An Advanced Systems Approach for Planning Practice in Complex Cities – Anticipating emergence through citizens' participation Explained on the example of Central European cities in transition

With increasing global interdependencies our cities become more and more complex, challenging planning methods and practice over and over again. Foreseen and unforeseen hazards of, e.g., climate change or global economic crises require to safe-proof our cities against uncertainties. Dynamic processes in cities worldwide, be it emerging cities in Asia or cities of Central Europe in transition, call for new, less rigid planning approaches.

Let's consider the example of the Central European second tier (i.e. non-capital) city in transition with its specific material and social structures developed through time. Growing from a medieval core the Central European second tier city went through a phase of rapid urban growth in the 19th and early 20th century. It has then been further influenced by national independence following World War I and substantial population shifts during and in the immediate aftermath of World War II. Finally, the communist regimes left their mark on the Central European second tier city which now has redeveloped it's urban functions during the past two post-communist decades.

These "inherited urban structures" (Turnok 1989, p. 151) from the medieval core to the communist blocks of flats influence today's social and, in turn, material form of the Central European second tier city through complex interdependencies. Having already gone through several steps of development, much more seems to lie ahead still – and uncertainty about what will emerge next is great. Since it is in transition still, the Central European second tier city is best characterized by processes instead of conditions. Some of these transition processes are framed by the inherited urban material and social structures. Others are triggered by national and supra-national processes or conditions. The intertwined transition processes are not easy to overlook.

Is the complex situation of the Central European second tier city reflected in current urban research and development approaches? In fact, it is not, since mainly isolated facets of urban development are considered today, often tackled by "best-practice" which is simply imported from elsewhere. What would be needed, instead, is a consideration of the interdependencies of intertwined processes and structures, both the inherited ones and the newly emerged ones. An approach to urban research and development must consider interlinked aspects, cross-disciplinary or cross-domain issues and it must make use of a framework to cover the actual urban processes and structures comprehensively.

A potential answer to this kind of challenges of urban systems under dynamic and uncertain conditions lies in the application of systems approaches. Such system approaches are of great help in planning practice, since they provide several methods for the understanding of urban complexity. Well known urban systems approaches have been introduced by Forrester (1969) and Vester (1988), where Vester's biocybernetic approach relates to and extends the system dynamics approach by Forrester.

The biocybernetic approach makes use of system diagrams in which (directed, weighted) relations between elements of the system under consideration are depicted. It reaches beyond pure system dynamics in so far, as it introduces eight biocybernetic principles and seven domains of natural and man-made viable systems to assure wholeness in systems models. Also, insights about system properties are gained by analyzing the sensitivity of system elements and by simulating scenarios in which the impact strengths of selected elements is altered.

The approach of Vester has been applied regularly in urban and regional planning. However, at least two reasons call for a revision of this seemingly established approach. First, when looking at recent-years' applications of the biocybernetic approach (see, e.g., Cole 2007), it becomes clear that Vester's original approach which intends to assure wholeness in the system analysis is not being followed any more. The eight biocybernetic principles and the seven domains of natural and man-made viable systems are regularly disregarded. Instead, recent applications only make use of the system diagram and tools for its analysis.

Second, Vester's (and Forrester's) urban systems approach is rooted in the research of the 1960s and 1970s, mainly highlighting feedback and relational characteristics, omitting more recent findings about urban systems, such as resilience and emergence (see, e.g., Deppisch and Schaerffer, 2010) as well as self-organization (see, e.g., Portugali 1997).

While resilience might be a secondary system effect, a result of feedback interaction within the urban system, and self-organization a result of random changes governed by the existing urban structures and processes, I suggest to consider emergence as a first system principle. Other first principles are the just mentioned random changes (also called mutations or fluctuations), the ability of a system to recreate itself, usually termed autopoiesis, and of course interaction of any kind. As outlined above, of these four system principles, the focus of systems approaches applied today is on the last one.

Subsequently, I will focus on the system principle of emergence.

1 Starting points of urban development matter

It is interesting to observe in literature about the Central European city how urban researchers and practitioners try to apply the same categories known from western cities to the Central European city. It appears to me that an almost marxist idea of a determined, inevitable transformation towards a capitalist urban society is guiding such thinking. That is why there is an almost desperate search for evidence of what are considered the downsides of a market economy, e.g., urban poor, spatial segregation, and bottom up driven urban revitalization ("gentrification"). For example, Kunzmann (2006) notes:

"In gentrified inner cities, attractive suburban communities and in leisure regions the nouveau-riche upper class is showing its wealth. In contrast, those who did not succeed in benefiting from the new market economy are forced to remain at the urban fringe of agglomerations, in the run-down pre-fabricated social housing schemes where Western supermarkets and fast food chains absorb their small incomes" (p. 21).

