The Grand Bazaar in Istanbul: The Emergent Unfolding of A Complex Adaptive System

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Abstract

The Grand Bazaar in Istanbul offers an example of a physical environment containing specific districts that have emerged over time. This paper theorizes that the Grand Bazaar exhibits the characteristics of a Complex Adaptive System. Then, it considers specific urban elements found in the Bazaar, in light of complexity theory, to see how these facilitate processes that lead to the emergence of contiguous districts. This study repurposes Kevin Lynch's categorization of urban elements to provide a useful framework for discussing complexity theory. This research is further informed by economic analysis derived from Evolutionary Economic Geography, which examines the emergence of business clusters.

Keywords

Grand Bazaar, self-organization, Complex Adaptive Systems Theory, emergence, Evolutionary Economic Geography, Kevin Lynch.

Preamble

The year is 2006. It is my first day in Istanbul with my mother, and we have just wandered from our hotel, the Taş Konak, after settling in from our afternoon flight. It is early evening, and we are strolling the streets of the city. We amble past merchants in the Bazaar, each calling to us – 'Come in! Just to look not to buy', 'Hello/bonjour where are you from? American? France?' and 'Come ladies! Sit and drink tea with me'. We thread our way along streets, drifting deeper into the market, when yet another merchant startles us as he smiles and states, 'Hello, Canadian mother and daughter from Taş Konak! Please come in to take a look.'

Who is this man? We have never seen him before, nor he us. But he knows who we are, the nature of our relationship, and where we are from. In a city of more than 10 million people, amid a throng of tourists, and within a few hours of landing, our presence has been noted, transmitted and successfully deployed to draw us into this particular shop, with this particular merchandise.

Later, our host will summon tea. Tulip-shaped glasses appear, like magic, carried on a silver tray by a young boy who quickly disappears. The tea serves as part ritual, part sales pitch –

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connecting with time honored traditions of hospitality to strangers, while serving to extend our stay in the shop as our host describes the wonders of his carpets.

This dance of knowledge, flow and traditions that extends throughout the labyrinth of the Bazaar is part of a weave of complex relations that unfolds in and through the urban fabric. My mother and I enter into this weave and our flow is quickly directed and modified by complex forces on the ground, bringing us to this particular juncture of site, meaning and culture.

Historical Stability: Formation of Districts within the Grand Bazaar

The Bazaar was neither simply a Tower of Babel nor a picturesque scene: it was a complex reality that would achieve a harmonious equilibrium.¹

Established in 1454 under Ottoman Sultan Mehmet II (1451-81), the Grand Bazaar has for centuries served as Istanbul's commercial center and continues to operate as an important civic hub. Initially, the bazaar's site was chosen in accordance with settlement patterns of the Byzantine city in an area already established as an important center for trade.² The location of the Istanbul *Bedesten*, the first section of the bazaar (adjacent to the Imperial Road, now *Divan Yolu)*, thus maintained old patterns of trade but altered the mode through which trade was administered and taxed. Under the Ottomans, the bazaar began to operate under the auspices of the *vakif* (pious foundation) system, whereby the *vakif* facilitated the construction of the bazaar through funds drawn from charitable endowments and then went on to collect rents from tradesmen. These pious foundations, 'were created in the towns and cities of the Ottoman Empire in early times by the sultans, their mothers, and high-ranking state officials. Being financially as well as administratively autonomous, these foundations were responsible for the construction of the cultural and commercial complexes in conquered cities.'³

Funds generated from rents were in turn used to support the work of the pious foundations, including the bazaar's upkeep, financial support for schools, hospices and soup kitchens, and maintenance of the city's mosques. The *Cevahir Bedesten* (jewelry market), the oldest portion of the bazaar, was established to generate financial resources for the Ayasofya Mosque. The bazaar was thereby part of a broader civic economic ecology that supported educational, religious and commercial components of city life.⁴

Various guilds designated streets around the *bedesten* as sites where merchants could sell their wares. Over time, these commercial streets expanded in response to the demands of a growing population. *Hans* (business inn) were built to serve as central depositories for shipments intended for a particular craft or guild. The bazaar was thus comprised of guild

streets (zoned by trade), *hans* that encircled the periphery and served as central depots, and *bedestens* used as storehouses and vaults for precious items.

While maintaining this general framework, the bazaar's physical structure nonetheless underwent various expansions and transformations over the centuries. Fires and earthquakes played a role in this evolution, since sections were frequently destroyed and rebuilt. Nonetheless, the same general structure was preserved. In its present incarnation, the covered market dates back to 1750. However, the 1894 earthquake reduced the market's scale: following that event, certain streets (including the book market) formerly enclosed within the bazaar, were left outside its boundaries. This reduced footprint is indicative of the bazaar's declining popularity, as new commercial enterprises – following European models – opened on Rue de Pera (today İstiklal Caddesi). The last significant rebuilding occurred after a fire in the 1950s; but despite extensive damage, reconstruction preserved the original built morphology.

Today, the bazaar primarily serves the tourist market. In approximately 75 acres it contains roughly 4,000 shops and 61 streets.⁵ Within this area are an array of supporting amenities such as *hans*, cafés, restaurants, currency exchanges, tea houses, and mosques.⁶ Streets bordering the bazaar form a contiguous open-air market [Figure 1]. The boundaries between these interior and exterior streets are at times clearly demarcated and at other times blurred: some streets of the bazaar lie within the original gates but remain uncovered, while in other cases streets, now covered, lie outside the bazaar's walls.



Figure 1: Greater Context, Istanbul. (Sharon Wohl)

For most of the bazaar's history, the guild system ensured that it functioned as both a cultural and economic entity. Craftsmen appointed guild leaders from their membership, and these leaders would in turn guarantee members a sound living. Guilds purchased and equitably distributed raw materials to their members, set ceiling prices on goods, imposed quality standards, determined the number of craftsmen permitted to practice a particular trade, and standardized shop dimensions.⁷ These measures protected consumers from shoddy goods and high prices as well as ensuring a stable market for merchants. In this context, competition or 'profiteering' was seen as a threat to the system.⁸ Instead, guilds aligned themselves with faith-based associations and worked to foster honor, tradition and brotherhood amongst their members.⁹ Competition and innovation were discouraged in an effort to preserve customs and stability.¹⁰

The location for each type of merchandise was established in the early days of the market. This occurred through a gradual process whereby temporary shops of traveling merchants would gradually evolve into permanent locations. Thus, 'the itinerant vendors of retail goods opened shops and were sedentarized [...] when one peddler's business flourished, others came and built shops next to his. The number of shops increased, [whereby] a cluster would occur of shops arranged according to the kind of goods sold'.¹¹

Hans were established to serve as central depots where goods were stored and then deployed to craftsmen within a particular district. This concentration of similar products reduced transportation and search costs for consumers and distributors.¹² The guilds, along with the pious foundations, structured and stabilized these locations by instituting a 'pre-capitalist form of agglomeration'.¹³ But the number of merchants in a guild and the size of the district they occupied varied 'according to the vicissitudes of the market'.¹⁴ While it has generally been assumed that guilds exercised a high level of control over membership, quality and price restrictions, Eunjeong Yi observes that, 'guilds apparently did not attempt to impose strict regulations on people coming into their trade or leaving it [...] shops changed hands freely and with little signs of involvement on the part of guild authorities'.¹⁵ Yi notes that as the city's population grew, the infrastructure provided for specific trades proved inadequate and merchants moved outside the confines of their initial district. The location of each guild in Istanbul therefore did not remain confined to specific streets or quarters and 'spatial concentration was not a binding principle'.¹⁶

