Risk versus risk; Double bind dilemmas in multi-actor decision-making on complex projects

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1. Introduction

Society’s challenges push public institutions to venture into complex initiatives, even though their organization may not be well equipped to manage the risks that accompany such endeavours. It at least requires hiring specialists to achieve the ambitions set. But that implies that management may become an even more challenging job because of the interdependencies that develop as a consequence. In infrastructure systems one can most particularly see public actors embark on expensive policy or projects with a high risk factor of technical failure, delays and cost overruns; often driven by appraisal optimism and the desire of politicians to leave a footprint (cf. Flyvbjerg, 2003, 2004). The policy or project requires high engineering proficiency that is rarely available in their organizations.

The higher the ambitions, the more challenging the decisions to be made and the larger the dependence on information from project partners such as contractors. Owners try to produce a project organization that is capable of balancing their ambitions and sensible management of risk in decisions on the project. But how is this done properly if the owner himself is not capable of making complete assessments? In many cases owners, or the client organizations that they set up, suffice by initiating a risk analysis and subsequently applying risk management throughout implementation of projects. Risk management is, however, far from flawless (Hubbard, 2009). One of its problems is that it can only produce known risks. As a result, risk considerations can easily be neglected in a pursuit of an appealing result.

Moreover, public clients can easily overvalue certain values on the basis of their main interests. Think, for instance, of a public institution that expands the scope of a policy initiative or project to increase its functional value, without expanding budget and implementation time accordingly. Or think of a public institution that is so preoccupied with delivering its policy or project on time or within budget that it unwittingly compromises the quality and safety of the end-result.

This paper presents the results of an explorative research conducted by the author into the manageability of complex public infrastructure projects, in which he looked at the options available in trade-offs that influence the balance and the possible implications of trade-off outcomes. It resulted in a set of fundamental dilemmas that are likely to occur in each complex project. The research shows that these risk related dilemmas have the troublesome feature that there is no best way to go and that choosing for an alternative implies that serious downsides must be overcome. This paper will present the double binds and gives suggestions on how to deal with them. It finally leads to a consideration on the position of risk in decision-making.

The main actors in the risk situations described are the decision-maker and the information owner/provider. Because the topic has been researched in the field of complex projects, this equals the roles of client (decision-maker) and contractor (the most common dominant information owners in projects). They tend to have a principal-agent relationship (Jensen and Meckling, 1976) with the client as principal and the contractor as agent. In the remainder of the article they will be referred to as such.

2. The empirical research

The author conducted extensive research into seven infrastructure construction projects with risk features in the Netherlands, Germany and the United States and studied publications on a
few more. Most research into effectuated risks in such projects focus on finding the origins of unfavourable consequences such as technical failure, delays and cost overruns. This often leads to determining who should get the blame. That is usually the person or organization responsible for the trade-off that led to deviance. In this research, however, this causal relationship between cause and consequence has only been used to describe the chain of events. Explanation is sought in a study of the framework of circumstances, conditions and constraints that applied to the project management when it made its trade-offs that led to the identified consequences. This was done by analyzing the complexity features of the project (see the trade-offs on this in section 3) and by interviewing the managers involved in the main trade-offs that determined the manageability of the project.

3. Indicators for risk trade-offs

To deal properly with the double binds, a manager should understand the complexity of the issues he is dealing with. This can apply both to the technical system he is dealing with, for instance in the case of infrastructure projects such as the ones studied in this research, and to the organizational or social system, i.e. the network of actors. There are three types of indicators that imply a certain amount of risk.

The first one is complexity. Complexity has two main features: differentiation and interdependence (Baccarini, 1996). Differentiation characterises the variety between system parts or actors (backgrounds, interests, dominant values, resources etcetera; cf. De Bruijn and Ten Heuvelhof, 2008) Interdependence describes the coherence of the network. It indicates where and to what extent system parts affect each other or actors depend on each other’s resources, support etcetera (ibid.).

The second is the possible occurrence of uncertainty (Williams, 1999), which is indicated by the gap between knowledge and expertise available to the project organization on the one hand and the knowledge and information required to deal with the features of the system at hand on the other hand (Galbraith, 1977). There are several difficulties to assess this properly:

- Clients may not know what knowledge and information other actors, such as the contractors have. Contractors are usually however the main knowledge owners (professional background) and information providers (because they are closest to the actual technical system).
- Much knowledge has a tacit nature (cf. Nonaka and Takeuchi, 1995).
- It is unknown to the client what knowledge, information and expertise is required for the system at hand if it is very complex and/or innovative.

