Software Startup Ecosystems Evolution
The New York City Case Study

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Context


• Ecosystem conceptual framework and its core elements

• Each ecosystem has its own characteristics and must find ways to evolve

• Ecosystem characterization is a dynamic process and it must be analyzed over time
Literature

Papers containing the term "startup ecosystem"

Source: Google Scholar
New York Case Study

- 25 semi-structured interviews with ecosystem agents

- initial contacts + Snowballing
  - Entrepreneurs (14), investors (4), scholars (4), and other players (3)
  - 17 males and 8 females
  - Average age: 42 (std 11)
  - CEO, COO, CTO, lawyer, professor, manager, founding partner, and writer
  - 100% undergraduate degree, 38% had a master’s or MBA and 13% were PhDs
NYC Study Goals

- Map the NYC Ecosystem (minor)
- Validate and refine our Software Startup Ecosystem Maturity Model
- Fit NYC into our maturity model
- Investigate the evolution of an ecosystem over time
Interview Protocol

• Mostly the same used in
  • Tel-Aviv, Israel
  • São Paulo

• A few new questions added to be able to answer the following research questions.

• Available at
  ccsl.ime.usp.br/startups/publications
Research Questions

• What are the minimum requirements for a startup ecosystem to exist in its nascent stage?

• What are the requirements for a startup ecosystem to exist as a mature self-sustainable ecosystem?

• What are the stages that ecosystems pass through? Can they regress or die?

• Can people proactively interfere in the evolution of ecosystems? Is it possible to create ecosystems as evolved as, e.g., the Silicon Valley?
Data sources

- Literature
- Crunchbase database
- 25 Interviews with experts
Findings about New York

• Evolved from M1 (late 1990s) to M4 in 2016
What are the stages that ecosystems pass through?

- M1: Nascent
- M2: Evolving
- M3: Mature
- M4: Self-sustainable
Before the 2009 financial crisis

- NYC was mostly in the financial and services sectors.
- Engineers were comfortable with salaries paid in the financial market.
- But, in 2009 the financial market crashed...
Cultural shift in New York City after the 2009 crisis

• Market crash made many tech talents lose their jobs.

• They realized they were not as safe as they believed.

• The opportunity cost of starting a new company seemed smaller and taking the risk was no longer such an issue.

• Investors started to look for new investment opportunities (outside of financial markets).
In addition to that

- Financial district office spaces were completely empty and rental prices went down.

- To promote the recovery of real state, financial district owners offered free co-working space for new startups, with the hope that their growth in the future could bring more real state business to the district.

- Many tech people decided to invest in their education (Masters, PhDs) => more basis for tech companies
Companies founded in NYC and first investment deals

Source: Our graph from raw Crunchbase data.
NYC startups acquisitions and IPOs

Source: Our graph from raw Crunchbase data.
M4 - Boulder thesis alignment

[Brad Feld 2012]

- Bottom-up / entrepreneur-led
- Inclusive: foreign founders, 2x more women than SV, from elderly to children...
- Events: NY Tech Meetup, Digital.NYC, entrepreneurship programs
- Long-term perspective: Cornell Tech, New York Angels, 3 generations
What are the minimum requirements for a startup ecosystem to exist in its nascent stage?

- Talent and engaged entrepreneurs from the beginning
- High-quality research Universities
- Presence of big tech companies
What are the requirements for a startup ecosystem to exist as a mature self-sustainable ecosystem?

- At least three generations reinvesting their wealth
- Angel investors and mentorship
- Exit opportunities: M&A and IPOs
- Media keeps momentum and entrepreneurship awareness
What are the stages that ecosystems pass through?

