Research proposal

A network approach onto Project Management practices.

The research aims at modeling project governance through evolving project socio technical network's metrics variances and volatility. Purpose is to gain insight into impacts of structural organizational patterns on projects outcomes.

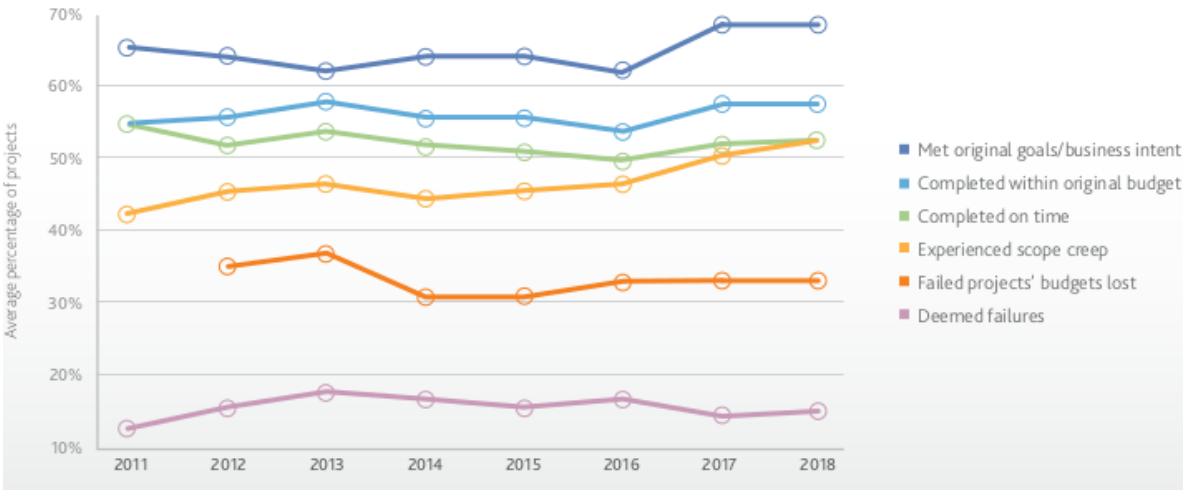
Research background

One of the aims of the Project Management Lab at Politecnico di Torino is to improve effectiveness and efficiency of project based work.

The Project Management Institute, an association of PM practitioners, reckons in a time series the average degree of achievement of these metrics.

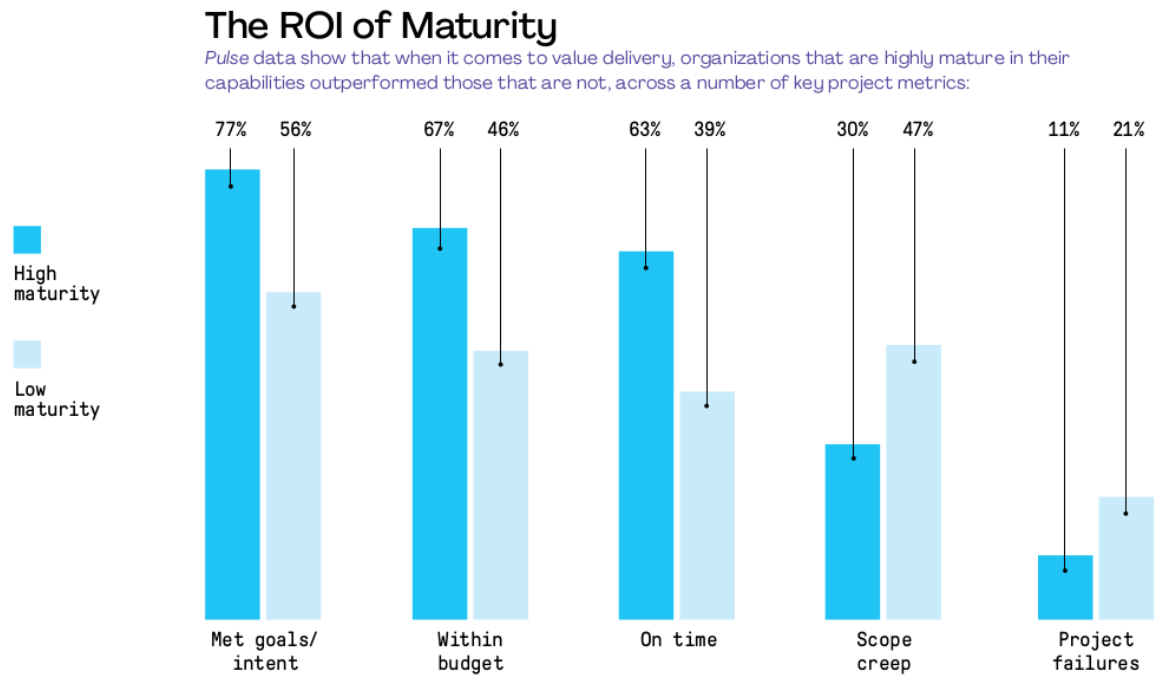
On their 2018 pulse of the profession report [1] the series is rendered in figure 6:

Figure 6: Project Performance Metrics



Where we can see that, on average, nearly 15% of projects are deemed failures, 32% of budget is lost and only 52% of projects are completed on time and, last but not least, only 68% of project deliver the business intent.

PMI also tracks variance of these metrics across industries and metrics. In their 2020 report [2] chart



This chart depicts the high impact of organizational maturity on project outcomes.

Alas, despite the highly graphical impact of the information conveyed, one cannot establish quantitative or statistical inference or correlation of project success metrics with the concept of Organizational Maturity. Indeed, literature shows that a number of Project Management Maturity Models (PM3s) have been proposed [3] and that these model are generally inspired by the Capability Maturity Model (CMM) developed by the Software Engineering Institute of Carnegie-Mellon University between 1986 and 1993. There, the metric of maturity is based and evaluated on the concept that organizations advance through a series of five stages to maturity: initial level, repeatable level, defined level, managed level and optimizing level. These five levels define an ordinal scale for measuring the maturity of an organization's process and for evaluating its process capability. The levels also help an organization prioritize its improvement efforts.

In other words prevailing literature seems to suggest that better project outcomes are related with higher project management competences throughout the organization, both at individual and procedural level. In our opinion we are facing an egg chicken dilemma, to be solved in a reactive way (ie. learning by failing) whereby excellent project are *a priori* determined by the parent organization excellence in managing projects. This resounds of Seneca the younger stoicism "*non est ad astra mollis e terris via*" ('there is no easy way from the earth to the stars').

Besides the difficulty in handling highly qualitative metrics, the correlation between the concepts of project success and organizational maturity seems to be established.

A theoretical explanation can be found in the nature of projects being socio-technical systems.

The interdependence of the social and technical systems of organizations was one of the core insights of the sociotechnical systems (STS) tradition associated with the Tavistock School (Trist and Murray, 1990, 1993; Trist et al., 1997). In fact their insight countered the prevailing technological determinism where technology implementations were expected to have direct effects, for example, if a robotic welding system is introduced on an assembly-line, production throughput will increase. They noted that human and organizational outcomes could only be understood when social, psychological, environmental, and technological systems are assessed as a whole. This approach has come to be known as a socio-technical systems (STS) perspective. This perspective assumes that organizations are "made up of people (the social system) using tools, techniques and knowledge (the technical system) to produce goods or services valued by customers (who are part of the organization's external environment). How well the social and

technical systems are designed with respect to one another and with respect to the demands of the external environment determines to a large extent how effective the organization will be" [4]

Though this basic insight is now routinely accepted in organization and management theory, in recent years, several authors have questioned the usefulness of the STS tradition as a source of continuing theoretical and practical insight into problems associated with stability and change in complex STS. These authors have argued that the STS tradition — because of an outdated focus on industrial production and industrial relations — has been difficult to apply to the study of topics such as organizational learning and sociotechnical innovation in the emerging organizational forms of the information age. [5]

Literature suggest that the realm of interaction between social and technical systems should overcome the divide between the "pragmatist/culturalist" and the "rationalist/functionalist".

These two schools differ mostly in their basic assumptions on human intelligence. Pragmatist/culturalist approaches recognize the situatedness (i.e. cultural specificity) of human intelligence. In this view, human individuals and human groups act pragmatically rather than rationally. That is, people tend to act in a way that they (and others) view as sensible in a particular situation though their behavior may not represent
"optimizing" behavior in some universal sense (and may thus be irrational).

