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Metropolitan Areas in a Learning Society: ICT-Policy in the Netherlands as an Example

Abstract
Metropolitan areas are often suffering from negative externalities of a high density of activities and interaction. In particular districts there are problems of economic backwardness, social isolation and high pressure on the environment. At the same time, high density and a high variation of activity may contribute to a high level of innovation in the urban economy. Information and communication technology (ICT) is seen as a technology that supports improving the quality of metropolitan areas, including their innovative capacity. There is however a comprehensive uncertainty in this respect. This paper takes ICT policies in Dutch cities as an example of urban policy areas that are subject to uncertainty.
To increase understanding, an evolutionary perspective is adopted, meaning an emphasis on uncertainty and learning in urban policy- and strategy making. Ideas underscoring an evolutionary approach are discussed and illustrated with uncertainty in urban ICT futures. This is followed by an analysis of uncertainty and learning in actual ICT policymaking in Dutch cities. What can be observed here are moderate expectations and lack of awareness and imagination about the potentials of modern ICT. The paper concludes with arguments for dynamic metropolitan learning (DML) and an outline of major ingredients of this learning.

Keywords: Urban policymaking, evolutionary approaches, uncertainty, learning, ICT.

1. Introduction

Learning regions, learning cities or smart cities, learning organizations, etc. have increasingly attracted attention of policymakers and researchers since the mid 1990s. The emphasis on learning is closely associated with the recognition of an increased complexity and uncertainty faced by urban entrepreneurs and urban policymakers. An important cause of this development is fast-changing technology. Technology is influencing the growth of cities in three main ways. First, new technology is the base for innovative firms, for example, using information- and communication technology (ICT), biotechnology, and nanotechnology, and as such constitutes a permanent source of renewal of the urban economy. Secondly, new technology in transport and communication determines the accessibility of cities and their connectivity with larger networks. Examples are high-speed internet and high-speed rail. A third way of technology influence on cities is in impacts on the carrying capacity of the land. Densely populated areas are now rapidly moving to more intensive (multiple) use of urban land, aboveground and underground, using new construction technology. Aside from new technology, policymaking itself is a source of complexity and uncertainty. This is true for example, for the gap between the growing scale of the functional urban territory and the small spatial units in spatial planning and policy practice.

The majority of the world population nowadays is living in urban areas, and this share is still increasing. There are no signs of change in the pattern of worldwide urbanisation. Modern cities however, are severely burdened by environmental costs and it is precisely these factors which will be decisive for the course a city will take in the future (see also Bertuglia et al., 1998). The ongoing “in-migration” has caused an increased stress on the urban labor market and housing market, and on the urban environment. The stress on the urban territory as a whole has simultaneously caused urban sprawl. Land prices and environmental factors in central areas of the cities have become impediments for new household and company locations, so that a massive outward shift has taken place. Essentially this shift only meant an expansion of the functional urban territory. Thus, a decline in urban environmental quality tends to create geographical relocation with a wider spatial coverage. The outward movement of urban activity has not prevented spatial concentration of negative externalities in particular urban areas, such as areas close to manufacturing sites and areas close to heavily used transport nodes and links. In addition, the selective outward move of urban functions has

contributed to the rise of commuting, particularly crisscross patterns, and a concomitantly heavy congestion of the urban road system. There is also a shortage of integration between urban inhabitants. Particular urban quarters represent the failure of social and cultural integration of low income groups and cultural minorities. Despite the previous problems, modern cities may reveal drastic evolutionary changes, in which the human resource potential, composed of creativity, competence and communication, exerts a dominant influence. In this framework, technological innovation and new technology policies are increasingly advocated as effective tools in urban and regional strategies for a balanced and sustainable development.

