Governance Structures of Free/Open Source Software Development

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[1]

The theory of **decreasing returns to scale** holds that increasing the number of persons working collectively has a negative effect on group performance because of (a) increased coordination costs and (b) reduced individual motivation.

[2]

Modularity theory holds that **modularity** [*a design principle implemented by breaking down a product into autonomous and independent components*] increases the potential number of persons that could work on a distributed project and has a positive effect on their productivity because it allows them to work independently of each other, with little or no need for active coordination.

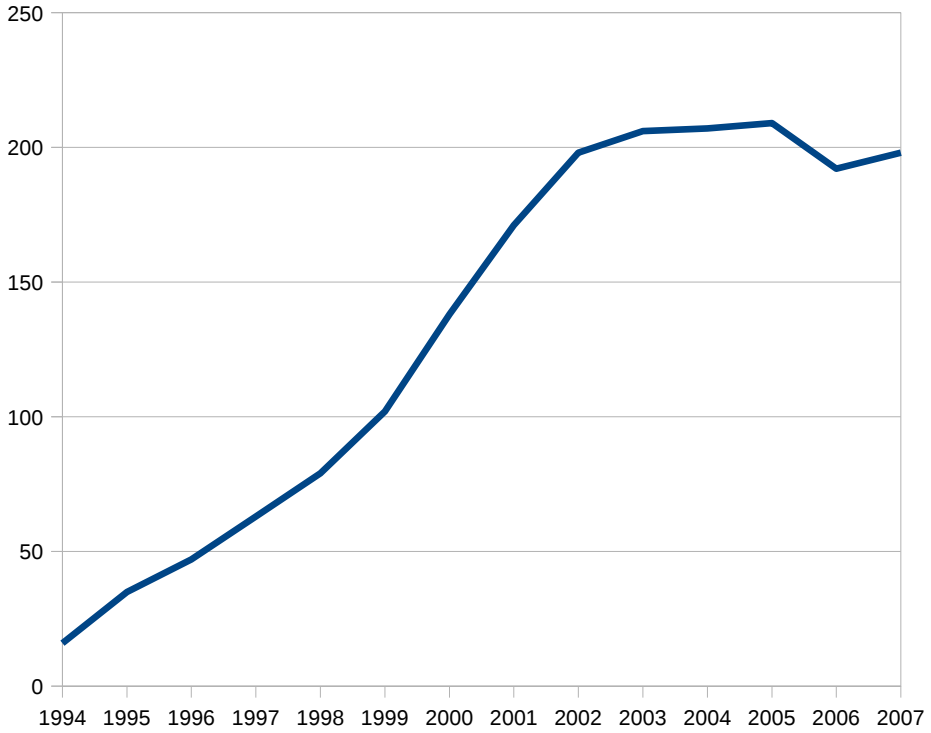
[3]

The theory of the **iron law of oligarchy** holds that a group's ability to self-organise diminishes as it grows larger, thereby necessitating hierarchical coordination.

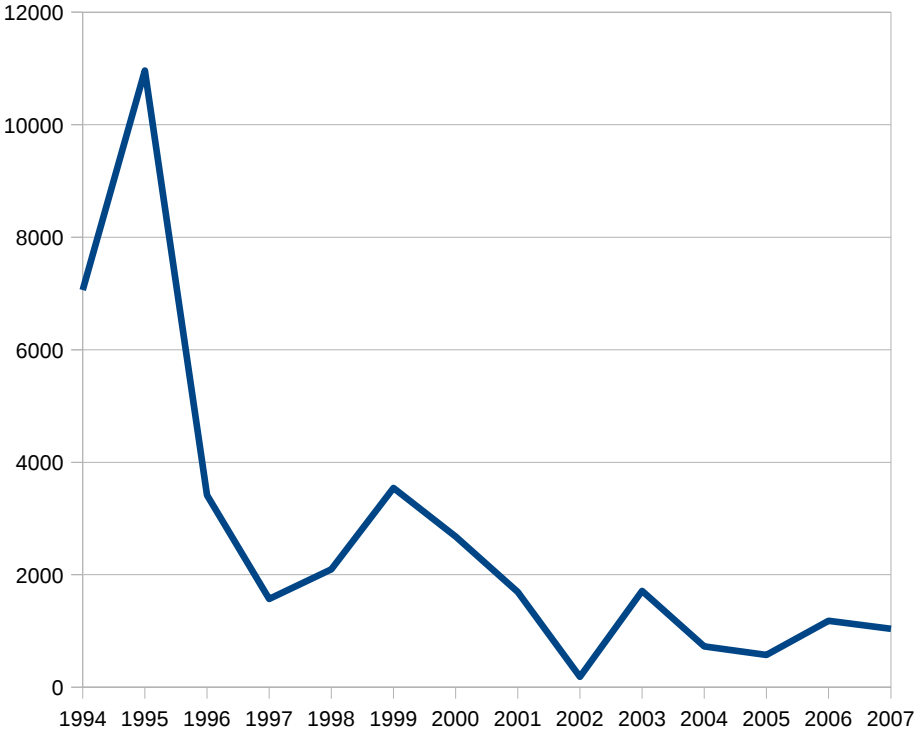
To test these theories, we looked at the development of FreeBSD, a free/open source software (FOSS) operating system, over a period of 15 years, in which time the number of persons developing it increased dramatically from a dozen people to several hundred.