However, such a transformation of the Central European city towards a (anyway rather stereotype) western neo-liberal place is now highly disputed, because the unique starting points of market-development matter. Pichler-Milanovic (2005) observes:

"In the 1990s it was rather assumed that transition […] would project cities in Central and Eastern Europe rather uniformly along a linear trajectory, which would result in their convergence […] with those [cities] in Western Europe. Such thinking, however, was not only naïve in the light of subsequent reality, but was often based on a lack of understanding […]. [C]ities in Central and Eastern Europe are »path dependent« on their pre-socialist as well as their socialist-period legacies."

For example, let's have a look at the "run-down pre-fabricated social housing schemes" from the 1960s and 1970s. Such large scale housing was built both in former communist cities and Western cities. The learning from the Western societies is clear: The 1960's high rises of Chicago's Robert Taylor Homes and Cabrini-Green settlements had become social hot spots and were eventually torn down. The high rise neighborhood of Köln Chorweiler, finished in 1972, is notorious for its social problems, high unemployment rate and large share of migrants. And the *banlieues* (suburbs) of French cities are similarly infamous for their social problems. In the West, the large scale housing estates are associated with crime and people living from social transfers.

Quite in contrast, more than twenty years after the fall of communism, the *paneláky* (blocks of flats in colloquial Czech) "are, for the most part, still stable social areas" (Grossmann and Steinführer 2011, p. 24). The apartments in the communist blocks of flats are still "sold and bought at good prices on the free market. Their social mixtures determines these estates not to be regarded as derogatory in terms of social prestige, as they more typically are in Western Europe" (Vais 2009).[1] Instead, rather unexpected from gentrification experience in Western cities, it is the old towns, especially the apartment houses from the late 19th century, that in some cities have become the place to live for the uneducated, unemployed.[2]

Hence, the starting points matter. Do we known which other distinct structures – material and societal – will emerge from the Central European second tier city?

2.A Urban self-organization is, in principle, predictable

Much of the change that occurs now in the Central European second tier city has been or could have been foreseen. Common tools to derive development scenarios are system models based on Forester's or Vester's work (see above) and agent based models simulating the (spatial) interaction of agents given a set of human-like behavioral rules.

By modeling interaction based on a given set of entities and rules, agent based approaches are, e.g., suitable to model spatial arrangements of people, revitalization of the old towns, or the appearance of shopping malls. The outcome of those tools – as of any (mind) model – however, is limited to such states which are within the *a priori* known space of states. The "unknown unknowns" cannot be modeled, as explained in the subsequent quote (Black Swan Theory):

"More generally, decision theory, based on a fixed universe or a model of possible outcomes, ignores and minimizes the effect of events that are 'outside model'. For instance, a simple model of daily stock market returns may include extreme moves such as Black Monday (1987), but might not model the breakdown of markets following the September 11 attacks of 2001. A fixed model considers the 'known unknowns', but ignores the 'unknown unknowns'."

[1] The quoted author refers to the situation in Cluj and cites Murie et al. (2005).
[2] See, e.g., Kabisch and Sagan (2011, pp. 95-96), referring to Polish cities.

In other words, the results of our models are within the limits of what we can expect as effects of the parts that make up the model. If we have people who move between neighborhoods, who give birth and die, who start commercial activities and buy, then we can imagine (and simulate) various distributions of residential and commercial areas, and the evolution of these over time. This evolution can be based on initial and learned behavior of the people (agents in simulation jargon), and on random changes (fluctuations, mutations) of behavior. If we start with a spatial distribution of agents with some behavior, then the output will be a spatial distribution of agents with some behavior. The simulation tells us something within the known coordinates, in this case the spatial distribution after a certain time. From such simulations we can learn a lot about self-organization, but less so about emergence.

2.B Emergence of urban phenomena is unpredictable

Some of the recent developments in Central European second tier cities could not have been predicted. An example of such an emergent development is that of the Hungarian city of Pécs, which became a "City of Lovers" by the symbolism of its "Love Locks", as described by Hammond (2010):

"Thousands of metal padlocks have transformed this East-Central European city. […] Often inscribed with initials and dedications, the locks are rumored to represent young paramours' hopes far the longevity of their passions" (p. 181).

