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Framing urban autopoiesis: street as a track for multiple adaptive cycles

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Abstract

Street is the elementary domain of urban complex systems adaptation. It frames all phases of urban evolution, as they can be described by an adaptive cycle conceptual model: a forward loop, including growth and conservation phases, and a back loop, covering release, or crisis, and a reorganization phase.

Urban dynamics are not composed of a unique adaptive cycle, as cities evolve through multiple ones, having different timescales, as well as many periods and durations. The whole of these cycles, deployed *on* and *in* streets, unfold street rhythms, which present time is the synchronic representation.

This communication will address multiple adaptive cycles intertwining in street life, identifying three main paths: (i) urban fabric forming process; (ii) ground level uses; (iii) public space appropriations, ephemeral occupations and activities.

Diachronic analysis of each path is carried out on the main case study of one street in Rabat, Morocco. It will be discussed by investigating change drivers and mechanisms, adaptation figures and resources, evolutionary phases and rhythms, persistence layouts.

The main goal is to figure out street evolutions dynamics and parameters in the framework of autopoiesis concept, as well as to highlight the role played by street in framing urban autopoiesis.

Keywords

urban morphology, urban forming process, public space, adaptation, autopoiesis

Introduction

Systematic observation of adaptation phenomena along a street aims at questioning the mechanisms of adaptive process within the theoretical framework of urban autopoiesis. This focuses on street not just as a physical element, but as a component of a systemic process operated by local organisation actions and reactions, of which it represents the founding structure. Street has, thus, a double meaning: it is the spatial structure shaping urban interactions and, at the same time, it is the product of such interactions, the synchronic projection of the whole systemic process.

Systematic observation herein presented concerns adaptation mechanisms and rhythms of a street in Rabat, Morocco, and particularly of a part of Sidi Mohammed Ben Abdallah Avenue. This is carried out through two synergic methodologies of investigation, to highlight actions, outputs, variables and factors that build up the taxonomy of the adaptive process: diachronic and comparative analysis of historical cartography and housing type plans; present analysis of practices and forms *in* and *of* the street.

Urban local adaptation: a theoretical framework

City is one of the main examples of a complex adaptive system¹. It is a set of interacting elements, whose relations are based on an action-feedback mechanism such as to determine the behaviour of its actors. It is also characterized by two principles, self-organization and amplification of the effects, explaining every configuration as determined by the previous one².

Street is a sub-system of the city, defining – and defined by – the territorial location of its actors³. It affects the possibility and the quality of the whole urban system elements interactions⁴, as it limits a set of relations that are more likely to be established, due to accessibility and proximity. By this, it shapes the ecological participation of its users, as "a state of mutually oriented interdependence of a plurality of actors who are not integrated by bonds of solidarity to form a collectivity but who are objects to one another"⁵.

Street system is thus more likely to an ecological system rather than a social one, whose behaviour could be appreciated through ecological resilience mechanisms. This theori-

cal model⁶ postulates two characteristics particularly effective in describing urban dynamics⁷: adaptation as a primary evolutionary mechanism; persistence as a measurement of resilience, based on state variable thresholds.

Adaptability provides a basis to analyse self-organisation mechanisms. It is the capacity of a system to reorganize itself within his stability domain, based on the capacity of the actors to use historical memory and drive change towards a desired direction⁸. In response to environmental forces, actors within a system modify individual action relating to favourable or unfavourable outcomes of previous adaptations, pursuing the maximization of individual effectiveness by the minimization of environmental resistance⁹. Adaptation actions are thus communicated to the system, which modifies its behaviour in relation to them¹⁰. Self-organized whole order emerges from the sedimentation of a myriad of such individual choices, in response to a precise set of housing, production and relational needs¹¹.

Adaptation is strictly linked to self-organisation and autopoiesis. Autopoiesis may be referred to how urban structure and morphology are created, transformed, organised and proceeded¹². Having been defined as the capacity of a living system to recursively reproduce through its own elements¹³, autopoiesis concept can be applied to social, organisation and interaction systems, abstracting from life and defining it as a general form of system-building, using self-referential closure¹⁴. Furthermore, Luhmann identifies communication as a founding element of social systems, instead of persons or actions¹⁵. Similarly, inner relations – personal, commercial, business, well-being – are the base elements of urban systems and of street sub-system. Hence, autopoiesis is to be intended as the production process of urban relations as well as of its founding structures – every artifact making cities – based on self-referential operations. The duplication of the same elements of a system, as elementary unit replication, is an autopoiesis feature. The criteria of such evolution – what element to be duplicated and how, e.g. the reiteration of row houses along a matrix path¹⁶ – depend on system structure, whose self-determination is due to self-organization¹⁷.