In the eighteenth century, Ottoman officials introduced the *gedik* system (complex term variously indicating tenancy rights or usufruct of transferrable property particular to a given craft) that licensed the number of craftsmen practicing a particular trade. However, as noted in the definition, these licenses were not tied to a particular location and were transferable in some circumstances.¹⁷ The impact of this system was twofold. First, when craftsmen lost their certificates, '[they] sought to practice their crafts outside the area designated for their guilds.' Second, 'the selling of *gedik* certificates enabled people with no artisan background to enter the guilds. Thus the *gedik* implied not only the spatial disintegration of the guild system further eroded after 1865 when ceiling prices were abolished.¹⁹ Thereafter, a massive influx of cheap imports from the West continued to weaken and de-stabilize the equilibrium the guilds had sought to maintain. In the absence of external control (and with the final dissolution of the guilds in the early 1900s) shopkeepers in the Grand Bazaar gained autonomy over what they could sell and where they could sell it.

Despite this autonomy, product selections continued to converge, such that discernable districts of similar goods emerged. Two maps of the Grand Bazaar ²⁰ depict its spatial regions at different times, exemplifying both the changing character of the bazaar and the persistence of coherent districts despite forces of change.²¹



Figure 2. Bazaar Districts, 1960. (Sharon Wohl, redrawn after Nebahat Tokath and Yonca Boyaci, 'The Changing Morphology of Commercial Activity in Istanbul', *Cities* 16, no. 3 (1999).)



Figure 3. Bazaar Districts, 2000. (Sharon Wohl, redrawn after Nebahat Tokath and Yonca Boyaci, 'The Changing Morphology of Commercial Activity in Istanbul', *Cities* 16, no. 3 (1999).)

The first map [Figure 2] depicts the bazaar in the 1960s. It includes districts of furniture producers, quilt-makers and scarf and towel manufacturers. The second map [Figure 3], dated 2000, bears no trace of these goods, instead revealing the rise of denim-wear and souvenir shops. In this latter map, jewelers have expanded to form a continuous band along the south edge of the bazaar. Souvenir shops form a large swath that dominates the western block. A single arm of fabric shops stretches toward the market's northern boundaries, ultimately connecting with fabric-dealers situated outside the confines of the bazaar. Antiquity dealers have relocated entirely, leaving a small zone in the southeast sector to occupy a new sector encircling the old *bedesten*. Sellers of leather goods are distributed in amorphous clumps. These concentrated distributions of particular goods are all emergent districts not planned by the individual merchants. But how have contiguous districts emerged in the absence of any guild or centralized control?

The bazaar captures imprints of spatial patterns and connections that have coalesced over time. This article examines how features of the urban fabric shape and modify these forces and flows in ways that support the bazaar's evolutionary capacity.²² In what follows, I will consider Complex Adaptive Systems (CAS) theory as a means of informing our understanding of present-day districts in the bazaar. The analysis will demonstrate how these districts might be explained through the phenomenon of *emergence*, a feature of CAS that arises from the uncoordinated interactions of many independent agents. In addition, I employ research from Evolutionary Economic Geography (EEG), a branch of economics that draws from complexity theory, to supply complementary insights into the mechanisms through which spatial agglomerations occur.²³ The following section will introduce CAS theory before considering the bazaar through this lens.

Properties of Complex Adaptive Systems

The valuable city is not an ordered one, but one that can be ordered – a complexity whose pattern unfolds the more one experiences it.²⁴

A wide array of distributed interacting structures – ants in a colony, websites on the internet, traffic on a street network – can be identified as Complex Adaptive Systems (CAS).²⁵ CAS are *Complex*, in the technical sense that these systems are non-linear. Minor differences in initial conditions can lead to wildly divergent trajectories for the system's end state. They are *Adaptive*, evolving over time and retaining useful characteristics, and they are *Systems*, composed of networks of interacting parts. Finally, they possess *Emergent* features: global properties that are irreducible to the additive characteristics of the individual parts. CAS theory, though originating within the physical sciences, can be used to analyze a wide array of systems.²⁶

CAS' are composed of basic independent units, termed 'agents'. Agents in complex systems evolve according to general Darwinian mechanisms of variation, selection and retention. The nature of an agent varies depending on the system under analysis. Agents might be ants in a colony, sites on the Internet or stocks on the market. Agents mutate and adapt their behavior, testing strategies that might draw resources their way. They then evaluate and adapt their actions depending upon whether feedback from this new behavior indicates that they have moved closer to, or farther from, a particular goal.

Scientists generally describe this process of testing strategies as exploring a 'fitness landscape' – the agent's resource environment. This landscape is not static. Rather, it appears shifting and uneven, modified by outside disturbances (perturbations), the presence or absence of resources and the interactions of agents inside it. Agents can explore the landscape in various ways: by refining existing strategies (climbing a fitness peak) or testing novel strategies (jumping to a new peak). Agents guide each other in exploring the fitness landscape through receiving and deploying signals called 'tags' (or stigmergic signals). Tags leave traces of strategies that are perceptible to other agents in the environment, thereby informing subsequent behavior.²⁷ Ants, for example, deploy pheromones to tag their environment thus guiding other ants toward food sources. Agents in CAS work simultaneously to explore the broadest possible range of fitness strategies. But these independent agents also exhibit a natural tendency to coalesce into larger aggregates, reducing the transaction costs of moving resources within the system.²⁸ These emergent clusters (or 'patches') exploit distinct forms of energy resources, while transference between patches allows resources to effectively propagate throughout the system as a whole.²⁹

While CAS theory focuses on the attributes of agents, network theory examines the topology of the flows that are transferred between agents. Resource flows (such as water, nutrients, dollars, etc.) fuel a CAS. The architecture of these flows evolves from the interactions of agents, but once in place, it begins to constrain subsequent topological features of the system. For example, the networked links of the Internet form an architecture that has emerged over time, but the dominance of particular sites (like Wikipedia) subsequently reinforces traffic flows to specific nodes. Networks thereby evolve into hierarchies of loosely and highly connected nodes.

This hierarchical arrangement of nodes follows a regular mathematical distribution, which is described by power laws. Examples of power law distributions found in CAS include: frequented sites on the Internet; rank distribution sizes of cities; and cited articles in academic journals. The presence of power law phenomena appears to be a natural attribute of systems that exhibit both growth and preferential attachment.³⁰ This ubiquitous structure allows for shortcuts or 'small worlds' that propagate flows. The capacity of a network to efficiently propagate resource flows and spur novel interactions is affected by structural aspects of network topology. Thus, the number and kinds of linkages are important, as well as the presence of a hierarchy of nodes that directs flows and maintains system stability.³¹

Distributed hierarchies of nodes serve other purposes. At the local level, junctions connect similar agents (an internet chat group on physics, for example). Higher up the hierarchical chain, major hubs bridge communities and disperse knowledge between groups (Google News, for example).

