

How to get rid of the Pyramid of Bureaucracy that tyrannises innovation?

In addition to its main purpose of publishing experimental innovation research related results, CIJ also publishes more light, inspirational food-for-thought intended "IdeaSquare Coffee Papers". These pieces are collaborative efforts prepared by visiting researchers from various walks of life visiting or staying at CERN IdeaSquare premises. The identity of the contributing authors is kept anonymous (although known) but helpful hints can be found in the literature references. Editors of this section are Dr. Markus Nordberg and Dr. Valeria Brancolini.

EXECUTIVE SUMMARY

This time the experimental innovation team of IdeaSquare navigates the seas of ecology, learning masters of architecture and sipping from the Fountain of Wisdom of ancient Egypt. Why? To help getting rid of pyramids... not the Egyptian ones but those that tyrannise innovation.

INTRODUCTION

World recognised business thinker from the London Business School Gary Hamel makes it clear: "Busting bureaucracy would add \$3 trillion to economic growth in the US alone"¹. He tirelessly campaigns for the eradication of bureaucracy in organizations and provides staggering insights on and how much damage the animal of bureaucracy does to productivity and innovation. Together with Michael Zanini he has released a complete blueprint on how to get rid of the bureaucracy pest².

As Gary Hamel advocates, cashing-in the 3 trillion dollar prize for killing bureaucracy requires reinventing strategic management by escaping out of the pyramidal architecture of "command-and-control"³.

Inspired by him, our self-appointed and at worst, self-taught, team of experimental innovators at CERN's IdeaSquare decided to dedicate several late night coffee sessions to pyramids of bureaucracy and give our little contribute to their eradication.

ENERGETIC INEFFICIENCY OF PYRAMIDS

Around 1920 the English zoologist and animal ecologist Charles Sutherland Elton pioneered the concept of food webs later described in his classical 1927 book "Animal Ecology"⁴. Food webs are a graphical representation of *who-eats-who* in an "ecological community". And guess what: they form pyramids (Fig. 1).

¹ See Gary Hamel's Blog <http://www.garyhamel.com/blog/3-trillion> , also <http://fortune.com/2014/03/26/why-bureaucracy-must-die/>

² Hamel, Gary and Zanini, Michele, The \$3 Trillion Prize for Busting Bureaucracy (and How to Claim it) (March 16, 2016). Available at SSRN: <http://ssrn.com/abstract=2748842> or <http://dx.doi.org/10.2139/ssrn.2748842>

³ <https://hbr.org/2014/11/bureaucracy-must-die>

⁴ https://en.wikipedia.org/wiki/Charles_Sutherland_Elton



Fig. 1. Representation of a food pyramid.

Elton's term "ecological community" later evolved into our modern concept of "ecosystem". It was coined by the English botanist Arthur George Tansley in 1935⁵. He devised the concept of ecosystem while drawing special attention to the importance of transfers of materials between organisms and their environment. Building on Tansley's notion, the US polymath Alfred James Lotka applied the principles of the physical sciences to biology. He thus deepened the concept of the ecosystem as an energy-transforming machine operating by exchanges of matter and energy among its components. In 1942, the ecologist Raymond Laurel Lindeman synthesized in a ground breaking paper all the previous ideas and formulated what are considered the cornerstone principles of ecosystems ecology:

- The ecosystem is the fundamental unit of ecology.
- Within the ecosystem, energy passes through many levels (or links) in a food chain.
- Each link in the food chain is a trophic level (or feeding level).
- Inefficiencies in energy transformation lead to a pyramid of energy in the ecosystem.

And Lindeman did more. He formulated his famous "Ten Percent Law" which states that only 10% of energy is transferred from one trophic level to the next. The remaining 90% is lost due to different mechanisms⁶ (Fig. 2).

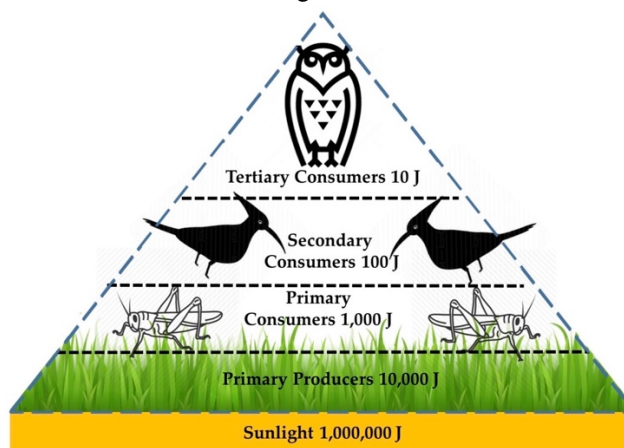


Fig. 2. Illustration of Lindeman's 10% law.