Generally speaking, there is uncertainty about ICT and the city on two levels. First, there is uncertainty about the idea that ICT can help creating conditions for urban innovation in terms of a balanced and sustainable growth. An important condition for such growth in the urban economic system seems the presence of seedbed conditions for technological innovation, the so-called incubator potential, ICT features being one of them (e.g. Glaeser, 1998; Graham 1999). The latter holds for connectivity with global grids and access to the fastest internet, and the availability of a highly educated workforce able to understand and manipulate the complex information, and combine it with other information and knowledge. In this context, urban quality of life, broadly taken in terms of levels of pollution, preservation of cultural heritage and social cohesion, seems also important. But how effective policy measures turn out to be, particularly in a context of competing cities, is a major point of uncertainty.

Secondly, there is uncertainty about the influence of ICT use on spread (concentration) of urban functions. The two well-known scenarios of the death of distance (spread) (Cairncross, 1997) and of global command centers (concentration) (e.g. Graham and Marvin, 1996) indicate a whole range of possible developments (van Geenhuizen and Nijkamp, 2001). In this context, it is also increasingly realized that spread and concentration may go hand-in-hand in the same metropolitan area, at different spatial scale-levels.

Now, the question is whether policymakers and other actors, mainly entrepreneurs, are able to effectively respond to above uncertainty. This issue is addressed in this paper by using a survey of the literature and empirical material on cities in the Netherlands. To increase understanding, an evolutionary perspective will be adopted on metropolitan innovation. This means an emphasis on uncertainty and learning in metropolitan policy- and strategy making.

In Section 2 we discuss the ideas underscoring an evolutionary approach and illustrate this in Section 3 with uncertainty in urban ICT futures. This is followed by an analysis of uncertainty and learning in actual policymaking on ICT in Dutch cities (Section 4). The paper concludes with arguments to further develop dynamic metropolitan learning (DML) and an outline of major ingredients of this learning, based on experiences with ICT policy (Section 5).

2. An evolutionary approach

In this section we will discuss evolutionary approaches to metropolitan innovation, including the behavior of urban firms and the behavior of policymaking organizations. Special attention will be given to the process of adjustment, concomitant uncertainty, and learning in response to uncertainty.

Evolutionary approaches are very adequate when considering the development of organizations (actors) and their behavior over time. Evolutionary approaches have a focus on the adjustment of organizations to changing conditions in their environment. In this context, the selection environment is seen as the market where the main competition takes place. For urban firms this is rather clear: the increasingly global output market for their products (services) and the markets for their main inputs: capital, knowledge and labor. For urban policymaking organizations the market is more diffuse, and may not be perceived by them as such. In this paper, we conceive of the market in urban policymaking as the one in which new technology and new investments are attracted, e.g. for construction of new infrastructure, revitalization of traditional urban quarters, and for increasing urban knowledge creation. In daily life this becomes apparent in competition between cities and lobbying by them, for example, to host important conventions, festivals and sporting games, to become a node in new transport and communication networks, such as a high-speed train terminal, and to attract investment of highly innovative firms.

The selection of new products and strategies is determined by the interplay between competence of the actors involved and environmental factors (van Geenhuizen, 1999; Lambooy, 2002). Competence may include the ability to detect new forces in the environment and to react (or pro-act) in a timely manner. Very often adjustments are incremental, including merely small changes compared with the previous situation. This pattern is based on

a type of learning in which actors find solutions based on previous success, i.e. familiar procedures and routines (e.g. Nelson and Winter, 1982). The use of such procedures and routines in fact reduces the range of different possibilities to be taken in the next future and causes a situation in which the next future is very much like the recent past (path-dependency). In more extreme situations, accumulated investments (sunk costs) and support (lobbies) of related institutions add to path-dependency in such a way that firms (and other organizations) remain led by previous success and reinforce old trajectories (lock-in) (e.g. Maskell and Malmberg, 1999).

The environment and adjustment to the environment using policies and strategies are full of uncertainty, *inter alia* caused by the increased globalization, fast technological change, and a growing fragmentation in behavior of urban actors. Hence, learning is very important in evolutionary approaches. If we focus in on one type of uncertainty, i.e. technological uncertainty in terms of adoption of a new technology, we may identify various relevant dimensions on which uncertainty happens in metropolitan policymaking and business strategies, and on which learning is undertaken (Table 1). There are four groups of uncertainty: (1) the technical nature of the new technology, (2) availability of resources, including time, (3) social aspects, including actor complexity, and (4) impacts of technology policies and strategies.