All these issues relate to “known unknowns” and “unknown unknowns”. Managers can nevertheless estimate the level of proficiency of the client organisation. They can assess the capabilities of the client organization and know whether it covers the required controllability of the complexity features mentioned in the previous paragraph. On the basis of earlier projects or events with expected comparable complexity and innovation features, the client’s managers can develop an image of the uncertainty they are facing and hence of the risk they take.

The third indicator is the way information and decision-making are being dealt with. To deal with the uncertainty mentioned in the previous paragraph, information flows will be evoked and decisions will have to be made. Information flows are supposed to bridge the “uncertainty gap” between knowledge and information available and knowledge and information required (see previous paragraph). The client as main decision-maker is the receiver. The sender can be either an external actor or a contractor hired to be part of the
project organization. Both sources have their downsides. External information does not flow spontaneously. It must be actively sought, which is difficult if the client is not aware that he should be looking for it. Information from an involved contractor can be strategically coloured or contaminated to serve the interests of the sender, who often pursues different values (making profit) than the client (efficiency). This is the common principal-agent problem (cf. Jensen and Meckling, 1976).

4. Three themes that define the balance between risk and manageability

An analysis of the empirical data resulted in the formulation of seven key-dilemmas. They are divided into three categories, based on the above defined indicators for risk-related trade-offs in complex projects.

4.1 Differentiation and interdependence

1. Actor diversity. Presence of multiple actors in a project is a given. But the influence of interdependence and differentiation depends on the way the manager wants to deal with this. Should information and decision-making be integrated or remain separate? Integration optimises the availability of information, but enables contractors to strategically influence the outcome for their own good (for instance making more money). Separation would prevent that, but also disables the actors involved to achieve the optimization of information exchange.

2. Information asymmetry. As indicated under 1, the fact that information is present in the project organisation does not imply automatically that it is available to the main decision-makers. In a multiple actor network there is a key-dilemma whether this is best solved by moving information to the decision-maker or by moving decision-making authority to the information owner. The former has as a disadvantage that the most poorly skilled actor of the two has to make assessments on the basis of the information to make sensible decisions. But the latter option would make the information provider very powerful; possibly at the cost of the client’s values and interests.

3. Value variety. Given that project organizations are multi-actor systems, there is likely to be a high grade of differentiation and interdependence in resources, interests and values. How to deal with this? Be receptive or repulsive to it? A large variety enriches the policy or project to reach an optimum of functionality, quality, costs and implementation time. But a small variety is much better manageable. The trade-off is between a risk of a sub-optimal result versus the risk of coordination difficulties

4.2 Uncertainty

4. Uncertainty gap. This issue defines the main uncertainty characteristics of a project. There is a fundamental question whether the technical system defines the organisational system or vice versa. Normally, the demanded functionality defines the terms of reference and on that basis a project owner raises a project organisation that is equipped for the job. The alternative is possible however. Another important issue is the availability of knowledge as compared to the requirements to implement the project. Should more information be acquired, or should ambitions be toned down? The former serves a pursuit of the most attractive end-results. The latter is therefore politically less acceptable, but also provides the smallest chance of failure. The trade-off here is thus a political risk versus a technical risk.
4.3 Information and decision-making

5. Strategic behaviour. A combination of information asymmetry and value variety, which characterises the principal-agent relationship between client and contractor, may lead to strategic behaviour. This behaviour, can determine for a considerable part the manageability of project implementation. But a decision-maker’s bolstering against it may exclude valuable input from trade-offs. So, should he bolster, or be receptive with the risk of becoming a victim of strategic behaviour?

6. Bounded rationality. To prevent becoming a victim of adverse developments as a result of information asymmetry in combination with value variety, decision-makers may grasp to objectifiable information because it makes their policy measureable and controllable. But it may exclude valuable unobjectifiable input, such as unsubstantiated but sincere concerns of professionals for the manifestation of risks.

