

Mapping Barriers and Solutions for Coping with Uncertainty and Complexity in Planning

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Abstract

Uncertainty is a phenomenon that is ever present in planning transportation projects. As conditions are intertwined, dealing with them appropriately for the right type can be difficult. Although many have been proposed for coping with uncertainty and complexity in academic literature, implementation seems to stay far behind. There is little research on if and why this is the case. Insights into our understanding of (coping with) uncertainty in transport planning and our understandings of current practices. This paper reports followed a three tier approach along the following questions: (1) what do planners in the Amsterdam Metropolitan Region (MRA) currently cope with uncertainty, such as what are their barriers in appropriately coping with uncertainty, and; (2) what are possible solutions to these barriers. These questions were answered through a review of the relevant literature and case studies involved in transport planning within MRA

1. Introduction

Uncertainty is a phenomenon present in all aspects of life and is inescapable. It is a challenge when considering the future and in transportation planning. The way transport uncertainty is perceived is mysterious and fascinating. Uncertainty represents the human vulnerability of the lack of control over happenings, which can be frustrating for planners. This desire for control is a desire that cannot be reached and is not acknowledged. In the same line of thought, a planner's core function as the provision or appearance of provision of future certainty in an unstable, dynamic and inherently uncertain world (Gunder, 2008; 189).

Unpredictability in transport planning (and in general) can be costly, not only in terms of time, energy and people as well. As the globalization and interrelationships between countries, the importance of conscious decisions becomes crucial. In the Netherlands, billions of euros are spent on traffic and transportation projects. Meaning, a great amount of money is involved in transport planning. In times of economic crisis should be used efficiently. The problem here is how to deal with uncertainty and complexity in the most appropriate and efficient way.

However, it is still unclear how transportation planners are coping with uncertainty in their projects, if at all and what the barriers are. Their approach depends on the way they interpret uncertainty. With the different definitions of uncertainty comes along different ways of approaching it. The research question is: What are the barriers for dealing with uncertainty and complexity different transport actors face in the Amsterdam Metropolitan Region and how to overcome?

And it will be addressed in the following sub-questions:

1. What are the theories about uncertainty and complexity and how to deal with them in transport planning?

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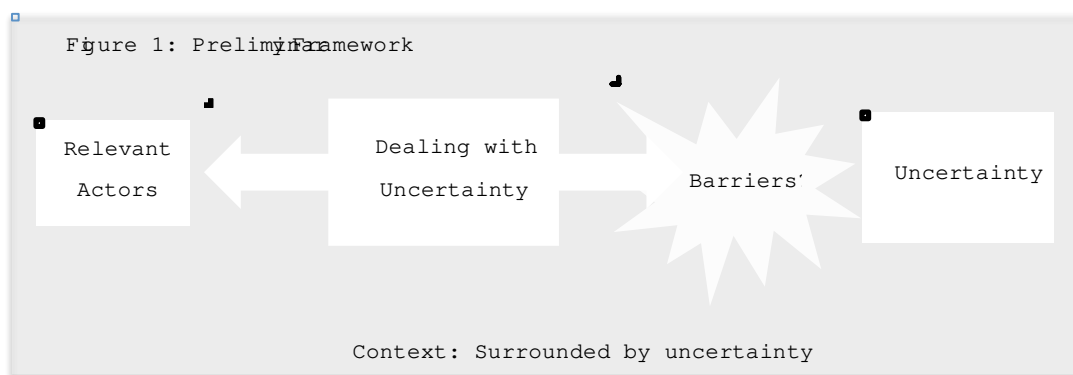
2. What complexities and uncertainties do transport actors in the Netherlands face?
3. What are transportation actors' approaches in coping with them in practice?
4. What are the barriers to adequately addressing uncertainty in practice and projects?

This question was answered in the exploratory methodology through theoretical review of literature and interviews with those involved in transport planning.

Uncertainty is something commonly feared, not welcome and an uncomfortable place to be in. In planning for the future, many uncertainties may be present. The initial question (1) served the purpose of gaining insights, background and familiarity on the concept of uncertainty, as well as creating a grounded theoretical framework of the issues surrounding it. The theoretical context clarified the existing concepts, which were tested in comparison with the data gathered from answering the rest of the questions through interviews.