Local adaptation is an observable phenomenon of system self-organization. Adaptation is concretely acted and registered in system's historical memory, as to shape future sys-

tem structure and reproduction. It is an infinitely iterative mechanism, made of successive adaptive cycles made of two proactive phases, i.e. expansion and conservations, and two reactive ones, i.e. release and spontaneous reorganization. Reorganization phase of adaptive cycle includes learning from historical memory, built heritage, functional habits, to manage present transformations and establish new relations or artefacts, whose consequent feedbacks will produce new learning. This builds up a self-referential process, operated within the system, while environment just acts as external force. An autopoietic system is strictly linked to its environment, as it adapts according to external variations, while keeping its internal organization¹⁸.

Across those cycles, some variables of the urban system change to react to external variations, depending on autonomous reorganization. Nevertheless, there are some slow-changing variables, linked to systemic values (e.g. identity, culture and awareness) and to the physical structure of space, that have higher inertia and influence system ability to manage change in a non-destructive way¹⁹. These are the milestones to define autopoiesis, as, by persistence, they shape system identity.

Systematic observation aims at grasping such specific characteristics of both street structure and organization: identifying adaptive cycles and highlighting their periods, actions of adaptation, outputs, persistence and change factors. Observation focuses on three main domains: urban forming process, ground floor activities and public space practices; they deploy physical, relational and functional factors making urban unicity, and managing shift from a state regime to another²⁰.

The goal is to outline autopoiesis trajectory – how street evolved producing new relations and artefacts – as well as the founding role street had in framing it.

Observation: street adaption phenomena

Rabat, Morocco: Avenue Sidi Mohammed Ben Abdallah in Yacoub el Mansour district

Rabat has had a quite recent metropolitan growth. Fitted in its traditional form until it became the capital of the French protectorate in 1914, it didn't reach significant dimensions even with the first colonial plan by Henri Prost. The metropolitan extension begun

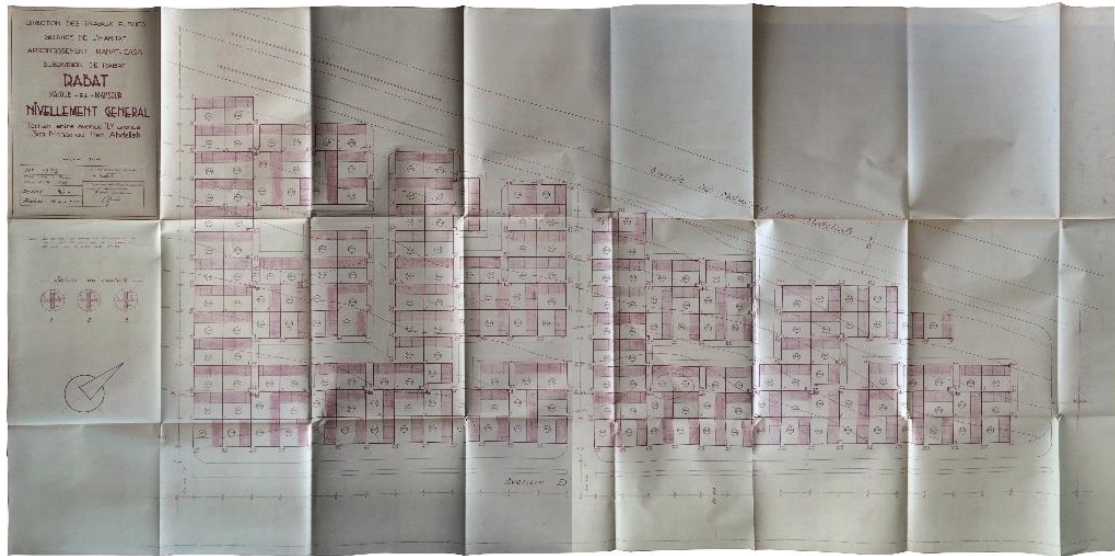
in 1940s, in response to the huge demographic growth driven by colonial economy, until the first organic plan for the Rabat-Salé conurbation was designed by Michel Ecochard in 1948. The plan identified three expansion districts for the emerging working class – Yacoub el Mansour and Takaddoum in Rabat, Tabriquet in Salé – to be realized through an evolutionary habitat concept, the *habitat pour le plus grand nombre*, including three models: the *trames sanitaires*, consisting of urban infrastructure and plots pattern design for self-made dwellings; the horizontal low-rise patio houses fabric, inspired by traditional morpho-typology; the vertical city, made of modern high-rise buildings.



(Fig. 01 - Aerial photo of Yacoub el Mansour district in Rabat, 1967 – Source: Photothèque ENA, Rabat)

Sidi Mohammed Benabdallah avenue is one of the main axes of Yaboub el Mansour district on the south-west side of Rabat. The analysed part goes from Avenue Assalam to Rue Al Karam intersections, focusing on the specific urban fabrication process, as result of the late protectoral planning. This is expression of modern planning theories, but actually inspired by traditional city morphology, to which the entire Ecochard work in Morocco is committed²¹. It is characterized by the juxtaposition of residential single units on small-scale plots, organized in progressive clusters following a fractal principle inspired by Medinas. Particularly, Sidi Mohammed Ben Abdallah avenue is defined by three distinct operations led by the *Service de l'Urbanisme*: the construction of a square, bordered by commercial galleries and a mosque; the settlement of a *cit  horizontale*

fabric, on one side of the street, made of Modern patio houses on 8 meters squared plots organised in clusters, centred on a small square; the settlement of *trame sanitaire* plots on the other side, to recover Douar Debbagh slum, depending on minimal public intervention principle: a 6 meters square pattern, equipped with hydraulic network and a toilet, on which small barracks with conical straw roof are built prior to the self-construction of hard-wall houses.



