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Gartner's Hype Cycle: A Simple Explanation

Jose Perez
The University of Texas at El Paso, jlperez8@miners.utep.edu

Vladik Kreinovich
The University of Texas at El Paso, vladik@utep.edu

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Gartner's Hype Cycle: A Simple Explanation

Jose Perez and Vladik Kreinovich

Department of Computer Science
University of Texas at El Paso
500 W. University
El Paso, TX 79968, USA
jmperez6@miners.utep.edu, vladik@utep.edu

Abstract

In the ideal world, any innovation should be gradually accepted. It is natural that initially some people are reluctant to adopt a new largely un-tested idea, but as more and more evidence appears that this new idea works, we should see a gradual increase in number of adoptees – until the idea becomes universally accepted.

In real life, the adoption process is not that smooth. Usually, after the few first successes, the idea is over-hyped, it is adopted in situations way beyond the inventors' intent. In these remote areas, the new idea does not work well, so we have a natural push-back, when the idea is adopted to a much less extent than it is reasonable. Only after these wild oscillations, the idea is finally universally adopted. These oscillations are known as *Gartner's hype cycle.*

A similar phenomenon is known in economics: when a new positive information about a stock appears, the stock price does not rise gradually: at first, it is somewhat over-hyped and over-priced, and only then, it moves back to a reasonable value.

In this paper, we provide a simple explanation for this oscillation phenomenon.

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1 Gartner's Hype Cycle

How innovations should be adopted. In the ideal world, any good innovation should be gradually accepted.

It is natural that initially some people are reluctant to adopt a new largely un-tested idea. However:

- as more and more evidence appears that this new idea works,
- we should see a gradual increase in number of adoptees –
- until the idea becomes universally accepted.

How innovations are actually adopted. In real life, the adoption process is not that smooth. Usually, after the few first successes:

- the idea is over-hyped,
- it is adopted in situations way beyond the inventors' intent.

In these remote areas, the new idea does not work well; so:

- We have a natural push-back, when the idea is adopted to a much less extent than it is reasonable.
- Only after these wild oscillations, the idea is finally universally adopted.

These oscillations are known as *Gartner's hype cycle;* see, e.g., [**?**, **?**].

A similar economic phenomenon. A similar phenomenon is known in economics: when a new positive information about a stock appears, the stock price does not rise gradually.

- At first, it is somewhat over-hyped and over-priced.
- And only then, it moves back to a reasonable amount.

Problem. How can we explain this phenomenon?

2 Our Explanation

Main idea behind our explanation. Any system is described by some parameters

$$x_1, \ldots, x_n.$$

The rate of change $\dot{x}_i$ of each of these parameters is determined by the system's state, i.e.:

$$\dot{x}_i = f_i(x_1, \ldots, x_n).$$

In the first approximation, we can replace each expression by the first few terms in its Taylor expansion. For example, we can approximate it by a linear expression:

$$\dot{x}_i = \sum_j a_{ij} \cdot x_j.$$

A general solution of such systems of linear differential equations is known; see, e.g., [**?**, **?**]. In the generic case, it is a linear combination of terms $\exp(\lambda_k \cdot t)$, where λ_k are (possible complex) eigenvalues of the matrix a_{ij}, i.e., roots of the corresponding characteristic equation

$$P(\lambda) = 0.$$

When the imaginary part b_k of $\lambda_k = a_k + \mathrm{i} \cdot b_k$ is non-zero, we get:

$$\exp(\lambda_k \cdot t) = \exp(a_k \cdot t) \cdot (\cos(b_k \cdot t) + \mathrm{i} \cdot \sin(b_k \cdot t)),$$

i.e., we get oscillations.

Explanation: details. The above argument explain why oscillations appear *sometimes*, but why do we see oscillations practically always?

Here is our explanation for this. The more parameters we take into account, the more accurate our description; thus:

- to get a good accuracy,
- we need to use large n.

Any polynomial can be represented as a product of real-valued quadratic terms. Some of these quadratic terms have real roots. If p_0 is the probability that both roots are real, then:

- for a polynomial of order n,
- the probability p that all its terms have real roots is:

$$p \approx p_0^{n/2}.$$

For large n, this is practically 0. Thus, practically all polynomials have at least one non-real root. So, almost all systems show oscillations.

This explain why Gartner's hype cycle is ubiquitous.

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