7. Dynamics and the required explicitness of trade-offs. Issues emerge during policy-making, but it is up to the decision-makers whether they are receptive (make explicit trade-offs) or repulsive to them. The former enables optimization with the risk of making a project unmanageable in terms of time and money for instance. The latter makes a much better manageable job, but may not be flexible enough to respond to the risks and challenges that occur when carrying out the policy or project. This is a trade-off between a risk of unpredictability and the risk of ending at a suboptimal result.

4.4 Double binds

These seven dilemmas have the common feature that there is not one best way to go. Initiatives to avoid risk in the trade-offs above, create new risks and uncertainties. There are trade-offs of varying nature in the list of section 4.3.

Dilemmas 1, 2, 5 and 6 all concern an apparently strongly manifesting dilemma in the management of projects and policy: strategic risks versus epistemic risks. Decision-makers’ pursuit of rationality clashes is several ways with the pursuit of diverging interests by other actors such as contractors. This manifests in two ways. On the one hand decisions depend strongly on the sender of the information and his values, interests and resources, and on the other hand it depends strongly on the receiver of the information and his assessment, for instance on the basis of his professional background, skills and dominant values. In the information asymmetry dilemma, moving information to the decision-maker gives room for poor assessment by the often less-informed project owner; but delegating decision-making authority to the information providers weakens the owner’s control and enables the information providers to act strategically and pursue his own interests.

Dilemma 3 concerns a trade-off between optimisation risks (i.e. the risk that project or policy has a suboptimal outcome) versus coordination risk (i.e. that risk that managers can no longer coordinate the network of actors or a set of tasks properly due to the large variety of values. Decision-makers may have a dominant focus. They for instance steer strictly on budget and implementation time; maybe because they feel they are primarily held accountable for those values. If other actors try to steer them towards sensitivity to design quality or protection of abutters for example, this might lead the decision-maker away from his primary value and reduces his chances of achieving his targets on that point, because it is difficult to keep a balance between multiple values. A better balance could make a better project though.
Dilemma 4 attends a trade-off of political risk versus aleatory and technical risk. To avoid risk of project or policy failure it would be best to reduce complexity (often at the cost of for instance functionality or appearance) or build in more redundancy, but this may be hard for initiators of the project or policy to accept. It violates their ambition to create something special and do so as efficiently as possible. In practice decision-makers will therefore most often try to acquire more information to rationalise decisions and ignore or neglect the challenges that they will then encounter later on. This is a rather easy step, because these challenges are usually hardly visible upfront and the decision-makers may overvalue their own skills in dealing with them, because that is most convenient.

Dilemma 7 concerns the trade-off of the risk of unpredictability and the risk of sub-optimisation. Decision-makers are often averse to dynamics, because that threatens their attempts to stay on schedule and within budget. But particularly in the more complex projects and policies issues tend to emerge that could optimise that project or policy further. This might requires to for instance change the scope, design or technology chosen. The decision-maker who is strongly focused on the values implementation time and costs will likely try to predict the preparation and implementation of his project or policy as much as possible and control the implementation on agreement with the terms defined ate the beginning. To obtain an optimum, he could also chose to focus on the flexibility and adaptability of the organisation if changes occur, rather then fending off all such dynamics. Implementation in accordance with benchmarks set may be more difficult, but he commits to the best possible result (cf. Koppenjan et al., 2011). The outcome of this trade-off often depends on conditions and circumstances. If the project leader has bad history of overrunning budgets and time schedules, he is less likely to be receptive to emerging issues.

5. Patterns of unmanageability in coherent risk trade-offs

The seven dilemmas are strongly interrelated. The elaboration of the dilemmas in previous sections showed that the dilemmas cannot be considered independently. A trade-off in one dilemma has implications for other dilemmas. As figure 1 shows, four tiers of dilemmas can be distinguished, corresponding with the risk indicators: differentiation, interdependence, uncertainty and information and decision-making. All manageability considerations start with the occurrence of uncertainty. The uncertainty gap dilemma can therefore be considered the central dilemma, perhaps even the origin of all dilemmas. If uncertainty did not occur, there would not be a manageability issue.
Figure 1: the main dilemmas in the management of complex underground engineering projects.

Manageability issues occur above all when managers do not reduce uncertainty by decreasing ambitions, but, as happens most of the time, by assembling more information. The first set of dilemmas emerge after choosing for this direction concerns the project organisation and how it deals with the required information flows.

