INNOVATION



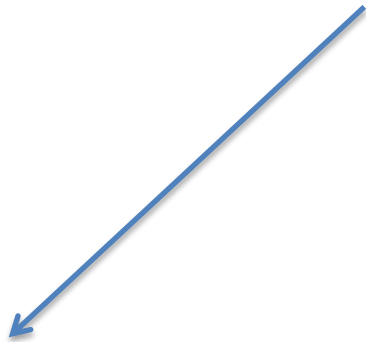
**SOMETHING
NEW**



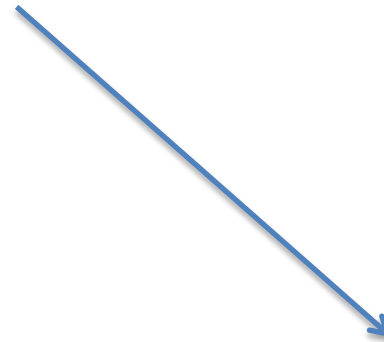
**SOMETHING
USEFUL**



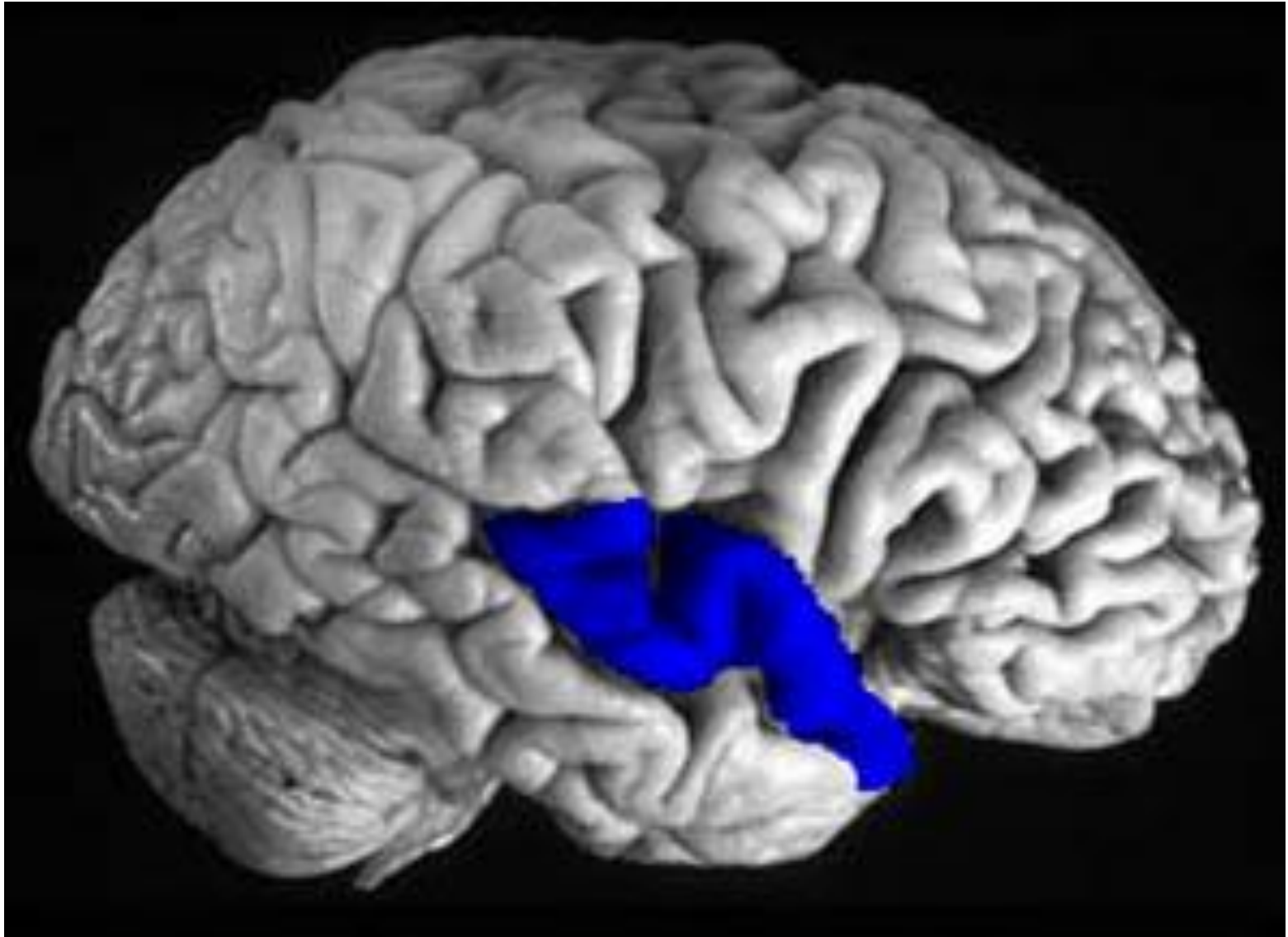
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**SOMETHING
NEW**