(Fig. 02 – Horizontal city: Service de l’habitat, Rabat Yacoub el Mansour, General plan of the site between avenue « D » and avenue Sidi Mohammed Ben Abdallah, 1951 - Source: Archives du Maroc)

The main avenue is more a circulation route rather than a structuring path, faithful to the modern principle of the separation of flows, as highlighted by geometric misalignment between the axis and the plots.



(Fig. 03 – Trame sanitaire : Service de l’urbanisme, Rabat, Lotissement indigne Yacoub el Mansour, General plan of « Douar Debbagh » new plots - Source: Archives du Maroc)

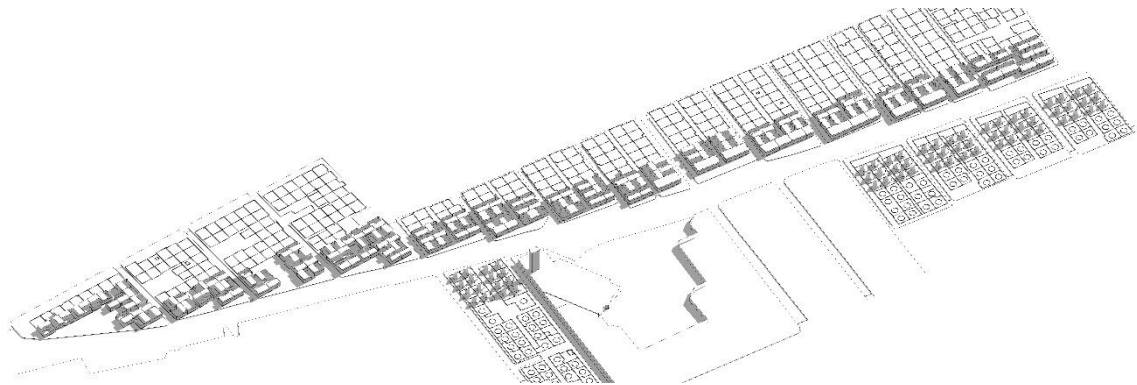
(i) *Urban forming process*

Michel Ecochard single-unit houses won’t last so long. The conservation phase of the new neighbourhoods has been marked by strong demographic pressure which the now independent public planning of Morocco is unable to cope with. This triggers a series of local adaptation processes of the urban structure left by Ecochard, driven by a singular dialectic between public actors and inhabitants:

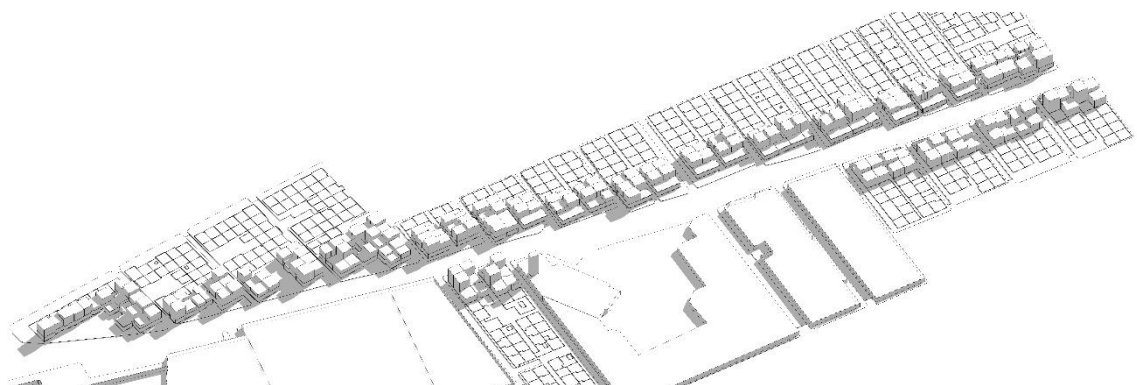
1. Saturation of initial houses patios, allowing to extend accommodation capacity;
2. Saturation of the *trame sanitaire* plots by self-construction;
3. Raising up of Ecochard patio houses and self-built ones, involving the typological transition to row houses, the loss of the patio as a centripetal element, the extroversion of domestic space onto public space by facades opening.

