BIMODAL IT: BEYOND THE HYPE WITH THE CONSTRUCTAL LAW?

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Abstract. Several models of Information Technology (IT) and digital products delivery organization have waxed and waned during the last five years: Two Speed IT, Bimodal IT, Multi-speed IT, Right-Speed IT, etc. In this article, we review and briefly compare some of the main models proposed, mainly by large IT research or consulting firms. In a second part, and since IT and Information Systems (IS) can be viewed as complex flow systems, we will show how the constructal theory can help to discriminate between these, often competing, IT organizational models. More particularly, we will show how the constructal theory of the origin of S-curve fits with Wardley's PST triple-modes model, which is rooted in the analysis of a generic IT product lifecycle logistic curve. We thus illustrate here a first approach to integrate the principles of the constructal theory into the domain of corporate and IT organization and processes.

Key words: Bimodal IT, Constructal law, Digitization, S-curve, Two-speed IT, Wardley's PST model.

1. CONTEXT: A WHOLE LANDSCAPE OF IT DELIVERY MODELS

1.1. The need for speed in the Digital economy

The evolution of information systems is becoming a strategic and competitive activity for many companies, more particularly due to the rise of e-commerce, mobile computing, and online social networks – in a word, due to the digitization of business [1–2]. For this reason, the delivery of digital products and services – for instance based on mobile apps, web sites, or connected devices–needs a faster delivery model than the traditional IT waterfall model, generally leading to long tunnels of software developments [1]. In brief, the interest to go faster is not just to be quicker than the competitors, but also, among other advantages, to be able to quickly validate the product-market fit, before injecting more substantial budget into it [3].

1.2. Gartner's Bimodal IT enters the scene

To cope with this challenge, several IT delivery models have been proposed during the last five years [1–8]. The more famous and discussed of these models probably being the so-called Gartner's "Bimodal IT" [1, 6]. Gartner is a famous IT research and consulting company. It is also widely known for its thematic technology forecasts called the "hype cycle", hence the title of this article–and the private joke: "Bimodal IT, beyond the hype", i.e. beyond the hype cycle [9].

"Bimodal IT", or more simply "Bimodal" is one the many concepts forged, by Gartner, whose job is also to identify-and name-new technological trends in the industries markets and in the IT industry especially. Based on a research on its documentary corpus, searchable online, the first Gartner's publication on Bimodal IT was released in February 2014 [1, 10]. This concept is defined, as follows, by Gartner:

"Bimodal is the practice of managing two separate but coherent styles of work: one focused on predictability; the other on exploration. Mode 1 is optimized for areas that are more predictable and well-understood. It focuses on exploiting what is known, while renovating the legacy environment into a state that is fit for a digital world. Mode 2 is exploratory, experimenting to solve new problems and optimized for

areas of uncertainty. […] *Marrying a more predictable evolution of products and technologies (Mode 1) with the new and innovative (Mode 2) is the essence of an enterprise bimodal capability. Both play an essential role in the digital transformation*" [11].

To summarize, the "Bimodal" model defines two main flow modes for the "Digital Era" company, one focused on "running the business" (mode 1, traditional), and a more exploratory mode focused on "transforming business" (mode 2, digital) thanks to a more exploratory, breaking innovation, approach. These two modes are sometimes compared by Gartner to the two different performance of a marathon runner (mode 1), and a sprinter (mode 2), as in [12, p. 16]. The adoption of this model within corporate organizations is of course very largely promoted by Gartner. For example, among many other frequent (and self-accomplishing?) predictions, Gartner announced in 2014 that "*by 2017, 75% of IT organizations will have a bimodal capability*" [13, p. 19].
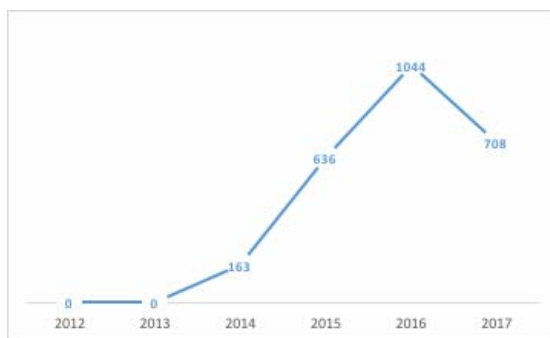

