An Ecosystem View of Developer Productivity

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Consider the development work in scientific software ecosystem:

- Software ecosystem
- Software ecosystem in science

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Scientific software work needs to deal with its complexities:

- Organizational complexity
- Science complexity
- Technology complexity: external/internal

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Technology complexities within scientific software ecosystem:

Use-contexts of software components

- Dependency structure
- Complementarity

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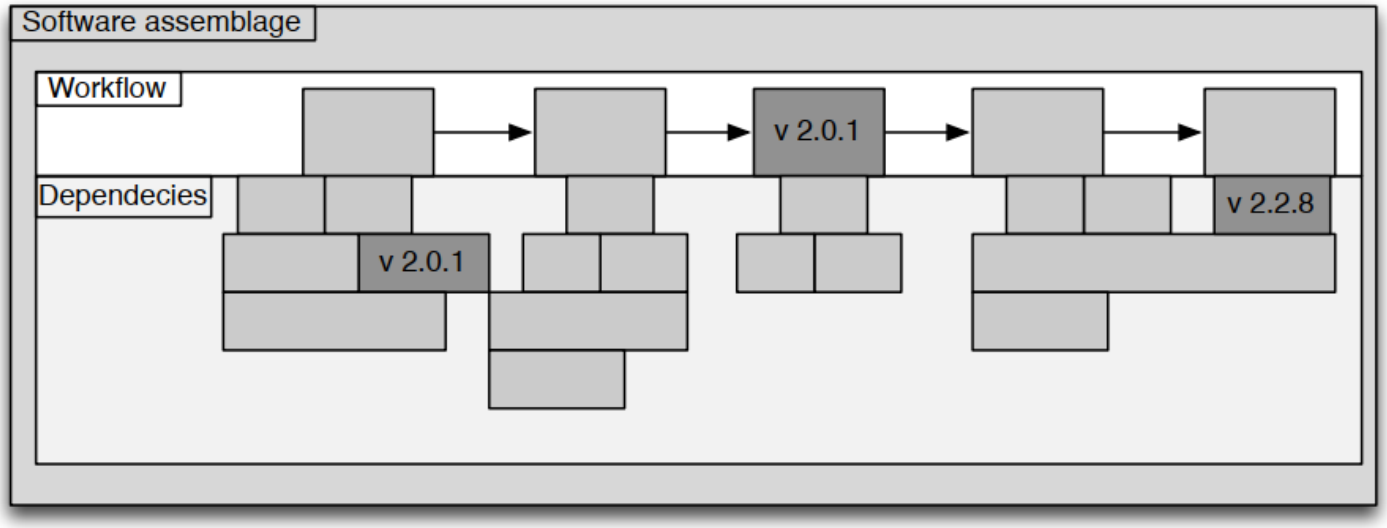
How do researcher-developers use software components?



Edwards, Batcheller, Deelman, Bietz and Lee, Segal, De Roure and Gobels, Ribes and Finholt, Howison and Herbsleb

How do researcher-developers use software assemblages?

- Researcher-developers periodically revisit software: reuse, extend, etc.
- Assemblages constantly shifting: components update, new release, etc.

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In reality…

- Dependency hell
- High ongoing maintenance cost

…that demotivates researcher-developers to work with software

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What's worse…

- Cascading change (exponentially exacerbates the problem)
- The production and use of software components depart from each other
- Intractable ecosystem. Science in face of high technical debt