**SOMETHING
USEFUL**



Anterior Superior Temporal Gyrus



Compound Remote Associate Problems

Aka CRAP

AGE, MILE, SAND

PLAYING, CREDIT, REPORT

SORE, SHOULDER, SWEAT

ANSWERS: STONE; CARD; COLD



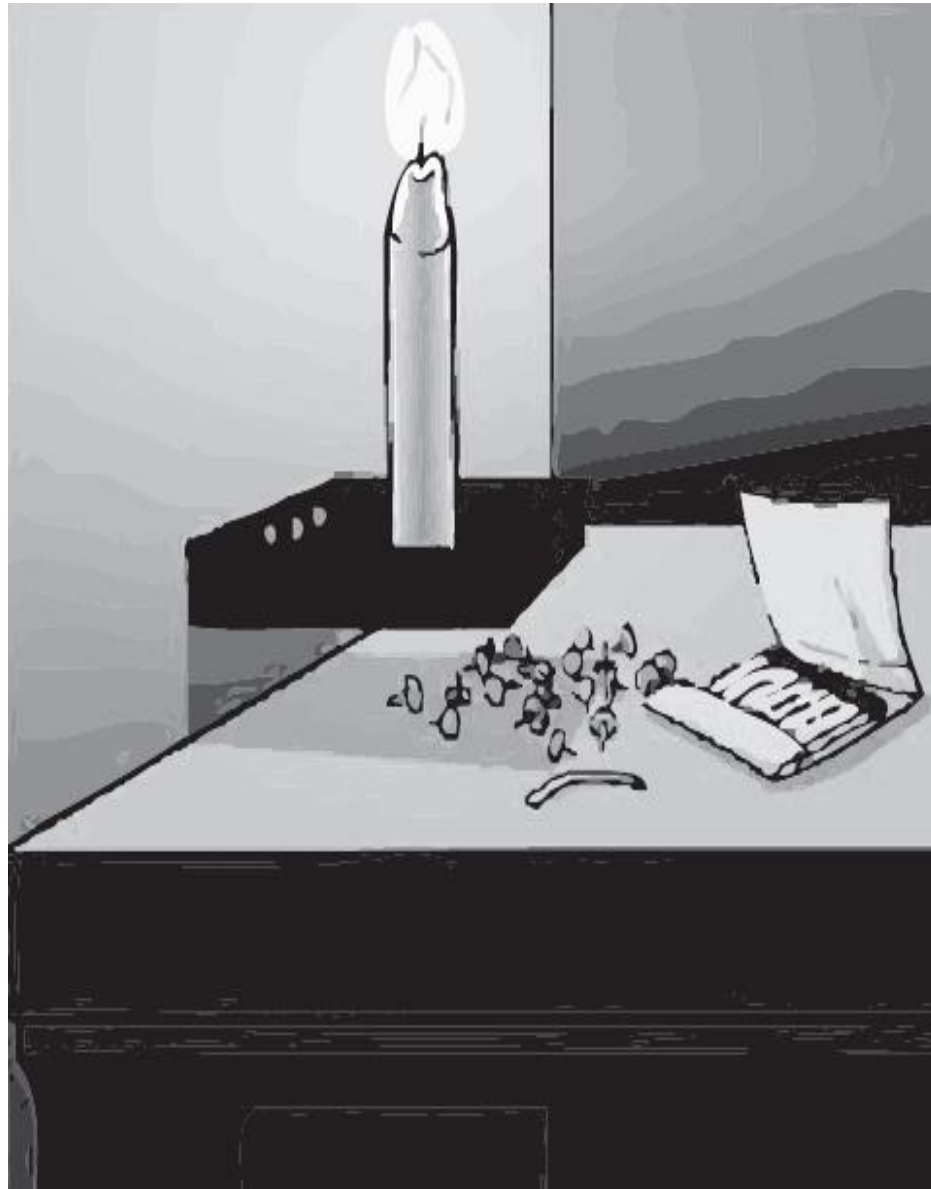
The Candlestick Problem



**Karl Dunker,
1945**

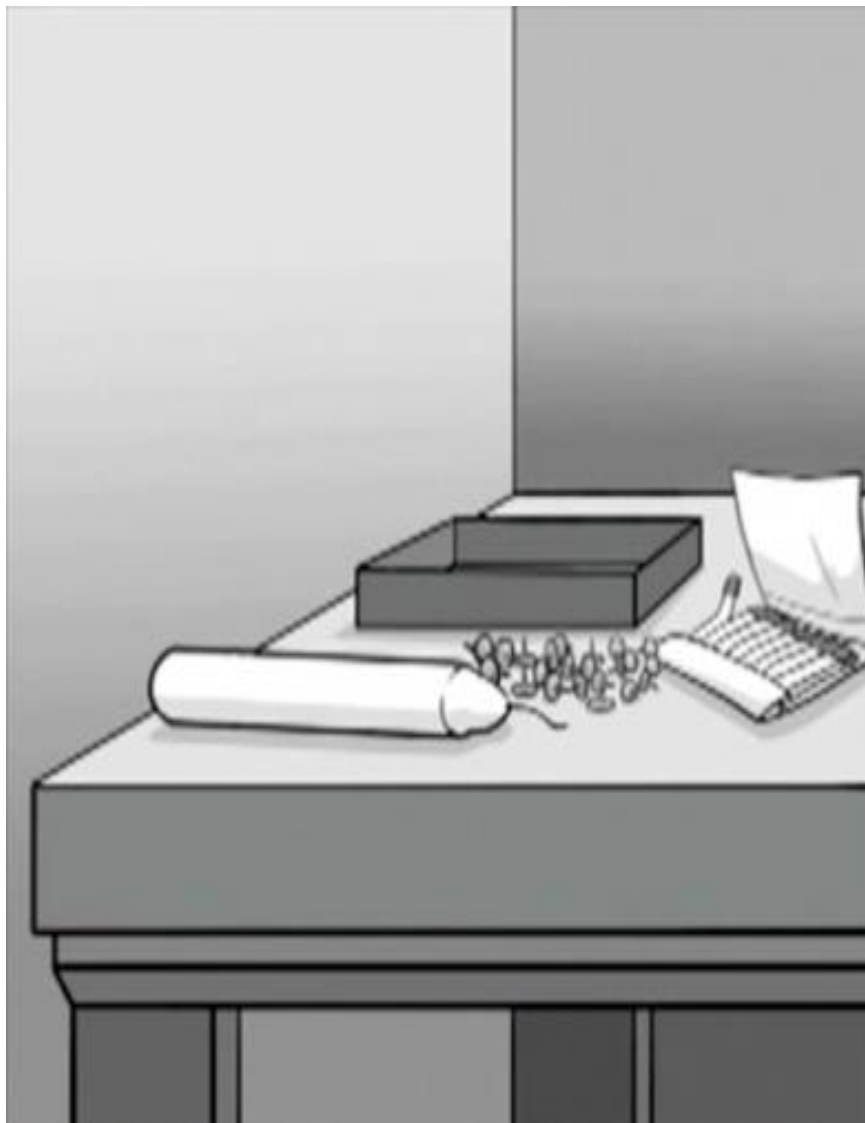


Solution:





Simple Candle Problem:





“Functional Fixedness”

**POVERTYMATTERS
BLOG**Supported by
**BILL & MELINDA
GATES foundation**

WaterWheel

WaterWheel to ease burden on women

Round 50-litre container enables water collectors to roll liquid from wells rather than carry it on their heads



Wheel of change: a WaterWheel user in India. Photograph: Wello

Girls and women carrying plastic jerry cans of water on their heads is a common sight in rural areas of poor countries. The WaterWheel eases that burden by storing water in a round 50-litre container that doubles as a wheel.

Designed after consultations with villagers in the dry northern Indian state of



Liter of light





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SOCCKET



RULE 1.

REFRAME



FAREDCE



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RED in the FACE



T RN



No U TuRN



Dylan and Dan were born on the same day of the same month of the same year. They have the same mother and father. But they aren't twins. How is that possible?



A man has married twenty women in a small town. All the women are still alive and none of them is divorced. The man has broken no laws. Who is this man?



RULE 2. THINK LATERALLY

Johannes Gutenberg

Dick Drew, 3M