Fig. 1 – Number of occurrence of "Bimodal IT" in Gartner's online research corpus, for all content type.
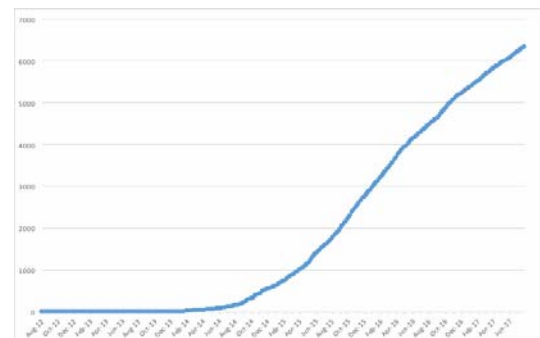

Fig. 2 – Cumulated Google Trends search interest rate for "Bimodal IT", in percent, since August, 2012.

On Fig. 1 is displayed the number of occurrence of the term "*Bimodal IT*" in Gartner's online research corpus (available at https://www.gartner.com/search/all/simple), for all content type, since January, the 1st, 2012. The data have been corrected only for 2012 and 2013, the search engine having provided one non-relevant occurrence for each year (ex. "*[…] bimodal, it […]*". It seems that the Bimodal hype reached its peak in 2016 for Gartner, but also for the general public, since its interest is now slowly decreasing, as can be seen in the inflexion of the cumulated search interested rate provided by Google Trends (trends.google.com), and showed on Figs. 2 and 3 – Clearly, Bimodal IT trend has already gone… beyond the hype.
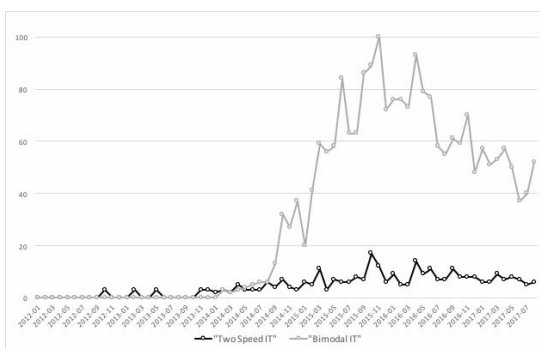

Fig. 3 – Google Trends' search interest rate for "Two speed IT" and "Bimodal IT", in percent, since January, 2012.

1.3. A clash of models

In the wake of the publication of Gartner's Bimodal IT model, in February 2014, several models have been proposed by other consulting firms, and competitors [4–8]. These models are listed here below in table 1. They include, for instance, McKinsey's vision of "Two speed IT" [8], Accenture proposition on a "Multi-speed IT" model [4], or Deloitte's "Right-Speed IT" view on this topic [7].

Usually, the proposed models are a more or less customized two-modes "copycat" model (e.g. McKinsey's [8]). Deloitte, on its side, doesn't exactly propose a model, but explain that each project must have his own pace, to meet its own constraint, hence the lack of a more generalized view, i.e. a model [7]. But several other kinds of models or other cases are worth considering [14–16]. First, it must be noticed that Gartner's Bimodal was not the first two-modes-IT delivery models ever proposed. More particularly, four years before, in August 2012, The Boston Consulting Group (BCG) was advocating for the adoption of a "Two Speed IT" model, in order to face the challenge of Digitization [14]. The two speeds were called "Industrial Speed" and "Digital Speed". Interestingly enough, in 2016, the BCG changed its position and recommended to abandon this previous two speed model–

allegedly due to the rapid evolution of the market under the Digitization pressure–, and advised to adopt now a single delivery mode model, inspired by Agile software delivery methods, and thus called "All-Agile" [15]. As can be seen on figure 3, the BCG's two-speed IT model had a very smaller impact on the market than the Bimodal IT. Effectively, the search interest provided by Google Trends for the "two speed IT" model hardly reach 20% of the interest triggered by "Bimodal IT". Finally, Gartner itself used the term two speed in at least of the its two seminal publication: "bimodal or two-speed approach to managing IT" [10, p. 2], § Recommendation.

Forrester, a very virulent competitor of Gartner [16], also promoted its own IT delivery model very early before the release of Bimodal IT. In a publication dating from July 2008, Forrester already describe its approach towards "Business Technology", as opposed to "IT Technology" [16]. This is the very same model Forrester has been opposing to Gartner's views, into several polemic publications directly attacking the Bimodal IT approach, and strongly advising against it. For instance see the following publication title: "the false promise of Bimodal IT" [16], "Bimodal Is Out Of Sync With Faster Change Bimodal Dinosaurs Won't Be Able To Lead Their Companies To Success" [18].