The next questions (2, 3, 4) directly targeted Dutch transport actors' use of coping strategies when they approach unknowns. Their responses were studied and compared to the various approaches found in the literature. Accumulating this information led to identifying the barriers to managing uncertainty and complexity in transportation projects.

It was appropriate to take on an explorative research to delve into the lack of academic research on this topic. This included creating a preliminary framework of the key research elements, shown in figure 1.



This shows how the relevant actors work within their context of uncertainty in dealing with it to reach their objectives and the barriers preventing them. There are two main assumptions in this framework: that individuals working in transport function within a context of uncertainty and that there are barriers existing between managing those uncertainties. It will be expanded and refined with added insights from literature and then interviews.

2. Methodology

The first question was answered through theory development. The rest were through semi-structured interviews with different actors involved in the transport planning and projects to

information. The units of the analysis were the beliefs and actions of those involved to paint a clearer picture of both what is actually taking place and how these individual concepts directly from the field (source). Their views and ways of managing uncertain variables. The interviews were combined with the theory to draw grounded conclusions.

The scope of this research looked at those involved in transport planning and projects in the Metropolitan Region (MRA). The MRA is an informal association of 36 municipalities in North Holland and Flevoland and the Amsterdam City Region. The metropolitan area in the territory of the northern part of the Randstad; it extends from IJmuiden to Lelystad and Haarlemmermeer. The focus will be on the MRA because it is the largest region in the country, important economically for the country and thus receives the most funding for transport projects. The large amount of money spent on this region makes it a more sensitive area. Uncertainties not being managed accordingly can result in a mismanagement of money. It is useful to use the MRA as a scope of this study since money is connected to many uncertainties, very precious in times of crisis.

At least two members at each level of organization were interviewed: National, Provincial and Local (Municipal), with the inclusion of non-governmental organizations: a citizen organization and a consultant. Each of these levels is directly or indirectly involved in transportation in the region, which was the criterion. The criterion was broadly defined to gain a diverse perspective and to address the possible vulnerability of the research: not enough participants. The variety in responses was crucial in compiling a well-rounded picture, since individuals in different contexts, working backgrounds and fields may have different experiences. This wide variety also meant that personal biases (from position, experience and background) are included. Interviewees were planners, project managers, advisors, engineers, and directors, and other transport actors here. The 20 non-hierarchized participants covered:

Municipality:

- o Amsterdam
- o Almere
- o Haarlem

City Region:

- o Amsterdam

Province:

- o North Holland
- o Flevoland
- o Utrecht

National:

- o Ministry of Infrastructure and Environment
Rijkswaterstaat (Infrastructure and Water)

Other:

- o Consultant
- o Citizen organization

They were all at least asked:

What are your ideas, views, and definitions of uncertainty (like unpredictability)?

How (or if) you manage/cope/deal with uncertainty and the process

The approach to analyzing the interviews in this study is a combination of inductive and deductive approaches. Coding is the method used for testing the theory compared to the interviews. The data obtained from the interviews was analyzed through classification and coding to open up new concepts. This was to translate the theoretical concepts and theories, such as the theory of uncertainty (which can be abstract) into categories of data and codes that may be used in practice. The concepts of the classification were: uncertainty and complexity, management barriers (and solution). There were two sets of codes: deductive and inductive which were pre-defined.

The first round of coding was essentially thematic analysis of the transcribed interviews. The literature coincided with the experiences of those interviewed. This was to find the theory based on the description from the literature in the interviews. Even though there is a theory on the topic, this theory, for the most part, has remained untested and unproven. The importance of the subjective experiences of social reality over constructed works of theory.

Not only was the goal to test the theory in the MRA, but to reflect and add to it. The theory-driven codes were combined with data-driven codes. The second set of coding was in an inductive manner, which looked for emerging themes within the transcribed texts and to highlight issues not mentioned or explained in the literature, yet existing in practice.

As for the deductive coding, a code from the theory was assigned to a piece of text. More than one code was possible. A similar process took place for the inductive codes. The codes identified compared and turned into codes. Tables tallied the repetition of inductive codes to show how often certain topics came up. This indicated the importance and prevalence of the theory. Although presented as a linear, step-by-step procedure, the research analysis was a reflexive process.