- How short should the lines of information flows be? Should decision-making be as close as possible to the information source and can a distance be covered?
- To what extent is there a variety of values between sender and receiver of information? This becomes relevant for dilemmas on the decision-making level. It is a key-dilemma that is a centre-piece to all patterns of dilemmas in the figure.
- To what extent can external flows (dynamics) affect manageability?

The interdependence dilemma largely follows from strategies to reduce the distance between sender and receiver of information. It is a step that is sometimes overpassed if the distance between sender and receiver of information is not reduced.

The information and decision-making dilemmas then cover the most concrete and tangible dilemmas that managers may recognise most: they are confronted with possible strategic behaviour and they are confronted with information that cannot be objectified.

The central message of an analysis of the double bind trade-offs is that manageability in complex underground construction projects does not depend on which direction managers
choose in individual dilemmas, but on how they deal with the coherence of dilemmas. The double bind nature of the dilemmas implies that each direction has downsides and the successful manager is the one that manages to mitigate the hazards of one direction of choice with measures on other. As a result, unmanageability occurs if managers do not acknowledge the ramifications of their trade-offs. This paragraph gives a few examples of patterns through the dilemma tree of dilemma 1 that have led to unmanageability. It is needless to say that there are plenty of other patterns possible. They tend to touch upon the same regularities that can be countered with help of solutions that will be suggested in section 6. For illustration there will be some references to real cases studied.

5.1 The alliance issue: the ‘dancing on your partner’s feet’ pattern

Actors can easily perceive the separation of information and decision-making authority as a problem, because it disables them to make rational decisions. In one of the studied projects, the Central Artery/Tunnel Project in Boston, this happened during implementation, when contractor and client integrated into a joint project management organisation. This brought decision-makers as close to the information as possible. In the meantime, however, the value variety between the contractor (profit seeking) and the client (efficiency seeking) remained. As a result, the interdependence between the two main actors remained as well and so did the client’s susceptibility to strategic behaviour. If the client feels so confident about his contractor that he becomes receptive to non-objectifiable input, he can easily lose control over the implementation process.

Another project with likewise attempts did not experience this unmanageability, because the project organization was set up in a way that prevented strong value variety. So the issue was taken care of in advance. It concerns the Build-Operate-Transfer Herren toll tunnel in Lübeck, Germany. The client handed over decision-making authority to the information owners, which were both contractors and financiers, and made that consortium responsible for all tasks.

This pattern shows the strong interrelation between the actor diversity and value variety dilemmas. These dilemmas should be considered in coherence and preferably early in the process. The former project management did not act on the basis of the value variety, which made them a passive dance partner who does not know the right steps. From the moment the managers of client and contractor merged into one organisation, the contractor could lead the dance and take his partner anywhere he wanted.

5.2 The dynamics issue: the ‘measure everything and know nothing’ pattern

To what extent can emergent developments be handled by the project organisation, and, more specifically, the client as main decision-maker? Clients and managers can try to fend-off or ignore such developments to keep the project predictable, controllable and, hence, manageable, or be receptive to keep the project at state-of-the-art, but including uncertainties. Receptivity to dynamics could evoke an uncontrollable information flow, so it is likely that the client will somehow try to order this.

Two important Dutch projects – Randstad Rail and the related Souterrain tunnel project; both in the The Hague region – provide examples of clients that tried to order the information flows by focusing strongly on objectifiable information. In both projects we see clients that desired clear and substantive information on exactly where the shoe pitches, whereas the information available comes predominantly from tacit knowledge; the kind that is most susceptible to strategic behaviour. The clearest example in the case of Randstad Rail is the doubts exclaimed by engineers about a very tight construction and trial schedule. The
client’s board ignored signals of unmanageability, because engineers could not substantiate them sufficiently. In the Souterrain project something comparable happened with a discussion between client and contractor about technical novelty that the contractor perceive as the most prominent risk in the design. The contractor distrusted the design for this reason, but could not indicate where exactly the predicted failure would occur.

