Efficient promotion strategies in hierarchical organizations: surviving the Peter Principle

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Outline of the talk

I. The Peter Principle: what it says

II. Agent Based Simulations: the principle in action

III. Use of Random promotion strategies to overcome it and increase the efficiency

IV. Work in progress & Conclusions

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The Peter principle revisited: A computational study

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\begin{abstract}
In the late sixties the Canadian psychologist Laurence J. Peter advanced an apparently paradoxical principle, named since then after him, which can be summarized as follows: ’Every new member in a hierarchical organization climbs the hierarchy until he/she reaches his/her level of maximum incompetence’. Despite its apparent unreasonableness, such a principle would realistically act in any organization where the mechanism of promotion rewards the best members and where the competence at their new level in the hierarchical structure does not depend on the competence they had at the previous level, usually because the tasks of the levels are very different to each other. Here we show, by means of agent based simulations, that if the latter two features actually hold in a given model of an organization with a hierarchical structure, then not only is the Peter principle unavoidable, but also it yields in turn a significant reduction of the global efficiency of the organization. Within a game theory-like approach, we explore different promotion strategies and we find, counterintuitively, that in order to avoid such an effect the best ways for improving the efficiency of a given organization are either to promote each time an agent at random or to promote randomly the best and the worst members in terms of competence.
\end{abstract}
Laurence J. Peter was a Canadian author, educator, psychologist, and management theorist in US.

1919 - Born 16th of September in Vancouver, British Columbia.

1941 - Began his career as a teacher.

1963 - Received the degree of Doctor of Education from Washington State University.

1964 - Peter moved to California, where he became an Associate Professor of Education, Director of the Evelyn Frieden Centre for Prescriptive Teaching and Coordinator of Programs for Emotionally Disturbed Children at the University of Southern California.

1968 - Published the The Peter Principle, in which he states: "In a hierarchy every employee tends to rise to his level of incompetence".


1990 - Laurence J. Peter died 12th of January.

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The Peter Principle

In the late sixties Laurence J. Peter advanced an apparently paradoxical principle, named since then after him, which can be summarized as follows:

‘Every new member in a hierarchical organization climbs the hierarchy until he/she reaches his/her level of incompetence’.

It holds that in a hierarchy, members are promoted so long as they work competently. Sooner or later they are promoted to a position at which they are no longer competent (their "level of incompetence"), and there they remain, being unable to earn further promotions.

Peter's Corollary states that "in time, every post tends to be occupied by an employee who is incompetent to carry out his duties" and adds that "work is accomplished by those employees who have not yet reached their level of incompetence".

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Is that real?

From a personal point of view everyone has good examples:

- A smart researcher who is not able to be a brilliant teacher or a good administrator
- A good worker who is not able to be an efficient manager
- A good soldier who is not able to be a good commander
- And so on...

But this is not sufficient to prove it!

As physicists we should be able to quantify the effects of Peter's claim in order to verify its applicability and eventually find a way to overcome it.

Physicists are often been asked to help social sciences in order to provide a more quantitative and rigorous understanding.

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Simulations

We verified the validity of the Peter principle by simulating promotions in a hierarchical organization by means of an agent based algorithm.

Our schematic organization

We consider here an organization with 160 positions divided into 6 hierarchical levels.

Each level has a different number of members (which decreases, climbing the hierarchy) with a different characteristic responsibility, reported on the left side. Empty positions are in yellow.

Each agent has two parameters:
• age - ranging in the interval [18,60]
• competence - ranging in the interval [1,10]

The agent color indicates the degree of competence, which at the beginning is normally distributed.

Positions become empty if

age > 60 or competence < 4

Average age 25 (std dev 5)
Average competence 7 (std dev 2)

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Freeware Software developed by Uri Wilensky at Northwestern University Boston
http://ccl.northwestern.edu/netlogo/

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Two different hypotheses

• **Common Sense:** the agent keeps the same competence (with a small random error) when promoted to a higher level

• **Peter Hypothesis:** the agent does not keep the same competence when promoted to a higher level and his new competence is completely random
First results on careers

The principle in action: Peter Hypothesis

The agent reaches his minimum of competence or his maximum level of incompetence at the end of his career... if one promotes the best.
The principle in action: *Common sense*

The competence remains almost constant if one promotes *the best*.
But what happens for the global efficiency of your organization?
Global Efficiency

One can define the global efficiency of the system by adopting the following formula:

\[ E(\%) = \frac{\sum_{i=1}^{6} C_i r_i}{E_{max}} \cdot 100 \]

where

- \( r_i \) with \( i = 1, 2, \ldots, 6 \) is the level dependent factor of responsibility
- \( C_i \) with \( i = 1, 2, \ldots, 6 \) is the total competence of the level \( i \)
- \( E_{max} \) is the maximal value of the efficiency obtained considering the maximal competence for all agents
online applet
http://www.ct.infn.it/cactus/peter_principle_sup_material.html

Who should you promote to improve the efficiency of your organization?