Finally, CAS systems can display emergent properties. These are features that, while clearly discernable, cannot be attributed directly to any of the agents that make up the system, nor are they the direct additive result of agent attributes. Examples of emergent phenomena include tornadoes, fish schools and stock market crashes.

Applying CAS to Urban Phenomena

The above features of CAS apply to any system domain (physical, chemical, biological, etc.), but are operationalized through distinct material or physical *carriers* specific to the system in question. In my analysis of the Grand Bazaar of Istanbul, I am interested in considering the physical features of the urban environment that support the bazaar and behave as a CAS. I therefore would like to turn towards identifying what aspects of the urban fabric might serve as enabling carriers of complex processes.

Kevin Lynch's framework for analyzing cities (*paths, landmarks, districts, edges and nodes*)³² supplies a well established analytical system that differentiates between key urban elements.³³ That said, Lynch's urban properties are generally viewed as 'physical' artifacts, where 'good city form' is seen as deriving from a well composed ordering of these elements. I wish to consider how this classification methodology can instead be repurposed to examine 'functional' attributes: where certain physical artifacts are important, not because of what they look like, but because of the behaviors they perform or enable. I employ Lynch's classification system as a means of identifying properties of CAS, because his features are familiar and intuitive as a starting point and not because I am analyzing the Bazaar according to Lynch's rubric.

The table below illustrates the links between Lynch's original formal designations, how these apply to physical features of the Grand Bazaar and how these physical features can be reinterpreted as functional features. These functions are then related to CAS properties. In order to make Lynch's system correspond to CAS properties, I have incorporated an additional feature – cell – to the original set. With this analytical framework in place, the next section considers how the urban fabric of the bazaar facilitates CAS processes.

Lynch's System (modified)	Physical Features:	Functional Role in a CAS:	Ecosystem Examples:	
Cells	Typical grain of urban fabric (shops)	Parallel agents working to maximize resource use	Species (birds, insects, mammals)	
Paths	Street Networks (carrying tourists, information, money, merchandise, etc.)	Network links facilitating flows of resources; information and energy entering the system and connecting agents across space	Channels of energy sources flowing through an environment (streams, sun-paths, ground nutrients, foraging trails)	
Hubs (landmarks and Nodes)	Gathering places (shop doorways, fountains, mosques, <i>hans</i> , coffeehouses, tea houses, currency exchanges	Junctions within networks that concentrate resource flows, either maintain existing routines and memories of useful flows, or test new sub-routines that transform flows into more useful forms	Food /fuel source sites (ponds, nutrient pools, fruiting plants, etc.) or storage stashes and congregation sites (nests, ant hills, dens, etc.)	
Edges ³⁴	Storefronts and displays	Tags signifying agent competencies, steering resources toward agents that can best process them. Also broadcasting to other agents successful and unsuccessful strategies for resource-processing	Signals broadcasting information to other species (pheromone trails, bird calls, plumage displays, etc). Interfaces indicating which resources are consumable by a particular species (ligands)	
Districts	Zones of similar products (leather, denim, fabric, etc.)	Aggregations of co-evolved agents that efficiently circulate resources	Patches of species inhabiting a particular niche (swarms of fish, flocks of birds)	

Table 1: Features of CAS in the Grand Bazaar

Modern Flux: The Bazaar as a Complex Adaptive System

A settlement is a valued arrangement, consciously changed and stabilized. Its elements are connected through an immense and intricate network, which can be understood only as a series of overlapping local systems, never rigidly or instantaneously linked, and yet part of a fabric without edges. Each part has a history and a context, and that history and context shifts as we move from part to part.³⁵

Cells: Agents of CAS

The grain or texture of the Grand Bazaar is comprised of the individual shops that define its fabric. When considering the Grand Bazaar as a complex system, these shops perform as cells or agents. Each cell is one of a series of parallel entities that form the base site of agency within this particular complex adaptive system (whereas an ant is an agent in a colony, for example). In CAS theory, the term 'agent' has a different usage where it is used to identify the base components of the system under study. This usage should be distinguished from 'agency', which implies volition. No volition is being ascribed to the inanimate building blocks of urban form and it is meaningless to speak of a shop having 'agency'. Nonetheless, a shopkeeper's agency is constrained by the material possibilities of the shop he or she occupies. Thus, a cobbler operating in a space of five square meters cannot repurpose his space to run a hotel. Thus cells affect agency, not because these cells are independent of human agents that interact with them, but to the extent that material artifacts provide an interface that mediates and structures human agency. Shops mediate between two types of actors in the bazaar with different goals: merchants and shoppers. These goals are negotiated at the site of the shop, where spatial characteristics assume agency (in the way that stock prices, within the complex system of the market, act as an interface between buyers and sellers, but do not have agency per se). I wish to examine how spatial characteristics of these cells affect the kinds of physical patterns that are possible within the bazaar.

John Holland highlights the importance of the flexible nature of agents within CAS, emphasizing that having the smallest possible functional scale that can be aggregated into larger units provides the greatest adaptability within these systems.³⁶ In the bazaar, the small and flexible nature of cells supports variation. Cells span one structural bay of the market, generally a distance of ten feet (though this varies from street to street). Typically, a cell encloses an area of 100 square feet that is programmed by owners, in accordance with their needs and their merchandise. Businesses normally operate within a single cell, but if successful, they may appropriate additional cells located in nearby storefronts or streets [Figure 4]. In some cases, shops extend into neighboring cells, particularly if the merchandise is larger in scale (for example, carpet stores). In these cases, merchants occasionally create openings between cells [Figure 5] that are covered over if shops revert to separate ownership. In instances where products are small, cells can also be divided in half to offset high rents. This occurs in some jewelry sections and at currency exchanges [Figure 6]. Similarly, corner

cells are often bisected to create two triangular stores. These operate independently, facing adjacent streets at right angles.



Figure 4. Joined cells: showing shops joining on one of the bazaar's most expensive streets. (Sharon Wohl)



Figure 5. Opening between cells: showing an opening between cells, joining sections of a carpet shop. The owners have a third location that is not contiguous, but nearby, allowing carpets to be shuttled from one location to another. (Sharon Wohl)



Figure 6. Cell subdivided: shops depicted sell high-priced jewelry. Cells are subdivided into equal sections to minimize rental costs. This scale is sufficient to display small goods. (Sharon Wohl)

The bazaar cell's small scale permits new markets, goods and districts to be tested with relatively minimal investment. Strategies are then refined or abandoned. This adaptability, along with the high number of possible iterations (4,000), provides inherent flexibility and the benefits of massive parallelism - accelerating evolutionary optimization. Although a great many of these variant strategies may fail, successful ones will have opportunities to replicate through expansion (growing into additional cells) or the reproduction of techniques (surrounding cells mutating to mimic success). Evolution occurs quickly because variant cells are not only sequential, but also parallel. The range of independently operated shops enables swifter adjustments to merchandise selections, locational choices and marketing tactics. Owners gain immediate feedback on their tactics such that, according to evolutionary economists, 'differential profits leading to differential growth rates render fitter routines to become more dominant'.³⁷

These processes are echoed in the shopkeepers' personal narratives. One owner, discussing transitioning from traditional carpet sales to custom patchwork rugs, explains: 'We started really small and in a way, very amateurish, but we received very positive feedback and became a name for patchwork.' ³⁸ Gradually, he converted his stock to fill this niche and opened a second location. Another source describes how an owner had '[begun] an

internship here when he was just 12 years old and after years of training he operates three stores, all different from each other. His principal store, on the main street of the bazaar, turns merchandise 13 times a year allowing [him] to infuse new concepts and products'.³⁹ Another owner I interviewed described his great-grandfather as a watchmaker in the bazaar. In the 1950s his grandfather moved to a new location, giving up the watch-making business to sell carpets and decorative animal skins. His father transitioned to selling leather artwork and the son, a fourth generation owner, now sells leatherwear.