Table 1 Dimensions of technological uncertainty in metropolitan areas

Urban Policy	(1) Substitution by future or (existing) alternative technology
	(1) Comprehensiveness of changes: broadness, scale and future stability
	(2) Availability of resources for investment and time-planning
	(1) Interdependence with other technologies or technology systems
	(3) Interdependence with social elements (actor preferences, actor complexity, sense of urgency)
	(3) Regulatory uncertainty
	(4) Intended impacts and underlying factors
	(4) Not-intended impacts and underlying factors
Business Strategy	(1) Substitution by future or (existing) alternative technology
	(1) Comprehensiveness of changes: broadness, scale and future stability
	(2) Availability of resources for investment and time-planning
	(1) Interdependence with other technologies or technology systems
	(3) Interdependence with social elements (preferences in the market, human resources)
	(3) Fragmentation in value chains and other networks
	(3) Regulatory uncertainty
	(4) Success in the market and underlying factors

Various responses are possible to uncertainty. For example, one may deny uncertainty and simply take decisions. One may also postpone decisions and wait until more is known of the area involved ("wait-and-see"). Learning is another response to uncertainty. Learning may be seen as an interactive process in which knowledge is developed in the context of application. The interactive process works through strong linkages between science-based knowledge development and demand-based knowledge development (application). This means that the processes of problem definition and -analysis and problem solving receive continuous input from consultation and knowledge exchange with scientific experts and societal organizations (Berkhout, 2000).

Learning can be divided along two lines, i.e. the subject of learning and the ways of learning. With regard to the subject of learning, there is first cognitive learning, meaning to gain a deeper understanding of a particular science, a policy sector (application), and - increasingly important - fields across the respective boundaries. Secondly, social learning mainly intends to increase understanding of other actors involved, their perceptions, underlying values, and their actions. A third form is basic to metropolitan development, i.e. institutional learning. This type of learning means learning to change institutional setups - routines, attitudes, organizational forms – that underpin learning, including to abolish old institutions if necessary. From a metropolitan point of view it is also important to distinguish local collective learning, which includes all previous ones, with an emphasis on institutional learning. According to particular lines of thinking, such learning in metropolitan society requires high levels of social capital. Social capital refers to various features of the social organization, such as the presence of shared norms, rules and trust which facilitates co-ordination and co-operation among individuals, companies and sectors, for their mutual well-being (Putnam, 1993).

Ways of learning include learning by chance, e.g. as a side-effect of other activity, and intended learning. Intended learning falls apart into learning by imitating, learning by comparing (e.g. benchmarking), learning by causal modeling, learning by monitoring, including experiments, and learning by future study, like scenario analysis and forecasting.

It is difficult to say what is the most effective learning in particular problem situations, but what is certain is that learning policies face various difficulties in a metropolitan context (van

Geenhuizen and Nijkamp, 1998). Many metropolitan areas seem not able to develop local institutional learning. First, there is actor complexity in learning, meaning the existence of different ideas about what the problem is and what learning should be. Secondly, there are man situations of lock-in in which learning has become one-sided, fragmented, without transparency and open access to stakeholders. Finally, in policymaking on learning there is often no clear problem owner, which means that learning policy is not systematically forwarded on the policy agenda.

3. Uncertainty and ICT futures of cities

The digital future of cities is full of uncertainty. For that reason, a couple of scenarios have been designed based on the identification of enhancing and hampering factors (MEA, 2000). Enhancing or driving factors are freedom of choice, comfort, and needs for interaction (Table 2). Hampering factors include price and investment costs, conservative behavior, dependency, reliability, protection, and privacy issues, and - from a different angle - labor market characteristics. By using both types of factors in different combinations and strength, and including different ICT-use in firms, three different digital futures may be identified (MEA, 2000) (Table 3).