Regarding the impact of the models reviewed, other than the BCG's or Gartner's, not enough search data were available on Google Trends to enable a comparison or analysis. By itself, this negative result is obviously a strong signal of the very lesser interest from the market, hence very lesser impact on it, of these alternatives models.

Table 1

IT delivery models reviewed

Source	IT Delivery Model	Number of IT delivery modes	IT delivery modes	Publication date (dd/mm/yyyy)
Simon Wardley	PST	3	Pioneering, Settling, Town Planning	27/03/2008
Forrester Research, Inc.	[IT to] Business Technology (BT)	2	IT Technology, Business Technology	09/07/2008
The Boston Consulting Group	Two speed IT	2	Industrial Speed, Digital Speed	01/08/2012
Gartner, Inc	Bimodal IT	2	Mode 1, Mode 2	14/02/2014
McKinsey & Company	Two speed IT	2	Slow-speed, Fast-speed	12/2015
Accenture	Multi-speed IT	2	Legacy IT, Agile IT (Fast Lane IT)	11/11/2015
Deloitte Development LLC	Right-speed IT	N	N/A (project-specific speed)	24/02/2016
The Boston Consulting Group	All-Agile	1	Agile	12/08/2016

Beyond the "small world" of IT research and consulting firms and competitors, the Bimodal IT model has also generated a lot of discussions, and polemics online in the, larger, IT world, the debate being facilitated by the easy access to many kinds of blogs or social media: "*Saying Goodbye to Bimodal IT*" [19], "*Why BiModal IT Won't Work*" [20], "*Bimodal IT: A Buzzword, a Solution, or a Smokescreen?*" [21], "*Bimodal IT - the new old hotness*" [22]. In favor of Gartner, it appears that the understanding of its model is often reduced to the caricature, e.g. "Agile" vs. "Waterfall": "*Bimodal is widely misinterpreted by many as simply the introduction of agile tools and methodologies such as Scrum or the introduction of DevOps practices*" [23, p. 4], § "*BECS Defined: Five Integrated Services*". This is of course the case for every concept when it diffuses into a larger public: the meaning dilutes, it is wrongly interpreted, or misunderstood–a phenomenon well known, unfortunately unavoidable, and sometimes called "semantic diffusion": "*One of the problems with building a jargon is that terms are vulnerable to losing their meaning, in a process of semantic diffusion*" [24].

1.4. A tri-modal, independent model: Wardley's PST

When considering the landscape of IT delivery models, we also included and reviewed a tri-modal approach, developed and promoted by Simon Wardley, an independent advisor. The model, as described in later documents by Wardley, e.g. in 2008 [25] or 2012 [26], is supposed to have been implemented and tested by Wardley itself as early as 2004 in companies where he worked, including a subsidiary of Canon. The model is called Pioneers, Settlers, and Town Planners (PST) [26], from the three successive modes characterized (the Settling phase was initially called Colonising [25]). Roughly, the first mode (Pioneering) can be assimilated to Bimodal IT's Mode 2, which is exploratory, whereas the Settling and Town Planning modes can be viewed as covered both by Bimodal IT's Mode 1, more oriented towards industrialization and run-the-business topics.

The probably main differentiating point of Wardley's PST is the underlying foundation of the this model: the model is a direct consequence of the IT product lifecycle considered. To summarize, any IT product development, according to Wardley–and based on strong evidences [27]–, follows a S-curve, i.e. its adoption by a market or a users' base develop accordingly to a logistic curve, as the products progress towards its own commoditization [28]. As such, three main phases can be differentiating: a slow-pace, and exploratory phase, followed by a faster scaling phase, finally ending in a product's end-of-life lower-pace, taking place into a strongly competitive and commoditized market. Each of these steps directly corresponds to one of the three PST modes, and is characterized by the skills required by the teams, the type of culture (innovative vs. industrial…), the methods used (Lean Startup vs. Six Sigma…), etc. [22, 28].

1.5. Brief historical perspective, *nihil sub sole novum*

For the sake of the historical perspective, it must be noticed that the debate raging in the IT world involves topics that have been researched for decades in the larger domain of corporate organization. To our view, the topic under scrutiny, behind all the "bimodal hype", could be resumed as "how to innovate in the digital age, while still ensuring the current business operations?". Again, this topic, besides the digitization context, is not new, and a large corpus of research would need to be considered, as it provides its own whole landscape of dual-core [29], ambidexterity [30], tri-core [31], or quad-core models [32], among others. Simon Wardley himself explains in [22] that he recognized his own model on one proposed in 1993, by R.X. Cringely and called Commandos, Infantry and Police [33, pp. 235–238], i.e. ten years befor his own experimentations.