Evolutionary Economic Geography describes this process of exploring products and concepts as a testing of rules whereby 'an agent originates, adopts, adapts and retains a novel generic rule'.⁴⁰ Spin-off firms inherit successful rules from parent companies, leading to competitive advantages within the marketplace. Agents test survival strategies in parallel, such that 'each agent interacts with a subset of other agents, and each agent carries only a subset of all economic rules'.⁴¹ Good rules propagate across the system:

An agent explores a new rule and its capabilities. This is a phase of learning and experimentation for a single agent, but as other agents also adopt the same rule, adoption, in turn, drives adaptation. This process of evolution re-structures the market and the organizational environment.⁴²

This step-by-step succession process takes place in the bazaar, where unsuccessful enterprises fail, shops transition to new owners, (selling the same or different goods) and 'market competition acts as a selection device causing "smart" fit routines to diffuse and "stupid" unfit routines to disappear⁴³. Successful enterprises begin dominating and expanding in the bazaar, creating contiguous territories. The experiences of my interviewees illustrate this point. One subject, a newcomer to the bazaar, opened a carpet business in a shop that previously sold textiles. After successfully establishing this business he acquired two additional shops (only one of which previously sold carpets) that were closely situated to his first shop. A cluster of carpet stores began to emerge in a process that now attracts subsequent entrants into the market.

In addition to promoting ease of variation, the bazaar's small scale promotes long-term stability once successful strategies are discovered. Most shops consist of one to three owners and are family-run.⁴⁴ Many have been in the same hands for generations, with successful routines remaining intact as they are passed down from one owner to the next. Resources (financial or personnel) from extended family networks can be drawn upon in times of need.⁴⁵ Family members provide supplemental staff during busy periods or can mind the store when business is slow, allowing owners to pursue side ventures so as to accumulate capital (such as travel to acquire goods or sales trips to other markets). The shop's small scale means that localized family resources are sufficient to mediate fluctuations.

This independent, small-ownership model thereby helps stabilize successful routines. It also means that the shop's success is linked to the character and reputation of the shopkeeper. One interviewee mentioned that after working in the bazaar for more than fifty years, he was able to leverage his personal reputation to obtain the necessary financing to purchase his rented shop. He explains: 'If your name has received the personal-credit of the others in your social and business circles, then money plays a secondary role, even if you don't have it all at that particular time'. The transition from renting to owning further stabilized his enterprise, consolidating the shop's place in the urban fabric. But this stability could not have been achieved without his positive personal reputation. The shop owner elaborates:

While the new banking laws in Turkey require a financial statement, being tradesman in the Grand Bazaar is enough of a statement for a bank. By comparison with the rest of the country, it is a very simple matter to conduct a credit check in the Bazaar because everyone knows each other and, as a result, the failing on credit payments, quite high nationwide, is almost unheard of here.⁴⁶

PATHS: Resource Carriers of CAS Networks

The bazaar sits at the crossroads of historically significant routes, channeling a high volume of resources inside its walls. Street networks, comprised of both shorter, local pathways as well as longer routes, serve as carriers of human, material, monetary and informational flows. Gateways into the bazaar gather denser flows from the port, the tourist district, the mosque and nearby Istanbul University. Inside the bazaar, streets form a tightly-woven grid that provides many potential routes between destinations. This variety generates shortcuts, cycling resources more effectively among agents and prompting synergetic connections. The physical topology of the Grand Bazaar's street network is intrinsically elastic, having the capacity to respond differentially to changing structures and hierarchies of flows. According to network theory, this high degree of redundancy in resource flows allows the network to auto-catalyze. Flows shift directions and densities, establishing new hierarchies, hubs and districts. Thus the original *bedesten*, once a major hub of the bazaar, has diminished in importance. Flow patterns have adjusted accordingly.

The bazaar's longest streets are also generally the widest, and these avenues generate the market's thickest flows. Streets that are centrally located draw higher volumes of traffic, while peripheral zones remain more private. The scale of streets corresponds to traffic flows. Major gateways from Nurosmaniye Mosque [Figure 7] direct high volumes of traffic into the bazaar, where rents are most expensive. Entries from the west are narrower, and shops in this area sell lower-priced goods [Figure. 8]. In addition, spaces that are deeply embedded within the bazaar's spatial structure (the *hans* which are scattered around the peripheral sections), are

accessed through a series of thresholds that act as boundaries, maintaining privacy. Entrances to these *hans* splinter off from main traffic routes, but are recessed within several thresholds that inhibit tourists from entering. Additional barriers to movement appear within these *hans*, where older stairwells, leading to upper levels, discourage tourists. Rents are less expensive in these secluded areas, and the second and third levels (used for storage and workshop space) are more private and removed from flows [Figure 9].



Figure 7. Major Gateways: Nuruosmaniye Kapısı. (Sharon Wohl)



Figure 8. Bazaar Gateways: entry from the West, Yorgancılar Kapısı. (Sharon Wohl)



Figure 9. Han Entry: Leather District. (Sharon Wohl)

High variations of denser and sparser flows inside the bazaar result in a wide range of rental rates. This means that different occupants can appropriate niches according to available resources. The market's highest rents correspond to locations where flows are greatest and to the highest-priced targeted goods. Thus the Kalpakçılar (the east/west artery from Nurosmaniye Mosque) draws not only tourists, but also specialized buyers who are focused on purchasing silver and gold. By contrast, the Yağlıkçılar/Sipahi artery (the north/west route with the longest continuity) also attracts high tourist volume, but these visitors are not seeking a particular good. Here, souvenir shops appear in abundance, and goods on offer are far more heterogeneous than at other locations inside the bazaar.

While high volumes of flows are important for garnering customers, other strategies are relevant when flows become distilled into individuals searching for specific products. Visitors interested in carpets are more likely to gravitate to a zone (that is less frequented) if it signals a higher percentage of carpet shops. Merchants thus evaluate the trade-offs between situating themselves in the presence of general flows (attempting to capture a portion of them) and moving to more remote locations that draw targeted flows (bringing fewer general consumers, but more buyers who are interested in their particular product line). Tourists, looking for non-specialized products, create high volumes of general flows, while thinner but more focused flows result from local or specialized users. These differences affect the character of each district. Streets that capture tourist flows are the bazaar's most

heterogeneous, where shopkeepers try to entice tourists with an array of products. By contrast, in areas where flows are in the form of repeat customers, shops display greater specificity and contiguity. Flows on the streets north of the bazaar are produced mostly by locals, and these areas appear far more specialized, with contiguous districts emerging to capture these repeat flows [Figure 10].