Table 2 Main factors influencing digital futures

	Dynamic	**Conscious**	**"Wait-and-See"**
Driving Factors			
-Freedom of choice	**	**	
-Comfort		*	***
-Need for interaction	***		
Hampering Factors			
-Price and investment costs			***
-Conservatism			**
-Reliability		**	**
-Security	**		
-Privacy	**	***	
-Labor market	***		
Emphasis in ICT use			
-Efficiency and cost reduction			***
-Effectiveness		**	*
-Innovation and flexibility	**		

Source: Adapted from MEA (2000).

In the first image, Dynamic Digital Future, the adoption rate of ICT is very high in housing, working (tele-work) and production, to enable a wide range of individual choices and interaction, and to enable innovation and flexibility (in manufacturing and services). As a result, living and working are relatively spread in space, with the exception of knowledge-intensive production and front-offices which are strongly concentrated in a few ICT-nodes (Table 3). In this image, mobility is increasing in terms of flow and diffused pattern alongside a decreasing congestion. Government involvement is very limited in this future image. In the second image, Conscious Digital Future, ICT is relatively widely adopted, particularly for support in finding solutions to environmental problems. There are no substantial changes in way of living and working, except for tele-working aimed at increasing labor participation. Further, there is a smaller selective clustering of activity in ICT-nodes compared with the first future image. In addition, mobility is increasing but negative externalities are reduced by using ICT. This future image is contingent with a relatively strong role of government policy in response to societal needs, such as in frame-setting, initiating and stimulating the use of ICT. In contrast, in the image of "Wait-and-See" we observe a limited use of ICT in housing and working, except when added-value is proven. There is clustering of economic activity mainly in a number of transport corridors, alongside an increase of mobility without a reduction of congestion. It seems that in this image economic and environmental advantages of the use of ICT are not exploited.

Cities are by their very nature focal points of economic activity. Although information may be ubiquitously available and routine types of information processing farmed out to non-urban locations, the point is that the collecting and processing of information is an urban function par excellence. This thinking is most clearly reflected in the Dynamic Digital Future (and to a smaller extent in the Conscious Digital Future), in which concentration of highly specialist knowledge activity in cities is assumed aside from some spread on lower levels of sophistication (van Geenhuizen and Nijkamp, 2001).

Table 3 Images of a digital future

Dynamic	Conscious	"Wait-and-See"
▪ ICT for effectiveness, efficiency and innovation ▪ High adoption rate and growth of ICT use in living and production ▪ High level of tele-work and flexible work ▪ Spatial concentration of front-offices and knowledge intensive production ▪ Increased mobility but controlled spread with less congestion	▪ ICT for effectiveness and efficiency, particularly for environment ▪ High adoption rate of ICT ▪ High level of tele-work for an increased labor participation ▪ Partial concentration of production ▪ Increased mobility but low negative externalities due to ICT use	▪ ICT for efficiency and comfort ▪ Selective adoption of ICT, small influence on daily life ▪ Moderate growth of tele-work ▪ Services and knowledge-intensive production lag behind ▪ Concentration in transport corridors ▪ Increase of mobility without decrease of congestion
• Weak role of government	• Relatively strong role of government in response to society	• Weak role of government
➢ Concentration and spread of urban functions at different levels	➢ Almost no change, only some concentration of urban functions	➢ Almost no change

Source: Adapted from MEA (2000).

In recent years we have witnessed the emergence of the E-city (electronic city) concept, an urban area governed and driven by the ICT sector. Such a city is a typical network city in which virtual communication and electronic connection form the guiding architecture, next to physical and face-to-face interactions. At the same time however, an important dilemma is coming to the fore: e-illiteracy among the population segments that have no ICT skills and are excluded from the benefits of the e-city. They have no access to tele-activities and do not enjoy the advantages of the club environment inherent in the e-city. It seems that this is particularly true for the elderly and, related with this, for single-person families. In the Netherlands 85% of the elderly people (65+) have no internet connection at home, against 35% of the population younger than 45 year. In addition, 70% of single-person families have no internet connection, versus 30% of families with children. These figures indicate that the ICT age leads to serious equity problems, a situation that can only be dealt with by paying more attention to the adoption and organization of ICT knowledge, through education and training, as an important task for public administration.