M1 Nascent
M2 Evolving
M3 Mature
M4 Self-sustainable
# Maturity Model - Short version

<table>
<thead>
<tr>
<th>Maturity Metric</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Strategies</td>
<td>none</td>
<td>a few</td>
<td>several M&amp;A and few IPO</td>
<td>several M&amp;A and several IPO</td>
</tr>
<tr>
<td>Entrepreneurship in universities</td>
<td>&lt; 2%</td>
<td>2-10%</td>
<td>~ 10%</td>
<td>&gt;= 10%</td>
</tr>
<tr>
<td>Angel Funding</td>
<td>irrelevant</td>
<td>irrelevant</td>
<td>some</td>
<td>many</td>
</tr>
<tr>
<td>Culture values for entrepreneurship</td>
<td>&lt; 0.5</td>
<td>0.5 - 0.6</td>
<td>0.6 - 0.7</td>
<td>&gt; 0.7</td>
</tr>
<tr>
<td>Specialized Media</td>
<td>no</td>
<td>a few</td>
<td>several</td>
<td>plenty</td>
</tr>
<tr>
<td>Ecosystem data and research</td>
<td>no</td>
<td>no</td>
<td>partial</td>
<td>full</td>
</tr>
<tr>
<td>Ecosystem generations</td>
<td>0</td>
<td>0</td>
<td>1-2</td>
<td>&gt;=3</td>
</tr>
<tr>
<td>Events</td>
<td>monthly</td>
<td>weekly</td>
<td>daily</td>
<td>&gt; daily</td>
</tr>
</tbody>
</table>
## Metrics importance

<table>
<thead>
<tr>
<th>Maturity Metric</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Strategies</td>
<td></td>
<td></td>
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<td>Specialized Media</td>
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<td>Ecosystem generations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- **very important**
- **important**
- **not important**
Can they regress or die?

- Yes, it is possible, but rare (natural disasters, wars, persistent economic crisis)

- Transition between stages is smooth and takes years

- “the ecosystem evolution is a one-way street, because created conditions are self-reinforced”

- “These are very rare situations [to regress or die], thus the natural path is evolution”
Can people proactively interfere in the evolution of ecosystems? Is it possible to exist other M4 ecosystems?

• “what has happened in NYC can happen anywhere that has the entrepreneurial spirit and the freedom to innovate”

• “You can create a vibrant long-term startup community anywhere in the world”

• Culture is key: it changes but takes time
Conclusions

• New York, from 1990s to 2016 evolved from M1 to M4

• It is now a big global center for Fintech and Media startups

• Financial crisis of 2009 played important role

• It was a combination of the presence of human talent with proper support from institutions
Limitations and Future Work

• Interviewees are biased by their knowledge of what today is considered a successful path for technology startups.

• Medium and small local (non-tech) companies were not included in the study and need to be further investigated.

• Is culture a limiting factor?

• How to measure ecosystem connectivity and density?
We want your collaboration!

- Get in touch with us to
  - provide your feedback on the maturity model
  - include your local ecosystem in the classification

- Prof. Fabio Kon <fabio.kon@ime.usp.br>
- Daniel Cukier <danicuki@ime.usp.br>
from this slide on, slides are optional and can be used for question and answer session
Generalized Map of a Software Startup Ecosystem

- **Race, religion, gender**
  - National origin
  - Language
- **Demographics**
- **Society**
- **Culture**
  - Events
  - Media
- **Family**
  - Geopolitical status
- **Entrepreneur**
  - Supports
  - Imitates
  - Influences
- **Startups**
  - Creates
  - Enables
  - Instruments
  - Mentors
- **Technologies**
- **Methodologies**
- **Education**
  - Provides knowledge in
- **University / Research Center**
- **Incubator / Accelerator**
  - Runs
- **Established Company**
- **Market**
  - Competes with
  - Collaborates with
- **Funding bodies**
  - **Self (friends and family)**
  - Angel
  - VC
  - R&D Funding Agencies
  - Tax Incentives
  - Governmental programs
- **Financial markets**
  - Private
  - Public
- **Legal frame**
  - IP Patents
  - Tax Laws
  - Labor Laws
  - Bureaucracy
Simplified Generalized Map