Figure 10. Market Streets: shopping district north of Bazaar. (Sharon Wohl)

Another strategy adopted by merchants who evaluate the trade-offs between choice locational streets and rental costs, is to maintain more than one location. In these cases, merchants occupy a small shop where higher traffic volumes exist, while also renting satellite shops on less expensive streets (or in *hans*). These satellite shops hold additional goods that can be quickly shuttled over to a customer at the main location. Here, the flow of goods supplants the flow of people, as merchants make their goods mobile.

This movement of goods is but one example as an abundance of material flows help catalyze the Grand Bazaar's functions. In addition there are mechanisms that ensure these flows find their way to where they are most needed. For example, merchants employ cell phones to quickly access merchandise or personnel from other locations, or order tea to build social capital during a transaction. Porters quickly and efficiently navigate the streets, bringing goods, food or tea from one region to another. The flexible and agile qualities of human pulled carts (or on the backs of porters, though this is becoming less common) are used to transport material flows along the tight streets [Figure 11]. Touts direct tourists to goods, leading them from one district to another, or deliver information to merchants regarding potential customers. Flows of products entering and exiting the market interact with, and are altered by, these knowledge flows.





EEG characterizes flows as consisting of capital, labor and knowledge.⁴⁷ In the presence of rich flows, ventures are apt to achieve greater success. This process results from:

(1) The mobility of human capital as the carrier of (often tacit) knowledge in these areas, (2) the transfer and feedback of information via dense (mainly informal) networks of local actors, reinforced by the techno-industrial specialization of the area, and (3) a common local culture of trust, based on shared practices and rules.⁴⁸

While gaining monetary flows is a key indicator of shop success, not all merchants regard money as the only 'fitness criteria' for their enterprise. Historically, profit was not a primary motive for shops (provided that enterprises supplied a livelihood). Carl Johan Charpentier, writing about the bazaar in the 1960s, tells of a dealer refusing to sell him a large quantity of carpets, since the transaction would deplete his stock and thereby limit future opportunities to conduct sales and foster social interactions.⁴⁹ This theme remained prevalent among many shopkeepers with whom I spoke. Longer-term tenants or owners seemed to be more concerned with building their reputation and relationships with repeat customers than with maximizing profit or drawing in tourists. But these priorities are changing. One of the subjects I interviewed commented on the loss of social 'glue' that forges connections within the Grand Bazaar. He clarified:

I notice the lacking social attention and respect towards one another when I compare it with the recent past. We all come here for our 'bread-money' but that does not mean that we should be ignoring the vital importance of other values, which are beyond making money, that play the glue-role in our daily life.

Many shopkeepers expressed concern over the influx of cheap counterfeit goods in the bazaar. One employee of a scarf shop explained how he had previously sold fake leather bags at the same location. Officials fined his employers several times for selling counterfeit goods, resulting in them eventually opting to sell scarves as a less lucrative but 'safer' enterprise. These owners were newcomers to the bazaar (investors) who had no interest in traditional forms (or authenticity). Furthermore, the owners entrusted the shop to an employee, rather than appearing on site, unlike traditional stores where the proprietor or close family members are always present. Similarly, new enterprises selling Turkish Delight (*lokum*) are run by outsiders. Several of these *lokum* shops have opened on the street with the highest rental rates, departing from the traditions of that street. But these shop-owners are not present. They run numerous outside businesses and are able to absorb the risks associated with failure. These shops' prices are high but fixed, allowing the owners to hire younger employees who are unskilled and do not have family ties of trust to the owner (normally required when prices are negotiated in the owner's absence).

Another concern expressed by shopkeepers with whom I spoke pertained to the loss of specialized knowledge flows. Compared to the challenges of selling a quality carpet, antique or leather good, minimal knowledge is required to sell a scarf or counterfeit bag. The value ascribed to artisan knowledge has thus diminished as profit motives increase. In more traditional businesses, historical values and reputation are still important. Merchants rely on their reputation, through referrals, repeat customers or guidebooks, to gather flows to their businesses. By contrast, selling souvenirs requires less technical knowledge and turnover is higher, with innovation and profitability being the main drivers. Businesses face enormous pressures to attract tourist dollars to pay for rents, which results in more aggressive marketing, including commissions to guides and touts - agents that distort natural flows. These factors result in competing cultures in the bazaar; one focused on high turnover in popular goods, and the other seeking to maintain tradition and authenticity. As material flows in the bazaar shift to meet tourism demands or satisfy profit-driven outside investors, there is growing concern that traditional values will be displaced. Shopkeepers must navigate between conflicting desires to attract tourists or repeat customers (located in main flows or specialized zones), and whether to maintain a personal relationship to their product, or shift their focus to highturnover goods.

Today's shifting architectural composition of districts reflects these competing values, with merchants adjusting their locational preferences in response to flows that are either monetary or pertain to social capital. Those merchants seeking to retain cultural traditions tend to be removed from major flows, since their reputations drive their businesses. They remain focused on a particular fitness peak. Alternately, where profit is the driving force, merchants change what they sell according to consumer trends, which results in higher turnover and swifter adaptations. Here, merchants are engaged in jumping between peaks, creating regions that display the greatest volatility and creativity.

HUBS: Intersections of CAS networks

Complex networks are characterized by different kinds of linkages where flows from various sources converge. These intersections or 'hubs' ground and orient certain kinds of behaviors. Flows intersecting at these hubs can be characterized according to the following parameters:

- A. Tacit vs. Explicit
- B. Global vs. Local.

T A C I T > (casual flows)	< E X P L I C I T (formalized flows)			
NODE	LANDMARKS (Global Pipelines)	LOBAL		
Han Courtyards Bath Houses	Mosques <i>Bedesten</i> (historically) University			
JUNCTIONS (Local Buzz)	ANCHORS	LOCAL		
Doorways/Shopfronts Coffee/Teashops Barber Shops	WC Tea Distribution Fountains/Ablution Sites			
EXPLORING NEW PEAKS (SERENDIPITY /CREATIVITY)	CLIMBING EXISTING FITNESS PEAKS (MEMORY/PROTOCOLS/ INFRASTRUCTURE)			

Table 2:

This table references particular spaces, but draws attention to their performative rather than physical attributes. Here, nodes can be regarded as physical junctures that support temporary, informal connections, but are accessible to a global range of flows. Junctions, while also characterized by the informal and local nature of the social relations they foster, tend to attract more localized flows. Both are 'third spaces',⁵⁰ connecting individuals from diverse backgrounds and supporting serendipitous interactions that may lead to innovations.

Similarly, EEG discusses the importance of 'local buzz',⁵¹ as providing tacit resources that promote interactions and prompt innovation:

Buzz consists of specific information and continuous updates of this information, intended and unanticipated learning processes in organized and accidental meetings. In this context, actors are not deliberately 'scanning' their environment in search of a specific piece of information but rather are surrounded by a concoction of rumours, impressions, recommendations, trade folklore and strategic information.⁵²

By contrast, Landmarks are the physical manifestation of weaves of thick flows that are channeled through more formalized and codified connections: the 'sacred' versus the 'profane' spaces of the city.⁵³ They channel flows that transcend day-to-day activities and permit local networks to 'jump scales', connecting to flows that operate at higher hierarchical levels.⁵⁴ Landmarks play a role analogous to 'pipelines' in EEG, acting as conduits through which global information is fed to local districts. Anchors also help preserve routine behaviors, but at the local rather than global level. The presence of local anchors means that certain tasks can be reliably outsourced, freeing agent resources to focus on discreet tasks. In the bazaar, this means that each shop does not need to provide services such as restrooms, refreshments or repair services. Instead, the work of providing these amenities can be delegated to other general service providers (located at anchor points) and accessed through the flow channels of the bazaar. Both landmarks and anchors ensure system resilience in moments of stress, preserving stable protocols and codifying reliable routines.