Illegal adaptations have been tolerated from local administration, due to combination of lack of control and acknowledgment of housing needs. Furthermore, typologies arising from adaptation have been accepted and transposed in new housing policies, marking

the transition towards a new adaptive cycle. The implementation of 8 meters plots and the elaboration of new type-plans in 1964, providing inhabitants with the typological scheme for multiple floors houses, establish a new expansion phase based on the outcome of the previous cycle spontaneous reorganization. In 1971 the Ecochard plots ended to be considered as temporary, and in 1973 the first post-independence Rabat urban plan incorporates the former evolutionary habitat²². Thus, dwellings continued to be built on 8 meters or smaller plots, settling 3 to 4 floors terraced houses known as modern Moroccan houses (*maisons modernes marocaines*)²³. Street evolution keeps a consistent urban structure, based on the original 6 to 8 meters plots, accommodating medium height individual row houses.



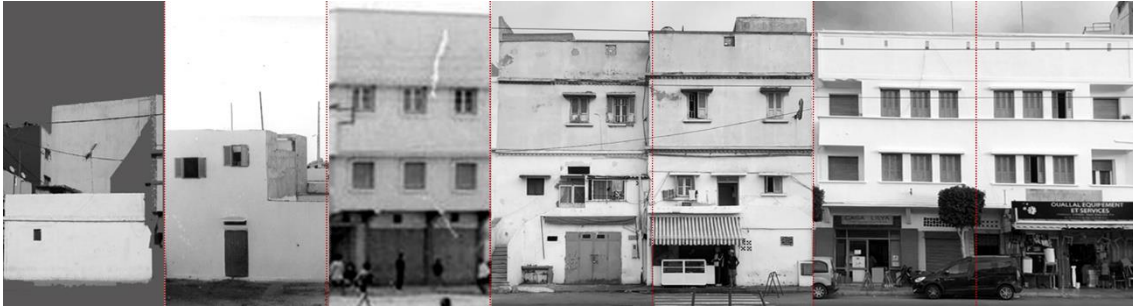
(Fig. 04 – Sidi Mohammed Ben Abdallah avenue in Rabat: diagram of original plot patterns – Source: Ahmed Amahzoune and Luca Maricchiolo, 2022)



(Fig. 05 – Sidi Mohammed Ben Abdallah avenue in Rabat: diagram of present urban morphology – Source: Ahmed Amahzoune and Luca Maricchiolo, 2022)

Further adaptive phase consists of the progressive shift from individual to collective housing through two different steps:

1. Subdivision of row houses in apartments, one per floor, with the consequent sharing of entrance and staircase;
2. Recasting of adjacent units in multi-plots collective buildings, with the redefinition of circulation paths leading to two or more apartments per floor.



(Fig. 06 – Dwelling typologies evolution, from ground floor patio houses to collective housing, since 1950s to present time. Photocollage – Source: Author, 2022)

Diachronic analysis based on historical cartography²⁴ measures changes of several variables: (i) urban structure, made blocks pattern and street network; (ii) plot pattern, based on initial 8x8 Ecochard's grid; (iii) urban form, building height and shape; (iii) dwellings typologies, evolving from patio houses, row houses, collective housing on single or adjacent plots; (iv) urban space boundaries: façades porosity and rhythms. Persistence or change of such variables lead to evaluate street morphology adaptive process. They describe by which patterns and rhythms street informally moved from low rise individual houses to collective housing.

(ii) Ground floors activities

Typological evolution of housing passes from individual ground-floor houses to collective buildings, horizontally split into apartments. Public domain undergoes as many changes: the activation of systemic processes based on local feedbacks creates dynamics of public space, not foreseen in the original design. This had planned public activities in specialised spaces at the hearth of neighbourhood units, according to Modern princi-

ples²⁵. There was no provision for a network of activities along streets, since housing fabric had a purely residential function.

Such functional micro-zoning is called into question by adaptive process. Original enclosures have been quickly saturated. Low density represented the widespread resource for adaptation, permitting to infill new functions:

1. Increase of accommodation capacity by the saturation of plots, without altering residential function;
2. Opening of some commercial spaces and artisan ateliers on ground floor, set in the patio or in the domestic space;
3. Attribution of ground floor to commercial activity, as a result of horizontal subdivision of the building;
4. Extroversion of productive space, according to public openness opposed to familiar intimacy, involving opening of large storefronts on ground floor walls;
5. External projection of commercial space, through showcases, tents, terraces, exhibition of merchandises, making the front sidewalk a sort of private pertinence.

Mapping of present activities, compared with the original micro-zoning²⁶, leads to evaluate change or persistence with regards to a further set of variables: (v) functional diversity, based on ground floor uses, i.e. residential/commercial/productive/tertiary; (vi) ground floor density, passing from patio house low soil occupation to intensification in use of ground for both housing densification and change of use; (viii) accessibility, from exclusive for inhabitants to open to the city. The variation or persistence of these indicators describes the quality of the functional adaptation of the public space, evaluating the transition from a mono-functional space to a selective mix of uses.