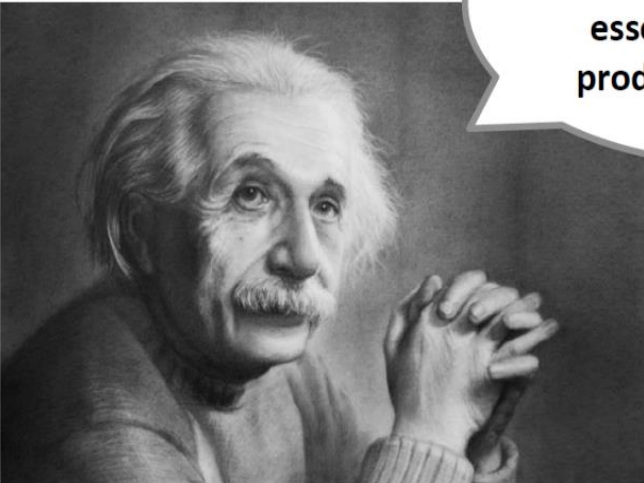
Wright brothers

Reed Hastings, Netflix

George de Mestral, Velcro



Creative Combination



“**Combinatory play** seems to be the essential feature in productive thought.”



“Creativity is just **connecting things..**”



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CANCER TUMOR



You are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient, but unless the tumor is destroyed, the patient will die. There's a kind of ray machine that can be used to shoot and destroy the tumor. If the rays reach the tumor all at once at a sufficiently high intensity the tumor will be destroyed.

Unfortunately at this intensity the healthy tissue that the rays passed through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue?



97% of people can't figure this out and conclude the patient will die.



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FORTRESS



A fortress was located in the center of the country. Many roads radiated out from the fortress. A general wanted to capture the fortress with his army. But he also wanted to prevent mines hidden on several roads from destroying his whole army.

As a result the entire army could not all go down one road to attack the fortress. However, most of the entire army was needed to capture the fortress; an attack by one small group could not succeed. The general therefore divided his army into several small groups. He positioned the small groups at equal distances from the fortress along different roads. The small groups simultaneously converged on the fortress. In this way the Army captured the fortress.