Aside from this, we may identify important roles of ICT in the public sector. ICT may enhance the efficiency in the urban administration by combining economies of scale and of scope, as well as support the delivery of new (renewed) government services to citizens (and

firms) as modern customers. The improvement of the quality of policymaking in terms of a faster and more transparent process is another potential role for ICT. In addition, the use of ICT may help to offer more participatory democratic procedures in countering a decreasing government legitimacy (Geurts et al., 1997) and it may satisfy the need for smarter ways of government control in a complex society, e.g. to provide early warning signals for hidden abuses of social security. There is still small experience with such new roles of ICT, concomitant policy measures and impacts.

It needs to be stressed that the above-mentioned new use of ICT in the public sector asks for important infrastructure, organizational and institutional adaptations in the implementation, causing large uncertainty. Infrastructure adaptations include a redesign of front-office, mid-office and back-office processes with ICT building blocks to provide flexible and customer-specific e-services. Organizational adaptations mean to find the best match between enforcement tasks on the operational level and the spatial scale of the organization involved (like in water management). Finally, institutional adaptations include a redesign of rules, for example, concerning access to data, authority over data, and selection of data that should be online. Regulatory issues such as concerning privacy are related.

We may conclude that uncertainty surrounding ICT and the city not only resides in the supporting role of ICT in urban innovation and in impacts of ICT on spread/concentration of urban functions, but also in implementation of the technology.

4. Urban ICT Policies in the Netherlands

In this section, we make use of results of a survey of urban policymakers in the Netherlands (see, Cohen et al., 2002) to illustrate uncertainty and the state of learning in this area. The following observations can be made. Policymakers perceive an important role for ICT in changing the quality of urban policymaking as a set of services (Table 4). For example, agreement exists on improved services to citizens, internal and external communication of the administration, and a better access of urban life to inhabitants of non-urban areas. No role of ICT is foreseen for an improved efficiency in policymaking, a stronger influence of citizens in policymaking, decreasing social inequality, improving social relations, and reducing traffic of persons. The latter despite the fact that traffic congestion is seen as a serious urban problem.

In other words, the role of ICT in improving communication and electronic access is widely accepted, but no further role of ICT is perceived in improving structural problems. Further, in terms of economic development, there is consensus about the role of ICT in supporting to develop various opportunities. However, there is no further articulation of such role, particularly ICT as a base of new economic activity. It seems that ICT is not seen as a factor that can improve the economy and urban social life structurally and speed-up a shift towards a new stage in the urban economic trajectory. It maybe that uncertainty in realizing such basic changes is felt to be too high, but it may also be that such far going impacts of ICT are not seen as realistic, partly because of the huge adaptations necessary for implementation of ICT.

Aside from moderate expectations there seems also to be quite some lack of awareness and imagination about what is possible with modern ICT. In terms of knowledge about current ICT strategies and ICT measure incorporated in a master plan, policymakers either do not know about ICT strategies or declare that there are no such plans for the city (Table 5). The relatively high percentage of "don't know" answers to the first two questions reflects the ambiguity of ICT policy status. This may be due to relatively new activities (that the respondents are still not familiar with), or a relatively low profile of orchestrated ICT activities. In this context it is surprising that the promotion of research about ICT has no high priority among policymakers (Table 4). Apparently there is no learning attitude towards opportunities of ICT.

Table 4 Urban policymakers' perceptions on the role of ICT

Perceptions	**Important**	**Not Important**
Role of ICT for the city	Mainly in communication and issues of access to municipal information and services.	Structural changes in power distribution and social inequity issues.
General goals of ICT policies	Developing the city and its opportunities, mainly economic development.	--
Direct goals of ICT policies	Supplying municipality information and services, and promoting ICT use in planning. Improving ICT infrastructure: network and PC availability.	Promoting various ICT activity for citizens. Promoting research about ICT.