(Fig. 07 – Ground floor uses evolution. Photocollage – Source: Author, 2022)

(iii) Public spaces appropriations

The positive feedback of ground floors adaptation impacts space organization and uses *in the street*. It attracts visitors, implements new businesses, drives a mixed informal and formal economy, feeds the adaptive process. Feedbacks foster synergies and concentrations in main streets as Sidi Mohammed Ben Abdallah avenue. A former eccentric street, relative to neighbourhood centres, becomes a subsequent matrix path. The functional division of the street into specialized spaces for different flows is systematically subverted by a multiplicity of forms of appropriations of space, that can be classified by type and temporality.

A first category of street adaptation consists in permanent occupation of public space through informal new hard-wall volumes for shops. In free spaces, and particularly in the gap between the orthogonal plot and the diagonal street axis, small constructions were built either as extensions or new installations, detached from the front by a small passage. In some cases, the addition of commercial volumes constitutes a new urban front, sometimes arcaded, which overlap a new gallery on the rhythmic scan of the plots, unifying closest blocks through a gate on perpendicular ways.

A second category of street section adaptation differs for technology and temporality of appropriation. A series of light constructions stands in front of the hard-walled volumes: kiosks in recycled material, metallic and textile tents, glass and aluminium verandas, wooden platforms, are either extensions of ground floors activities or independent business directly installed on sidewalks.

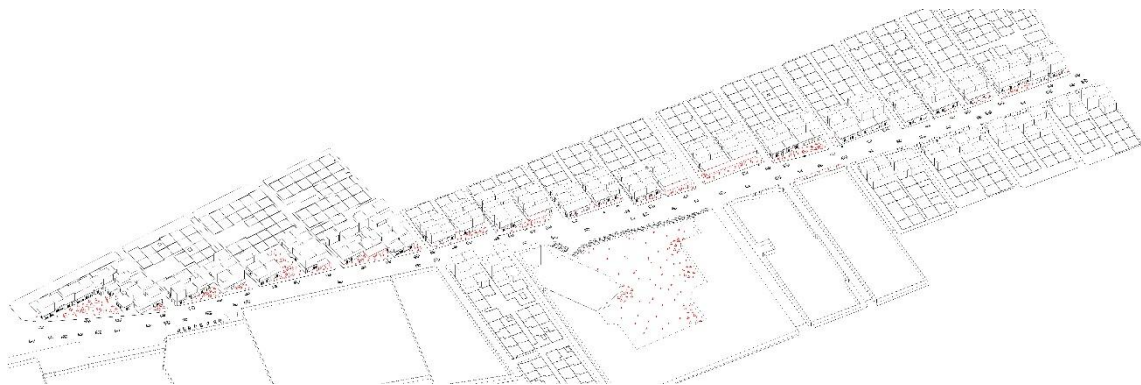
The third category of adaptation is the ephemeral occupation. Café's terraces occupy sidewalks seasonally, parking lots allow the installation of hawkers for weekly markets, boutiques thresholds are employed by boxes and showcases on daytime; during the month of Ramadan, the square becomes a space for prayer, commerce is reduced, restaurants close during the day, removing their tables from sidewalks to extend those onto the roadway after *f'tour*. The five-to-ten meters band facing urban front hosts a mix of uses, very flexible in uses, which can be ordered as a succession of temporalities²⁷. The ambiguity - even regulatory - of space expresses a great diversity of rhythms and geometries. The experience of the street is an overlap of noises, sensations, sounds and en-

counters, featured by several variables, as duration, uses, type of merchandise, extension (punctual or linear), shape and construction.



(Fig. 08 – Public space appropriations. Photocollage – Source: Author, 2022)

Direct observation on day and night time allows to grasp two further variables to describe the whole adaptation process: (ix) public space hierarchy, evident in the gain of importance of the main axis, a former circulation path expected to remain aside of public centralities; (x) public space occupation, challenging the street regulation.



(Fig. 09 – Sidi Mohammed Ben Abdallah avenue in Rabat: diagram of ground floors activities – Source: Ahmed Amahzoune and Luca Maricchiolo, 2022)

Observation results

The diachronic analysis and present observation unfold multiple adaptive cycle deployed *on* and *in* the street. These have been classified on three categories on the basis of the spatial domain of deployment and the temporal scale of duration. Phenomena restitution highlights further parameters associated to each cycle: the crisis triggering back loop phases, main adaptation actions, the temporal scale of the cycle and the forms and figures that spontaneous reorganization has taken. The quality of the transformation