Versions in Italiano qui

Click on the image below to start the Java applet

WHAT IS IT?

In the late sixties the Canadian psychologist Laurence J. Peter advanced the apparently paradoxical principle which can be summarized as follows: 'Every new member in a hierarchical organization climbs the hierarchy until he reaches his level of maximum incompetence.' Despite its apparent unreasonableness, such a principle would realistically apply in any organization where the way of promotion rewards the best members and where the competence at a new level in the hierarchical structure does not depend on the competence they had at the previous level, usually because the tasks at the levels are very different between each other.

This applet, realized with NetLogo, shows that the latter two features actually hold in a given model of an organization with a hierarchical structure, then not only the 'Peter principle' is unavoidable, but it yields in turn a significant reduction of the global efficiency of the organization.

HOW IT WORKS

The applet considers a prototypical pyramidal organization made by six levels, where each agent is characterized by an 'age', increasing in time, and by a 'degree of competence', which is represented by a colour scale of increasing intensity and which includes all the features characterizing the average performance of the agent in a given position at a given level. At each time step all the agents with a competence under a given dismissal threshold or with an age over a given retirement threshold leave the organization and their positions become empty (yellow).

Simultaneously, any empty position at a given level is filled by promoting one member from the level immediately below, going down progressively from the top of the hierarchy until the bottom level has been reached. Finally, empty positions at the bottom level are filled with the recruitment of new members.

The applet provides two possible ways for the transmission of the competence of an agent from one level to the next one: the 'common sense hypothesis', where a member inherits his old competence in his new position with a small random variation added, and the 'Peter hypothesis', where the new competence of every agent is independent from the old one and is assigned randomly. For each one of these two ways exist three different ways for choosing the agent to promote at the next level: the most competent (The Best strategy, suggested by the common sense and adopted also in the Peter principle), the less competent (The Worst strategy) or one agent at random (Random strategy).

In order to evaluate the global performance of the organization was introduced a parameter, called 'global efficiency', calculated step by step by summing the competences of the members level by level, multiplied by a level-dependent factor of responsibility ranging from 0 to 1 and increasing by climbing the hierarchy (such a factor takes into account the weight that the performance of the agents of different levels have on the global efficiency of the organization). The result is normalized to its maximum possible value and to the total number of agents, so that the global efficiency can be expressed in percentage.

CREDITS

This applet was realized by A. Puchino, Department of Physics and Astronomy, University of Catania, and it is provided as supplementary information for the paper "Peter Principle Revisited: a Computational Study" by A. Puchino, A. Rapisarda and C. Garofalo, Physica A 2009, in press.
Results for the organization efficiency

http://www.ct.infn.it/cactus/peter_principle_sup_material.html

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Efficiency time evolution for different strategies

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In general one does not know with certainty which hypothesis (*Common Sense* or *Peter Hypothesis*) is more valid for the organization one wants to study.

If one wants to maximize the global efficiency or at least minimize the risk for diminishing it in both cases, then the random promotion strategy seems to be always the best solution.
Summary of the results for different promotion strategies

These results are quite robust with respect to the numbers of agents and the number of levels of the hierarchy.
The Generalized Peter Principle

The Peter Principle is a special case of a more general statement:

“Anything that works will be used in progressively more challenging applications until it fails.”

This is "The Generalized Peter Principle."

So we can imagine applications for

1. Objects or tools of various kind
2. Clusters of personal computers: Grid
3. Models, Theories, Ideas
4. etc.
On-line debates

The paper stimulated interesting debates already before publication.

It was cited among many others by MIT Technology Review.
and by **DEMOCRATIC UNDERGROUND.COM**, the blog of the American Democrats

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The Peter Principle Revisited: A Computational Study (Two solutions)

They found two solutions for the Peter Principle.