3. Theory

3.1 Defining Uncertainty and Complexity

To understand uncertainty, what is encompassed by it needs to be established. Re-examination of certainty in relation to uncertainty points out the assumptions surrounding certain knowledge, which is considered known-knowns (Ivankova, 2008). Knowledge is usually seen as objective and superior (Van der Sluis, 1991). Certainty is prized and craved, thus it is strived for. Uncertainty (and complexity) are system attributes, meaning they are interpreted based on the cultural and contextual values of the system. In any system, there will be human and technological limitations preventing complete certainty (Christensen, 1985).

The concept of uncertainty can be difficult to grasp since it is about the possibility of error. Walker et al. (2003) define it as any deviation from the unachievable ideal of complete knowledge of the relevant system. The possible natures of uncertainties are 1) variability, as the root attribute of the uncertainty. For the location, a majority

the context of the project (Walker et al., 2003). This happens from internal and the different levels of uncertainty, risk is essentially statistical uncertainty. Structural uncertainty is more uncertain than scenario uncertainty; the occurrences possibilities cannot be predicted. Recognized ignorance is a deeper level of uncertainty. The thing known is that ignorance is present (Walker et al., 2003). All the above (statistical, risk, scenario, structural and recognized ignorance) fall under unknowns. The deepest level of uncertainty is an unknown-unknown, which is essentially unconceivable unknowns and total ignorance. However, outside of the linear spectrum are the unknown-knowns. These are also unrecognized and can be potentially more harmful unknowns (Mohammadzadeh, 2012).

Complexity breeds uncertainty and uncertainty contributes to complexity in project relationships and interactions we do not fully comprehend or of which we may not be aware (Salet et al., 2012; 3). Furthermore, complexity is a relative concept, based on environment. Scarcity of space is the context. An increased amount of interests involved creates plans bringing more opinions, which can have positive and/or negative effects (complexity, inertia and chaos). Previously made political or management decisions set up the plan. EU regulations have slow time cycles of change, making them a context of uncertainty.

There are three areas of complexity found in transport projects: technical, organizational (contract types) and environmental (stakeholders' perspectives) (Bosch-Repsel et al., 2009). The newness of technology serves as a source of complexity due to the unfamiliarity of organizational category, trust is an influential factor.

Common sources and outcomes of complexity are time and cost overruns, decentralization, privatization, geopolitical trajectories and politicians' desire to leave a legacy. To the sources of complexity, some outcomes have introduced more complexities in a project. Optimistic thinking, strategic misinterpretations, and desired representations of complexity in a more layered way (Flyvberg, 2008).

The characteristics of uncertainty and complexity outlined in this section illustrate why it is difficult to get a hold of, especially when precious funds are involved.

3.2 Dealing with Uncertainty and Complexity

For the contextual issues, similar to the idea of evolutionary planning is that the definition arises simultaneously. That is when a problem is defined a solution is limited by limited resources usually decide the end of a project despite other factors. Implementation is continuous and irreversible. Finally, space for experimentation is limited because planners are accountable for their decisions. This way of dealing with uncertainty is through a constant being alert and open. Communication of the certainties and uncertainties also generalizes throughout those dealing (Rittel and Weber, 1973; 164).

For managing complexity, institutional change and commitment are important in building a consensus as well as creativity. To bring about this change, a right moment in time is needed to spark the energy as a catalyst for change. Finding possible options and narrowing them down to Actions at the individual level can be taken: creating a learning or safe environment.

can address some social and contextual uncertainties. Having experience or a needed set can be useful in dealing with different locations and natures of uncertainty. The combination of cooperation and competition that includes variation rather than uniformity is good.

Planners take on various roles when dealing. The manager role evaluates, the pragmatist uses incrementalism, the resource allocator uses tactics such as facilitating and power, and the charismatic leader provides public confidence. There are different responses to deal with different ends and/or means. When both technology and goal are known programming and monitoring are used to keep up to date. When the goal is unknown bargaining and compromise is needed. When the technology used is unknown research and experimentation can be used. For both unknown goals and technology finding is needed (Christensen, 1985).

Four ways of coping with the monster of uncertainty are exorcism, adaptation, embrace, and assimilation. Exorcism extracts uncertainty by reducing it or covering it. Adaptation makes it fit within the scope. Embrace is fascination and acceptance of the reality of it. Lastly, assimilation judges uncertainty based on cultural values (Vago, 1997).