"Lindeman's pyramid" has been refined by the US ecologist Howard Thomas Odum into the interesting concept of "ecological productivity pyramid" better capturing the production or turnover of biomass at each trophic level. In the "pyramid of productivity" this turnover is graphically represented in a way in which each step is 10% the size of the previous step. Instead of showing a single snapshot in time, productivity pyramids show the flow of energy through the food chain. Typical units are grams/square meter/year or calories/square meter/year.

During endless night discussions our team concluded that organizations are described and subsequently modelled using many metaphors such as "organizations as machines", "organizations as organisms", "organizations as brains", etc⁷. Inspired by the ecology pioneers above we suggest a paradigm of "organizations as unproductive pyramids". Moreover,

⁵ https://en.wikipedia.org/wiki/Arthur_Tansley

⁶ Lindeman, RL (1942). "The trophic-dynamic aspect of ecology". *Ecology* 23: 399–418.

⁷ Gareth Morgan (2006) *Images of Organization*, Newbury Park, CA: Sage Publications.

we postulate that Lindeman's 10% law applies boldly to this unproductive pyramids. Thus, The IdeaSquare innovation team conjecture|:

Only 10% of productive capacity is transferred from one level to the next in an organization. The remaining is lost due to bureaucracy.



Fig. 3. Simplified illustration of IdeaSquare's paradigm of "organizations as productivity pyramids". Inter-layer departments are omitted. The arrows indicate the two directions where the Lindeman's 10% rule applies.

But as usual among physicists and engineers who are far busier exploring the last corner of the Standard Model of particle physics⁸ voice concern our discussion that claim for an improvement of the conjecture. As pointed out by the only economist in the team (accepted as an interesting anomaly), bureaucracy effects are felt on a vertical as well as horizontal levels within an organization (Fig. 3). For example, take the case of the process for developing an innovative product from an "out of the box" idea within a large organization. The efficiency of the process is affected across the vertical levels of an organization. If the idea is generated by the team members, they have to convince their team leaders; team leaders have to do the same with managers; manager need to convince directors; directors have to convince their vice presidents and vice presidents have to convince the CEO. But as well the efficiency is affected at the horizontal level since the team leader of section X has to convince team leader of section Y for resources, etc, etc, etc. Anyone who has worked for a large organization surely recognises this manifestations of bureaucracy.

Our resulting refined conjecture is then:

Only 10% of productive capacity is transferred both across each intra-level and inter-level in an organization. The remaining is lost due to bureaucracy.

Clear then? In order to gain in productivity (i.e. lower bureaucracy) it is necessary to build organizational pyramids with the smallest number of inter and intra layers as possible. But how?

ARCHITECTURE TO RESCUE ARCHITECTURE

Pyramids are resilient and ubiquitous constructions⁹. They have been built by almost many civilizations over time. For thousands of years, the largest structures on Earth were pyramids. Their shape allows weight to be distributed evenly throughout their structure. Most of the weight in a pyramid is on the bottom and it decreases towards the top. This allowed ancient civilizations to create huge structures of stone that were very sturdy. Much that has survived till today is in a remarkable condition. Pyramid structures also occur in nature as a stable place for sediment to build up in mounds. Anyone digging a hole knows this. As you dig, the removed earth piles up higher and higher. If you place this earth in the same area, the resulting shape will be a pyramid.

Alarmed by the possibility that for pyramids apparently "the sky is the limit" our team decided to dig out some architectural guiding principles as a rescue recipe "against the architectural endurance of pyramids".

The year is 1938. One of the most influential 20th-century German architects, Peter Behrens, is busy with one of his last commissions: the new AEG Turbine Factory headquarters in Berlin¹⁰. Working with him is his young pupil, Ludwig Mies van der Rohe, who later became a world known avant-garde architect¹¹. Ludwig is presenting a draft to his Master

⁸ https://en.wikipedia.org/wiki/Standard_Model

⁹ <https://en.wikipedia.org/wiki/Pyramid>

¹⁰ https://en.wikipedia.org/wiki/Peter_Behrens

¹¹ https://en.wikipedia.org/wiki/Ludwig_Mies_van_der_Rohe and <http://www.miessociety.org/legacy/>

on aspects of his work. As recounted by Detlef Mertins¹², the historian and professor of modern architecture, the 21-year-old van der Rohe recalled designing the glazing of the west, courtyard elevation¹³. It was while working on this that he for the first time stumbled into one of the most cited expressions that he made his own: “less is more”. In his words:

“I heard it in Behrens’s office for the first time. I had to make a drawing for a facade for a factory. There was nothing to do on this thing. The columns were 5.75 meters. I will remember that until I die. I showed him a bunch of drawings of what could be done and then he said, ‘Less is more’,” but “he meant it in another way than I use it.”



