

# Cost versus Stability

## in a Cloud Environment

Cat Swetel  
August 2024



# Thank you!



# Nubank - The Tech

>2000 Clojure microservices

~200 deploys/day for backend services

## Datomic as our canonical database

An append only database intended to be backed by DynamoDB. Recent Jepsen test: <https://blog.datomic.com/2024/05/Jepsen-test-s-Datomic.html>

## AWS native bank

Over 40 AWS services

## (Roughly) Cell based architecture

Great for resilience but has cost tradeoffs



Amazon  
EC2

amazon  
S3



# THE FRUGAL ARCHITECT

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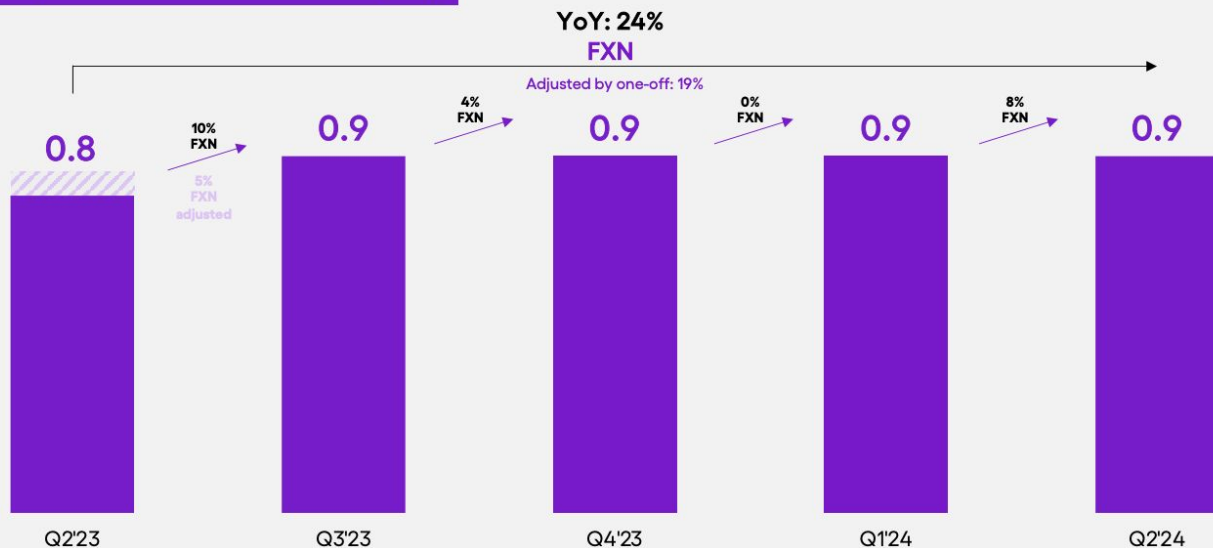
Simple laws for building cost-aware, sustainable,  
and modern architectures.





# Stable Cost to Serve Underscores Operating Leverage Potential

## Cost to Serve per Active Customer (US\$)



**Note 1:** Amounts are presented in US dollars and growth rates on an FX Neutral basis. For additional detail on calculations please refer to the appendix Non-IFRS Financial measures and reconciliations. **Note 2:** 'Cost to serve' is defined as the monthly average of the sum of transactional expenses, customer support and operations expenses (sum of these expenses in the period divided by the number of months in the period) divided by the average number of individual active customers during the period (average number of individual active customers is defined as the average of the number of monthly active customers at the beginning of the period measured, and the number of monthly active customers at the end of the period). **Note 3:** Q2'23 one-off adjustment was related to network reimbursements in Mexico. **Source:** Nu.