- Society & Culture
- Body of knowledge
- Entrepreneur
  - Startup
    - Funding bodies
  - Organizations
  - Market
  - Legal frame
4 Maturity Levels

- M1: Nascent
- M2: Evolving
- M3: Mature
- M4: Self-sustainable
4 levels - Nascent (M1)

When the ecosystem is already recognized as a startup hub, with already some existing startups, a few investment deals and maybe government initiatives to stimulate or accelerate the ecosystem development, but no great output in terms of job generation or worldwide penetration.
4 levels - Evolving (M2)

Ecosystems with a few successful companies, some regional impact, job generation and small local economic impact. To be in this level, the ecosystem must have all essential factors classified at least at L2, and 30% of summing factors also on L2.
4 levels - Mature (M3)

Ecosystems with hundreds of startups, where there is a considerable amount of investment deals, existing successful startups with worldwide impact, a first generation of successful entrepreneurs who started to help the ecosystem grow and be self-sustainable. To be in this level, the ecosystem must have all essential factors classified at least at L2, 50% of summing factors also on L2, and at least 30% of all factors on L3.
4 levels - Self-sustainable (M4)

Ecosystems with a high startups and investment deals density, at least a 2\textsuperscript{nd} generation of entrepreneur mentors, specially angel investors, a strong network of successful entrepreneurs compromised with the long term maintenance of the ecosystem, an inclusive environment with many startups events and presence of high quality technical talent. To be in M4, the ecosystem must have all essential factors classified as L3, and 80\% of summing factors also in L3.
M4 aligned with Brad Feld’s model

- Bottom-up / entrepreneur-led
- Inclusive
- Rallying points (events)
- Long-term perspective
Objectives

- Propose a methodology to measure ecosystem maturity based on multiple factors
- Base the maturity model on the ecosystem core elements (taken from the conceptual framework)
- Help ecosystem agents to identify what are the next steps required for evolution
- Propose a theory about Startup Ecosystem evolution and dynamics
- Secondary: compare ecosystems
Methodology

• Elements of the conceptual model become factors

• For each factor, we defined 3 levels
  • started with our initial guess
  • refined in 2 steps with a dozen experts from at least 3 ecosystems

• Version 1 published and workshopped

• Version 2 refined from
  • Workshop feedback
  • New York ecosystem observations and experts feedback
Differences in Version 2

- New Angel Funding essential factor
- Access to funding changed to summing factor
- Factors measured by absolute values changed to relative
- Short version
- Metrics importance table
Maturity Model - Long version

• 22 factors - 10 essential, 12 summing

• Maturity Level is not a binary measurement, classification is fuzzy

• Some factors measurements are relative to size and there is no linearity when going to higher levels
## Maturity Model - Long version

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit strategies</td>
<td>0</td>
<td>1</td>
<td>&gt;=2</td>
</tr>
<tr>
<td>Global market</td>
<td>&lt;10%</td>
<td>10-40%</td>
<td>&gt; 40%</td>
</tr>
<tr>
<td>Entrepreneursip in universities</td>
<td>&lt; 2%</td>
<td>2 - 10%</td>
<td>&gt; 10%</td>
</tr>
<tr>
<td>Mentoring quality</td>
<td>&lt; 10%</td>
<td>10-50%</td>
<td>&gt; 50%</td>
</tr>
<tr>
<td>Bureaucracy</td>
<td>&gt; 40%</td>
<td>10 - 40%</td>
<td>&lt; 10%</td>
</tr>
<tr>
<td>Tax Burden</td>
<td>&gt; 50%</td>
<td>30 - 50%</td>
<td>&lt; 30%</td>
</tr>
<tr>
<td>Accelerators quality (% success)</td>
<td>&lt; 10%</td>
<td>10 - 50%</td>
<td>&gt; 50%</td>
</tr>
<tr>
<td>Access to funding US$ / year</td>
<td>&lt;200M</td>
<td>200M-1B</td>
<td>&gt; 1B</td>
</tr>
</tbody>
</table>
## Maturity Model - Long version