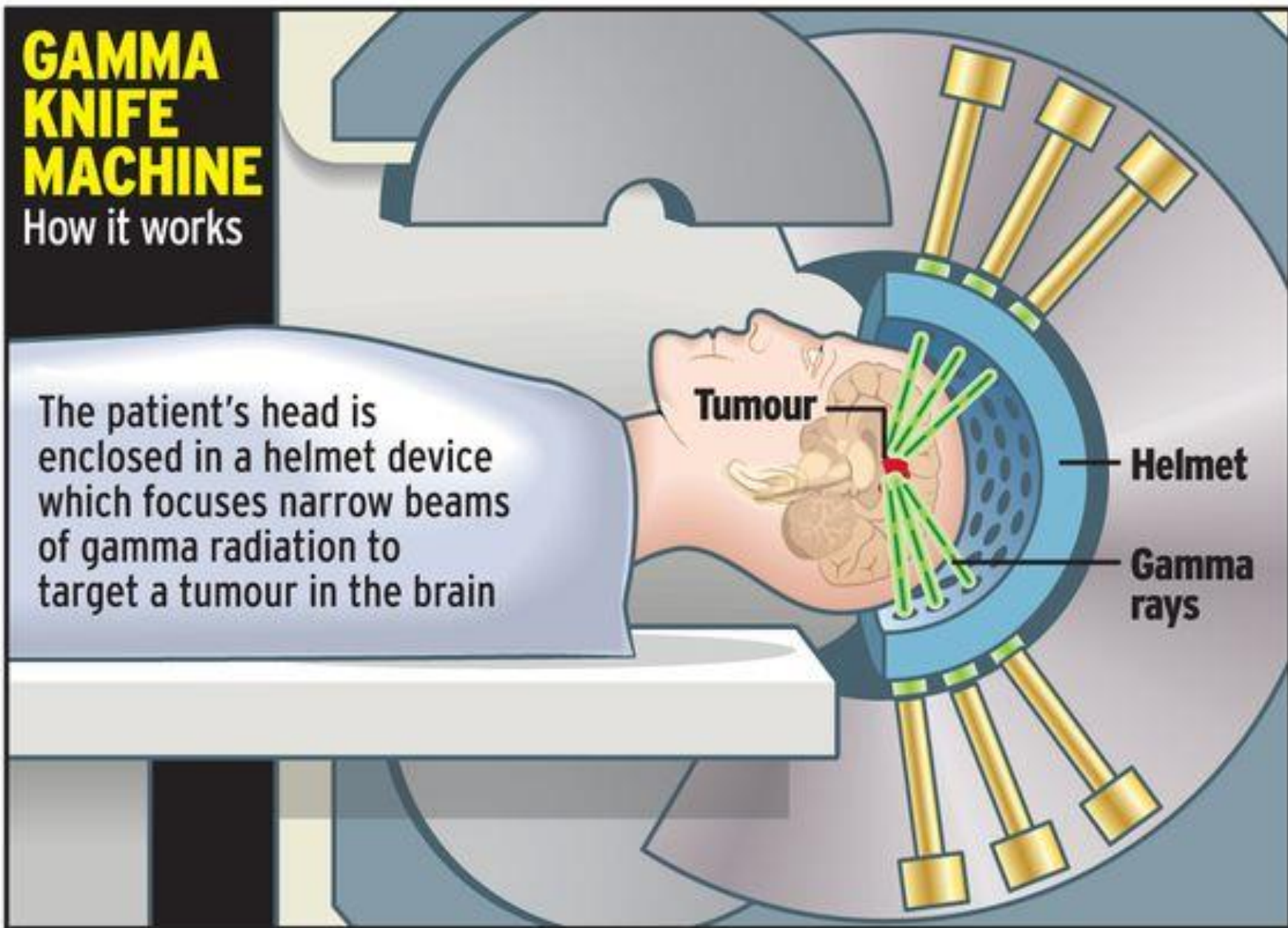
**Now 70% of people can
solve the first problem.**



GAMMA KNIFE MACHINE

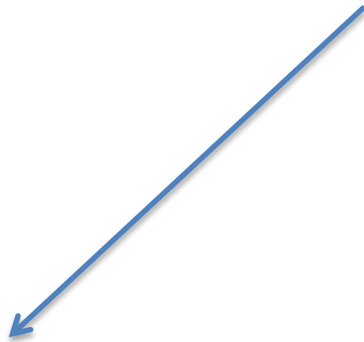
How it works

The patient's head is enclosed in a helmet device which focuses narrow beams of gamma radiation to target a tumour in the brain

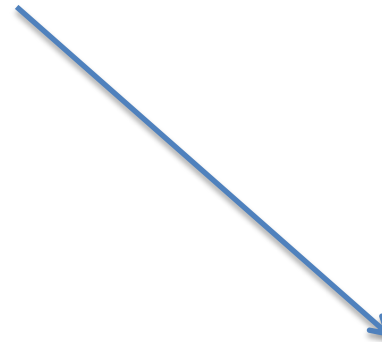




INNOVATION



**SOMETHING
NEW**



**SOMETHING
USEFUL**



**MAKE
SOMETHING
PEOPLE
WANT**



Percentage of startups that fail:



75%

-- Shikhar Ghosh,
Harvard Business School



Percentage of new products that fail:

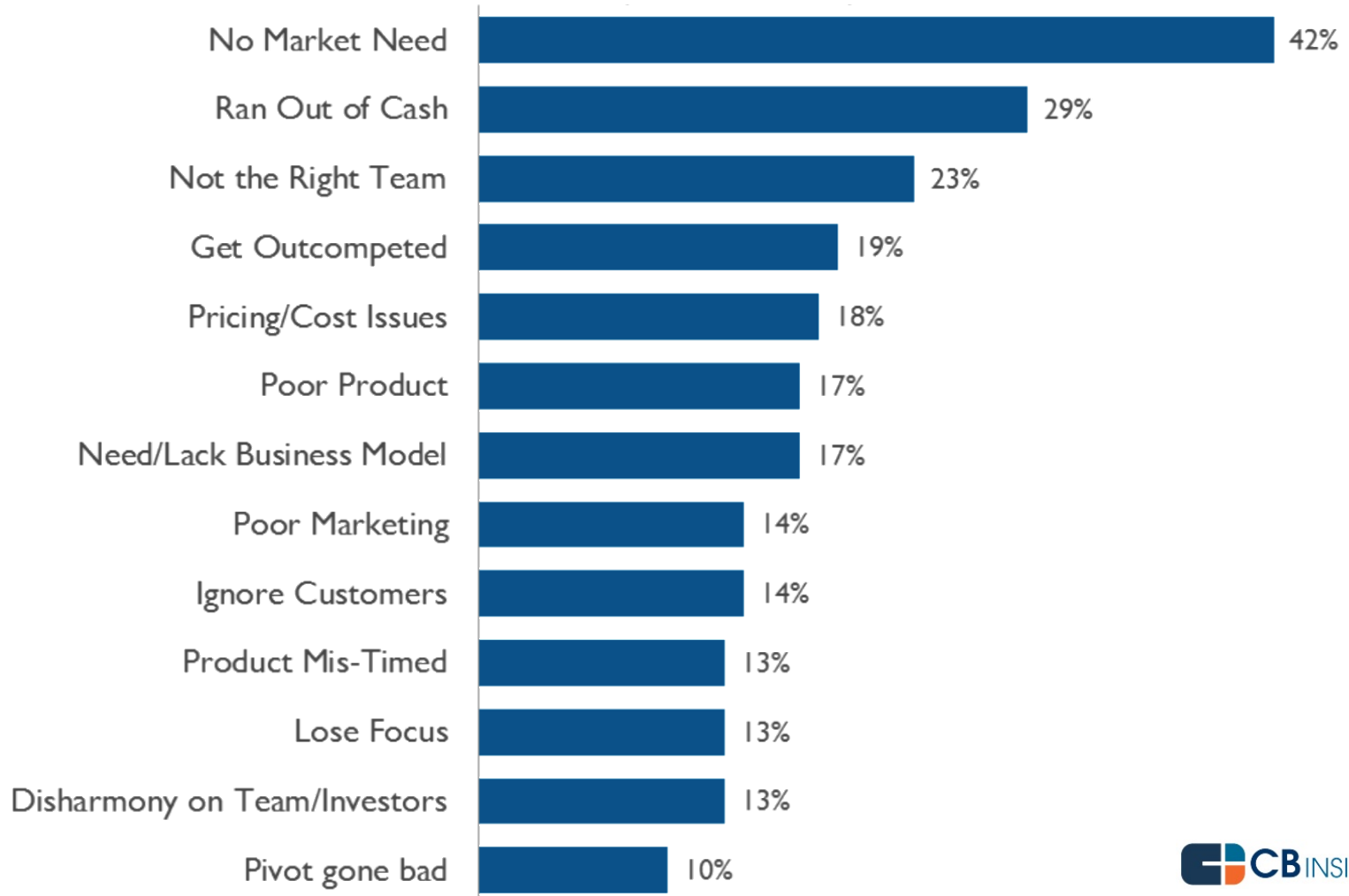


95%

-- Clayton Christensen,
Harvard Business School

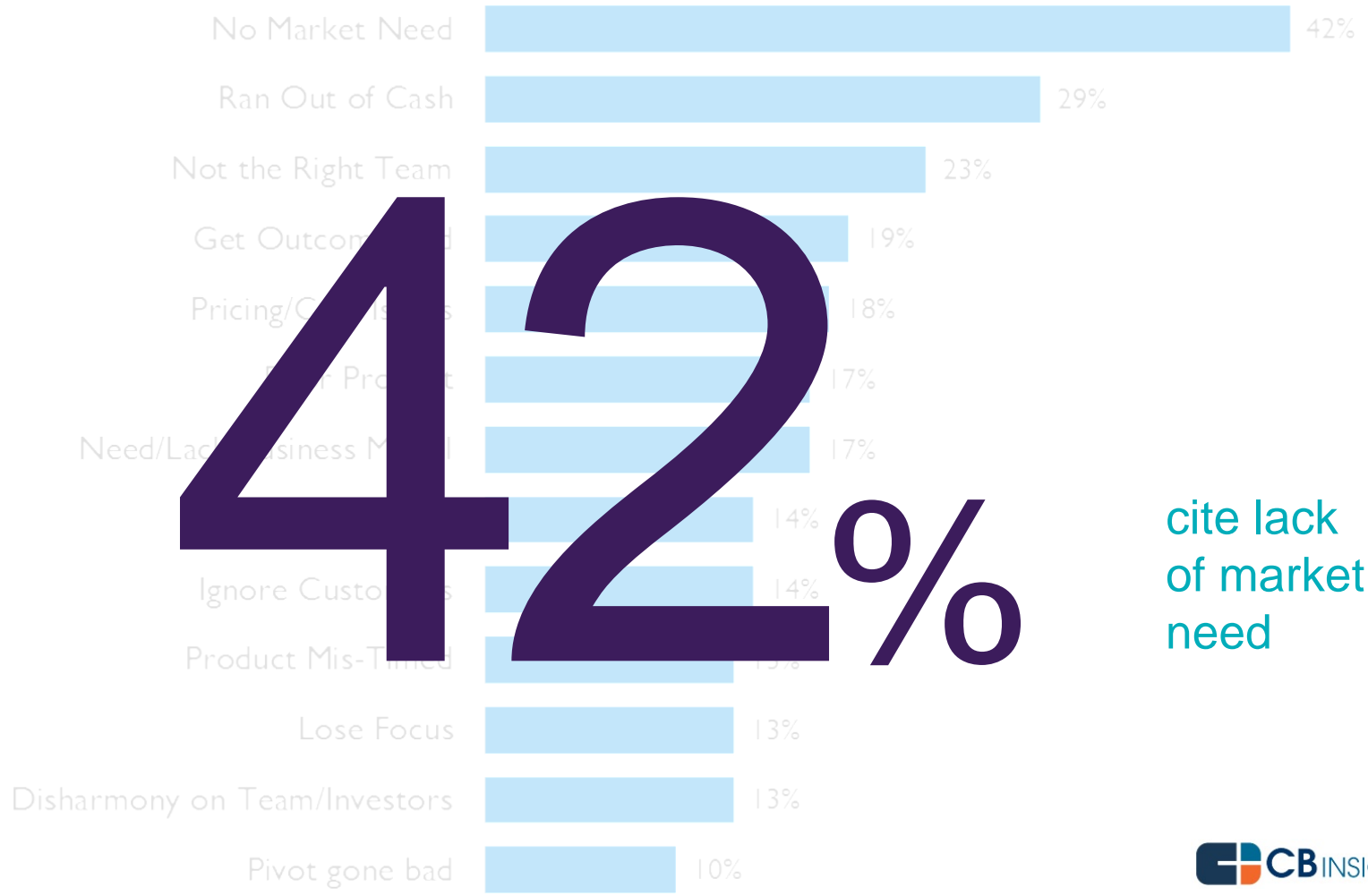


Top 12 Reasons Startups Fail