Fig. 4. Farnsworth House, 1951 by Mies van der Rohe. Certainly “less is more” and is not a pyramid. (Source: https://en.wikipedia.org/wiki/Farnsworth_House)

“Less is more”...the profoundness of this sentence is still a matter of debate among philosophers but for our team, in agreement with Dan Hoffman, it is a phrase that “transforms a negative (less) into a positive (more) as well as serving as a regulative concept”¹⁴. Modestly we have found the guiding principle we are looking for (Fig. 4). Translating it into our IdeaSquare paradigm of “organizations as unproductive pyramids” we propose the use of the Behrens-Rohe’s principle “less is more” for avoiding the pyramids to rule the world. Less complexity in the architecture of an organization...perhaps leads to more productivity. Moreover, as Mies used to say:

“Architecture starts when you carefully put two bricks together. There it begins”.

In consonance, our team advocates reshaping the basic architecture of organizations from the first bricks under the principle “less is more” ...but not leaving the task unattended since otherwise a pyramid will naturally form.

THE IMPORTANCE OF LOOSE INTERFACES: MODERN ARCHAEOLOGY TIPS

Despite “less is more” our team remained concerned that it should have been something else that made the Great Egyptian Pyramids endure after 5,000 years. While going deeper into this mystery we were surprised to learn that ancient Egyptians knew about a “dirty little secret” demonstrating once more that they were indeed a wise civilization.

In November 2010, the Discovery Channel aired two 90-minute documentaries called “Engineering the Impossible”¹⁵. The idea behind the program was to view some of the construction feats of the Egyptians and Romans through the eyes of an engineer. Modern technologies, like portable laser or ground penetrating radar made it possible to sharply analyse these man-made structures and reveal fine details about how they were built. Among the team heading the scientific efforts was the prestigious structural engineer as well as Commander of the Order of the British Empire, Steve Burrows, also referred to as the Indiana Jones of engineering¹⁶.

One of the most remarkable findings for making millennia-lasting pyramids has to do with how Egyptians carefully cut stones. In Steve’s words¹⁷:

Before the Great Pyramid, the Egyptians hadn’t cut the stones accurately enough to make the joints really tight. They had problems with what’s called ‘freeze thaw’. This is when moisture gets into the joints, so if the weather gets cold enough, the water freezes, solidifies and expands – pushing the joint apart. That cycle of the joints being opened and closed effectively makes buildings fall apart, and we have that problem today. The Egyptians had realised that – they knew that if they could construct joints so tight that water couldn’t get in, then the building would not destroy itself and

¹² <http://archinect.com/features/article/43677>

¹³ Detlef Mertins, “Mies”, Phaidon Press, 2014.

¹⁴ Dan Hoffman, *The receding Horizon of Mies-Work of the Cranbrook Architecture Studio* in “The Presence of Mies”, Detlef Mertins, Princeton Architectural Press, 1994.

¹⁵ <https://www.youtube.com/watch?v=sKMO2E9GtM8>

¹⁶ <http://dailycommercialnews.com/Technology/News/2014/12/Adventures-in-engineering-with-WSPs-Steve-Burrows-1004626W/>

¹⁷ <http://www.sciencefocus.com/feature/environment/time-scanners-how-have-egyptian-pyramids-lived-so-long>

it would last a long time. They did this in the Great Pyramid. In addition, they used stone like granite: a material so hard that it wouldn't act like a sponge – the water didn't penetrate it. So, the stone would shed the water and the building would last longer.

This ancient Egyptians' "dirty little secret" immediately turns inside out our recipe for destroying pyramids: "Let interfaces loose".

But yet again, our picky engineers pointed out two problems. First: if interfaces get too loose the whole structure falls apart and becomes useless...so you don't want to get interfaces too loose. Second: if interfaces are loose but in close contact to allow friction it generates heat (which is a form of energy) and then we go back to square one since heat is released to the environment as "unproductive energy"...all in all productivity lowers and bureaucracy increases.

What to do? Yes, lower the friction...but how?

GREASE MOVES THE WORLD AROUND

Friction is the force resisting the relative motion of surfaces sliding against each other. If you want things to move smoothly then you have to minimise friction. The first reference about "friction minimization" is a drawing discovered in the tomb of Tehuti-Hetep at El Bersheh, Egypt, dating back to about 1880 BC¹⁸. It shows a large carved statue on top of a gigantic sledge being pulled by multiple rows of slaves¹⁹. At the front the statue there is a small human figure pouring a liquid (perhaps water) that apparently served to increase the stiffness of the sand and likely reduced the force needed to move the statue by 50%. This figure is considered to be the first lubrication engineer (Fig. 5) or in other words the first "tribologist"²⁰.