Source: Adapted from Cohen, van Geenhuizen and Nijkamp (2003)

In contrast to strategic plans or ICT measures that are incorporated in the master plan, projects are more specific initiatives (Table 5). Usually, such projects are focused in more operative goals, and tend to be less general than strategic plans or master plans. Most of the respondents indicate that there is, was, or would be a project (or more) that is related to ICT. However, a significant share of the respondents state they "don't not know" about such projects (34%). This is again another indication for the relatively low profile of ICT activities in the city and low awareness to such activities.

Table 5 ICT strategy and ICT projects in the city

	Yes	No	Don't know + no answer
▪ Is there a formal strategy plan/program on ICT on your city?	39.8%	39.8%	20.3%
▪ Are ICT issues integrated in any way onto the urban master/development plan?	34.4%	39.8%	25.8%
▪ Are there any projects currently going on ICT?	44.5%	21.9%(a)	33.6%

a. of which 14.1% mention projects in the past and in the future.
Source: Adapted from Cohen, van Geenhuizen and Nijkamp (2003).

The contradicting and vague conclusions that can be drawn about ICT policies and activities in the city point out a general problem with regard to ICT policies. There is often no clear address in the municipality for such information. In some cities, where a strategic plan does exist, we may find a person or department which accumulates knowledge about ICT-related information. In other cities the knowledge is spread and thus it is difficult to form a complete or transparent picture. Unlike the case of transport or education policies, where there is a clear address to explore the city activities in those fields, ICT activities are not yet exclusively related to one specific department or field, or to a specific plan or strategy. The relatively low awareness to ICT activities and plans may reflect the fragmented knowledge as well as the low importance of such activities in the city.

The above picture complies with results of a study among municipalities in the United Kingdom that indicates that in most cases ICT projects are stand-alone initiatives, not embedded in strategic plans or policies (Gibbs and Tanner, 1997). A related explanation is concerned with an interesting feature of ICT policies. It seems that at least part of these policies are taken without the aim to solve a specific problem, but are based on the general

uncritical assumption that such a policy is beneficial. In other words, the reason for the existence or implementation of ICT measures is (in many cases) not to be a latecomer. From this point of view, it is not surprising to find that ICT plans are not always related to a specific problem or to a specific desired goal.

We may conclude that, in general, public policymaking on ICT tends to a low profile involvement in structural matters. As such this pattern fits into the future images of the Dynamic Digital Future and the "Wait-and-See" Future. However, the moderate expectations, low awareness and low priority for research on ICT in the current stage of policymaking may particularly point to the latter image. This would mean that urban planners in the Netherlands refuse to take large decisions and, concomitantly, take the risk of not exploiting economic advantages from ICT in timely manner.

An exception to this pattern is the municipality of Amsterdam, the largest city in the Netherlands. In the past few years Amsterdam has developed the ambition to become one of Europe's ICT-capitals. Currently, a conglomerate of large and small ICT-firms is emerging on the southern edge of the city, based on access to one of the most advanced Internet connections (Watergraafsmeer) (Gigaport, 2000) and proximity to the international airport of Amsterdam (Haarlemmermeer). This activity is partly linked with the financial sector, partly with other sectors like publishing and international trade (KPMG-BEA 2000). What it shares with the more traditional activity of financial services is similar levels of uncertainty and similar needs for support from the local environment to increase competitiveness in global markets.

It is quite difficult to indicate the size of ICT-activity in Amsterdam to date because statistical categories do not match with the phenomena involved. But even if a narrow definition is used, important dynamics can be identified in the past five years, i.e. an increase of jobs by 136%, along with a trend for concentration in Amsterdam, witness an increase of Amsterdam's share in the national sector from 14.1% to17.2%. Due to lack of data, however, it is difficult to monitor whether aims to enhance ICT activity are being reached.