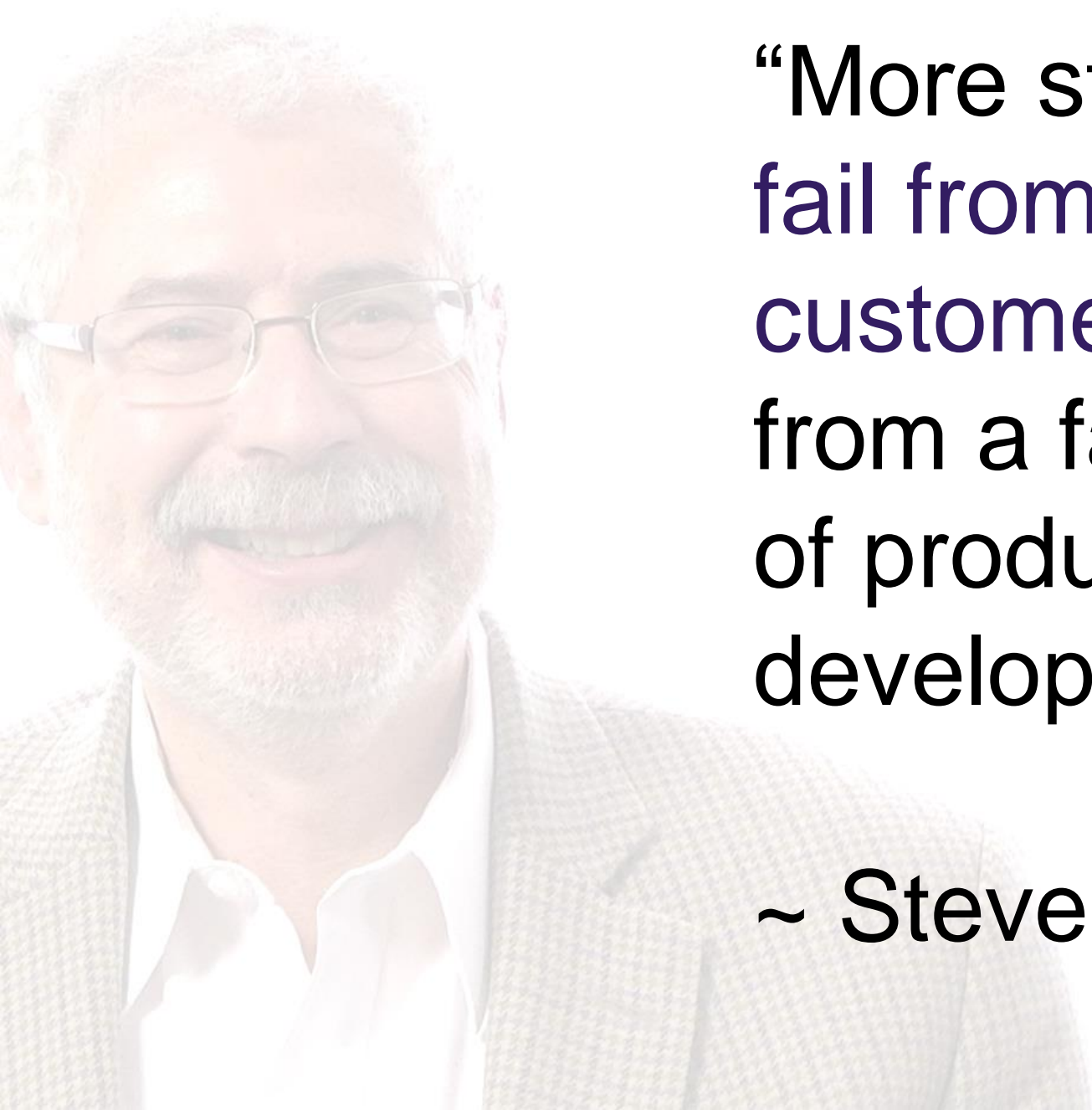


Top 12 Reasons Startups Fail



42%

cite lack of market need



“More startups fail from a lack of customers than from a failure of product development.”