Rationalist/functionalist approaches, following Simon (1976), assume that human rationality is bounded and argue that modern economic institutions are structured so as to ensure greater economic efficiency
and productivity. Neo-rational choice approaches envision agents with different kinds of cognitive maps or schema operating in and adapting to particular local environments by making "rational choices" within the constraints presented by these local environments.

Getting back to matter, we see that the current school of thought on PM3 relies heavily on the rationalist/functionalist approach: in its essence it stipulates axiomatically that organization accumulate explicit and implicit knowledge on their portfolio of projects and deploy a current project routine that is "rational" and will inevitably lead to project success.

Here we espouse the case for blending traditional project management approaches with a physical modeling technique akin to the pragmatist/culturalist Actor–network theory (ANT) of social systems interaction.

ANT stipulates that everything in the social and natural worlds exists in constantly shifting networks of relationships. It posits that nothing exists outside those relationships. All the factors involved in a social situation are on the same level, and thus there are no external social forces beyond what and how the network participants interact at present. Thus, objects, ideas, processes, and any other relevant factors are seen as just as important in creating social situations as humans. ANT holds that social forces do not exist in themselves, and therefore cannot be used to explain social phenomena. Instead, strictly empirical analysis should be undertaken to "describe" rather than "explain" social activity. Only after this can one introduce the concept of social forces, and only as an abstract theoretical concept, not something which genuinely exists in the world.

This leads us to a wider conceptualization of project initiation and governance. Whereby in traditional standards of pm practice the social system should be rationally and functionally "retrofitted" to the needs of the technical system the project will deliver, here we argue that an holistic project governance should be assumed to reckon, monitor and improve the network of relationship that are instanced by the socio-technical interaction, in a managerial variation of ANT (see [6].

A good metaphor of our endeavor is the representation of a game of chess. The pieces of each player constitute the nodes and the relationships between these pieces (distance from the pieces) constitute the links, the comparison of the evolution of the network metrics of each player with every move proved to be decisive in predicting the winner.

Now, in chess there is a wide body of knowledge based on scripted behavior that abstract from the actual game dynamics (a website [7] boasts of a database of more than 3000 openings lines). The scripted games are, in our view, a good representation of rationalist/functionalist approach, where by iterations an "optimum" set of play sequences can be defined, whereby, if we can afford the computational power, a pragmatist model of ANT transaction can lead to win. In fact, Big Blue won against Harry Kasparow in 1997.

Reality fragment

To improve an overly theoretical discussion let's focus on a reality check and try to construct a network out of a simple building renovation project.

In this project we have a family that using Italian government financial support would renovate their attic to a living / small office home office (SOHO) space.

According to the ISO standard [8] the project framework can be construed:

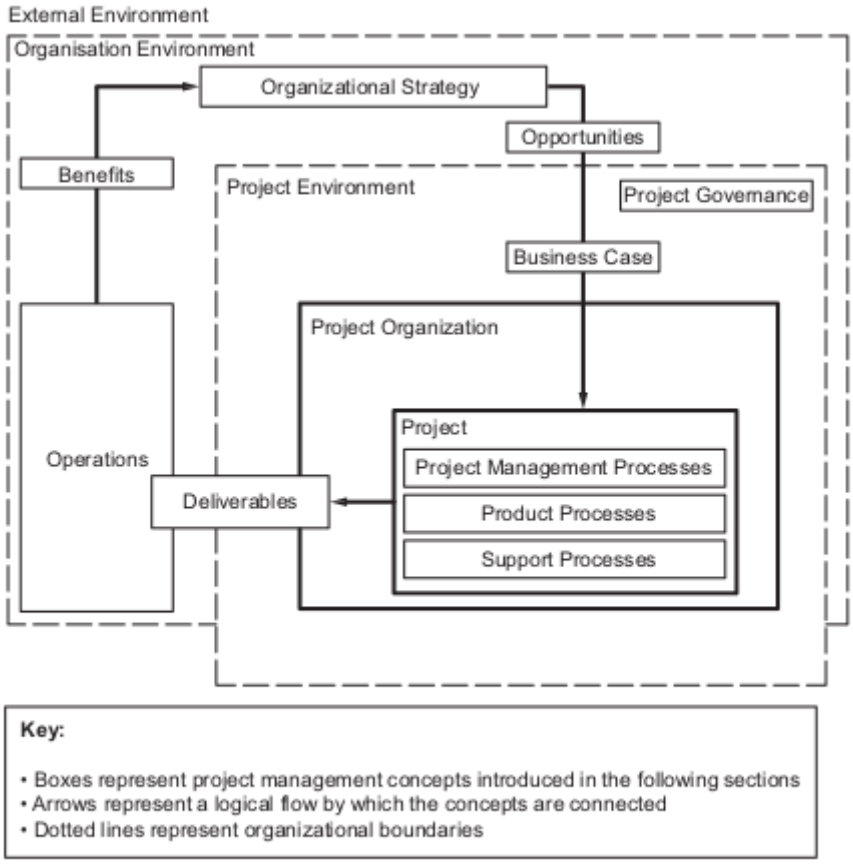


Figure 1 — Overview of project management concepts and their relationships

where:

- Operations: daily and social living of a family of 4, the husband smart working, husband and wife running a family business in cosmetics design and selling
- Benefits: they seek extra space for a SOHO, a roof terrace / penthouse leisure space, a social functions extra space
- Strategy and Opportunities: accrue family estate, diversify wealth portfolio, improve attic space, leverage on post Covid19 tax credits that will be enacted by Italian government,

mitigate construction risks by efficient lean construction approach
- Project governance: will be discussed later
- Business case: here we have some issues. The family has not rationally construed a case comparing alternatives and opportunity costs. They simply adopted their pet project, and a quasi-affective case toward their planned artifact, loaded with totemic features very high in the Maslow pyramid.
- Project and project processes: the family has a very low PM maturity. And this is normal, as building is typically a First-of-a-kind (FOAK) for most families... The result is that the family currently are sustaining a very high market cost trying to accumulate knowledge on the building construction process, mostly by consulting experts, consultants and various tradesmen. Outcome is an informational overflow that seems to increase the distance between their situational as-is and their cherished penthouse.
- Deliverables: throughout this process it has emerged that key deliverables are the building permit, the fitting of a new roofing and interiors, a stair connecting the new space. But there are options for energetic improvement in terms of additional insulation and installation of equipment for renewable energy production.

Side note on project governance

Project governance is defined [8] as

> 3.6 Project governance:
>
> Governance is the framework by which an organization is directed and controlled. Project governance includes, but is not limited to, those areas of organizational governance that are specifically related to project activities.
>
> Project governance may include subjects such as the following:
>
> - defining the management structure;
> - the policies, processes and methodologies to be used;
> - limits of authority for decision-making;
> - stakeholder responsibilities and accountabilities;
> - interactions such as reporting and the escalation of issues or risks.
>
> The responsibility for maintaining the appropriate governance of a project is usually assigned either to the project sponsor or to a project steering committee.

The mostly adopted project management body of knowledge [9] devotes section 1.3 of the standard to linking organizational governance and project governance. There, project governance is defined as:

> Project governance is the framework, functions, and processes that guide project management activities in order to create a unique product, service, or result to meet organizational, strategic, and operational goals.
>
> ...
>
> The project governance framework provides the project stakeholders with structure, processes, roles, responsibilities, accountabilities, and decision-making models for managing the project.

The rest of the standard then declines how projects are to be delivered by a scripted process of so called ITTOs, input, tool & techniques, output that, mostly processes written records of information to, in general, advance project knowledge to plan and command the execution of the project itself.

But project governance is not the subject of some of the those ITTOs. One is therefore left to bespoken approaches to plan and execute governance tasks.

Project governance of our reality fragment

In our approach we focus on the last bullet point of ISO standard, ie interactions such as reporting and the escalation of issues or risks, stressing the initial concept, interactions, thus leading us to a direct ANT approach.

