Exploring Mutation in Digital Platforms: A Case of Video Game Digital Platform

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Motivation

- Design principles for information infrastructure (Hanseth and Lyytinen 2010)
- Evolutionary dynamics of digital platforms (Tiwana et al. 2010)

1. Design initially for usefulness
2. Build upon existing installed base
3. Expand installed base to gain momentum
4. Make design as simple as possible
5. Modularize

Short-term
- Composability
- Malleability
- Evolution rate
- Envelopment
- Derivative mutation
- Survival / Mortality
- Durability

Long-term
- Bootstrapping
- Adoption
- Adaptation
## Timeline of events

<table>
<thead>
<tr>
<th>Date</th>
<th>Key events</th>
<th>Dynamics</th>
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</thead>
<tbody>
<tr>
<td>2004</td>
<td>Unity emerges as a video game engine platform only for Mac OS. The engine followed an unsuccessful launch of a video game.</td>
<td>DP 1; DP 4; DP 5; Derivative mutation</td>
</tr>
<tr>
<td>2005</td>
<td>Unity is adapted for PC and web browsers; plug-ins, a Software Development Kit and API are created</td>
<td>DP 2; DP 3; DP 5; Evolution rate; Feedback loops</td>
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<td>2006</td>
<td>The Unity guys were runner-up in the Best OS X Graphics category in the 2006 Apple Design Awards</td>
<td>DP 2; DP 3; DP 5; Evolution rate; Feedback loops with 3rd party</td>
</tr>
<tr>
<td>2008</td>
<td>Launch of the first video game engine to support iPhone. Cartoon Network Network used Unity3D to create FusionFall, an MMORPG for kids that’s been played by 8 million people.</td>
<td>DP 2; DP 3; DP 5; Evolution rate; Feedback loops</td>
</tr>
<tr>
<td>2009</td>
<td>Electronic Arts uses Unity to make Tiger Woods PGA Tour Online. Microsoft and Ubisoft became customers. A secondary market emerges in which open source libraries and other assets that were created by Unity users were traded.</td>
<td>DP 2; DP 3; DP 5; Evolution rate; Feedback loops</td>
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<td>2010</td>
<td>Unity releases version 3.1 of the platform which integrates its own marketplace “Unity Asset Store”. With the asset store programmers, game designers, texture artists or 3D modelers can sell and buy creations from each other.</td>
<td>DP 2; DP 3; DP 5; Envelopment; Feedback loops</td>
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</tbody>
</table>
Emergence of a secondary market

Developers

Secondary market

Developers

Developers

SDK

API

Reaction – Unity Asset Store

"We noticed that users were already building business like this themselves (...). Unity Asset Store is a platform for sharing and trading between users, and it’s a pretty wild piece of software" (David Helgason, 2010, CEO Unity)
Unity as a case of derivative mutation

- Unity video game engine platform emerged after the video game which was built was unsuccessful

  Gamers

  Video game

  Video game engine

  Programmers, designers, …..

- **Derivative mutation:** “unanticipated, serendipitous creation of a spin-off platform or module that inherits some properties of the parent but with a completely different function than its parent” (Tiwana, 2010, p.682).
Derivative mutation (Tiwana et al. 2010)

- Spin-off platform or module
  - Merriam-webster
    - a significant and basic alteration
    - a relatively permanent change in hereditary material involving either a physical change in chromosome relations or a biochemical change in the codons that make up genes
- What mutates? Functionality
- Who/What causes the mutation? Manipulation of platform owner:
  - “Mutation is akin to exercising a growth option in real options lingo. Just as species can break out of competitive exclusion by diversifying, platforms can break out of the race to the bottom by diversifying into different markets where their existing assets give them some advantage over the incumbent rivals. A platform owner must first clearly articulate exactly how—using the resource litmus test—its assets can be a distinctive advantage in the target market.”
  - Influence by the alignment between architecture and governance

Questions ????

- Derivative mutation is specific of digital platforms/infrastructure but....
- Do other classes of mutation exist? (causes)
- Which elements of a digital platform can mutate?
# Mutation in biology.... Causes

<table>
<thead>
<tr>
<th>Mutation Causes</th>
<th>Biology</th>
<th>Description</th>
<th>Digital infrastructures/platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous mutation</td>
<td>Natural rearrangements of sequences of DNA as a consequence of repositioning of certain of its parts.</td>
<td>Changes in a digital infrastructure by rearranging its existing modules.</td>
<td></td>
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<tr>
<td>Error prone replication by-pass</td>
<td>The DNA replicates itself, including its errors, forming new mutations. Errors are understood as any variations from the original intend.</td>
<td>Side effects in a digital platform create a new digital platform in which the previous side effects become part of the new platform.</td>
<td></td>
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<tr>
<td>Errors introduced during DNA repair</td>
<td>Mutation happens when errors detected in a DNA sequence are repaired.</td>
<td>Actions taken to mitigate or fix the side effects of a platform change the platform itself.</td>
<td></td>
</tr>
<tr>
<td>Induced mutation</td>
<td>Mutation happens because of the effect of an external agent (chemical or radiation).</td>
<td>An external agent (another platform, 3rd party developer, etc.) changes the host platform.</td>
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# Mutation in biology.... Types

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<td>By effect on structure</td>
<td>The output functionality is the same but the structure is different.</td>
<td>The functionality of a platform remains the same, but with a different configuration of its modules.</td>
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<tr>
<td>By effect on function</td>
<td>Loss or gain of functions. It might also include lethal mutations (that lead to the death of the organism that carries it).</td>
<td>New functionalities are introduced to the platform or removed from the platform. Any of these changes might also kill the platform.</td>
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<tr>
<td>By effect on fitness</td>
<td>Whether the mutation is beneficial or harmful as it increases or decreases the fitness of the organism (an organism’s fitness is its ability to survive and reproduce).</td>
<td>The changes in the platform affects in a beneficial way (increases its generativity) or harmful way (decreases its generativity).</td>
<td></td>
</tr>
<tr>
<td>By impact on protein sequence</td>
<td>Increases or decreases certain functionality.</td>
<td>The changes in the platform: modules increase or decrease the output of certain functionality.</td>
<td></td>
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<tr>
<td>By inheritance</td>
<td>Mutation is acquired from the combination of parents’ conditions.</td>
<td>Resulting platform incorporates modules of the forming or parent platforms.</td>
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</table>
Concluding remarks

- Derivative mutation as a specific case of digital platforms (not present in organisms)

- Mutation causes and types from biology as an alternative to evolutionary dynamics (survival, durability, envelopment, evolution rate, derivative mutation, composability, malleability, ...) used by the digital platform and infrastructure literature

- Which design and governance principles favor each of the mutation types?

Thank you very much.