~ Steve Blank



PROBLEM SOLVING

VS.

PROBLEM FINDING

Gather Problems

Type 1



Type 2





**WHAT DOES
SHE NEED?**





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**WHAT DOES
SHE NEED?**

WHAT'S THE REAL PROBLEM?





startupzap.com

**THE ONLY WAY TO WIN IS
TO LEARN FASTER THAN
ANYONE ELSE.**

Eric Ries

Image: <https://www.flickr.com/photos/jdlasica/11320871225/>





The Lean Startup

Who's Lean?



UBER

NORDSTROM



Instagram





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Jobs to be done

--Clayton Christensen, Harvard Business School





“job to be done”

a fundamental problem (or set of problems) the customer is trying to solve in a particular circumstance

“People don't want to buy a quarter-inch drill...”



SOLUTION\$
(WHAT)

”

...they want a quarter-inch hole!”

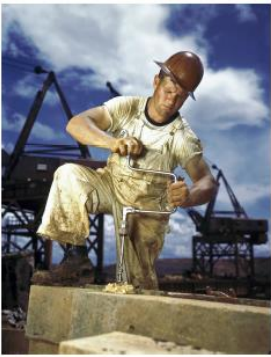


JOB\$
(WHY)



Jobs to Be Done

- Functional → Perform or complete specific task or solve a specific problem
- Social → Look good, gain power or status...
- Emotional → Aesthetics, feel good, security...
- Basic Need → Communication, food, transportation...



Job

“Help me perform like a professional”

Functional

“Make me efficient at my work”

Power → give me the ability to cut through thick/dense material

Speed → help me get the project done quickly

Emotional

“Make me confident that I can get the job done”

Confidence → ensure me that I can count on my equipment

Versatility → give me the ability to work in different environments

Social

“Convey my professional status”

Value → demonstrate my ability to recognize value

Status → show others that I focus on quality starting with my equipment

Guess the product from the job

I want the convenience of shopping online

I want to be able to decide how much I will pay for a product

I want an easy way to sell things I no longer need



I want an efficient way to share my pictures with all my friends and family

I want feel 'in-the-know' about things happening in my social circle

I want a way to reconnect with friends I haven't talked to in a while



I want to feel confident when having a close conversation

I want my mouth to feel refreshed

I want to kill the germs that cause bad breath



I want to show that I have the latest gadget

I want to be able to get information easily when on the go

I want to kill small snippets of time productively



I want to feel like I'm buying the best for my family

I want to be socially conscious

I want access to high-quality grocery products



What are **YOUR** Social, Emotional, and Functional Jobs?

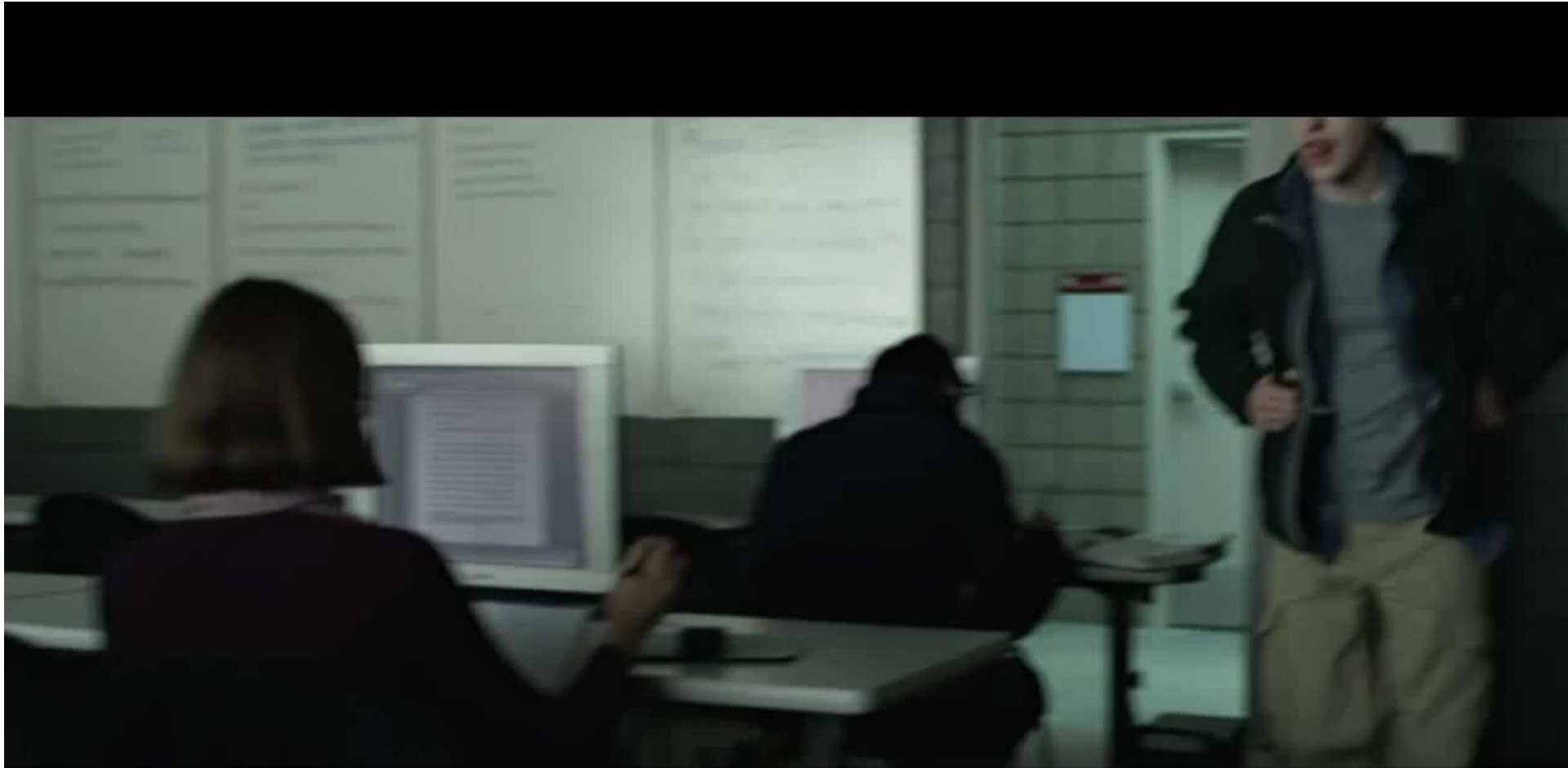
When _____
(situation) _____
(target user)