We should note that in doing so we somehow subvert the prevailing practice of modeling project management framework. A traditional PMBOK based representation of pm processes rests on the progressive transformation of knowledge, embodied in a standardized set of information fragments:

Table 1-2. Project Management Plan and Project Documents

Project Management Plan	Project Documents	
1. Scope management plan	1. Activity attributes	19. Quality control measurements
2. Requirements management plan	2. Activity list	20. Quality metrics
3. Schedule management plan	3. Assumption log	21. Quality report
4. Cost management plan	4. Basis of estimates	22. Requirements documentation
5. Quality management plan	5. Change log	23. Requirements traceability matrix
6. Resource management plan	6. Cost estimates	24. Resource breakdown structure
7. Communications management plan	7. Cost forecasts	25. Resource calendars
8. Risk management plan	8. Duration estimates	26. Resource requirements
9. Procurement management plan	9. Issue log	27. Risk register
10. Stakeholder engagement plan	10. Lessons learned register	28. Risk report
11. Change management plan	11. Milestone list	29. Schedule data
12. Configuration management plan	12. Physical resource assignments	30. Schedule forecasts
13. Scope baseline	13. Project calendars	31. Stakeholder register
14. Schedule baseline	14. Project communications	32. Team charter
15. Cost baseline	15. Project schedule	33. Test and evaluation documents
16. Performance measurement baseline	16. Project schedule network diagram	
17. Project life cycle description	17. Project scope statement	
18. Development approach	18. Project team assignments	

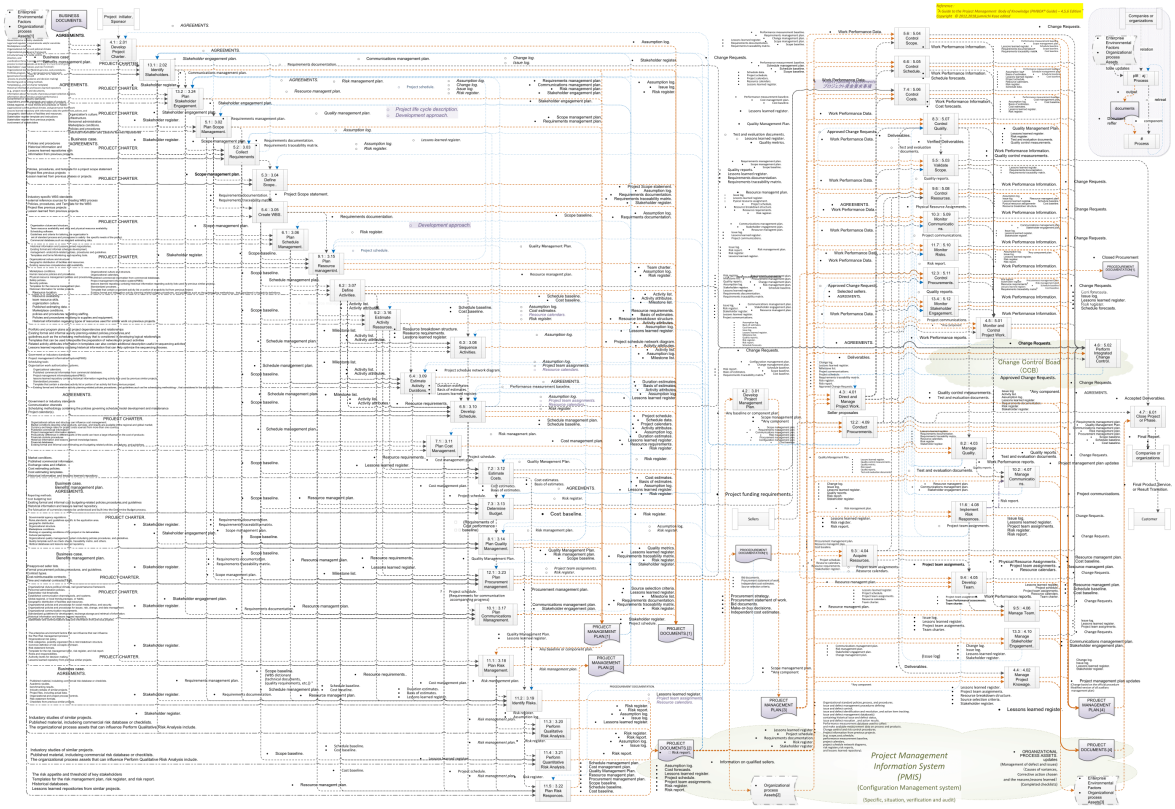
And this done by processes articulated by macro-process groups and knowledge areas:

Table 1-1. Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

And this yields a very complicated data flow diagram shown below:

PMBOK® sixth edition Data Flow diagram by english

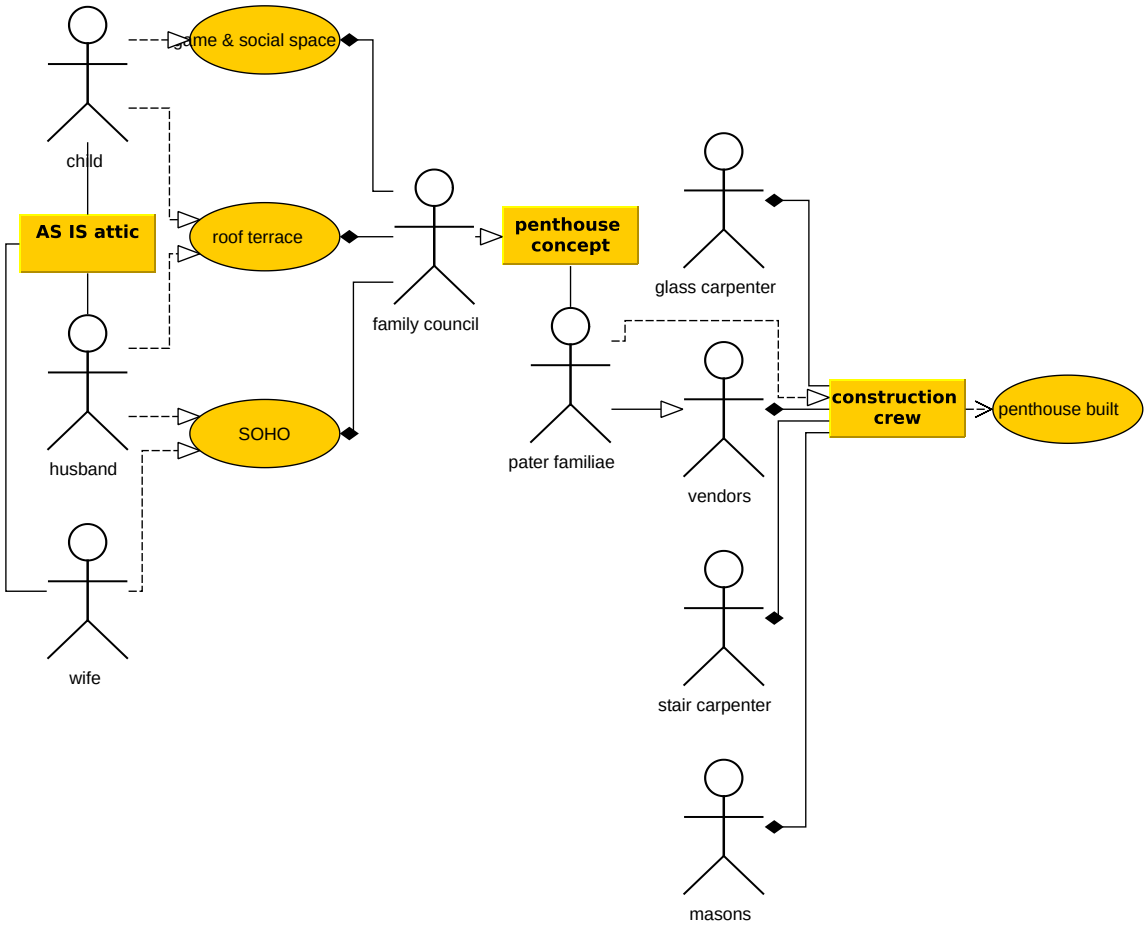


The reasons for distancing from prevailing approach rest in the very complicatedness of the chart above. If project governance has to be proactive, can the governing body make informed decisions based on a model built on the maze of causal relationships shown above? It's of course a rhetorical question...

Networking the case at hand

Based on the framework brief above, we may instantiate a number of actor-to-actor relationships.