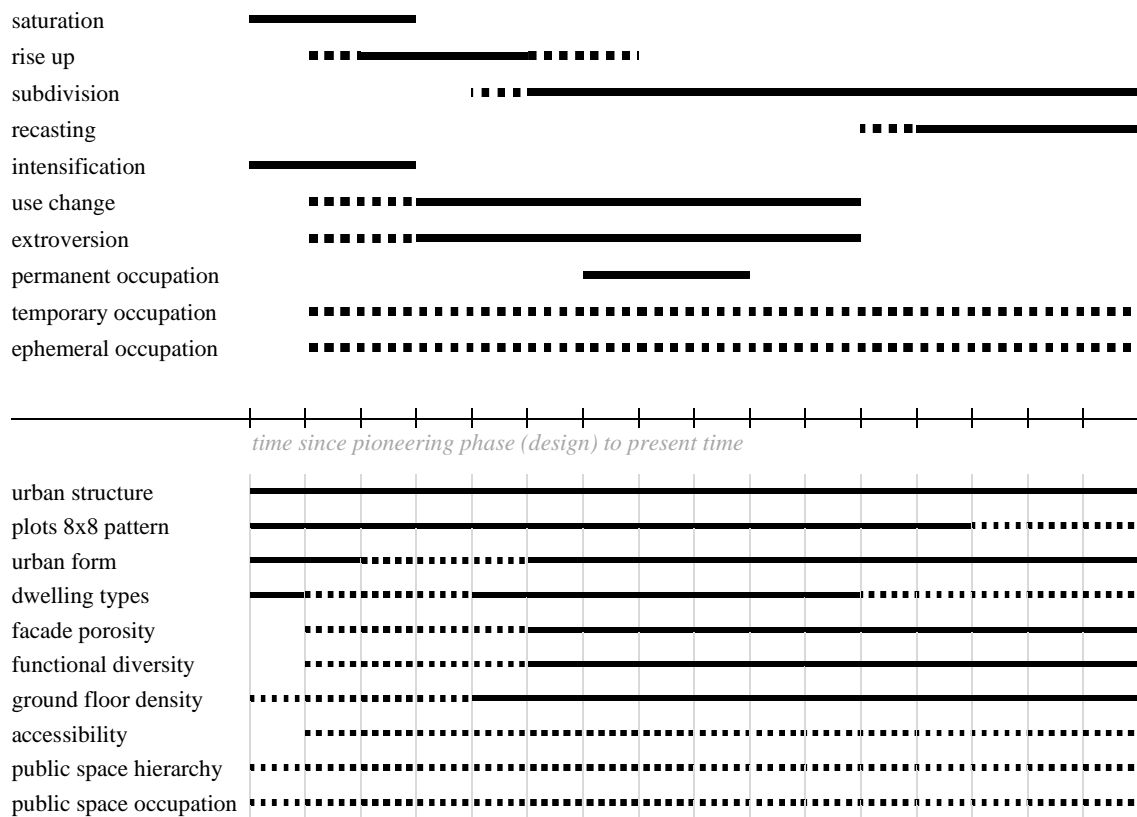
is measured according to change rate of the ten above mentioned variables, adopted as adaptation indicators. Moreover, among these, each adaptive process is based on some factors acting as a resource for adaptation, linked to slow variables of change, thus steering the adaptation²⁸.

A taxonomy of adaptive cycles allows to relate adaptive actions with outputs, resources for adaptation and persistence variables.

<i>Adaptive Cycle</i>	<i>Action of adaptation</i>	<i>Outputs of adaptation</i>	<i>Drivers</i>	<i>Local change</i>	<i>Local persistence</i>	<i>Adaptation resources</i>
Urban forming process 1	Saturation (densification)	Roofing of inner patios	Urban population growth	Dwelling types	urban structure, plots pattern, urban form	Buffer space exceeding initial needs
		Substitution of initial barracks with ground-floor hard-walled houses	Private means increase	Dwelling types, urban form	Urban structure, Plots pattern	Plots space, urban infrastructure
Urban forming process 2	Rise up (densification)	Building of 3-to-4 floors row houses on low-rise initial patio houses	Urban population growth, private means increase	Dwelling types, urban form, facades porosity	Urban structure, plots pattern,	Basement, redundancy of urban infrastructure exceeding initial needs
Urban forming process 3	Subdivision (densification)	Split of row house into collective housing with one apartment per floor	Urban population growth, Households composition evolution	Dwelling types	Urban structure, plots pattern, urban form, facades porosity	Staircase sharing
Urban forming process 4	Recasting	Unification of adjacent row house in a multi-plot collective building	Increase of private means	Dwelling types, Facades porosity or pattern	Urban structure, plots pattern, Urban form	Juxtaposition, small scaled plots
Ground level transformation 1	Intensification (densification)	Increase of housing capacity	Urban population growth	Ground floor density, dwelling types	Urban structure, Plots pattern, urban form, functional diversity, Accessibility	Buffer space exceeding initial needs
Ground level transformation 2	Change of use	Attribution to productive activity to ground floor	Economical needs	Functional diversity, dwelling types	Urban structure, Plots pattern, urban form, ground floor density, accessibility	Redundant space in the house, small scaled plots
Ground level transformation 3	Extroversion of commercial space	Opening of showcases and windows	Economical needs	Accessibility, Public space hierarchy, dwelling types	Urban structure, Plots pattern, urban form, functional diversity, ground floor density	Boundary of urban space, small-scaled plots, urban paths hierarchy
		External private appropriation	Economical needs	Accessibility, Ground floor density	Urban structure, Plots pattern, urban form, functional diversity	Redundant space on sidewalks
Public space appropriation 1	Permanent occupation (densification)	Commercial building construction on main axes	Economical needs	Plots pattern, urban form, public space hierarchy and occupation	Urban structure, functional diversity, dwelling types	Redundant space of urban pattern gaps
Public space appropriation 2	Temporary occupation (densification)	Kiosks, tents, verandas, platform	Economical needs	Public space hierarchy and occupation,	Urban structure, plots pattern, urban	Redundant space of urban pattern gaps,