# Continued Growth of One of the World's Largest Digital Banking Platforms

## Q2'24 Main Highlights

**104.5MM**

Customers +20.8M YoY  
56% of Adult Population of Brazil  
83% Monthly Activity Rate

**US\$ 2.8BN**

Revenues +65% FXN YoY

**US\$ 1.4BN**

Gross Profit +88% FXN YoY  
Gross Profit Margin 48%

**US\$ 487.3MM**

Net Income +134% FXN YoY  
Annualized ROE 28%

**US\$ 562.5MM**

Adj. Net Income +131% FXN YoY  
Adj. Annualized ROE 33%

■ Customers (MM)



**Note 1:** Adult population market share is calculated as the Nu's Brazilian adult customers divided by the adult population of the country. Adult Population of the country is estimated from the 2023 Brazilian demographic census. **Note 2:** Adult population is defined as 18+ years for Brazil. **Note 3:** 'Activity Rate' is defined as monthly active customers divided by the total number of customers as of a specific date. **Note 4:** For additional detail on calculations of Adjusted Net Income please refer to the appendix Non-IFRS Financial measures and reconciliations. **Note 5:** Amounts are presented in US dollars and growth rates on an FX Neutral basis. For additional details on calculations please refer to the appendix Non-IFRS Financial measures and reconciliations. **Note 6:** 'ROE' stands for Return on Equity. It is annualized and a non-GAAP measure. Refer to the appendix Non-IFRS Financial measures and reconciliations. **Source:** IBGE, Nu.



## Pix features



### Instant solution

An instant payment solution that settles funds transfers in a few seconds, assuring the immediate availability of funds to the final beneficiary.



### Convenience

Simple experience for end users. Convenient for businesses.



### Full-time availability

24 hours every day, including no-business days.



### Low-cost functionality

No fees for people.  
Low cost for businesses, considering a very competitive market

## How Pix works

One of the greatest advantages of Pix is its transactions' speediness. And it is fast even before the transaction is initiated. Instead of asking for information regarding the beneficiary's account and/or personal data, the payer just asks for the Pix alias or scans a QR code (static or dynamic) in order to start a Pix funds transfer at any day and time.

Additionally, Pix tends to have a lower acceptance cost for merchants and businesses in general, because its transactional framework has fewer intermediaries than traditional methods of payment.

Once started, Pix transactions are irrevocable and processed individually in a few seconds. Pix will promptly notify the end users (both payer and payee) of the transaction's conclusion. With the payment confirmation, the payer has certainty that the payment was received and funds are available for the beneficiary. It must be emphasized that the Pix alias is only used to facilitate initiating a Pix transaction and, therefore, to pay with Pix it is not necessary to register a Pix alias.



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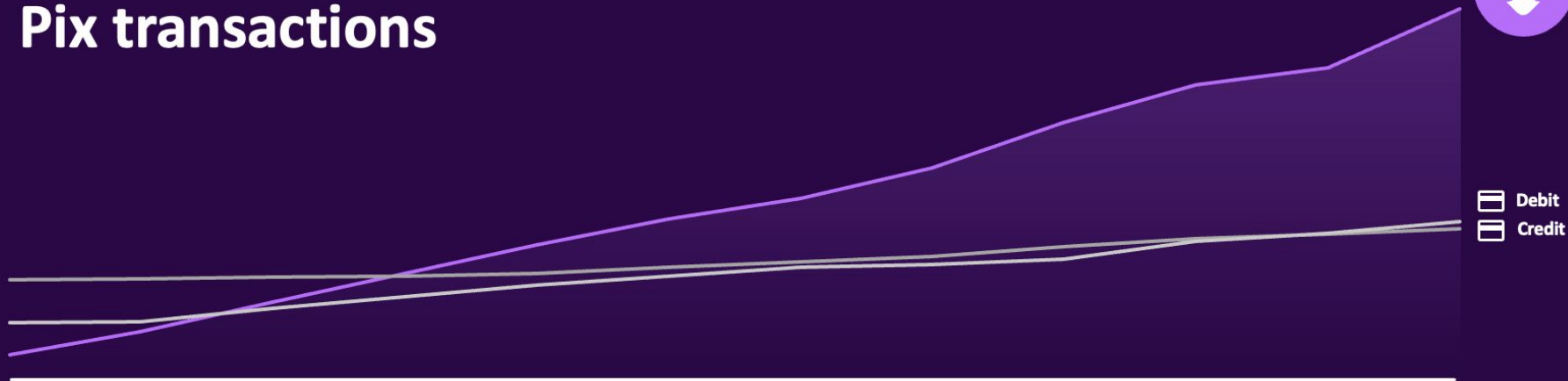
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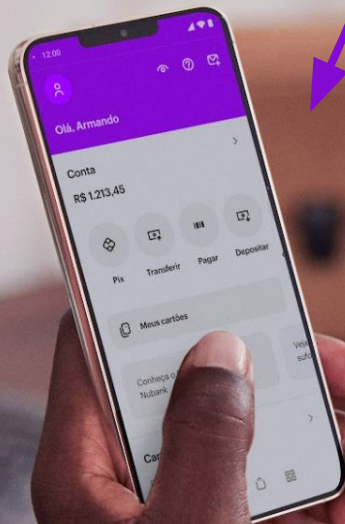