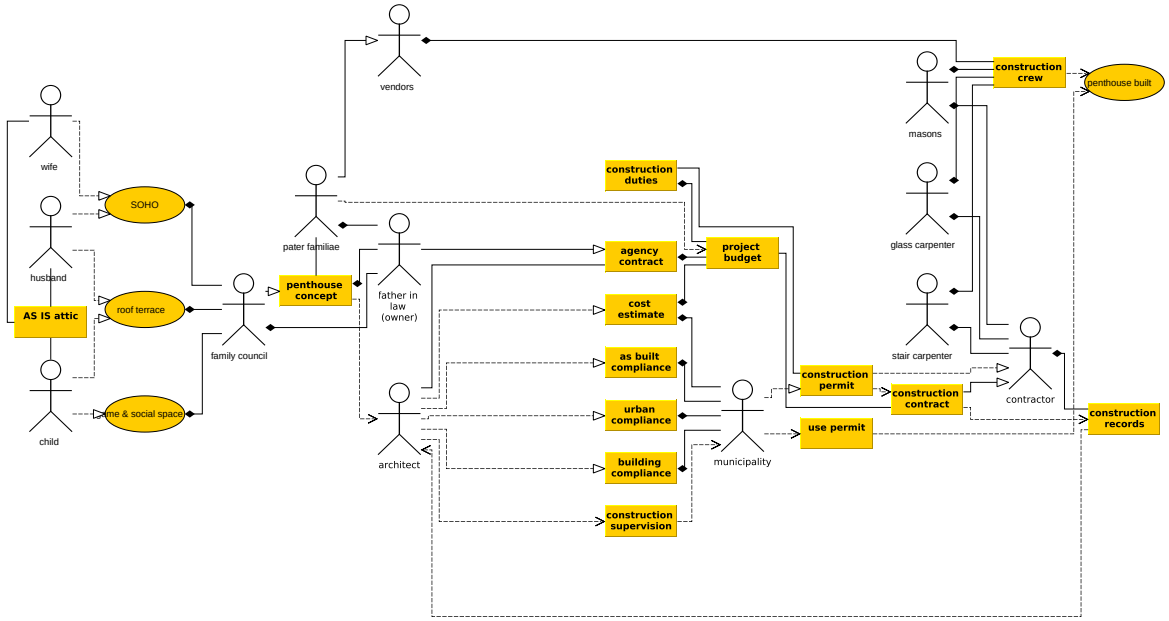
In a t=0 state the network may look like this:



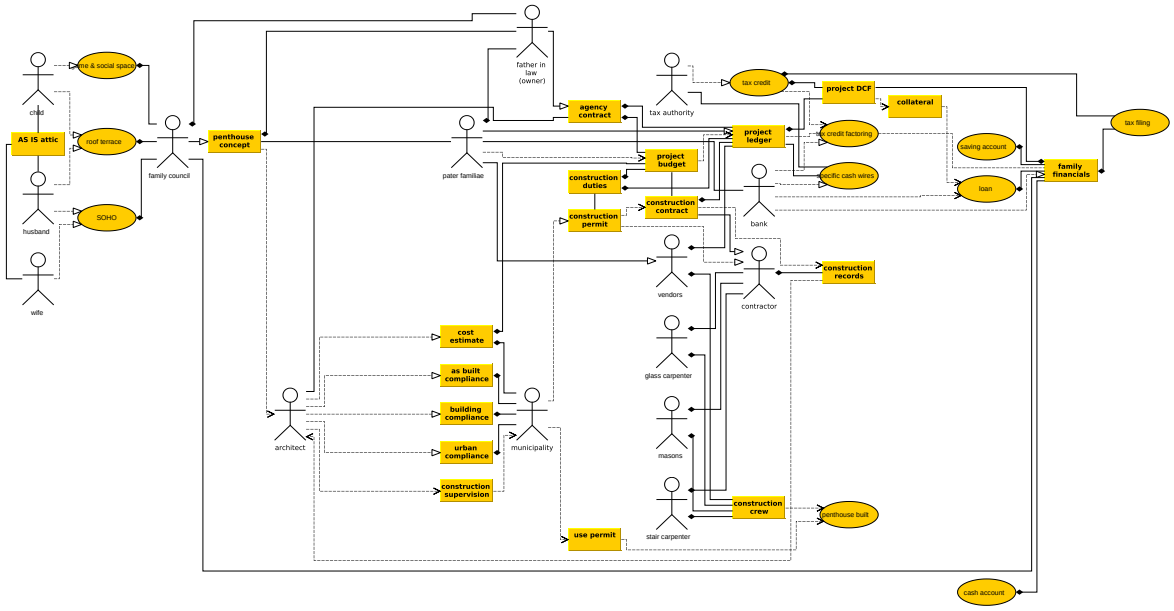
This network may seem overly simplistic: through it only the labor production factor is deployed. Capital and specific know-how seem to be "reasonable and common-sense" and affordable therefore are minor issues that would only support the network without any relationship worth noting. This delivery model adheres perfectly to agile delivery, as it complies with the agile manifesto [10].