(Table 01 – Taxonomy of street adaptations – Source: Author, 2022)

From the taxonomy of local adaptation phenomena, through chronological localisation of few events²⁹, we can draw a diagram of temporal deployment of the adaptive cycles of the avenue. Although the set of information is not precisely quantifiable for the entire period, the diagram provides qualitative insights on persistence rhythms and duration. The notion of persistence, declined on a local temporal scale, identifies variables that persist in at least one adaptive cycle. Local persistence variables are slow variables on a larger time scale. General persistence is a limit case of the long periodicity of change.



(Table 02 – Chronological diagram. Section A (top) shows major deployment of adaptation actions. Section B (bottom) displays changing (discontinuous) or persistent (continuous) variables – Source: Author, 2022)

Discussion

Adaptation, persistence and change

Synoptic view of the adaptive processes of Sidi Mohammed Ben Abdallah avenue in Rabat allows to grasp the evolutionary trajectories of the urban street system. Different

adaptive cycles, specialized for resources, drivers and activated processes, overlap on different time periods, showing indicators of local variability and persistence. Local variability identifies fast changing variables. On the contrary, local persistence describes slow changing variables, thus state variables whose transformation, over the decades, has been sporadic, slower or fainter.

As a limit state of slow change, the following variables of street structure are identifiable as persistent:

- Plot pattern: from pioneering phase (design) to nowadays, plot patterns kept its initial structure, acting as a resource for change and as a main factor influencing urban form adaptation in its shapes
- Urban structure: despite hard transformations, public space geometry remained almost unchanged, as it is recognizable by comparing Ecochard plan with Google aerial photos.

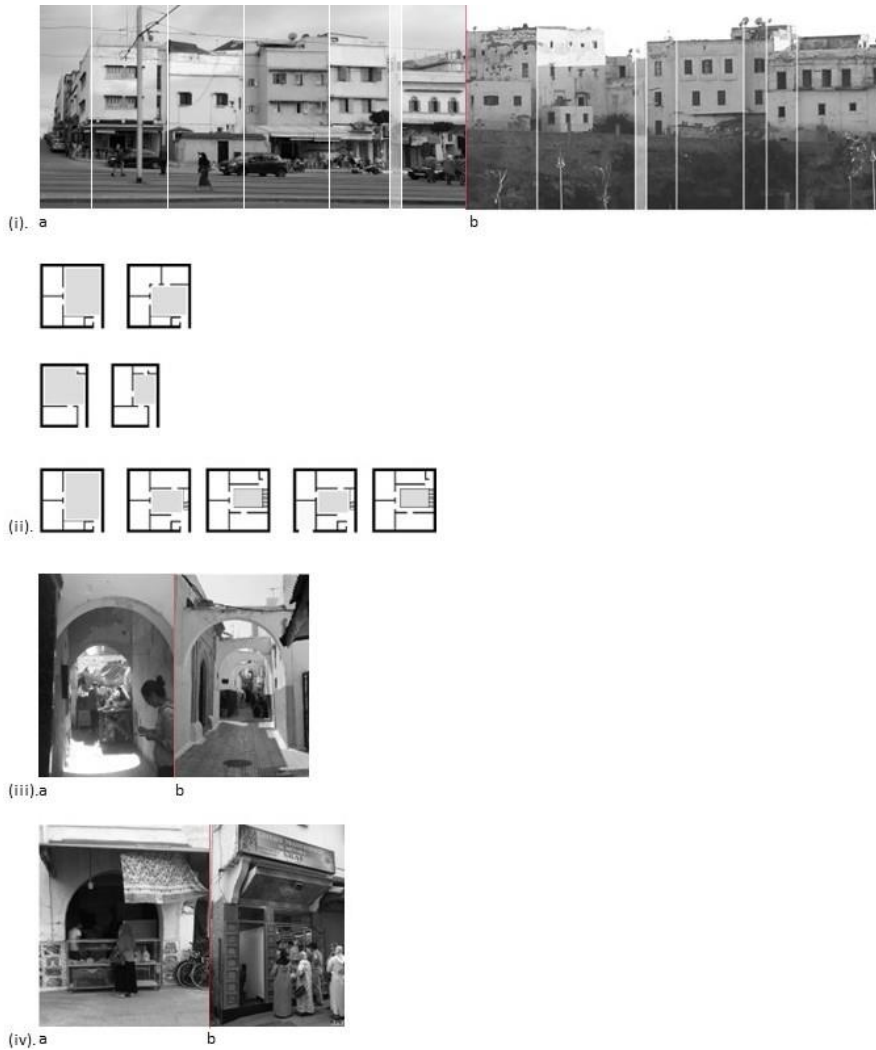
Furthermore, those processes describe a global densification trend, in land and housing density increase, in primary functions, in street activities and frequentations. Densification trend testifies to a positive feedbacks chain, expressed in the categories of population attractiveness, commercial appeal, economic growth. Positive feedbacks feed adaptive process, which generated further positive feedbacks, stimulating the whole process, according to the effects amplification principle.