As for planning methods, incremental planning takes plans and pieces them into small steps. Evolutionary planning realizes that transportation systems are evolutionary and continuous. It uses reliance and adaptability (Bertolini, 2007). Resilience is active, as in using it, and adaptability is a way of reacting to unforeseeable change in a system. This system functions and is still able to change in the case of uncertainty. Adaptive planning is robust rather than optimal solutions. It includes goal finding and monitoring to keep up to date, hedging and flexing to cope with unknowns (Marchau et al., 2008). Implementation is possible when enough information is available to progress. In addition, the plans are continually updated to new events and technology that may arise.

More technical ways of approaching uncertainty is using scenarios and models. Forecasting a fulfilling scenario, predictive sets out what is most likely, the explorative looks at possibilities, and normative sets up with a goal in mind. In using models, the lens used should be related to the openness/closure of the system: strategic is wide and operational is detailed (Naess, 1982).

Various ways of coping with uncertainty and complexity have been presented. Obvious tactics, in general and in terms of transportation and planning.

4. Results

4.1 Areas of Uncertainty: Deductive

The most (repeatedly) agreed upon code of the entire research was financing as a source of uncertainty. Money is one of the three major sources of uncertainty that creates the triangle of uncertainty, with two corners being scope and time (S). Most risks have consequences for one or more categories. The focus/priority depends on the political decision makers. The second most agreed upon code was political factors as a source of uncertainty. Political uncertainty is outside of their realm of influence, thus uncontrollable. The repetition of this code in transport planning actually is and the need for coping methods, which is expanded upon in the next section.

Changing roles of government creates new working contexts; Privatization and redistribute power, particularly responsibility, but not always money (J). However responsibility requires a structure and knowledge base to understand how to deal involved in the transition. With privatization the image is that responsibilities groups however, without proper regulations, private groups do not fulfill their ne practice, privatization is pushing responsibilities of dealing with uncertainties of government onto the private level without private actors fully being aware of must deal with, nor the repercussions of being responsible. Delays and failures of may be pushed back onto the public.

Since transport is traditionally a result of a public-public cooperation, it is hi privatization of transport companies, their actions, projects and decisions are st more compared to urban planning.

Elections are known to bring change every 4 years, resulting in discontinuity in th times there are discrepancies between the goals of political actors and the opinion latter of which, in the end, don t have the final say. However, new politicians can catalyzers; this happens when a new politician is elected and takes a stagnate pro the influence and power from her or his position (Q).

4.2 Dealing with Uncertainty: Deductive

The simultaneous identification of issues and solutions can be problematic. The mindset is geared towards thinking in terms of projects and not in terms of chall are identified first and separately, solutions that relate to the context can be s (P). When solutions are already in mind, they do not leave space for innovati unidentified problems, which can be costly. However, this point of view appro scientific problems because the systems-approach of understand then solve unnatural for the type social uncertainties transport planners face (Rittel and W other hand, goal and problem defining (through research) are useful to gain coherence understanding the uncertainties involved. Open means and solutions help prepare fo make it easier to adapt to them.

One crucial, yet unpredictable, tactic is creating or using a moment as a catalyst the moment of inertia makes timing a crucial factor in uncertainty (P). This point as momentum: the right moment in time to take advantage of an act or timing, de aspects/information being available (B).

Research studies are widely trusted and esteemed, especially scientific research, as deal uncertainties; this may be because the initial impression of uncertainty is thought uncertainty. Conducting a risk analysis can be used for lower levels of uncertainty scenario and structural. At times the risk analysis occurs early on when some part worked out (B, C), but it is used to get a clearer picture of the situation and mi (E/F). Although risk analyses identify possible risks, they do no always propose a control them (E/F).

Creating a learning environment for an open attitude is important to learn from one persistently and actively, is a way to continually deal with uncertainties by continuing information to battle unknown-knowns (B). This also includes having a better understanding of political and social uncertainties through political awareness sessions to grasp a better understanding of the elements and their complexities involved; experienced members bring a sense of confidence or safety.

Innovation and experimentation are other ways to deal with uncertainty to open up to a way a range of options can be openly developed and narrowed to the most-suited. Drawing wisdom of the city.