Solving the Peter Principle? One Word: "Darts"
By Paul Kedrosky - Friday, July 3, 2009

There is a fun new working paper out from some Italian scientists that models the Peter Principle. The principle says, of course, that people climb in an organization until they reach their level of maximum incompetence.

The authors simulated the preceding in a pyramidal organizational form using a mathematical agent model. Here is the outcome:

Here we show, by means of agent based simulations, that if the (above two conditions) actually hold in a given model of an organization with a hierarchical structure, then not only the “Peter principle” is unavoidable, but it yields in turn a significant reduction of the global efficiency of the organization.

...the best strategies to improve, or at least not to diminish, the efficiency of an organization, when one ignores the actual way of competence transmission, are those of promoting an agent at random or of randomly alternating the promotion of the best and the worst members. We think that these results could be useful to guide the management of large real hierarchical systems of different nature and in different fields.

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**The New York Times**

December 2009

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**The 9th Annual Year in Ideas**

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**Random Promotions**

- In 1969, the Canadian psychologist Laurence J. Peter posited the Peter Principle: people in a workplace are promoted until they reach their “level of incompetence.” This happens, Peter argued, because we wrongly assume that people who are good at their jobs will also be good at jobs that are one rung up on the corporate ladder — so we promote them. But often the new job is so different from the previous job that the employee can’t handle it. Now performing incompetently, the employee stays in place, dragging the efficiency of the firm downward. Eventually the entire economy becomes like the paper company Dunder Mifflin in “The Office” — clogged with incompetence.

- Is there any way to avoid this trap? Yes, by promoting people at random. That’s what a trio of Italian scientists discovered this year. They created a computer model of a 100-person corporation and programmed it with Peter Principle-like logic: the best performers were promoted, but they had only a random likelihood of being good at their new jobs. Sure enough, the firm was soon cluttered with incompetents, and its efficiency plunged. But then the researchers tried something different: they reprogrammed the firm so that it promoted people entirely randomly, and the overall efficiency of the firm improved.

- They also tried alternately promoting the absolute best and absolute worst performers. That, too, worked out better than promoting on merit. The scientists say these strategies work because they harness “Parrondo’s Paradox,” a piece of game theory in which you win by alternating between two losing strategies. “In physics or game theory, this isn’t new,” says Andrea Rapisarda, a physicist at the University of Catania in Italy and a co-author of the study, which was recently published in the journal Physica A.

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Should Job Promotions Be Random?

A group of Italian researchers recently conducted a study that found random job promotion was more effective than merit-based promotion. *Inc.* asks several experts if it could work in real life.

By Josh Spiro | Dec 18, 2009

We're accustomed to living in a meritocracy, so the notion of getting ahead based on anything other than skill and hard work seems cruel, almost Kafkaesque. But what if random job promotion turned out to be a better alternative to the Peter Principle, which posits that employees will continue to be promoted until they can no longer do their job well?
Mark Buchanan
December 2009

Incompetence rules

So your organisation is managed by people who couldn’t run a burger stand? Here’s why

The idea that high-level incompetence is the norm rather than the exception may be relatively new, but it is increasingly being voiced by people who have been in the business for a long time. The concept of the incompetent leader is not new, but it has become more prominent in recent years as more people have come to realize that it is not just a problem of individual leaders, but a systemic issue.

The reasons for this are many and varied. One of the most common is the lack of experience and training that many leaders have. Many of these leaders have been promoted based on their ability to please others rather than their ability to manage complex situations.

Another reason is the lack of accountability. Too often, leaders are not held responsible for their decisions and actions, which allows them to continue to make mistakes. When mistakes are made, it is often the case that the organization as a whole is held responsible, not the individual leaders.

The lack of transparency and accountability is a major problem in many organizations. This lack of transparency can lead to a culture of fear and mistrust, which can hinder the organization’s ability to achieve its goals.

Incompetence is not just a problem for organizations, but also for individuals. When individuals are unable to perform their jobs, it can lead to a decrease in productivity and a decrease in the quality of the work.

Incompetence is a problem that needs to be addressed, but it is not an easy one. It requires a commitment to change and a willingness to take responsibility. It also requires a willingness to learn and to grow.