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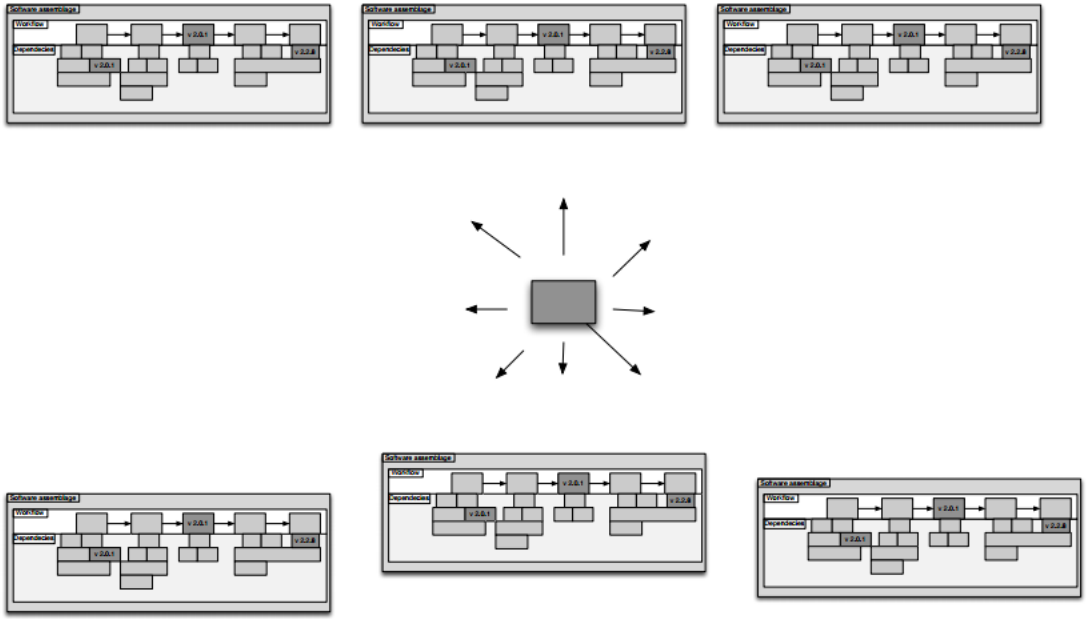
The ecosystem disorder is driven by…

Number of users (reuse)



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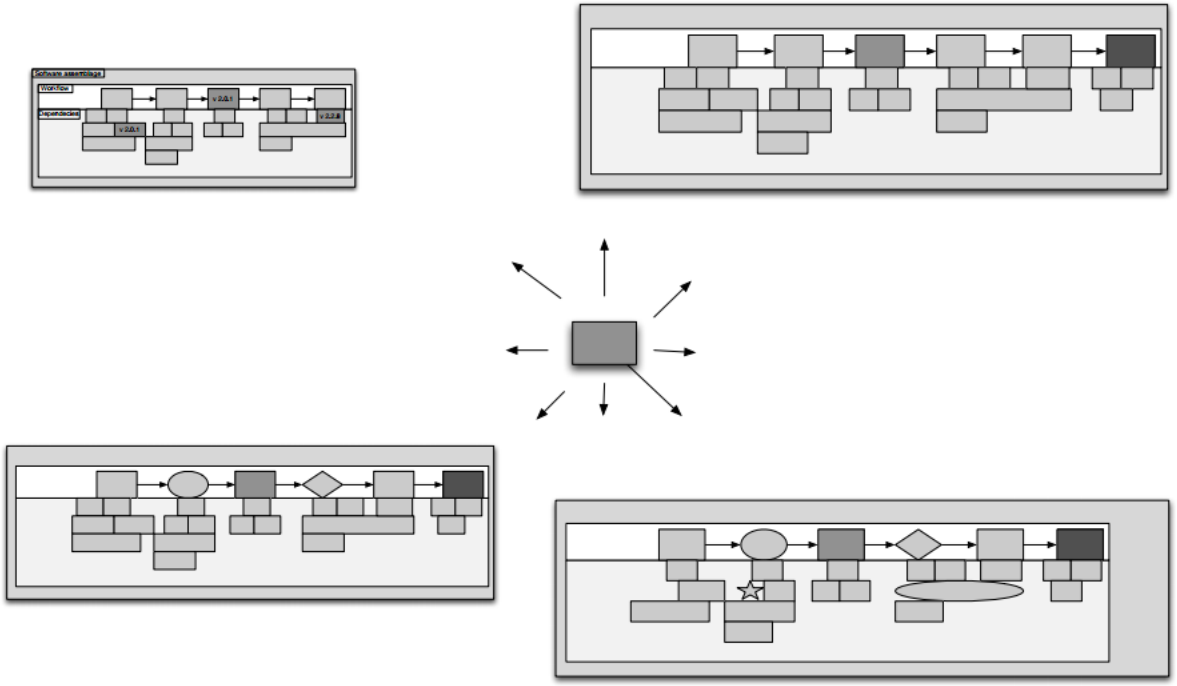
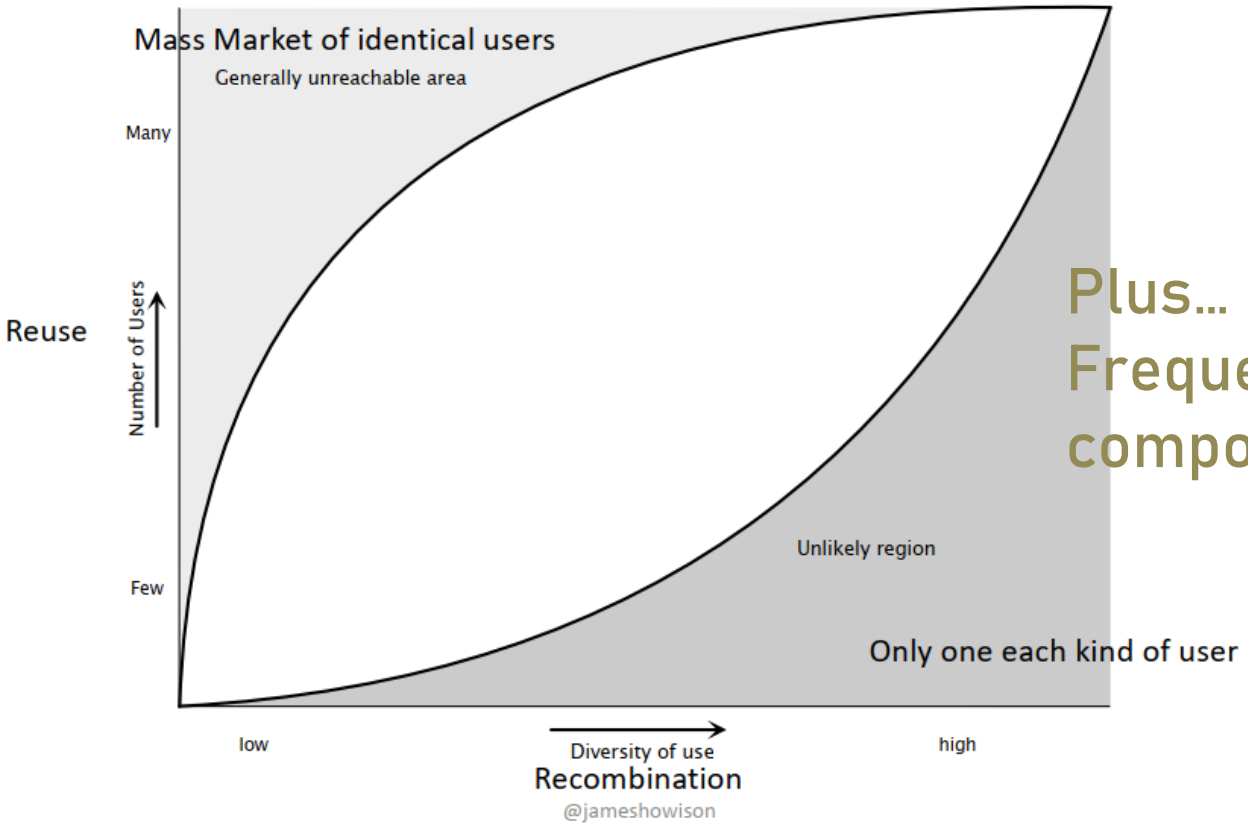
The ecosystem disorder is driven by…