In addition, it is difficult to assess where Amsterdam stands as an ICT city in global competition. For that reason, a comparative study with other European cities and New York,

has been carried out. The potentials of Amsterdam to realize further ICT ambitions have been assessed as follows (KPMG-BEA 2000):

- In terms of demand, the small national market can be seen as a disadvantage but there are many relations outside the ICT-sector and abroad - with some in New York reflecting international appreciation.
- There is a modest self-image of the sector concerning innovation and competition, and this goes along with mainly only recent initiatives, i.e. newly established firms, support from the public sector and establishment of a network for knowledge exchange and cooperation, and related with this:
- There is not much attention for networking and partnerships, and this conforms with the idea of a weakly developed economic complex.
- Positive location factors are the excellent infrastructure, including the Internet hub (direct access to the newest broadband technologies). Favorable are also the good Internet culture and the many English speaking people in the labor market. Negative factors are a weak image as an ICT-city and shortcomings in the labor market and real estate market.

It may be concluded that benchmarking is an important learning method, i.e. to identify opportunities for growth but also to identify various basic shortcomings within a setting of competition.

5. Towards Dynamic Metropolitan Learning

Urban ICT policies exemplify situations in (spatial) policymaking in which uncertainty exerts a strong influence on policy outcomes, due to for example a lack of knowledge about the impact of policy measures and underlying causal factors, a lack of awareness among policymakers of ongoing or past projects, and insufficient indicators for measuring the phenomena at hand. Not taking uncertainty into consideration may lead to not reaching policy aims or reaching policy aims but being overruled by other, more competitive, cities or alternative technologies (a waste of resources). Even worse, denying uncertainty may lead to adverse effects (calling for additional resources to mitigate these effects).

The increased complexity and uncertainty calls for new types of policymaking and planning of which the adaptive approach is an example (Walker et al. 2001). In adaptive policymaking, there is a continuous monitoring of ongoing changes and of the key factors that contribute to success of the policy at hand, with adjustment of the policy if monitoring results indicate the need for this. In another type of planning, vision-based planning, there is a strong emphasis on experimentation and simulation, and learning from these results (e.g. Stacey, 1992). Any new type of planning needs to put strong emphasis on learning, be-it from causal modeling, benchmarking, experimentation, etc.

In dynamic metropolitan learning (DML) we distinguish the institutional level, the basic (broad) policy level and the project level. Learning at the level of institutions means in general to evaluate and improve local institutions and local practices (routines) in terms of conditions for open learning. It means that local actors are capable of reflecting critically upon their own institutional arrangements and can derive conclusions for the need for institutional change. On the three levels - institutional, basic policy and project – the following activities need to be undertaken:

Institutional level

- To create sufficient transparency, appreciation of equal access, shared responsibilities and commitment between the actors involved.
- To facilitate communication (interaction) between societal stakeholders on one side and the scientific world on the other.
- To develop mechanisms which enable a critical evaluation of existing institutional arrangements and routines, and enable changing them.
- To design a process architecture through which policymakers can learn from institutions in other regions (interregional learning).

Basic policy

- To define a (broad) basic policy, including aims and measures, and criteria for success.
- To model the causal background of major changes in the field (particularly the technology at hand) and to monitor factors that influence policy success.
- To define critical values in these variables, which indicate when ongoing policy measures need to be changed (adapted) or otherwise policy measures are necessary (e.g. to prevent adverse effects).

- To design a process architecture through which cities and policies can be compared, with the aim to improve causal insights (modeling) and to increase knowledge about relative performance (benchmarking).

Project level

- To define projects within the basic policy and to increase coherence and match between them.
- To evaluate past projects and register outcomes in a systematic way, enabling learning from the past.
- In situations that are open to find creative solutions, to design stylized experiments and simulation tasks, enabling learning from creativity.
- In situations in which just policy measures are taken without knowing about impacts, to monitor developments, enabling learning by trial and error.
- To compare (similar) projects to improve causal insights into success (causal modeling) and to gain insights into relative performance (benchmarking).

For many local governments developing the above learning activities would be rewarding in terms of increasing the quality and success of policymaking. However, in most cases it will take a long time before the new policymaking is effective because local government institutions need to adapt themselves, i.e. become a learning organization.

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