In introducing the capital and know-how factor we jump into a fraught institutionalized set of relationships: capital, through banking instruments and intermediation with tax authority for granting tax credit, and regulated know-how through compliance with building codes negotiated by a registered architect supported by other certified specialists who interact with municipality to obtain a construction and use permit. Applying these constraints significantly amplifies the network and re-shape its quasi-linear pattern.

Compliance adjusted network graph:



By introducing the capital / finance dimension the network could yield the third graph.



Now if we associate the graphs to the classic sequence of project life-cycle we can evaluate the deltas in network metrics at main stage gates

Stage	Gate	Stage	Gate	Stage
Initiate	Project kick off	Planning	Execution kick-off	Execution
graph 0		graph 1		graph 2
	network evolution A		network evolution B	

If we identify network evolution as changes and if we adopt a conservative "culturalist" we may assimilate network evolution > change > risk. Therefore pro-active governance governance, that now we may define as the deeds and means to preserve stakeholders integrated purpose and commitment, could be seen as an application of main risk management techniques: avoid > transfer > mitigate > accept.

Anecdotally that may make sense: as it is well established by the World Bank ranking, FDI in Italy is hampered by the fraught relationship with institutional actors that may capture the project, or, in our parlance, becoming nodes with a degree higher than the project owner or sponsor. Thus the avoid tactics.

In logistic infrastructures (warehouses) it is common to deliver facilities under an 'agreement to design, build and lease', whereby a tenant leases a premises (or part of a premises) from the landlord following design and construction of the premises by the landlord. For the tenant, it will ensure a purpose-built facility, which the tenant will then be able to fitout to satisfy its needs. Alternatively, the landlord could undertake those fitout works for the tenant as part of the construction process. For the landlord it will help provide the necessary tenant commitment and construction detail that the landlord requires to commence construction. So the user transfers the governance of the construction via a leasing agreement and can keep himself at arms length with the network and relationships are mostly monetary.

Agile and lean approaches, implicitly make a lot of effort in a principled course of action where those shifts are mitigated, in agile by the continuous delivery by a monistic delivery team, in lean by seeking change through controlled kaizen burst.

Accepting is make do with states of the project.

References

1. https://pm-lab.polito.it/nextcloud/index.php/f/23542 ↩

2. https://pm-lab.polito.it/nextcloud/index.php/f/29852 ↩

3. https://pm-lab.polito.it/nextcloud/s/5Q3Mw3s3cf2TLat https://www.researchgate.net/publication/257609098_Project_Management_Maturity_Models_-_A_Critical_Review ↩

4. https://pm-lab.polito.it/nextcloud/index.php/f/29879 ↩

5. https://pm-lab.polito.it/nextcloud/s/tWf7b8gHFZFff7a ↩

6. https://pm-lab.polito.it/nextcloud/s/pcty69pJ986RmQ9 ↩

7. https://www.chess.com/openings ↩

8. https://pm-lab.polito.it/nextcloud/s/7wR5JzBRJdoYiLW ↩ ↩

9. https://pm-lab.polito.it/nextcloud/s/3XRcTF9Lxz87inw ↩

10. Individuals and interactions over processes and tools, Working software over comprehensive documentation, Customer collaboration over contract negotiation, Responding to change over following a plan https://agilemanifesto.org/ ↩