The city has integrated the Love Locks into its cultural and marketing image, and "travel websites […] describe Pecs as a 'City of Lovers'" (p. 181). Now that it has emerged, this phenomenon impacts on the image of the city, urban life, the touristic development and, through the latter, the wealth of the city and its citizens.

But who could have predicted this development which, before it happened, belonged into the realm of the "unknown unknowns, […] things we do not know we don't know" (Rumsfeld 2002), but which had a tremendous impact on the city? Who could have predicted that from somebody adding a first padlock onto a gate, a bottom up process would lead to the emergence of new cultural and image aspects of the city, of new possibilities of urban marketing, tourist attraction, history telling? "[T]he newly emergent entities […] introduce new possibilities" which were formerly unpredictable (Popper and Eccles 1977, p. 30). Or, in the words of Hammond (2010):

"What the locks do offer is a radical aesthetics of interruption, which, even in their recuperation, are an indelible trace of how cities emerge through oppositionality. …

they are the telling detail which has the potential to unravel the image as a whole" (p. 192).

As a more general example, the emergence of urbanity seems to me a good example to distinguish predictable self-organizing phenomena from unpredictable emergent ones. Who could have described urbanity before it appeared? Still today, we only try to understand that what makes a place urban. If the interaction of people and streets, places and public infrastructure etc. make a city, what else is it that makes the city urban? How did the Central European cities manage to become urban again after communism, when urban centers had become «void», deprived of urbanites (Schlögel 1996, p. 229)?[3]

Real emergence, not just self-organization, is that which transcends the *a priori* known space of states of its elements. Emergence leads to "real novelty … much that was not foreseeable, at least not for human knowledge." As Jaques Monod put it for the emergence of life: " … we were unpredictable before we appeared" (Popper and Eccles 1977, p. 16). Emergence happens, when we require new words to describe the new phenomenon.

Likewise, urbanity is something more than the sum of its parts, i.e. more than a number of people in a built up environment. It is not simply an unknown state of known phenomena (e.g., people, behavior, spatial arrangements). It is a new phenomenon which emerges from the elements we deal with. It's not only unknown to us in what way the elements are going to arrange in dimensions we know, it is the occurrence of something which we wouldn't naturally expect from looking at the elements alone. No computer simulation can tell us when urbanity emerges from the interaction of people in space. Neither can we determine which quality in which quantity leads to an emerging phenomenon. We are also unable to rebuild the emergent phenomenon elsewhere.

3 Planning emergence in the urban context?

Now that we have had a look at emergence in the urban context it should have become clear that emergence of urban phenomena cannot be predicted, nor can the factors which are eventually leading to the emergence of a phenomenon be determined. Or, if they could be separated in one case, the insight would be of no great use since any other case would be much different anyway (different place, different time).

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[3] Original reads: "Die »Leere« der städtischen Zentren … spricht vom Verschwinden der städtischen Urbevölkerung … des Stadtbürgers."

However, urban planners would sometimes like to trigger desired emergent phenomena in cities. For example, town planners often hope that by physically structuring a neighborhood, a certain type of society will emerge. But while we can copy the physical elements of a successful urban area somewhere (and, to a certain extend, also try to get the "right" people in, e.g., the now fashionable "creative class"), we can only hope that the implementation of these structures (the elements) will lead to the emergence of a vivid, urban, thriving, etc. neighborhood (the whole) elsewhere.

Planning is an essentially top down process – it sets the frame for development (this is true even if during the planning process people were engaged bottom up). In contrast, emergence is both a top down *and* bottom up phenomenon: While natural and man made systems may frame developments of the entities within, those entities (in cities usually the people) may trigger their own new phenomena, e.g., the Pecs' Love Locks. Or, while planners might plan new towns (like the above mentioned Köln Chorweiler) according to their best practice, they cannot plan social and cultural behavior (emergent or self-organized) which might thwart the original good intentions. Planning is often carried out involving or avoiding factors of which we don't know the emergent effects. Does urbanity really die from increasing social segregation? Will urbanity survive much more greenery in the center?

4 Planning under uncertainty

The planning situation is, however, not entirely hopeless. But we need to learn much more about the peculiarities of the cities we are developing. And we need to enlarge our tool base.

Which fate would our experience and our models have predicted for the Eastern European kiosks twenty years ago? It doesn't seem unreasonable to assume that from our predictions they would have vanished by now, or at least been marginalized by large supermarkets. This fate has not come true. Instead, the kiosks can still be found in many cities across Eastern Europe today.