wants to _____ so he/she can
(Job to be Done)

(expected outcome)



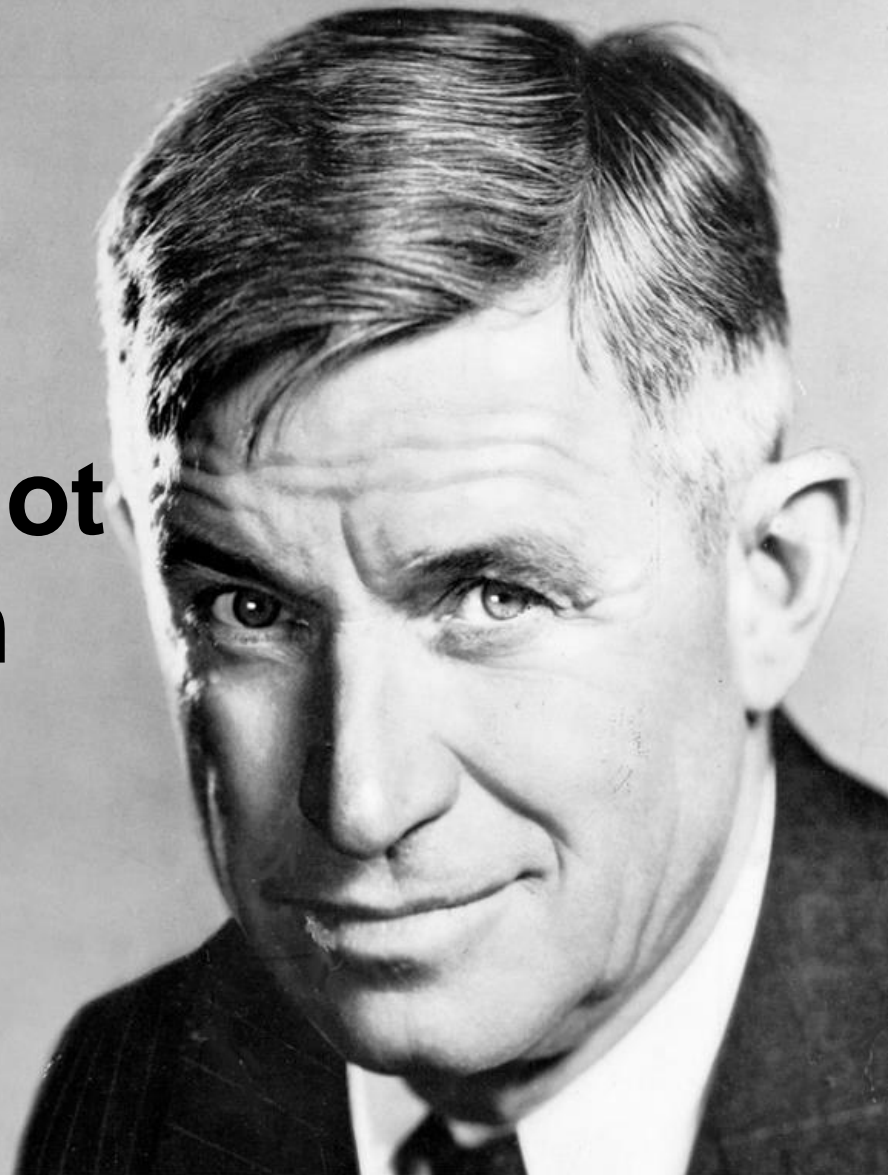
What job was Facebook created to do?





**“Good judgment
comes from
experience, and a lot
of that comes from
bad judgment.”**

--Will Rogers





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Thank you



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Entrepreneurial
Institute



VentureWell Pre-Capstone Innovation Experience Award



NSF Award Award/Contract Number: IIP-1644681