Interactions that promote serendipitous encounters are most valuable during times of innovation or 'exploring a fitness landscape'. By contrast, interactions that maintain memory and protocols are critical when building upon success or 'climbing a fitness peak'. Certain kinds of hubs enable informal, tentative connections to be explored at little cost. Others foster the maintenance of stabilized, routine interactions, where functions can be outsourced with no inherent risk. The presence of a variety of hubs within the urban fabric permits actors to explore and maintain networks of trust, knowledge, reciprocity and social capital.⁵⁵ These networks then fuel shops, by gathering and dispersing information, material or economic flows.

Nodes that encouraged tacit flows, such as those that historically were found in *hans*, coffeehouses, and bathhouses, have largely disappeared from the bazaar. Landmarks that once supported formalized connections have also been marginalized. Today, during the Friday call to prayer, mosques lack sufficient space to house all participants. Prayer thus occurs on the streets of the bazaar [Figure 12]. While the bazaar's mosque plays an important functional part, it lacks a strong physical presence [Figure 13]. By contrast, mosques outside the bazaar

are both functional and physical landmarks. The erosion of global Nodes and Landmarks might explain the lack of social 'glue' that is now missing from the bazaar, according to shop-owners. Many merchants with whom I spoke point to a cultural rift developing in the bazaar between relative newcomers and others who have been present for generations. Given the absence of common hubs to bridge these rifts, friction between communities may continue to grow.



Figure 12. Friday Prayer: Yağlıkçılar Caddesi. (Sharon Wohl)



Figure 13. Çakır Ağa Mosque. (Sharon Wohl)

Despite these rifts, merchants in every section of the Bazaar spoke extremely positively about their immediate region. An oft-repeated comment was that their neighborhood (an area encompassing approximately 50 shops) was 'like family'.⁵⁶ Those I interviewed knew each worker in their region and showed a preference for 'their'

neighborhood over others. While shopkeepers were familiar with individuals in their surroundings, they enjoyed close connections to only four to five of these workers, who often occupied different sectors. These connections seemed to derive from common values rather than commonalities of merchandise. Social connections appeared to develop at shifting junctions that occur on the streets, rather than in specialized locations. When business is slow, shopkeepers leave their shops but remain in close proximity to one another, engaging in conversation while keeping an eye on their store [Figure 14]. The entrances to shops thus serve as informal gathering places. When customers arrive, these tacit encounters shift to other storefronts. Merchants watch over the goods of other merchants, especially during prayer, when shops are vacated and merchandise is simply covered. One merchant I spoke with stated: 'there are ten eyes on the street, watching everything'.

For the most part, social connections in the bazaar appear to be forged through streetside encounters. These practices differ from the past, when *hans* played an important role in creating ties. Historically, *hans* served as distribution depots, acting as important Nodes within the global context of tacit networks of flows. Distributors brought goods and news from afar, which were then disseminated through local guilds. *Hans* also served religious functions, by housing ablution fountains [Figure 15]. Today, *hans* have lost many of these functions, but still provide stable local infrastructure that supports surrounding businesses. They are local Anchors that sustain various district functions - restrooms, teahouses, barbershops and repair shops [Figure 16].



Figure 14. Temporary street junction: small table and chairs serving as a temporary node. (Sharon Wohl)



Figure 15. Ablution Fountain: Bodrum Han. (Sharon Wohl)



Figure 16. Hans today: Bodrum Han. (Sharon Wohl)

Some manufacturing persists in the *hans* [Figure 17], but this has diminished as largerscale manufacturing workshops have relocated to peripheral regions. *Hans* on the streets surrounding the covered bazaar, while morphologically similar to those inside, operate differently. Whereas *hans* in the bazaar house heterogeneous shops on the main level, *hans* on the outside are more homogenous, storing and selling specific merchandise such as luggage, fabrics or silverware that is also sold in the immediate surroundings [Figure 18]. These *hans* continue to serve as major distribution points that mediate local and global flows.



Figure 17. Artisan manufacturing in Han near Grand Bazaar: located on the second level of a Han adjacent to the Grand Bazaar. (Sharon Wohl)



Figure 18. Hans outside the Bazaar: Shopping streets North of Grand Bazaar. (Sharon Wohl)

EDGES: Tags of CAS

Tags (or stigmergetic signals) within a complex system operate as labels that broadcast, display, and manifest information regarding established strategies and competencies. These signals are perceptible to other agents and inform their subsequent behaviors. Within the

context of the bazaar, tags take the form of each cell's street-frontage, where merchants display their goods.⁵⁷ Individual cells broadcast a range of signals, including the nature of work being undertaken (goods sold), popularity of merchandise (the number of visitors stopping), availability for casual interaction (whether doors are open or closed), marketing strategies (the format of items on display) and personal values (whether the space is vacated during prayer, or the nature of goods: craft versus counterfeit). Since individual street-frontages are narrow, a wide array of high-density information is available at a glance. Merchants stand or sit outside their shops, monitoring tourists and one another's business [Figures 19 and 20]. Neighbors view what is displayed, purchased, by whom and in what quantities.

As competencies and demands shift, evidence of successful product lines become embedded in these tags. The street-front displays tag the shop's merchandise and competencies [Figures 19 and 20]. This information is immediate and reliable; uncluttered by 'noise' that interferes with signal fidelity. Merchants evaluate this information and use it to develop shortcuts in their respective evolutionary strategies. EEG discusses the advantages of these ambient signals whereby, 'firms benefit from their co-location through which they are well informed about the characteristics of their competitors' products and about the quality and cost of the production factors that they use. Advantages of proximity arise from continuous monitoring and comparing.'⁵⁸



Figure 19. Casual street monitoring—'tagging' of jewelry merchandise: Kalpakçılar Caddesi. (Sharon Wohl)



Figure 20. Casual street monitoring—'tagging' of leather goods: Kürkçüler Çarsisi. (Sharon Wohl)

Tags also suggest the district's 'degree of freedom', - that is, its energetic constraints to action.⁵⁹ The maps shown previously depict how denim stores replaced quilt shops and souvenir sales edged out furniture in the bazaar. While these transitions can be attributed to a shifting marketplace (foreign tourist exports replacing domestic and household goods), the variations are constrained within certain sectors – textiles and household goods, respectively. Thus innovation is supported, but within parameters that maintain existing competencies (for example, knowledge of textile distribution or sewing techniques). Agents constrain their variations to exploit the presence of transferable routines, allowing them to refine their niche segments.