From adaptive planning, identifying certain and uncertain vulnerabilities can create a path for realizing the uncertainties involved. Vulnerabilities are forecasted early in the scenarios and in the overview (C, D, E/F, I). They look at what can go wrong and work the way (E/F) and to distinguish the known-unknowns and unknown-unknowns (G). Focus on finding new uncertainties and realizing that the identified ones will never be taken to take action for needed information helps to link to current progress, demand and that a point in time (J). Adapting information with technology, growth and events, deadlines can be more attuned with reality and points reached. Determining the model through monitoring to keep track of trends, progress and failures for balanced learning evaluation allow for adjustments and improvements to be made when needed; however to be reactionary rather than proactive. Monitoring should be clearly communicated which is a convincing tool

Institutional change, as a process, is a way of solving systematic barriers (C). Organizational reorganization of planning teams and departments, which integrates different ways of working while N mentioned to need for Institutional change from the top down culture (especially Decentralized decision-making can address imbalance power relations and the existing in (planning) (N). Offering more opportunities for citizens decisions (C, J) can address uncertainties and have larger implications of institutional power restructuring (N). Dialogue is needed to bring new ideas, opinions and perspectives for a fresh approach to uncertainty decision-making and power restructuring can help but the change brings complication

Keeping an open mind towards uncertainty creates alertness and awareness. Being open (personal) expectation management for uncertainties in projects. Many recognized the awareness of the existence of uncertainties; uncertainty can keep people sharp and aware of the possibilities by identifying, categorizing and giving them a place. Uncertainty limitations puts the project and uncertainties into perspective. Building trust through open dialogue and no secrets to build personal relationships through learning to work (C). Building trust can loosen tensions when involving many different parties of interest and is good for image and reputation (C).

4.3 Barriers: Deductive

4.3.1 Institutional

Path-dependency structures are not always conducive for dealing with uncertainty and regulations take very long to adjust, meaning policy from 10 years ago is still in use surrounding the process and the ways power, money and decision-making are divided. Barriers (C, Q). Legislation requirements are hard and strict while uncertainty is difficult to match them. In addition, lack of political support and stability of a project (B, I) since major decisions are political ones. When there is no ambassador support or influence a method, is it difficult to initiate new tools being used. Influence can act as a catalyst or a barrier.

4.3.2 Social

Representation of issues can affect the way they are perceived and approached. Efforts can help gain influence over uncertainty, because planning involves people not only of issues, such as for problem finding, is influenced by political ambitions, especially high (B). Planners find it difficult to shape research and deal with political expectations. Transparency and presentation (B). Political influences on framing act as a barrier representing uncertainty.

Fostered connections between different parties involved are important in building trust, tensions, and understanding each other's work (C, G). Putting in time for one-to-one to understand perspectives, expectations and interests creates a safe environment for identifying weak points (because different people react differently) (G, L). Working out disagreements only project participants, but also users and residents can address social uncertainty early, less prestige, emotion, money and time is invested which makes room for those to come together and form a sense of joint ownership (G). Connections are affected by management and lack of integration (structurally, inter-personally, and with other disciplines) and seamlessly with others (B). Without involving others early on, projects can be halted by secrets, and bad experiences (C).

Lack of communication about the way others work and not keeping others updated (sharing) can cause many problems in projects (G, B). Understanding others' assumptions early and openness of knowledge flow can help to tackle blame. Continuously meeting to share information create a combined knowledge inventory to address unknown-knowns and recognize knowledge. Without transitions and clear direction from communication, separation and dissection of people and phases, especially when different people are involved at different phases with many involved, it is difficult to communicate every detail so a level of trust is built (B).

4.3.3 Individual

Personalities are pertinent because planning includes working with people and their needs louder than planning theories (G). Human behavior determines how people step into complex situations. A tunnel mindset can be destructive and prevent understanding between people. Technical mentality is part of the reason that infrastructure ideas don't fit well. Different working cultures (i.e. strict requirements in transport where uncertainty is high) lead to different goals. Traditionally, transport planning follows of the spatial development. We look to transport planners to ensure their future development will be accessible, and

look to developers to ensure their transport networks are supported with enough use of different heartbeats for different functions.