[1]

The increase of FreeBSD developers resulted in a fall in group performance:



Committers



LOC added per committer

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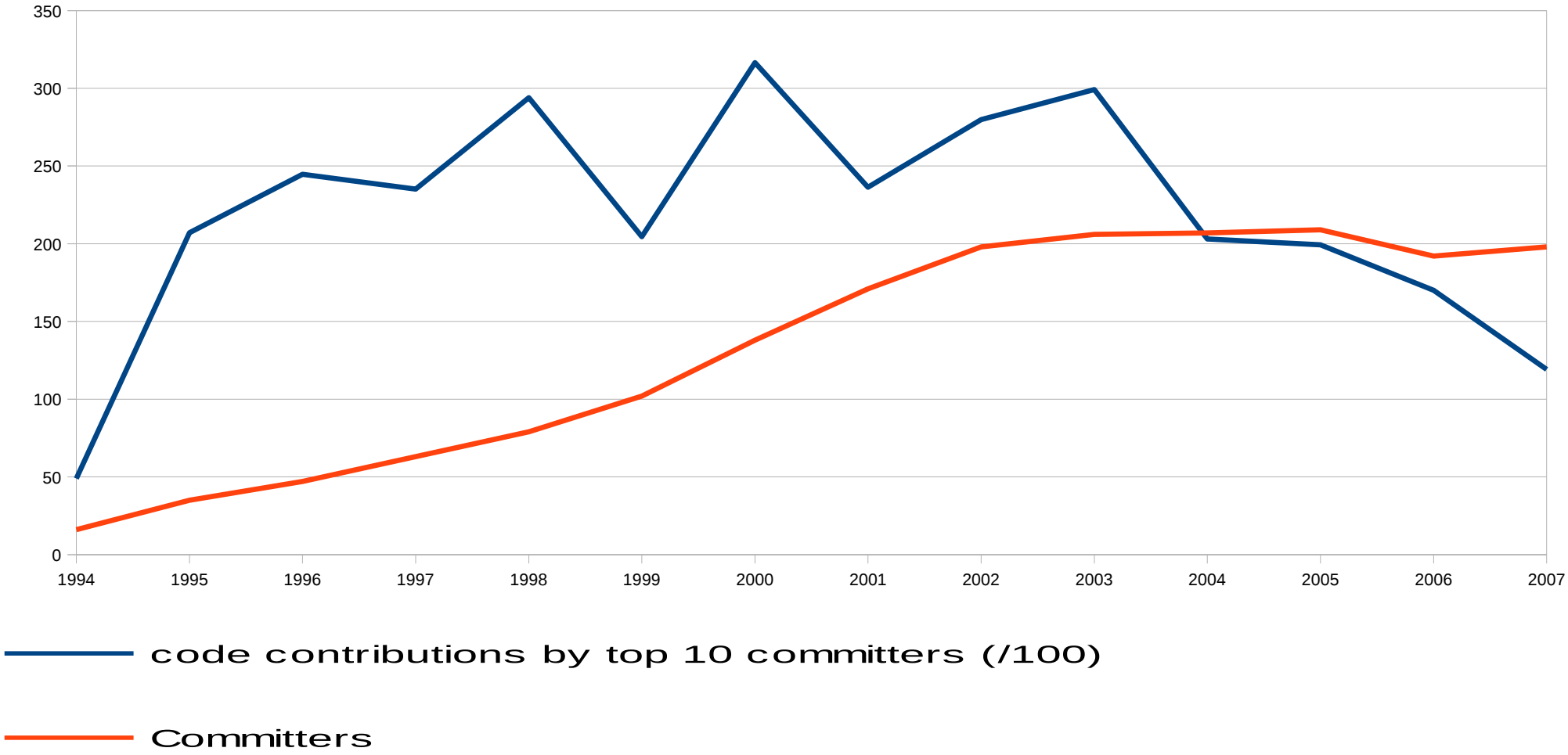
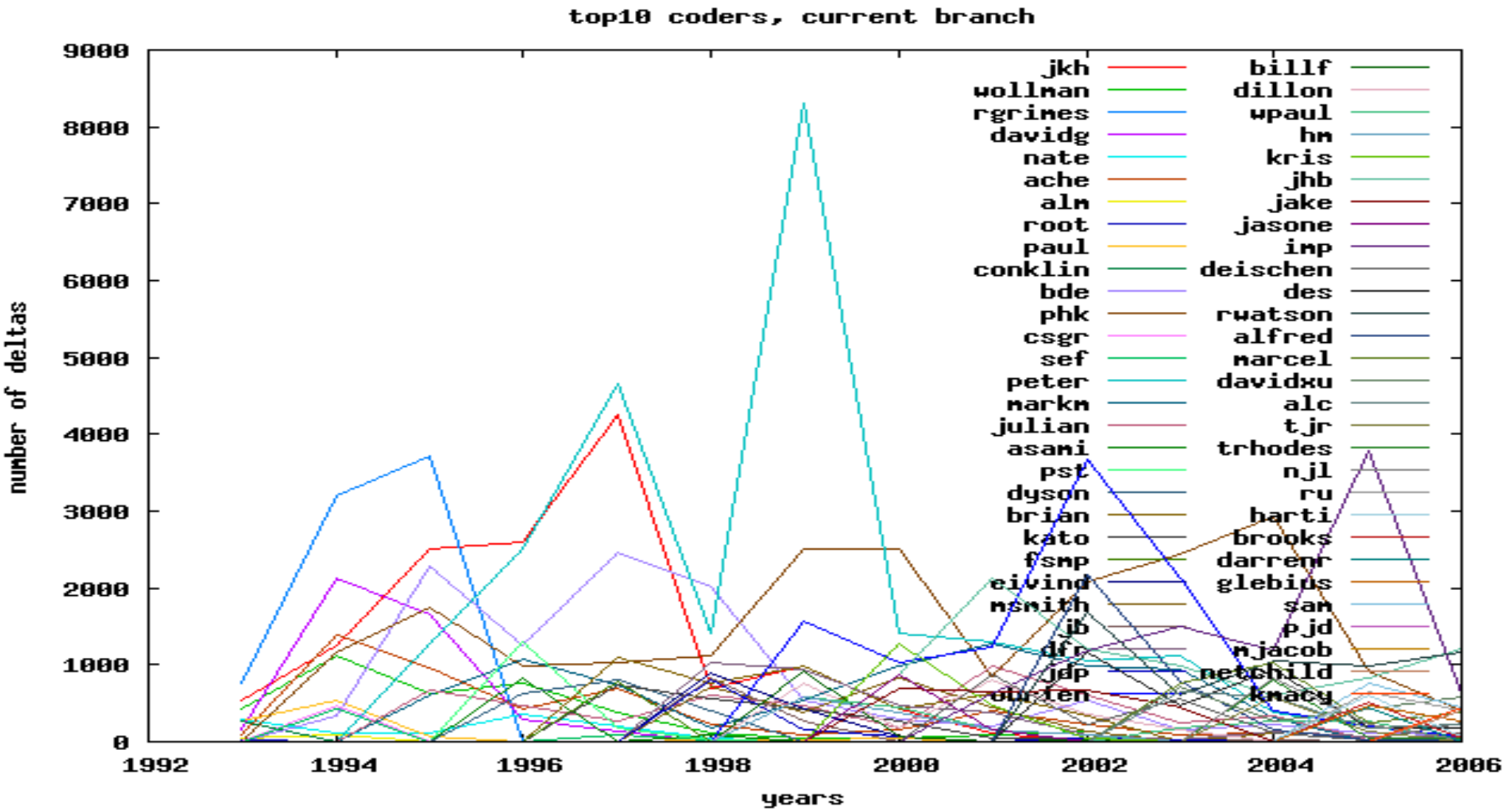