# Pix transactions





Many products  
One app









LISTED NYSE

IPO CELEBRATION

DECEMBER

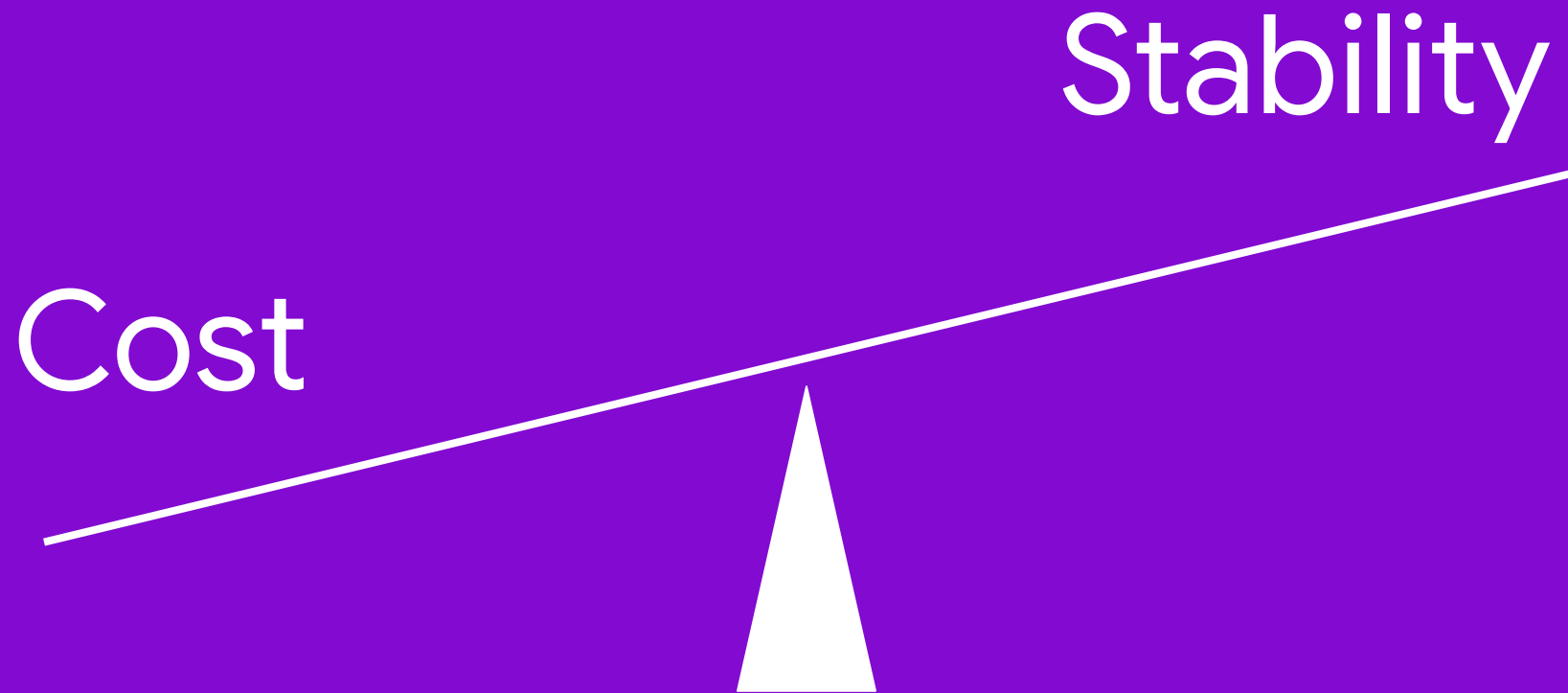
#NUDAY