The mentality of fearing change is a result of not having a fluid perception of people to get attached to predetermined views. Mind set change begins at schooling

4.4 Areas of Uncertainty: Inductive

The distribution of responsibility in large transport projects can be crucial uncertainty if not clearly detailed. Responsibility between building companies and government is often blurred (L). Dividing responsibility becomes a struggle where money lies (J). When great amount of funds are involved, responsibility becomes a determine early on. Transport planners feel the responsibility to meet all imposed responsibility is slowly being shifted to the market (Q).

As responsibilities are changing, the involvement of consultants and contracts as a source of uncertainty. This transition period comes with uncertainties, such as contracts that can add complexity to the process by bringing parts together (E). A contract is that it is fixed, with strict details, so changes to be open are costly for lawyers. This provides difficulties for dealing with uncertainty in an open adaptive tension (Q). Large long-term contracts involve high stakes in interest and money availability of contracts, the details become more crucial (Q). The problem occurs when multiple options are not clearly discussed beforehand to allow for the company to adapt to uncertainties (Q). There is a lack of understanding between the pressures each party develops decisions, and works with uncertainty.

4.5 Dealing with Uncertainty: Inductive

The use of rhetoric in presentation skills is referred to in planning theory and uncertainty. This includes methods of proving, explaining and giving reasoning to back up. The way information is presented influences how it is perceived and in this case the use of convincing others involved (decision makers, stakeholders, etc.) of her/his success in explaining in a manner that allows for others to understand the context (whilst meeting expectations) of the situation and be slowly led through the process together (especially (M). This allows for others to get more comfortable with uncertainty when they are

Although reports alone no longer suffice, using convincing power, accurate and up-to-date information is gaining importance because reports are given meaning through people (M). Even written political act, especially when planners have to sell their stance in a game like politics, servants are realizing their role in such political decisions and they receive their role accordingly to political context.

Prioritization is a response gaining popularity as available finances are cut. A list of plans are rated on necessity and level of relevance in order to prioritize the most important initiatives. Prioritizing projects helps deal with most important issues first, with uncertainties since they are more needed. Prioritizing, however beneficial for decision making, can also have negative drawbacks for completing projects.

Money, a source of uncertainty mentioned by everyone interviewed, can also be used with uncertainty. Many uncertainties are costly and functioning in a highly budgeted transportation, it is a scarce resource. Solutions can be to adapt to the budget, sources of funding, to be active rather than reactive and relying on spatial development. Gathering a surplus of funds for a project can make uncertainties less threatening to stability (O). However more realistically, saving money by making projects cheaper and soberly is way of managing monetary uncertainties. Prioritizing helps in reducing money is spent on what is really needed, which is why all who mentioned money as a source of uncertainty, also mentioned prioritizing. Spending more cost-effectively can be the way for coping with uncertainty such as through research and monitoring (M). The program exemplifies cost efficiency by better utilizing existing infrastructure (Q). Creating extra un-programmed money helps deal with the financial uncertainties.

Related to being cost efficient in light of uncertainty is downsizing the scale of projects they are realizing (from forced circumstances that pressured them into changing) large scale projects are longer feasible (L, J, C, E/F). Large-scale development are complex and costly, they move towards small-scale to humanize infrastructure (T). Usually politicians and commission projects (maybe to leave their mark or political legacy) however those are too expensive and unrealistic (L). Despite the more manageable scale to reduce complexities, is also a challenge. Due to the fact that transport planning traditionally follows spatial planning and needs density and higher user-ship/ ridership in order to function and sustain itself, large (spatial) developments do not offer this stability. This lack of stability causes challenges in transport despite the de-complexifying of spatial developments. This results in even other to make a move.

The Multi-Year Investment Programme (MIRT), which combines infrastructure, spatial planning and goals for 10-15 years, offers a structured strategy (T). At the regional level, it works with advisors from all substantial regional parties and Rijkswaterstaat to give a framework lays out the standard steps in conducting basic project research for project options while excluding the variable of cost to bring creative solutions. Once all options are narrowed down and divided into phases, each ending with a go/no-go decision (P). The program attempt to de-complexify and rationalize decision-making processes to deal with project options do not enjoy deliberation (T). Developed in a top-down format from the national scale, the processes are invented to manage complexities and gain power over them (P, T). The program is that uncertainties do not fit easily into such structures; they are dynamic.