This means that core developers either spend more time on the project over time or their work is not burdened with higher coordination costs

- To find out, we did a survey
- Top 10 committers over time: 58 persons
- Sent email questionnaire to 53; 28 replied (52.8%)



Results

- The majority remarked the tendency to spend more time on the project over time
- Crucially, the need to coordinate changes increases in proportion to the scope of coding tasks one tackles
- So, the relation coordination costs-scale is mediated by the scope of coding tasks one chooses to work on

More results

In fact, our statistical tests show that increasing group size has a positive effect on their performance. Larger groups enable a more extensive division of labour, enabling core developers to focus on their task of choice, namely new code development.

Modularity effect?

[2]

Strong empirical support for claimed benefits of modularity:

- Positive effect on number of committers
- Positive effect on average group performance in large-scale settings
- Positive effect on core developers performance in large-scale settings

Modularity creates the conditions in which a project can take advantage of the benefits of a more extensive division of labour without incurring a productivity loss

[3]

Increase of scale did not result in hierarchy: This organisational outcome is accounted for by the normative standard of individual autonomy of action (*subjective conditions*) and, equally important, by the distributed environment in which FOSS projects operate (*objective conditions*: participants are not bound by relations of economic dependency; they are dispersed around the world; they can easily walk in and out of a project)


thank you