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IG Nobel prize 2010 for Management (Harvard University, Sept. 30 2010)

We received the prize from Frank Wilczek (Nobel prize winner for Physics 2007)
Sheldon Glashow (Nobel prize winner for Physics 1977)
Roy Glauber (Nobel prize winner for Physics 2005)

More info at http://www.dfa.unict.it/home/rapisarda/

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Then the paper became really very popular...
But was it the result of a very particular case?

There was a need to test the robustness of our findings by changing the main features of the simple model used, as for example the size, the topology, the time dependence, etc...

We now discuss very recent results obtained with a more realistic model by using modular networks

See: Pluchino, Rapisarda, Garofalo, Physica A 390 (2011) 3496
Testing the robustness of our results

We adopted a more realistic model with a modular network topology

The total number of agents $N$ is given by

\[ N = \frac{L^K - 1}{L - 1} \]

being $L$ the average number of links and $K$ the number of levels

Pluchino, Rapisarda, Garofalo,

Physica A 390 (2011) 3496
Two modes for promotions

Global mode = not following the links to go from one level to the next, one recovers the old pyramidal model

Neighbors mode = just following the links to go from one level to the next

Other new features
1. time unit = 1 month
2. relative efficiency gain with respect to a meritocratic initial regime

Pluchino, Rapisarda, Garofalo, Physica A 390 (2011) 3496
New results:
changing the size and the amount of randomness

Global mode

Random selection is always a winning strategy ... the gain is size-independent and randomness increases efficiency even if applied with a small percentage !!!

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Random selection is always a winning strategy... the efficiency gain is size-independent.
Randomness increases efficiency even if applied with a small percentage !!
Similar behavior both in global and neighbors mode.

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Focusing on the initial period of 20 years

The increase in efficiency is immediate and persistent, reaching after only 20 years almost 80% of the asymptotic total gain.

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But is this result so counterintuitive after all?
There are analogies with the Parrondo’s paradox, see for example Nature 1999.
Natural selection

Although our results may seem paradoxical and counterintuitive, natural selection proceeds exactly in this way....through random mutations.

Moreover, those random mutations which give an advantage to a particular species are maintained and reinforced, never moved away.
Further benefits of a random selection

• it can be also very useful against corruption and nepotism (it was largely used in the ancient Athens, when democracy was born)

• it can give a chance to everybody and allow the emergence of new hidden talents (famous cases are for example Toscanini, Callas among many others)
Psychological effects

• A frequent question is if we included psychological effects and how this can influence the global efficiency

The answer is no, we neglected them

But we think that one should distinguish a reward for a well done job from a promotion, which can change the task of the employee

Promoting the best we risk a double loss: we loose an excellent employee, who will likely have a poor performance in the new role, and we substitute him with a less competent one !!!

A prize for a good performance could better be an increase in salary or more free time without a change of role

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A real successful experiment: the **SEMCO** company

We have found that a certain amount of randomness helps the efficiency of an organization and eliminates the negative effects of the diffusion of incompetence. We have often been asked if someone has ever been so brave to put in practice a similar strategy....

Well, we have recently discovered that a real example exists and it is a very successful one: this is the case of Ricardo Semler and his **SEMCO** company.

*Ricardo Semler* transformed his family company into a world leader company by applying his innovative management strategy based on *democratic participation and job rotations* (very similar to our random promotion strategy) going even beyond the results we have found.

Semler wrote also very successful books on his experience and gives regularly lectures in the most prestigious universities of the world on his innovative strategies.
Concluding remarks

- **Bad news:** our simulations confirm that the Peter Principle holds in hierarchical organizations when the transmission of competence between the levels of the hierarchy is not correlated.

- **Good news:** By adopting random strategies (even in a small percentage) one can increase the efficiency of his own organization overcoming the effects of the Peter Principle. The results are robust and independent in size and structure.

- The principle can be generalized and these findings can be applied to different scenarios.

  - **Work in progress:**
    - application to **Grid** (strategies for job assignments - no psychological effects)
    - application to **political elections** to improve the efficiency of a Parliament, see *Physica A 390 (2011) 3944* and the talk of Alesandro Pluchino on Friday.

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The Peter principle from the point of view of a disappointed wife...

A possible solution...

"I'd heard about the Peter Principle, of course, but I never really understood it till I got married."

Message: a bit of randomness can really improve our life!

Thanks

Andrea Rapisarda - ECCS'11 Vienna

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