The MIRT plan seeks to rationalize and neutralize the public decision making process in a complex sectorial-organized system. Within this system they speak an abstract language (networks) and have difficulty speaking in terms of cities and people at the occupational level. The command and control system is highly based around large amounts of money with power.

Privatization has been seen as a way to deal with less public money by leaving the variability up to the market - since they may be more attuned with demand and can deal with a range of necessities (J). This means that the government is stepping back to make way for the market to solve problems, leaving responsibility to the market (Q). It is seen as a way to encourage initiatives and work in a more integrated way (J, C). Looking to market development, attracting private parties in projects is increasingly important (C). This is the

market taking over projects much earlier so they can develop plans in times of what comes up (C). When involving the market, active policy is needed and strict rules imposed (C, J). This requires more discussion between the public and private to face uncertainties in privatization (J). However, they too fear political uncertainties in the policy process, even private initiatives are hesitant toward the constant change. Uncertainty and long-term visions can help (J).

Privatization is also a way (or an attempt) to depoliticize transportation as the tension making exists frequently between public realms of government: civil servants and politicians. Privatization opens up those processes to civil society, spreading the public-on-public to public-on-private interactions, more similar to urban planning, thus a way to moderate political uncertainties by making politics less dominant. Money involved, since private money is less contentious than public money.

Seeking the expertise of consultant groups, under various contract types, is increasingly a way of being flexible to gain different perspectives, and cheaper implementation. Some emphasize a flexible approach while others claim to work with full certainty (L).

4.6 Barriers: Inductive

Lack of control over situations of uncertainty bars them from actually being addressed in the traditional sense of them being beyond control, rather, having the power lie elsewhere. Power to address uncertainty is recognized and exists but is not directly accessible. Power serves as barriers: top down forms of power structures (despite the state claim in the past. Power and money often coincide: There is a constant struggle between where the money is (J). The status of power (and money) of who is leading the discussion is considered. Those from government and civil society who don't have access to the money tend to have a sense of vulnerability towards uncertainties (A, I).

The lack of power is mostly experienced in relation to political uncertainties with the few actions to be taken to prevent them (A, C, S). ² From the perspective of decision makers dealing with uncertainty in the face of political decision makers who have the final say in their mind (B, M). It is difficult to gain influence over uncertainty without power with power (B). Political decision makers add as a source of uncertainty (if they act as a barrier (since they have the final say) (C). Working with political pressure affects the way ideas are communicated and presented (C).

Although complete control is impossible, involving individuals of influence in support for handling uncertainty. Gaining the attention of powers comes through a convincing power (B, M). Depending on where the power is affects projects moving forward or stopping it completely (B).

Governance structures can act as barriers, especially the governance surrounding funding. Old governance models still in use are not open to flexibility and cooperation (J,

² Societal cost benefit analyses

down models are strict and have long decision-making processes that cause much uncertainty. Rigid structures are not conducive to flexible initiatives (C, N).

Time works as a barrier when there is too little and too much. Long processes (i.e., too many invested resources exacerbate complexities and increase vulnerabilities. Deadlines (which is connected to power) always put pressure on the space given to adequately address uncertainties.

Reserving future budget for a project with many uncertainties is difficult and tends to favor more stable & guaranteed projects. Thus, complex regulations/frameworks and rigid structures create barriers to accessing money. Rigid money accessibility prevents addressing uncertainties quickly. Transport projects cost money rather than generate it like other types of projects.

Dealing with uncertainty involves using a level of uncertainty, which can be difficult to imagine abstract ideas.

4.7 Solutions

Desire and awareness to learn about uncertainties is a continuous process (both individually and organizationally). External influences are useful to push past the fear. One way to overcome this is through learning from successful experiences and to help ground abstract concepts with examples, (e.g., case studies, debate) and excursions. Realize uncertainty is natural by identifying it to reduce the level of courage and confidence is needed to face uncertainty; instilling pride and ownership established together can improve perspectives and create a sense of ownership for the future.

Maintaining consistent policy and having active policy to deal with the changing landscapes. Starting early garners the awareness and helps building trust to know the future. Beginning early when people and investments are still impressionable and creating a strong foundation (in time, research, process, budget and technically) is helpful. Citizens also need to be involved early on to increase understanding of the uncertainties transport actors face.