In both cases the clients have explained their behaviour with their fear of strategic behaviour. In both cases the information providers had more specialist knowledge about technology and implementation, but also had some interests that might diverge from the client’s, bringing the origins of the dilemma again to value variety. This justifies the conclusion that there is a potential tension between dynamics and information flows. Dynamics evoke information flows and information flows imply susceptibility to strategic behaviour. To counter this, the client could give a strong mandate to an independent engineer who could check this kind of crucial information. It would be a way out of the information asymmetry dilemma. Another option would be to solve the value variety dilemma that causes strategic behaviour. If information providers have no incentive to provide strategically contaminated information, the client does not have to make difficult trade-offs in a situation of bounded rationality.

5.3 The technical discord issue: the uneducated guess pattern

The cases provide several examples of situations in which clients experienced the (technical) uncertainty gap. The most concrete and clear example is the one mentioned in the previous section: the discord between the municipality of The Hague and its contractor on the risky design feature mentioned above. The client experienced a lack of information and tries to solve this half-heartedly. On the one hand he assembles information, but on the other hand he is very suspicious about the nature of this information. What starts to play a role is not so much from which actor the client can expect the qualitatively best information, but from which actor he expects least strategic behaviour. Provided that the client is the less knowledgeable actor, possibility that information is strategically contaminated is much more visible to the client than the possibility that ‘safe’ information comes from a poorer source.

In this concourse the paradox develops that options that are least backed by professional knowledge become the ones that are most strongly supported by the client, without him being aware of this paradox. But apart from founding decisions on the qualitatively less information, this mechanism also encloses strong potential anomalies, such as groupthink and reliance on ‘yes-men’. In the case of the Souterrain it is hard to bluntly say that the municipality’s engineering designer was less specialised than the construction contractor, but it is hardly denied that the contractor had more experience in practice. The pattern of distrust, that followed from the value variety between client and engineering designer on the one hand and contractor on the other, was not broken by joint incentives or a proper countervailing power.

6. Ways out of the double bind for the intervening manager

Providing that there is no best way to deal with these trade-offs, managers and decision-makers should instead focus on the implications the outcomes of their trade-offs have on the other dilemmatic choices and strive for neutralisation of the adverse effects. To this end, the author will explore a combination of installing the right incentives for the actors involved, organising countervailing powers and using process management. The aim of such an endeavour is to find an optimum in risk acceptance and preparedness for adverse effects.
6.1 Countervailing powers

One of the most dominant manageability problems on risk trade-offs occurs because the interdependence between commissioning actors, i.e. clients (decision-makers) and hired contractors (information owners) is in fact a unilateral dependence of the commissioning actors on their contractors. It is, after all, the client who has the primary commitment to the end-result.

Two countervailing powers should be organised to counter adverse effects as a result of the unilateral dependence. One should prevent the hired contractors from providing strategically coloured information by neutralize incentives for actors to behave strategically by prevailing self-interest over the common good. The other should prevent the client from (unwittingly) straying off to risky solutions in an attempt to fend off such strategic behaviour. Managers should organise their own opposition to keep them away from convenient truths, warn them for adverse effluences or ramifications of their policy. The easiest and probably least inefficient solution would be a small committee of engineering specialists who are unrelated to the contractors and who have sufficient distance from the decision-making role of the client to remain detached from politically and budgetary motivated trade-offs and just focussing on the substance. Whereas input from functional managers that is badly substantiated or unobjectifiable might be ignored, the input from the expert back-up should have a higher authority in the information flows. The department of Public Works of Massachusetts, which commissioned the complex Central Artery/Tunnel Project in Boston started with such a “second opinion committee” to compensate for its own deficiencies and to provide a countervailing power to the information flow to the department from its super contractor. After the committee had disbanded, however, a new governor did not restore it but chose to move closer to the private contractor instead. This gave the contractor more indirect power over decision-making and affected control mechanisms.

But there are more ways to attune the network of actors to the situation. Managers can try to design a network in which dependencies are mutual by only including an actor if his unique resources or powers (production power, blocking power) can be mirrored by resources and powers that are indispensable for that actor. Managers can for instance make use of knowledge on the background of an actor. If it is an actor who is eager for work to keep his company running, the manager might be able to demand for privileges, such as accepting some more risk responsibility.