Over time, specialized tags present greater clarity regarding where particular goods can be sourced. These signals are especially valuable for visitors seeking specific goods. Tags in the bazaar act like tags in eco-systems where, for example, a patch of flowers signals a general niche, while an orchid's distinct shape alerts a particular bird to a receptive 'match' for pollination. Tags increase an environment's legibility for actors seeking specific products. That said tourist flows increasingly dominate the major arteries of the bazaar. As many of these shoppers do not have specific goals in mind, the market's major streets are becoming heterogeneous. Goal-specific tags that orient behaviors are being subsumed by mechanisms that enable random search.

DISTRICTS: Emergent features of CAS

While certain sectors of the Grand Bazaar are becoming more heterogeneous, there is an overall persistence of distinct districts. These districts correspond to the emergent structures discussed in CAS: coherent entities that develop from the bottom-up. While the bazaar has governing bodies that deal with security and repairs, there are no authorities that partition it into districts. A merchant's only constraint on locational choice is the presence of available rental space. And yet, in the absence of rules governing locational choices, distinct clusters emerge. The urban framework of the bazaar (and its environs) is due to its inherent spatial elasticity, well suited to enable this clustering. Contiguous districts expand and contract depending on each shop's market capacity. The maps above show how the jewelry district, as an example, extended to the west as its market share grew. Its success became evident through street tags, which encouraged new start-ups to enter the growing sector. This expansion could occur incrementally because of the flexibility of the underlying urban grain.

Districts expand and contract as merchants opt for one of two evolutionary tactics: developing within a successful market segment or creating a new market niche (climbing a fitness peak or jumping to a new peak). Both strategies carry advantages and risks. Souvenir shops appear relatively low-risk due to high tourist demand, but the volume of low-skilled actors competing in this sector means that individual profits might be minimal. John Holland likens this trade-off to a game, wherein players line up in a queue to collect a resource payoff: 'as the number of players in the queue increases, the payoff per individual decreases. The longer the queue (or the larger the district), the more "crowded" the niche'.⁶⁰ To avoid this problem, agents can move to queues where there are fewer resources, but also fewer competitors. Thus, while some shops deal in high volumes with relatively low-priced tourist goods, others market expensive collector items. Both survival strategies are found within ecosystems, in which some species compete for abundant food resources, while others extract scarcer but less sought-after forms. The size of the district represents the 'carrying capacity' of the queue, or the number of agents that can be supported by a particular resource segment.

In the bazaar, some streets offer total homogeneity, whereas others are punctuated by unique offerings, or 'tests' of innovative products. Recently, a series of Turkish Delight (*lokum*) shops opened on the bazaar's main silver/gold street. The appearance of these new shops exemplifies attempts by new merchants to exploit high volumes of tourist flows on this major artery. As the carrying capacity of silver/gold is reached, other strategies are tested. Thus spatial contiguity is counter-balanced by new niche tests [Figure 21]. Shop owners evaluate the potential payoff of a given queue and switch queues (test a different niche) if they believe the new one will yield greater resources. My interviews showed that within the

bazaar, almost none of the merchants who were in business for generations had remained in the same sector. Instead, switching queues has proven a common response to market forces. Morton and Küçükerman also make this observation, noting how, 'Hakan Yılmaz, [...] attributes his third generation presence [in the Bazaar] there to his adaptation abilities. First he made furniture, then he dealt with cotton textiles, and since 1995, he has been in towel manufacturing'. ⁶¹



Figure 21. Niche testing—showing a sole carpet shop amidst a row of jewelry shops: Kolancilar Kapısı. (Sharon Wohl)

Districts that flexibly expand and contract according to the market's potential not only effectively allocate resources to agents, but also create efficiencies between them. Resources regarding market trends and access to customers seeking a particular product travel more fluidly between shops in close proximity. Thus, co-located shops offering similar goods tend to gain competitive advantages over their isolated counterparts. Subsequent entrants to the market increase their chances of success when located near clusters, which prompts increasing returns and positive feedback loops for co-located groups. Studying industrial agglomerations, scholars of EEG examine these phenomena, noting:

[Firstly] geographical concentration of industrial activities can generate agglomeration economies fostering start-ups and innovation [...]. Second, geographical concentration of firms increases the level of competition and makes exits of firms raise the average fitness of routines. Third, spatial concentration of firms can also affect the opportunities of collective action as such initiatives are more likely to emerge among proximate agents that can more effectively control opportunistic behavior.⁶²

Scholars of EEG observe how: 'After a threshold (a specific number of firms in the region) has been crossed, the leading region becomes more attractive for new firms to locate there, even if these firms have other locational preferences.'⁶³ Stabilized districts then develop networks of complementary functions – tea merchants, restaurants and barbershops, for example – as synergetic clusters of functions that catalyze further economic and social transactions.

Despite such efficiencies, the erosion of district cohesion occurs (as previously mentioned) within the most touristic areas of the bazaar. Tourists engage in random searches seeking generic 'souvenirs' that can take many forms, such as carpets, scarves, lamps or ceramics. These visitors do not seek spatial cues to inform their search, which results in fewer efficiencies brought about by the clustering of sectors. By contrast, products that still cater to local flows (books) or highly specialized flows (currency exchanges), maintain greater district contiguity. Furthermore, market streets that are just north of the bazaar maintain high levels of specialization and contiguity. Shops selling military supplies, lingerie items, bedroom fabrics, prayer beads (*tesbih*) [Figure 22], ribbon supplies [Figure 23] and children's wear [Figure 24] represent a sample of the many programs that coalesce into specialized pockets. In addition, there is greater coherence of distinct *han* merchandise outside the bazaar [Figure 25]. It appears that a certain amount of repeat traffic is needed to maintain coherent districts, while areas constantly frequented by newcomers provide fewer of the benefits associated with colocation.



Figure 22. Prayer bead shops in Uzun Çarşı Caddesi, north of the bazaar. (Sharon Wohl)



Figure 23. Ribbon shops: streets north of Bazaar. (Sharon Wohl)



Figure 24. Children's wear arcade: Passage Street, North of Bazaar. (Sharon Wohl)



Figure 25. Silverware: Kalcılar Han. (Sharon Wohl)

Conclusion

This paper employs an analytical framework that treats Lynch's urban 'objects' as CAS 'operational' categories, to examine how the behaviors of Complex Adaptive Systems are supported within Istanbul's Grand Bazaar. CAS processes do appear to manifest within this area, with the urban fabric enabling complex dynamics to unfold. Individual shops – as malleable agents within this system – track an evolutionary course of testing viable strategies, and where synergies exist, develop into discernable emergent districts. The urban system's ability to develop complex operative features is supported by both the flexible and redundant nature of street networks (that allow for variations in flows), as well as the existence of urban elements that test and stabilize connections, including infrastructural anchors and informal junctions. When my mother and I stepped into this complex pattern of interacting networks and flows, we were unwittingly guided into one such juncture.

Analyzing complexity at the scale of the bazaar can only illuminate complex interactions that operate at this particular field of magnification. Considering other scales of behavior would require us to switch the depth of field of our analysis. The bazaar constitutes a complex system, but it is also a node within Istanbul's larger complexity. At the scale of the city, the bazaar is itself a landmark: a place where global forces of change conflict with local patterns of continuity.