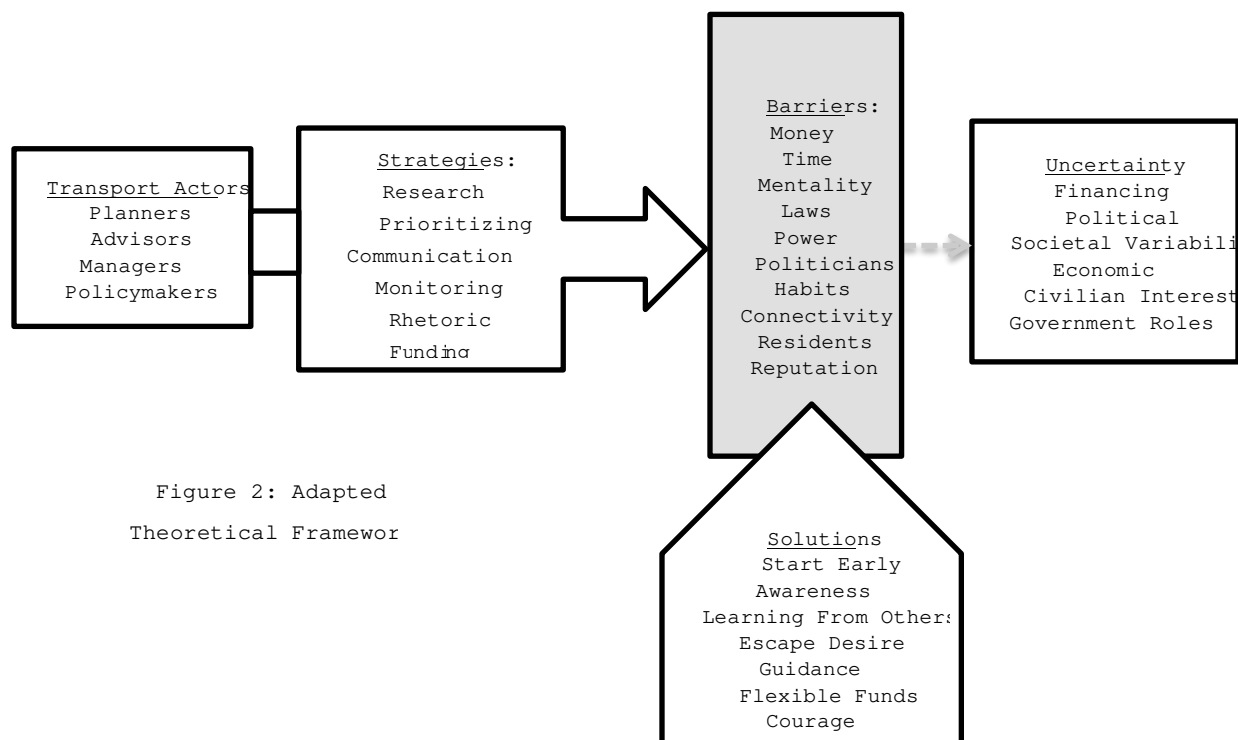


Figure 2: Adapted Theoretical Framework

5. Conclusion

Many barriers were the sources of uncertainty themselves and many ways of address previously identified ways of dealing with uncertainties. Such emphasis placed proportional to the theory. Transport planners tend to shy away from talking about they are involved in, but it should be accepted and addressed. Transport planners independent of politics which is what the theory failed to expand upon.

Another issue underdeveloped in the theory was the type of mentalities present domain. The traditionally hard structured technical culture that transport is emb tunnel vision. A cultural shift of closed mentalities is needed to be able to co integrated. Creating a learning environment should be emphasized to move away from for all types of uncertainty and complexities, awareness is needed. It is the bas must be acknowledged.

For transport planners that deal with much uncertainty and high stakes (with t involved), identifying and addressing uncertainties is crucial in carrying out understand the realities with conscious decisions. Otherwise efforts will be waste society without immunity and are always responsible (Rittel and Weber, 1973). The go planners past the fixation on risk to the awareness of the other unknown aspects i is not intended to be followed by fear or confusion, rather courage and understand planning environment. Planners can work better when enlightened.

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