6.2 Incentives

A situation of countervailing powers does require a conflict driven implementation process. In many cases the client may consider his organisation not very powerful to weigh up against contracted actors. A solution for this could be found in providing the contractors with incentives that match the client’s interests. The appeal of such incentives is that they will solve the client’s oversight problem, not by requiring a lot of investment and effort to build control mechanisms, but by encouraging desired behaviour. Proper incentives are most probable to be obtained if contractors have an interest in the end-result that matches the client’s. Complete outsourcing of the project implementation and operation for a designated period can create such a situation, as well as a secure return on investment. This provides the contractor with an incentive for self-discipline. In such a case, information and decision-making authority can be integrated with less threat of unmanageability than in case of the Central Artery/Tunnel Project example after the disbanding of the second opinion committee, mentioned in section 6.1. In normal contractual relationships a contractor’s blocking of the
process might be perceived as mutiny. An interest in the end-result might change this. Not just because the contractor then has an incentive to block the process if it considers this necessary, but also because the client probably understands that there might be good reasons and would not consider it mutiny. Meanwhile the client should have an incentive to listen to all input and rely on the absence of strategic information. To do so, the client should be self-aware, be critical about his own capabilities and acknowledge his shortcomings. Long-term commitment to a certain policy or project is desirable to prevent hit-and-run strategies and rather facilitate a durable interest. Financial commitment is probably the strongest commitment. It could be arranged by involving actors in both the investment and the revenues of a project or policy. Unfortunately, the more risk involved in a project, the more difficult it may be to interest potential partners in such long-term commitment. This could lead to a lack of partners or very unfavourable conditions of collaboration. The more certain a prospect of gain such actors is offered, the more likely their willingness to participate.

6.3 Process arrangements

Risks are the situations in project management where conflict is probably most likely to occur, because decision-maker and information owner depend most on each other and are confronted with most uncertainty, which they assess from different frameworks of reference; the client from the total performance on project benchmarks that have strong political values and the contractor from his professional background and his operational management which is aimed at making profit.

If, due to the uncertainty, rationality in trade-offs on risky issues cannot be obtained on the substance of the matter, managers involved can at least try to obtain a procedural rationality. By agreeing on how to act in the occurrence of a trade-off that involves risk, managers can take away the unpredictability that makes actors nervous in such events.

Procedural rationality can for instance be obtained by establishing how information will be dealt with, how assessments will be made, how representatives of the contractor will be involved in decision-making by the client etcetera. Such procedural rationality can have several purposes beyond avoiding conflict, such as disciplining the client in his decision-making, preventing that the decision-maker waives valuable input from independent actors and substantiating the way in which contractors should present their input (preferably on the basis of objectifiable data, with reference to concrete experiences etcetera). Each preference of one project value (costs, implementation, time, scope, quality, mitigation of nuisance) over the other should be justified.

7 Conclusions

Risks make project management and policy making difficult. The difficulties persist despite the advances in risk analysis and risk management methods. A cause can be found in the double bind nature of the trade-offs decision-makers have to make. Moreover, decision-makers in a situation of verging risk do not always consider multiple trade-offs in coherence, even though they are often interrelated. Unfortunately, the double bind nature disables the decision-makers to properly deal with the risks by making the right trade-offs. As a result, they should redirect their attention to the way they organise the project or policy implementation. If risks manifest strongly, attempts to obtain substantial rationality will be deceptive, because they provide false security. The alternative can be found in interactive and procedural rationality; with soft power instead of conflict and force.
If we attend risk this way, what role should it have in decision-making on projects and policy initiatives? The final stage would be a situation in which risks and uncertainties are no longer perceived as disadvantageous side-effects of making policy or managing a project. Instead, risk and uncertainty might get a position in the centre of decision-making. Not to scare policy-makers off, but to use risk challenges to be faced as the point of departure for designing an organisation in terms of knowledge availability, incentives (for instance in contracting) and procedures. Subsequently, such an organisation should not focus on attempting to choose the best direction in a risk-related trade-off. After all, in a situation in which risk can become problematic, decision-makers cannot know the future. Instead, the organisation should focus on neutralising the downsides of the chosen direction. In hindsight, a chosen direction is always difficult to defend if risks have turned to failure and risks were just considered side-effects. With risks at the centre of decision-making, the decision-maker is constantly aware of the necessity to mitigate. Moreover, it offers a third option besides trying to choose the best direction in a trade-off and neutralising the adverse effects of a chosen direction: not accepting the risk if the reach of its adverse effects is considered too large, and therewith renouncing the project or policy all together if necessary.

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