These competing forces reverberate within the walls of the Grand Bazaar, threatening its unity. At the same time, these pressures are key to the market's ongoing transformation, innovation and renewal. While distinct districts within the bazaar have emerged in the absence of top-down control, the presence of transient user groups erodes the ongoing stability of these districts. Certain forms of local hubs remain present, but unifying global nodes and landmarks have disappeared. These changes point to a loss of common cultural values within the bazaar, a split lamented by many in the community. While many merchants expressed concern with the infiltration of cheap, mass-produced goods into the Bazaar, from a complexity perspective, the successful coexistence of mass-marketed and traditional goods is perhaps illuminating: it highlights the bazaar's inherent ability to respond to change, while maintaining stability. As one interviewee observed: 'The Bazaar is like a living organism: it keeps changing all the time'.

Continuity and change find spatial expression through an urban fabric that is able to reinforce, reproduce and relay shifting competencies. The urban landscape thus absorbs and reflects new traditions, economic patterns and cultural norms in an ongoing adaptive process that sustains and breathes life into Istanbul's Grand Bazaar.

Contributor Details

Sharon Wohl holds an MA in Architecture from the University of Manitoba. She recently began teaching in the College of Design at Iowa State University, while completing her doctorate in Spatial Planning at Delft Technical University. She previously taught urban planning and architecture at the University of Manitoba and worked with 5468796 Architecture, an award-winning Winnipeg-based practice.

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Endnotes

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³ Onur Yıldırım, 'Ottoman Guilds in the Early Modern Era', *International Review of Social History* 53, no. Supplement S16 (2008): 86.

⁴ Halil İnalcık, 'Capital Formation in the Ottoman Empire', *The Journal of Economic History* 29, no. 1 (1969): 134.

⁵ The exact number of shops in the Bazaar cannot be quantified as this continuously changes when stores subdivide or amalgamate.

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¹⁰ Eunjeong Yi, *Guild Dynamics in Seventeenth-Century Istanbul: Fluidity and Leverage* 27 (Leiden: Brill, 2004), 124.

¹¹ Mortan and Küçükerman, Istanbul and the Grand Bazaar, 57.

¹² Naseer Arafat, 'Crafts and Trade: Public Markets in Nablus', in *The Bazaar in the Islamic City*, ed. Mohammad Gharipour (Cairo: American University of Cairo Press, 2012): 177.

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¹⁶ Yi, Guild Dynamics in Seventeenth-century Istanbul, 27: 25.

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¹⁸ Yıldırım, 'Ottoman Guilds in the Early Modern Era', 74.

¹⁹ Mortan and Küçükerman, *Istanbul and the Grand Bazaar*.

²⁰ Both these maps (originally from other sources) are reproduced from: Bilge Köroğlu,

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²¹ For further discussion of this phenomena of shifting functions in Islamic Bazaars, see also: Arafat, 'Crafts and Trade: Public Markets in Nablus'; Anna Madoeuf and Marika Snider, 'New Trinkets in Old Spaces'; in *The Bazaar in the Islamic City*, ed. Mohammad Gharipour (Cairo: American University in Cairo Press, 2012).

²² The author uses a combination of information gathering methods, including a review of historical literature and academic articles (listed in citations) pertaining to the Bazaar's economic, social and cultural aspects. The author conducted ethnographic observations (between 1997-2011), remote interviews with select Bazaar Merchants in 2013, and field research and interviews in 2014, (with representatives from the markets for leather, jewelry, antiques, custom art, and carpets). Quotes from merchants are derived from either the author's formal questionnaires or cited sources. During face-to-face interviews conducted in 2014 (approximately 25 interviews with both merchants that had been in the bazaar for generations as well as relative newcomers) no verbatim records were made. The decision not to record notes directly facilitated a less formalized discussion, which note taking or recording may have hindered. The author recorded the essence of the interviews as faithfully as possible following each discussion. In addition, the author attempted to have each merchant steer the content of these discussions, in order not to bias findings.

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³¹ Albert-László Barabási and Réka Albert, 'Hierarchical organization in complex networks', *Physical Review E* 67, no. 2 (2003): 2.

³² Kevin Lynch, *The Image of the City* (Cambridge, MA: Technology Press, 1960).

³³ I should clarify that my intention here is not to provide a 'Lynchian' analysis of the Bazaar, but rather to employ Lynch's urban categories as a way to discuss the Bazaar as a CAS.

³⁴ In Lynch's original framework, edges are specified as being the boundary conditions of districts. However, the term has subsequently been employed by designers to consider characteristics of street facades that border paths. It is this usage that proves most useful for this discussion.

³⁵ Kevin Lynch, Good City Form (MIT Press, 1984), 116.

³⁶ Holland, Hidden Order, 36.

³⁷ Boschma and Frenken, 'Why Is Economic Geography Not an Evolutionary Science?': 278.
 ³⁸ See 'Sounds of Urban Life | Soul Istanbul Guide: Interview with Mehmet Güreli, Dhoku', accessed July 20, 2013, http://soundsofurbanlife.com/istanbul/istabulmeet-the-locals-dhoku-

interview-with-mehmet-gureli/.

³⁹ See Duffy Weir, 'Turkey's Time to Shine', *Specialty Retail Report*, 2012, accessed July 20, 2013, http://specialtyretail.com/issue/2012/09/retailing-locations/turkeys-time-to-shine/.
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Economics 14, no. 3 (2004): 269.

⁴¹ Dopfer, 'Micro-meso-macro'.

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⁴⁴ Mehran Kamrava, 'The Semi-Formal Sector and the Turkish Political Economy', *British Journal of Middle Eastern Studies* 31, no. 1 (May 1, 2004): 69.

⁴⁵ Kamrava, 'The Semi-Formal Sector', 68.

⁴⁶ Mortan and Küçükerman, Istanbul and the Grand Bazaar: 227.

⁴⁷ Ron Boschma and Koen Frenken, 'Applications of Evolutionary Economic Geography', *DRUID Working Papers* (2006): 6.

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⁵⁵ Ron Martin and Peter Sunley, 'Deconstructing Clusters: Chaotic Concept or Policy Panacea?', *Journal of Economic Geography* 3, no. 1 (2003): 24.

⁵⁶ I should note that this particular phrase is a common idiom within Turkish culture and should be considered within this context (thanks to the anonymous reviewer for bringing this to my attention).

⁵⁷ Originally, Grand Bazaar shops were formed of shelf-like cabinets that were attended by the merchants. It was not until the 1894 Earthquake that this physical structure shifted. At that time the deeper shops we know today were opened up, with large window displays created that echoed the format being popularized in the Pera district.

⁵⁸ Bathelt, Malmberg, and Maskell, 'Clusters and Knowledge', 36.

⁵⁹ Also referred to as 'enslavement' within a system. See: Hermann Haken, 'Synergetics', *Naturwissenschaften* 67, no. 3 (March 1980): 123.

⁶⁰ John Holland, *Signals and Boundaries: Building Blocks for Complex Adaptive Systems* (Cambridge, MA: MIT Press, 2012): 64.

⁶¹ Mortan and Küçükerman, *Istanbul and the Grand Bazaar*: 223.

⁶² Boschma and Frenken, 'Why Is Economic Geography Not an Evolutionary Science?', 294.

⁶³ Boschma and Lambooy, 'Evolutionary Economics and Economic Geography', 418.