Diversity of use (recombination)





Plus…
Frequency and rhythm of component change

To counteract ecosystem disorder…

Three types of work needed at the ecosystem level:

- Sensing: understanding impactful changes in use-contexts
- Adjustment: local adaptation to changes in use-contexts
- Synchronization: coordinated change among interconnected components

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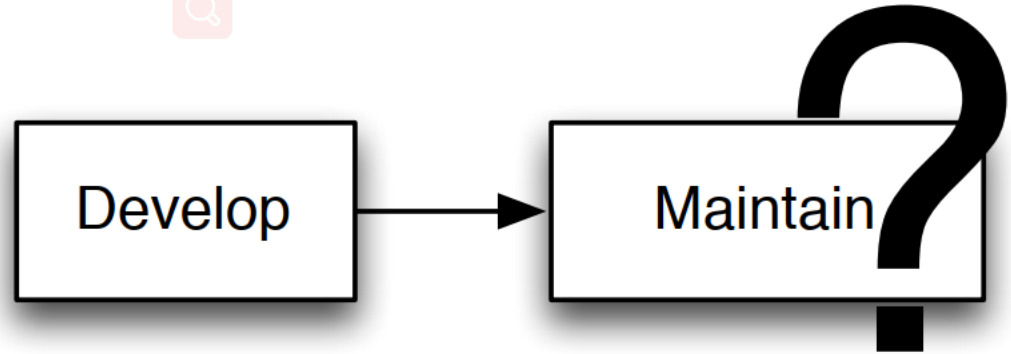
The challenge is…

How to motivate, organize, and implement coordinated, continuous development at the ecosystem level?



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Thanks!

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