NU

NEW YORK STOCK EXCHANGE

NYSE

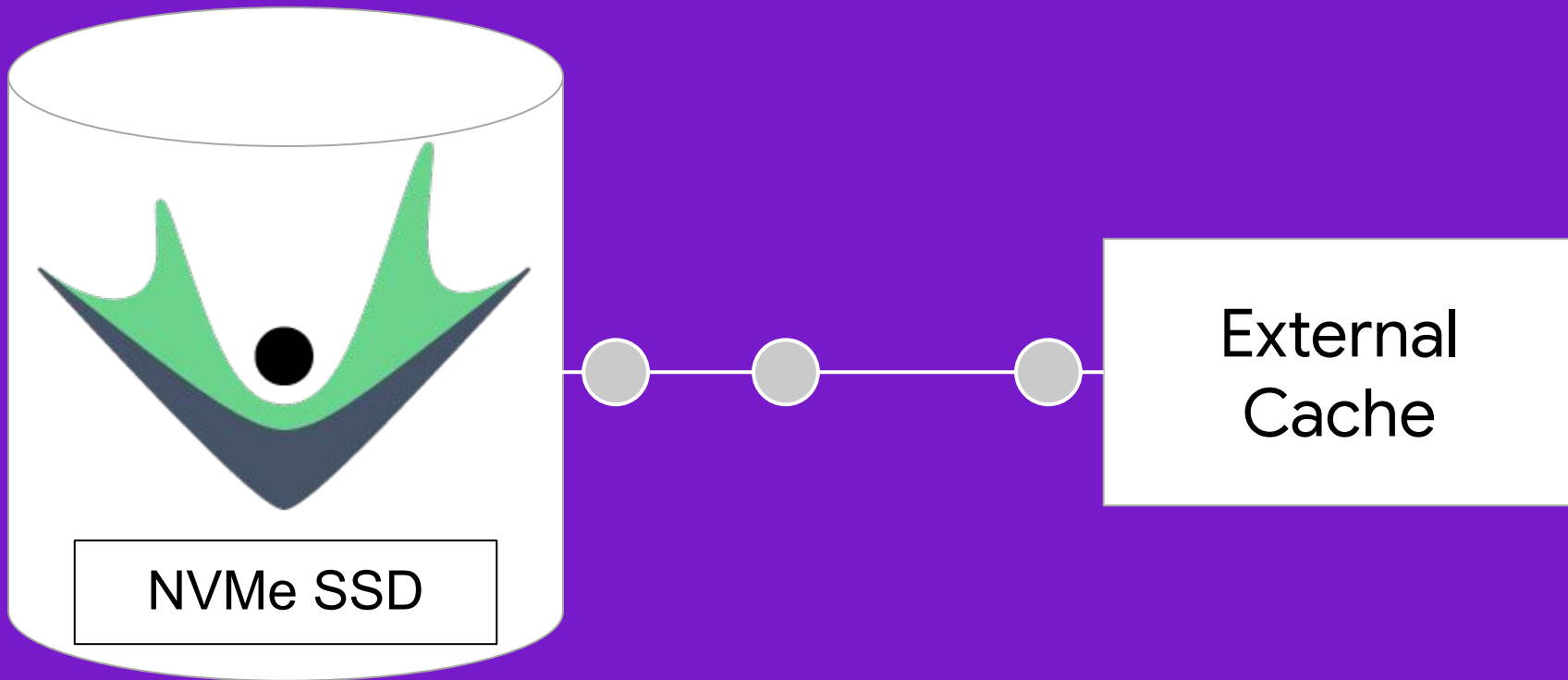




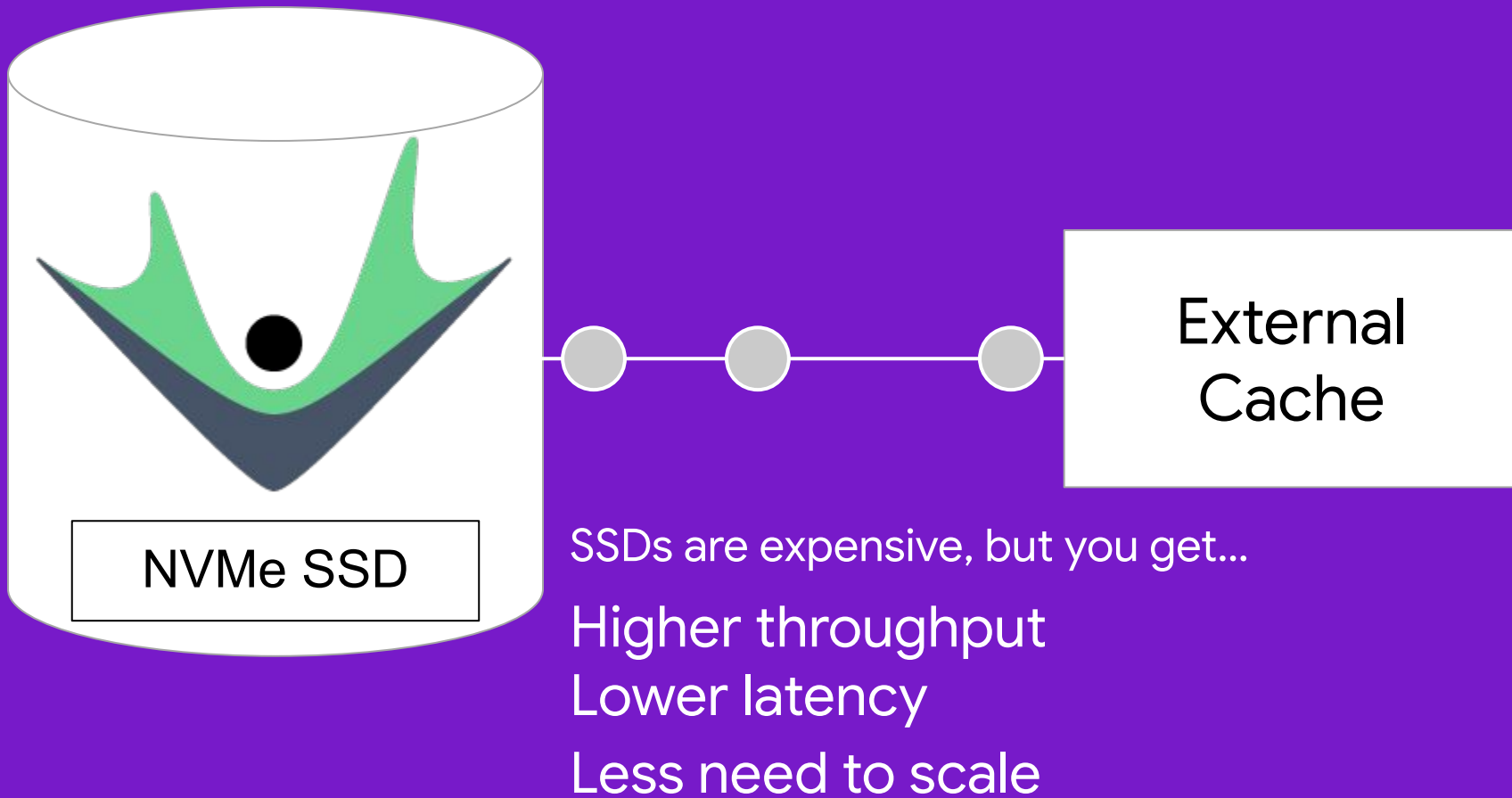
...decomposition  
...decoupling  
...other intuitive changes

...decomposition  
...decoupling  
...other intuitive stuff  
...and some ***counterintuitive*** changes