2. Discussion: Constructal theory to the rescue

For the end-user of this whole landscape of IT delivery models, i.e., generally, for the CIO of a large company, the main problem is to discriminate between all the previous models: what to choose to implement? A Bimodal or a All-Agile reorganization cannot be considered as pet projects, they will have a tremendous impact on the company, and usually will require several years to implement–successfully, or not… Furthermore, they will require large, substantial budget. It's worth thinking twice, or thrice, when it comes to making the choice of a new way of organizing the business, and how to mitigate the risks of a misleading choice or wrong assumptions. Considering pilot projects, progressive and incremental implementation, change management, coaching, etc., is certainly not an option…

For this reasons we propose to consider the insight that can be provided by the Constructal theory [34, 35]. For two decades, the constructal theory has effectively demonstrated its relevancy to design from scratch, or to predict the evolution of, many natural or engineered systems, on the basis of the constructal law [34, 35]. This new law of physics provides a second arrow of time, and a new paradigm and theoretical framework to study such phenomena. Since IT organizations and IS can be viewed as complex flow systems with the necessary freedom to reorganize, it seems reasonable to look at how the constructal theory can help to discriminate between these, often competing, IT organizational models.

The constructal theory has already been applied to various domains beyond its original realms of thermodynamics and mechanical engineering: biology, environment, sport, astrophysics, geophysics, topography, software engineering, etc. [34, 36, 37]. One of the most inspiring research results of Constructal

theory for our current topic, concerns the origin of the logistic curve [39]. "S-curve are everywhere" is the title of one of the article investigating the root cause of such pattern in natural, engineered, or social systems [39] showed that the Constructal theory provides a conceptual framework enabling to predict the emergence of S-curve phenomena. The theoretical model is simple: it considers the invasion of a surface or volume, by a flow. In this context, it has been showed that the flow will display three typical regimes: a slower-pace mode, when the flow begins to invade the system, an increased and faster-pace-mode when the flow spread and diffuse to whole system's surface or volume, and a final quieter and slower-pace-mode, when the flow reaches the last corners of the system being invaded. As can be seen on Table 2, the Constructal model of the logistic curve fits easily with Wardley's PST three-phases model.

Table 2

Constructal theory model of the logistic curve compared to the PST-model

Constructal theory model of the logistic curve	PST Model	Flow pace (e.g. customer acquisition rate)
Invasion phase	Pioneering phase	Slow
Consolidation phase	Settling phase	Fast
Plateau phase	Town-Planning phase	Slow

From this point of view, the Constructal theory strongly advocates for a triple modes delivery model, in order to match the "physical" constraints characteristic of the different phases. It's worth noticing at this point that Gartner's itself recognizes that the Bimodal IT model must not be interpreted as a pure "bimodal" model, but this model just points the fact that, at least, two different IT operation modes are required by the digital organization, and it identifies the characteristics of these two main models–two main and not two only. Accenture also provide a complementary view on the IT product S-curve revenue growth phenomena, which is the almost only visible S-curve. Accenture advise to consider three hidden, but underlying, curves, sustaining and nurturing a successful product: market changes, distinctiveness, and talent sourcing and retention.

As already said, an IT product delivery can be view as a complex flow system. By complex we mean a system with multiple flows of different natures, but intertwined: information (ideas, knowledge…), software artefacts (specifications or user stories, software source code, software binaries…), software network frames, etc. As such, it is very not surprising that the Constructal theory can applies to this domain. As a last example, in the domain of IT delivery methods and practices, the objective of the modern DevOps approach is to shorten the IT product's time-to-market: another way to formulate this approach is to say that DevOps objective is to minimize the time travel of the product between the phase of ideation (product idea and business model definition), and the market use of the product. In this sense, we recognize the basic Constructal optimization problem of a one-to-many or point-to-surface flow system design.

In conclusion, while the debate on IT delivery models is still raging, and often lacking scientific basis, we showed that the insights provided by the constructal theory of the origin of the logistic curve can help to discriminate between the models proposed. More precisely, we showed that a three-modes delivery model, such as Wardley's PST, is strongly suggested by the constructal model of a S-curve phenomena. We thus illustrated here a first approach in order to integrate the principles of the constructal theory into the activities of IT organization and processes, and IT advisory.

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