Although the kiosk example is one of self-organization and not of emergence (the survival of the kiosk was a predictable scenario within the known space of states), it shows how much we need to understand about the cities and how limited the transferability of knowledge, let alone "best practice", from elsewhere is.

Looking at emergent phenomena, the uncertainty of planning gets even worse. As described above, we are stuck with the coordinates we know, our models cannot transcend the dimensions for which they are set up. Yet the key question for urban development under uncertainty remains: what's going to emerge next? What is going to have tremendous impact, although from where we are now, with the knowledge that we currently hold, we cannot simulate, foresee, predict it?

Which new structures – material and societal – may emerge in the Central European second tier city under its specific conditions of deregulation, limited public financial resources, and fast growing economies? The Central European city has shown its ability to adapt rather well to changing conditions although municipal governance was usually weak. Schlögel (1996, p. 232) even argues that the Central European city "doesn't need top down organization any longer, it organizes itself."[4]

Who could have told about a re-emerging coffee shop culture in Central Europe? This hasn't happened because it was planned, and it wasn't anticipated either. In addition, the new coffee shop culture is not uniform across all Central European cities. While Budapest and L'viv – to pick just two examples – have experienced a revival of their historic coffee shops (it might, hence, be arguable whether one could talk about an emergent phenomenon), in other cities a clearly distinct coffee shop scene has emerged. For example, in Poznan, small and uniquely furnished coffee shops of a style unknown before mushroom around old town square, and also in Košice some alike coffee shops can be found.

Hence: How can we handle emergent behavior in the city?

I would like to suggest one possibility to widen the scope: involve citizens. How do people see the future developing around them? We might get ideas about what may be the next big thing. People are early "seismic" indicators for emerging phenomena – they won't predict, but they can provide a feeling for what has most recently emerged and might subsequently grow. To a certain extend, they might even anticipate what may come, i.e. they generate emergent thoughts. In a sense, this approach is a simulation of emergence in an interactive setting.

It is important to note that the suggested approach is different from participatory approaches applied today. In the participatory approaches common today, people are basically asked for their wishes. In the approach suggested above, asking people is to get knowledge about how the city works, about latest developments, and even about things that emerge (in people's minds).

5 Conclusion

What should have become clear by now is that every city has grown unique, producing its own emergent phenomena. Some cities, like those cities in transition in

[4] Original reads: "[Die Stadt] bedarf der Organisation von Oben nichtmehr, sondern organisiert sich selbst."

Central Europe, are especially prone to surprise, since their very situation of being in transition means that their structures – physical and societal – are not stable, but changing. They might more likely produce new phenomena than other, more stable cities. From emergent phenomena, opportunities may arise, like the "City of Lovers" image of Pécs. For such opportunities we need to embrace emergence, although we can hardly get a grip on it. Also, improved understanding of the cities is a precondition to informed decision making.

With cities being unique, and self-organization and emergent phenomena being produced by unique cities, it becomes clear that a simple "copy and paste" of "best practice" from elsewhere will hardly produce best results.

Have you ever heard about the Košice IT valley? Or other clones of the Silicon Valley, the thriving region south of San Francisco? People around the world are trying hard, for decades, to figure out the success factors of the Silicon Valley. They try to copy this success and bring it into their own countries and regions, around their own cities. How many copies of the silicon valley can you count around the world? And which of these, often funded with a lot of public money, is coming close to the original one? Who can tell the success factors? Today, dozens of Silicon Valley copies around the world simply won't thrive as the original place does.

Where local, bottom up forces of self-organization and emergence are at work, the conditions change fast and are never the same for any two cities. The setting in time and space is always different. A "best practice" from somewhere, yesterday, is unlikely to be adapted in the very same way elsewhere, today.

Instead of copying what worked somewhere else (for often unclear reasons), we should allow ourselves to be surprised by emergent, bottom-up phenomena. We may try out different things in the city, set impulses and test their effect, and we might not want to suffocate bottom-up organization and emergence through too strict top-down conditions (regulations, subsidies, levies etc.). The concept of emergence in urban systems is important, because it opens our eyes for the yet unknown and lets us refrain from simply copying best practice. It also leads us to embrace uniqueness. In emergent phenomena lies the source of cities' *unique* potentials – much more than in copying what has been done elsewhere before.

We need to observe: What will emerge from the many subsystems in transition in Central European cities? And in order to anticipate emerging phenomena, we need to involve citizens as outlined above.

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