A lubricant is a substance helping to reduce friction between surfaces in mutual contact, which ultimately decreases the heat generated when the surfaces move. It therefore plays a critical role in transmitting well the forces between moving parts. It is extremely difficult to overestimate the past and present key role of lubricants in our economic progress.

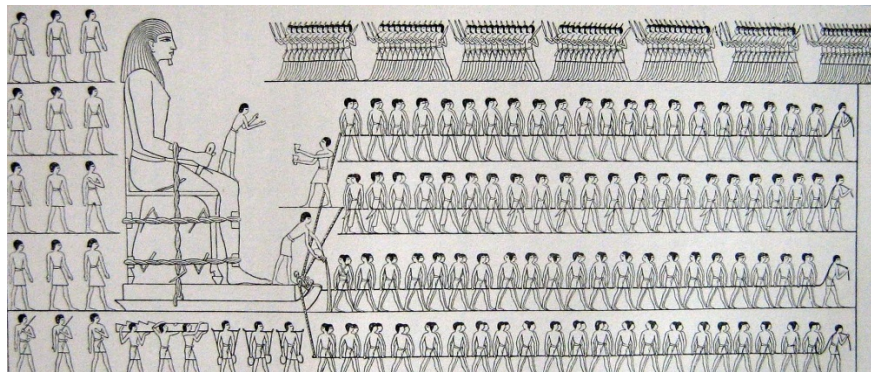


Fig. 5. Can you spot the first lubricant engineer? (Source: https://en.wikipedia.org/wiki/Djehutihotep#cite_note-davies-6)

Just a nugget to illustrate. March 9th 2016 marked the 50th anniversary of the publication of the ground breaking report "Lubrication (Tribology) Education and Research"²¹. It is commonly referred to as the "Jost Report", since the committee producing it by request of the UK government was chaired by Prof H Peter Jost, a British mechanical engineer recognised as founder of the discipline of tribology and as well Commander of the Most Excellent Order of the British Empire²². The "Jost Report", besides coining the word "tribology" for the first time, outlined the dramatic financial savings that could be gained through the correct application of tribological principles of friction, wear and lubrication²³. It estimated that for many countries, around 10% of the GDP is spent overcoming friction and wear.

Finally our arduous long nights full of coffee yielded us the last missing piece of the puzzle: "grease your interfaces".

¹⁸ Again Egyptians. Call it a coincidence or fate but the 1986 world hit "Walk like an Egyptian" by the The Bangles was again top-of-the-pop at IdeaSquare (including the dancing thing!).

¹⁹ <https://en.wikipedia.org/wiki/Djehutihotep>

²⁰ Tribology is the study of science and engineering of interacting surfaces in relative motion. It includes the study and application of the principles of friction, lubrication and wear. <https://en.wikipedia.org/wiki/Tribology>

²¹ <http://events.imeche.org/ViewEvent?code=S6346>

²² https://en.wikipedia.org/wiki/Peter_Jost

²³ Jost H P (1996) Lubrication (tribology) education and research. A report on the present position and industry's needs. Department of Education and Science, Her Majesty's Stationery Office (London).

CONCLUSIONS FROM IDEASQUARE @ CERN

This time, IdeaSquare's experimental innovation team was triggered by Gary Hamel's crusade against bureaucracy and his recommendation of eliminating "command and control" pyramids.

We have sailed the seas of ecology to learn that inefficiencies in energy transformation lead to pyramids. Therefore we launched the paradigm of "organizations as unproductive pyramids". We also learnt about the "Ten Percent Law" which states that only 10% of energy is transferred from one pyramid level to the next. Thus, we formulated a conjecture to be tested by innovation experimentalists:

Only 10% of productive capacity is transferred both across each intra-level and inter-level in an organization. The remaining is lost due to bureaucracy.

In our efforts to provide "armchair experimental recipes" to increase productive capacity (by getting rid of pyramids or at least impede that they reach the sky) we studied the principles of some of the great masters of architecture and concluded that *less is more* could be used as a cornerstone regulatory mechanism for organization building or reshaping.

But as well that some other dirty little secrets coming from ancient Egypt can help to implement *less is more* such as *keep your interfaces loose and grease them*.

Just like we perform "Walk like an Egyptian" at IdeaSquare. Why don't just come and have a look for yourself?
Cheers.