Global brain inspired alignment by Drupal: between strategic problems, practical web development and cognitive insights.

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The global brain is a metaphorical description of what the Internet can become. For many, the Internet is a knowledge system, but a brain is about intelligence. This paper will make a global brain inspired alignment by adding the notion of aggregative intelligence to the global brain vision. Such an alignment can be particularly useful for R&D management. The paper will present a case study, an interdisciplinary analysis and an action-research experiment. The case is about Drupal, an open source content management system. The interdisciplinary analysis is about complex adaptive systems, multi-agent systems and feedback mechanisms. The case and the analysis lead to alignment statements, which are further illustrated by an action-research experiment. The experiment is about the course "Web Service Development for Business". In this course, the alignment statements are applied to build social-software and web 2.0 applications, using Drupal as framework. The case study, the analysis and the experiment denote hypotheses that can be verified in future studies.

1. Introduction

The global brain concept is about a worldwide network evolving towards a super brain (Mayer-Kress and Barczys, 1995; Heylighen, 1997). The global brain is not pro-actively built: visions follow after practice. Indeed, so far mostly practitioners delight in the web as an entrepreneurial utopia. For example, venture capitalists took more risk after they saw rises in stock valuations of dot-com companies. Likewise, concerning web 2.0, businesses only recognized the web was a platform after practitioners created such application frameworks.
In a similar way, this paper looks at current practice to shed new light on the global brain vision, which in turn will renew strategic alignment for web development. This new light involves inclusion of intelligence in the global brain vision.

With respect to intelligence, our current practice shows an intriguing phenomenon. On the one hand, problems in Artificial Intelligence (AI) indicate that *intelligence is a hard-to-trade skill*, which makes it hard to engineer, but also of tremendous economic value. Even though AI is successful in specific niches, general artificial intelligence – known as strong AI (Searle, 1980) – is barely touched upon. On the other hand, *intelligence has become abundant*, through the web as a global communication platform (Friedman, 2005). Such intelligence can be coordinated to execute tasks usually done by experts (Surowiecki, 2004). Regarding this so-called crowdsourcing (Howe, 2006), the challenge is to direct abundant (amateur) intelligence and coordinate it towards solving complex problems, which usually can be solved only by scarce (professional) intelligence. Indeed, we don't have to build intelligence, but can aggregate it.

We will intentionally create ambiguity in this paper by using the abbreviation "AI" for *Artificial-or-Aggregative Intelligence*. This is because intelligence for the global brain is artificial – man made as opposite to spontaneous (Simon, 1969) – and aggregative (e.g. crowdsourcing). Hence, including intelligence to the global brain is *AI-alignment*.

AI-alignment is about mediating people's intelligence by social-software. In this way, bidirectional coordination between people and technology arises. In fact, such

bidirectional coordination is not exclusive for the web. It is part of a broader technological evolution, which becomes clearer with IT and overwhelmingly clear with web applications. This evolution of bidirectional coordination enables us to expand our understanding from well-controlled environments – containing many static elements – to Complex Adaptive Systems (CAS).

Understanding well-controlled environments is necessary as a solid scientific foundation. As research matures in several disciplines, researchers are now starting to work on the harder problem of understanding CAS. For example studies on the history of technology show how models of Smithian growth get complemented with models of Schumpeterian growth (Mokyr, 1995).

In innovation management, many scholars introduce their concepts by expanding a simple static problem to a harder dynamic problem – 'static' and 'dynamic' here referring to specific skills for conducting a certain innovation. Similar dichotomies are, amongst others, incremental / radical (Freeman and Soete, 1997), continuous / discontinuous (Hamel and Prahalad, 1994), sustaining / disruptive (Christensen 1997) and component / architectural (Henderson and Clark 1990).

Remarkably, the same division can be observed in natural science, where a shift from Newtonian science to Darwinian science is occurring. This shift is particularly apparent in Newtonian physics, which is being expanded in three directions. The first two directions maintain time symmetry: quantum mechanics and general relativity. A third direction is breaking down the idea of determinism by including irreversibility and instability (Prigogine 1997). Irreversibility and instability are central to Darwinian science, as irreversibility is a necessary condition for growth, and as instability triggers self-organization.

The history of Darwinian physics, according to Prigogine (1997), began in 1893 with Poincarés solution to the "three body problem", a prototypical problem in the Newtonian paradigm. Other Darwinian sciences emerged more or less during the same time period (e.g. fractals). At the end of the 19th century, few people knew the concepts, but by the 70s they got widely disseminated (e.g. computer-constructed Mandelbrot in 1975, Prigogine's Nobel Prize in 1977). As Darwinian science is disruptive and evokes widespread resistance from the science community, it has emerged only slowly.

As the Schumpeterian growth model is essentially Darwinian in nature, the model is often met with similar intuitive defiance. Familiarity with the history and the models of Darwinian science may make the Schumpeterian growth model more plausible, despite this intuitive defiance. Think about Pasteur's famous quote: *fortune favours the prepared mind*.

This paper should be seen in light of Darwinian science and Schumpeterian growth. The research method applied so far is action-research, which strives to create experience and build theory based on that experience. The paper has tree parts: a case study, an interdisciplinary analysis and an action-research experiment.

The case study is about a re-opening Content Management System (CMS) market. It is in these turbulent markets, where no design has become dominant yet and economic value are redefined, that state-of-the-art strategic innovation management should be researched. More specifically, the case concerns Drupal. It is argued that Drupal can become the dominant design of the CMS market.

The interdisciplinary analysis crosses domain borders to create a particular story. It starts with innovation management in relation to CAS. The management domain shows relation to CAS properties, but not to CAS mechanisms. There are conceptual CAS mechanisms and CAS feedback mechanisms, both get elaborate by *creative agents* (Kiemen 2003, 2006). The mechanisms will help the transformation from an agent-based simulation to a web framework that mediates people. The mechanisms are also the reason why we stimulate ambiguity by using AI (Artificial-or-Aggregative Intelligence). Some argumentation will be given in respect to this ambiguity.

The case and the analysis build up to statements for AI-alignment, which get examined by action-research experiment on a course. The goal of the course Web Service Development for Business (WSDB) is to teach business students about opportunities for a future web development. This is a very ambitious goal if you consider the innovation speed on the web. The course is now running in its fourth year. During the years it turned out that Drupal was the best option to create prototypes.

2. Drupal case

OS projects generally are disruptive innovations, as they redefine the economic value of software development. Hence, OS is particularly useful for new markets. However, the generality of prior statement is a bit of a drawback. It would be more interesting to have a theory that can indicate, for a similar market, which projects payoff and which fail. In this case, our hypothesis is that Drupal will most likely become the dominant design for the CMS market. By comparison, we reason for our hypothesis.

Comparing the evolution of several players gives a practical way to perceive what is emerging. We will leave a more fundamental theory concerning emergence and aggregation to the interdisciplinary analysis. Still, a small example can illustration the subtlety of the problem we are dealing with. The problem to see what is emerging is about a holistic view or Gestalt. Seeing only part of the picture leads to wrong conclusions.

For example, Tuomi (2005) criticizes Linux for not being genuinely innovative, as Linux is simply re-implementing functions that exist in Windows. Now, Linux's growth is slow compared to other web projects. In this respect, the Linux case should be compared to Christens's Bobcat case (1997): its growth is spread over generations of other, similar technologies. Insight on slowly emerging innovation arises by historical studies. Mokyr (1995) elaborates that a re-implementing technieks is a key feature for slow innovations. To take Tuomi's purely functional perspective, a long time will pass before we see innovation on top of what is re-implemented. So it is way to early to make any conclusion.