# Garbage Collector Drama

2nd counterintuitive change

## G1

Less CPU intensive

Longer GC pauses

## ZGC

More CPU intensive

Shorter GC pauses

# Garbage Collector Drama

2nd counterintuitive change

## G1

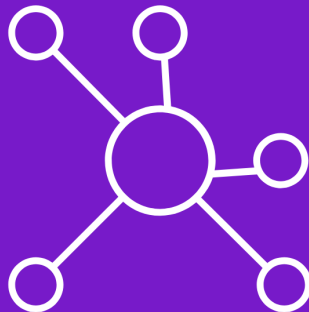
Less CPU intensive

Longer GC pauses

## ZGC

More CPU intensive

Shorter GC pauses



**More efficient:**  
Cheaper overall because  
it is *more stable* and  
*more performant*

# Culture change

Cloud cost champions  
for all established  
business units

Business unit  
classification based on  
AWS budget and  
maturity of the product



## **Cloud Efficiency:**

Drive platform and infrastructure  
efficiency improvements



## **Cloud Financial Management:**

All established business units  
(platform / infra and revenue driving)  
have a cost champion

# Culture change

Now most\* pay for use tools (internal and external) are decentralized

\*We believe some tooling should never be charged back, eg CI/CD



<https://www.cloudzero.com/>

## **Cloud Efficiency:**

Drive platform and infrastructure efficiency improvements



## **Cloud Financial Management:**

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“Every engineering decision is a buying decision.”

Erik Peterson, CTO CloudZero

# Cost

# Stability



# Is this tradeoff

# real?

Cost

Stability

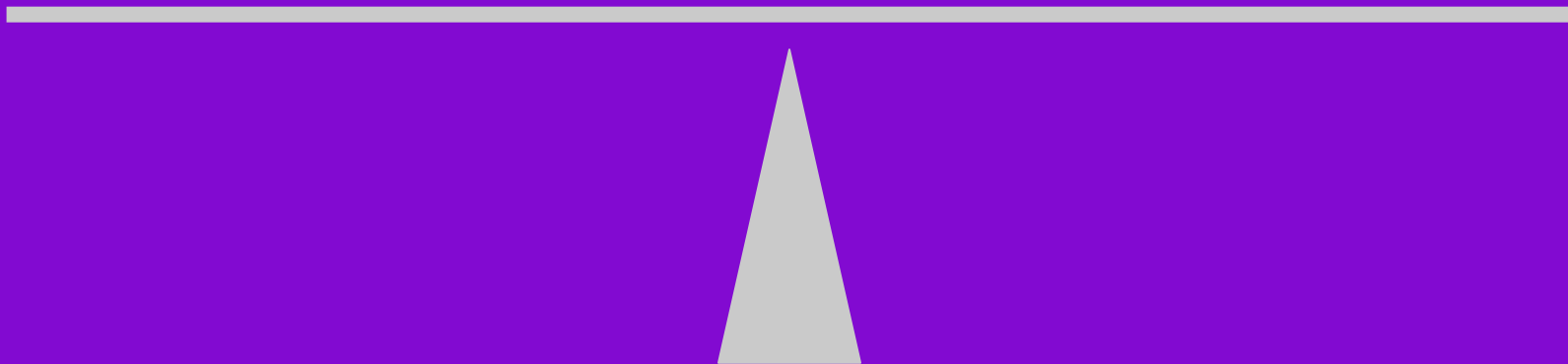


The era of

# Stable Efficiency

Cost

Stability



# What's next?

# Engineering Principles

1. Leverage through platforms
2. Customer trust is hard to earn and easy to lose
3. Data as a strategic asset
4. Ownership and technical resilience
5. Canonical approaches consistently applied
6. Multiple perspectives build better software



<https://building.nubank.com.br/nubanks-engineering-principles-interview-with-ed-wible/>

# Engineering Principles

How do we live these principles in a world of many products, many countries, one app?

1. Leverage through platforms
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# Continuous Resilience

Even as our product landscape shifts significantly every day

1. Leverage through platforms
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4. Ownership and technical **resilience**
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# ...see you next year?

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# Thank you!

## Connect on LinkedIn ->

<https://boards.greenhouse.io/nubank>