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital quality</td>
<td>&gt; 20th</td>
<td>15 - 20th</td>
<td>&lt; 15th</td>
</tr>
<tr>
<td><strong>Culture values for entrepreneurship</strong></td>
<td>&lt; 0.5</td>
<td>0.5 - 0.75</td>
<td>&gt; 0.75</td>
</tr>
<tr>
<td>Technology transfer processes</td>
<td>&lt; 4.0</td>
<td>4.0 - 5.0</td>
<td>&gt; 5.0</td>
</tr>
<tr>
<td>Methodologies knowledge</td>
<td>&lt; 20%</td>
<td>20 - 60%</td>
<td>&gt; 60%</td>
</tr>
<tr>
<td>Specialized media players</td>
<td>&lt; 3</td>
<td>3-5</td>
<td>&gt; 5</td>
</tr>
<tr>
<td>Startup Events</td>
<td>monthly</td>
<td>weekly</td>
<td>daily</td>
</tr>
<tr>
<td>Ecosystem data and research</td>
<td>not available</td>
<td>partially</td>
<td>fully</td>
</tr>
<tr>
<td>Ecosystem generations</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
## Absolute measured factors

per 1 million inhabitants

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of startups</td>
<td>&lt; 200</td>
<td>200 - 1k</td>
<td>&gt; 1k</td>
</tr>
<tr>
<td>Access to funding # of deals / year</td>
<td>&lt; 50</td>
<td>50 - 300</td>
<td>&gt; 300</td>
</tr>
<tr>
<td>Angel Funding # of deals / year</td>
<td>&lt; 5</td>
<td>5 - 50</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Incubators / tech parks</td>
<td>1</td>
<td>2 - 5</td>
<td>&gt; 5</td>
</tr>
<tr>
<td>High-tech companies presence</td>
<td>&lt; 2</td>
<td>2 - 10</td>
<td>&gt; 10</td>
</tr>
<tr>
<td>Established companies influence</td>
<td>&lt; 2</td>
<td>2 - 10</td>
<td>&gt; 10</td>
</tr>
</tbody>
</table>
## Essential / Summing factors

<table>
<thead>
<tr>
<th>Exit strategies</th>
<th>Accelerators quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global market</td>
<td>High-tech companies presence</td>
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<tr>
<td><strong>Entrepreneursip in universities</strong></td>
<td>Established companies influence</td>
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<tr>
<td>Number of startups</td>
<td>Human capital quality</td>
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<td>Access to funding US$ / year</td>
<td><strong>Culture values for entrepreneurship</strong></td>
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<td><strong>Angel Funding</strong></td>
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<td>Specialized media players</td>
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<tr>
<td>Bureaucracy</td>
<td>Ecosystem data and research</td>
</tr>
<tr>
<td>Tax Burden</td>
<td>Ecosystem generations</td>
</tr>
<tr>
<td>Incubators / tech parks</td>
<td><strong>Startup Events</strong></td>
</tr>
</tbody>
</table>
## Ecosystems Comparison

<table>
<thead>
<tr>
<th>Essential Factors</th>
<th>TEL AVIV</th>
<th>SÃO PAULO</th>
<th>NEW YORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>L3 (9)</td>
<td>L2 (9)</td>
<td>L3 (10)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summing Factors</th>
<th>TEL AVIV</th>
<th>SÃO PAULO</th>
<th>NEW YORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 (7), L3 (6)</td>
<td>L1 (8), L2 (5)</td>
<td>L2 (4), L3 (8)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maturity Level</th>
<th>TEL AVIV</th>
<th>SÃO PAULO</th>
<th>NEW YORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature (M3)</td>
<td>Evolving (M2)</td>
<td>Self-sustainable (M4)</td>
<td></td>
</tr>
</tbody>
</table>