Adaptive factors in cultural and economic fields are the resources for such positive dynamics:

- Small plots scale, allowing easier installation, management and transformation as relate to the population economic means;
- Tight rhythm of plot patterns, strengthening neighbourhood relations;
- Buffer and redundant spaces, providing physical resources for adaptation;
- Urban structure, translating fractal Medina's structure to easily establish space progression and hierarchy from main axis to inner public space, which are consistent with local urban tradition;
- Horizontality of management process, due to lack of public control and weak regulation, admitting informal action.

There are obviously mutual relations between persistence characters and adaptation factors, as, generally, slow changing variables depend on system identity. Some of those remained consistent across change, influencing adaptation and being exploited as resources in further configurations. Some others have been spontaneously recreated, as the linear disposition of commercial activities along the avenue to the detriment of initial local centralities, as well as of the less attractive main square.

The nature of persistence variables can be discussed in the theoretical framework of urban self-organization and autopoiesis. Adaptation feedbacks rule the production of new relations and the success of the existing ones. The evolution of the analysed street is built up through replication of urban syntaxes – hierarchies, paths, activities – and artefacts – patterns, buildings, ephemeral objects – matching both self-determination and self-referentiality principles. First, the process has not managed by planning, being driven by inhabitants after Ecochard founding plan in 1948. Then, although driven by external forces, as demographic, political and economic changes, it is locally operated on local sources: adaptation draw solutions from Ecochard design, as well as from traditional city: main transformation towards hierarchical progression from commercial road to inner fabric depends on the relationship between diversity and intimacy expressed in the fractal structure of the traditional city: matrix path of the *souk* was spontaneously recreated along the avenue Sidi Mohammed Ben Abdallah.



(Fig. 10 – Self-referential closure. (i) Street and skyline rhythm: a. Sidi Mohammed Ben Abdallah avenue; b. Rabat ancient medina; (ii) Dwelling typologies evolution, from Ecochard to present time; (iii) Public space shape: a. Sidi Mohammed Ben Abdallah avenue; b. Rabat ancient medina; (iv) Commercial typologies: a. Sidi Mohammed Ben Abdallah avenue; b. Rabat ancient medina – Source: Author, 2015-2022)

Conclusion

Adaptation actions and outputs profile an autopoiesis trajectory and describe the role of the street as an accumulation path. This leads to draw few conclusions and research perspectives from a design point of view.

Firstly, self-referential closure revealed the deepest identity of the city, reproducing living secular habits that had inspired Ecochard planning³⁰. Autopoietic public space carries a *metis*³¹ value³², that arises from intuitive adaptive ability³³ and could unfold

future adaptation paths. Modeling of autopoietic features, as well as mapping of adaptation resources by parametric tools, should provide a strong basis for urban design, foreshadowing adaptive possibilities facing present time uncertainty.

Furthermore, the autopoietic trajectory displays a trend towards human-scaled urban space. Self-organized process does not follow an a priori project, but it acts according to the ability of each element to adapt its behaviour by taking advantage of environmental change³⁴: persistence is not just inertia, is more likely an active organization, an energetic effort to maintain the identity, and consequently the form³⁵. There is, thus, an implicit idea of purpose in urban self-organization³⁶; in Rabat inhabitants realized their own urban aspirations through informal actions³⁷. The expressed trend offers a gaze on contemporary city and complexity intuitive management: it outlines a model of a tight urban fabric, made of small buildings and spaces, intense rhythms, pedestrian paths, proximity, densification, functional *mixité*, and it conveys an idea of a certain ambiguity in space regulation and a strong simultaneity in uses, being relevant for consumption reduction.

Finally, street confirms the founding role it had in urban history³⁸. As it had marked the formative processes of European medieval city, systematically based on the pioneering colonization of a matrix path, persisted in subsequent evolutions, the comparison with the Rabat case-study highlights the recurrence of the same transition process, passing through the settlement of small single units along a street, their implementation, the recasting of adjacent units, the genesis of linear collective housing³⁹. Self-organization depends on likelihood of relations established within the urban system. Hence, defining ecological participation, street is an accumulation path for systemic interactions, and as such it frames autopoiesis and directs morphogenesis.

Acknowledgments

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